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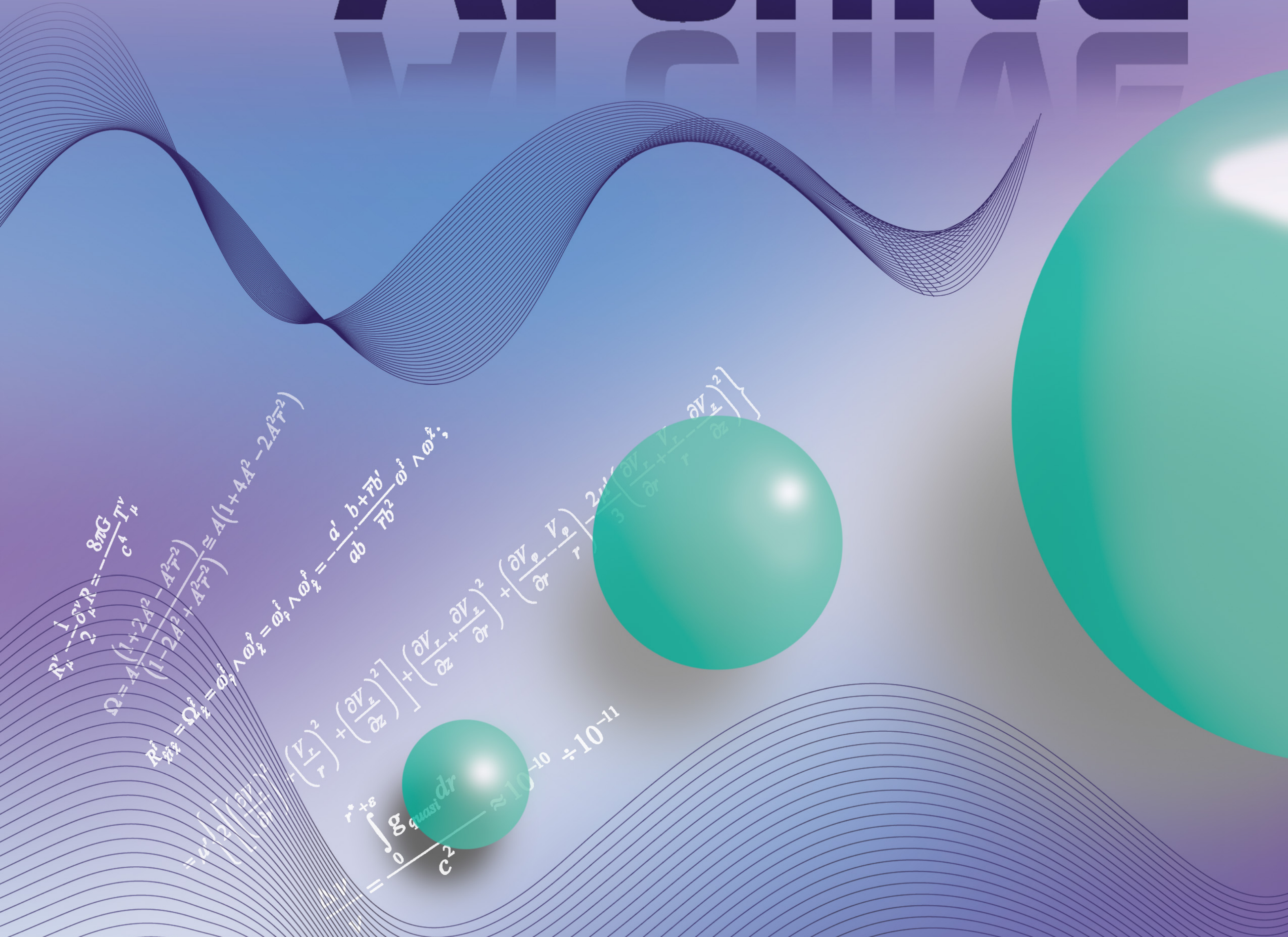

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The magnetic moment of the Lee model

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Abstract

The Lee model of the unstable particle $V \rightleftharpoons N + \Theta$, where N-particle is considered charged and $\Theta-$particle uncharged, is inserted into electromagnetic field. While the $\Theta-$particle propagates undisturbed, the N-particle is deflected by the extended photon source. The result of such process is the additional magnetic moment of the Lee particle. The Schwinger source theory is employed to present the calculation of the magnetic moment of the Lee model of the unstable particle.

1 Introduction

The Lee model of elementary particle was originally introduced by Lee (1954) as an exactly soluble and a renormalizable model that describes the interaction between pions and two neutral nucleons, where the nucleon can exist in two different intrinsic states. The particle corresponding to the Bose field is called Θ and the particles corresponding to the intrinsic states of the nucleon are called V and N particles.

The Lee unstable particle is defined by the equations

$$V \rightleftharpoons N + \Theta, \tag{1}$$

where V, N, Θ are particles, the physical characteristics of which fulfil some conservation laws.

We will suppose in this article that the particles participating in the process (1) have spin, mass and charge as follows:

$$\Theta \equiv \Theta(0,0,\mu), \quad N \equiv N\left(\frac{1}{2}, e, m\right), \quad V \equiv V\left(\frac{1}{2}, e, \kappa\right). \tag{2}$$

Although this model is not realistic, the important features of nucleon-pion system can be understood in a relatively simple way and one can get rid of the infinities without applying perturbation theory techniques. Moreover, the complete non-relativistic version of this model that describes one heavy particle sitting at some fixed point interacting with a field of non-relativistic bosons is as important as its relativistic counterpart.

2 Source theory

Source theory (Schwinger, 1970; Schwinger et al., 1976; Dittrich, 1978) was initially constructed for description of the particle physics situations occurring in the high-energy physics experiments. However, it was found that the original formulation simplifies the calculations in the electrodynamics and gravity where the interactions are mediated by photon, or, graviton respectively, where the source theory of gravity forms the analogue of quantum electrodynamics where in QED the interaction is mediated by the photon (with spin 1) and the gravitational interaction is mediated by the graviton (with spin 2) (Schwinger, 1970). The basic formula in the source theory is the vacuum-to-vacuum amplitude (Schwinger, 1970; Schwinger et al., 1976):

$$\langle 0_+ | 0_- \rangle = e^{\frac{i}{\hbar} W(S)}, \tag{3}$$

where the minus and plus tags on the vacuum symbol are causal labels, referring to any time before and after space-time region where sources are manipulated. The exponential form is introduced with regard to the existence of the physically independent experimental arrangements which has a simple consequence that the associated probability amplitudes multiply and corresponding W expressions add (Schwinger, 1970; Schwinger et al., 1976).

Source theory has a number of important advantages over standard quantum field theory. There are no ultraviolet divergences, no asymptotic states and no adiabatic hypothesis with the inevitable difficulties in adiabacity. The diagrams in this theory have immediate physical meaning.

The source theory version of quantum field theory enables to construct vacuum amplitudes and field equations for particles with arbitrary spins. The question arises how to extend the formalism in order to involve the specific experimental situation in particle physics. This situation is characterized by the phenomenological definition of the elementary particle. The elementary particle as such is defined only by the collision that create it. Although we do not know the details of how a particle is created, we recognize the production of the particle in a collision process as the result of a transfer of certain characteristic as energy, charge, spin etc. to the particle of interest. All the other particles are present to supply the net balance i.e. all the other particles act as the source of the particle of interest. They form so called the emission source.

We unite axiomatically the emission and the absorption sources under general heading of source $S(x)$ and this operation forms one of the postulates of the source theory.

Source $S(x)$ can be obviously defined indirectly through its effectiveness to create a particle similarly to the electric field which is defined how it acts on a charge. $S(x)$ is then a numerical measure that describes where the collision act occurs distributed in space-time.

The distribution of the collision process in momentum space is $S(p)$, and $S(x)$ and $S(p)$ are complementary aspects of the same source. They are related by a Fourier transform

$$S(p) = \int (dx)\, S(x) e^{-ipx}, \tag{4}$$

where the notation and metrics was used as follows:

$$(dx) = dx^0 dx^1 dx^2 dx^3; \quad x = (ct, \mathbf{x}) = (x^0, \mathbf{x}) = (-x_0, \mathbf{x})$$

$$px = \mathbf{p} \cdot \mathbf{x} - p^0 x^0. \tag{5}$$

We distinguish the strong sources and the weak ones. The strong source emits several particles during one act, while the weak source is defined as the source which creates only one particle.

Scalar particles are created by the scalar sources; vector, tensor and spinor particles are created by the vector , tensor and the spinor sources.

The neutral particles are described by the real sources, while charged particles are described by the complex sources.

Every collision process involves three elementary events. The emission of particle (or, particles), its propagation in space and the detection of the particle.

The vacuum amplitude ought to involve these particular subprocesses in order to describe the physical reality correctly. Let us show the decomposition of the vacuum amplitude in order to involve emission, propagation and detection of a particle.

$W(K)$ in (3) is action which for the noninteracting spinless particles has the following form:

$$W(K) = \frac{1}{2}\int (dx)(dx')K(x)\Delta_+(x-x')K(x'), \tag{6}$$

where $K(x)$ is the scalar source and $\Delta_+(x-x')$ is the propagation function which propagates the source effect from x' to x. It is symmetrical in x and x', or,

$$\Delta_+(x-x') = \Delta_+(x'-x). \tag{7}$$

Now, let us consider the causal arrangement in which particles are created by source K_2, propagate in space-time and then are detected by source K_1 which is localized later in time than source K_2. Then, if we consider the case of the weak source, i.e. only one particle can be created or annihilated by a source, then, we write the vacuum persistence probability amplitude in the form:

$$\langle 0_+|0_-\rangle^K = \langle 0_+|0_-\rangle^{K_1}\langle 0_+|0_-\rangle^{K_2} + \sum_p \langle 0_+|1_{p-}\rangle^{K_1}\langle 1_{p+}|0_-\rangle^{K_2}, \tag{8}$$

where $\langle 1_{p_+}|0_-\rangle^{K_2}$ is the probability amplitude of creation of the particle with momentum p and $\langle 0_+|1_{p_-}\rangle^{K_1}$ is the probability amplitude of annihilation of the particle with momentum p. We will show that the decomposition of the vacuum amplitude (8) is equivalent with the original amplitude (3) after suitable definition of the partial amplitudes in eq. (8) and accepting some postulates which are fundamental ingredients of the source theory.

In the source theory only the total source

$$K = K_1 + K_2 \tag{9}$$

is of the physical significance which follows from the postulate of the space-time conformity of sources (Schwinger, 1970). Then, the weak source limit of the vacuum persistence amplitude follows from formula (8) in the form:

$$\langle 0_+|0_-\rangle^K \approx 1 + \frac{i}{2}\int (dx)(dx')K_1(x)\Delta_+(x-x')K_1(x') \quad +$$

$$\frac{i}{2}\int (dx)(dx')K_2(x)\Delta_+(x-x')K_2(x') \quad +$$

$$i\frac{1}{2}\int (dx)(dx')K_1(x)\Delta_+(x-x')K_2(x'). \tag{10}$$

For the weak source limit we can also write

$$\langle 0_+|0_-\rangle \approx 1 + f(K); \quad |f(K)| \ll 1; \quad f(0) = 0 \tag{11}$$

and introducing definitions

$$\langle 1_p|0_-\rangle \stackrel{d}{=} iK_p = i\sqrt{d\omega_p}K(p) \tag{12}$$

$$\langle 0_+|1_p\rangle \stackrel{d}{=} iK_p^* = i\sqrt{d\omega_p}K(-p), \tag{13}$$

where * denotes operation of complex conjugation, we have instead of eq. (10):

$$\langle 0_+|0_-\rangle \approx 1 + f(K_1) + f(K_2) + \sum_p iK_p^* iK_p \quad =$$

$$1 + f(K_1) + f(K_2) + \sum_p i\sqrt{d\omega_p}K_1(-p)i\sqrt{d\omega_p}K_2(p). \tag{14}$$

The quantity $d\omega_p$ is defined as

$$d\omega_p = \frac{(d\mathbf{p})}{(2\pi)^3}\frac{1}{2p^0}; \quad p^0 = +\sqrt{(\mathbf{p}^2 + m^2)} \tag{15}$$

and it represents the invariant measure in momentum space.

3 Modified propagation function for scalar particles

When a source emits enough energy to produce a particle, the two-particle emission can occur and the two-particle exchange between sources. We will here assume the two-particle emission is caused by the interaction which can be described by the interaction Lagrangian. The mathematical structure of such Lagrangian depends on the physical model which is either realistic i.e. correctly reflecting the physical reality, or instructive, clarifying the substance of the theory.

In this section we will consider the instructive model with the interaction Lagrangian (Dittrich, 1974; 1978)

$$\mathcal{L}_{int} = g\psi^*\psi\varphi, \tag{16}$$

which replaces the more realistic Lagrangians. The symbol g in eq. (1) is the coupling constant, field ψ has mass m, μ is mass corresponding to the field φ and sources corresponding to ψ^*, ψ and φ are H^*, H and K.

It is obvious that the two-particle exchange between sources is the integral part of the one-particle exchange which leads to the modification of the propagation function (propagator) of the free particle. In our case we shall consider the modification of the μ-particle propagator, assuming the two-particle exchange will be realized by ψ-particles. The two-particle system has mass that ranges from $2m$ to ∞. Though we are here restricted to $\mathcal{L}_{int}$ given by eq.(16), the generalization for the different interactions can be obtained by some analogy.

The action corresponding to the scalar fields ψ^*, ψ, φ with the interaction Lagrangian (16) is as follows:

$$W = \int (dx) \left[K\varphi + H^*\psi + H\psi^* + \mathcal{L}\right], \tag{17}$$

where

$$\mathcal{L} = -\frac{1}{2}\left[(\partial\varphi)^2 + \mu^2\varphi^2\right] - \left[(\partial\psi^*)(\partial\psi) + m^2\psi^*\psi\right] + g\psi^*\psi\varphi. \tag{18}$$

The principle of the stationary action then implies the following set of the coupled field equations:

$$(-\partial^2 + m^2)\psi(x) = H(x) + g\psi(x)\varphi(x) \tag{19}$$

$$(-\partial^2 + m^2)\psi^*(x) = H(x)^* + g\psi^*(x)\varphi(x) \tag{20}$$

$$(-\partial^2 + \mu^2)\varphi(x) = K(x) + g\psi^*(x)\varphi(x). \tag{21}$$

For $g = 0$ we obtain the free theory, or in other words, the particles traveling without interaction.

Such situation is involved in the amplitude

$$\langle 0_+|0_-\rangle^{K,H,H^*} = \langle 0_+|0_-\rangle^{K}\langle 0_+|0_-\rangle^{H,H^*} \quad =$$

$$\exp\left\{\frac{i}{2}K\Delta_+^{\mu}K\right\}\exp\left\{iH^*\Delta_+^{m}H\right\}. \tag{22}$$

Expanding eq. (22) in a series and adding the absorption and emission indexes 1 and 2 to the fields and sources, we can write:

$$\langle 0_+|0_-\rangle = -\int(dx)(dx')\psi_1^*(x)H_2(x)H_2^*(x')\psi_1(x'), \tag{23}$$

where the amplitude (23) corresponds to the situation where source $H_2H_2^*$ emits couple of particles with fields ψ_1^* and ψ_1. The vacuum amplitude generated by expansion of $\exp\left\{(i/2)\int(dx)\mathcal{L}_{int}\right\}$ is on the other hand equal to

$$\langle 0_+|0_-\rangle = ig\int(dx)\psi_1^*(x)\psi_1(x)\varphi_2(x). \tag{24}$$

After comparison of eq. (23) with eq. (24) we get the relation for so-called effective source $H_2H_2^*$ as follows:

$$iH_2(x)H_2^*(x')|_{eff\ emiss} = g\delta(x-x')\varphi_2(x). \tag{25}$$

We can picture the process of the two-particle emission by the effective source by means of the diagram. Circle represents there source, thin lines represent the causal propagation of real particles and the heavy line indicates the non-causal propagation of a virtual particle. Time is read vertically.

For the two-particle absorption, we get by the analogical procedure so called effective absorption source and its mathematical form is the following one (Dittrich, 1974; 1978):

$$iH_1(x)H_1^*(x')|_{eff\ abs} = g\delta(x-x')\varphi_1(x). \tag{26}$$

Unifying the process of emission and absorption, we get the real process consisting of the two-particle exchange between sources.

The two-particle exchange between effective sources is obviously involved in the vacuum amplitude

$$\langle 0_+|0_-\rangle = \exp\left\{i\int H_1^*\Delta_+^m H_2\right\}\exp\left\{i\int H_1\Delta_+^m H_2^*\right\}, \tag{27}$$

because the following formula can be extracted from its expansion:

$$\langle 0_+|0_-\rangle = \int iH_1^*(x)H_1(y)|_{eff\ abs}\Delta_+^m(x-x') \quad \times$$

$$\Delta_+^m(y-y')iH_2^*(x')H_2^*(y')|_{eff\ emiss}, \tag{28}$$

where we have introduced the effective sources.

Inserting relations (25) and (26) into eq. (28) we get the following mathematical form of the vacuum to vacuum amplitude for the two-particle exchange between effective sources:

$$\langle 0_+|0_-\rangle = g^2\int (dx)(dx')\varphi_1(x)\left[\Delta_+^m(x-x')\right]^2\varphi_2(x), \tag{29}$$

which may be easily interpreted as the process of emission, propagation and absorption of the particle with mass μ by the field φ acting here as a source.

For the causal arrangement of sources, i.e. $x^0 > x'^0$, we get:

$$\left[\Delta_+^m(x-x')\right]^2 = \left[\int id\omega_p e^{ip(x-x')}\right]^2 = -\int d\omega_p d\omega_{p'}e^{i(p+p')(x-x')} \quad =$$

$$-\int d\omega_p d\omega_{p'}e^{ik(x-x')}(2\pi)^3\delta(p+p'-k)\frac{(dk)}{(2\pi)^3}, \tag{30}$$

where we have inserted the unit factor 1 represented as

$$1 = \int (2\pi)^3\delta(p+p'-k)\frac{(dk)}{(2\pi)^3}. \tag{31}$$

Supposing that k is the four-momentum or the virtual photon, we have

$$-k^2 = M^2 > (2m)^2 \tag{32}$$

from which follows

$$2k^0dk^0 = dM^2, \tag{33}$$

which gives

$$\frac{(dk)}{(2\pi)^3} = \frac{d\mathbf{k}}{(2\pi)^3}dk^0 = \frac{d\mathbf{k}}{(2\pi)^3}\frac{1}{2k^0}dM^2 = d\omega_k dM^2. \tag{34}$$

Using the last relations, we can write ($x^0 > x'^0$):

$$[\Delta_+^m(x-x')]^2 = i\int dM^2 id\omega_k e^{ik(x-x')} d\omega_p d\omega_{p'} (2\pi)^3 \delta(p+p'-k) =$$

$$i\int dM^2 \Delta_+(x-x', M^2) d\omega_p d\omega_{p'} (2\pi)^3 \delta(p+p'-k), \qquad (35)$$

where we have used relation

$$i\int id\omega_k e^{ik(x-x')} = \Delta_+(x-x', M^2). \qquad (36)$$

The last integral in (35) is a function of M^2. In order to evaluate it, we have possibility to evaluate it in the rest frame of k, or, in other words for $k^0 = 0$. Then,

$$\mathbf{p} + \mathbf{p}' = 0; \quad p^0 = p'^0 = \sqrt{|\mathbf{p}|^2 + m^2} = \frac{M}{2}; \quad -k^2 = M^2. \qquad (37)$$

Then, we get for this integral

$$f(M^2) = \int d\omega_p d\omega_{p'} (2\pi)^3 \delta(p+p'-k) = \frac{1}{(4\pi)^2}\left(1 - \frac{4m^2}{M^2}\right)^{1/2}. \qquad (38)$$

The formula (35) does not involve the mathematical procedure called the space-time extrapolation. This procedure involves the operational content consisting in replacing the $\Delta_+(x-x', M^2)$ in (35) by the modified function

$$\Delta_+(x-x', M^2) = \int \frac{(dk)}{(2\pi)^4} \frac{e^{ik(x-x')}}{k^2 + M^2 - i\varepsilon}, \qquad (39)$$

where C. T. is so called contact term and it will be determined later. For the square $[\Delta_+^m(x-x')]^2$, we get:

$$[\Delta_+^m(x-x')]^2 = \frac{i}{(4\pi)^2}\int \left[1 - \left(\frac{2m}{M}\right)^2\right]^{1/2} \Delta_+(x-x', M^2) dM^2. \qquad (40)$$

Finally, we get the vacuum-vacuum amplitude corresponding to the two-particle exchange between sources in the following form transformed into the momentum space:

$$\langle 0_+|0_-\rangle = \frac{i}{(4\pi)^2} g^2 \quad \times$$

$$\int dM^2\sqrt{1-\frac{4m^2}{M^2}}\,\frac{(dk)}{(2\pi)^4}\varphi_1(-k)\left(\frac{1}{k^2+M^2-i\varepsilon}+C.T.\right)\varphi_2(k). \tag{41}$$

Using field source equations

$$\varphi_2(k)=\frac{1}{k^2+\mu^2-i\varepsilon}K_2(k) \tag{42a}$$

$$\varphi_1(-k)=\frac{1}{k^2+\mu^2-i\varepsilon}K_1(-k) \tag{42b}$$

we get after insertion of (42a, 42b) in the vacuum-vacuum amplitude (41)

$$\langle 0_+|0_-\rangle = i\int\frac{(dk)}{(2\pi)^4}K_1(-k) \quad \times$$

$$\frac{g^2}{(4\pi)^2}dM^2\sqrt{1-(2m/M)^2}\left[\frac{1}{(k^2+\mu^2)^2}\,\frac{1}{k^2+M^2-i\varepsilon}\right]K_2(k), \tag{43}$$

which indicates about double poles in $k^2 = -\mu^2$. We shall see in the following text that the unacceptable poles can be suppressed by the suitable choosing of the contact term.

The vacuum amplitude for the free μ-particle is

$$\langle 0_+|0_-\rangle^{(0)} = i\int\frac{(dk)}{(2\pi)^4}K_1(-k)\Delta_+^{\mu}(k)K_2(k), \tag{44}$$

which forms together with the amplitude (43) the total vacuum-to-vacuum amplitude involving the two-particle exchange between effective sources. The explicit form of this amplitude is as follows:

$$\langle 0_+|0_-\rangle \quad = i\int\frac{(dk)}{(2\pi)^4}K_1(-k) \quad \times$$

$$\left[\Delta_+^{\mu}(k)+\frac{g^2}{(4\pi)^2}\int dM^2 I(M^2)\frac{1}{(k^2+\mu^2)^2}\,\frac{1}{k^2+M^2-i\varepsilon}\right]K_2(k), \tag{45}$$

where

$$I(M^2)=\sqrt{1-\left(\frac{2m}{M}\right)^2}. \tag{46}$$

From eq. (45) we can extract the total μ-propagation function involving the two-particle exchange process in the form:

$$\tilde{\Delta}_+^\mu(k) = \frac{1}{k^2+\mu^2-i\varepsilon} + \frac{1}{k^2+\mu^2-i\varepsilon} M(k^2) \frac{1}{k^2+\mu^2-i\varepsilon}, \qquad (47)$$

where

$$M(k^2) = \frac{g^2}{(4\pi)^2} \int_{(2m)^2}^{\infty} dM^2 I(M^2) \left(\frac{1}{k^2+M^2-i\varepsilon} + C.T. \right). \qquad (48)$$

As $M(k^2)$ does not vanish at $k^2 = -\mu^2$ which means that the behavior of propagation function is drastically modified in neighborhood $k^2 = -\mu^2$. This contradicts the phenomenological basis of the theory. But on the other hand, the source couplings that are inferred through space-time extrapolation of causal arrangement can always be supplemented by contact interactions. Unless additional physical considerations adduced, the contact terms can be omitted. In our case they play the role of suppressing the singularities in the neighborhood of $k^2 = -\mu^2$. The natural requirement is

$$M(k^2) = 0; \quad \frac{\partial M(k^2)}{\partial k^2} = 0; \quad \text{for} \quad k^2 = -\mu^2, \qquad (49)$$

which can be achieved by

$$C.T. = -\frac{1}{M^2+\mu^2-i\varepsilon} + \left(\frac{k^2+\mu^2}{M^2-\mu^2} \right)^2, \qquad (50)$$

which gives

$$M(k^2) = (k^2+\mu^2) \frac{g^2}{(4\pi)^2} \quad \times$$

$$\int_{(2m)^2}^{\infty} dM^2 I(M^2) \frac{1}{(M^2-\mu^2)^2} \, \frac{1}{k^2+M^2-i\varepsilon}. \qquad (51)$$

Then, the μ-particle propagator function is of the form

$$\tilde{\Delta}_+^\mu(k) = \frac{1}{k^2+\mu^2-i\varepsilon} \quad +$$

$$\frac{g^2}{(4\pi)^2} \int_{(2m)^2}^{\infty} dM^2 I(M^2) \frac{1}{(M^2-\mu^2)^2} \frac{1}{k^2+M^2-i\varepsilon}, \qquad (52)$$

or, in the configuration space

$$\tilde{\Delta}_+^{\mu}(x-x') = \Delta_+^{\mu}(x-x') \quad +$$

$$\frac{g^2}{(4\pi)^2}\int_{(2m)^2}^{\infty} dM^2 I(M^2)\frac{1}{(M^2-\mu^2)^2}\Delta_+(x-x';M^2). \tag{53}$$

4 The Lee model in the electromagnetic field

We follow here the article by author (Pardy, 1979) with the elimination of the typographical errors. So, we use the following notation for the corresponding fields, sources and the Green functions (propagators):

$$\Theta \equiv \Theta(\varphi, J, \Delta_+), \quad N \equiv N(\psi, \eta, G_+), \quad V \equiv V(\chi, \zeta, G_+^{\kappa}). \tag{54}$$

The action W in the fundamental source ansatz

$$\langle 0_+|0_-\rangle = e^{\frac{i}{\hbar}W(S)}, \tag{55}$$

is

$$W = W(\zeta, \eta, J) = \int (dx)\left\{\chi(x)\gamma^0\zeta(x) + \zeta(x)\gamma^0\chi(x) + \right.$$

$$\left.\psi(x)\gamma^0\eta(x) + \eta(x)\gamma^0\psi(x) + \varphi^*(x)J(x) + J^*(x)\varphi(x) + \mathcal{L}\right\}, \tag{56}$$

where

$$\mathcal{L} = \mathcal{L}_0 + \mathcal{L}_{int} \tag{57}$$

and

$$\mathcal{L}_0 = \chi\gamma^0\left(\gamma\frac{1}{i}\partial + \kappa\right)\chi + \psi\gamma^0\left(\gamma\frac{1}{i}\partial + m\right)\psi + \left(\partial\varphi^*\partial\varphi + \mu^2\varphi^*\varphi\right), \tag{58}$$

$$\mathcal{L}_{int} = -g(\psi\gamma^0\varphi\chi + \chi\gamma^0\varphi\psi), \tag{59}$$

The differential equations for χ, ψ, φ follow from the variation of W. Their integral representations are as follows:

$$\chi(x) = \int (dx')G_+^{\kappa}(x-x')\zeta(x') \tag{60a}$$

$$\psi(x) = \int (dx')G_+(x-x')\eta(x') \tag{60b}$$

$$\varphi(x) = \int (dx')\Delta_+(x-x')J(x'). \tag{60c}$$

where the causal Green functions $G_+^\kappa, G_+, \Delta_+$ obey equations

$$\left(\gamma\frac{1}{i}\partial + \kappa\right) G_+^\kappa(x-x') = \delta(x-x') \tag{61a}$$

$$\left(\gamma\frac{1}{i}\partial + m\right) G_+(x-x') = \delta(x-x') \tag{61b}$$

$$\left(-\partial^2 + \mu^2\right) \Delta_+(x-x') = \delta(x-x'). \tag{61c}$$

Now, we have in hands all the most important relations and we can approach derivation of the propagation function corresponding the process of emission and absorption (1).

5 The V-particle propagation function

The interaction term $\mathcal{L}_{int}$ involves the interaction which changes the motion of the free V-particle and leads therefore to the modification of the V-propagation function. The considered process includes the emission and the absorption. First, we will consider the emission.

5.1 EMISSION

The process

$$V \to N + \Theta \tag{62}$$

represents the emission of the N and Θ -particles by the V-particle.

In the language of the source theory the process (62) has the following physical meaning: the extended V-particle source created N and θ-particles by emitting the time-like momentum P.

The vacuum amplitude of the process (62) is

$$\langle 0_+|0_-\rangle^{\eta J} = \langle 0_+|0_-\rangle^{\eta}\langle 0_+|0_-\rangle^{J}, \tag{63}$$

where

$$\langle 0_+|0_-\rangle^{\eta} = e^{i\int (dx)(dx')\eta(x)\gamma^0 G_+(x-x')\eta(x')} \tag{64}$$

$$\langle 0_+|0_-\rangle^{J} = e^{i\int (dx)(dx')J^*(x)\Delta_+(x-x')J(x')}. \tag{65}$$

On the other hand, the first term in $\mathcal{L}_{int}$ describes of the emission of N- and $\Theta-$particles. Therefore

$$\langle 0_+|0_-\rangle = e^{-ig\int(dx)(dx')\psi(x)\gamma^0\varphi^*(x)\chi(x')}. \tag{66}$$

Expanding eqs. (63) and (66) gives for comparison:

$$\langle 0_+|0_-\rangle_{emission} = (-i)^2 \int (dx)(d\xi)\psi(x)\gamma^0\eta(x)\varphi^*(\xi)J(\xi) \tag{67}$$

and

$$\langle 0_+|0_-\rangle_{emission} = -ig\int (dx)\psi(x)\gamma^0\varphi^*(\xi)\chi(x). \tag{68}$$

After transition to the effective sources

$$J(\xi)\eta(x) \to J(\xi)\eta(x)|_{eff.} \tag{69}$$

and putting

$$iJ(\xi)\eta(x) \to iJ(\xi)\eta(x)|_{eff.emission} = -g\delta(x-\xi)\chi(x) \tag{70}$$

we get the vacuum amplitudes (67) and (68) are equal. Obviously, the momentum representation of eq. (19) is as follows:

$$iJ(k)\eta(p)|_{eff.emission} = -g\chi(P), \tag{71}$$

where

$$\eta(p) = \int (dx)e^{-ipx}\eta(x) \tag{72}$$

$$J(k) = \int (d\xi)e^{-ik\xi}J(\xi) \tag{73}$$

$$P = p + k. \tag{74}$$

In connection with eq. (74) we still define a quantity M by relation:

$$-P^2 = M^2 \tag{75}$$

5.2 ABSORPTION

We mean the process

$$N + \Theta \to V. \tag{76}$$

The second term in $\mathcal{L}_{int}$

$$-g\int(dx)\chi(x)\gamma^0\varphi(x)\psi(x) \tag{77}$$

involves the process (74). Thus we have to compare

$$\langle 0_+|0_-\rangle^{\eta J} = \langle 0_+|0_-\rangle^{\eta}\langle 0_+|0_-\rangle^{J} \tag{78}$$

with

$$\langle 0_+|0_-\rangle = e^{-g\int(dx)\chi(x)\gamma^0\varphi(x)\psi(x)}, \tag{79}$$

or,

$$\langle 0_+|0_-\rangle_{absorption} = (-i)^2\int(dx)(d\xi)J^*(\xi)\eta(x)\gamma^0\varphi(\xi)\psi(\xi) \tag{80}$$

and

$$\langle 0_+|0_-\rangle_{absorption} = -ig\int(dx)\chi(x)\gamma^0\varphi(x)\psi(x). \tag{81}$$

After transition to the effective sources

$$J^*(x)\eta(x)\gamma^0 \to J^*(\xi)\eta(x)\gamma^0|_{eff.}, \tag{82}$$

where we put

$$iJ^*(\xi)\eta(x)\gamma^0|_{eff.absorption} = -g\delta(x-\xi)\chi(x)\gamma^0 \tag{83}$$

we get the vacuum amplitudes (80) and (81) are equal. Obviously, the momentum representation of eq. (70) is as follows:

$$iJ^*(-k)\eta(-p)\gamma^0 = -g\chi(-P), \tag{84}$$

Now, in view of the fact we are able to describe the process of emission and absorption, we can describe the total process (1) as it represents the causal arrangement of eq. (11) and eq. (25). The vacuum amplitude of such causal arrangement for $x^0 \geq x'^0, \xi^0 \geq \xi'^0$ is the following

$$\langle 0_+|0_-\rangle|_{causal} = \int(dx)(dx')(d\xi)(d\xi')\times$$

$$\left[iJ(\xi)\eta(x)\gamma^0\right]_{eff.abs.}G_+(x-x')\Delta_+(x-x')[iJ(\xi')\eta(x')\gamma^0]_{eff.emiss}. \tag{85}$$

Or, using eq.(70) and eq. (83), we have

$$\langle 0_+|0_-\rangle|_{causal} = g^2\int(dx)(dx')\chi(x)\gamma^0 G_+(x-x')\Delta_+(x-x')\chi(x'). \tag{86}$$

At this stage, we can approach the determination of the causal vacuum amplitude for the V-particle moving in the electromagnetic field.

6 The V-particle in the electromagnetic field

If electromagnetic field is present, the following transformations of the Green functions and wave function must be used:

$$G_+(x-x') \to G_+^A(x-x') \tag{87a}$$

$$\Delta_+(x-x') \to \Delta_+^A(x-x') \tag{87b}$$

$$\chi(x-x') \to \chi_+^A(x-x'). \tag{87c}$$

However, $\Delta_+(x-x') = \Delta_+^A(x-x')$ because $\Theta-$particle is neutral, So, we have for the vacuum amplitude (86) the formula:

$$\langle 0_+|0_-\rangle \to= g^2 \int (dx)(dx')\chi^A(x)\gamma^0 G_+^A(x-x')\Delta_+(x-x')\chi^A(x'), \tag{88}$$

where $G_+^A(x-x')$ is given by the formula (Schwinger, 1973)

$$G_+^A(x-x') =$$

$$\int \frac{(dp)}{(2\pi)^4} e^{ieq\int_{x'}^{x} d\xi^\mu A_\mu(\xi)} e^{ip(x-x')}(m-\gamma p)\frac{1}{p^2+m^2-eq\sigma F - i\varepsilon}. \tag{89}$$

Let us remark that from relation (89) follows, that the Green function of a charged particle in electromagnetic field is formed from the Green function of the free particle by multiplying the latter by the factor

$$\Phi = e^{ieq\int_{x'}^{x} d\xi^\mu A_\mu(\xi)} \tag{90}$$

and the transformations

$$m^2 \to m^2 - \delta; \quad \delta = eq\sigma F; \quad \sigma F = \frac{1}{2}\sigma^{\mu\nu}F_{\mu\nu}. \tag{91}$$

7 Determination of $G_+(x-x')\Delta_+(x-x')$

We shall use this fact in determination of $G_+^A(x-x')\Delta_+(x-x')$ in eq. (88). For $x^0 \quad \geq \quad x'^0$ we have (Schwinger, 1973):

$$\Delta_+(x-x') = i\int d\omega_k e^{ik(x-x')} \tag{92}$$

$$G(x-x') = i\int d\omega_p e^{ip(x-x')}(m-\gamma p), \tag{93}$$

where

$$d\omega_k = \frac{(d\mathbf{k})}{(2\pi)^3}\frac{1}{2k^0} \tag{94a}$$

$$d\omega_p = \frac{(d\mathbf{p})}{(2\pi)^3}\frac{1}{2p^0}. \tag{94b}$$

Eqs. (82) and (83) give

$$G_+(x-x')\Delta_+(x-x') = (i)^2\int d\omega_p d\omega_k e^{i(p+k)(x-x')}(m-\gamma p). \tag{95}$$

From the spectral requirements

$$-P^2 = M^2, \quad P = p+k, \tag{96}$$

we have for the three-dimensional momentum

$$d(P^0)^2 = -dM^2 \tag{97}$$

and

$$\frac{(dP)}{(2\pi)^3} = d\omega_p dM^2. \tag{98}$$

Using identity

$$1 = \int (2\pi)^3\delta(P-p-k)\frac{(dP)}{(2\pi)^3} = \int d\omega_P dM^2(2\pi)^3\delta(P-p-k) \tag{99}$$

we get

$$G_+(x-x')\Delta_+(x-x') =$$

$$\int d\omega_P d\omega_k dM^2(2\pi)^3\delta(P-p-k)e^{i(P+k)(x-x')}(m-\gamma p). \tag{100}$$

After performing k and p integration in the last formula, we have:

$$G_+(x-x')\Delta_+(x-x') = \int d\omega_P dM^2 e^{iP(x-x')}F(P), \tag{101}$$

where

$$F(P) = \frac{1}{(2\pi)^2}\left(m - \frac{M^2+m^2-\mu^2}{2M^2}\gamma P\right) \quad \times$$
$$\left[1-\frac{(m+\mu)^2}{M^2}\right]^{1/2}\left[1-\frac{(m-\mu)^2}{M^2}\right]^{1/2}. \tag{102}$$

8 The space-time extrapolation and determination of $G_+^A(x-x')\Delta_+(x-x')$

During the derivation of $G_+(x-x')\Delta_+(x-x')$ it was assumed that $x^0 \geq x'^0$ i.e. the detection source was in time later than the emission one. The generalization of this assumption was enabled the source theoretical axiom called space-time extrapolation (Schwinger, 1973). We mean by the space-time extrapolation the transformation

$$\int d\omega_p d\omega_k e^{iP(x-x')} \to \Delta_+(x,x',M^2), \tag{103}$$

where

$$\Delta_+(x,x',M^2) = \int \frac{(dP)}{(2\pi)^4}e^{iP(x-x')}\frac{1}{P^2+M^2-i\varepsilon}. \tag{104}$$

After insertion of eq. (103) in to eq. (101), we have

$$G_+(x-x')\Delta_+(x-x') \to \int dM^2 F(P)\Delta_+(x,x',M^2), \tag{105}$$

where $F(P)$ is given by eq. (102). As we have remarked in section 4. we can obtain the product $G_+^A(x-x')\Delta_+(x-x')$, which involves the electromagnetic field, from the field product $G_+(x-x')\Delta_+(x-x')$ by multiplication by the factor

$$\Phi = e^{ieq\varphi(x,x')} \tag{106}$$

and using transformation

$$m^2 \to m^2 - \delta; \quad \delta = eq\sigma F; \quad \sigma F = \frac{1}{2}\sigma^{\mu\nu}F_{\mu\nu} \tag{107}$$

in $G_+(x-x')\Delta_+(x-x')$. In such a way we have:

$$G_+^A(x-x')\Delta_+(x-x') =$$

$$\Phi \int dM^2 F(P)\Delta_+(x,x',M^2)|_{m^2\to m^2-\delta, M^2\to M^2-\delta} \tag{108}$$

and after modification

$$G_+^A(x-x',m^2)\Delta_+(x-x',\mu^2) \to$$

$$\to \Phi \int dM^2 \left\{ \left(m - \frac{M^2+\sqrt{\alpha\beta}}{2M^2}\gamma\Pi \right) + \frac{M^2+\sqrt{\alpha\beta}}{2M^4}\gamma\Pi\delta \right\}$$
$$\times \quad (I(0)+I'(0)\delta)(\Delta_+(x-x',M^2-\delta), \tag{109}$$

where

$$\alpha = (m+\mu)^2; \quad \beta = (m-\mu)^2 \tag{110}$$

$$I = \left(\frac{1}{4\pi}\right)^2 \left[1 - \frac{\alpha-\delta}{M^2-\delta}\right]^{1/2} \left[1 - \frac{\beta-\delta}{M^2-\delta}\right]^{1/2} \tag{111}$$

$$I(0) = I|_{\delta\to 0}; \quad I'(0) = \frac{dI}{d\delta}|_{\delta\to 0}. \tag{112}$$

In the presence of electromagnetic field we put

$$\gamma P \to \gamma\Pi, \quad \Pi = p - eqA \tag{113}$$

and using relation

$$\Phi\Delta_+(x-x',M^2-\delta) \to \frac{1}{-(\gamma\Pi)^2+M^2-i\varepsilon} \tag{114}$$

we have to the first power of δ

$$G_+^A(x-x')\Delta_+(x-x') \quad \to$$

$$\int dM^2 \left[m - \frac{M^2+\sqrt{\alpha\beta}}{2M^2}\gamma\Pi \right] I(0)\frac{1}{-(\gamma\Pi)^2+M^2-i\varepsilon} +$$

$$\int dM^2 \left[m - \frac{M^2+\sqrt{\alpha\beta}}{2M^2} \right] I(0)\gamma\Pi\delta\frac{1}{-(\gamma\Pi)^2+M^2-i\varepsilon}$$

$$\int dM^2 \left[\frac{M^2+\sqrt{\alpha\beta}}{2M^4}\right] I(0)\gamma\Pi\delta\frac{1}{-(\gamma\Pi)^2+M^2-i\varepsilon}+C.T., \tag{115}$$

where at this stage we have introduced the so called contact term $C.T.$. It guarantees the nonsingular behavior propagation function at point $\gamma\Pi = -\kappa$.

The conditions, which determine the contact terms are as follows:

$$L(\gamma\Pi = -\kappa) = 0 \tag{116}$$

$$\frac{dL}{(\gamma\Pi)}(\gamma\Pi = -\kappa) = 0, \tag{117}$$

where L is the expression between $\chi(x)\gamma^0\,\chi$. The condition (116) and (117) can be realized by the following transformations:

$$\frac{1}{\gamma\Pi - M - i\varepsilon} \quad \rightarrow \quad \frac{(\gamma\Pi+\kappa)^2}{(M-\kappa)}\frac{1}{\gamma\Pi - M - i\varepsilon} \tag{118}$$

$$\frac{1}{\gamma\Pi + M - i\varepsilon} \quad \rightarrow \quad \frac{(\gamma\Pi+\kappa)^2}{(M-\kappa)}\frac{1}{\gamma\Pi + M - i\varepsilon}. \tag{119}$$

Using the procedures (118) and (119), we have for the integral in (115):

$$-(\gamma\Pi+\kappa)^2 g^2 \int_{m+\mu}^{\infty}\frac{dM}{M}\left\{\frac{(M+m)^2-\mu^2}{(M-\kappa)}\frac{1}{\gamma\Pi+M-i\varepsilon} \quad - \right.$$
$$\left. - \quad \frac{(M-m)^2}{(M+\kappa)}\frac{1}{\gamma\Pi-M-i\varepsilon}\right\} I(0). \tag{120}$$

The last formula is at the limit $\gamma\Pi \rightarrow \gamma P$ the propagation function derived by Dittrich (1974).

9 The magnetic moment of the Lee model

The additional action term replacing

$$\int (dx)(dx')\chi(x)\gamma^0 M(x,x')\chi(x') \tag{121}$$

is in the presence of electromagnetic field, the following one:

$$g^2\int (dx)(dx')\chi(x)\gamma^0 M(x,x',F)\chi(x'), \tag{122}$$

where $M(F)$ is given by eq. (115). This supplements the initial action expression

$$\int (dx)\chi(x)\gamma^0(\gamma\Pi + \kappa)\chi(x'). \tag{123}$$

In the presence of electromagnetic field, we have

$$(\gamma\Pi + \kappa) = 0, \tag{124}$$

or,

$$\gamma\Pi = -\kappa \tag{125}$$

Then,

$$M(F)|_{\gamma\Pi=-\kappa} = \int_{\alpha}^{\infty} dM^2$$

$$\left\{\left[m + \frac{M^2 + \sqrt{\alpha\beta}}{2M^2}\kappa\right] I'(0)\frac{1}{M^2 - \kappa^2} - \frac{M^2 - \sqrt{\alpha\beta}}{2M^4} I(0)\frac{\kappa}{M^2 - \kappa^2}\right\}\delta \tag{126}$$

Further we have

$$g^2 M(F) = \lambda\frac{eq\sigma F}{2\kappa}, \tag{127}$$

where, (if we put $M^2 = x$)

$$\lambda = \frac{2\kappa}{(4\pi)^2} g^2 \int_{\alpha}^{\infty} dx \left\{\left[m + \frac{x + \sqrt{\alpha\beta}}{2x}\kappa\right]\frac{1}{x^2}\left[(x-\alpha)(x-\beta)\right]^{1/2}\frac{1}{x-\kappa^2} - \right.$$

$$\left. - \left[\frac{x + \sqrt{\alpha\beta}}{2x^2}\right]\frac{1}{x}\left[(x-\alpha)(x-\beta)\right]^{1/2}\frac{\kappa}{x-\kappa^2}\right\}. \tag{128}$$

The effective action is equal as it follows:

$$\int (dx)(dx')\chi(x)\gamma^0\left(\gamma\Pi + \kappa + \lambda\frac{eq\sigma F}{2\kappa}\right)\chi(x'), \tag{129}$$

where

$$\lambda\frac{eq\sigma F}{2\kappa} \tag{130}$$

is the additional magnetic moment of the Lee model of elementary particle. For small α we can put approximately

$$[(x-\alpha)(x-\beta)]^{1/2} \approx x \tag{131}$$

and we have from eq. (79) after elementary integration

$$\lambda = \frac{2g^2}{(4\pi)^2}\left\{\left(\frac{\sqrt{\alpha\beta}}{\kappa^2} + \frac{m}{\kappa}\right) \lg \frac{\alpha}{\alpha - \kappa^2} - \frac{\sqrt{\alpha\beta}}{\alpha}\right\}. \tag{132}$$

10 Discussion

In this paper, we have considered the relativistic Lee model in the framework of the Schwinger source theory of elementary particles. After inserting the Lee model into the constant electromagnetic field we observe new term in the Lee model which corresponds to the magnetic moment of the Lee unstable particle.

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Magnetic field evolves to gravity field part: 3 Electromagnets

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Abstract

The STOE suggests gravity emerges from magnetic effects of hods in matter structures. The Scalar Theory of Everything (STOE) proposes gravity is an asymmetry (only attraction) in the magnetic field of particles. Differences between the poles of permanent magnets are absent in electromagnets. Therefore, the magnetic field of particles is similar to the magnetic field of permanent magnets. Models suggesting revolving charges causes particle magnetic fields are rejected because of increased complexity and reduced inclusion.

keywords: magnet, gravity, electromagnets

1 INTRODUCTION

Experiments rejected the Biot-Savart Law (Hodge 2018b). The Scalar Theory of Everything (STOE) suggests two different types of magnetic field in Maxwell's equations (Hodge 2018d). One type is from permanent magnets; the other is from electric current (electromagnets). The STOE suggests the hods, photons, and particles are modeled by assembles of permanent disc magnets (Hodge 2016a). Gravity may be the sum of the poles at the side of photons or the photons comprising particles (Hodge 2019a).

Table 1 (corrected) shows the North Pole of permanent magnets has statistically larger force exerted W vs distance d^{-2} slope than the South Pole while the W relation with d^{-1} is nearly identical (Hodge 2019a). This would speculate the North Pole dominates at the side of the photon (bar) configuration as suggested in Hodge (2012).

This Paper examines electromagnets as a cause of the asymmetry in gravity. The description of the experiments is in section 2. The magnetic field effect on iron filings is show in section 3. The Discussion and Conclusion are in section 4.

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Table 1: Data from Hodge (2019a).

	South-South		North-North	
run No.	No. pts.	W (gw)	No. pts	W (gw)
Zone 1	14	$(0.70*1000/d-21)\pm 5$	13	$(0.7*1000/d-13)\pm 2.7$
Zone 2	15	$(4.35*1000/d^2-0.74)\pm 0.17$	13	$(6.1*1000/d^2-1.8)\pm 0.8$
Zone 3	5	$75.7e^{-0.09d}\pm 0.6$	7	$99.4e^{-0.1d}\pm 1.5$

2 THE EXPERIMENT 1

As in Hodge (2019a), electromagnets were glued to the wood supports. The scale (AWS-100, Digital scale) measures gram weight W (gw) and has a tolerance of ± 0.02 gw. A calibration 20 gram mass weighed 19.99 gw. By repeatedly assembling a measurement setup, the scale read ± 0.4 gw for small forces. This is attributed to the tolerance of the wood support being poor for small forces. All measurement are $\pm 10\%$ unless otherwise stated. The distance between the top ends of the iron core d_{fe} and the distance between the top ends of the coils d_{air} are measured.

Table 2: Linear regression of the data of the Zones of the electromagnet with an iron core.

	South-South		North-North	
run No.	No. pts.	W (gw)	No. pts	W (gw)
Zone 1	4	$(0.008*1000/d_{fe}+2)\pm .03$	4	$(0.008*1000/d_{fe}+2.07)\pm .02$
Zone 2	12	$(0.73*1000/d_{fe}^2+0.11)\pm 0.02$	12	$(0.69*1000/d_{fe}^2+0.41)\pm 0.03$
Zone 3	17	$5.24e^{-0.06d_{fe}}\pm 0.02$	17	$4.96e^{-0.05d_{fe}}\pm 0.4$

Table 3: Linear regression of the data of the Zones of the electromagnet comparing the North-North with an air core distance d_{air} versus the iron core distance d_{fe}.

	Air core		Iron core	
run No.	No. pts.	W (gw)	No. pts	W (gw)
Zone 1	4	$(0.02*1000/d_{air}+2)\pm .05$	4	$(0.008*1000/d_{fe}+2.07)\pm .02$
Zone 2	12	$(0.72*1000/d_{air}^2+0.05)\pm 0.02$	12	$(0.69*1000/d_{fe}^2+0.0.41)\pm 0.03$
Zone 3	17	$4.00e^{-0.05d_{air}}\pm 0.06$	17	$4.96e^{-0.05d_{fe}}\pm 0.4$

Tables 1 through 3 lists the linear regression equations with one standard deviation uncertainty.

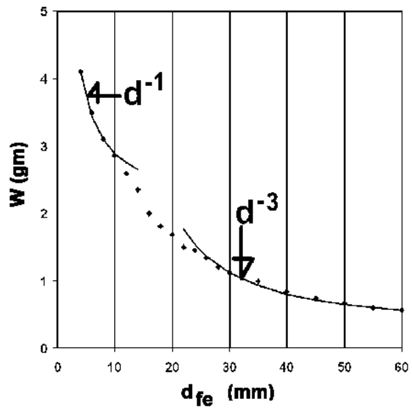

Figure 1: Plot of the W versus d_{fe}.

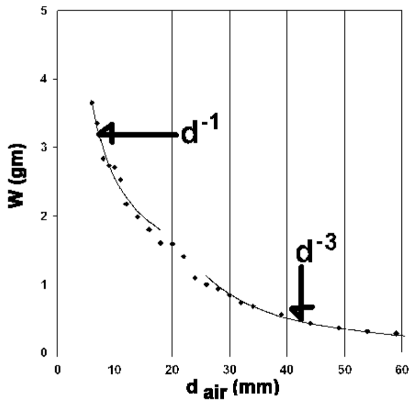

Figure 2: Plot of the W versus d_{air}.

3 EXPERIMENT 2

The magnetic fields of various configurations of permanent magnets and electromagnets were examined by use of iron filings.

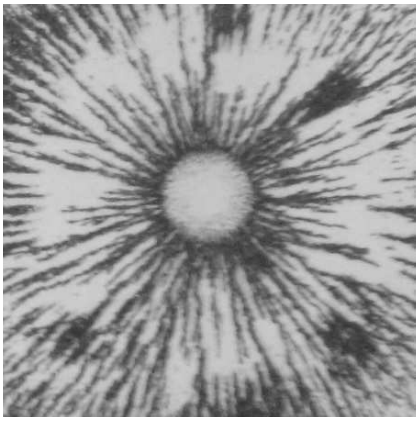

Figure 3: Photo of iron filings of permanent magnets with the axis perpendicular to the plane for the South Pole.

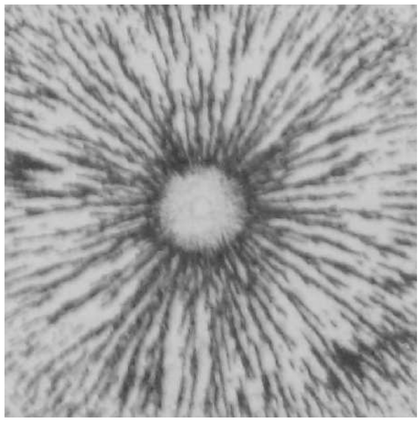

Figure 4: Photo of iron filings of permanent magnets with the axis perpendicular to the plane for the North Pole..

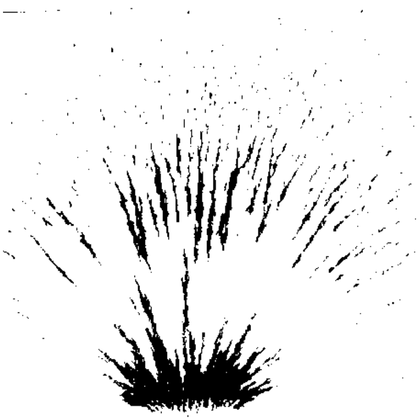

Figure 5: Photo of iron filings of permanent magnets with the axis in the plane for the South Pole.

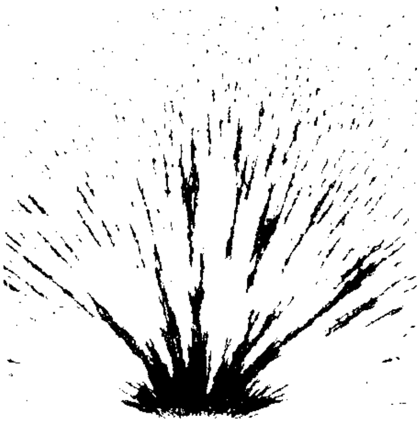

Figure 6: Photo of iron filings of permanent magnets with the axis in the plane for the North Pole.

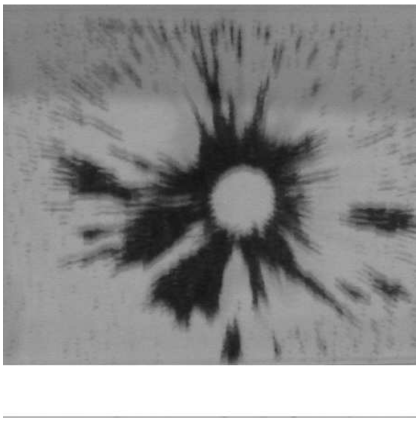

Figure 7: Photo of iron filings of iron core electromagnets with the axis perpendicular to the plane for the South Pole.

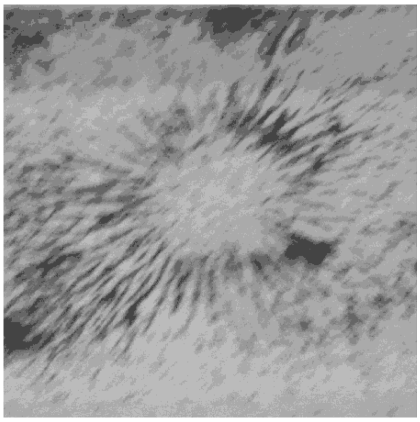

Figure 8: Photo of iron filings of iron core electromagnets with the axis perpendicular to the plane for the North Pole.

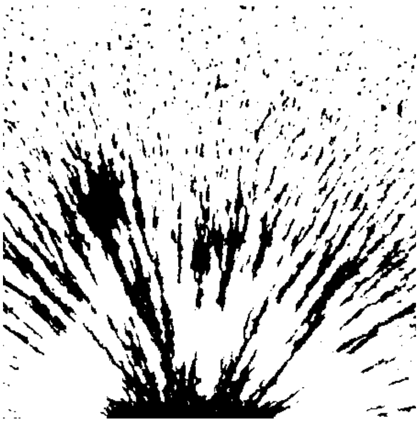

Figure 9: Photo of iron filings of iron core electromagnets with the axis in the plane for the South Pole.

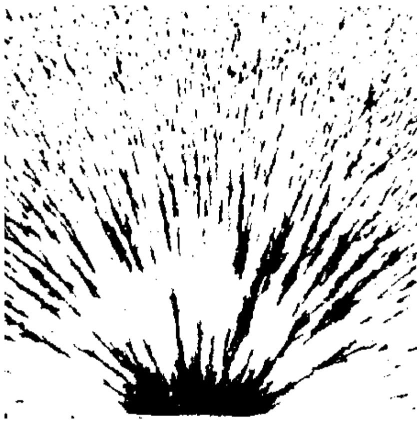

Figure 10: Photo of iron filings of iron core electromagnets with the axis in the plane for the North Pole.

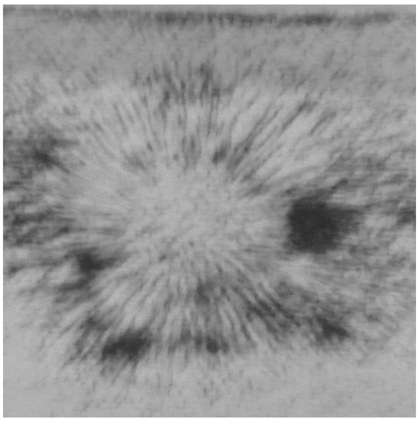

Figure 11: Photo of iron filings of air core electromagnets with the axis perpendicular to the plane for the South Pole.

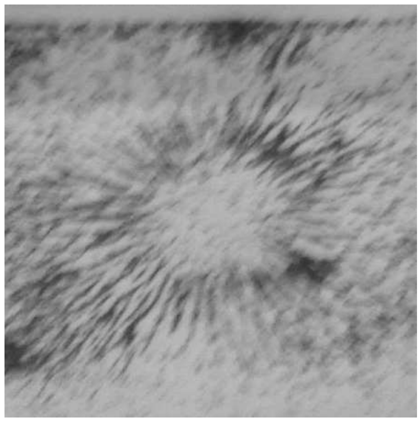

Figure 12: Photo of iron filings of air core electromagnets with the axis perpendicular to the plane for the North Pole.

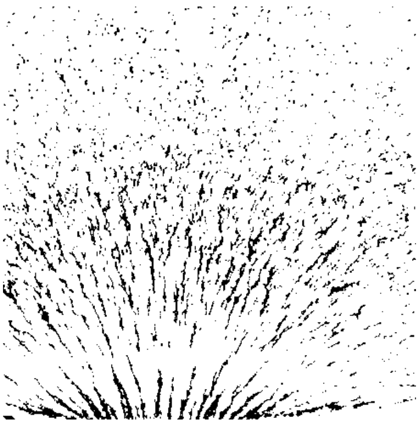

Figure 13: Photo of iron filings of air core electromagnets with the axis in the plane for the South Pole.

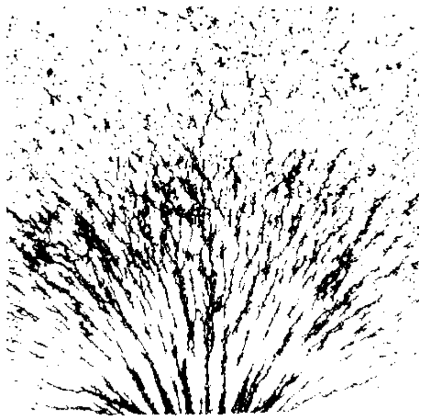

Figure 14: Photo of iron filings of air core electromagnets with the axis in the plane for the North Pole.

4 DISCUSSION AND CONCLUSION

The magnetic field of permanent magnets show a difference in force W exerted in Zone 2 (large d) (Tables 1, Fig. 3 through 6). The fields on both air core and iron core electromagnets show little difference (Table 2, Table 3, and Figs. 7 Through 14).

The number of dendrites at given radius from the center is less for the South Pole (56) than the North Pole (64) of permanent magnets. The number of dendrites at given radius from the center is approximately the same for the South Pole and North Pole of both iron core and air core electromagnets. Another difference is that the field from permanent magnets is more focused outward in analogy to a fluid flowing outward from a pipe (by the method of conjugate functions using the transformation $w = z + \mathrm{e}^z$). The field from electromagnets is more rounded. That is the edges of the field are caused by the edge wire current flow.

Gravity is an asymmetry effect (only attraction) of particles. The STOE proposes gravity is an asymmetry in the magnetic field of particles. Differences between the poles of permanent magnets are absent in electromagnets. Therefore, the magnetic field of particles is similar to the magnetic field of permanent magnets. Models suggesting revolving charges cause particle magnetic fields are rejected because of increased complexity and reduced inclusion.

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Magnetic field evolves to gravity field part:4 Atomic structure

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Abstract

The Scalar Theory of Everything (STOE) suggests gravity emerges from magnetic effects of hods in matter structures. The suggested structure of electrons formed from disc magnets is expanded to describe atomic structure. The model improvement is the STOE atomic structure is more closely related to observations of Maxwell's Equations, of interference phenomena including those that reject wave models, and of cosmology through common basic components of the universe. The formation of atomic structure by magnetic rather than electric forces suggests all matter is composed of magnetic structures.

keywords: magnet, gravity, atomic structure, atomic spectra

1 INTRODUCTION

Atomic structure has been suggested by observations of atomic spectra (Condon and Odabasi 1980; Herzberg 1944). The emitted and absorption of spectra appear as lines in a spectrograph. The lines represent different energies of light. The lines appear as grouping of lines that are labeled "series". Some series, particularly lower energy series, overlap other series. Balmer found the relationship between lines of the series that bears his name could be calculated by:

$$v = Z^2 R \left(\frac{1}{n^2} - \frac{1}{n_1^2} \right), \tag{1}$$

where v is the wave number of the light which is proportional to energy, R is the Rydberg constant which is different for each element, Z is the atomic number, n is an integer that denotes the series (called the "principle quantum number"), and n_1 is the line in the series. A line is the difference between n and n_1. This

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works well for hydrogen and poorly for heavier elements. This concept uses arbitrarily assigned numbers to correspond to empirical data.

Bohr attempted to relate the n of an atom and its structure. The Rutherford-Bohr model posits the atom consists of a heavy nucleus with a positive charge of Ze that electrons revolve around at discrete classical orbits where Z is the atomic number and e the electric charge. Radiation is absorbed or emitted by the transition of electrons from one orbit to another. The light energy E is $h\nu$ where h is Planck's constant and ν is the light frequency in a wave model of light. Franck and Hertz observed experimentally in inelastic collisions the transfer of energy is equal to excitation energy of the spectrum.

An advantage of Bohr's concept is that the light emitted has an energy which is related to spectrographic data. A mass orbiting a center also has a calculable mass that is related to the radius of the orbit. The calculated radius for atomic electron spectra is of the same order of magnitude as the calculated "cloud" of electrons from collision experiments.

Because only certain orbits occur, an added postulate without justification was that the angular momentum is an integral multiple n of $h/2\pi$. Thus, the radii r of the possible orbits are proportional to n^2. The radius of the smallest orbit (0.529 Å) is the same order of magnitude of the radius of the atom. Several refinements include the idea the orbits can be elliptical that results in postulating a "azimuthal quantum number" k. Relativistic considerations resulted in a dependence of the energy on the "fine structure constant" ($\alpha = 2\pi e^2/hc$)

The n and k levels and sublevels should combine with other sublevels to correspond to observed energy difference or spectral lines. However, the number of observed components is much smaller than the expected number of the combinations. This discrepancy is treated by assumed so-called "selection rules". Even then there are deviations from the selection rules that suggested several new assumptions that are the addition of quantum numbers to n and k.

The idea of electron orbiting the nucleus is contradicted by the experiments resulting in Maxwell's Equations. Accordingly, de Broglie suggested the electrons are waves and the circular or elliptical circumference of an "orbit" defined by its radius is the integer number of waves of the electron. Modern models of atomic spectra modify the Bohr/de Broglie model by adding additional quantum integer parameters to describe the variation in energy levels of lines. Empirical data required additional selection rules be assumed.

The emitted light is the difference in the number of waves. However, this model then presupposes the light has a wave nature. Although the wave nature of light is generally accepted, several experiments have rejected wave-like light in favor of particle (photon) light (Hodge project).

The Scalar Theory of Everything (STOE) posits the universe is composed of hods and plenum which emerge to form all in the universe (Hodge 2016b). The hods are discrete and the plenum is continuous (Hodge 2018e, figure 3.1). That is, discrete phenomena emerge from hod behavior and structure. Continuous phenomena emerge from plenum behavior and structure.

Charge models of electrons would have negative charges forming the electron. This structure would explode and forming such an electron structure would require energy input. A magnetic structure would be a minimum of potential energy for the hods. It is, therefore, a stable structure conforming to the emergence of complex structures from simpler components.

Electric effects are vortices formed in the plenum by the movement of hods and hod structures through the plenum (Hodge 2018a). The STOE suggests the self-similarity principle that posits small size scales are similar to our everyday size scale. Accordingly, disk magnets were used to model photons and leptons (Hodge 2016a). According to the STOE, atomic spectra must be an emerged property of the hod structure. Therefore, atomic structure results from magnetic effects rather than electric effects.

The STOE rejected the Biot-Savart Law and suggested two types of magnetic effects (Hodge 2018b,c,d). One type emanates from magnets, the other from electric currents. The suggested model is that electrons (see Hodge (2016a)) have hairs (see Fig. 1) that shed hods as the electron travel through a wire which is one type of magnetic field.

The STOE model of a photon is a column of hods (Hodge project). This model and its simulation program successfully reproduced the interference experiments including those that rejected wave models of light. The spectrographic behavior of STOE photons is developed from the energy of photons being proportional to the number N of hods in the column of hods. Each hod is a permanent magnet modeled by disc magnets. The photoelectric experiments relate the energy of photons proportional the wave model frequency of light. The slope of the resulting line is, in STOE terms, caused by the addition of one more hod to the photon. Therefore, the energy E of a photon is $h'N$ where $h' = Kh$ and K is a proportionality constant between light frequency and N determined spectrographically [sinc() function]. The model suggests the hods in the photon are a constant distance between them that is dependent of the average density of the surrounding plenum (Hodge 2012). That is, the photons have a length $l \propto N$.

This Paper suggests a STOE compatible model of atomic structure of disk magnets to represent hods to begin the enquiry. The description of the basic model is in section 2. The Discussion and Conclusion are in section 3.

2 THE MODEL

If the spectrum of light is different for different light, the photons are of different length. If the light originates from emission from atoms, then different length photons are a part of the atomic structure. They are like rods holding the electrons and protons together by magnetism. The electric vortex field is caused by particle motion as the electrons and protons of an atom move. The magnetic field is stronger than the vortex field.

The connecting rod concept solves the lack of radiation of orbiting electrons without using waves of de Broglie or quantum numbers that have to be assumed ad hoc. The rods of hods then become directly linked to many other observations such as spectra and interference experiments.

Figure 1: Picture of an electron with hairs.

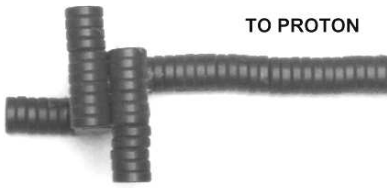

Figure 2: Picture of a hydrogen electron.

Figure 2 shows a model of the hydrogen electron bound to the nuclear proton. The electron is attached and becomes part of the magnetic structure of the electron. The other hairs are directions of possible attachment of other electrons or protons.

The rods are bar magnets with a stronger North Pole than the South Pole (see Table 1 of Hodge (2019b)). So, the rod connection of an electron to a proton (see Fig. 2) is slightly stronger if the North pole is the connection to the electron. This is the observed "spin" energy level.

Figure 3 shows a model of the helium atom atomic structure. The noted angle forms naturally in the magnetic structure of the electron. Because the nucleus has a small diameter relative to the length of the connecting photons, the angle has the outward directed photons diverging such that no other nucleus of 2 or more protons can connect. The connection of single protons (2 hydrogen atoms) may connect. However, the distance between them is sufficient that the electric vortex field generated by their movement would repel them away.

If the rods of photons are longer, then the angles are reduced so that another atom may also connect with rods to the same two or more electrons. This is the covalent bond as modeled in Fig. 4. Covalence bonding is formed by electrons in the second valence shell (of eight) or higher.

The photons in the top of the electron may form an angle between them (see Fig. 5). Figure 17 of Hodge (2019a) shows the magnetic field strength around the electron structure. The peaks occur every 45°. This field from the body helps twist the hairs. By forming the electron from disc magnets, without outside forces the angle a formed is $20° \pm 20°$ if the internal height (see the brackets in Fig. 6) is seven discs high and $40° \pm 10°$ if the internal height is six discs high. That is, $0° \leq a \leq 50°$. The circle of electrons formed by an $a = 45°$ is eight electrons and by an $a = 20°$ is eighteen electrons - the "full" numbers

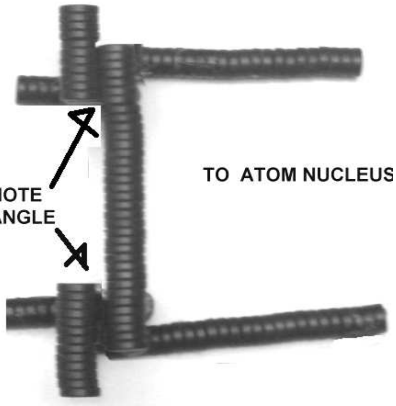

Figure 3: Picture of a helium electron pair.

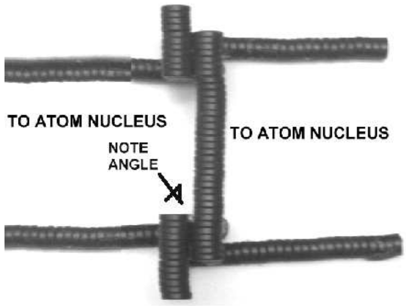

Figure 4: Picture of a covalent bond.

of shells 2, 3, and 4.

If the number of electrons in the 2 shell is less than 8, then a "hole" may exist such as seen in Fig. 5. An electron from another atom with a single valence electron may fill this hole by bonding with the electron hairs on either side rather than with photons in the nucleus.

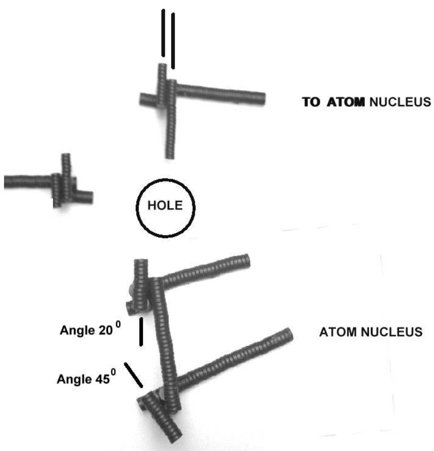

Figure 5: Picture of the electrons nearing an ionic bonding.

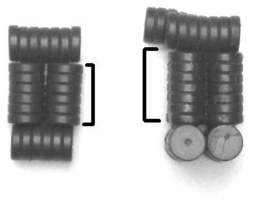

Figure 6: Picture showing the difference in the internal number of disks (hods) effect on height of the electron.

3 DISCUSSION AND CONCLUSION

The STOE proposes over several papers that phenomena of the small may be better explained by cause–and–effect analogy to our everyday world rather than by mysterious, weird statistics.

The suggested structure allows the calculation of the cord length c between electrons in a shell by $c = 2l\sin(a/2)$. This is the same kind of relation that de Broglie suggested that also avoids the violation of Maxwell's Equations. However, instead of invoking ellipsoid lengths, the STOE allows a to change dependent on the number of electrons in a near circular orbit including ionic bound electrons and electrons from other atoms in a molecule. The l and, hence, the c may change depending on the Z of the nucleus. The STOE suggests the n terms of Eq. 1 are related through a circular structure of electrons, thus the n^2 and Z^2 as in the Bohr model.

The magnetic forces of the electron shells force a geometric structure on the electrons. The photon connection to the nuclear protons suggests this same structure of the protons. This leaves the remaining protons to form neutrons by a low energy binding of electrons and the other protons.

The cause of the number of hods in an emitted photon remains to be empirically determined. The model improvement is the STOE atomic structure is more closely related to observations of Maxwell's Equations, of interference phenomena including those that reject wave models, and of cosmology through common basic components of the universe. The formation of atomic structure by magnetic rather than electric forces suggests all matter is composed of magnetic structures.

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Magnetic field evolves to gravity field part:5 Final

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Abstract

The Scalar Theory of Everything (STOE) suggests gravity emerges from magnetic effects of hods in matter structures. An experiment is performed to demonstrate the net magnetic field from hods in a body only attracts the hods from other masses to evolve into the gravity affect for distances greater than molecular sizes.

keywords: magnet, gravity, atomic structure, atomic spectra

1 INTRODUCTION

The Scalar Theory of Everything (STOE) started with the Quasi Steady State Cosmology (QSSC) model that suggested the creation of matter at the center of galaxies (Sources) (Narlikar 2002; Narlikar et al. 2015). This model is successful at explaining spiral galaxy rotation curves without dark matter and other problems for traditional cosmology. The STOE adds Sinks at the center of elliptical galaxies. The STOE uses the Newtonian concept of forces rather than energy to develop a Universal Equation (Hodge 2018e). These additions allow the description of many more anomalous and problem observations.

The STOE posits the universe is composed of hods and plenum which emerge to form all in the universe (Hodge 2016b). The hods are discrete and the plenum is continuous (Hodge 2018e, figure 3.1). That is, discrete phenomena emerge from hod behavior. Continuous phenomena emerge from plenum behavior.

The STOE proposes that phenomena of the small may be better explained by cause–and–effect analogy to our everyday world. Because the universe is one, the models valid in our everyday world apply to the small (quantum) world. The STOE model of mass is an assembly of hods.

The STOE developed a model of photons and photon behavior. This model and its simulation program of photons successfully reproduced the interference experiments including those that rejected wave models of light (Hodge project).

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A model of gravity requires a link between cosmology and the small world. The STOE model of gravity is similar to the model of magnetic effects. That is, the forces are a result of the divergence of the plenum density on hods.

The STOE experiments rejected the Biot-Savart Law and suggested two types of magnetic effects (Hodge 2018b,c,d). One type emanates from permanent magnets and hods, the other from electric currents. The model of hods includes the idea the hods causes a plenum density that mimics the North and South poles of permanent magnets. The forces of the magnetic poles are different for the different poles (Hodge 2019a).

Hodge (2016a) suggest particles are specific structures of hods (Hodge 2016a, 2019a). Hodge (2019b) suggest the atomic structure is an assembly of photons which hold the electrons in specific structures. This in contrast to the wave or quantum models to account for spectrographic observations.

This Paper suggests a STOE compatible model of gravity based on the interaction of the magnetic fields of hods in one body of mass with hods in another body of mass. The description of the basic model is in section 2. An interpretation of the experiment is in section 3. The Discussion and Conclusion are in section 4.

2 THE EXPERIMENT

The same fixture and equipment used in Hodge (2019a) was used in this experiment. The bottom support had attached several disk magnets. The upper support had the same number of disk magnets as the bottom support and held so that they can rotate about a center. The center was held on the axis of the bottom magnets. The North Pole was the zero of the angle measured A and was up at $A = 0°$. The force F exerted on the lower magnet was measured by the scale for various position of rotation of the upper magnet. The magnets have a diameter $L = 18$mm.

An asymmetry was indicated for Zone 2 of Hodge (2019a) which was the distance d between magnets for $d > 2L$. The Zone 2 force was proportional to the square of the inverse distance. When 1 or few magnets were used, the F readings were too low. With seven magnets the $d = 97$mm ($d > 5L$) gave acceptable F readings for the scale used.

Figure 1 shows the results of an average of 10 runs of the present experiment. Each run consisted of a disassembly and reassembly of the measuring fixture. The same magnets were used for all 10 runs.

Region 2 is the area of the graph where the North Poles of the upper and lower magnets face each other (therefore, the F is repulsive, positive reading). Region 1 is the area not in Region 2 (attractive poles - negative F- and repulsive South poles). The equation for the lines is:

$$F = C\cos(A), \tag{1}$$

where for Region 1 the coefficient $C_{\mathrm{S1}} = 1.5 \pm 0.1$gw, $C_{\mathrm{N1}} = -1.5 \pm 0.1$gw which are shown as a solid line on the graph. For Region 2 $C_{\mathrm{N2}} = -1.3 \pm 0.1$gw which

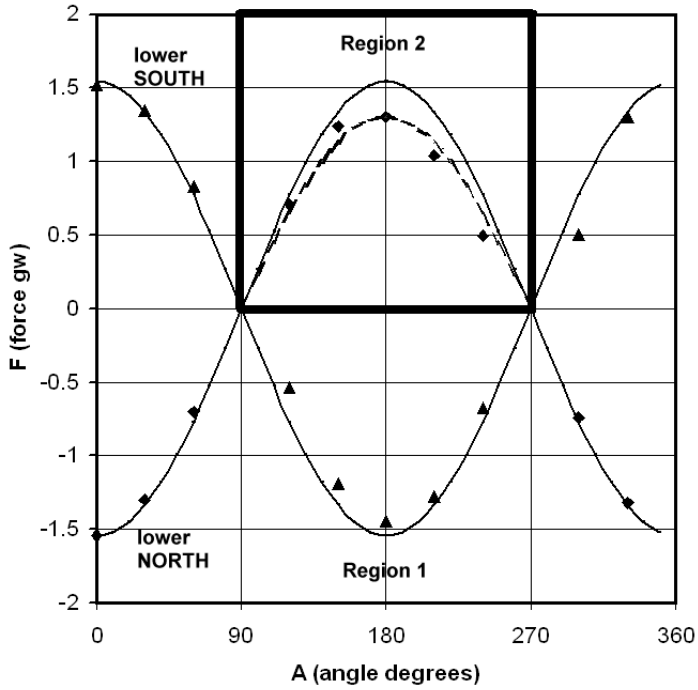

Figure 1: Graph of the results. The diamonds indicate the data points for the case of the lower magnet with the North Pole up. The triangles indicate the data points for the case of the lower magnet with the South Pole up.

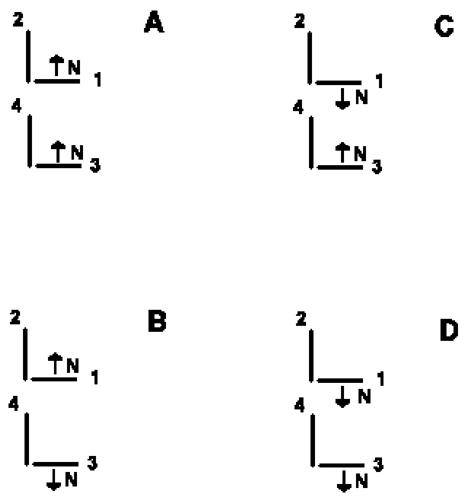

Figure 2: Sketches of the various hod configurations of hods in two bodies.

is shown as a dashed line on the graph. The uncertainty is determined by the standard deviation of the 10 repetitions of the experiment.

3 INTERPRETATION

The STOE suggests all matter is composed of hods that have a permanent magnetic field that causes their influence on the plenum. The disk magnets in the experiment are the Newtonian world analogy of the hods. The measurement is the magnetic force exerted by one hod on another. If the magnets are close, a mass of a body is formed. If the distance is such that there are two bodies, the very weak magnetic force is only attractive and is called "gravity".

A 2-dimension situation is simplified for ease of description in Fig. 2 This figure depicts the four cases where the lines represent hods and the numbers identify the hods. Hods "1" and "2" are in one mass, hods "3" and "4" is another mass. Hods "2" and "4" are at an $A = 90°$ or $A = 270°$ which exerts $F = 0$ on each mass. Hods "1" and "3" are at an $A = 0°$ or $A = 180°$ which exerts $F = C$ on each mass. Cases "A" and "D" are attractive in Region 1. Case "B" is repulsive in Region 1. Case "C" is repulsive in Region2.

The total Force F_{T} exerted on each mass is the sum of these four situations: $F = -1.5 + 1.5 + 1.3 - 1.5 = -0.2$gw, respectively.

4 DISCUSSION AND CONCLUSION

Experiments with disk magnets demonstrate closeness may determine structure. Adjacent disks in near contact must be either axially or perpendicular such as seen in photons and electrons. However, farther apart magnets can exist without joining. This will place limits on the structure of particles, nuclei, atoms, and molecules. These structures provide a random orientation of hods in a body consisting of many molecules.

Note in Fig. 2 there are only two hods in each mass, but only one has the force F_{h} of the hod directed to the other mass because $A = 0°$. Remember F_{h} is different for the poles. The other hod has $A = 90°$ or $A = 270°$. The general case for a mass would have the $F = \sqrt{2}F_{\mathrm{h}}/Nd_{\mathrm{avg}}^2$ where N is the number of hods in the 2-dimensional body and d_{avg} is the average distance of the hods (the center of mass). A 3-dimensional body has $F = \sqrt{3}F_{\mathrm{h}}/Nd_{\mathrm{avg}}^2$ in general.

However there are exceptions. One is the column of hods that is a photon. The photon has the $F_{\mathrm{h}}N\cos(A)$ oriented in the axial direction. The direction perpendicular and in the plane with the center of the photon has $F = 0$. The neutrino structure two axis with the $F = \sqrt{2}F_{\mathrm{h}}/N$ and one axis with $F = 0$. A body that has permanent magnetic properties has the assumption of random orientation being invalid.

An experiment is performed to demonstrate the magnetic field from hods attracts the hods from other masses to evolve into the gravity affect.

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Archetypes in the Context of Social and Individual: the Experience of Social-Philosophical Analysis

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Abstract

Understands the archetype in From a socio - philosophical position. Particular attention is focused on the interpretation of the concept of "archetype" in the philosophical concepts of A. Averintsev, M. Eliade, K. Jung. It is noted that the phenomenon of archetype is exploited in those spheres of human spiritual life where there are prototypes and recurrence, in particular in mythology, folklore, art, culture in general. Archetypal images have always accompanied man, they are the source of mythology, religion, and art. In these cultural formations there is a gradual grinding of tangled and spooky images, they become symbols, more and more beautiful in form and general in content. Mythology was the initial way of processing archetypal images. It is shown that K. Jung's individualization is the formation of a single, homogeneous being; insofar as "individuality" encompasses our secret, final and unrealizable uniqueness, it also includes the formation of the Self. Therefore, individualization can be imagined as a "path to self" or "self-realization."

Keywords: archetype, symbol, collective unconscious, self-realization.

Introduction. The present state of social relations requires the development of a new holistic view of the forms we have in the way of interaction of social and unique being based on the identification of archetypes in their bases. Existing research attempts to create, above all, a projection of the identity of social space based on pragmatic relations, which, in essence, conceals the essential characteristics of archetypes for both man and society itself.

In modern research, the hypothetical position of the archetypal foundations of social organizations of varying complexity clearly sounds. Noting that every society conceals leading archetypes, it is particularly emphasized that the invisible archetype, it has a stronger impact on the way people live. A certain historically formed system of archetypes encompasses many aspects of the collective subject's life. Thus, the relevance of research and identification of significant archetypes involved in society is substantiated.

Insufficiently lit parts of the problem. Insufficient development of this topic and its relevance cause the need for a new socio - philosophical analysis of the social and personal bases of archetypes in K. Jung's philosophy, which is a scientific problem in this study.

The purpose of the study is a socio - philosophical analysis of the concept of "archetype" in the context of its social and individual principles and justification of the space of its manifestations.

The main content (research methodology). Archetypal images have always accompanied man, they are the source of mythology, religion, and art. In these cultural formations there is a gradual grinding of tangled and spooky images, they become symbols, more and more beautiful in form and general in content. Mythology was the initial way of processing archetypal images.

We can assume that the human personality consists of two parts: first, it is consciousness and all that is covered by them; second, it is the vague deep regions of the unconscious psyche. If the former can be more or less clearly defined and delineated, then the integrity of the human personality must be declared inaccessible for full description or definition. In other words, each personality contains some infinite and indistinguishable part, because its conscious and observable part does not include a number of factors, the existence of which we are forced, however, to assume, to be able to explain the observed cases. These are unknown factors and form what we call the unconscious. We have no idea about the content of these facts, since we only observe their consequences. We can only assume that they have a psychic nature comparable to the contents of consciousness, although we do not have full confidence in this. But one has to imagine that similarity exists, and we no longer refrain from further development of thought. Since the content of our minds are conscious and perceived only in association with the Ego, therefore, the phenomenon of a voice endowed with a personal character may also belong to the center, but no longer identical with our conscious Ego.

The main content (Discussion). In the socio - historical projection, archetypes, which create myths, religions and philosophies that affect whole peoples and the historical epochs that characterize them, manifest themselves significantly. Although the problem of archetypes is a cornerstone of all European philosophical thought, it has not been the subject of detailed analysis in Ukrainian historical and philosophical literature. At the present stage, there are isolated studies in Ukraine that touch upon the analysis of certain aspects of such a problem, in particular K. Jung's archetypal concept [1]. However, in general, the problem of understanding archetype in the concepts of domestic and foreign authors remains insufficiently explored, and therefore a promising field of historical and philosophical studies.

It is common knowledge that each historical era is based on the typical constants that underlie the spiritual life of human civilization. In different philosophical concepts, they are given different names: "archetypes", "prototypes" [2]., "Universals", "invariants", "forms without meaning", "end-to-end information and energy structures. Invariance can be traced in those spheres of human spiritual life where there are prototypes and recurrence, in particular in mythology, folklore, art, culture in general. Even with the indirect description of the myth, it is impossible to avoid words such as "first elements", "primitives", "schemes", "types" and their synonyms, which are reduced to the concept of "archetype". Quite often, the term "archetype" is used to refer to the ascending schemes of representations, and common mythological motives, and perverts, and primordial elements. Much of these concepts relate to each other, for example, the first-person and first-element can be regarded as identical components of the motive.

Archetype theory was introduced into the scientific field by K. Jung. Studying the spiritual state of modern western society, the researcher repeatedly pointed to his painful condition, exaggerated attention to the material, rational side of life. The reason for this condition was "the loss of understanding of the symbolic discourse by Western society. The loss of symbolic perception was a catastrophe on a scale not only of the individual, but of the whole society as a whole" [1, p. 60]. At the personal level, this was embodied in the increase in the number of neuroses and depression, a general sense of the meaninglessness of life, at the social level, in the spread of epidemics of the latest doctrines, which often became political.

K. Jung's significant achievement is the isolation of the phenomenon of the collective unconscious of humanity, which is relayed in the form of archetypes. Archetypes become a concentrated expression of the psychic energy actualized by an object. Images of the collective unconscious, according to the scientist, can be biologically inherited, because myths are embedded in the structure of the human soul. At the same time, archetypes as categories of symbolic thought are moving into figurative language. They are equally present in the minds of the mentally ill, ordinary people and geniuses [4], where they play the role of protecting the mental equilibrium of the individual.

The main results of the study are that the category: "archetype", which is used in various fields of scientific knowledge, is one of the epistemologically capacious, heuristically valuable and perspective categories of cultural philosophy; in the history of conceptualization of the archetype token, the following historical stages can be distinguished: the cosmocentric (philosophy of antiquity), within which the archetype is interpreted as a cosmic order; theocentric (philosophy of the Middle Ages), within which the term "archetype" is interpreted as a divine idea, a nouman originally existing in the mind of God; rational-centric (classical philosophy), in which the concept of "archetype" is interpreted in two ways - as a natural (natural) structure and as a form of intelligence; dialogical (non-classical and post-nonclassical philosophy) within which the category "archetype" is interpreted from the standpoint of epistemological pluralism, that is, finds polyphonic sound.

Conclusions. On the basis of the analyzed material it is possible to make certain generalizations and conclusions.

The human personality consists of two parts: first, it is consciousness and all that is covered by them; second, it is the vague deep regions of the unconscious psyche. If the former can be more or less clearly defined and delineated, then the integrity of the human personality must be declared inaccessible for full description or definition. In other words, each personality contains some infinite and indistinguishable part, because its conscious and observable part does not include a number of factors, the existence of which we are forced, however, to assume, to be able to explain the observed cases. These are unknown factors and form what we call the unconscious. We have no idea about the content of these facts, since we only observe their consequences. We can only assume that they have a psychic nature comparable to the contents of consciousness, although we do not have full confidence in this. But one has to imagine that similarity exists, and we no longer refrain from further development of thought. Since the content of our minds are conscious and perceived only in association with the Ego, therefore, the phenomenon of a voice endowed with a personal character may also belong to the center, but no longer identical with our conscious Ego.

Individualization, according to K. Jung, is the formation of a single, homogeneous being; insofar as "individuality" encompasses our secret, final and unrealizable uniqueness, it also includes the formation of the Self. Therefore, individualization can be imagined as a "path to self" or "self-realization."

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Convergence of Activity of the Creative Elite on the Basis of Self-Realization of Personality

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Abstract

The main idea is revealed that the creative elite of Odessa South Ukrainian School of Painting is a significant phenomenon of all social life, plays an important role in the life of society, and has a multifaceted impact on the whole life of social space. It is revealed that in the case of the creative elite, its influence on the formation of a particular social space occurs in an ideal sphere at a complex level, and the essence of this influence is determined by the essential "value" characteristics of representatives of the creative elite. It is noted that the Odessa creative elite can be considered as a carrier of a set of social, ethical, psychological, spiritual ties and relationships, it should be defined as the national elite - the creative national elite. It is substantiated that the functional characteristics of the elite representatives, who form a special social space, are the organizing force that makes any society an integral socio-cultural system.

Keywords: creative elite, Odessa school, creative social space.

Introduction. The multivariate social processes of the present arouse interest in the creative elite, which demonstrates high achievements in creativity and leads a constant search for new patterns and guidelines that can be the basis for the development of all structures of society as a whole. The relevance of the study of this problem lies in the fact that without the creative elite, the flowering of culture is impossible, and the problem of the nation's self-awareness, the quality of communication, and the spiritual atmosphere in society are associated with the qualitatively expressed potential of the creative elite.

Need is to comprehend and understand the spiritual world of the creative elite and, in particular, one of the most important components of which is the sphere of not only artistic creation, but also the basis for the formation of a special creative social space.

The degree of elaboration of the problem. The problems of the elite are characterized by the contribution to the solution of the studied problem of thinkers who worked at the intersection of sociology, psychology and philosophy. In the historical context, the philosophical idea of the creative elite, understood not only as an integral part of the hierarchical structure of society, but also as ideas for the spiritual improvement of man, originates in the writings of Pythagoras, Plato, who considered this hierarchy as a derivative from the spiritual (including moral) personality traits. The concept of Plato was developed by philosophers of the following eras: ancient - such as Aristotle, Seneca, Plotinus, Proclus, medieval - Augustine, Thomas Aquinas, Roger Bacon, Renaissance and the New Age - N. Machiavelli, J. Bruno, F. Bacon, T. Hobbes, Pico della Mirandola, Erasmus of Rotterdam, J. Locke, Leonardo da Vinci, J. Vasari, Scaliger; Recent times - I.G. Fichte, A. Schopenhauer, L. Feuerbach, F. M. Dostoevsky, V. S. Soloviev, P. Teilhard de Chardin, J. Dewey, K. Jaspers, M. Heidegger, J. P .Sartre, M. Young. In the works of I. Kant, J. Russo, F. Schelling, F. Nietzsche, it is significant that everyone represented the idea of the historical mission of the human mind, which passed in its evolution from clearly optimistic to pessimistic self-esteem. An analysis of the phenomenon of the elite as a creative active minority in the context of the development of culture and civilization is made in the works of O. Spengler, A. Toynbee. An important role in developing understanding of the creative elite also belongs to N.A. Berdyaev and H.Ortega-i-Gasset.

Insufficiently lit parts of the problem. Despite a sufficient number of works on the elite and elitism, it is necessary to synthesize them and build a concept based on the idea of the innovative capabilities of the creative elite as representing a special social space.

The purpose of the study is to consider the activities of the creative elite in society and the disclosure of its qualitative characteristics. To justify that the creative elite creates a special social space and identify its functional characteristics.

The main content (research methodology). At the moment, there are concepts and theories of elites that have their own ideas about this social institution. In the twenty-first century, the theory of elites can be considered in a more special social context than previously. The main existing schools in the study of elites are monistic and pluralistic with the inclusion of functional and value approaches. Proponents of the value approach develop the idea that the elite are people who have special qualities. The elite is treated as a layer of society, united on the basis of concern for the common good. The authors of civilizational theories considered ongoing social, economic, political processes as development initiated by the elites. From the point of view of the modern synergetic approach, the characteristics of subjects with high cognitive structured thinking are decisive for the elite; representatives of the elite are not a separate stratum, but individuals located at all levels of the hierarchy of the social pyramid.

The main content (Discussion). The creative elite of Odessa South Ukrainian School of Painting is a significant phenomenon of all social life, which plays an important role in the life of society, have a multifaceted impact on the whole life of society as a whole. In the case of the creative elite, its influence on different aspects of the life of the society occurs in an ideal sphere at a more complex level, and the essence of this influence is determined by the essential "value" characteristics of representatives of the creative elite. Odessa's creative elite can be seen as a carrier of a set of social, ethical, psychological, spiritual ties and relationships, it should be defined as the national elite - the creative national elite.

It is possible to turn to the conclusion of the modern Ukrainian researcher Z. Atamanyuk, who notes that in the context of considering “the influence of the concepts of the national elite on the formation of Ukrainian statehood, it turns out that on the Ukrainian soil the problem of the elite has its own specificity. In the conditions of Ukraine's statelessness, there is every reason to say that its elite existed. It did not perform a managerial function because there was no state. But the elite of Ukraine has managed to realize itself without the state ”[1]. According to Z. Atamanyuk, “a new reading of the role and functions of the national elite is connected with significant changes and transformations in the social structure. During the critical period of development of Ukrainian society, the elite was not able to solve the problems positively. Transition conditions in Ukraine have adversely affected the balance of elites. Today in Ukraine the dominant role is played by the political elite, which negatively affects the spiritual and cultural life of Ukrainian society. Therefore, it is advisable to distinguish between the elite of the stable period of development of society and the elite of the critical phase of development of society ”[1]. Identifying the factors of influence of the creative elite on the creation of a special social space, we are in agreement with Z. Atamanyuk's position on the expediency “to consider transformation from the point of view of the phenomenological approach, the game concept. This will reveal a kind of scheme, a model of change that has taken place with the elite during the transformation crisis. Inclusion in the game is considered as an opportunity for the individual to go beyond the ordinary, to break away from the usual and standard, to dissolve in the spatio-temporal sphere of activity. The game mechanism is capable of establishing new spiritual and social connections. It creates the illusion of excellence that is focused on real possibilities. It is this kind of game that embodies the essence of the person playing (Homo Ludens), carries the content of the creator of new social relations and forms, ways of movement of the society ”[1].

In exposing the influence of the creative elite on the creation of a special social space by the example of the South Ukrainian school of painting, we were guided, first of all, by the position that this creative elite is the bearer of a certain set of social, ethical, psychological, spiritual ties and relationships, which determine the factors formation and formation of a very special social space. Secondly, Odessa is a cultural city that always has a special style in all socio - cultural manifestations. The traditions of the City, related to its cultural myth, which combine with the intellect and cosmopolitanism kindness, humor and tolerance, and where painting was no exception, but in addition to all this, largely determined the features of "Odessa painting - a special style, where in the works always reflect the southern charm, European glamor and chamber elegance.

For P. Bourdieu, the creative elite is characterized by "the desire to accumulate knowledge and skills is inseparable from the search for recognition and the desire to create a name for yourself" [2, p. 132]. The specificity of the field of cultural production consists in a combination of two components: power and semantic relations. If the former are manifested as competition, the struggle for the monopoly of possession of dominant positions, for recognition, the latter are built on the basis of the opposition of styles, trends, forms of communication accepted in this field. Competition for legitimate dominance in the field, which takes the form of a struggle for one’s own authority and attempts to undermine the authority of others, leads to constant changes in its configuration. A writer or an artist creates not only for the public, but also for his colleagues acting as competitors. The rivalry in the field of culture "produces a specific form of interest, which seems disinterested only in comparison with ordinary interests, especially to power and money, and is aimed at gaining a monopoly on authority, where technical competence and symbolic power are closely intertwined" [2, p. 131]. In the field of literature, P. Bourdieu emphasizes, as well as in any other field of cultural production, there is an opposition of “masters,” carriers of tradition representing the dominant trends and genres, to “newcomers” working in new, marginal genres and styles [2, R. 131].

To substantiate our assumptions about the features of social space, and based on the concept of our research, we turn to R. Florida's work on the "creative class" by which we understand the creative elite. According to R. Florida, "the peculiarities of the post-industrial economy of cities are that" the more mobile everything becomes, the more decisive the city becomes. Cities are not just a repository for smart people, but a conducive infrastructure in which connections are made, contact networks are created and a fundamentally new mix is formed. The most valuable characteristics of cities are not basic services or economic opportunities, but the objects of social and infrastructure of the city, its goodwill and beauty. It shows that factors such as involving large companies in the city, active participation in the civil society institutions of its inhabitants, close social ties, uniting the urban community are no longer the key to economic success. More important is the creation of comfortable conditions for professionals of the "creative class" (R. Florida term), whose presence in the city directly depends on its development "[2].

The significant consequences of the influence of the creative elite on the creation of a special social space are the following: the creation of a new organization that created a new artistic and aesthetic space (Society in Odessa on the initiative of a group of local artists led by N. Skadovsky); the continuation of the tradition of bringing art to the masses (the founders of TPRC were, above all, followers, and many members of the Association of Mobile Art Exhibitions); the formation of a new communicative structure, which, of course, in image, reflected on the idea in society of the lives of artists (in TPRH consisted of artists, close and creative and in spirit, united by a sense of friendship and mutual sympathy. Hence the long-standing informal gatherings of South Ukrainian, famous Ukrainian "Thursdays". At these evenings music was played, poems were read, cartoons were drawn to each other, fun draws were made); philanthropic activities that fostered a positive attitude towards the arts - artists (the Society organized annual charity balls, which were decorated with great fiction, for example, in "Egyptian" or "Chinese" styles); public activity that supported relationships and relationships in society (artists participated in charity auctions, amateur performances, performed at meetings of literary, artistic, photographic and other societies); introduction of the idea of involving the masses of artists with different preparation for creative work; expanding ties and contacts with other art elite regions (Odessa artists and sculptors tried not to be locked in a narrow, small provincial world, focused on the artistic life of major cultural centers); attention to art education and continuous professional development (traveling abroad for educational purposes; some artists received professional training at the St. Petersburg Academy of Arts, art schools and academies in Germany, Italy, France; a certain seclusion of social space the works of the South Ukrainian artists - exhibitions of their works, if you believe the reviewers, became less and less interesting from year to year, not because the level was falling, but because there was no movement forward); mutual assistance in their professional environment (the situation in Odessa did not greatly contribute to the prosperity of art: the indifference of the public, the narrow circle of collectors and philanthropists, potential buyers of paintings and sculpture, the very atmosphere of a large shopping city, where business has always preferred culture. not only did they support and assist in exhibiting their works, but, most importantly, they contributed to their sale, because most of the artists, with the exception of a few wealthy ones, lived mainly through professional work and teaching (K. Kostandi, T. Dvornikov); association based on community in elementary art education (almost all Odesa participants of periodic exhibitions were students of the Odessa Art School (since 1900 - art school); freedom of artistic views and expression (the school was dominated by the spirit of democracy and relative freedom of views, for example. that in 1910 D. Burlyuk returned to the art school to receive his diploma (he began his education in 1899-1900), by that time he was already scandalous and was accepted despite the negative attitude of K. Costandi and the director of the school. A. Popov to all manifestations of "modernism"); leveling of professional and creative secrecy (one of the indisputable advantages of TPCRC was the lack of caste seclusion, openness to all who want to participate in exhibitions - from venerable academics to young students, students of Odessa schools; , formation and establishment of a special Odessa plein air painting school (tradition lives in time, passed from master to student. And today, plein air for the Odessa painting school continues to be one of the main characteristic features the qualities that shape her personality); Art traditions from the past pass over to our time ("Society of South Ukrainian Artists" and "Society of Independent Artists" have defined the following two trajectories of the art movement of Odessa. In the 60s of the last century there is a "second wave of avant-garde", though, of course, it arises far beyond the Union and even in support of it, however, those who started this long-standing tradition have long been members of the Union and its leading bright figures (members of the Mamay Art Association).

Conclusions. On the basis of the analyzed material it is possible to make certain generalizations and conclusions.

It follows from history that, despite the different social and historical circumstances, the influence of the South Ukrainian School of Painting - its creative elite - was constantly felt on the creation of a special social space not only in Odessa, but this influence eventually spread to all territories. Influence of the South Ukrainian School of Painting of the XIX-XXI centuries. - as a creative elite to create a special social space, reveals the convergence of the creative elite on the basis of self-realization of the individual.

The elite, as a social entity that preserves existing values or forms new ones, determines the history of the community to which it belongs. It is possible to consider the creative elite as the bearer of the totality of certain social, ethical, psychological, spiritual ties and relationships. The creative elite, as an integral part of the elite, acts as an independent objectively existing phenomenon of social life, which plays an important role in society, has a diverse effect on both the spiritual and other components of the life of the elite and society as a whole. It is proved that the functional characteristics of the elites are the organizing force that makes any society a holistic sociocultural system. In this context, the creative elite can be seen as the bearer of the totality of certain social, ethical, psychological, spiritual ties and relationships. Without the creative elite, neither the flourishing of culture, nor education is possible, and the position and quality potential of the creative elite are connected with questions of the nation’s identity, the quality of communication, the moral and spiritual atmosphere in society. The impact of the creative elite on different aspects of society’s life takes place in an ideal sphere on a more complex level, and the essence of this impact is determined by the essential “value” characteristics of the representatives of the creative elite.

Prospects for further research. As a prospect for further research of the ethics of the creative elite within the framework of the general theoretical orientation of understanding the creative elite, we can call an analysis of the content and mechanisms of the influence of the creative elite both on the elite in a broader sense and on society as a whole within the framework of the dichotomy of the elite - the mass, taking into account features of the post-industrial and information society.

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Advertising Slang Worldwide Usage

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Abstract

The article highlights pluses and minuses of slang like a part of advertising in different countries. How the target audience perceives the slang and complexity of translating such advertisements. Now slang has become much more widely used than before. The purpose of the study is to analyze the process of transmitting sociolinguistic information in slang in the context of word usage to present an approach to slang that is different from the vocabulary, that is, to show slang as a microsystem in advertising and to demonstrate what place separate groups of slangisms occupy in this microsystem.

Key words: slang, advertising, American slang, Spanish slang, Germany slang, market, consumer.

Having seen a lot of advertising on social networks from around the world, we noticed that slang is very often used in advertising. This tendency is most characteristic of the American market and it is not surprising, since American slang is the most widespread in the world.

It is possible that overusing internet slang in advertisements may yield unfavorable results, although such slang might attract more attention compared with standard language (SL).

To explore our topic, we have taken three countries: America, Germany, and Spain.

In order to be understood by the target audience for which the advertising message is intended, one simple rule must be observed: speak the language of this target audience. To achieve this goal, vocabulary of limited, even reduced use can be used, including colloquialism, professionalism, jargon, that is, words used by a certain layer of people [1].

The purpose of the article. To find a place of slang in advertising and how often advertisers use slang for target market.

Presenting main material. Slang is a special word or new meaning of existing words, which is used by a group of people, in our case - American advertising. Using slang is risky because no one knows how long a term will be popular [4].

We can understand language in different case depending on where it is used. Using slang in a slogan or title of advertising can sometimes feel too hard for conception, and for product or promotional purposes might appear unclear.

Conducting research we can find just how many brands use slang in advertising even if it means losing a large percentage of their existing audience.

Actually, some companies do not pay attention to the notion of audience at all, working of a particular phrase or word – regardless of whether or not it makes much sense [3].

We can find a good example using slang in American advertising, American delivery service “Post mates” is a company that shows people that everything delivered within an hour – recently unleashed a billboard using the phrase “Postmates and chill”.

There is the most popular word of advertising slang –*“bae”* (“shudders”) – but it also happened to use it in the wrong context. In case you didn’t know *“bae”* actually stands for ‘before anyone else’. So essentially, Mountain Dew’s Company tweet made no sense whatsoever [9].

In American advertising composite words very quickly enter into active use. For example, *“comeback”* (“renewal of orders”, “return”), *“rag-fair”* (“flea market”), *“moneybags”* (“rich people”), *“slop-shop”* (“cheap clothing store”), *“bosshead”* (“project manager”). Of interest are also blended words, that is, words that are formed, so to speak, from the "spare parts" of other words: *“Brexit”* (Britain + exit = Britain's exit from the EU), *“bomorrow”* (business day + tomorrow = next business day).

And we can say that the use of slang in American advertising is very active. America is not afraid to experiment and add slang to its ads more and more.

In German advertising slang is called youth insofar as the main source of its formation is precisely speech and orientation towards the German consumer, namely in the youth environment, the formation of most new lexical units. Which then replenish the stock of German slang.

With slang in Germany, we need to be especially careful, even if it does not apply to advertising, since such vocabulary is very specific and along with a completely neutral sound can have a pronounced negative and often very rude meaning, used in a specific situation or in the context of a conversation. Therefore, we must use such words in advertising with extreme caution and only if absolutely necessary, when we need to convey information to a very specific target audience.

Although slang is still present in the vastness of the German market, there are several examples where slang in advertising really worked. The German food delivery company "Lieferando" is one of not many who have slang in almost every advertising. Take for example the main advertising of company:

"Deine Mudda Kocht"(Du bestellst online bei lieferando.) [12]

"Deine Mudda" is just an intentionally misspelled *"Deine Mutter"* (your mother) to phonetically mimic the pronunciation of this phrase by a low-educated street bully. Joking viciously about your mother is an indirect way to insult you: if your mother is so bad, you seem to be even worse [15].

With just one word, the company managed to grow about 10 percent of consumers and the company found its strategy: Cheeky sayings, jokes, slang, and delicious food. Unfortunately, such strategies did not work with all companies in Germany.

Since the distinctive features of the national character of the Spanish advertising are increased emotionality, energy, and impulsiveness, the addressee considers these features of the audience's mentality when creating an advertising message. Thus, Spanish advertising is dynamic, expressive, and imaginative. According to *Héloïse Guerrier* (currently editor at Astiberri), the Spanish language is more obscene than other languages, for example, French, which is its mother tongue [8].

That is why in Spanish advertising slang is difficult to find as a component. Spanish slang is, however, more commonly used in everyday life than in advertising, because every person can understand their own meaning.

The most commonly used word in Spanish advertising is *“Guay”* usually refers to something cool, and can even go as far as amazing. In general, we can use it for anything positive [13].

As the study showed the poetic function is most often realized in Spanish advertising.

Conclusions and prospects of research. After analyzing the use of slang in advertising in America, Germany, and Spain, we come to the conclusion that each country has its own unique slang and a system of using it in advertising. Slang in advertising is very often implemented nowadays, and America is a leader in this segment through the use of slang in everyday life.

As for Spain, it also often uses slang in everyday life, but the Spanishpeoe are reluctant to introduce a large number of slang into the advertising field because their language is more obscene than other ones.

Germany is developing the advertising industry with the use of slang, and it is doing well. German companies, following the example of the US, are increasingly using slang without worrying about the consequences.

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Technological Vessels Online Monitoring Systems

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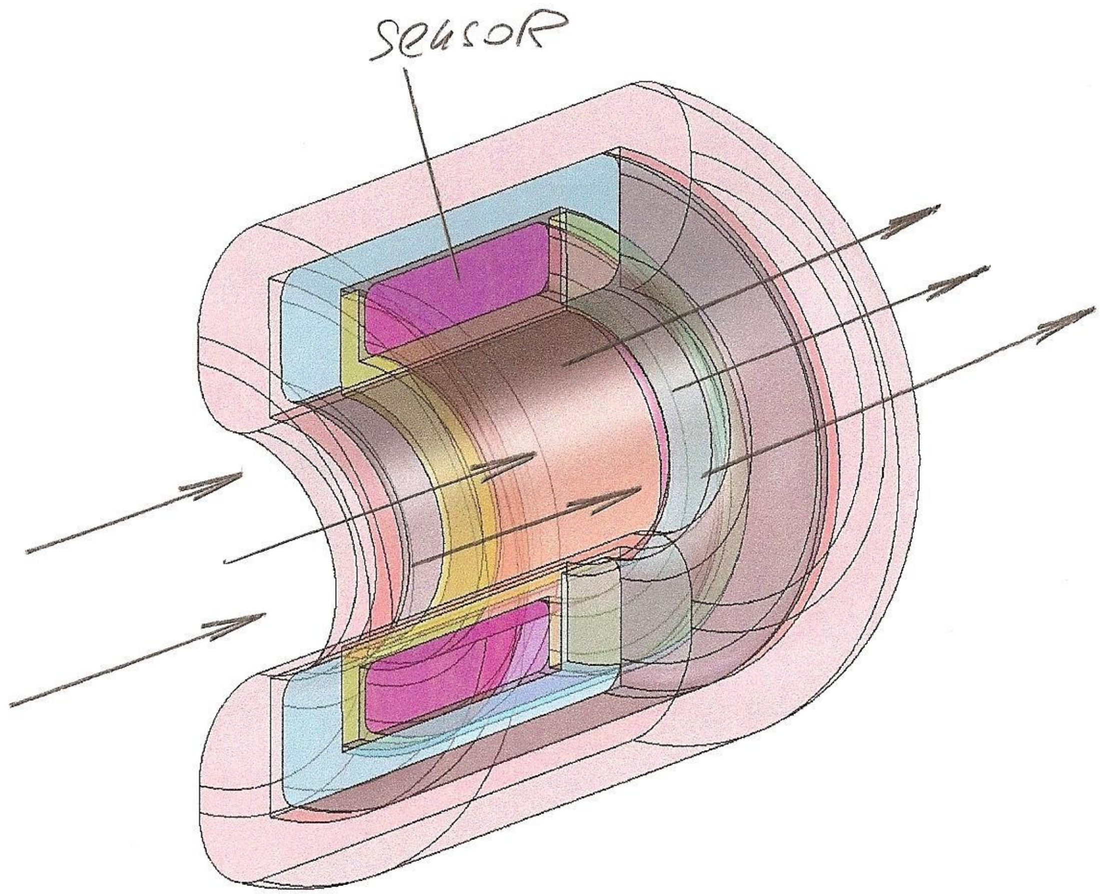
Abstract

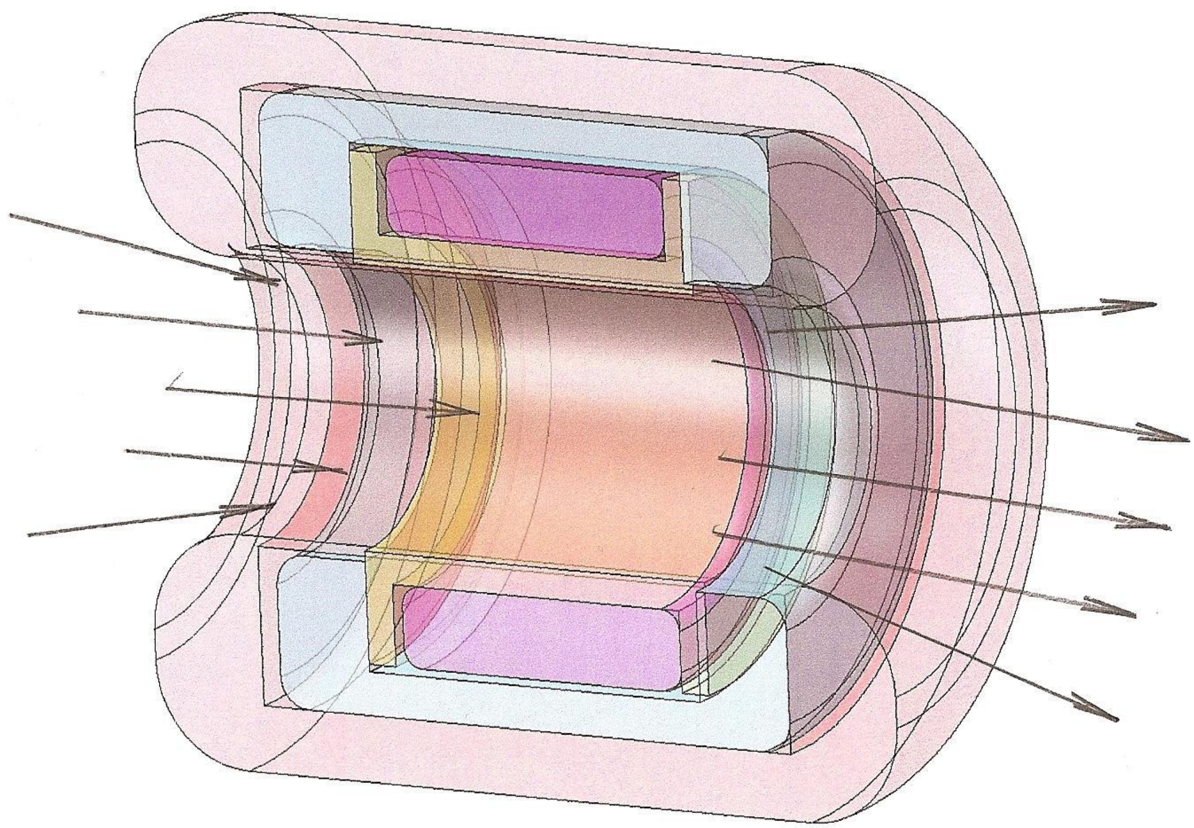
This article is dedicated to the investigation of the possibility of the monitoring process physical parameters occurring in process vessels containing so-called dead zones. Modern production requires a qualitative, uniform throughout the volume of capacity, the technological process. During the working cycle of the processes flow in process vessels there are parts, the dynamics of processes in which differs from the dynamics of processes in other, more active parts of process vessel. Such activity is due to the circular liquids movement. Processes, chemical reactions in different turbulence areas proceed with a difference, and the results of measurements can vary significantly. The chemical reactions require control. An important issue is the possibility of equalizing process parameters in all parts of the vessel, including in dead zones. The author of the article proposes an monitoring technique of a process vessel entire working volume by means of a special measuring module in the form of a sleeve with a built-in measuring instrument. Two versions of this device are considered: stationary and mobile. It is pointed out the importance of selecting the shape of the device in order to avoid mechanical resistance during the process fluid movement. The principle of operation is proposed for both implementations of the device – comparison of the reference signals of the resonant sensor with the signal obtained from the trial measurement. The article is recommended for engineers involved in controlling of technological processes physical parameters in modern automated production.

Modern automated productions require continuous monitoring of all the processes main technological parameters and especially a precise connection between sensors and control systems, including both the central processing systems and the control computers.



If, as an example, the modern pharmaceutical production is considered, then it is possible to find so-called dead zones in each process vessel of such production. Processes are slowed down in these dead zones and their dynamics radically differ from the same processes in active parts of the process vessel, where, as a rule, developed turbulent motion of process fluids.

In the corners of such vessels, the dynamic activity drops sharply and the results of chemical reactions can differ significantly from such results in the high turbulence zones.

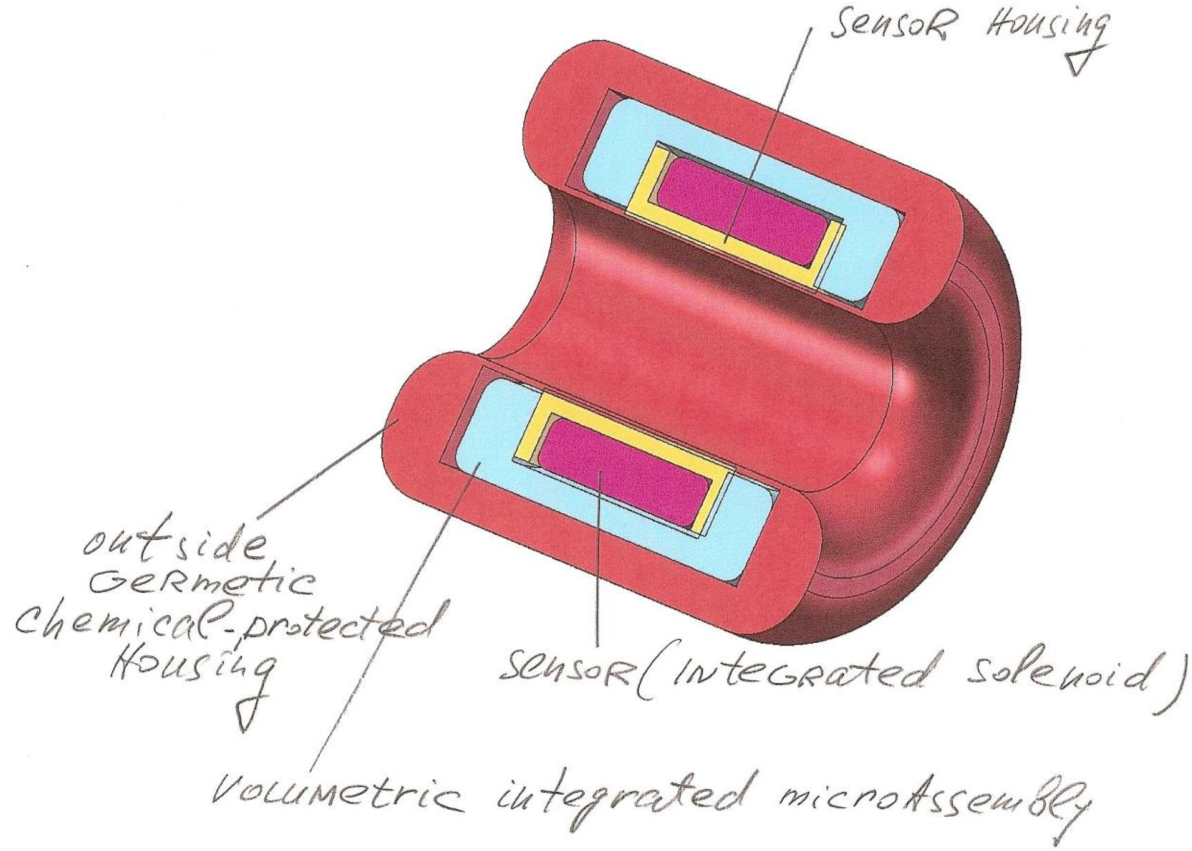


In order to control the chemical reaction activity of the entire working volume of the technological vessels and, as needed, equalize all the main operating parameters of the process and besides of that in order to ensure the same time of high-quality technological process at all points of the working volume of the technological vessel, on the basis of modern achievements and possibilities of non-contact sensor technology a sensor module is formed in the form of a sleeve. In that sensor module a sensor-solenoid of a certain design is built.

First of all, the sensor module is shaped in such a way that it completely corresponds to the basic properties of liquids that participate in the technological process initiated in the process vessel.

The sensor module is designed in the form of a sleeve in which the ends are shaped in such a way that their edges are rounded. In combination with the cylindrical part of the sleeve it forms torus-shaped bushings into the cylindrical part of the sleeve.

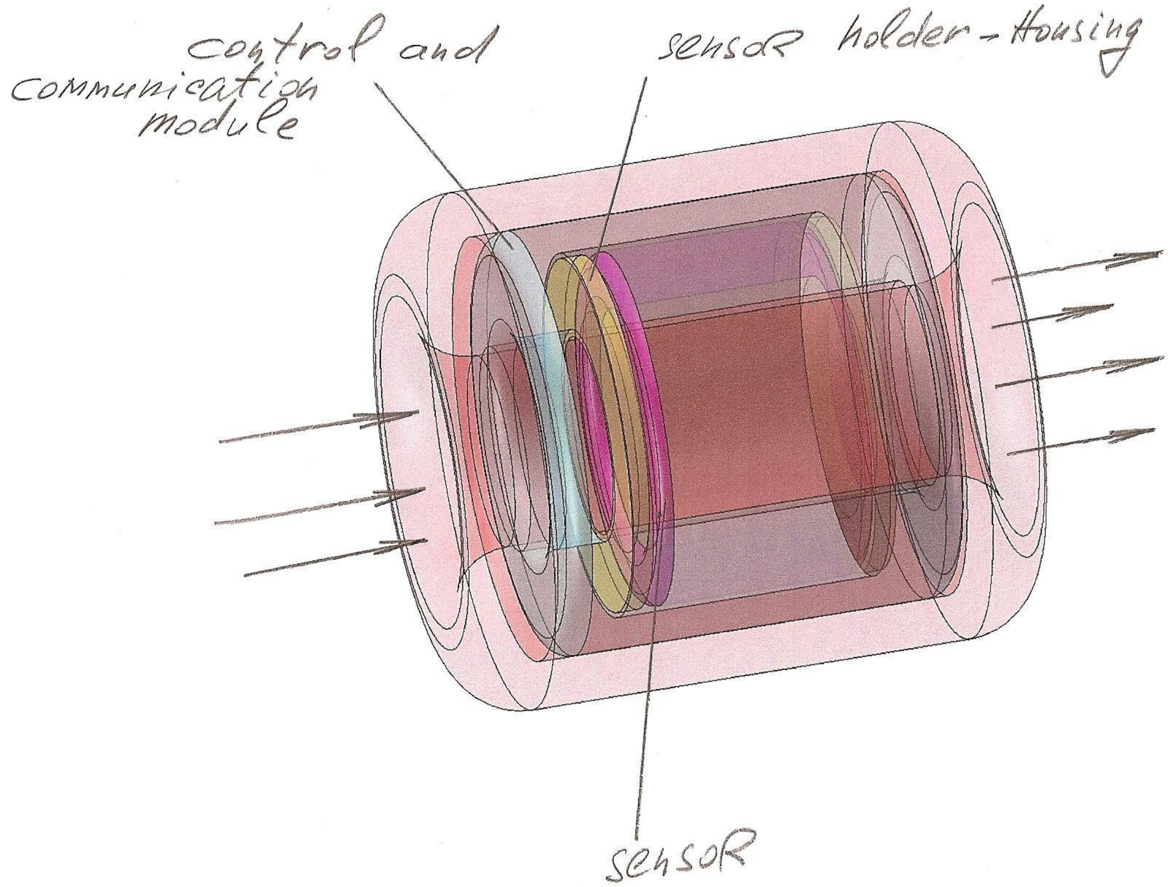
Radii of toroidal surfaces depend on the viscosity of the controlled fluids. They are designed in such a way that would not cause a hydraulic resistance and do not slow down the movement of liquids through the inner bore of the sleeve.



The height of microroughnesses on all internal surfaces of the sleeve is minimal, in order, to reduce the mechanical resistance to the movement of controlled liquids through the sleeve of the sensor module.

Thus, the sensor module is adapted to the specific conditions in the process vessel.

Now, to deploy automatic control of necessary parameters in all phases of the process, appropriate mathematical models of both process fragments and the reactions of all system elements to the impedance-resonant background around the sensor module are needed.



The sensor module has two basic implementations. The first one is for installation directly on the process pipeline before entering into the working volume of the process vessel within the production premises. The second is portable, intended for selection from the dead zones of process vessels of a sample of a technological solution or a mixture of technological solutions in a section of the pipeline on which the sensor module is mounted.

Both product implementations of the sensor module with all necessary internal and external infrastructure are laconic, made of plastic, usually PVC, compact and easy to use.

The principle of operation for both versions of the device is based on comparing the reference signals of the resonant sensor with the signal obtained from the trial measurement;

The reference signal is obtained on fully compliant standards with a technological multicomponent or aqueous solution.

The sensor of the sensor module in combination with additional equipment of sensor devices fixes the slightest deviations from the reference signal. The sensitivity threshold is:

- for metals 0.000000005 grams;

- for radioactive isotopes, - 0.000000000001 grams;

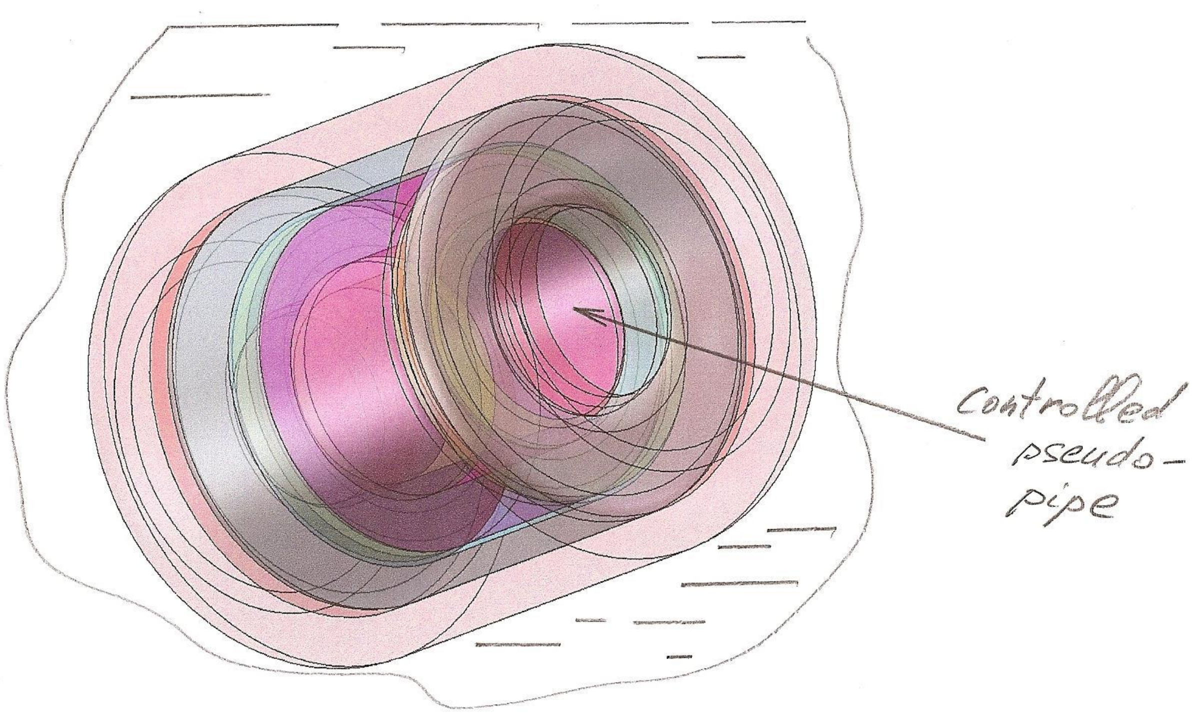
- for silicates, - 0.000001 grams;

-for organic acids and compounds,- 0.0000001 grams;

All specified concentrations are indicated per liter of water.

The device in its simplest version does not separate or fix selectively every component of contaminants or impurities, but due to its sensitivity, it determines the 50% threshold of the concentrations of components and ingredients dangerous for the accuracy of the technological process or for the purity and stability of the technological process, contamination in drinking or process water.

Such high accuracy of the autonomous production device allows to constantly monitor the quality of the process, water used for technological purposes and even before reaching the concentration of impurities or impurities of a dangerous level, take measures to effectively eliminate them.



In the system of the sensor module, all electronic boards and micromodules should have the highest possible speed without additional energy resources.

Health standards and technological standards of most developed countries recommend the quality continuous monitoring of components and materials used in technological processes, as well as water and aqueous solutions, and the implementation of this requirement often encounters the absence of a reliable, easy-to-use and accurate instrument on the market whose price will allow it wide use.

The proposed implementations of the device in accordance with the author's proposals, fully comply with the standards requirements, both on the materials safety used, and on the application effect.

Both implementations of the device are technologically in production, do not require any special technologies for manufacturing applications and can be manufactured practically in small enterprises conditions at the optimal price.

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Innovation Engineering Education

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Abstract

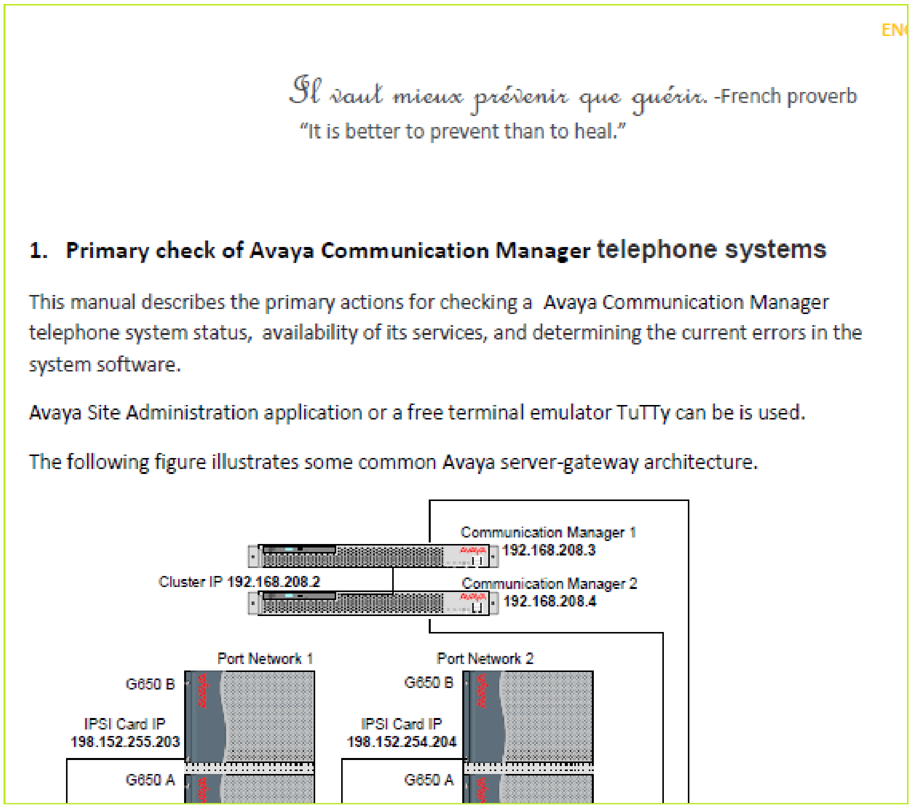
The author analyzes the issues of training engineers capable of innovation in the modern world. Some contradictions in the educational process and their consequences are indicated. Ideas for developing students' innovative approach are suggested. The role of production methodological developments is touched upon. It points to the task of training specialists with a high level of skill, creative potential, ready and capable of creative activity, with the fact that teachers can not divide students into capable of creative work and are not capable of separating them. The question is raised about a professional mobile specialist and an innovative specialist, a creative specialist with the skills and skills to make innovative decisions in his and related fields of science, technology and technology. It points out the importance of competencies related to production and technological and organizational management activities, planning and conducting experiments and design developments. The issue of training a professionally mobile specialist within the walls of an educational institution, capable of solving various professional tasks, designing its own professional activity, ready for purposeful professional creativity is considered. It points to the importance of forming a creative beginning only after acquiring all the necessary knowledge and skills in the process of applying them.

The need for the innovative development of any society sets a task before the modern community related to the provision of effective assistance to teachers of technical universities in training of specialists with superior skills and a creative potential, who are ready for and capable of creative activities. At each specific manufacturing site young professionals are trained and more often retrained to perform their basic professional production tasks and, of course, it would greatly simplify the task, if young professionals receive the necessary basic skills at the educational institution. In any case motivational incentives and feeling of a real need for the innovative level of solving of arising or long-standing production problems are of great importance. Personal characteristics of each specialist should also be taken into account, since the ability to absorb job instructions and methodological materials are not the same, and only persons with pronounced creative emphasis can absorb them in short time and follow the requirements and recommendations of their governing documents. Unfortunately, when studying compulsory educational disciplines teachers cannot divide students into those who are capable of creative work and are not capable of creative work and are forced to
work with everyone equally, although it was proved long age that creatively working specialists make up only a very small part of all workers. For companies, including innovative ones, it would even be harmful, if all specialists are innovative enthusiasts, because there are standard, restricted

works that must be performed without technological imagination, in due time and in a quality manner, in accordance with the requirements of the specified guidance and methodological documents. Again, unfortunately, teachers believe that a professionally mobile specialist is typically an innovative specialist, a creative specialist who is able to make innovative solutions in own and related fields of science, engineering and technology. The basis for this level of qualification is a high level of education in the field of humanitarian and exact sciences, special disciplines. Is that the case? Possession of computer technology, design techniques and information search, system engineering, methods of creative thinking activization, social and value orientations helps to reveal an engineer as a professional specialist. In the process of studying at a technical university students should acquire general professional competencies related to the ability to master new knowledge independently, use natural scientific, mathematical and engineering knowledge to solve problems of innovative development of the society. But at the same time it is impossible to take into account the specifics and peculiarities of all existing manufacturing sites in the course of training, and this determines the importance of methodological and guidance documents and papers on site. Competencies associated with engineering and manufacturing activities, as well as organizational and management activities, planning and carrying out of experiments and design developments are important. General cultural competences are related to the ability to negotiate, establish contacts, show initiative, take organizational and managerial decisions and bear responsibility for them. The craving for self-development, improvement of qualification and skills, realization of the social significance of their profession, comprehension of gained experience and readiness to change their professional profile, adapt to changes in the content of social and professional activities are relevant to a future specialist, regardless of the branch of industry. In fact, there is much tension around the issue of training at an educational institution of a professionally mobile specialist, capable to solve professional problems, design and coordinate own system of professional activity, ready for results-oriented professional creativity. Many teachers believe that during the study at a university it is not enough to develop ways of adapting to a changing environment and achievements of the scientific and technological progress in a person. Education, as many believe, should form creativity, promote creativity in becoming the norm and form of its existence, an instrument of achievements in all spheres of human activity — at work, in science, technology, culture, arts, management, politics — in a person. The higher the pace of change in the world is, the higher the requirements for education are. This statement cannot be accepted. First of all, education must be education, i.e. it should give fundamental knowledge and a clear ability to use it to a future specialist. If during the study part of the study time of a person, who does not yet have basic skills and knowledge, is devoted to innovative exercises, then nothing good will come of it — he will not have fundamental knowledge and will not become a new inventor. So, the most important feature of engineering activity is its creative nature, but only after acquiring all necessary knowledge and skills in applying it. Creativity is understood to be the process of human activity, during which qualitatively new material and spiritual values are created. But with the best will such a process cannot be infinite. Unfortunately, it is often not explained to future inventors that an innovative idea should be adjusted to a real product and not always generators of ideas can be effective in this process. Creativity is an emerging ability of a person to create a new reality on the basis of knowledge of the laws of the objective world that can satisfy diverse social needs using the material delivered by reality. Types of creativity are determined by the nature of the creative activity. If we evaluate results of the innovation process by economic categories, it becomes clear that certain commercial conditions are necessary for the innovation process, and not always even the most talented young engineer can get into such conditions and, especially, create such conditions. Therefore, it makes no sense to assert that the level of education creates an innovative specialist; it is only in some lucky cases that he can be one of the components of innovation success.

The author of this paper has already noted several times, based on the experience of the best technical universities in the United States of America, it is impossible to train innovative engineering specialists without an Institute of Innovative Entrepreneurs.

Only when the teaching staff is completed with entrepreneurs, innovative education can give certain advantages to talented young engineers, but the specifics of each manufacturing site or peculiarities of the manufacturing process of each specific company could be studied and understood only on site and on the basis of methodologies and guidelines prepared by the specialists of the enterprise.



Il vaut mieux prévenir que guérir. -French proverb
"It is better to prevent than to heal."

1. Primary check of Avaya Communication Manager telephone systems

This manual describes the primary actions for checking a Avaya Communication Manager telephone system status, availability of its services, and determining the current errors in the system software.

Avaya Site Administration application or a free terminal emulator TuTTy can be is used.

The following figure illustrates some common Avaya server-gateway architecture.

FIGURE 1. Excerpt from the author's study guide.

Obviously, not all can get high results in certain areas of activity, so it makes it possible to state that the level of creative potential, i.e. creative ability, is different in different people.

We can agree with this statement, but under the sole condition — if high creative potential is available, if an innovative entrepreneur notices it and promotes in time.

Another most important feature of this adaptive process is the ability of an entrepreneur to link general requirements and provisions with certain conditions and demands put forward at each specific manufacturing site considering all latest and newly emerging opportunities that harmoniously take into account the principle of technical feasibility and its stage-by-stage association to commercial viability.

Based on the classification proposed by teachers, we will distinguish levels of personal creative development that were found among students of technical universities. *Low* level is manifested in the ability to analyze the subject situation with the aim of transforming it, in realizing real-life problems and own experience in solving practical problems. The peculiarity of this level is rational arrangement of knowledge, a pragmatic view of the situation, and the reproductive nature of tasks performance.

Students of this level of creative development find it difficult to look at the situation in a new, unusual way, show a wide range of actions when performing problem tasks. The alternativeness of thinking is not a real factor of integration of knowledge of all academic disciplines. Students show only some independence in decision-making. In this regard it is extremely necessary to systematize and correctly direct the alternativeness of thinking, since it is very often possible to lose the basic idea when you strive to think alternatively.

Here we should turn to computer modeling and check all the options using the whole process and its variants for a comprehensive analytical tool for the intensification of the personal stage of brainstorming.

In this case brainstorming involves consideration of all options and possibilities that come from new materials, fundamentally new control systems and fundamentally new systems of computer design and detailed design.

Medium level of personal creative development is manifested in reflection about what I “can” and what I “want”, in understanding the determinants of own development, in the ability to set goals and objectives for self-transformation and self-improvement. An adequate reflection of yourself, the ability to analyze your own actions and foresee their consequences are psychological innovations of this level. As a rule, this level assumes creative inclusion of knowledge into a real production process.

The specialist’s ability to solve production problems independently and efficiently is the criterion of the achievement of this level of training in production conditions. This raises the question of maximum integration of the educational process with real problem situations that are typical for each company and each type of manufacturing sites.

Any template in this process can lead to a conceptual error and movement of the whole process away from the desired direction.

So, developers of methodical guidelines and standard operating procedures, who have a handle on the situation and are creative individuals by default, should first consider niceties of local specifics in combination with general provisions, taking into account the role of innovation in the transformation of modern science and its linkage to specific tasks and needs of each specific manufacturing site.

High level of personal creative development makes it possible to solve at each particular inventive level complex problematic tasks that arise, inter alia, at the junction of classical disciplines. Results of activities of an innovative and creative specialist spark, as a rule, a public outcry gradually turning into the commercial equivalent of success.

The ability to take technical decisions at this level, the ability to find the required information and learn, the ability to communicate and convince, maintain the atmosphere of creativity in the team, understanding of contemporary problems, adherence to the rules of professional ethics are the qualities that are the basis for the creative, productive activity of a technical university graduate.

People of this level are both dreamers and pragmatists; they are self-sustained and independent, flexible, effective and emotionally stable. But the basic skill is an innovative, inventive approach. It is no coincidence that an engineer in Latin means “contriving, devising”.

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Composite Complex Technical Solutions as a Necessary Basic Activating Foundation for Creating Combined Software Products-Equivalents of Complex System Integrative Inventions

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Due to the introduction into everyday practice of various kinds of combined software products, usually including many interrelated elements not interconnected in early design versions, there was a real need to create composite and complex technical solutions where all elements previously not interconnected form a composite complex technical solution.

Figure 1. An example of a composite complex technical solution that includes combined software products, aligned with complex system integrative inventions in the field of environmentally friendly and fully automated dairy production.

Almost complete transition of the economies of developed countries to innovative methods of planning and management dictates new criteria for the qualification of technical solutions used.

Gradually, any kind of production in such conditions, in order to maintain the necessary level of competitiveness - shall transform and optimize its technological and commercial assets to achieve the level of so-called smart production.

But it does not make much sense to create production, for production, without a serious well thought out strategic framework, including in terms of the most effective information tool for attracting partners and customers, such as web sites with a dynamic information system.

Today, more and more attention is paid to this process as part of smart production, including parallel creation of appropriate software techniques and tools, including, of course, three-dimensional graphics elements that carry more and more information containing data of innovative tools, equipment and materials used.

Taking into account the fact that, for example, in the USA, new patent legislation has already been adopted and introduced, it makes sense to dwell in greater detail on the feasibility of including in these information materials on the latest developments used in the advertised products and which can be qualified for compliance with the four basic signs of invention. This would be, first of all, the criterion of non-obviousness of the invented technical solution.

Of course, in such situations, for commercial reasons, it is important to preserve all possible levels of protection of the rights to the original intellectual property, even in cases when reliable protection has not yet been created and the product is already being delivered.

What kind of information and in what form can bring the level of information able to form a positive perception of the new product and all information related thereto, to concerned parties?

First of all, such information may include data on fundamentally new materials used in a new innovative product and their combinations with traditional materials that are quite well known in the market.

Of course, the disclosure of all details and features of the application must be approached with a known and sufficient degree of caution, since violation of the criteria of absolute novelty may close the way to patenting a product or its components.

A huge role in ensuring the proper technical level of new products and their consumer qualities is played by the presence of composite materials therein, especially carbon-carbon compositions.

Innovative composite materials are usually combined with innovative manufacturing technology, also in terms of smart production, and the most valuable quality of such smart production is the capability to monitor quality in real-time at all stages of the production process.

Finally, the nature of information presentation, including on websites, is influenced and affected by new and modernized consumer standards as well as new environmental standards and their perception in each of the specific areas of the consumer market.

Availability of fundamentally new materials

Fundamentally new materials today can come in a wide variety of types and purposes and can be used in innovative products for a variety of reasons.

One of the most important aspects of the search for and use of fundamentally new structural materials is the need to use processing equipment with digital software control to manufacture parts and elements of a new product.

This equipment has a place for new structural tool materials and alloys, and especially cutting materials of increased hardness and durability.

Recently, metal-ceramic materials and their variants have become especially popular in this area.

The use of such materials significantly increases the reliability and accuracy of metal-cutting tools, as well as equipment performance.

With the emergence of 3D-injection molding machines, various plastics and their ceramic equivalents are increasingly required for construction materials.

Variance can be very broad, and we can talk about a variety of final products, significantly differing in many technical characteristics, including mass and weight characteristics, as well as practical areas of application.

Figure 2. An example of the use of fundamentally new materials in fire protection demonstrated at the international exhibition of protective technologies and materials. This type of information does not reveal production, technological, constructive and operational secrets and at the same time allows us to bring all the winning parameters and capabilities of new products to potential customers.

As is known from the patent legislation, just the replacement of the used construction material with a new one, or even a fundamentally new one, is not an invention.

On the other hand, such a simple replacement is not always possible at all. Complete replacement of the material requires other additional technical solutions, including both schematic and component ones.

As a rule, in combination with the fundamental solutions on replacement of the material and on changes in the product properties and parameters arising from changes in the properties of the new material, a comprehensive technical solution arises, and its main distinguishing features form compliance of the invention with criteria, including on the basis of non-obviousness of the technical solution for the specialist of the average qualification in this area.

Most often, if a new product is developed, manufactured and tested in one working group or in a start-up team, patent search and qualification of a technical solution for compliance with signs can be carried out only after all production test cycles and final qualification tests of the actual technical feature of a new product.

If a new product includes a controlling and monitoring processor or a group of processors, then the nature of the search by the proposed invention expands, and the search pattern changes, just like the invention structure.

The invention scheme takes the following form - design, system, program, and method.

Thus, novelty of the distinctive features of an innovative product consists of several mutually dependent attributes relating to various elements of the working characteristic.

Particular interest in this process of integrative identification of new technical solutions is paid to the use of fundamentally new structural materials and technological solutions, emulsions and aerosols.

The method of presenting the information of these novelties to potential users of these products today is largely determined by the level of information load of the web product of the developer and manufacturer of this product.

This is because in principle, in accordance with the patent laws of the United States and other countries with innovative economies, simply replacing a material, even with one which is the newest and most advanced, is not an invention. Correct presentation of technological and constructive gains on the website without violating the product novelty, allows the maintaining of the principle of novelty and at the same time brings all the information required for decision-making to the attention of parties potentially interested in an innovative product.

The line between fundamentally new materials and composite materials can be quite narrow, but it still makes sense to allocate a separate place for composite materials.

Presence of composite materials

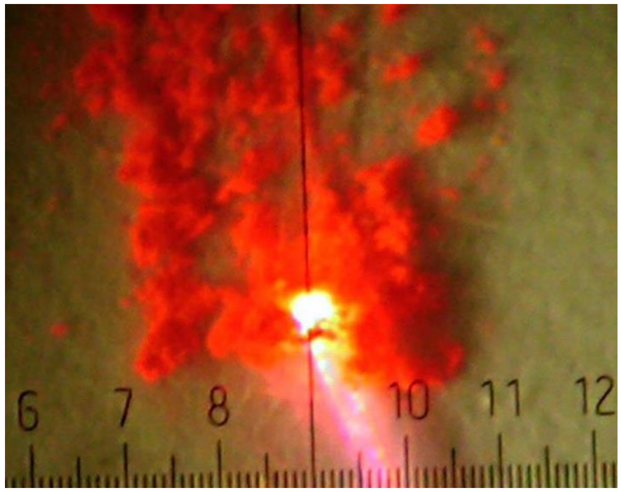

Figure 3A. An example of the use of innovative composite materials – luminophors in laser technology and fiber optics; Red luminophore.

Luminophors shown in Figure 3A and Figure 3B are used in disposable surgical laser instruments.

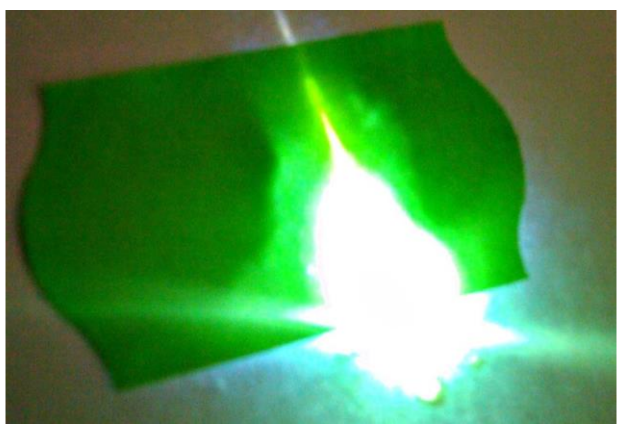

Figure 3B. An example of the use of innovative composite materials – luminophors in laser technology and fiber optics; Green luminophore.

The use of composite materials fundamentally changes even the principles of industrial design - if earlier, when selecting construction materials, the choices made were guided by the materials' properties and parameters, strength, elasticity, chemical resistance, durability, specific gravity, electrical resistance, etc. Now when using composite materials, it becomes possible to control the properties and quality of composites, changing the composition of their ingredients and their interrelations.

This is especially noticeable when using carbon-carbon composites. Such composites are produced by multilayer pyrolysis in a vacuum on a substrate of viscose fabric.

The number of pyrolysis layers can be changed depending on the need and because of this, it is possible to define the properties of the material in advance. Thus, the same equipment, the so-called tunnel vacuum furnaces, can produce both flexible and rigid electrodes for electrochemical cells and flexible permeable contacts for electrochemical reactors.

All of the above shows that, on the basis of the same technological methods, it is possible to make various innovative products practically on the same technological equipment.

One of the tasks of the combined software products is targeted coverage. For example, on the website, this could be targeted coverage of all aspects of innovative applications of composite materials and targeted adjustment of output parameters of final products by adjusting the parameters of composites used in their manufacture.

New directions in the technology of manufacturing elements of products and innovative items, including in conditions of smart production

Technological production lines of modern enterprises are complex and expensive systems and complexes, and each change in production conditions and requirements introduces significant changes and adjustments to the lines.

Figure 4. An example of experimental embedding of an innovative system for regeneration of process water without the use of chemical reagents in a typical modern food production facility; an electrochemical reactor which is an integrative invention, is used in the system as the main instrument of electrochemical impact on polluted water

In this situation, the most important thing is not to change the main equipment, and, if possible, to modernize it, embedding new elements into the existing technological line.

In many ways, this possibility of substantial modernization with minimal changes and, accordingly, with minimal costs, determines the reality of the introduction of new products and technologies at existing enterprises.

New consumer standards

Figure 5. An example of the developers' response to the increased demands of consumers for the level of cyber security, including for web resources

Composite commercial solutions in an innovative economy require an appropriate approach from developers at all levels and especially developers of combined software products, including website developers.

Consumers today focus on ensuring full protection of information, with maximum openness and full clarity of the material presented.

In turn, developers of relevant software products are also interested in the possibility of maximum possible protection of their developments while at the same time maximizing the opportunity to provide users with the fullest informational picture possible.

New environmental standards

Figure 6. An example of a highly pure and environmentally friendly technological module in an enterprise producing high-quality food; The readers are invited to assess the degree of purity and compliance against the most stringent requirements of environmental standards

Despite the fact that controversial elements are constantly found in the interpretation of requirements and limitations of environmental standards, the control technique itself is constantly being improved. Likewise, the software for consistency and accuracy of control is also being optimized and modified in parallel with the development of new measurement equipment and technology.

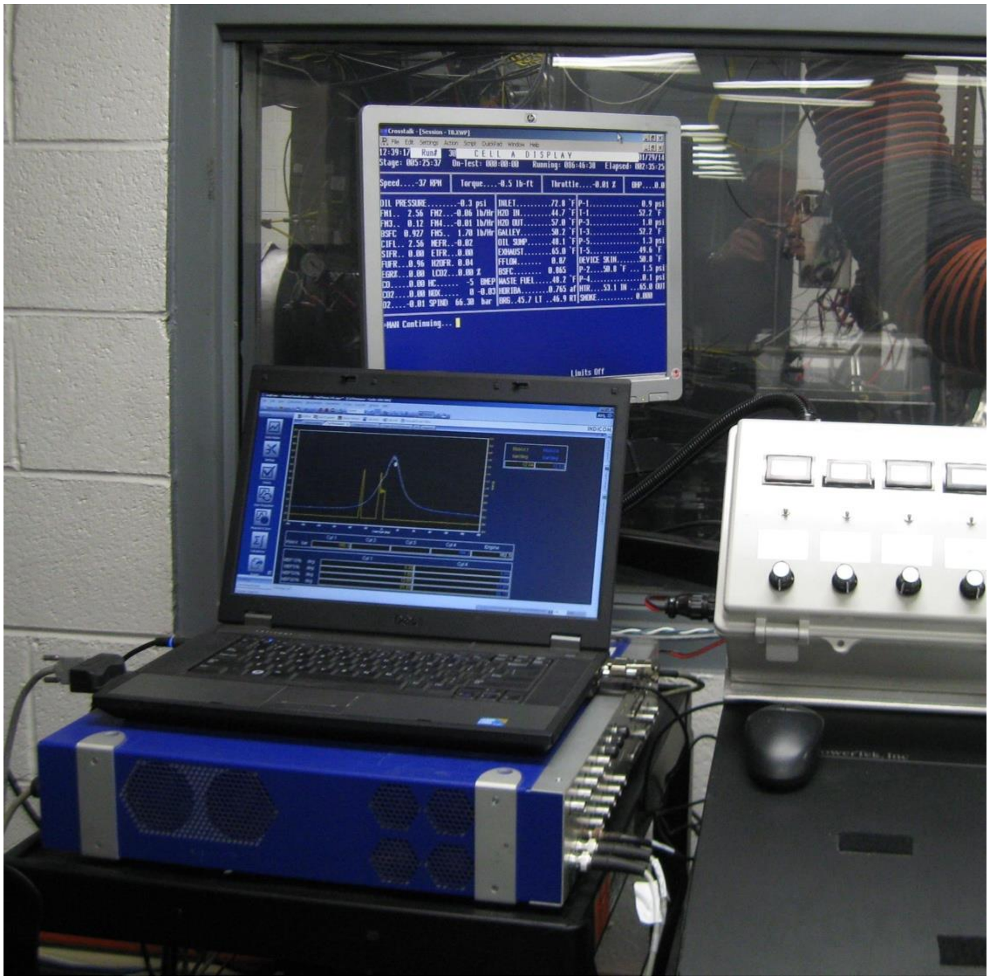

Figure 7. An example of a control system for monitoring the level of toxicity of exhaust gases of a diesel engine that uses diesel fuel of medium viscosity

In countries with a developed innovation economy, maximum attention is paid to the process of the correspondence of environmental standards to real conditions.

Therefore, when presenting, for example, on websites, information on the compliance of technical characteristics and capabilities of new products at the commercialization stages with all limitations of environmental standards, it also requires a preliminary analysis and, to some extent, a forecast of options for making these requirements and values still more stringent.

In the absence of direct options for comparing product indicators at the commercialization stage and tabular values of the restrictive requirements of relevant environmental standards, it makes sense to conduct a system search in specialized laboratories of institutes involved in the development of relevant standards and guidance materials and instructions.

Criteria for assessing levels of environmental safety

Figure 8. An example of a laboratory complex for analytical verification of compliance of the exhaust gases toxicity level with the requirements and limits of the current environmental standards

As for many product and product groups, indicators of their environmental characteristics are also complex and require, for example, the monitoring of the exhausts of internal combustion engines, and simultaneous monitoring of thousands of parameters. Systematic assessment and comparison of the reference level of environmental safety with actual indicators of a product or item, requires specially developed tables of comparison with mathematical models of analytical and comparative evaluation of the same kind of environmental safety to be included in the relevant, official documents.

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Composite Technical Solutions in the Modern Innovation System of Project Development and Their Influence on the Process of Creating Complex Software Products as Part of These Projects

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Influence of industrial fashion

The current state of equipment and technology forces us to much more deeply link various scientific and technological aspects in the projects under development and compare their possible solutions with the provisions of TIPS (Theory for Inventive Problem Solving) and AIPS (Algorithm for Inventive Problem Solving).

To begin the analysis, denote the terminology:

- Technical system (TS)
- Main useful function (MUF) of the developed technical system
- Elementary useful function (UF) of the developed technical system

Main useful function (MUF) is the main object and purpose of development, of course, provided that it is defined correctly and its definition takes into account all possible functional loads that must be met by TS, especially when complex software products and their commercial functions and technological derivatives are included in its configuration.

For a set of useful functions performed by TS, one can always find a more general useful function directly reflecting the purpose of TS, the purpose of its existence and activities (and coinciding with them, especially due to the presence and necessity of introducing into the structure and basic functions of TS complex software products and, in turn - their derived elements, including components made and corresponding to the parameters of cybernetic systems, equivalent to artificial intelligence systems).

This general TS function is called the main useful MUF of the whole TS, in contrast to the elementary useful functions (hereinafter referred to as simply useful, UF), which together and separately ensure the implementation of MUF. The relationship between MUF and UF is the same as between the system and its subsystems. MUF refers to the system as a whole, and UF to its subsystems.

The positive effect, especially from complex TS, today largely depends on the degree to which complex software products are included in TS and their combinations with purely technological and constructive solutions, especially with complex active control systems and remote processor control systems, and operational information transfer to controlling computers.

Any change in TS that increases the capabilities of this TS in meeting the needs of super-systems (and society as well) is an improvement of the system.

The improvement in TS is manifested in the following changes in the system at the level of external functioning:

– quantitative growth of useful "capabilities" of TS – transformation of non-useful "capabilities" into useful ones; the use of complex software products to increase the quantitative and qualitative growth of the useful capabilities of the technical system;

– elimination of harmful "capabilities" until they turn into useful ones; the use of complex software products and their combinations and articulations with designer systems and functional blocks to increase the quantitative and qualitative growth of the useful capabilities of the technical system;

– an increase in the ratio of the useful output to the input, that is, an increase in the TS efficiency, including due to the original characteristics and complex functional features included in the technical system of complex software products.

Availability and constant intensive development of software products

Any technical system that is being developed today cannot function in a modern technological infrastructure and in the system of production and commercial interconnections that has developed in an innovative economy without corresponding software products and their derivatives, the technical characteristics of which must be functionally and systemically integrated into the technical system.

Since software solutions are by definition not technical solutions and cannot be autonomously represented as objects of inventions, including integrative ones, the introduction of software solutions of their combinations and products into technical systems, primarily for patent protection of such systems, requires strict and system linking of the elementary useful functions of each functionally complete element of such systems with the complex of functions included in the main useful function of the whole technical system.

Change of rules and criteria of industrial design

Globalization of the economy leads to the need for a much more comprehensive and in-depth analysis of designer developments and functional characteristics of the products and technologies under development.

I propose to consider this thesis on the example of options for complex water treatment used for technological needs.

1. Treatment of liquids containing organic materials in combination with heavy metals

To separate a liquid into fractions with a high concentration of organic substances and into a liquid with heavy metal ions, a combined treatment is used, where the properties and parameters of the formed foam change when the pressure of compressed air changes.

A liquid with a high concentration of organic substances is separated with the foam, and after removing the foam, a liquid containing predominantly heavy metal ions remains.

But liquid treatment in the field requires other design solutions that meet the requirements of standards and are quite reliable.

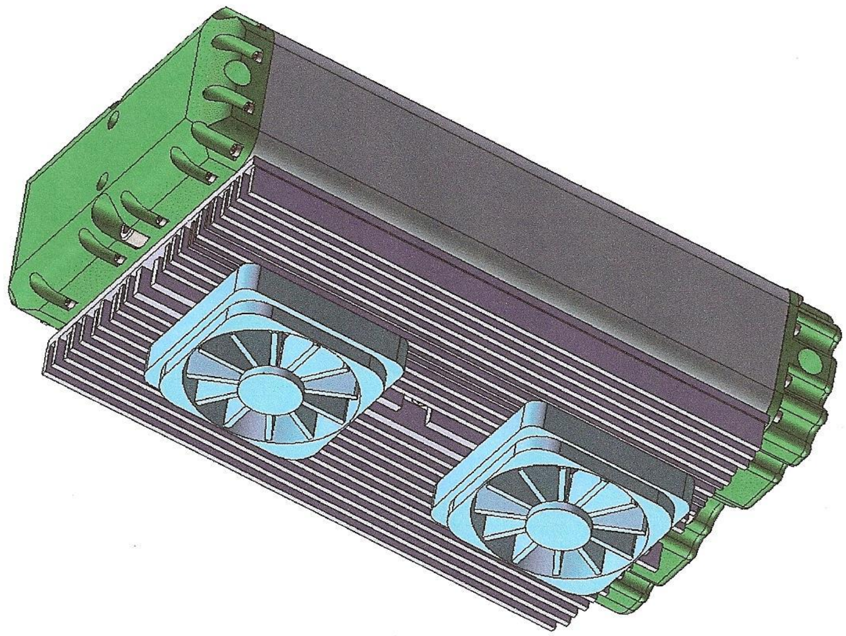

Figure 1. Model of an autonomous device for water regeneration in the field using natural materials - zeolite or other aluminosilicates.

Such a solution should be created on the basis of extremely simple design resources, at the same time ensuring the implementation of both elementary useful functions and full compliance with the Main Useful Function of the device.

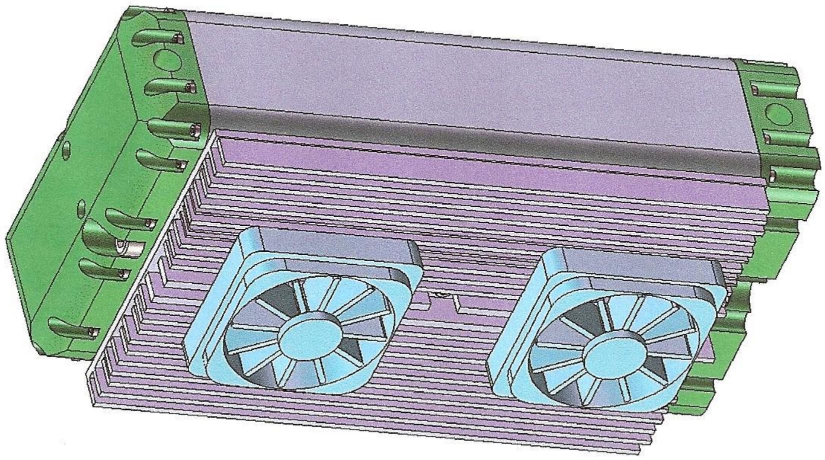

Figure 2. The model of an autonomous device for regeneration of radioactive water in the field using natural materials, such as crushed algae of the Ozol type, and also zeolite or other aluminosilicates combining with them, with the main useful function of absorption of radioactive ions of heavy metals, such as molybdenum isotopes, ruthenium, etc.

2. Treatment of liquids with acidic background, containing heavy metals in combination with organic acids.

Typically, these liquids contain complex contaminants (TSS, TDS, BOD, COD) and to extract heavy metals, it is necessary to separate the fractions of contaminants first.

To separate a liquid into fractions with a high concentration of organic substances and into a liquid with heavy metal ions, a combined treatment is used, where the properties and parameters of the formed foam change when the pressure of compressed air changes.

A liquid with a high concentration of organic substances is separated with the foam, and after removing the foam, a liquid containing predominantly heavy metal ions remains.

In addition, active homogeneous treatment with air leads to primary formation of oxides which simplifies the process of further treatment of water or an aqueous solution.

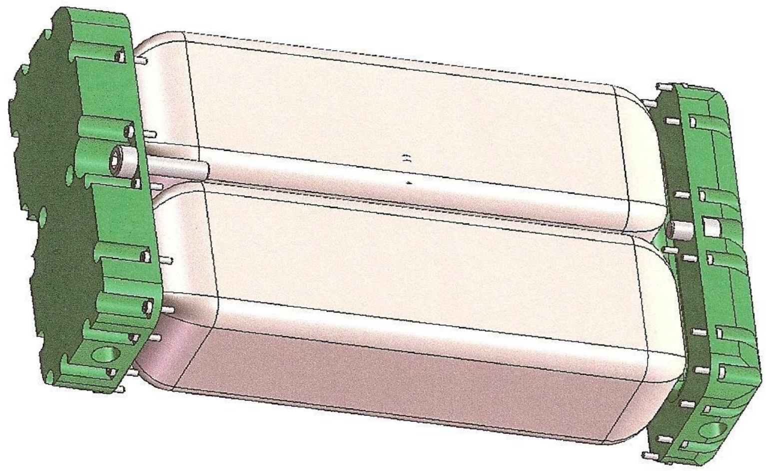

Figure 3. Models of liquid-permeable capsules with granulated active ion-exchange materials, mainly natural, such as, for example, zeolite, ozol, activated carbon, etc.

The same design of working capsules can be used for synthetic ion-exchange resins, and natural materials can be combined with synthetic ones.

As, for example, a mixture of zeolite granules with synthetic ion-exchange resin – cationite, which allows to solve the problem of cooling water regeneration in atomic reactors.

The same mixture of zeolite granules can be used with ion-exchange resin – anionite.

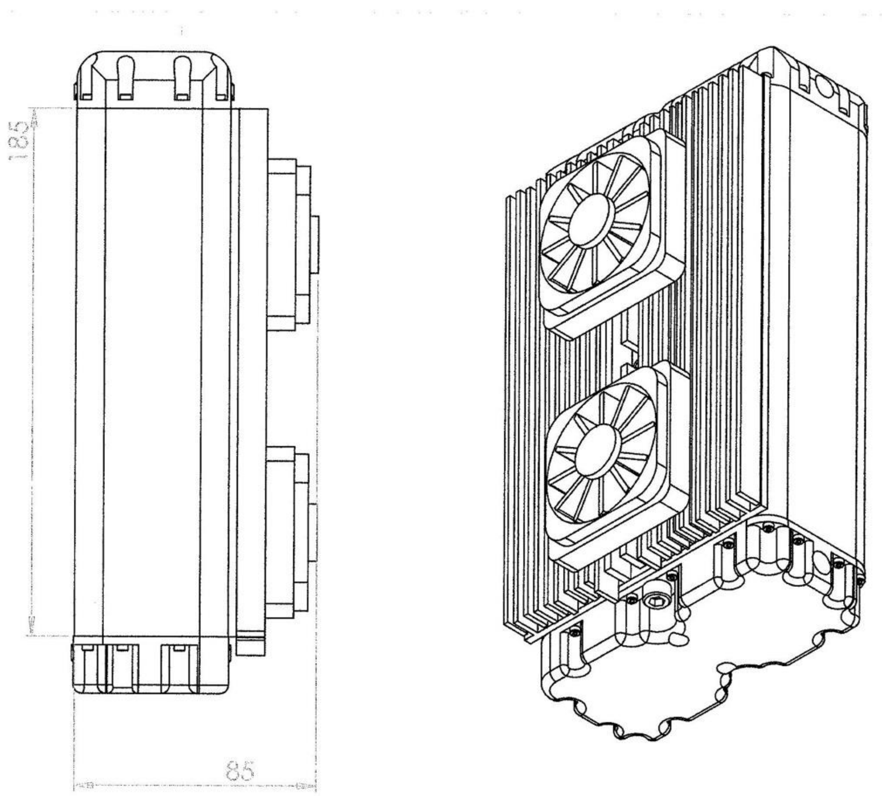

Figure 4. General view of the autonomous device for regeneration of aqueous process solutions; The device contains a number of composite technical solutions which can be controlled from the control processor with special software; As can be seen from the drawing, the device has extremely small dimensions.

3. Treatment of liquids with a high alkali content and a rich background of various contaminants, both organic and inorganic, containing heavy metals in combination with heavy metal salts.

Typically, these liquids contain complex contaminants (TSS, TDS, BOD, COD) and to extract heavy metals, it is necessary to separate the fractions of contaminants first.

To separate a liquid into fractions with a high concentration of organic substances and into a liquid with heavy metal ions, a combined treatment is used, where the properties and parameters of the formed foam change when the pressure of compressed air changes.

A liquid with a high concentration of organic substances is separated with the foam, and after removing the foam, a liquid containing predominantly heavy metal ions remains.

4. Formation of a kind of vortex cutter for cleaning surfaces.

Formation of a vortex tube creates active cavitation on the surface being cleaned and washed, which increases the efficiency of cleaning and washing 3–5 times and reduces water consumption required for these technological operations 1.8–2.5 times.

5. Technological Pools for complex washing of large parts.

In this case, devices for foam formation (foam generators) are used to create a mode of uniform, active, and aggressive pulsation of a liquid with minimum size of gas bubbles and raising the level of liquid in the pool during the operation of foam generators, which makes it possible to reduce the volume of contaminated water during washing by 25 – 35%.

6. Homogeneous saturation of process solutions and liquids with gas.

The use of foam generators or their structural equivalents increases the efficiency and reduces the cost of saturation of various liquids with various gases.

At the same time, the foam generator technology provides, in the process of saturation, complete control of the geometry of compressed gas bubbles in real time.

7. Rolled steel cooling in the metallurgical industry.

Water, or an aqueous solution can be modified by introducing a stream of bubbles of compressed gas (for example nitrogen), with sizes of no more than 25-50 microns.

When a gas is introduced into a liquid, it lowers its temperature, and further, when it comes into contact with the cooled surface and when the shells of air bubbles break, gas expansion and more substantial cooling occur.

This reduces energy costs for cooling 2 – 3 times and significantly increases the cooling process efficiency.

The cooling process can be carried out at the same energy consumption in parallel with the process of washing or cleaning the cooled surfaces.

8. Technologies and applied technique for activating classical flotation processes.

Devices for foam formation (foam generators) can be effectively used to produce uniformly sized air bubbles.

At the same time, the adjustment of technological modes is considerably simplified, since it is carried out only by adjusting the parameters of compressed air, and the bubble diameters are determined only by the foam generator geometry.

This significantly reduces energy consumption and improves the cleaning quality.

9. Combined flotation technologies with dynamic foaming

Foam generators can be used to create a combined flotation process, where foam is formed at the first stage, at high air pressure (6–8 bar), and after its separation, at low pressure (0.5–1.5 bar), treatment is carried out by forming a uniform flow of air bubbles.

10. Technologies of forced separation of liquids and contaminants when low concentrations of detergents are introduced into the treated fluid.

In many cases, the liquid to be treated does not contain foaming substances.

In this case, it is advisable to introduce a small amount of detergent into the liquid (no more than 25 milligrams per liter of the liquid being treated).

The active foam formed during the foam generator operation makes it possible to significantly reduce the concentration of contaminants before transition of the foam generator to production of air bubbles and, accordingly, transition to the classical flotation mode.

11. Technologies of dynamic mixing of liquids of various properties

When a liquid is supplied to the foam generator instead of air, and a flow discharged from the foam generator enters another liquid, an effective homogeneous dynamic mixing process takes place, which is 5 to 7 times more effective than mechanical mixing.

12. Water saving technologies for process baths.

The use of foam generators in various process baths, the effect of raising the level of water or any other liquid in the bath, lowers the level of water or any other technological solution in the bath by 25 –30%.

This saves 10 - 15% of technological solutions, with low consumption of energy for the preparation of compressed air.

13. Technologies of formation of fine-dispersed and aerosol mist.

Above the surface of the vortex tube formed during the foam generator operation, a mist appears, consisting of air bubbles in the shell of liquid in which the foam generator operates.

For fine and precise washing technologies, it is preferable to apply a mist treatment with a high cavitation effect, which occurs when the air bubble shells break.

Effective mist formation requires air pressure of 7 to 8 bar at a flow rate determined on the basis of the volume of the liquid being treated.

14. Treatment of aqueous solutions with high concentration of contaminants.

Provided for pre-treatment of aqueous solutions before electrochemical or any other treatment.

For treatment, the aqueous solution foams and contaminants concentrate in the foam.

The more contaminants tend to foam, the more effective the treatment process.

Contaminants are removed with foam.

Effective foam formation requires air pressure within 6 to 8 bar, a flow rate is determined on the basis of the volume of the liquid being treated.

15. Processing of aqueous solutions containing chemical complexes.

Provided for pre-treatment of aqueous solutions before electrochemical or any other treatment.

In this case, foaming of an aqueous solution is used, where the solution with all impurities is oxidized, and all impurities are present in the foam composition, since water does not foam.

If the foam is permanently removed, the system comes to a point when all the substances that have foam formation properties are removed from the solution.

Effective foam formation, according to the experience, requires air pressure within 6 – 8 bar (depending on the process intensity, the flow rate is determined by experiments).

The above 15 variants of the use of foam generators in technologies for regeneration of water and aqueous solutions show flexibility in the compositional formation of processes and give an idea of the potential for introducing software products into process equipment and process flowcharts of compositional technical solutions.

A new look at the durability and quality of a new product, including containing complex software products and their derivatives in the technical system

Dialectical contradiction in the technical system is aggravated in case of introducing into functions and parameters of its technical characteristics of a complex software product and its derivatives.

The source of development of conventional TS and TS modified with the introduction of a software product, as well as any object of the material world, is the law of unity and struggle of opposites – the universal law of development of nature, society, and technology.

Opposites are the sides of an object that are in mutually exclusive relationships. In this case, the side of an object or phenomenon is understood as everything that is somehow inherent in the object or phenomenon, characterizes it and can be comprehended.

Opposites in TS are “input” and “output”, useful functions, costs, and “capabilities”.

The interaction of opposites, when they both mutually presume and at the same time deny and exclude each other, is a dialectical contradiction.

Technical contradiction (TC) in the technical system is a dialectical contradiction, which manifests itself in the technical system as a deterioration of one side of TS at the level of external functioning (from the standpoint of super-system needs) while improving the other side of TS.

In other words, TC can be defined as the dialectical unity of interdependent positive and undesirable effects in TS.

In this situation, a complex software product, with proper and comprehensive consideration of all possible technical contradictions, should play a positive role and to a large extent should reduce the severity and influence of these contradictions on the main useful function of the technical system.

TC is always associated with some component of TS (element, group of elements, or interaction of elements), which is commonly called the nodal component (NC).

This TS component is immediately related to two sides of TS, and a quantitative change in some parameter (or state) of this component leads to an improvement in one and a deterioration in the other side of TS.

Therefore, more precisely, TC should be defined as the dialectical unity of positive and undesirable effects interdependent on quantitative or qualitative changes in the nodal component of TS.

Physical contradiction. Technical contradiction in its form appears in TS at the level of its external functioning. At the level of internal functioning, no mutually exclusive relations between the parties to the system are observed: from a physical point of view, TS is in some one state determined by the laws of nature.

But if we set the task of eliminating TC within this TS, asserting positive and negating undesirable effects, then mutually exclusive relations will manifest at the level of internal functioning, in the form of incompatible requirements for the parameter (state) of the nodal component of TS, more precisely, to the physical state of NC.

Such contradictions are called physical (FC). FC manifests itself in setting of the problem of eliminating TC, in other words, FC is a form of expression of the problem of eliminating TC within this TS. FC resolution is to establish new forms of organization and movement of matter in TS, when both incompatible requirements for the NC state are met, or, according to specialists introducing software products into the technical system, to establish such a "form of movement where this contradiction is both realized and permitted."

This phenomenon comprises the need to introduce complex and integrated software products into modern innovative technical systems.

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Composite Technical Solutions, Program Products and Complex Integrative Technical Systems Containing Them, as the Underlying Basis for the Modification of the Algorithm for Inventive Problem Solving while Creating Equivalents of Complex Integrative Inventions

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Continuous complication of new developments, in preparation of all stages of their design and classification analytical stages of evaluation, requires patent search and commercialization stages, new managers and corrective analytical tools similar in efficiency, versatility, and significance to the Algorithm for Inventive Problem Solving known in professional innovation groups.

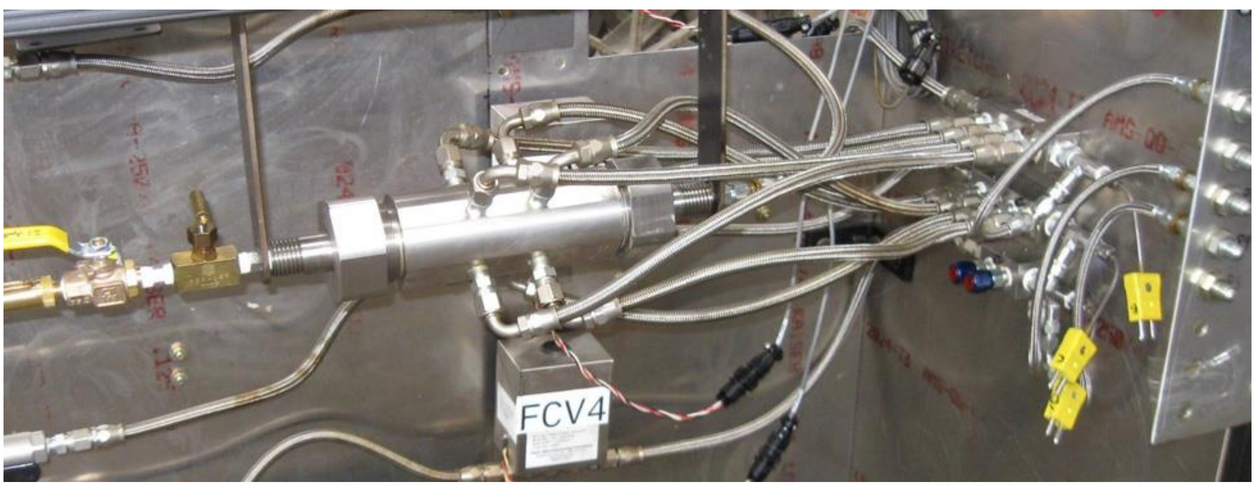

Figure 1. An example of a composite technical solution (developed integrative technical system) designed to optimize the hydrodynamic parameters of the fluid flow in a pipeline, including stabilization of the basic and auxiliary hydrodynamic parameters of the fluid flow in a developed turbulent flow where turbulence levels under standard conditions in the center and on the periphery of the pipe are significantly different. An example is shown on the prototype of the above technical solution, installed on a test bench to verify correctness of the input calculations and assumptions, and subsequent tests and comparative verification of the adopted conceptual solutions.

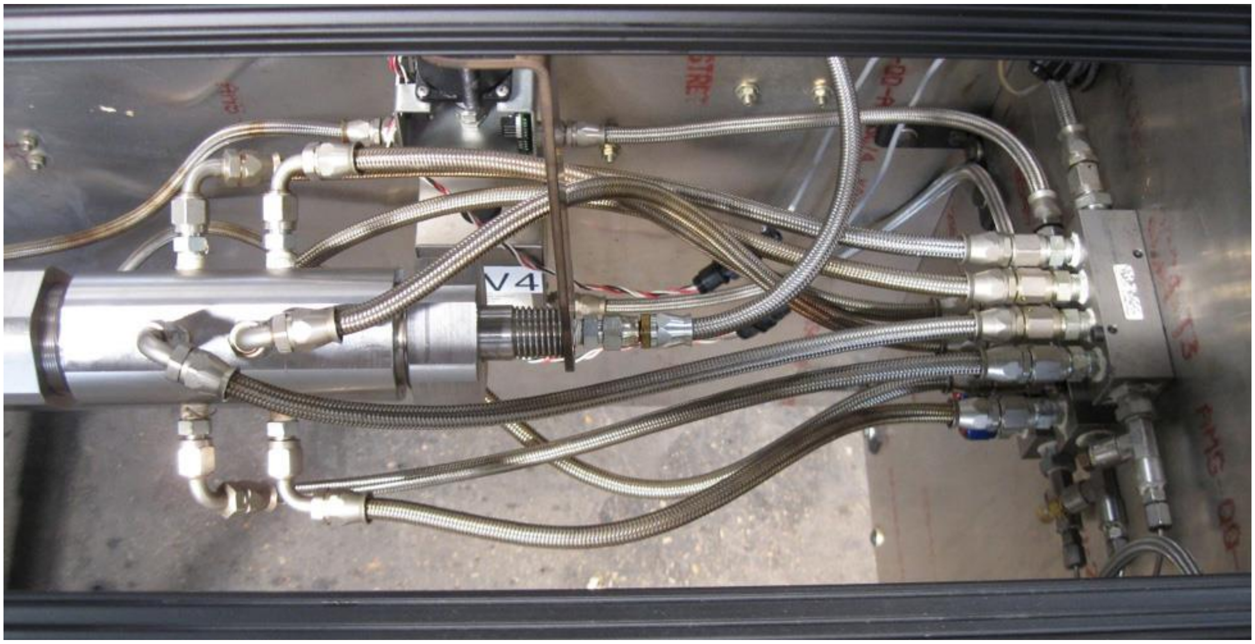

Figure 2, - an example of a composite technical solution (developed integrative technical system) designed to optimize the hydrodynamic parameters of the fluid flow in a pipeline, including stabilization of the basic and auxiliary hydrodynamic parameters of the fluid flow in a developed turbulent flow, installed on a dynamometer test bench at the following test phase for subsequent monitoring of correctness of the adopted fundamental design solutions, and harmonization of the results of implementation of these developed technical systems for compliance with the criteria - a perfect end result.

It should be noted that the various organizational and economic levels of commercial structures where the concept generation takes place, the creation and implementation of such technical systems may differ significantly and depend on the size of the economic structure implementing the innovative concept.

At the same time, many examples have emerged of how the structure and system of a modern large enterprise negates innovative projects and focuses, as it seems at the time of decision-making, on the most effective innovative ideas, often neglecting equally effective solutions whose inventors and authors get (often undeservedly) severe psychological trauma.

An integrated systemic approach to the consistent, balanced, and accurate formation of such an innovative integrative technical solution or to a group of local unified innovative ideas connected by a single innovative integrative concept, which together constitute a systemic object of a complex integrative invention, is very important as well.

The systemic approach is a reflection and development of the dialectic principles of the “universal interconnection” and “development” and, in fact, is one of the principles of the dialectical method of cognition.

The systemic approach methodology from the point when the Algorithm for Inventive Problem Solving emerged implies the representation of any object in the form of various system variants and its comprehensive consideration.

Such an analysis requires clarifying the wording and definitions of the system and its components.

1. The System

The system, in the modern view, is a complex of elements, consistently organized in space and time, interconnected with each other and forming a certain integral unity.

The system is characterized by the composition of the elements, structure and performance of a specific function.

A significant addition to the concept of the system in modern conditions is the program and processor component of the system, taking into account vertical and horizontal components of integration of the elements of its structure as well.

2. Elements

Elements are relatively indivisible parts of the whole, objects that form a system together. An element is considered indivisible within the limits of preservation of a certain given quality of the system.

The new commonality of elements is the degree of their autonomy with regard to additional possibilities of autonomization with the help and with the participation of program and processor tools.

3. The Structure

The structure is a regular, stable relationship between the system elements, reflecting the form, the method of arrangement of the elements, and the nature of interaction of their features and properties.

The structure makes the system a certain qualitatively defined whole, different from the sum of the qualities of its constituent elements (since it involves interaction of the elements with each other in different ways, only by certain features and properties, not as a whole).

More accurate classification of the structure requires formulating the definition of the limits of influence and autonomy related to the field of influence on these parameters by the processor and program components.

The capabilities of the processor and program components of the structure in combination with the traditional constituent elements to determine the levels of compliance of such a complex structure with the criteria of artificial intelligence today also create new limits for the criteria for assessing the general level of the structure and its compliance with the averaged technical requirements and conditions comparable to the definition of a perfect end result.

4. The Function

The function is an external manifestation of an object (element) properties in a given system of relations, taking into account the activity and influence of processor elements and, additionally, the functions of artificial intelligence. Such a complex function is a certain way of the object interaction with the environment, the object's "capability" of systemic interaction. Systems have many functions.

5. Subsystems

Subsystems (constituent systems) are parts of the system that represent some arbitrarily or naturally distinguished groups of elements, now often functionally connected by processor and program elements. Subsystems are allocated by functional features.

A single element can sometimes coincide with a certain subsystem or be a part of several different subsystems at once.

At the same time, the relationship between the elements within subsystems and within the system differs from the nature of the relationship between subsystems themselves. Elements and subsystems are united by the concept of a system component.

6. The Supersystem

The supersystem (metasystem) is a system of a higher order in relation to the given one, and where this system is included and functions as a subsystem.

Today, as a rule, the supersystem is defined and characterized by the level of the computer control and monitoring system, again, the relationships between the subsystem integration levels and flexibility, and the capability of self-control and systemic reorganization of the functional characteristics.

At present, the capabilities of remote control and contactless methods of measurement and monitoring of parameters in real time also characterize the classification and quality level of the supersystem.

7. The Technical System

The technical system (TS) is an artificially created material unity of interrelated elements naturally organized in space and time, with the aim of its functioning to satisfy a certain social need while maintaining a certain level of autonomy. TS elements can be both artificial and natural.

Any TS is part of two systems of relationships. On the one hand, it is an object of the material world that obeys the laws of nature (first of all, the laws of physics as the most common); on the other hand, TS acts as an element of public relations because technology and especially computer and processor technology are only means for social goals.

If TS is characterized by a spatial arrangement of elements, then TS is a device or substance. All technical systems, regardless of the nature of spatial arrangement of the elements, should now have inherent processor and program elements and real-time monitoring and control systems based on them.

If TS is characterized by organization of the elements in time, we are dealing with a method, although we should note the fact that today only one method that is not related functionally and by causal factors to a specific and effect relationship is not recognized as an invention.

The concept of TS allows to formulate the main feature of the technical solution (TSL).

TSL indicates a specific TS which functioning allows to achieve the goal set, that is, indicates the relationship of TS to a certain goal.

From the standpoint of systems engineering, TS can be represented as:

INPUT – PROCESSOR – OUTPUT.

The processor converts the input to the output and at the same time is a component (constant) of the input.

INPUT and OUTPUT reflect the system interaction with the environment. From the physical point of view, TS has space, time, mass, energy, and information at the output and input.

From the socio-technical point of view, at the input we have the “needs” of TS – the costs of society for its creation, and at the output – the TS “capabilities”, their main part is the functions of such system.

Acting in the form of the action of TS function in unity, the composition, and structure of the system’s activities are determined, showing what TS can do: move in space, provide heating, and resist the wind.

The remaining “capabilities” characterize how the actions are taken: reliably, retaining the possibility of repair and regeneration, etc.

One can select the appropriate subsystem for each function in TS.

8. Useful Functions

Useful functions (UF) are functions that correspond to the system purpose, characterizing the most important constituent useful outputs.

In real TS, not all of the output is useful.

The usefulness of a particular part of the TS output can only be determined based on social positions. Those “capabilities” of TS that correspond to its purpose, i.e., social needs at the supersystem level, are useful.

Other capabilities may be useless or harmful, and that which actively interferes with the performance of useful “capabilities” is considered harmful, for example, by destroying TS elements, etc.

New look at the new product reliability

If we follow the above principles and definitions, then we should consider such a fundamental issue in new, especially innovative and combination developments as reliability and durability, through the prism of definitions and classifications at the first stage of the supersystem, then along the chain – the subsystem, then the technical system, then the structure and then the function.

Since reliability of computer technology and mechanical elements of any technical system quite differ, we should pay great attention to the calculations of reliability of such combined systems which include integrative inventions, computer simulation systems, and elements of artificial intelligence, and at the same time, the methodology of such calculations and analytical assessments should be thoroughly worked out by elements in certain and real production conditions comprising similar elements of the above chain of definitions and classifications at the first stage of the supersystem, then along the chain – the subsystem, then the technical system, then the structure, and then the function.

Figure 3, - an example of a composite technical solution (developed integrative technical system) designed to optimize the hydrodynamic parameters of the fluid flow in a pipeline, including stabilization of the basic and auxiliary hydrodynamic parameters of the fluid flow in a developed turbulent flow at the next stage of technological inspections, production tests for the subsequent optimization of constructive and technological solutions for the production of prototypes, consistent operational control of the correctness of the chosen basic design solutions, and technologies and equipment for the production.

As practice shows, in any project of any innovation and composition structural level, only a properly organized pilot industrial operation can provide the final answer in the development of any innovation project and in a comparative analysis and evaluation of its commercial and innovation potential.

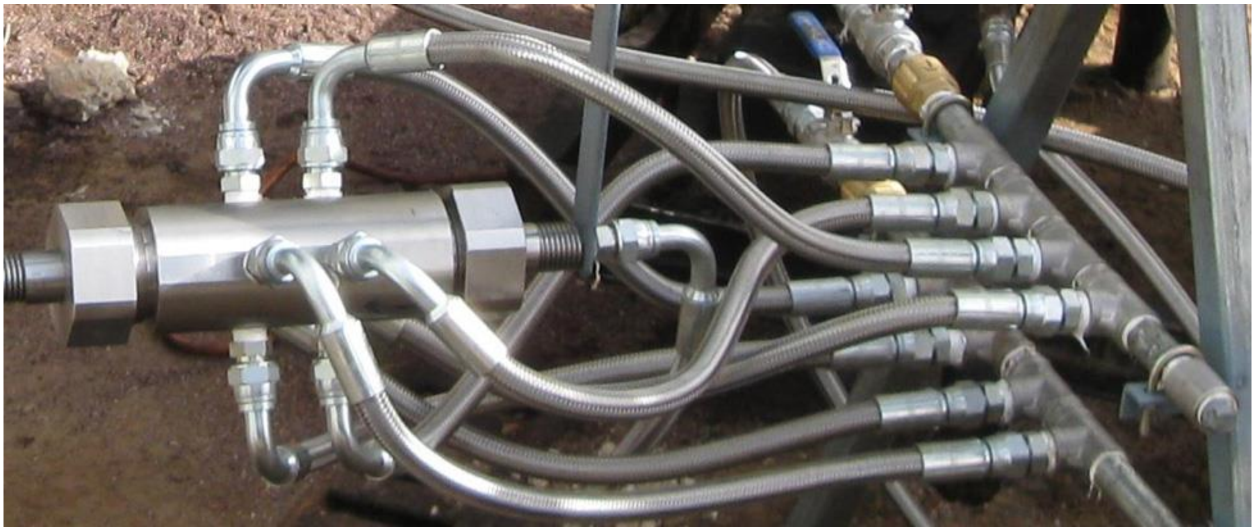

Figure 4, - an example of a composite technical solution (developed integrative technical system) designed to optimize the hydrodynamic parameters of the fluid flow in a pipeline, including stabilization of the basic and auxiliary hydrodynamic parameters of the fluid flow in a developed turbulent flow in real production tests and on test benches at the next complex production stage of testing for the final stage of subsequent monitoring and analytical evaluation of the correctness of the chosen basic design solutions and technological solutions.

Technical creativity and its highest manifestation - inventive activity aimed at creating original self-sufficient technical solutions - which became the basis of effective inventions demanded by society, requires tremendous work and creative impulse, time expenditures incommensurable with the time spent on only the technical or technological components of any project and more - an innovative project with signs of an integrative invention.

In the modern market conditions, when the final stage of the actual use of the invention can only be a product with a steady demand, the need for cooperation with specialists in the complex commercialization of innovations becomes a reality for practical inventors.

As the practice of the last decade shows, the most commercially successful are technical solutions not focused on the already existing and well-understood consumer demand, but on forming a new, unusual, previously unknown demand.

Since the technical level of engineering and technology is constantly growing in such, as a rule, integrative and complex solutions, following the laws, postulates and principles of the Theory of Inventive Problem Solving and the Algorithm for Inventive Problem Solving requires a constant comparison of existing provisions with newly emerged circumstances.

And even after realizing the need for systemic modification and optimization of the ideological, estimate and technical-technological base of such multi-stage cooperation between the generators of ideas - technical and innovative interpreters of global and even partially abstract ideas into really solved and realizable technical solutions, after realizing the need for deep cooperation with specialists in commercialization of new technological ideas and solutions, there remain specific, but in principle absolutely strategic issues that can be solved only by the inventor, who is the best to understand and know the features of his or her invention.

It seems to the author of this paper that just to help inventors in the process of identifying and deepening their understanding of the capabilities and peculiarities of their inventions, adaptation of the Theory of Inventive Problem Solving and the Algorithm for Inventive Problem Solving to modern conditions can provide all the necessary analytical tools.

The emergence of new markets, domestic and external, and the development of an economic organization from a craft workshop and factory to concerns such as U.S. Steel, illustrates the same process of economic mutation – if the biological term can be used here – which is constantly revolutionizing… the economic structure from the inside, destroying the old structure and creating a new one.

This process of "creative destruction" is the very essence of modern production.

Every enterprise that introduces innovations has to exist within its framework.

The behavior of an enterprise should be assessed only against the background of the overall process, in the context of the situation it generated. It is necessary to clarify its role in the constant stream of "creative destruction". It is impossible to understand it outside this stream.

In the future series of papers offered to readers, the author set a goal of relating future work on the commercialization of any invention with the initial stages of working on its creation, especially at the stages of generating ideas.

The inventor, who begins the process of forming basic ideas and principles for creating his or her future invention, even without knowing the principles of the Theory of Inventive Problem Solving and the Algorithm for Inventive Problem Solving, whether wanting it or not, uses them, even intuitively.

At the same time, the Theory of Inventive Problem Solving and the Algorithm for Inventive Problem Solving in their historical and classical edition do not help the inventor to decide on the estimated commercial value of his or her future invention.

In contrast to repeatedly practically proven and unique methods and principles, laws of technical systems development, which are basic for the Theory of Inventive Problem Solving and the Algorithm for Inventive Problem Solving, the methods of commercialization and analysis of the potential capabilities of inventions as commercial products, do not yet have a systemic theoretical basis.

Recently, many publications have appeared to provide recommendations on commercialization, and a decision has been made based on them to use one of them, to, firstly, provide the inventors with real-time information which they can, if they wish, adapt with the technical characteristics and advantages of their invention, and especially important, secondly, to show one of the possible versions and principles of practical actions showing how to change and adjust the technical characteristics and parameters of the future innovation development depending on market requirements.

Taking into account the conditions and all sorts of restrictions formed by the features of the innovation process in the mode if globalization of the world economy, it can be assumed that, namely, the systemic unification of the elements of innovative products at the component level can help to gradually form a library of components, assemblies, and basic parts, which the inventors can use to form the technological embodiment of their ideas.

It seems to the author of this publication that taking into account possible market requirements at the stage of generating an innovative idea will enable forming such a technical characteristic of a new product that will contribute to a more confident and cost-effective introduction of the innovation, but if the assessment of the commercial significance of the generated idea is low, giving up this idea and paying attention to something else, or by modulating and unifying the idea, turning the idea in a cost-effective direction.

In his papers on the Theory of Inventive Problem Solving and the Algorithm for Inventive Problem Solving, the author had to repeatedly note the indisputable fact that most of the inventions being created now are integrative because any modern effective technical solution have both digital control systems, composite materials, nano-coatings, and various integrative combinations of the program, system, method, and apparatus type.

For such complex, combined and integrated systems, the principles of a system analysis of their commercial value have yet to be formulated, and publication of information about the methods, techniques, and working schemes of commercialization will help inventors working in the field of innovative projects today.

Impossibility of successful commercialization without forming the principles of the compositional interactions and the compositional structure of a new technical solution.

The primary insight into a new product in the market as a composition technical solution within the Technical System and within the framework of interrelations comprising a supersystem with processor and computer elements inherent in modern innovative products cannot be imagined without an appropriate presentation format via the Internet and relevant websites using all innovative information presentation, modeling, and simulation capabilities.

Thus, the success of the first stages of commercialization largely depends on the success of such a presentation.

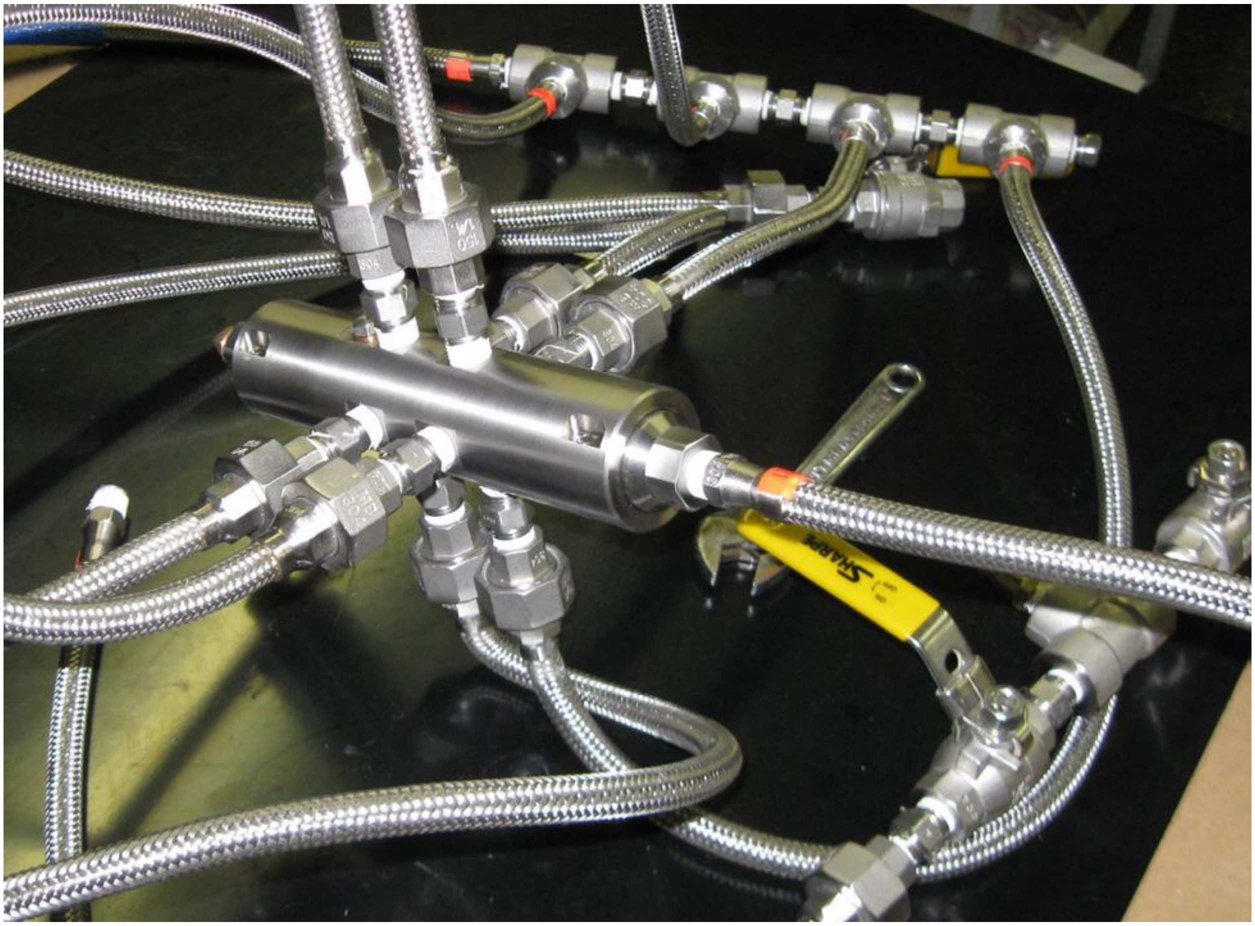

Figure 5, - an example of a composite technical solution (developed integrative technical system) designed to optimize the hydrodynamic parameters of the fluid flow in a pipeline, including stabilization of the basic and auxiliary hydrodynamic parameters of the fluid flow in a developed turbulent flow at the next stage of testing after the final design stage and after applying numerically controlled production methods, for subsequent control of the correctness of the chosen basic design solutions, methods, and equipment for the production.

The proposed techniques and methods for formation of a compositional style in creation of new innovative solutions

As can be seen from the above, the systemic bases for defining the criteria of compositional style as a direction for creating new innovative solutions and technical systems are in the process of defining and forming, and there is every reason to believe that the Theory of Inventive Problem Solving and the Algorithm for Inventive Problem Solving will play the key role in this dynamic process.

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Composite Technical Solutions as a Basic Basis for Formation of Innovative Technical Systems and Their Software Products, as Effective Equivalents of Complex Integrative Inventions

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Composite technical solutions, especially those containing fragments and components that are integrative inventions, have recently been increasingly referred to as smart technologies, smart materials, smart production, etc.

This kind of comprehension began with the definition of smart materials.

Of course, there is no formal definition of the catchy term “smart materials”. It is usually the name of materials that can change their properties under the influence of the environment. For example, there are so-called materials with shape memory.

For example, titanium nickelide wire (also called nitinol), when bent, returns its original shape after heating.

For the first time, these properties were applied in the medical devices in the last century, when performing operations to close the Batalov duct in the partition between the heart ventricles.

An umbrella was created from nitinol microplates on which an elastic silicone rubber case was stretched. In the folded state, the umbrella was fed along the catheter to the place of an open duct, and when the body temperature was reached, the shape memory returned the nitinol plates to the initial position. The umbrella blocked the duct and the heart disease was eliminated without surgery.

It should immediately be noted that, despite the freshness of the term itself, the effects associated with smart materials were discovered quite a long time ago.

For example, the shape memory effect was studied as early as in the 1930s, and the properties of nitinol were studied by Soviet metallurgists, Kurdyumov and Khandorson, in 1948 (although the alloy was named so because of its rediscovery in the 1960s by the Americans, but this is a completely different story).

We will focus on a special class of smart materials - self-repairing materials. This term means technical systems that can withstand structural failure due to mechanical impact.

The main requirement for such materials is that the "healing" of damage occurs without human intervention. There are a lot of mechanisms for such healing.

One of the ways to protect metal (for example, aluminum) parts is chromating - they are treated with special solutions, often containing chromic acid.

This treatment forms a thin layer that protects the metal from corrosion. The same layer serves as an excellent primer for subsequent painting or spraying. Chromating, however, involves hexavalent chromium. This material is considered hazardous to health, because, unlike, for example, trivalent chromium, it is relatively easy to penetrate into living cells.

However, in some industries, for example, aviation and aerospace, hazardous chromating is still used in the processing of aluminum alloys.

Among other things, this is due to the fact that, during operation, such a coating can heal minor scratches and damages within several weeks. Roughly speaking, chromium itself migrates to the scratch, filling and closing it. During such migration, the scratch, of course, will not close (commodity appearance of the product will be spoiled anyway), but the aluminum alloy substrate will be protected (worse, of course, but protected).

Thus, one of the tasks the chemists face is to create a coating that could replace the hazardous chromating. In late October 2012, scientists from the University of Nevada presented their prototype of such a coating. They came up with a molybdenum based coating. Scientists have also proposed a method of applying this coating on the surface of aluminum alloy AA2024-T6 used in the space industry.

During the study, scientists deliberately damaged the sample. Then, using several spectroscopic methods at once (for sure), they verified that molybdenum is present in the damaged area, that is, the coating is capable of self-repair. Scientists, themselves, say that their work is not yet completed - they are working to improve the coating formula. It is noteworthy that, before obtaining acceptable results, the researchers tried about 200 different compositions.

But smart materials and technologies today, first and foremost, include technical systems with complete recycling of consumables and without production waste.

One of the most important processes in modern chemistry and electrochemistry is the process of continuous regeneration in real time, for example, etching solutions in the production of electronic and microelectronic circuit boards.

When designing these kinds of composite complex processes, the most critical is the process of adjustment without the use of chemical reagents of the level of acidity or alkalinity in the solution undergoing regeneration.

In the last decade, methods and apparatuses have been invented for such a purpose.

Until today, this integrative invention has not been improved by anyone, or no one has managed to create something better.

Recently, combined compositional technical systems have also emerged. Their evolution is quite dynamic, and at each stage of development, all the technical systems used represent complex integrative inventions, having a number of consecutive elements of constructive and technological regeneration tied to the supersystem functional algorithm.

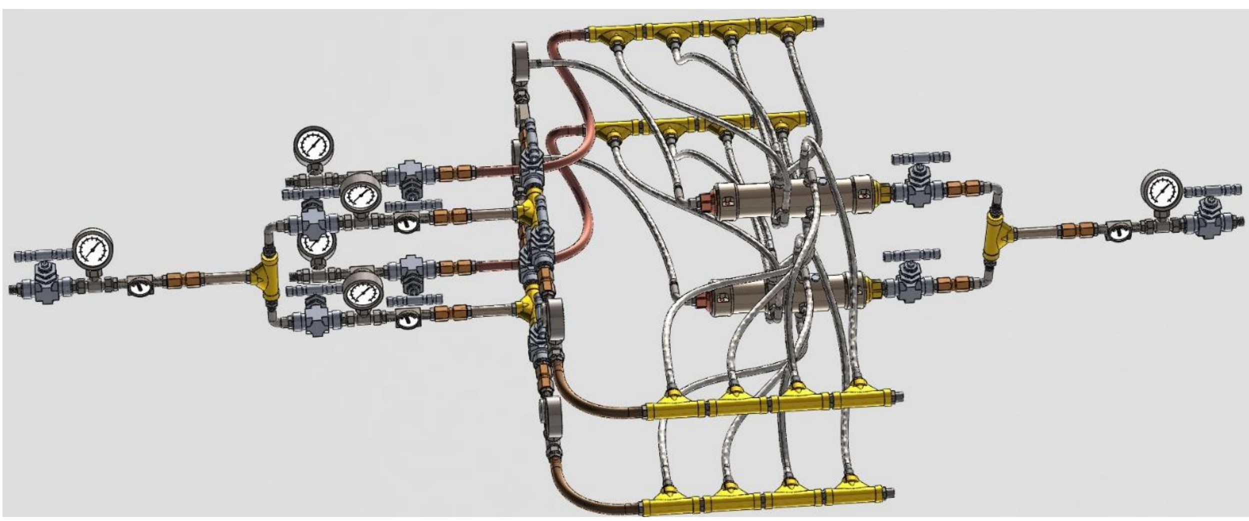

Figure 1. A duplicated technical system for a linear homogenization station of liquid fuel in the fuel system of an industrial boiler with a capacity of 10 tons of steam per hour.

The technical system is based on standard components, without composite materials and without reference to the production capabilities of equipment with digital program control.

As can be seen from the figure, the technical system also includes control measuring devices for monitoring pressure and flow in real time, but controlled with valves operating in manual mode.

Devices for homogenization are connected and work in parallel, mutually complementing each other.

Components and fittings of standard pipeline equipment are applied with their main purpose, which required several large dimensions, while maintaining the required performance.

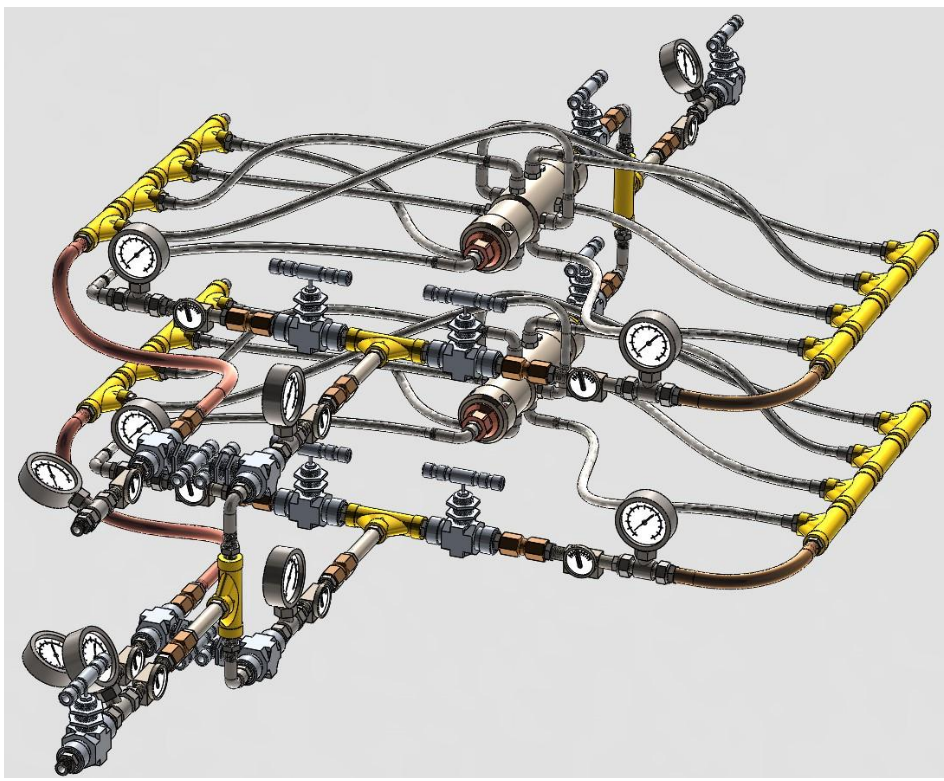

Figure 2. A redundant technical system for a linear homogenization station of liquid fuel in the fuel system of an industrial boiler with a capacity of 10 tons of steam per hour.

The technical system is based on standard components, without composite materials and without reference to the production capabilities of equipment with digital program control.

As can be seen from the figure, the technical system also includes control measuring devices for monitoring pressure and flow in real time but controlled with valves operating in manual mode.

The devices for homogenization are connected and work in parallel, mutually complementing each other, but the larger scale of the figure shows the characteristic color of the pipeline valves, made of copper and copper alloys, which, in addition to high cost, leads to the need for regeneration, as stability, strength and durability of parts made of copper at high pressures and the presence of chemically active substances have much lower values.

The need to fundamentally transform traditional technical systems into composite technical solutions, with innovative structure and innovative functionalities and characteristics of the integrative invention that develops in the vertical and horizontal hierarchies, leads to the need to re-formulate the techniques and methods for a gradual transition from the basic (however the composite foundation of the existing technical solution or complex technical system) to a new technical solution and to the basic foundation and integrative invention structure.

Techniques and methods of transition from the created composite foundation of a new technical solution to the basic foundation of an integrative invention

As the first stage of modification of the technical system, we should call the stage of complex and consistent replacement of system components with more advanced ones adapted to work in a composite technical and technological cycle.

Figure 3. A modernized redundant technical system for a linear homogenization station of liquid fuel in the fuel system of an industrial boiler with a capacity of 10 tons of steam per hour.

The technical system is based on innovative and modified components, with the most use of composite materials and with reference to the production capabilities of equipment with digital program control.

As can be seen from the figure, the technical system also includes control measuring devices for monitoring pressure and flow in real time, but controlled with valves operating in semiautomatic mode.

Devices for homogenization are connected and work in parallel, mutually complementing each other, but, if necessary, can work separately in an independent operating mode.

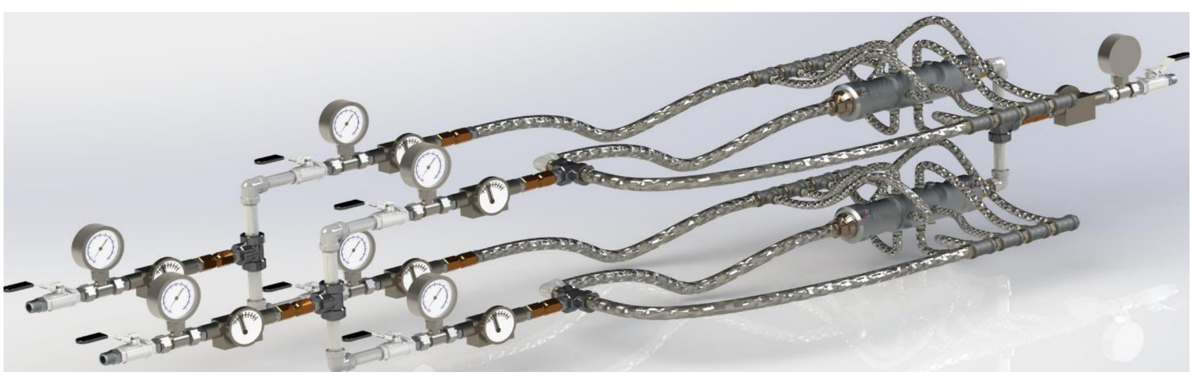

Figure 4. A systematic modernized redundant technical system for a linear homogenization station of liquid fuel in the fuel system of an industrial boiler with a capacity of 10 tons of steam per hour

The subsequent modification of the technical subsystem and the technical supersystem are based on standard, but modified components, with the maximum possible use of composite materials, and with constructive and technological reference and adaptation to the production and technological capabilities of equipment with digital program control.

As can be seen from the figure, the technical system also includes automated control measuring devices for monitoring pressure and flow in real time but controlled with valves operating in semiautomatic mode and that can be included in the closed automatic system of control and monitoring with programmable controllers.

The devices for homogenization are connected and work in parallel, mutually complementing each other, but their technical capabilities and characteristics allow to optimize within the framework of the existing technical solution, taking into account supersystem demands.

The need to switch to combination technical systems, especially to systems related to the level of supersystems, requires optimization and fundamental directions for the development of the Theory of Inventive Problem Solving and the Algorithms of Inventive Problem Solving.

The following main areas can be distinguished:

1. The traditional phenomenon for the evolution of TIPS and AIPS is a general increase in the degree of algorithmization due to a more complete and deeper use of the objective laws of the development of technical systems, including first and foremost – combination complex technical systems (supersystems) with built-in programmable controllers and with higher-power controlling and modeling systems.

2. Significant strengthening of the "bridge" (causal connection) between physical contradictions and ways to resolve them.

3. Strengthening the information fund, strengthening the links between TIPS, AIPS and existing standards, as well as a software solution for preliminary estimate operations and system modeling and simulation in real time.

4. Transformation of the second half of AIPS (development and use of the idea found) into an independent algorithm using the latest software technologies and advanced features of modern computer and processor technologies.

5. Development of a new initial part (or a separate algorithm) to identify new tasks, including innovative tasks, with adaptation to the full simulation cycle.

6. Strengthening of general upbringing and general educational functions based on the latest techniques of system programming, modeling and simulation.

TIPS and AIPS should more vigorously and selectively develop the skills of concentrated, purposeful and logical strong thinking based on the advanced capabilities of modern computer technology.

7. Gradual integrative multilevel increase in composite universalism, composite interchangeability, mutual selective applicability and modularity in composite format.

Combination of functions and conversion of functional load between the local modules of the innovation system.

This perspective makes sense to be detailed.

A sequential step-by-step algorithm for the implementation of this task is proposed, of course, in a multifunctional version with maximum unification and full local interchangeability of all links and elements of an innovative technical solution.

PART 1.

1. FIRST STEP

Determine and formulate the final version of the generated idea and the ultimate goal of solving the problem of implementing this idea

What is the technical goal of solving the problem ("What characteristic of the object should be changed?" Is there a connection between the parameters of the task and the parameters of the innovation tasks already successfully implemented?).

What characteristics of the object can not be changed when solving the problem?

What is the economic goal of solving the problem and what commercial goal is pursued ("What expenses will decrease if the task is solved?").

What are the (roughly) eligible costs?

What is the main technical and economic indicator that needs to be improved?

1-2. SECOND STEP

Check the bypass route. Suppose the problem cannot be solved in principle; which other — more general, well-known and already solved — problem must then be solved in order to get the required final result, if possible, an ideal final result?

(Use system analysis — the scheme of such an analysis can be based on the principles of an optimal and detailed strategy for patenting and licensing a developed technical system).

1-3. THIRD STEP

Determine the solution of which problem is more expedient — the initial or the bypass.

Compare the original task with the development trends of this branch of technology.

Compare the original task with the development trends of the leading branch of technology.

Compare the bypass task with the development trends of this branch of technology.

Compare the bypass task with the development trends of the leading branch of technology.

Match the original task with the bypass. Make a selection.

1-4. FOURTH STEP

Determine the required quantitative indicators.

1-5. FIFTH STEP

Introduce "time adjustment" to the required quantitative indicators.

1-6. SIXTH STEP

Refine requirements caused by specific conditions intended for the implementation of an integrative invention.

Take into account the implementation features. In particular, the allowed degree of complexity of the solution.

Take into account the intended scope of application.

PART 2. REFINEMENT OF PROBLEM CONDITIONS

2-1. FIRST STEP

Refine the problem using patent literature. Search by the US and European patent offices by ISSUED PATENTS, PATENT APPLICATIONS, and patent applications filed. Search the funds of the European Patent Office in subsections regarding the names of the authors of inventions, companies-applicants of inventions and by complex indicators and keywords.

How are (according to patent data) problems close to this one being solved?

How are problems similar to this one being solved in the leading branch of technology?

How are the inverse problems solved?

2-2. SECOND COMPLEX STEP

Select from all the options such an element that is most susceptible to changes, alteration, changeover, modification, optimization.

Note:

a. If all elements are equal in the degree of changes allowed, you should start the selection with a ***fixed*** element (it is usually easier to change than a mobile one).

b. If there is an element in the technical system directly associated with an undesirable effect (usually this element is indicated in the technical description), it makes sense to select it as the last.

PART 3. ANALYTICAL STAGE

3-1 FIRST STEP

Formulate the IFR (ideal final result) as follows:

a. The object (take the element selected earlier).

b. What it does.

c. How does it do it itself.

d. When does it do.

e. Under what mandatory conditions (restrictions, requirements, etc.).

3-2. SECOND STEP

Make two figures or two models: "before" (before IFR) and "after" (IFR).

Notes:

a. Figures can be conditional as long as they reflect the essence of "before" and "after".

b. The "after" figure should coincide with the verbal wording of the IFR, and if possible, with the model.

3-3. THIRD STEP

In the "after" figure, find the element indicated at the previous stages and select the part that cannot perform the required action under the required conditions. Mark this part (with hatching, different color, stroke of contours, etc.).

3-4. FOURTH STEP

Why is this part not able to perform the required action?

3-5. FIFTH STEP

Under what conditions can this part perform the required action (what properties should it have)?

3-6. SIXTH STEP

What should be done in order for the selected part of the object to acquire the properties noted in the terms of reference?

Figure and models.

Supporting questions:

a. It is necessary to show, in the figure and models, with arrows, the forces that must be applied to the selected part of the object in order to provide the desired properties.

b. What ways can be used to create these forces?

3-7. SEVENTH STEP

Formulate a method that can be implemented in practice. If there are several such methods, it is necessary to select the most promising.

3-8. EIGHTH STEP

Provide the scheme of the device for implementation of the first method.

Figure, models.

Supporting questions:

a. What is the aggregate state of the working part of the device?

b. How does the device change during one working cycle?

c. How does the device change after many cycles?

The effect of restrictions on the number of paragraphs of the invention formula on the possibility of reliable protection of composite technical solutions.

The proposed structure of the independent paragraph of a composite integrative invention formula, built on the basis of a composite technical solution within the framework of a composite technical system.

The first independent paragraph of the integrative invention formula is of most importance to the application.

The first paragraph of the invention formula should be extremely brief, and at the same time, consist of three parts.

The first part provides the commercial name of the technical solution, which should cover as large a commercial use area as possible, and at the same time, give an idea about the limits of distribution of the claims of the proposed technical solution, excluding advertising speech and paradoxical statements...

The second part of the first paragraph should describe the distinctive features, their aggregates, and interrelations known and used as basic ones for the realization of distinctive features.

The third part of the first paragraph should describe the distinctive features, their aggregates and static and dynamic relationships of the distinctive features with the basic known features that together achieve the ideal final result.

The proposed structure of the dependent paragraph of the invention formula, built on the basis of a composite technical solution

The subsequent dependent paragraphs of the formula should describe, in more detail, the distinctive features in the most general form possible. All subsequent paragraphs of the formula should disclose all possible uses of the distinctive features to form an effect and achieve the ideal final result. If the ideal final result can be achieved in some variations, and, is subject to the presence of different combinations of distinctive features with basic characteristics, all possible options should be specified in the subsequent paragraphs.

Each subsequent paragraph of the formula also consists of three parts, the requirements for each of them correspond to the requirements for the first paragraph of the formula.

1. Second independent paragraph of the invention formula
2. Paragraph dependent on the first and third paragraphs of the invention formula
3. Paragraph dependent on the first and third paragraphs of the invention formula
4. Dependent on the first and third paragraphs of the invention formula
5. Dependent on the first and third paragraphs of the invention formula
6. Third independent paragraph of the invention formula

If the object of the invention is a device or unit and is named, for example, the ... unit, it is desirable to have at least three independent claims, whatever the first item is, a unit for ..., a method of application and an associated method of ... manufacturing.

Third paragraph, - method of applying the ... unit;

Eighth paragraph, - the unit for ... and the associated method of its manufacture ...;

All of the above are just examples. Each technical solution has its own original features, and this may change the composition and structure of the invention formula paragraphs.

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Composite Technical Solutions in Combination with Modern Software Products as Multifunctional Equivalents of Complex Integrative Inventions

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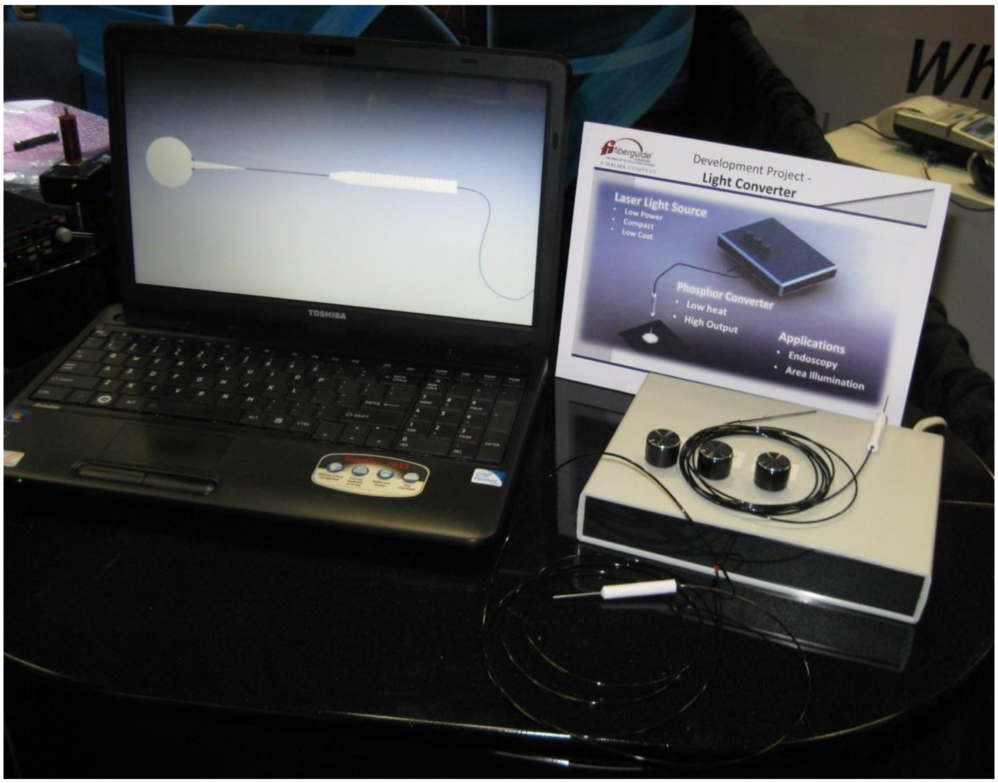

Figure 1. Example of a composite technical solution in combination with modern complex software products and base units made as multifunctional equivalents of complex integrative inventions in several related technological areas, including laser diodes, precision optical cables with composite luminophores and encoding and decoding of disposable laser tools with correction of emission spectrum using composite luminophores deposited on an optical cable.

All inventors know that sometimes technical solutions are created that, in real conditions, operate, work and solve many tasks, which, when stated, pushed the inventor to innovative analysis and initiated his/her purposeful creative activity, but there are at first glance interesting technical solutions, but as a result of a deeper analysis, turns out that they are created in isolation from reality and solve absolutely nothing, except for the realization of ambitious claims to at least some (most often not very useful, and sometimes useless at all) - idea in the field of engineering and technology.

In addition, technical solutions arising in a local area necessarily directly or indirectly affect existing stereotypes and even psychological barriers that arise on their basis, which prevent from overcoming common technical and specific technological contradictions that have arisen on the basis and in the course of development of these psychological barriers.

Even twenty years ago, the need for inventions of the second group and the equally important need to take into account the influence of psychological barriers were somehow justified by their supporting role as the basis for the selective choice of the most effective technical solutions.

The emergence of information technologies and a sharp reduction in the time cycle intended for the development and transformation of an inventive idea into a really necessary, demanded and marketable product, complication of the technical and technological components of new products, causing a proportional increase in the cost of manufacturing prototypes of the invented product and their testing, make us completely consider the possibility of creating technical solutions with innovative support functions in a completely new way.

Now, if the inventor wants his/her innovative ideas to be used, he/she must be more versatile and must have both the technique of foresight, intuition and, to a certain extent, developed imagination, and also be a practically universal specialist, at least feeling and (better) well aware of the commercial and consumer demands of the market regardless of the technical and technological stereotypes combined with them and arising on their basis and under their influence including psychological barriers.

There are several basic directions that have a decisive influence on the fate of new ideas in today's conditions and, taking them into account can provide real and high level of commercial success, or their neglect will forever close the way for the idea to be implemented in any commercial form.

I propose to consider some of these basic areas (of course, the scope of the article and the monograph only allow doing it in abstract form):

Availability of fundamentally new materials

Consider, for example, two new technological areas, creation of efficient light sources based on blue laser (laser diode) radiation and creation of composite food products based on efficient mixing systems and hydrodynamic activation.

Both of the above technological areas for development require structural materials, which, due to their properties, in each direction, will provide parameters that cannot be obtained using conventional materials.

The possibility of using new materials is not absolute and their application requires a primary composite solution.

For example, lasers require a highly efficient heat sink and a system for scattering current pulses, and its implementation requires changes in the design of a laser case in order to use composite diamond-copper material which can perform these functions due to its parameters and properties.

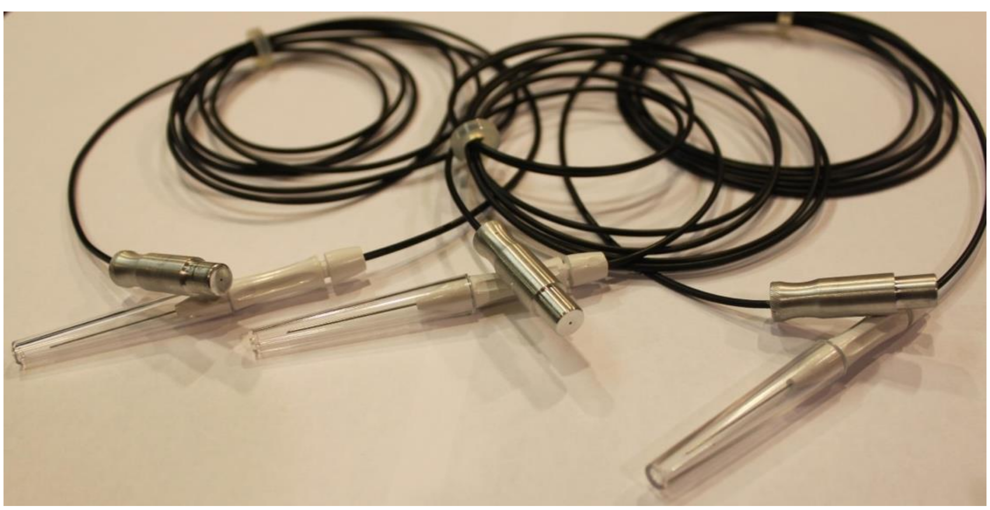

Figure 2. The figure shows disposable laser tools, which are also composite technical solutions in a lower hierarchy of complex technical solutions, where fundamentally new materials determine the possibility of achieving an ideal final result while maintaining the

design concept without significant changes, as well as preserving the principles of directed impedance and resonance coding and decoding to ensure the identification of replaceable disposable instruments.

But it turns out that replacement of the material does not solve all the complex problems faced by the creators of new lasers; What is the solution? A solution can be a composite scheme, when, for example, in addition to the material, a radio frequency driver is introduced into the system of technical composition, which, in combination with the material that performs the functions of cooling and dissipating excess heat and current pulsations, allows the laser to provide the pumping mode, which in turn allows for a laser with a power of 1 watt, to introduce a pumping current of, say, 2 watts.

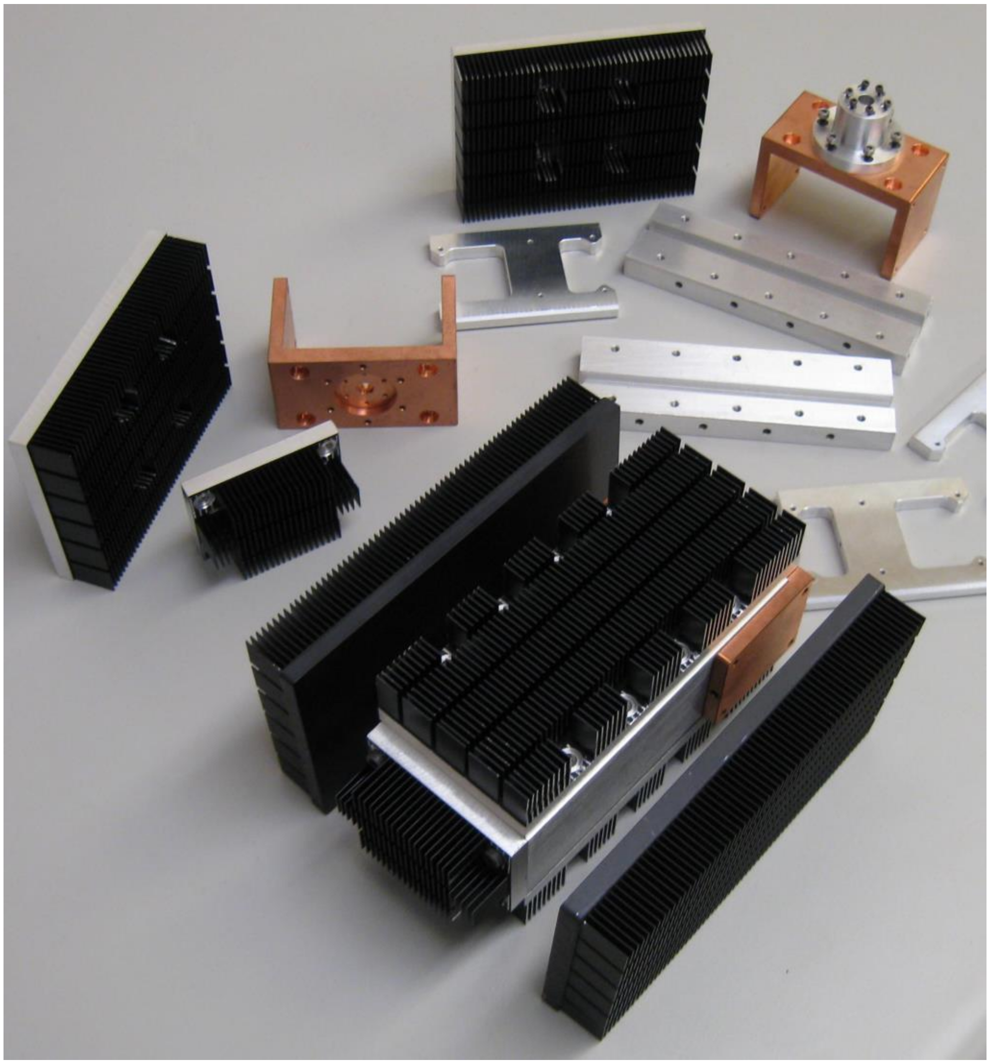

Figure 3. The figure shows the laser module components containing basically the options of diamond and copper composites, changing the basic parameters of the technical capabilities of the housing modules for laser diodes and providing, among other things, the possibility for a significant increase in the speed of the electronic components of the system, which, due to these composites, allow applying progressive integrative inventions - RHYTHM - boards, which in turn are a complex integrative invention.

This is already the so-called leap of effect and quality, and this illustrates the fact that in modern conditions the most optimal technical solution bringing the desired result is a composite technical solution.

In the second example, the composite solution looks quite different, in it, a fundamentally new material is the final product of the technology, which can be represented as a new homogeneous food composition, produced just and only thanks to the composite system of the homogenization process in the process of mixing and churning.

Figure 4. The figure shows samples of composite butter containing more than 30% fortified filler; In such composite solutions, the main factor ensuring the efficiency of the technology is the factor of the technique of churning of the composite butter using an earlier integrative solution, the so-called dynamic churning in the "tumbling barrel" system.

Presence of composite materials

Information on scientific and technological developments of composites is eagerly awaited in the market and new composite materials are constantly appearing, and their presence makes adjustments to the design of new products and the process of their manufacture.

In order to link these new developments with the enormous scientific, technical and technological experience gained in research and development enterprises, we consider, as an example, the method of creating nano-composites, where the main component is a nano-powder of synthetic diamond, by the way, its production technology was born in the Ukrainian Institute of Superhard Materials.

A significant novelty added to this technology was the method of high-speed nano-coatings on nano-diamond powders made of the most ductile metals, such as copper, silver, gold, platinum, and with further introduction of these components into a complex technological composition, with the introduction in the process of the operation of initiating the flow properties of plastic metals at low temperatures and subsequent plastic calibration under ultrahigh pressure, of thus obtained nano-capsules; Thus, we see in this composite solution a sequentially horizontally oriented integration of the technique of precision nano-coatings and the technique of initiating cold flow in a material deposited using the same coatings.

Thus, this publication aims to show that the existing level of research and development in the field of composite materials science allows, when the task is correctly stated, the developers of one component of the composition and, with in-depth cooperation with the developers of similar technologies whose product is another component of the composition, creating technology and materials relevant and popular in the market.

Now we can trace how the process of forming a composition of technologies and materials is developing.

From the creation of complex integrated, energy-rich semiconductor devices, in particular, semiconductor lasers (laser diodes), the problem of effective heat sink, heat dissipation, current pulses dispersion and fluctuations appeared.

The cause of this problem was the absence among structural materials, alloys and various combinations, and combinations of materials, of the ability to reliably and steadily perform these functions.

All materials and their derivatives in a certain degree did not suit the developers and operators, and only with the advent of the possibility of creating complex composite technical solutions, problems of this level can be solved.

New areas of component manufacturing technology

In composite technical solutions, methods and technologies for manufacturing product parts and components are the most important factor determining general introduction of this product.

As an example, consider a nozzle or fuel injector of an internal combustion engine. This is one of the most popular products. Over a billion of such injectors is manufactured in the world per year.

For such a product, its key value is determined by several key factors, - diameter of outlet orifices and ensuring tightness at high fuel pressures (up to 2,000 atmospheres). Making holes using the conventional technology determines the limits of the minimum diameter of holes, and since at high pressures holes are required with the diameter of microns, the technology for making these holes should be, for example, laser; In this case, the inventor of a new injector should provide a composite component of the invention novelty, expressed in accordance with specific requirements of the equipment for laser drilling.

New consumer standards

Constantly changing conditions and consumer demands, in combination with local consumption standards, with cultural and national traditions underlying local consumption standards, create informal, but tacitly present conditional consumer standards.

If the goal of the inventor is to ensure commercial success for his/her invention, then a basic understanding of the current consumer standard criteria, parameters of technical, operational and functional characteristics of a new product, should be an essential part of its commercial strategy.

If technological risk is excluded because inspections and tests of a new product have yielded positive results, the risk of commercial failure for this, technologically quite successful product, really remains, if the inventors and their commercialization partners did not take into account or did not understand the essence of the consumer standard for their product.

New environmental standards

As is known, the restrictive requirements of environmental standards are becoming more stringent. While working on the invention of a new product, which application somehow affects the limits of permissible parameters regulated by environmental protection standards, it is necessary to provide for full compliance with the requirements and restrictions of existing standards when operating a new product.

As a rule, existing standards are constantly being improved and the requirements that are in effect in the current year will be consistently made more stringent in a few years.

This is especially important for various power equipment and internal combustion engines.

There are cases when an internal combustion engine was invented with an innovative cylinder layout, with an extremely efficient fuel economy, but the concentration level of nitrogen oxides and soot in the exhaust gases exceeded the permissible standard, which should take effect two years later.

This was enough for the newest engine to be subject to revision, where its technical solution was changed to a composite level with the inclusion in it, integrated with previous technical solutions, of an innovative system of treatment and activation of fuel, which allowed to reduce the concentration of harmful substances in exhaust gases.

Fashion effect

Even for high-tech products, fashion exists, as a developed by time and practice kind of integral complex stereotype that combines both objective and subjective commercial and operational factors.

Subjectivity of this concept is not always explained by direct logic methods, but it must be taken into account by the inventor both when developing a new product and when preparing its presentation for potential partners and consumers.

Very often, an innovative product lacks elements, factors or signs that future consumers wait for and will favorably accept with interest, while the authors concentrate on purely technical aspects and offer them nothing at all that they want to hear and see.

Availability and constant intensive development of software products

Significant complication of equipment and especially various types of electronic and microelectronic devices has fundamentally changed the principles of their protection as objects of complex, multidimensional and multifunctional intellectual property.

For such objects, the essential differences regarding purely design features, circuit solutions, combinations of these solutions do not determine all aspects of the invention, since today very often all of the listed features and differences can be realized into a working system or prototype only under certain conditions and capabilities of manufacturing and control technology, and very often it is the manufacture that determines the basic properties of the invention.

The development of processor control systems also determines viability of the technical solution, and therefore the algorithm or algorithms, programs, feedback between the elements of the structure or scheme become or have confidently become an organic part of the technical solution underlying the claimed invention.

Thus, in one description it is necessary to combine or integrate several different technologies and this combination, the identified possible channels and links of such integration should be presented in the invention formula in such a way as to prevent the patent department expert from doubting the unity of all integrated distinctive features of a future invention and divide it into a number of local technical solutions based on one technological direction.

Possibilities of patenting in the field of information technology affect a huge layer of activity in modern society. And if very recently it was possible to characterize or limit a certain technological sector very accurately, with the advent of high technologies and their branches, information technologies, into all areas of human activity, such classification capabilities and protective mechanisms have changed significantly and transformed into a new system of technical, commercial and legal relationships.

In almost all, even relatively simple processes, their structure becomes integrative and includes technological methods, methods and systems never used before, and, moreover, the integration of classical technical solutions with new capabilities provided by information technologies radically changes the concept of invention itself.

This factor that has arisen at the junction of technologies significantly changes the attitude to formulation and protection of those elements and their combinations, which in such new conditions can be qualified as integrative technical solutions that correspond to the key signs of the invention and based on composite design and technological elements.

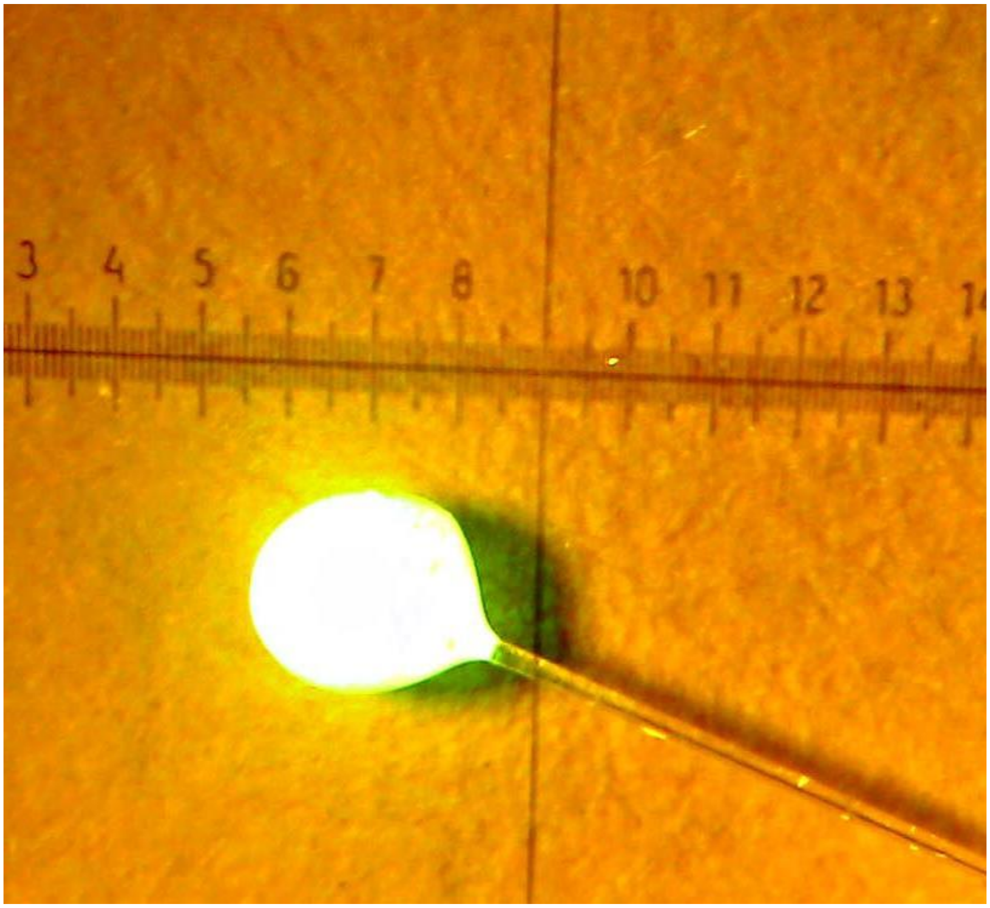

Figure 5. The figure shows a drop of luminophore at the end of an optical cable connected to a laser diode; Shooting takes place in such a way that after it is completed, the resulting amount of information provides the full amount and cycles of computer modelling and simulation of all processes to identify mistakes and directions for correcting them at the next design stages.

Change of rules and criteria of industrial design

Introduction of new technologies, the use of new materials, replacement of traditionally accepted production methods with unusual ones, which help and are an indispensable condition of a technological leap or breakthrough and increase production efficiency, are now called innovative processes.

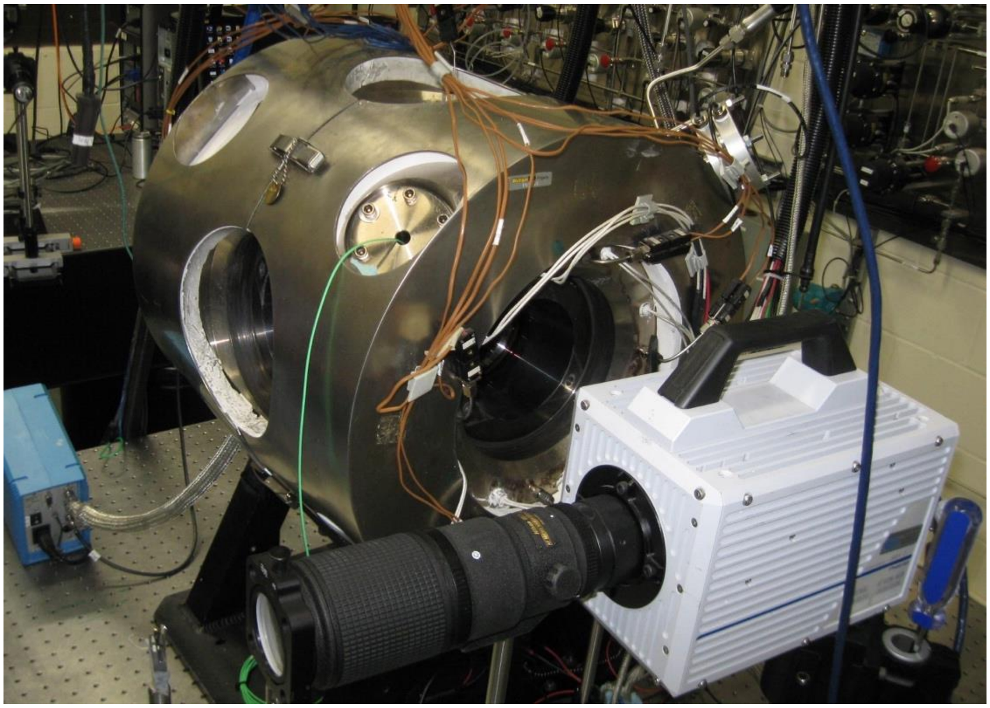

Figure 6. The figure shows the experimental design of a system for testing and verifying special single-cylinder experimental engines capable of recording the processes of injection and combustion in real time; such tests are performed before transition to full-engine testing to eliminate the risks and verify the need for additional changes in the design and mode of engine operation at a low level of costs

This process in conditions of different technical and technological cultures, in conditions of different levels of starting positions for the beginning of the initiated process of innovation, may differ significantly, but there is an urgent need to start such a process and this fact does not cause any doubts.

In recent years, the economy in almost all industrialized countries has become and continues to become of an increasingly innovative nature.

And if at the beginning of the process innovation breakthrough had a local value and was experienced in the field of high technology, microelectronics and so-called nano-technology, today the innovation process is becoming more and more focused on classic, basic technology, energy, medicine, transport, i.e. covers all basic spheres of human life.

In order to increase competitiveness of their products and technologies, entrepreneurs are constantly forced to look for new ways to improve efficiency, reduce energy intensity and overall energy costs, increase environmental safety and economic stability within each individual enterprise or company.

New features in the design and performance testing of technical solutions also add elements of composite design solutions, and they become the main criteria for the tools and methodology of industrial design.

A new look at the new product longevity

More recently, the product longevity was one of the most important criteria determining its commercial value. Currently, with a constant decrease in the time from the start of a new product sales period to the beginning of a newer product sales period, this time period is so small that there is often no point in the innovation process to focus and spend effort and money on an excessive increase in longevity, which exceeds the period between the beginning of the exploitation of an existing product and the entry of a newer or modernized product to the market. Since this period may differ significantly for different types of product, the concept of longevity may be blurred in time and is not critical as the purpose of the invention.

Figure 7. The figure shows an experimental composite mobile system for homogenizing milk at low pressure; Comprehensive tests of this system make it possible to take into account, when switching to stationary systems, all the necessary parameters including, first of all, longevity and strength of such equipment, taking into account the potential high level of wear of the working surfaces of the system and safety requirements during its maintenance and operation

There is another subjective longevity factor to be taken into account. The stereotypes of longevity formed for different types of products, determine many commercial factors, including the number of products required and, therefore sold, and their actual price. Imagine that you have found a technical solution to increase the product longevity and in this case this factor reduces the amount of the required product, while maintaining the existing level of price that the consumer is willing to pay for this product.

This leads to a decrease in sales volumes of companies making the product and puts these companies before a choice - to accept innovation or do everything to block the implementation and introduction of innovation. As practice shows, these companies choose the second option and block innovation, and in this process, the only loser is the inventor who invented something rejected by the market.

A new look at the new product reliability

The issue of the new product reliability and the new criteria for evaluating and calculating reliability also undergo fundamental changes. First of all, it is the connection of reliability and warranty obligations of the new product manufacturer before the consumer. Very often the cost of performing warranty obligations is comparable to the cost of the product itself.

That is, reliability is a factor that, being one of the achieved objectives of the invention, can determine (naturally, in combination with other technical and operational factors achieved as a result of the invention implementation) the level of commercial success.

In this case, the subjective factor of time also plays an important role, and more than the required reliability over time, can become a negative factor and play a cruel joke with the inventor in a situation when the created ultra-reliable product turns out to be commercially unprofitable for the manufacturer.

New features in efficiency of system search and analysis of previous technical solutions for novelty

It is clear that new information technologies open up new opportunities in the system search for similar solutions when elaborating a developed technical solution.

Imagine that, with the preliminary design of the structure of the composition, we came to the need to combine and integrate several classical solutions and new, say, digital technologies connecting them into the composition, so to speak, at the same level of horizontal integration, and after that, we also came to the need to go to the next level of integration with the inclusion in the composition of algorithms, software products and interfaces for communication with the previous level of integration.

How to search, in what directions, and do it most effectively and identify existing analogues of the composition being created.

In this case, it seems to me that it is most probable to start a search, after forming the content of the composition being created, to begin a system search, after decomposition and identifying independent technical solutions included in the composition.

After this stage of the search, it is better to choose one basic technical solution from these technical solutions and upon searching through it, start to attach other technical solutions to the basic solution, that are included in the composition, and conduct a consistent search through the basic technical solution with each technical solution attached and so on until achieving full composition.

New features for assessing the usefulness and possibility (as well as expediency) of modifying and modernizing known technical solutions

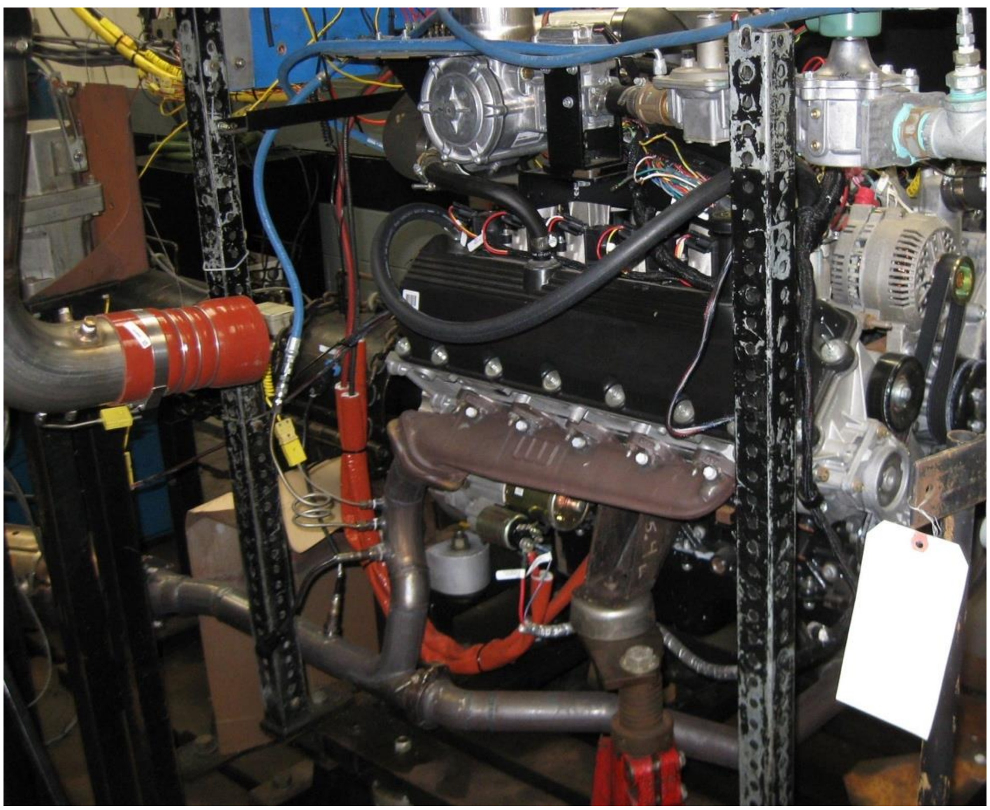

Figure 8. The figure shows the working elements of the engine of a backup electric generator installed on a dynamic stand, being modernized to change the type of reserve fuel from gasoline to natural gas; The installation on the stand was planned in such a way that,

first of all, to make sure that there are all conditions and technical grounds for modernization.

Very often the new is well forgotten old...

Therefore, when setting a task and deciding on the start of an innovation process for synthesizing a new product, it is advisable to check whether some functional elements of the composition that need to be invented have been previously invented.

If such or an equivalent solution is found, then the replacement of materials, the use of new components and the introduction of a digital monitoring and control system into a future composition will make it possible to create a new technological composition that has the potential to integrate into a higher level composition.

Impossibility of successful commercialization without forming the principles of composite technical and integrated technological solutions, and the composite structure of a new technical solution with all the differences and properties

As practice shows, the possibility of selling or licensing autonomous technical solutions, in the event that they are not previously tied to systems or solutions of a higher technological and qualitative level, is reduced to zero.

To ensure the guaranteed commercial potential of such integrated solutions, the development of design, engineering and technological documentation requires specially planned stages of end-to-end computer modeling and simulation of internal vertical and horizontal integrative connections of the new development, and the program of such modeling should be one of the basic parts of Initial Technical Requirements for the product and must be taken into account in the Terms of Reference for the new product.

If the field of use of the new product is regulated and limited to the requirements of the relevant standards, including international ones, it is necessary to take these requirements into account in the process of preparing and agreeing on the Initial Technical Requirements and the Terms of Reference for development.

As a rule, composite technical solutions are more flexible in all respects, which allows them to be tied to the requirements and restrictions of standards at all levels and to avoid adjustments and problems at the stages of commercialization.

Figure 9. The figure shows the structure of a flexible production and technological module in the production process of dairy products, where autonomous components are applied, each being a composite technical solution and in turn contains a structure consisting of a complex of integrative inventions that have a coherent integration with adjacent elements of the entire technological system both in the horizontal version, and in the vertical version, but at the same time each such component in the system hierarchy has a certain degree of autonomy and delegates to each adjacent component a part of its control functions within the framework of the end-to-end technical characteristics of the system and under the exchange protocols between the adjacent components in the entire kinematic scheme of the entire system of flexible automatic modules altogether comprising the base for all production cycle.

Inventions of a composite nature, having at least a principal schematic solution for integration into technological and structural systems of a higher functional level, are implemented more confidently and in a shorter time, because investors, buyers or consumers of the license have the methodology and technique of this integration in the description and in the formula of this integrative and composite technical solution.

Proposed techniques and methods of forming a composite style in creation of new innovative solutions

Thus, the composite structure of a technical solution is the engineering and design style of developing new technical solutions for incorporating them into existing process schemes and configurations.

Since the technique of such incorporation can often be unique and have a significant novelty, the description and formula of the invention of a composite nature, a multi-level architecture for building causal relationships between the components of the composition and distinctive features integrated into the design and technological relations of the composition, determine the commercial success of these innovations to a large extent.

Techniques and methods of transition from the created composite foundation of a new technical solution to the basic foundation of an integrative invention

The design and technological composition in many cases requires additional, often fundamentally new relations between the components and elements of the composition, in other words, often having a design and technological composition clearly expressed in terms of properties and content, in order to turn it into a finished innovative product or item, fit is necessary to find versions of the composition integration into this final and repeatedly and at many levels systemically integrated product.

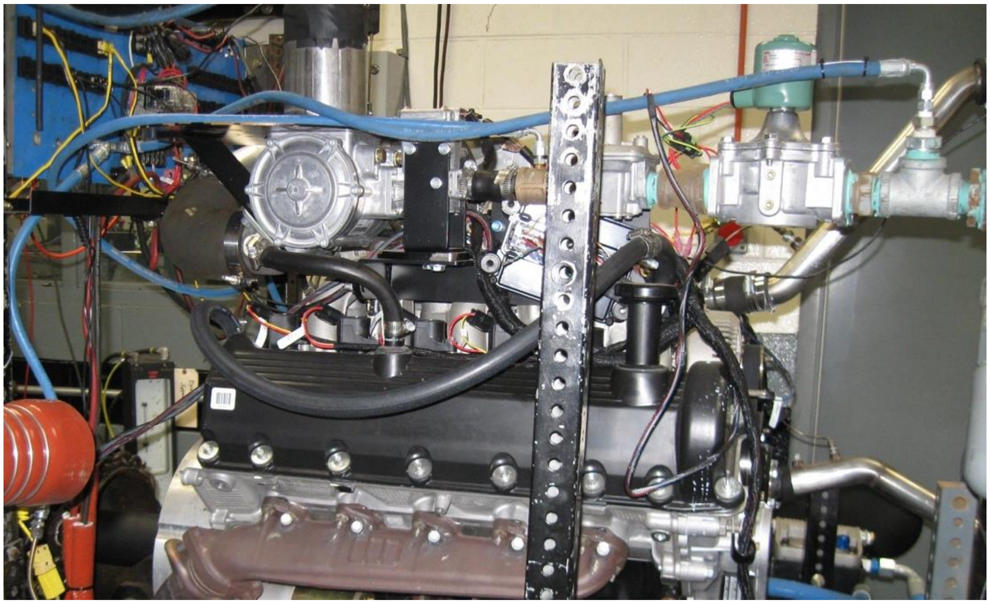

Figure 10. The figure shows a fragment of a gasoline generator prepared for switching the engine fuel system from gasoline to natural gas, and natural gas must be supplied to the combustion chambers of the engine in the form of a vortex tube formed in the course of the natural gas flow along the fuel line where the integrative inventions of the previous stage off engine modification and optimization, disk vortex generators, are mounted; In the same principal configuration of the addition to the engine fuel system, a natural gas flow can be mixed with compressed air within the same vortex tube, in order to reduce air consumption for stoichiometric mixing and at the same time reduce potential carbon monoxide exhaust and also reduce overall consumption of natural gas while retaining the previous thermal and dynamic performance of the engine and to reduce hazardous exhaust concentration

Figure 11. The figure shows a fragment of the system of composite integrative inventions in general forming flexible automated dairy production in a closed automatic cycle and with full control of all operations at the level of process parameters, detailed to the parameters of each technological operation and successively to each technological transition and measuring local stage.

Versions of integration can be very different; it is only important that the end result of the integration was a leap of the effect or a leap of the quality having no precedent earlier.

The effect of restrictions on the number of paragraphs of the invention formula on the possibility of reliable protection of composite technical solutions.

Restricting the number of invention formula paragraphs in principle makes it difficult to reliably protect an invented item, but a correctly found principle of a composite solution can, on the contrary, increase the degree and level of protection.

The ideal case is a system of causal relationships to get the declared effect only in the proposed system of composite relationships with clearly defined conditions and signs that determine the content and independent functions of each of the elements of the resulting composition.

Due to limited space and form, it makes sense to select only those signs and relationships in the composite solution that do not affect the well-known independent features and functions of each of the elements and components of the composition, but arose as a result of the composition formation from the fields of functional influence of the composition components on each other.

It can be said that in the correctly selected composition components, when they are subordinate within the framework of the composition to the conditions and properties of the newly created technological system, a new integrated system of signs, relationships, feedbacks and functions, possible only within the framework of this composition and, moreover, having a tendency to the development and improvement of intra-compositional relations, arises.

Following these principles, within the framework of a limited number of formula paragraphs, allows focusing only on the main distinguishing features of the composition, while ensuring the maximum level of protection of the composition and the maximum level of understandability of the invention essence.

The proposed structure of the independent paragraph of the invention formula built on the basis of a composite technical solution

As I determined as a result of my first experiments and as recommended by specialists, the independent paragraph of the invention formula, if the invention is a composition, should have at least three main parts.

The first part carries formulates commercial essence of a compositional invention and should disclose the meaning and necessity of compositional integration for:

- accurate formulation of the composition task

- limiting the degree of functional relationships in the composition and disclosing the degree of necessity of each composition component for its formation and normal and effective functioning

- formulation of the composition name

The second restricting part includes all the basic information about the invention as such and includes the characteristics of all basic technical solutions inherent to the composition components and at the stage of drafting the invention formula not qualified for the presence of essential novelty elements in all design and technological aspects and relations of the composition.

The third distinctive part includes information about components, their relationships, materials, integrative elements and associated software products and their basic algorithms, each of them, independently or in any combination, creates elements of significant novelty for composite, multiple (and integrated at many levels) technical solutions of any complexity and structure.

The proposed structure of the dependent paragraph of the invention formula built on the basis of a composite technical solution

Restricting the number of paragraphs of the invention formula imposes a special mission in the overall strategy of formulating and protecting the novelty of an invention in each paragraph of the formula.

Based on it, the second restricting part of such paragraph of the invention formula shall include all the basic local and specific information about the invention as such and includes local and specific characteristics of all basic technical solutions inherent to the composition components and at the stage of drafting the invention formula not qualified for the presence of essential novelty elements in all design and technological aspects and relations of the composition.

The third distinctive part includes local information specifically focused on technical details and elements, about components, their relationships, materials, integrative elements and associated software products and their basic algorithms, each of them, locally, independently or in any combination, creates locally specific elements of significant novelty for composite, multiple (and at many technological and constructive levels) complex integrated technical solution.

The proposed methodology for designing prototypes of composite technical solutions to test and verify the correctness of each innovative element of the composition

Designing of a prototype or a pilot sample of an innovative product-composition is most convenient when using the design program and its engineering analytical applications. I prefer the Solid Works software product, since this tool can build a valid model of a composite technical solution and conduct a control simulation of its operating cycle, without resorting to expensive design and making prototypes.

Analysis of found analogs and prototypes of a new composite technical solution

If, as a result of the search, homogeneous, basic technical solutions are found in the first approximation, being analogs or prototypes of the conceived composite technical solution, they should be tested in various versions and combinations of integration with additional elements and components of the considered composition.

If information about these prototypes or analogs is available in the respective storage media (including in digital format), then it is advisable to use Solid Works tools to build models of the found technical solutions and to conduct a digital simulation of the working cycles of these models to compare them with similar working cycles of the proposed invention - a composite technical solution.

Examples of composite technical solutions perceived by the market

Examples of composite technical solutions today are products of computer technology, communications equipment, tablet computers and many other products of mass and non-mass demand, well-known to everyone.

Uncertainty in wording of patent applications as the most complex technical solutions underlying these products has led and leads to numerous patent disputes and wars.

More extensive use of composite technical solutions and their integrated extensions and interpretations will reduce the intensity of passions and may help in promoting innovative products to the market.

Of the most well-known compositional technical solutions, the most relevant to all of the above, today are widely known iPhone smartphones produced by Apple.

Due to its complete composite three-dimensional constructional structure and full integration into all possible fragments of the existing external information infrastructure, this stunning multi-functional device shows unprecedented commercial success in world markets.

Compositional technical solutions as a set of useful functions of a technical system (TS)

Main useful function. For a set of useful functions of TS, we can always find a more general useful function that directly reflects the TS purpose, the purpose of its existence and activity (and coinciding with them).

This general TS function is called the main useful MUF of the whole TS, in contrast to the elementary useful functions (hereinafter referred to as simply useful, UF), which together ensure the implementation of MUF. The relationship between MUF and UF is the same as between the system and its subsystems. MUF refers to the system as a whole, and UF to its subsystems.

Positive effect. Any change in TS that increases the capabilities of this TS in meeting the needs of super-systems (and society as well) is an improvement of the system.

The improvement in TS is manifested in the following changes in the system at the level of external functioning:

- the quantitative growth of useful "capabilities" of TS - transformation of unuseful "capabilities" into useful ones;

- elimination of harmful "capabilities" until they turn into useful ones;

- increasing the ratio of the useful output to the input, i.e., increasing the TS efficiency.

Dialectical contradiction. The source of development of TS, as well as any object of the material world, is the law of unity and struggle of opposites – the universal law of development of nature, society, technology.

Opposites are the sides of an object that are in mutually exclusive relationships. In this case, the side of an object or phenomenon is understood as everything that is somehow inherent in the object or phenomenon, characterizes it and can be comprehended.

Opposites in TS are “input” and “output”, useful functions, costs and “capabilities”.

The interaction of opposites, when they both mutually presume and at the same time deny, exclude each other, is a dialectical contradiction.

Technical contradiction (TC) is a dialectical contradiction, which manifests itself in the technical system as a deterioration of one side of TS at the level of external functioning (from the standpoint of super-system needs) while improving the other side of TS.

In other words, TC can be defined as the dialectical unity of interdependent positive and undesirable effects in TS. TC is always associated with some component of TS (element, group of elements, or interaction of elements), which is commonly called the nodal component (NC).

This TS component is immediately related to two sides of TS, and a quantitative change in some parameter (or state) of this component leads to an improvement in one and a deterioration in the other side of TS.

Therefore, more precisely, TC should be defined as the dialectical unity of positive and undesirable effects interdependent on quantitative or qualitative changes in the nodal component of TS.

The inventive problem arises in case of an exacerbation of TC inherent in TS. At the same time, improvement of some "capabilities" of aTS due to a quantitative change in some parameters becomes impossible due to a significant deterioration in other "capabilities."

Attempts to preserve TS due to a compromise between opposing sides in this case are not successful. The resolution of TC is possible in case of a transition of TS to a new qualitative state – a dialectical jump. This is an invention.

When considered from a more general perspective, the problem of resolving the contradiction between public need and the possibility of satisfying it can be reduced to one of two tasks:

a) search for a material form based on the laws of nature and allowing to perform a function corresponding to a specific public need – an information task (search for a new system);

b) resolution of the internal dialectical contradiction in a technical system that satisfies a certain public need – a problem-contradiction.

These two types of tasks are related to each other and in practice of technical creativity they go one into the other.

Physical contradiction. The technical contradiction in its form appears in TS at the level of its external functioning. At the level of internal functioning, no mutually exclusive relations between the parties to the system is observed: from a physical point of view, TS is in some one state determined by the laws of nature.

But if we set the task of eliminating TC within this TS, asserting positive and negating undesirable effects, then mutually exclusive relations will manifest at the level of internal functioning, in the form of incompatible requirements for the parameter (state) of the nodal component of TS, more precisely, to the physical state of NC.

Such contradictions are called physical (FC). FC manifests itself in formulation of the task of eliminating TC, in other words, FC is a form of expression of the problem of eliminating TC in the framework of this TS. FC resolution is to establish new forms of organization and movement of matter in TS, when both incompatible requirements for the NC state are met, to establish such a "form of movement where this contradiction is both realized and permitted."

Introduction to the theory of invention problem solving (TIPS)modified based on the recent conditions for the development of unified innovative systems and complexes

1. Creative activity is usually determined through the result. As an example, one of the most common definitions can be given: "Creativity is a human activity that creates qualitatively new material and spiritual values."

If we try to formulate the definition of creativity as a process, we will see that creative activity is the process of finding a solution.

In essence, all human activity can be divided into two large areas: area of routine operations and area of problem solving.

Representation of creativity in the form of a problem-solving process makes the following conclusion self-evident: in order to scientifically organize creative activity, one must first of all put the problem-solving process on a scientific basis. In other words, TIPS is required.

2. Problem solving is of two types: strict and nonstrict. Strict solutions are based on complete reliability, accurate information and, as a rule, are quite unambiguous. Solutions obtained on the basis of incomplete, inaccurate information, under conditions of uncertainty, are called nonstrict.

Accordingly, methods for obtaining solutions are divided into strict and heuristic methods. When solving problems put forward at the present level of social development, these methods complement each other.

As science develops, many heuristic methods of solution are formalized and transferred to the strict class according to the following scheme: accumulation and systematization of knowledge – development of "intuition", intuition – formalization, development of the theory – the algorithm.

3. The existing problem-solving apparatus is adapted to the search for rigorous, quantitative solutions. It includes such sciences as system analysis, solution search theory and decision theory. The basic idea of system analysis is the following: "The solution to any problem is the process of creating a new system."

System analysis is based on systems engineering (construction of large technical systems) and organizational systems engineering (systems engineering of organizations).

Decision theory considers methods for finding the best ways to achieve goals.

It includes such disciplines as operations research (the use of mathematical, quantitative methods to substantiate solutions in all areas of targeted human activity), a linear programming method (choosing the optimal solution from a large number of possible).

The solution search theory considers the process of searching for a solution in conditions of uncertainty in terms of information.

4. TIPS deals with the search for complex composite heuristic solutions. Its main features include the following:

a) the theory should provide a significant increase in the probability of getting the right solutions;

b) the theory should be engaged in search for solutions at a qualitative level;

c) the theory should take into account the characteristics of the object and the subject of creativity.

TIPS meets all the above requirements. In addition, it is based on two main provisions:

1. A new, truly creative solution in engineering corresponds to the next stage in the development of the object which the solution relates to.

2. The patterns of the technology object development process are knowable and can be used to search for new technical solutions.

The feature factor is what is inherent only in a given theory, is most characteristic of it, and distinguishes this theory from similar fields of knowledge. For TIPS, the feature factors are:

- the use of the identified patterns of construction and development of technical systems;

- availability of optimal logic for identifying the problem and finding new technical solutions.

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Complex Integration of Aerodynamic Micro-Foam Generators into Specialized Technological Devices with Artificial Intelligence and Artificial Neural Networks for System Control

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Abstract

The system of aerodynamic foam generation is covered in this article as well as its structure and main technological and structural characteristics. The author describes technological and industrial processes related to production of thin filmed micro assemblies from which logically follows the expediency of using micro foam for solving specified objectives, its main advantages as well as reasoning behind choosing the aerodynamic principle for foam generation. Besides the principles of system operation, the author also considered different options for its application in industrial settings. Special attention is focused on the application at lines of photolithographic masking and galvanic coating on the boards of thin filmed micro assemblies, but the author also considers a case for usage as a fuel mixture which leads to reduction of fuel consumption and simplification of the construction of combustion chamber sealing or cylinders of the diesel engine. Author considers in detail the main structural components of the construction of the device for aerodynamic micro foam generation as well as the properties and characteristics of the obtained micro foal primarily due to aerodynamic effect. Thorough description is given to the principle diagram and principles of assembly operation for using the aerodynamic foam generator for various industrial technological processes. Comparative analysis is conducted for the suggested technical object and known technical objects that were discovered during patent search. As a result, the list of properties for significant novelty is elicited and outlined. The described system allows usage of artificial intelligence and machine learning for system control. Analyses of the suggested technology was performed in accordance with the methods and criteria of Theory of Inventive Problem Solving and Algorithms of Inventive Problem Solving.

Keywords: Activated foam, aerodynamic foam generator, thin-filmed micro-assembly line, activated fuel mixture, artificial intelligence in control systems

Introduction

The local technical system (sub-system) for aerodynamic foam generation is new. Thus, for beginning of analytic estimation of its properties and significant differences the author in general terms suggests the following preliminary formulation, that characterizing structural and technological dependencies and connections between main underlying elements of the specified system. A device for foam generation in isolated and flowing in the pipeline liquid stream mainly of organic nature. It includes successively located (in the stream direction) connected to the generator of specified current volume hydrodynamic amplifier of turbulence level and connected to the source of compressed gas aerodynamic stimulator of tridimensional micro-turbulence of the specified current which connects to the conical reflector.

Figure 1. Aerodynamic foam generator made of stainless steel with specially profiled plate that are used for smooth increase in turbulence level in the stream of foamed liquid flowing from the gap-channel between membranes that is combined with conical reflector.

Problem Formulation and Analysis

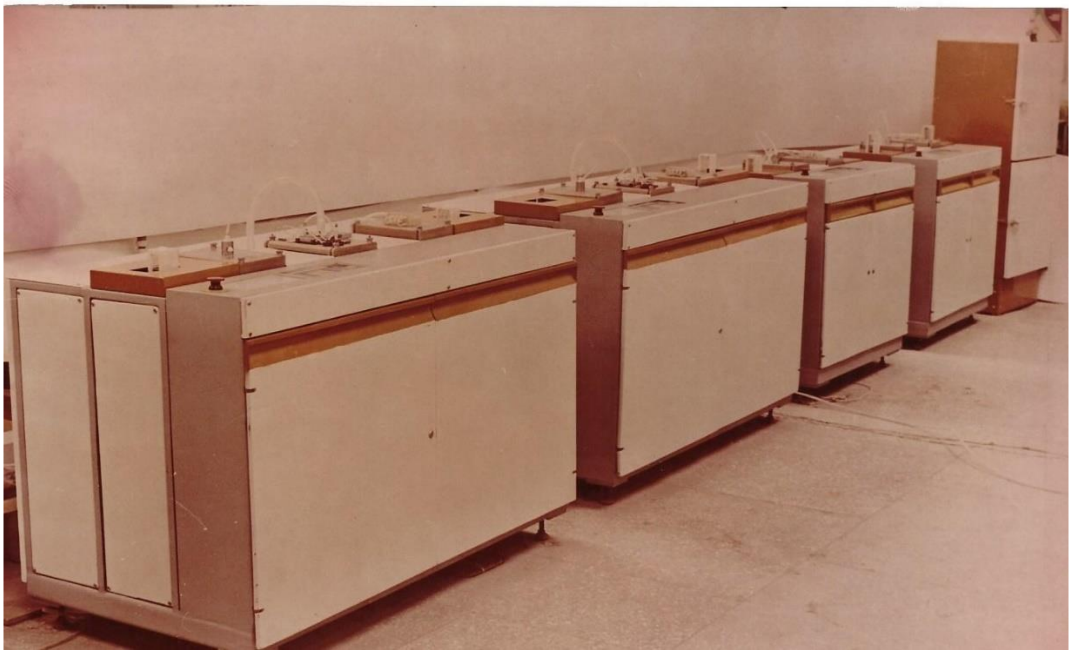

Figure 1.1. Automatic line of galvanic coating on the boards of thin-film micro assembly

All line plants contain at least two working position (including at least one centrifuge) in combination with two loading-unloading modules and three intermediate modules. Usually every plant has at least one module that is used for preparation of the surface or for cleaning and the time required for this operation should be equal to processing time on other working positions. Thus, the time of efficient work should be minimal and furthermore, the quality of this operation should be in accordance with standard requirements and main criteria of the technology.

When choosing an option for these operations the most expediently is to use aerodynamic foam generators, moreover for both cleaning and regeneration of the technological water, because aerodynamic foam generators are the most efficient technical solutions for this kind of problems.

It is particularly important, that the time required for foam formation is minimal and due to properties and characteristics of foam generator the gas or air bubbles in the resulted foam are totally identical (in terms of size) and the bubble diameter is determined by the distance between base of the reflector and the top plane of generator body. This prevents errors in setup and in the range of pressures and compressed gas consumptions feeding to the foam generator and provides absolutely identical foam parameters and ensures equal conditions for technological operations and transitions of automatic line machines.

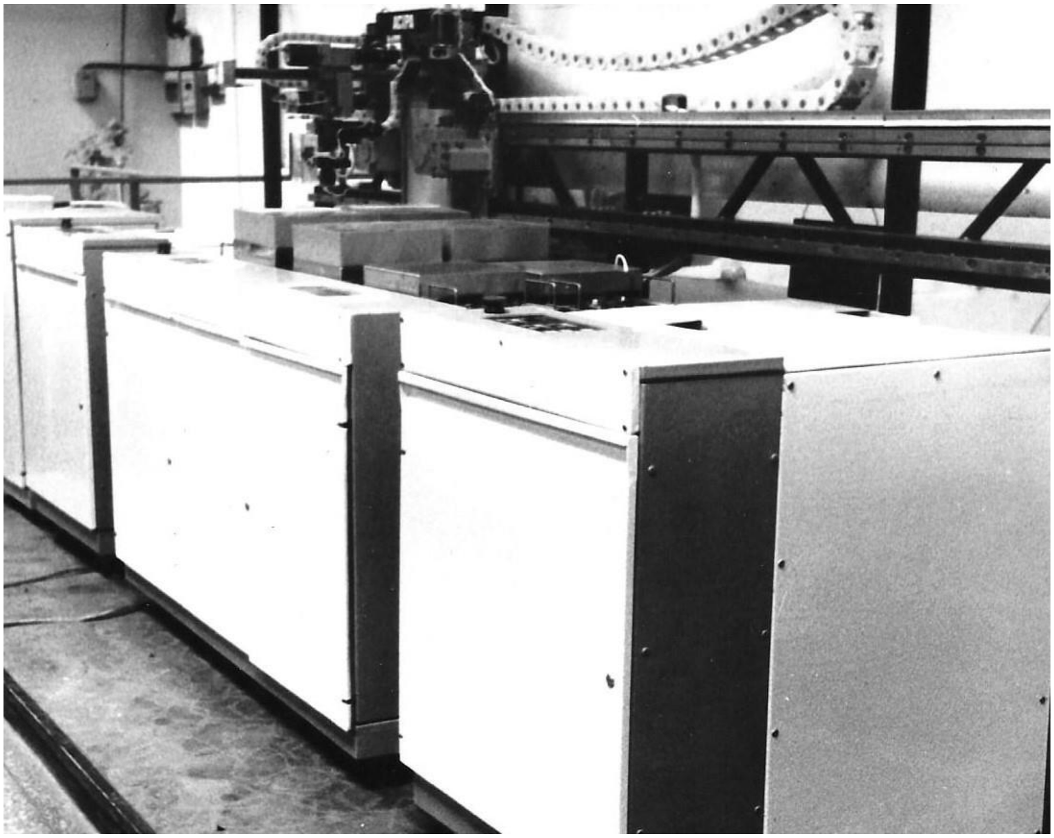

Figure 1 – 2. Adjustable automatic production module for photo-lithography on the boards of thin-filmed micro assemblies where operations of general load-unload of operation positions are performed by robot-operator

Duration of operations for surface preparation, cleaning and regeneration of the discharged water and other technological liquids and solutions for such flexible automatic manufacturing module is even more critical. Taking into consideration proved significant advantages of aerodynamic foam generators in comparison to other devices with same applications, in many of which the foam is a product of chemical reagents, one may suggest that usage of aerodynamic foam generators where foam is formed without chemical reagents and thus this process is more stable and more preferable and efficient, specifically for this type of special technological equipment. As main requirements for the foam quality the properties of controllable three-dimensional homogeneity, stabilityб and guaranteed speed of formation can be considered.

Approach Methodology

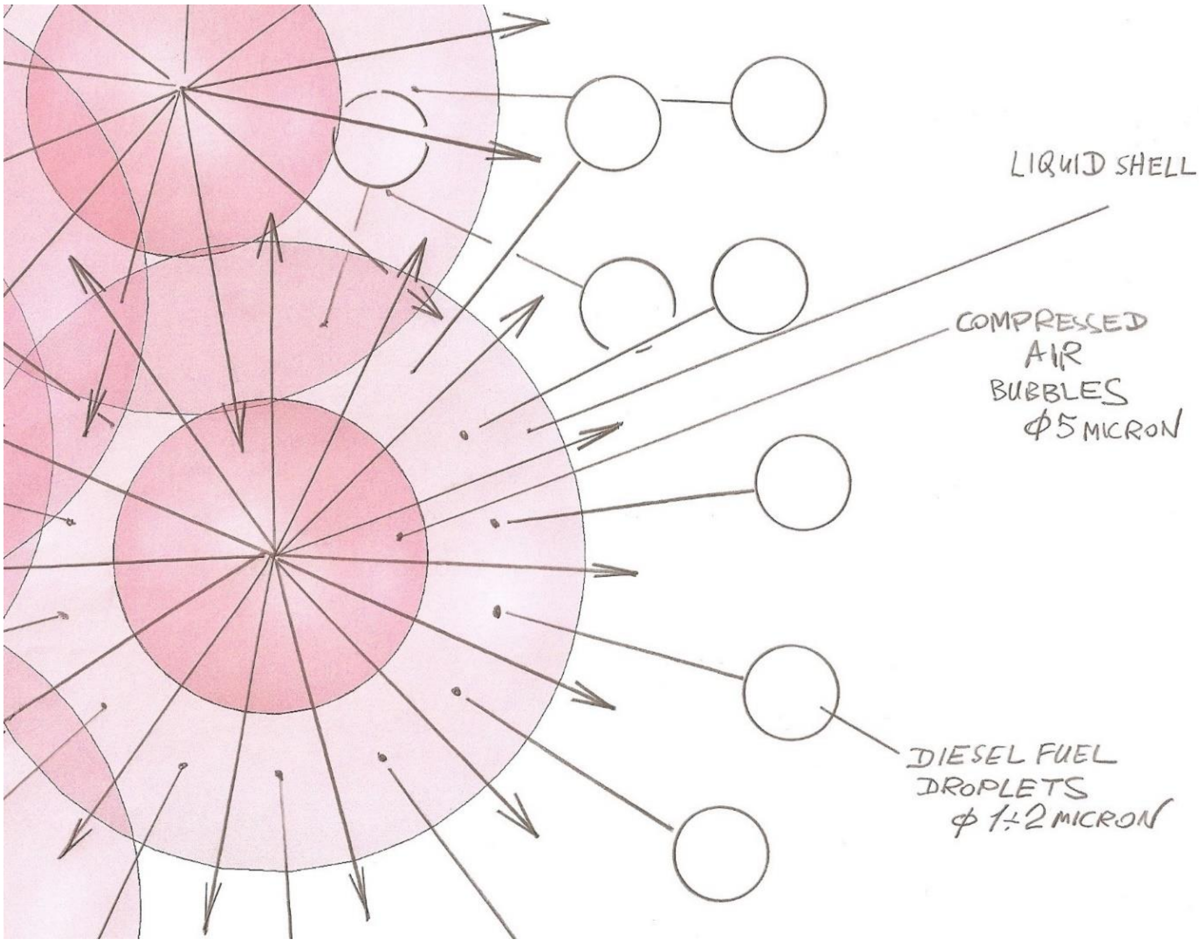

Figure 2. Principal diagram of active foam structure, obtained from aerodynamic foam generator during a process of diesel fuel activation before its injection into combustion chamber

Figure 2 shows that the foam obtained from aerodynamic foam generator initially consists of spherical capsules which have a core of compressed air with a diameter of 5 microns with a coating of diesel fuel which also has a thickness of 5 microns which after injection is disrupted by the streams of dilating air to the parts of size 1-2 microns.

Aforementioned statements require clarifications of the formulations.

For defining formulations for the aerodynamic foam generator:

Foam generator (device for aerodynamic foam generation) which includes:

- At least one container with liquid to be foamed
- At least one pump connected to the inner volume of specified container

- Pipeline connected at the input with the output pump branch pipes and having built-in in its inner-volume at least two consecutive stages of the volume effect on the turbulence level of the specified stream and inserted in object consuming the foam (object-consumer)
- Located in the direction of the liquid stream in the pipeline hydro-dynamic turbulence amplifier-mixer
- Located after the hydro-dynamic amplifier of the turbulence level in the direction of the liquid stream in the pipeline connected to the source of compressed air, aerodynamic stimulator of three-dimensional micro-turbulence in the stream of specified liquid

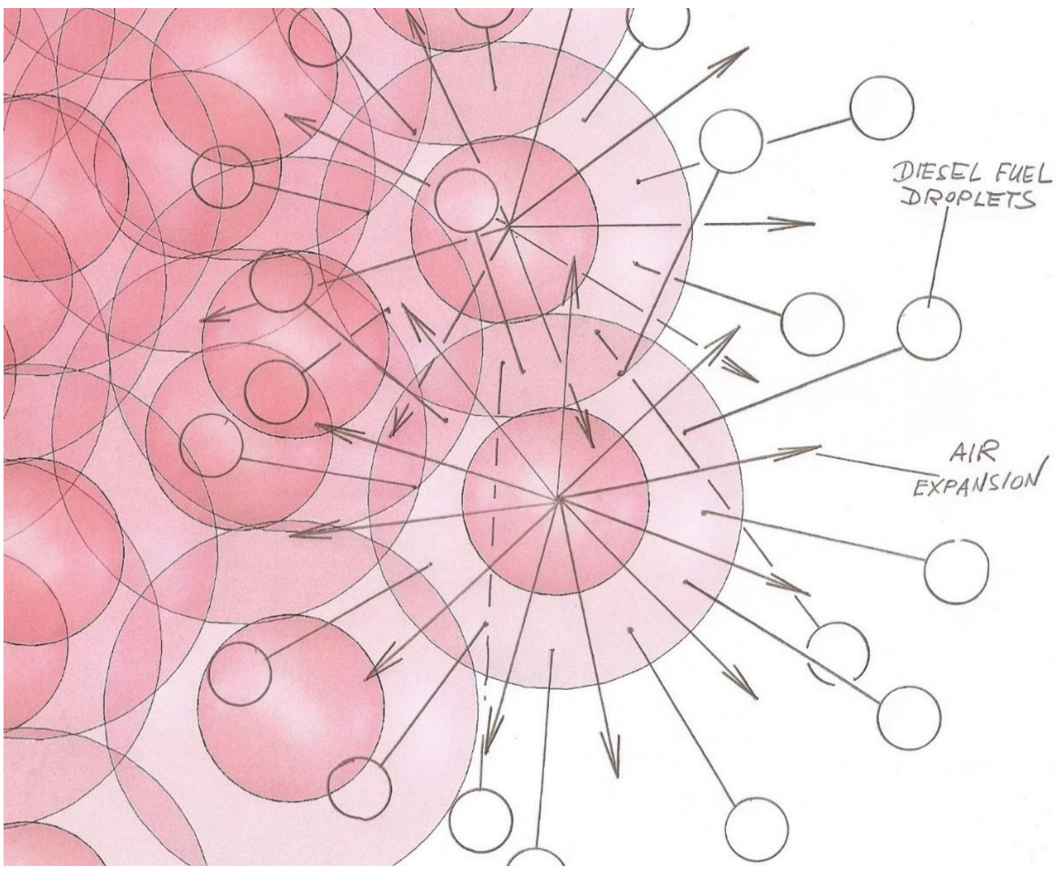

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Figure 3. Detailed principal diagram of the active foam structure of the foamed diesel fuel with specification of the versions of the three-dimensional compressed air expansion from foam capsules after injecting in the thermo-dynamic object combustion chamber

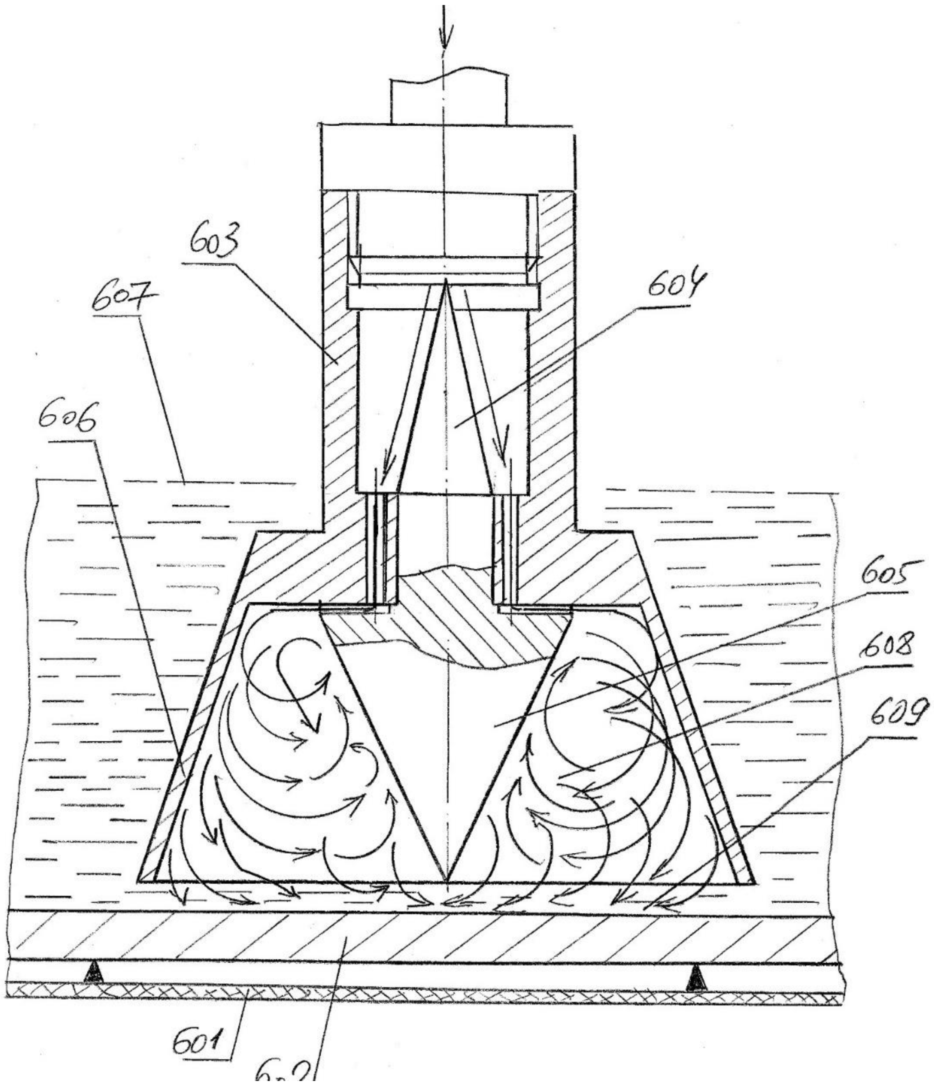

Figure 4. Model of a one type of aerodynamic foam generator which is used as an activating and cleaning device in the equipment for surface preparation without using of chemical reagents

Numbers in the Figure 4 stand for:

- 601, - container base
- 602, - cleaning surface
- 603, - aerodynamic foam generator body
- 604, - reflector that is located first in the direction of compressed air flow, which uniformly dispenses the compressed air stream over the whole body diameter of element 603

- 605, - reflector forming the annular zone for foam formation in the toroidal space constrained by the conical surface of reflector 604 and inner conical surface of the funnel 606
- 606, - conical funnel of the aerodynamic foam generator body which constrains the toroidal space where foam is forming
- 607, - technological liquid, where under the affect of the aerodynamic foam generator operation the toroidal three-dimensional vortical volume of dynamic foam is formed which interacts with all the surfaces participating in the process and has an effect of hydro-dynamic cutter which in terms of properties and effects is equivalent to the properties and effects of a vortical pipe formed geometrically by conical surfaces of 605 and 606
- 608, - Inner volume where happens the formation of the aerodynamic foam with dynamic properties of vortical pipe and equivalent to it hydro-dynamic cutter, distribution of which is constrained and caused by specified toroidal space
- 609, - transition hydro-dynamic zone between toroidal space where the aerodynamic foam is forming and surface of detail 602, which is a subject to processing

As the invention of aerodynamic foam generator has a structure of apparatus, program, system and the associated application method, the part of invention formula is provided, which is related to associated method of the liquid agent foaming in various compositions and modifications:

The way of liquid agent foaming consisting of at least one liquid component primarily of an organic nature containing the insertion of specified liquid agent in the pipeline and formation of the dynamic stream of the specified liquid agent in the pipeline, insertion of the stream into the input cone of the hydro-dynamic turbulence amplifier-mixer, stream acceleration in the capillaceous channels and its reaching of the developed turbulence state with simultaneous injection of the three-dimensional stream micro-turbulence of the compressed air in the aerodynamic stimulator, compressed air stream acceleration in the capillaceous channels uniformly distributed over the cross-section area of the specified pipeline, formation in the compressed air acceleration zone of the area of the reduced pressure and suction in the created local zone of rarefication of all the volume of formed turbulence stream and micro-bubbles formation in the stream at the output of a zone with reduced pressure, stream saturation by the gas micro-bubbles and filling the whole pipeline volume with the foamed liquid agent.

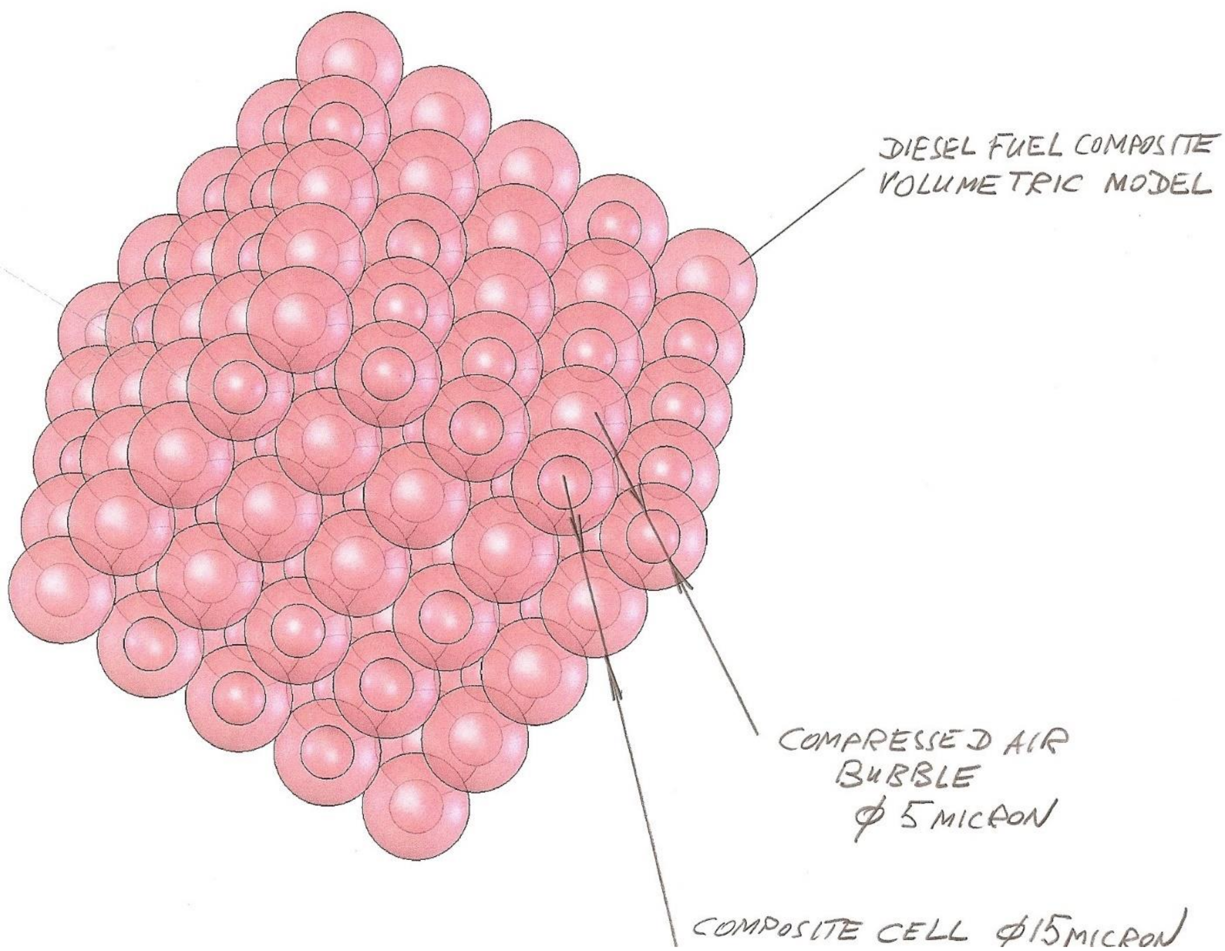

Figure 5. Three-Dimensional foam model obtained via aerodynamic foam generator using the aforementioned method for liquid agent foaming

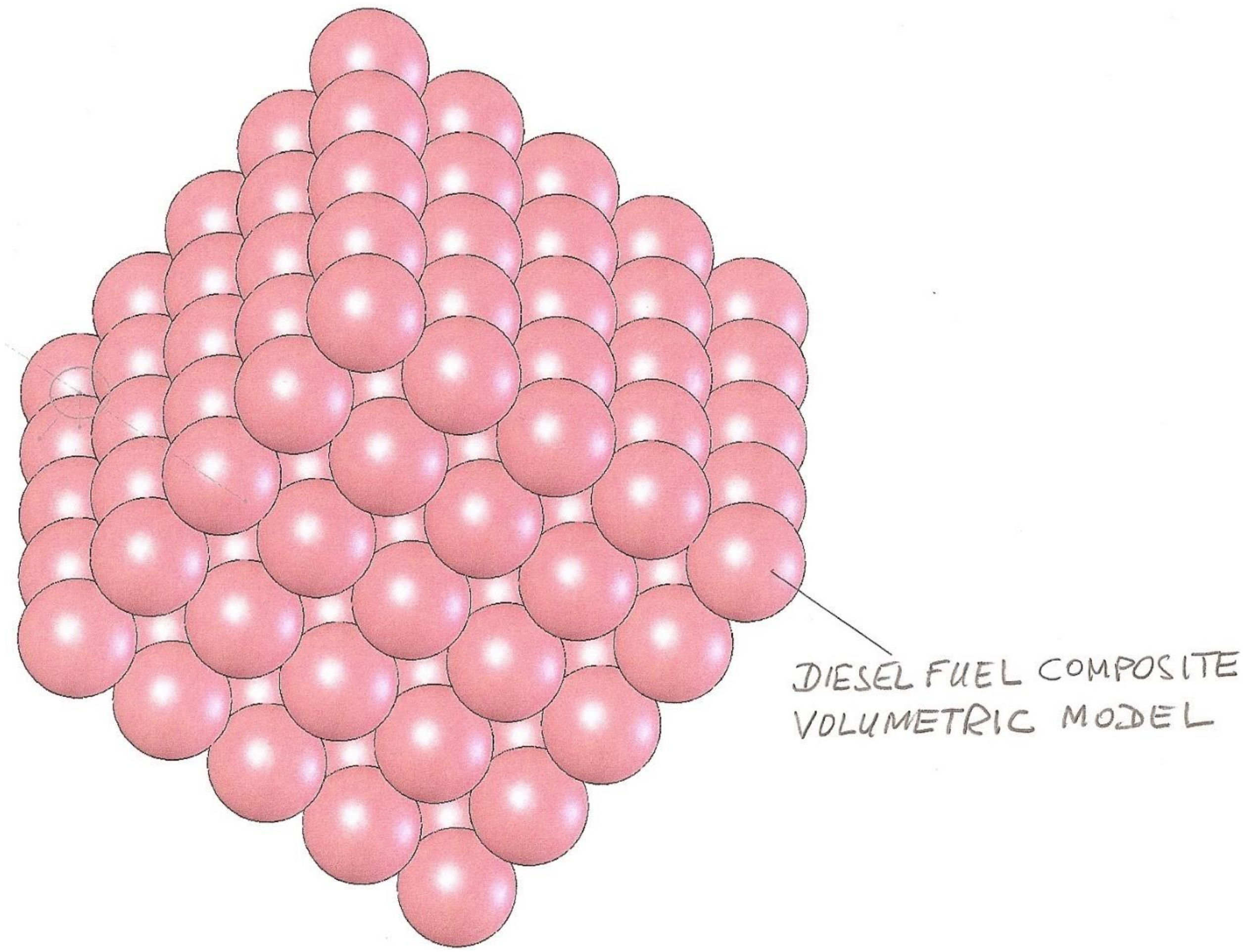

Figure 6. Three-dimensional foam model of a diesel fuel and air.

In the figure 6 the size of foam capsules that consist of core (which is a bubble of compressed air with diameter of 10-25 micron) and its spherical cover with a thickness of 10 micron leading to the total capsule diameter of 30-45 micron. Such structure gives this foamed fuel composite significant qualitative and operational advantages. It also allows to achieve the significant fuel economy with reduced toxicity of the exhaust gases when using the aforementioned fuel composite.

Foam generated with this method consists of many spherical capsules (composite elements) each of them consists of at least two components. Inside each capsule there is a bubble of compressed air under the pressure of 3-7 bar with a diameter of 5 microns. As the membrane of foamed liquid of liquids mixture has a thickness of 5 microns on average, the overall capsule size is 15 microns. This capsuled micro-foam by all its properties can be considered a composite and aerodynamic foam can also be considered a composite material with properties of compressible liquid.

Coming back to the topic of analytical analysis of novel foam properties obtained via aerodynamic foam generators, we can conclude that the obtained structure due to micron size of the spherical foam capsules can be classified as a compressible liquid.

If this foam is used as a fuel, then such properties allows it to solve one of the most difficult problems of injection fuel supply stability leading to reduction of vibration amplitude and fuel mixture pulsation in the fuel pipeline. This helps to increase the resulting net power efficiency, reduce fuel consumption and improve level of ecological safety of the combustion process while reducing the level of aerodynamic noise.

It is also important to analyze the required injection pressure. Experiments indicated that the required injection pressure in a range of 1600-2000 bar which is used for injection in the serial diesel engines when using a fuel composite as a composite fuel foam can be reduced to 930-1000 bar while maintaining analogous output parameters of the combustion process. Such pressure reduction allows to reduce fuel consumption by 8-10 percent and also allows to simplify the structure of the sealings of combustion chamber or diesel engine cylinders.

These factors certainly need further experiments with additional usage of more complex combinations of liquid fuel, for example using the mixture of diesel fuel №2 with methanol or ethanol, and also with different combinations of mixture and biofuel. Mixtures and foam formation with more heavy fuel types as well as with varieties of masut (fuel oil) are the targets of further steps of research and experiments.

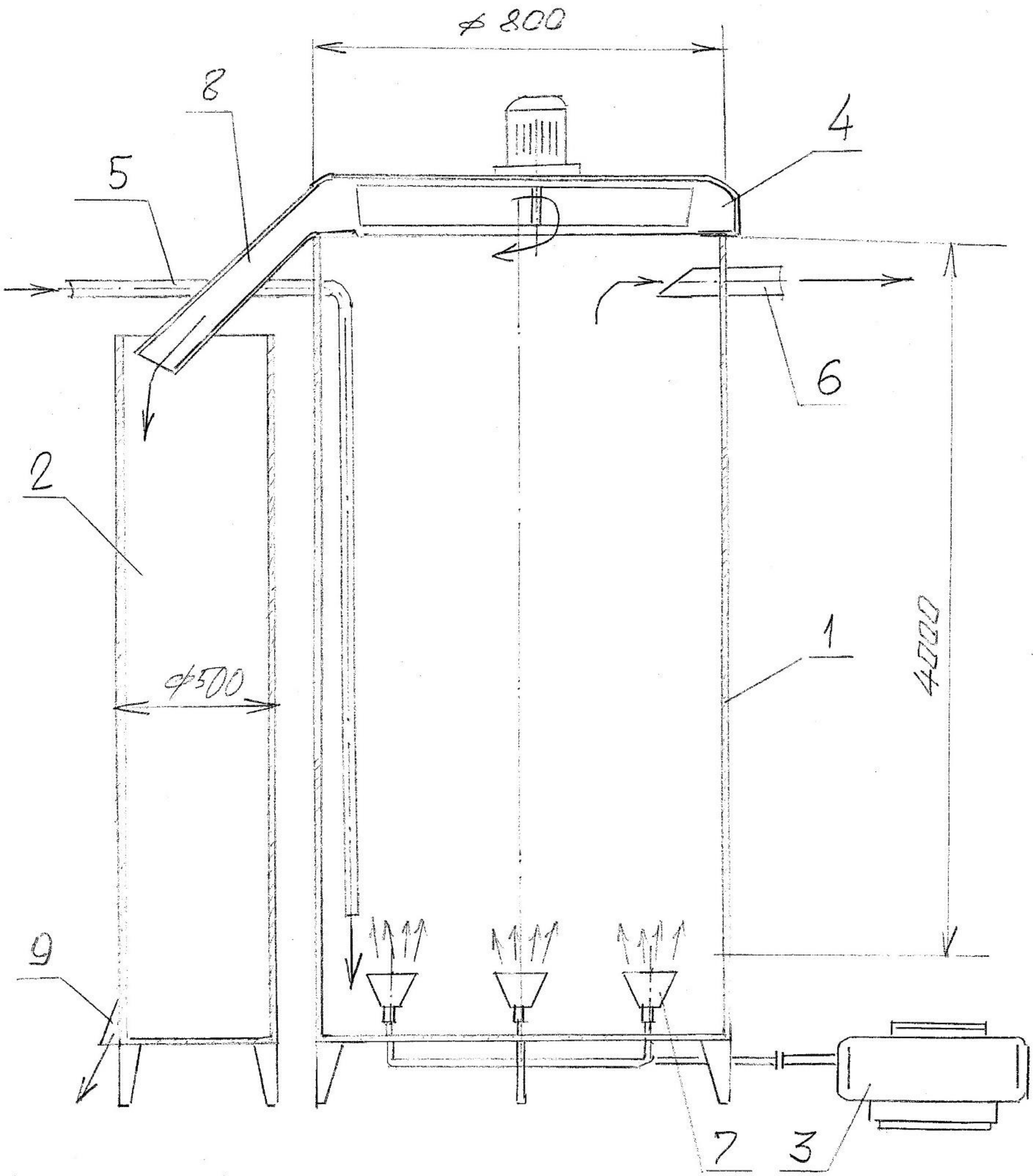

Figure 7. Principal diagram of the device for using the aerodynamic foam generator for various manufacturing processes including regeneration, cleaning and flotation processes and so on.

Signs of significant novelty discovered during the comparative analysis of the suggested technical object and existing technical objects identified during patent search:

- foam generator is located inside the inner volume of the pipeline which is intended for supplying liquid for foaming or for supplying components for mixing with subsequent foaming;
- The process of mixing and subsequent foaming is based on the physics principle of local pressure reduction in the zones of active effect on the dynamic flow of components of liquid for mixing and subsequent foaming or for increasing turbulence level and subsequent aerodynamic foaming;
- for increasing turbulence level and increasing the value of Reynolds number method of stream division into the set of identical micro-streams was used. These micro-streams are uniformly distributed over the pipeline cross-section, and their linear speed is by the order of magnitude higher than the speed before division;
- method of staged consecutive operations for increasing the turbulence level in the stream and then for creating zones with reduced pressure sequentially ordered in the direction of stream flow was used. These zones gulf the stream with high intensity, sharply increase its speed and/or mix or foam the liquid or mix of liquids moving in the stream;
- all structural properties and connections for hydro-dynamic turbulence level amplifier and for aerodynamic foam generator during analysis of its discovered analogues indicated its complete novelty. Furthermore, the principle of the counterflow supply of liquids or liquid and compressed gas can be considered a pioneer as it was not found in any of the analogues.

Invention Analysis by Methods of Theory of Inventive Problem Solving (TIPS) and Algorithms of Inventive Problem Solving (AIPS)

1. <u>Fundamental distinctive properties of the developed technology</u>

1.1. Both liquid and gas components are used simultaneously as a working body;

1.2. Local rarefaction zone is created on the dynamic border between gas and liquid;

1.3. Mechanical two-sided reflector performs several functions for both gas and liquid: separation, join and formation;

1.4. In local rarefaction zone the dynamic contact of two mediums happen. It results in kinetic diffusion of the gas medium into liquid one due to higher dynamic characteristics of the gas medium stream;

1.5. Kinetic diffusion of a gas medium into the liquid medium happens with detaching of gas bubbles from the stream and their free migration in the liquid medium volume following vortical trajectories;

1.6. Trajectory pattern of the air bubbles is formed by the set of symmetrical reflectors that are concentric with the dynamic border between two working mediums;

1.7. Dynamic border between two mediums has a shape of closed annular area. Its elements' geometric coordinates lie in the three-dimensional system which is concentric and coaxial to the channel that supply the gas working agent.

2. <u>Goals which this invention accomplishes.</u>

2.1. Efficient formation of plenty of microscopic air bubbles in the volume of liquid working body. These bubbles are uniformly distributed over the volume of liquid working body and have high kinetic energy.

2.2. Efficient formation of the specified bubbles while having minimal energy consumption and usage of the physics principles amplifying this effect.

2.3. Obtaining the optimal results while having the minimal dimensions of the operating devices.

3. <u>Ways of obtaining same effect using other technical devices.</u>

3.1. All seven principal distinctive properties together fully ensure achieving the specified goals;

3.2. In order to theoretically achieve same results using other technical devices that are not equivalent to the suggested device it is necessary to completely change patterns of all seven distinctive characteristics. Furthermore, the nature of the structural and technological interconnections between those characteristics must be changed as well, which is practically impossible to achieve.

4. <u>Changing elements in the suggested technology components in order to obtain a patent.</u>

4.1. The invention represents tight and technically sufficient interconnections between seven principal distinctive traits;

4.2. Any principal change should change the nature of their interconnections which eliminates obtaining the specified effect and the operability of the device itself can be questioned;

4.3. Any change in the device dimensions does not change the general operation principles of the device and corresponding technology. Thus, it cannot ensure the device operability which is comparable to the suggested invention.

5. Necessity of using dimensional and numerical dependencies in the invented device design instead of general definitions and distinctive properties and ways it can make a patent stronger.

5.1. Transition to the specific dimensional characteristics from the principal and generalized characteristics significantly weaken the invention;

5.2. In order to introduce any dimensional changes or constrains in addition to the suggested principal differences, it is necessary to significantly weaken the protective functions of the patent and constrain the flexibility of its application.

6. The principle and the related Bernoulli effect are only the consequence of applying all seven principal distinctive characteristics and their structural and technological interconnections.

7. All empirical formulae and dimensional dependencies and combinations are shown in the figures of the corresponding publications and can be considered only in scope of principal distinctive properties and they do not bring any value on their own.

Conclusion

After analysis by methods of Theory of Inventive Problem Solving (TIPS) and Algorithms of Inventive Problem Solving (AIPS) the suggested technology can be considered as a pioneer in terms of technological complex solution (foam generation method); nature of foam properties and characteristics (product characteristics); device properties and characteristics (foam generator); process of foam usage in the formation of thermo-dynamic equipment fuel system. Capabilities of formation of the qualitative foam aspect and almost instant high-quality foam formation open new perspectives in the development of new layout arrangements in special technological equipment especially in the conditions when it is necessary to create an infrastructure that corresponds to utilization of artificial intelligence and neural networks in combination with modern processor and programmable controller devices in technical systems.

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PATENT AND LICENSING STRATEGY – as a control and analytical algorithm for the readiness of smart technology for mass production and integrated marketing

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Abstract

Recently, several new, in many ways, fundamentally new directions for the development of innovative high-tech products, which are unequivocally products of mass demand, have taken shape systematically.

Such innovative areas include those named and classified as - smart products and technologies, products such as - smart design, like smart medical technologies, equipment and instruments, which certainly include medical equipment and devices with effective mobile applications, smart transport and smart transportation, smart manufacturing and smart manufacturing equipment, including special technological equipment with digital program control and the most advanced processing centers and flexible manufacturing cells.

Keywords: Patent, Licensing, Smart technology, Mass production, Smart manufacturing, Storage media, Data encryption, Start-up a business in the USA

В последнее время системно оформились несколько новых, во многом – принципиально новых направлений развития инновационных продуктов высоких технологий, которые однозначно являются продуктами массового спроса.

К таким инновационным направлениям можно отнести, названные и классифицированные как – умные продукты и технологии, такие продукты как – умный дизайн, как умные медицинские технологии, оборудование и инструментарий, безусловно включающие в себя и медицинскую технику и приборы с эффективными мобильными приложениями, умный транспорт и умное транспортирование, умное производство и умное производственное оборудование, включая и специальное технологическое оборудование с цифровым программным управлением и наиболее совершенные обрабатывающие центры и гибкие производственные модули.

Сюда же входят и системы подготовки – умной рабочей силы (Smart workforce development).

Рассмотрим весь этот процесс на примере внедрения модификаций мобильного защитного кодирования цифровых внешних носителей информации.

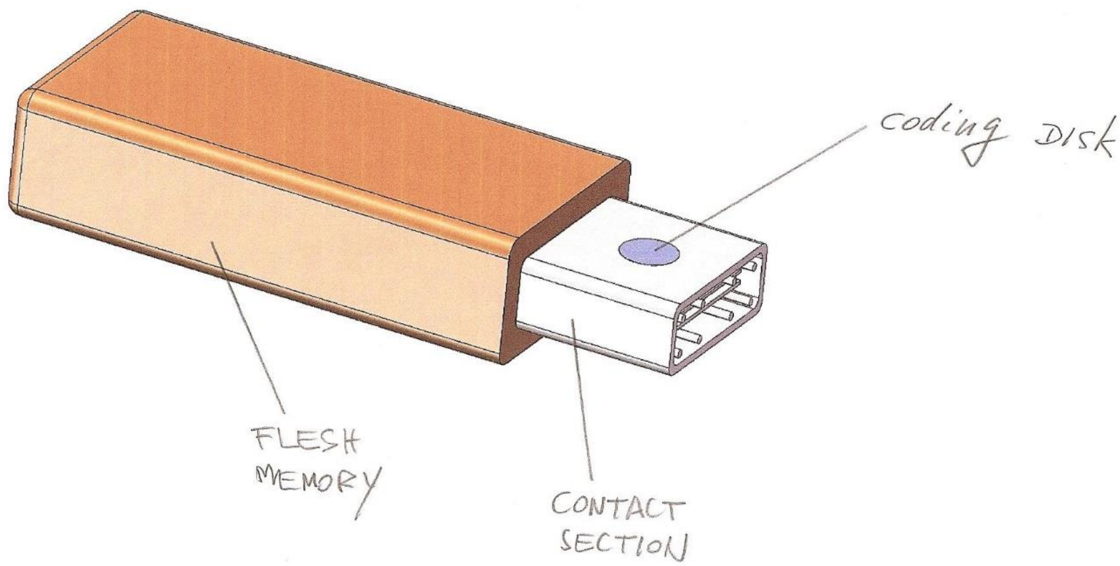

Рисунок 1, - *на рисунке представлен пример такого внешнего носителя информации, модифицированный инновационной системой кодирования*

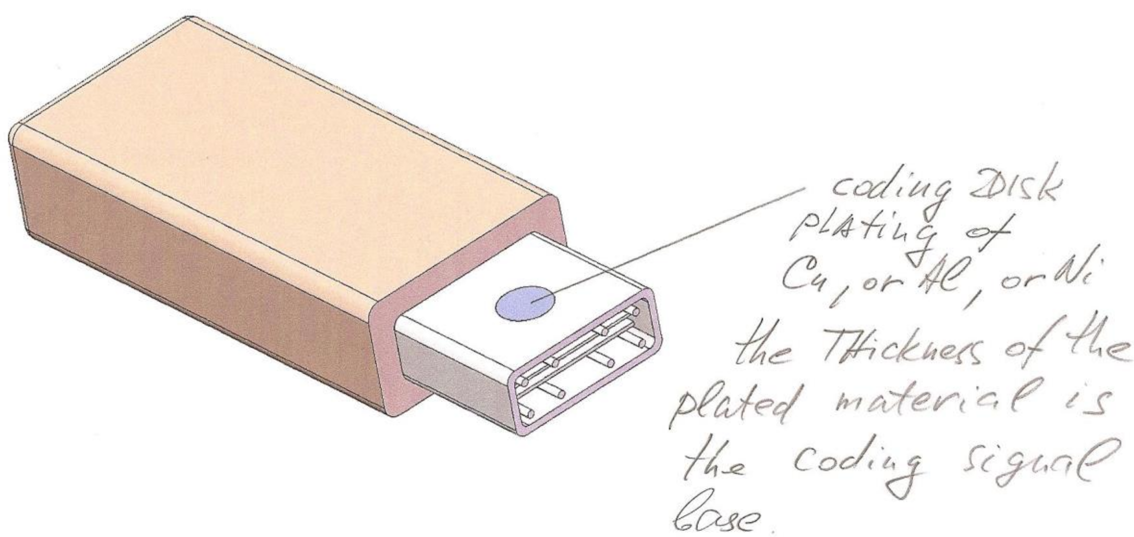

Рисунок 2, - *на рисунке также представлен пример такого внешнего носителя информации, модифицированный инновационной системой кодирования*

Принцип системы кодирования и использованные для её построения материалы, и их сочетания также показаны на рисунке.

Решение такого кодирующего и декодирующего узла, при всей своей простоте, позволяет получить максимальную точность идентификации кода, так как указанная точность определяется точностью толщины кодирующего или декодирующего диска.

Имеется как минимум два метода изготовления и установки на корпусе этого диска, - первый метод, – это метод изготовления кодирующего диска из прецизионной фольги, второй метод – это нанесение прецизионного электрохимического покрытия в проточке, выполненной в корпусе для кодирующего диска.

Общая информация

Все проекты этой группы технических решений базируются на одном методе кодирования и последующей идентификации записи кодирующего элемента.

Сущность принципа состоит в нанесении на защищаемый объект кодирующего покрытия или его технологического эквивалента и последующего измерения толщины этого покрытия, определяющего совпадение или не совпадение результатов измерения с кодом.

При совпадении полученного результата с установленным происходит положительная идентификация кодирующего элемента, при не совпадении, - происходит отрицательная идентификация и остановка или блокирование рабочего цикла оборудования или потребителя информации, например, - компьютера.

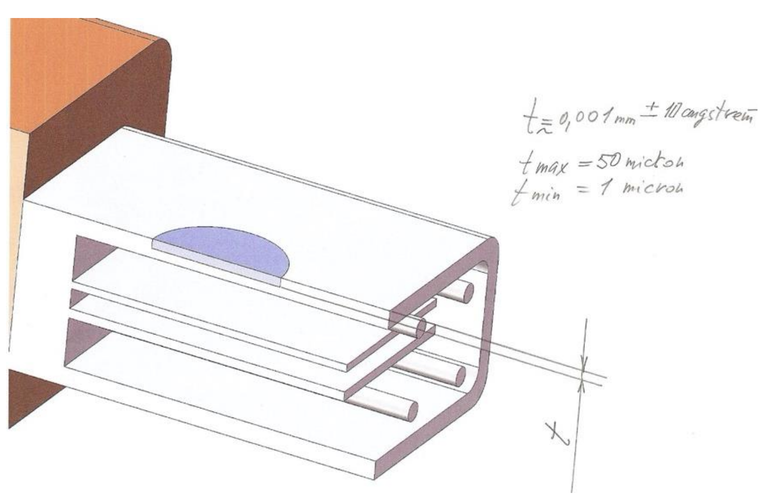

Рисунок 3, *- на рисунке также представлен пример такого внешнего носителя информации с указанием технических деталей, модифицированных инновационной системой кодирования*

В сечении показана наиболее критичная величина, определяющая точность кодирования или декодирования, - толщина диска – t.

Минимальная толщина может быть равной – 1 микрону, максимальная толщина – 50 микронам.

Дополнительные технологические особенности

Технологически вопросы нанесения специальных покрытий решены, и эта технология была многократно проверена на аналогичных задачах, связанных с контролем толщины плёнок на панелях солнечных батарей и в традиционном полупроводниковом производстве.

Дополнительные особенности и возможности применения технологии, применительно к новым условиям, возникшим на рынке носителей и накопителей информации в течении последнего года с учётом возникших новых направлений в технических решениях и технических системах любых уровней в конечном счёте приводящих к синтезу так называемых умных технологий и комплексных технических систем с элементами искусственного интеллекта и искусственными нейронными сетями.

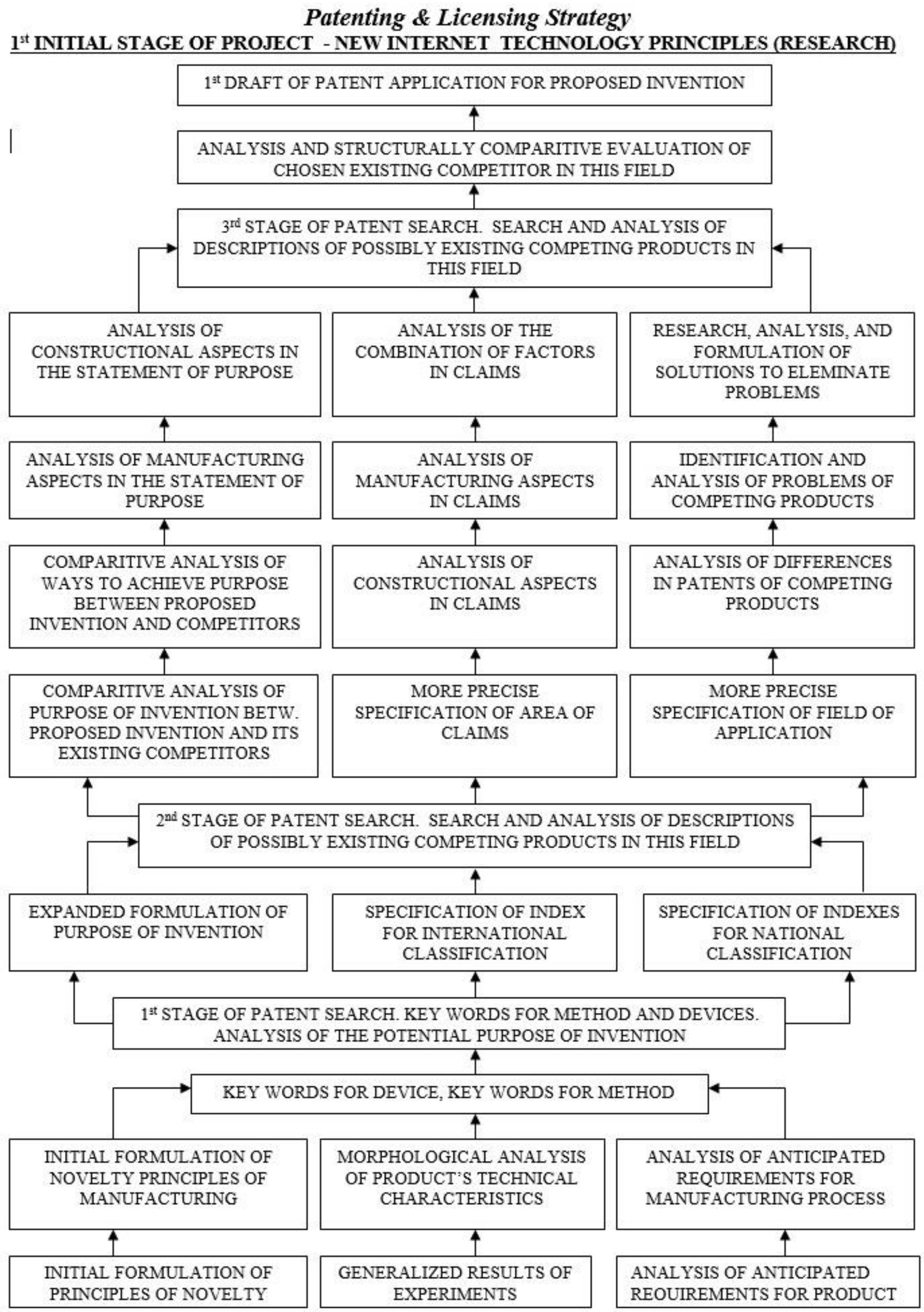

Рисунок 4, - *на рисунке представлен алгоритм применения патентной и лицензионной стратегии на начальных стадиях развития проекта*

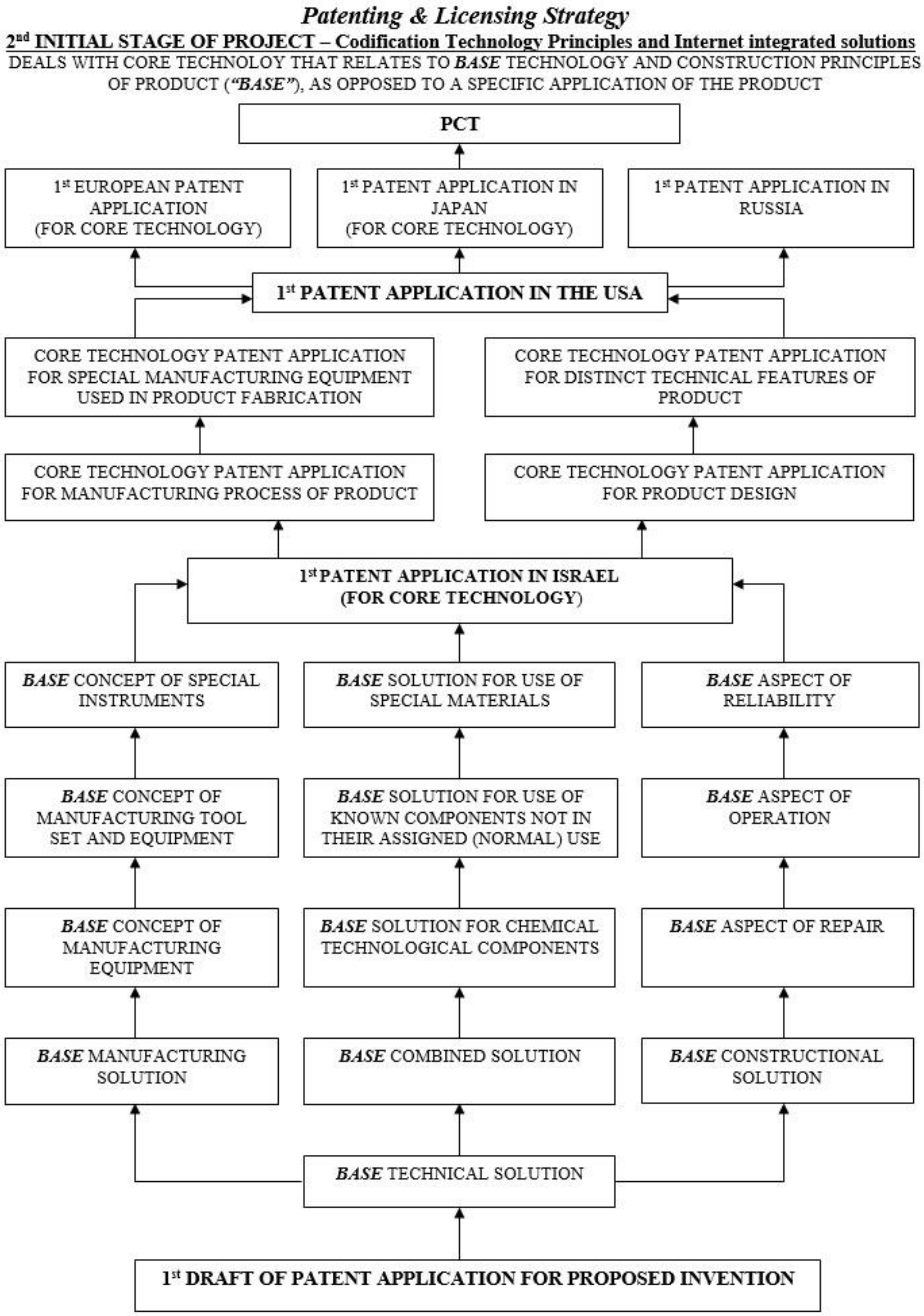

Рисунок 5, - *на рисунке также представлен алгоритм применения патентной и лицензионной стратегии на последующих стадиях развития проекта*

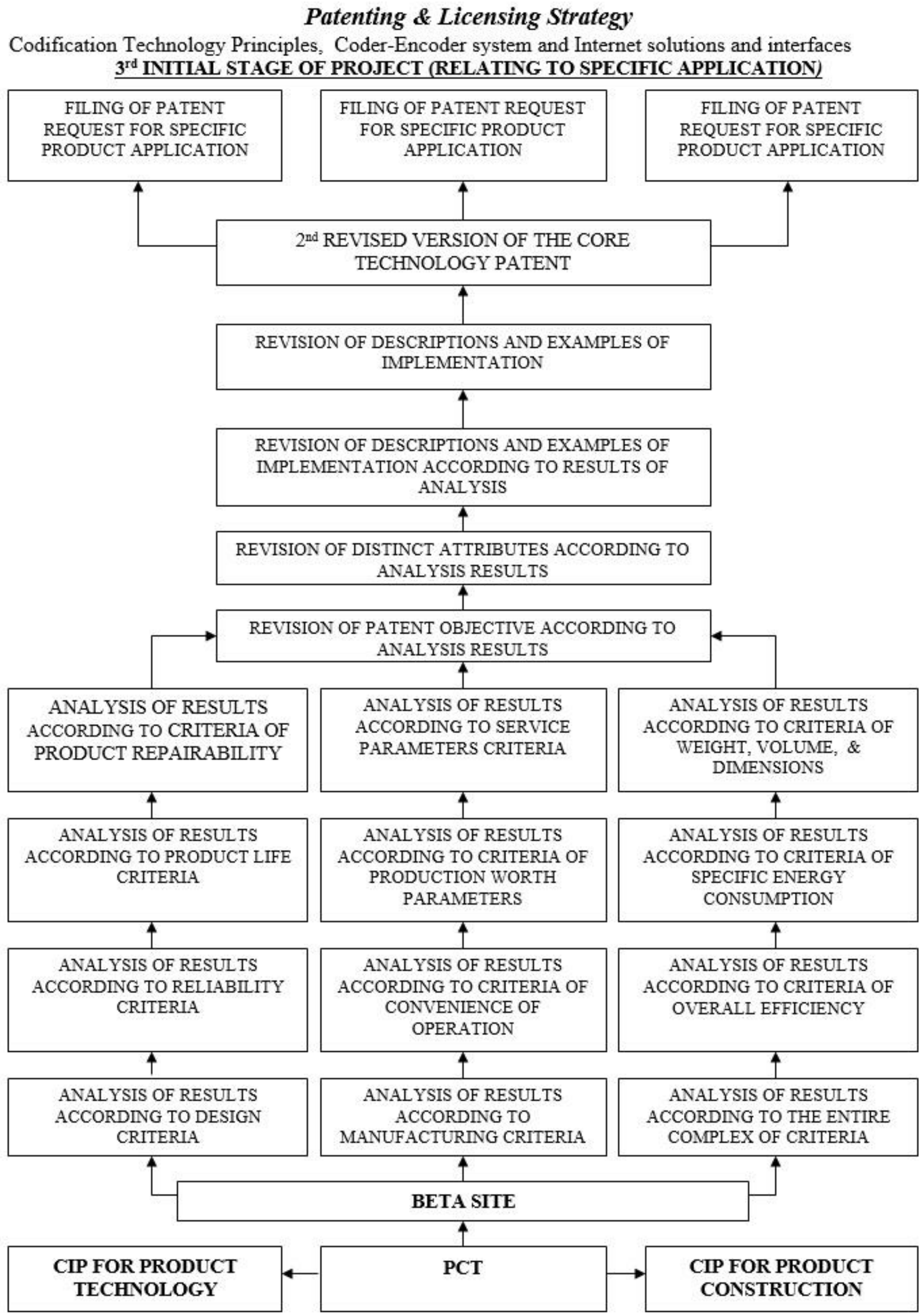

Рисунок 6, - *на рисунке представлен алгоритм применения патентной и лицензионной стратегии на средних стадиях развития проекта*

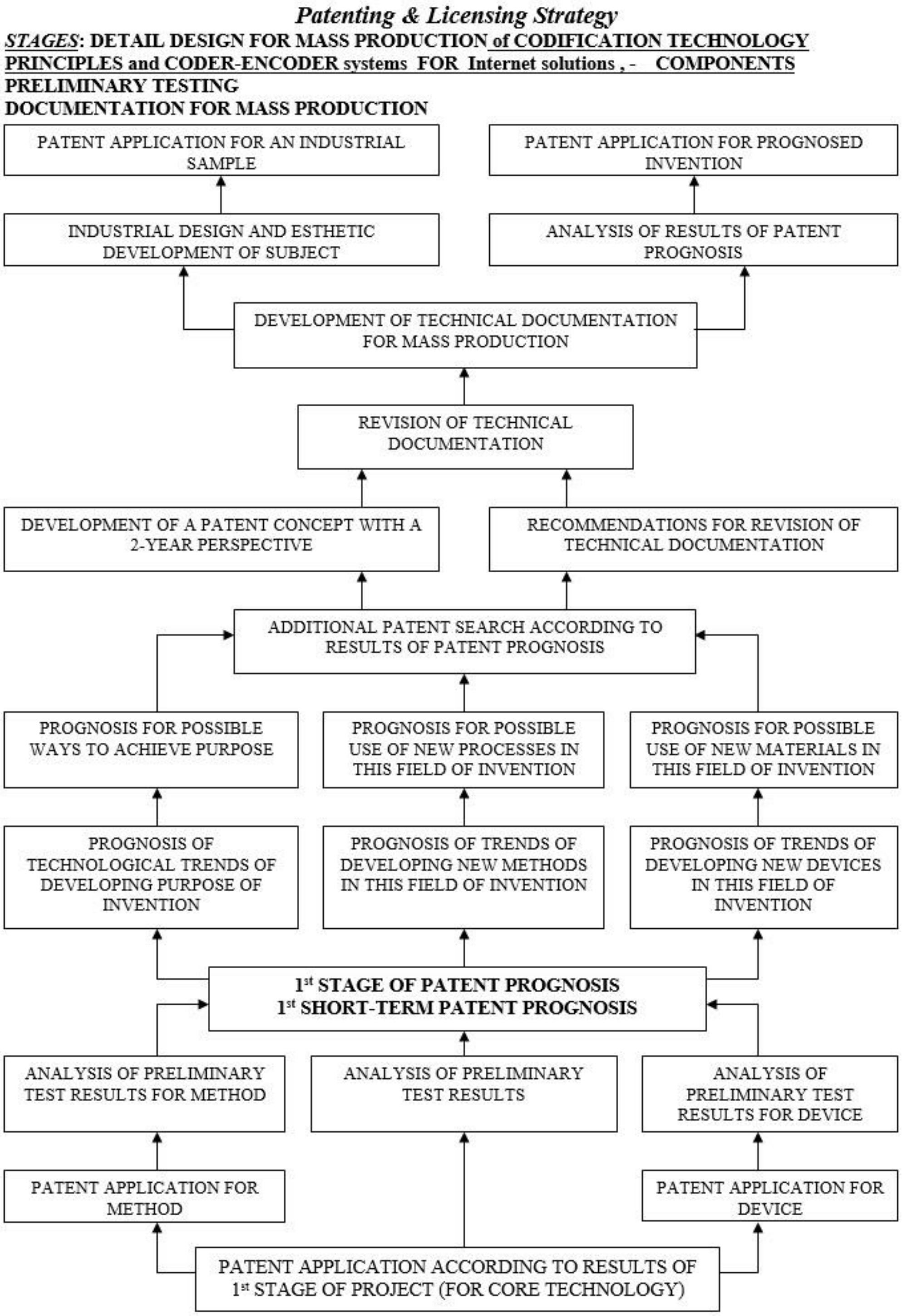

***Рисунок** 7, - на рисунке представлен алгоритм применения патентной и лицензионной стратегии на стадиях дизайна для массового производства*

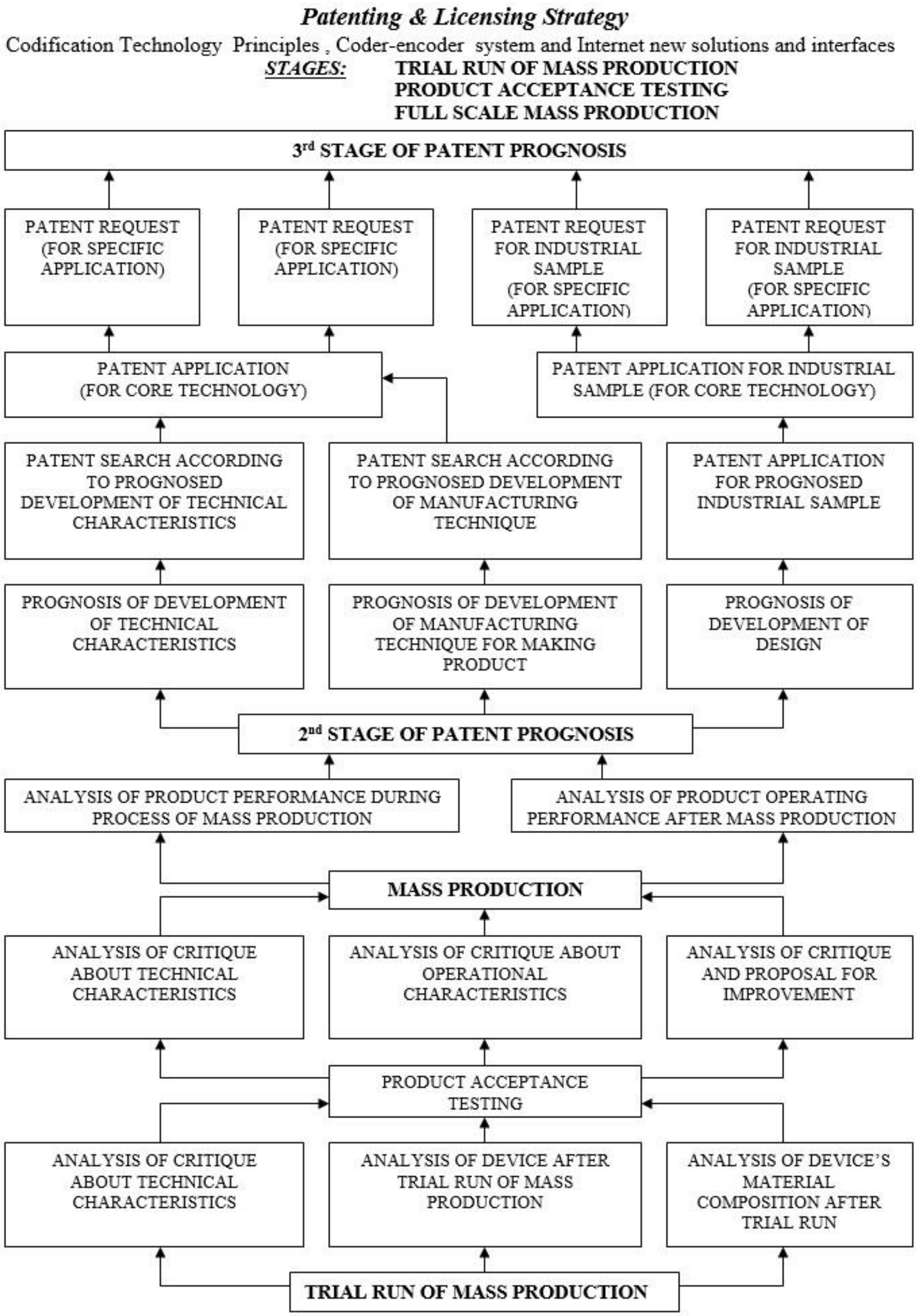

Рисунок 8, *- на рисунке представлен алгоритм применения патентной и лицензионной стратегии на стадиях массового производства, этапах приёмных и*

квалификационных испытаний и после корректировки по их результатам переход к полномасштабному массовому производству

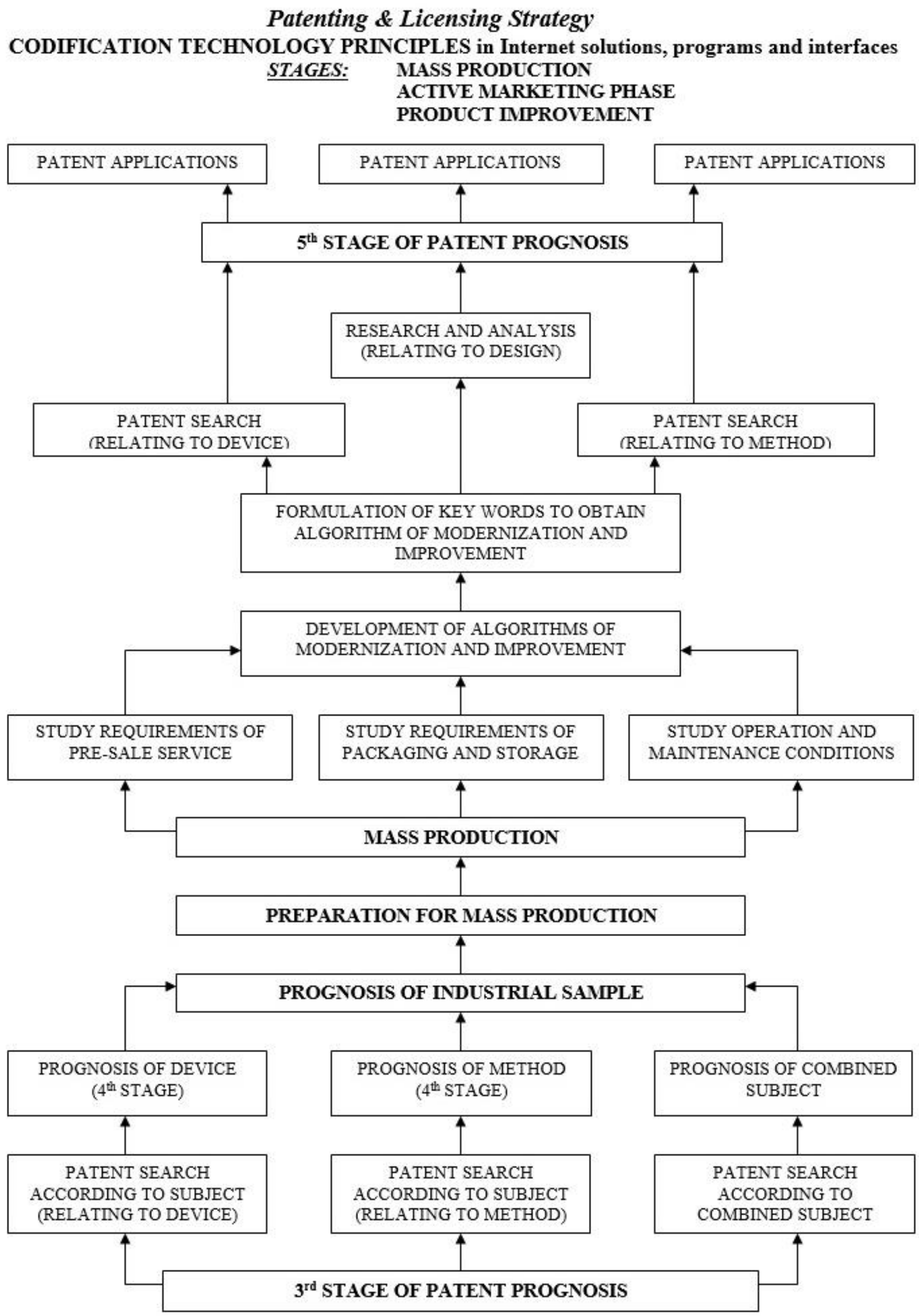

Рисунок 9, *- на рисунке представлен алгоритм формирования и внедрения патентной и лицензионной стратегии на этапах развития проекта, - таких как, - массовое производство, активная фаза комплексного маркетинга и последующий после их и*

параллельно с ними интегративный этап оптимизации и модификации продукта с приданием продукту свойств и характеристик, - умного продукта , произведённого по умной технологии, на умном оборудовании, с применением умных материалов и компонентов, при использовании умной рабочей силы в рамках умной производственной инфраструктуры

Особое внимание (в соответствии с алгоритмом) уделяется патентному прогнозированию в разрезе устройства, в разрезе – методов, в разрезе – комбинированного и интегрированного объекта, по возможности с применением во всех составных частях инфраструктуры продукта, - элементов искусственного интеллекта с искусственными нейронными сетями.

По опыту маркетинга после реализации всех аспектов и особенностей массового производства нового продукта, в алгоритм внедряются аналитические требования к всем элементам системы обслуживания процесса маркетинга, - изучение предпродажного сервиса, изучение требований к упаковке и хранению, а также изучение требований и условий (особенно технических требований и технических условий) к порядку и методике ремонта и обслуживания.

Все эти виды активности предусматривают интегративное сочетание всех вышеуказанных аспектов и на их базе возможное формулирование целей и задач по оптимизации и дальнейшему развитию проекта.

Комментарии к алгоритмам (показанным на рисунках выше)

Рисунок 4, - на рисунке представлен алгоритм применения патентной и лицензионной стратегии на начальных стадиях развития проекта.

Характерные вопросы, решаемые по этому фрагменту алгоритма:

- формулировка общей новизны продукта;
- формулировка общей эксплуатационной характеристики продукта;
- формулировка технической характеристики продукта;
- формулировки регламента производства продукта;
- формулировка исходных технических требований к продукту и его производству;
- формулировка требований к патентному поиску;
- формулировка технической характеристики продукта и её потенциала сравнительной новизны и потенциала на последующие 5, 10, 15 лет.

Рисунок 5, - на рисунке также представлен алгоритм применения патентной и лицензионной стратегии на последующих стадиях развития проекта.

Начало алгоритма – формирование первого варианта патентной аппликации по новому продукту с учётом всех особенностей и результатов всех видов патентного поиска, а также исследований рынка.

Завершение алгоритма – формирование и подача международной патентной заявки с учётом всех результатов исследований рынка и его требований к новому продукту.

В отработке алгоритма постоянно анализируется характер базовых концептуальных решений по всем характеристикам и свойствам нового продукта.

Рисунок 6, - на рисунке представлен алгоритм применения патентной и лицензионной стратегии на средних стадиях развития проекта.

Начало алгоритма – формирование и подача международной патентной заявки с учётом всех результатов исследований рынка и его требований к новому продукту, а также развитие проекта нового продукта и его приложений в формате – программа, система и ассоциированный метод по методу – CIP, - continuation in part.

Системный анализ результатов опытно промышленной эксплуатации и всех видов испытаний.

Завершение алгоритма – подготовка и подача системных заявок на предполагаемые изобретения, по материалам опытно-промышленной эксплуатации, по результатам испытаний и по результатам системного анализа всех полученных результатов этого этапа производства и реализации проекта нового продукта.

Рисунок 7, - на рисунке представлен алгоритм применения патентной и лицензионной стратегии на стадиях дизайна для массового производства.

Начало алгоритма – подготовка и подача системных заявок на предполагаемые изобретения, по материалам опытно промышленной эксплуатации, по результатам испытаний и по результатам системного анализа всех полученных результатов этого этапа производства и реализации проекта нового продукта.

Завершение алгоритма – подготовка материалов и подача аппликации на получение промышленного образца на новый продукт.

Кроме этого, в этот алгоритм вошли все стадии и этапы разработки технической документации, начиная с этапов технического задания, технического предложения, эскизного проекта, технического проекта, рабочего проекта, корректировок документации по результатам испытаний и опытно промышленной эксплуатации.

Также в этот алгоритм вошли этапы патентного поиска по массивам мировой информации с учётом результатов испытаний и их структурного анализа.

Рисунок 8, - на рисунке представлен алгоритм применения патентной и лицензионной стратегии на стадиях массового производства, этапах приёмных и квалификационных испытаний и после корректировки по их результатам переход к полномасштабному массовому производству.

Начало алгоритма – массовое производство нового продукта

Завершение алгоритма – 3 этапа патентного прогнозирования, для выявления направлений оптимизации нового продукта.

Теория решения изобретательских задач (ТРИЗ) и Алгоритмы решения изобретательских задач (АРИЗ)

Теория решения изобретательских задач и все известные её производные Алгоритмы решения изобретательских задач были созданы в стране СССР и в период с 1945 по 1947 года, где коммерциализации инновационных решений не придавалось особого значения , можно даже сказать , что на определённом этапе создания Теории и Алгоритма решения изобретательских задач вопросы коммерциализации преднамеренно игнорировались в пользу чисто технологических вариантов инновационных решений, абсолютно оторванных от реальной экономики и в большинстве случаев от реальной жизни.

В результате такой близорукой и однобокой организационной модели развития инновационного процесса, имевшей место в это время, изобретатели, выросшие и воспитанные на классических приёмах и принципах ТРИЗ и АРИЗ оказались совершенно не подготовленными к особенностям и приёмам конкурентной борьбы в условиях современного общества с свободной конкурентной экономикой, особенно при постепенном переходе к системным умным технологиям, особенно применяющим элементы искусственного интеллекта и искусственные нейронные сети.

Они готовы и любят изобретать, но не готовы и не умеют заработать на своих изобретениях, чтобы получить достойную компенсацию за свой талант и творческий труд.

Особенно важно оценить необходимость начала инновационного процесса и понять, а ещё лучше рассчитать все возможные варианты развития событий в процессе коммерциализации.

Для этой цели мы и находим целесообразным применить систему оценочных алгоритмических критериев и таблиц в виде аналитического оценочных листов, алгоритма патентной и лицензионной стратегии, состоящего из 6 групповых элементов оценки критериев и параметров возникшей инновационной идеи или инициативы и процесса их развития и реализации.

В связи с появлением новых форматов записи и чтения на оптических носителях информации с использованием голубых лазеров, и в связи с началом производства многослойных оптических дисков, базирующихся на этой же технологии, предложенные принципы и технические решения по защитному кодированию приобрели ещё большее значение, так как количество записанной информации на каждом диске увеличивается и отсутствие защиты приводит к всё большим потерям секретных или конфиденциальных данных.

В дополнение к уже переданной информации необходимо указать возможности по кодированию каждого слоя в многослойных дисках , при котором кодируется каждый уровень слоёв записи, что является существенным усовершенствованием системы форматирования оптического носителя информации в трёхмерном выражении и является средством обеспечения (для особо важной и секретной информации) локального избирательного кодирования информации в пределах одного диска.

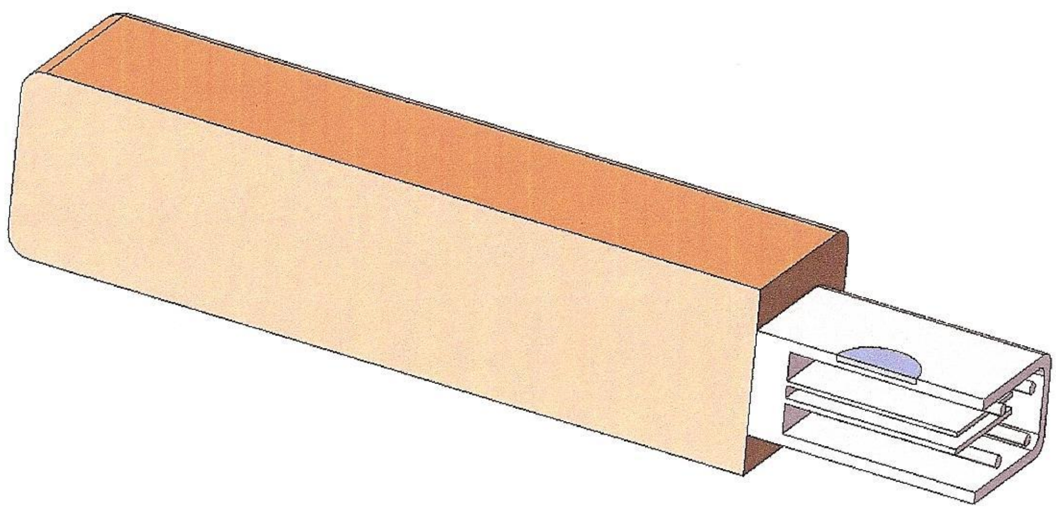

Рисунок 10, - *на рисунке показана модель носителя информации в осевом сечении*

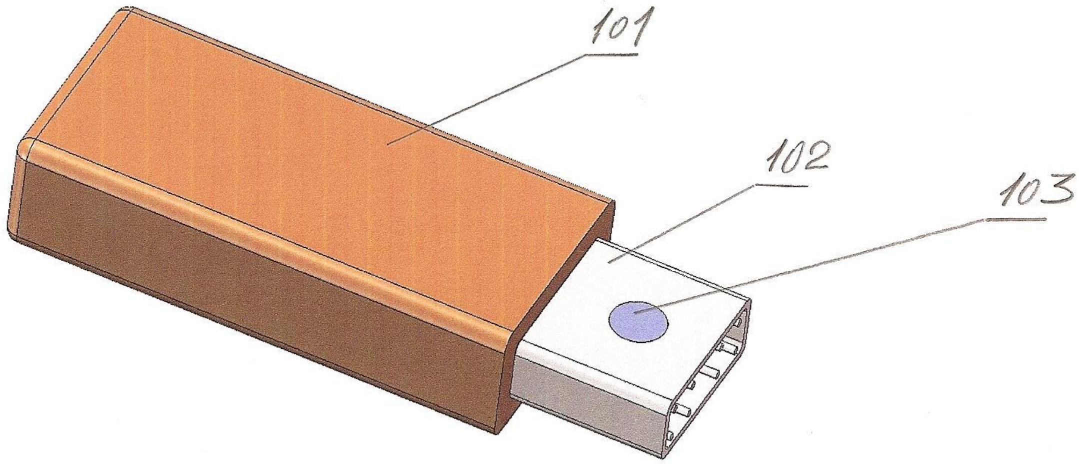

Рисунок 11, - *на рисунке показана трёхмерная модель носителя информации*

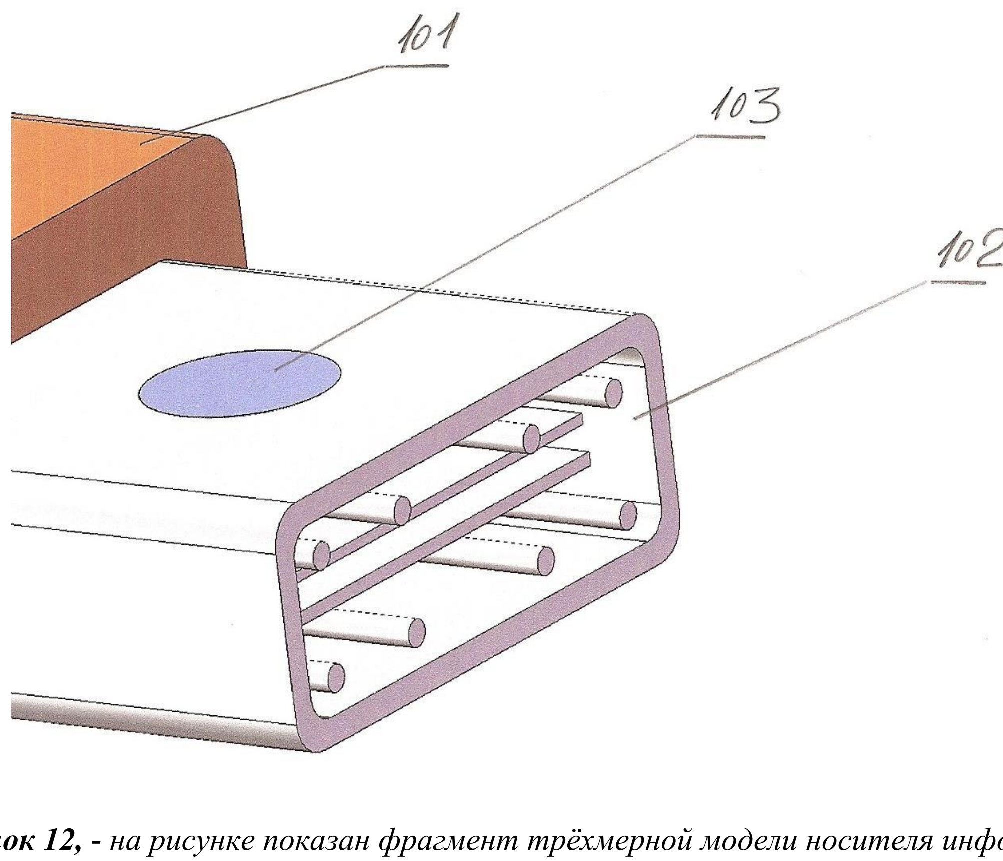

Рисунок 12, - *на рисунке показан фрагмент трёхмерной модели носителя информации в районе плоского штекера с кодирующим и декодирующим диском*

Цифрами на рисунке 11 и 12 обозначены:

- 101, - корпус носителя информации;

- 102, - плоский штекер;
- 103, - кодирующий диск.

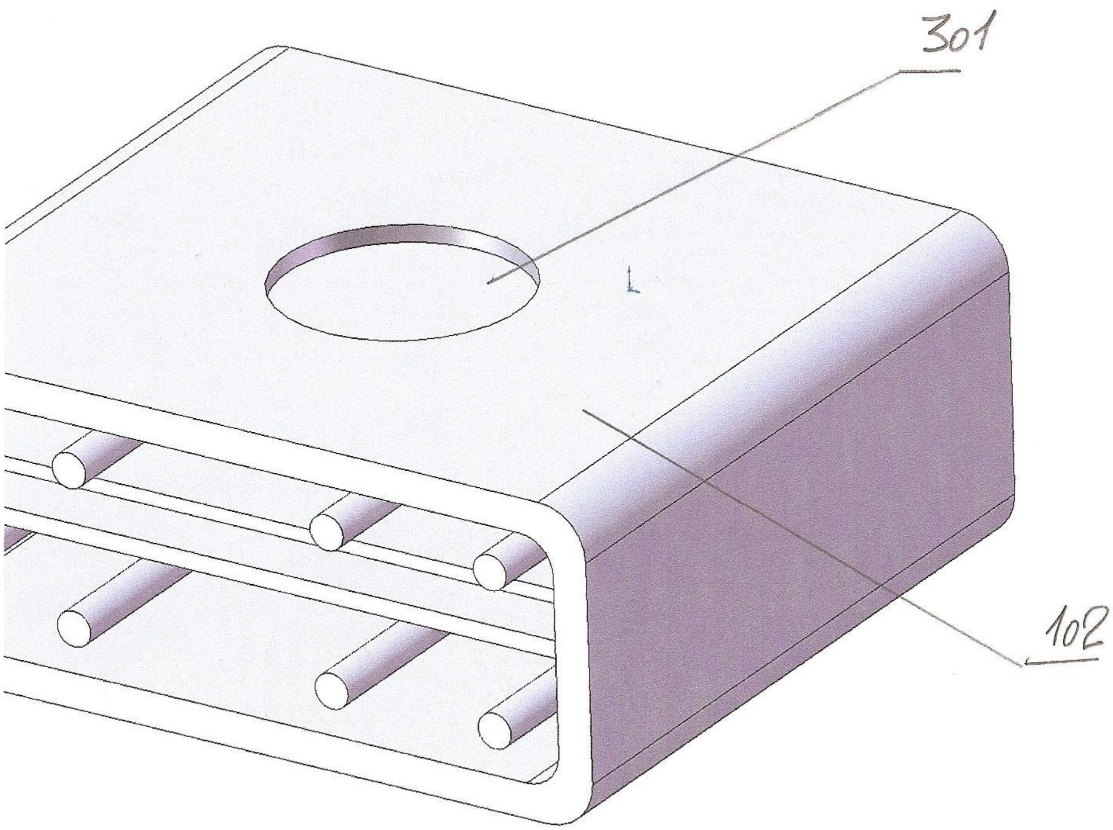

Рисунок 13, - *на рисунке показан фрагмент трёхмерной модели носителя информации в районе плоского штекера с кодирующим и декодирующим диском до установки кодирующего и декодирующего диска*

Цифрами на рисунке обозначены:

- 102, - корпус плоского штекера;
- 301, - выточка на корпусе для установки кодирующего диска в любом конструктивном варианте.

Как видно из всех представленных моделей носителя информации на рисунках 10, 11, 12 и 13, конструктивно система кодирования и декодирования довольно проста, что позволяет её интеграцию даже на носителях информации выполненных без такого устройства и таких функций.

Отсюда вытекает важная дополнительная возможность применения самых новых технологий для повышения маркетингового потенциала нового продукта. Как пример можно привести следующую технологию:

Метод производства модуля для установки, охлаждения, управления и контроля энергетически насыщенных оптических и электронных систем включающий:

- подготовку поверхности стальной ленты (рулона) (вместо стальной может быть указано, - металлической);
- нанесение фоторезиста;
- проявление фоторезиста;
- скоростное струйное электрохимическое покрытие никелем в направленном потоке электролита (толщиной в 2-3 микрона);
- скоростное струйное электрохимическое покрытие медью в направленном потоке электролита (толщиной в 25-35 микрон).

«Поскольку этот технологический феномен является основным базовым отличием и формирует пакет существенных преимуществ предложенного инновационного метода», – автор считает необходимым дать некоторое объяснение этому феномену.

Скоростное струйное электрохимическое покрытие – это развитый гальванический процесс в селективно ориентированном направленном потоке электролита с постоянной, обновляющей электролит системой рециркуляции электролита, в которую (систему рециркуляции) входят:

- ёмкость с электролитом с определёнными параметрами режима содержания электролита в ёмкости такие, как:
  - концентрации никеля и меди в электролите
  - температуры электролита
  - уровня кислотности или щёлочности электролита плотности электролита
  - электрического сопротивления электролита (проводимости)
  - благодаря вышеуказанным преимуществам технологии и применяемых материалов нет необходимости в использовании органических добавок к электролиту – осветлителей;
- насос с фильтром;
- анод для струйной металлизации, который имеет растворимый в данном типе электролита и нерастворимый в данном типе электролита компоненты.

Компоненты, установленные последовательно по ходу движения электролита, причём нерастворимый компонент выполнен из композитной, графитной, токопроводящей ткани (типа ЭТАН). Нерастворимый компонент расположен параллельно металлизированной поверхности и последним по ходу движения электролита и первым перед покрываемой поверхностью (катодом). Оба компонента подсоединены к положительному электрическому потенциалу и также оба компонента, имеют избирательную регулируемую гидравлическую проницаемость для электролита.

В аноде также имеется система равномерного распределения электролита по плоскости растворимого компонента, которая автоматически повторяется на нерастворимом компоненте и, следовательно и на металлизируемой поверхности – катоде:

- удаление фоторезиста;
- травление железа, с одной стороны, на половину толщины стальной ленты
- удаление продуктов травления с поверхности аэродинамическим и за этим, - гидродинамическим воздействием;
- опрессовка жидкотекучей полимерной композицией, - по такому технологическому порядку:
  - заливка мономером
  - последующая послойная полимеризация
  - термическая стабилизация;
- травление железа со второй стороны ленты (с теми же отличиями);
- опрессовка со второй стороны (с теми же отличиями);
- нанесение протектора на электропроводные структуры;
- покрытие в вакууме всех теплопроводящих структур – слоистой системой из полупроводниковых нано-структурных поликристаллических алмазных плёнок.

Такое технологическое дополнение к традиционным технологическим приёмам и методам позволяет существенно расширить области внедрения приёмов маркетинга нового продукта.

Организация корпоративных систем защиты

Предложенная технология при организации системы защиты информационных потоков в пределах одной корпорации обеспечивает защиту на нескольких системных уровнях, включая и отслеживание в системе реального времени состояния и местонахождения каждого диска, имеющегося в корпорации.

При использовании предложенных методов кодирования, для защиты информации на мобильных внешних носителях информации, предполагается получение тех же преимуществ, что и при применении на оптических носителях и накопителях информации.

Изменения в структуре и границах использования продукта, созданного в результате реализации проекта

Таким образом на базе аналогичных решений можно создать как минимум два проекта с большим количеством аппликаций в каждом, - проект технологии для кодирования оптических накопителей информации в виде диска, включающий и соответствующее аналитически – сенсорное устройство, которое может в свою очередь иметь множество аппликаций в самых различных сферах и отраслях.

И проект для кодирования и защиты информации на мобильных внешних носителях информации, включающий и соответствующее мобильное или стационарное сенсорное измерительно-аналитически-сравнительное устройство, также имеющее множество аппликаций и дизайн-моделей.

Дополнительные устройства и системы, которые могут быть созданы на базе тех же принципиальных технологических решений

В состав проектов при требовании потребителя проектов может быть включён раздел, касающийся дополнительных или специальных устройств, с помощью которых формируется вся корпоративная система охраны и защиты информационных потоков в пределах одной корпорации или группы корпораций или (по Российской специфике, - госкорпораций) отдельных научно-исследовательских учреждений, академических институтов и крупных учреждений в системе здравоохранения.

В качестве специального продукта может быть создана система защиты информации не только в области хранения, но и в оперативной области, при передаче команд и сигналов в условиях армейских частей и соединений, и особенно, в условиях – морского флота.

В современных условиях, когда информация концентрируется в относительно очень малых размерах и объёмах устройств для её хранения, возможный ущерб от несанкционированного или преступного входа в эти массивы информации, может быть предотвращен или локализован при помощи создания специальной инфраструктуры указанных защитных систем, которая может быть стандартизована в пределах специфики данного министерства, главного управления или структурных корпоративных соединений и предприятий более низкого организационного уровня.

Серия рисунков, - от рисунка 14 до рисунка 20 показывает, как пример, применения технологий кодирования и декодирования в идентификации одноразового инструмента в лазерных медицинских приборах.

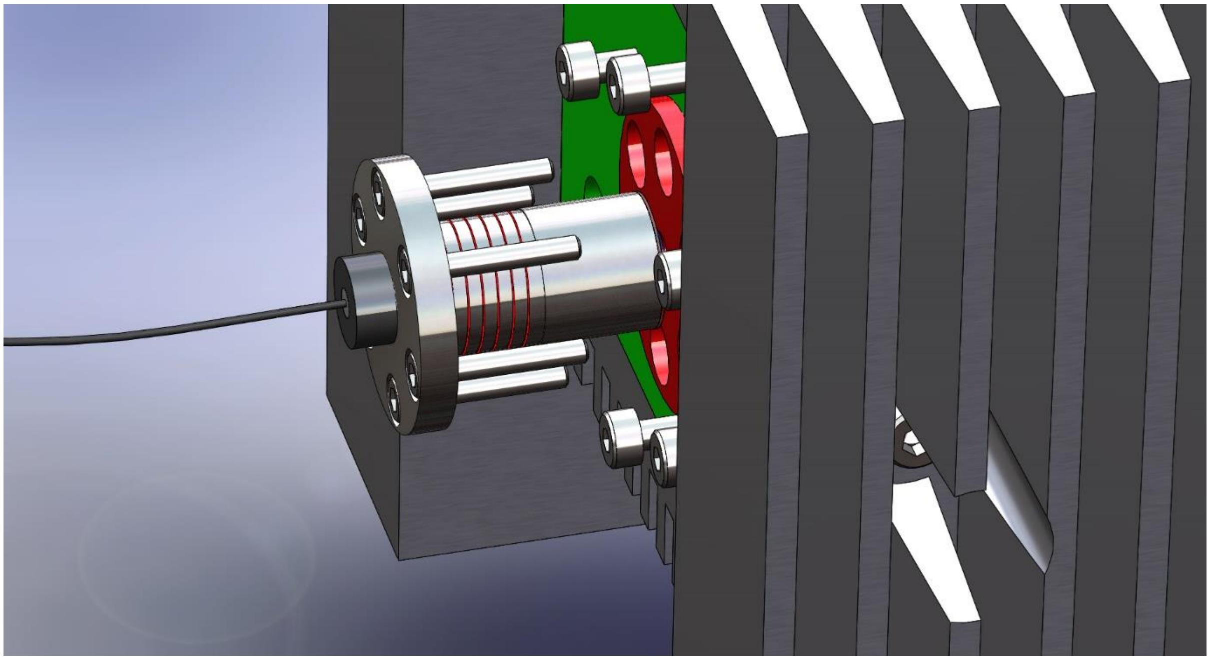

Рисунок 14, - *на рисунке показана трёхмерная модель стыковочного узла лазерного эндоскопа для установки и идентификации одноразового инструмента*

Такое совмещение функций повышает эффективность работы системы и существенно упрощает конструкцию узла, что в свою очередь снижает его стоимость и затраты на эксплуатацию и ремонт.

В свою очередь снижение издержек при повышении качества дают дополнительные гарантии для более уверенного маркетинга для нового продукта.

Конфиденциальность информации

Более подробно (в объёмах выходящих за пределы настоящей публикации и иллюстративных материалах к ней) вся необходимая информация может быть предоставлена при документально-юридическом формулировании намерений потенциального потребителя или партнёра, после подписания с ним договоров о конфиденциальности (по взаимно согласованной, приемлемой для обоих сторон юридической форме).

Для более полного представления о существующих физических основах выполнения операций кодирования и раскодирования оптических дисков применён магнито-резонансный метод, краткое описание которого приводится ниже.

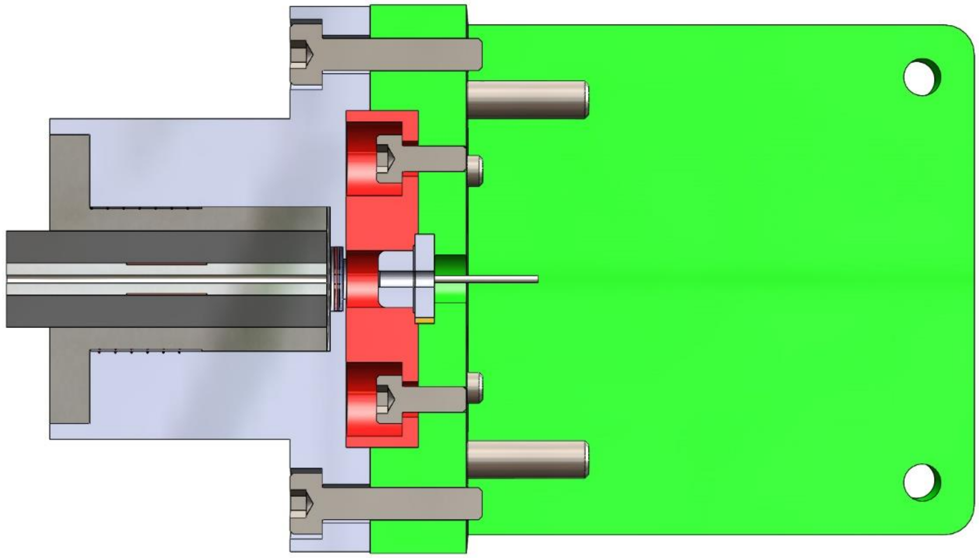

***Рисунок 15, -** на рисунке также показана трёхмерная модель стыковочного узла лазерного эндоскопа для установки и идентификации одноразового инструмента. Модель показана в осевом сечении, где видна система функционального взаимодействия между лазерным диодом и оптическим кабелем, как осью одноразового инструмента*

Система предельно проста для воспроизводства и эксплуатации

Краткое описание резонансного метода

Метод предусматривает создание переменного электромагнитного поля в пространстве, в котором располагается исследуемый образец. Это поле является посредником между резонансным контуром и испытуемым образцом.

С одной стороны, резонансный контур является эмиттером (излучателем) этого поля, а с другой – акцептором (чувствительным элементом), тех изменений в электромагнитном поле, которые вносит испытуемый образец.

Даже в отсутвии испытуемого образеца создаваемое соленоидом переменное электромагнитного поле является суммой двух электромагнитных полей, которые изменяются в противофазе друг другу.

Одно поле порождается изменением магнитной индукции соленоида и имеет своим следствием вихревое электрическое поле (Maxwell-Faraday equation). Другое – порождается изменением электрического поля, созданного разностью потенциалов между крайними наиболее удалёнными друг от друга витками соленоида (если образец помещён внутрь соленоида) или разностью потенциалов между ближайшим к поверхности измеряемого образца витком и самим образцом (если образец расположен напротив торца соленоида), и имеет своим следствием вихревое магнитное поле (Ampère's circuital law with Maxwell's correction).

Под воздействием внешнего переменного электромагнитного поля в испытуемом образце, в зависимости от его природы, могут индуцироваться такие электрические явления, как линейные и вихревые токи проводимости, линейные и вихревые токи смещения, а также линейные и вихревые ионные токи (упорядоченное движение ионов).

В соответствии с принципом суперпозиции полей эти электрические явления вносят искажения во внешнее переменное электромагнитное поле.

Эти искажения воспринимаются соленоидом резонансного датчика. Резонансный контур, в состав которого входит этот соленоид, изменяет своё поведение аналогично тому, как если бы в его состав были добавлены дополнительные элементы: конденсатор, индуктивность и резистор.

Совокупность дополнительных емкостного, индуктивного и активного сопротивлений представляет собой дополнительный импеданс, вносимый в систему испытуемым образцом, этот атрибут и измерят резонансный датчик.

Изменения параметров резонансного контура отражаются в изменении его ампдитудно-частотной характеристике, а именно, меняются резонансные частота и амплитуда контура.

Исследуя эти изменения, можно судить об импедансе исследуемого образца.

Принцип обработки данных, получаемых от резонансных датчиков

Резонансный датчик позволяет определить величину суммарного импеданса исследуемого образца на рабочей частоте этого датчика (см. «Краткое описание резонансного метода»).

Сама по себе эта величина мало информативна.

Но всё коренным образом меняется, если мы имеем набор датчиков с разными рабочими частотами.

В этом случае возникает возможность использовать уникальный природный феномен, наблюдаемый во всех типах веществ: неорганических, органических и биологических. Этот феномен заключается в том, что вещество меняет свой удельный импеданс в зависимости от частоты, воздействующего на него, электрического поля и это изменение зависит от состава исследуемого вещества.

Этот феномен исследует и активно использует быстроразвивающаяся в последнее время научное направление, называемое Магнитно-резонансная спектроскопия – impedance spectroscopy.

В англоязычных источниках её чаще называют Electrochemical Impedance Spectroscopy (EIS) (Электрохимическая Магнитно-резонансная спектроскопия – impedance spectroscopy).

Магнитно-резонансная спектроскопия – impedance spectroscopy – метод исследования различных объектов, основанный на измерении и анализе зависимостей импеданса от частоты переменного тока.

Разные объекты и процессы характеризуются разными зависимостями активного и реактивного импеданса от частоты, что делает возможным решение обратной задачи - получение информации об этих объектах и процессах путем анализа частотных характеристик их отклика на переменном токе.

Тот факт, что изменение импеданса при изменении частоты зависит от состава вещества, позволяет выявить изменения и влияние каждого компонента на суммарный импеданс вещества при различных частотах.

После определения весовых коэффициентов влияния соответствующих компонентов на суммарный импеданс вещества на каждой из рабочих частот резонансных датчиков, можно на основании показаний датчиков, решая систему линейных уравнений, получить информацию о концентрации исследуемых компонентов.

На точность этого метода огромное влияние имеет правильный выбор рабочих частот датчиков.

Путём сканирования в широком диапазоне частот необходимо определить наиболее характерные для каждого компонента области частот, то есть частоты, на которых компонент даёт наибольший отклик.

Традиционная импедансная спектроскопия в своих исследованиях использует источник переменного напряжения, который контактным способом воздействует на исследуемый образец, при этом в цепи возникает электрический ток, величина и сдвиг фазы которого, зависит от импеданса образца.

Результаты отображаются, как правило, в виде фигур Лиссажу или диаграмм Найквиста.

При таких исследованиях трудно добиться высокой чувствительности и точности измерений. Предлагаемая методика, в которой измерение импеданса производится с помощью резонансных контуров, обладает значительно более высокой чувствительностью и точностью, к тому же она бесконтактна.

Существуют определённые технические трудности создания колебательного контура с перенастраиваемой в широком диапазоне резонансной частотой, поэтому для поиска «характерных» для компонентов частот придётся использовать традиционную Магнитно-резонансную спектроскопию – impedance spectroscopy.

После того, как характерные частоты будут найдены и будет созданы резонансные датчики для этих частот, созданная на базе этих датчиков система мониторинга компонентов будет обладать исключительной чувствительностью и точностью.

Помехозащищённость

Такие «механические» параметры как ВЯЗКОСТЬ, ПЛОТНОСТЬ, ПРОЗРАЧНОСТЬ, ДАВЛЕНИЕ (если среда несжимаемая) не должны оказывать никакого влияния на измеряемые электрические параметры вещества.

СКОРОСТЬ ДВИЖЕНИЯ В ТРУБОПРОВОДЕ и ТУРБУЛЕНТНОСТЬ – эти явления слишком медленные, чтобы оказать влияние на «мегагерцовые» процессы измерения импеданса. ЖЁСТКОСТЬ – это химический показатель, который полностью определяется входящими в вещество компонентами.

Температура, как правило, оказывает влияние на величину импеданса, но измерение температуры и её учёт при измерении импеданса не представляется сложной технической задачей.

1. Принципиальные основы защитного кодирования оптических носителей или накопителей информации, преимущественно в виде диска, прозрачного для светового потока, исходящего из выходной оптической системы одномодового лазерного диода, имеющего стандартные исполнительные размеры, - наружный диаметр, - 120 миллиметров, и толщину, - в 1,2 миллиметра.

   Диск склеен из двух половин, каждая толщиной в 0,6 миллиметра; покрытие нанесено на одной из половин диска на кольце наружный диаметр которого, - 120 миллиметров, а внутренний диаметр которого, - 118 миллиметров; толщина покрытия варьируется в диапазоне от 1 микрона до 10 микрон с интервалом в 100 ангстрем.

   Такая точность полностью обеспечивается свойствами и параметрами технологии скоростных электрохимических покрытий и также в эксплуатации обеспечивает высокую точность идентификации, не допуская ошибок, связанных с неточностью измерений кода.

1.1. Концептуальные основы кодирования заключаются в следующем принципе: - кодирующий сигнал формируется из реакции сенсора или группы сенсоров на толщину кольцевого покрытия на диске, сравнения полученного сигнала с статистическим эталоном этого сигнала, - эквивалентом резонансной реакции сенсоров на толщину покрытия, удельные показатели материала покрытия, проводимости материала покрытия, плотности материала покрытия, электрического сопротивления материала покрытия.

1.2. В систему серво-маркировки отформатированного диска, которая, как правило имеет вид групповых сочетаний серво-точек на информационных треках диска, вместо одной из точек группового сочетания , вводят сигнал от декодирующего сенсора системы защитного кодирования, и, в случае совпадения интегрированного сигнала от трёх сенсоров с заданными параметрами сигнала, сервосистема дисковода начинает ориентировать фокус лазера на информационном треке, и, таким образом система начинает процесс чтения или записи на оптическом диске.

1.3. В случае несовпадения сигнала от сенсоров с статистической формой сигнала в памяти процессора дисковода, сервосистема дисковода не ориентирует и не стабилизирует траекторию фокуса луча лазерного диода на информационном треке диска и чтение или запись на диске становятся невозможными.

2. ВАРИАНТЫ ИДЕНТИФИКАЦИИ ДИСКА В ДИСКОВОДЕ:

2.1. Идентификация диска в дисководе может вестись при помощи измерения в режиме реального времени толщины покрытия, сравнения результатов измерения с хранящимся в процессоре дисковода статистическим значением этого параметра и выдачи сигнала на сравнивающее устройство в процессоре дисковода.

2.2. Процесс идентификации может вестись при вращении диска или при установке диска в дисковод.

2.3. При идентификации при установке диска в дисковод, отрицательные результаты идентификации не позволяют включение какой-либо структуры дисковода, и, наоборот положительный сигнал идентификации включает необходимые структуры дисковода.

2.4. Аналогичная логика и порядок работы имеют место и в системе кодирования и декодирования одноразового инструмента в различных приборах и технических системах любого уровня.

2.5. Такая конструктивная взаимосвязь значительно унифицирует все технологические переходы процесса идентификации, кодирования и декодирования, вне зависимости от конкретного вида и области применения продукта , а только в зависимости от конструктивных особенностей и характеристик специального узла для кодирования и декодирования.

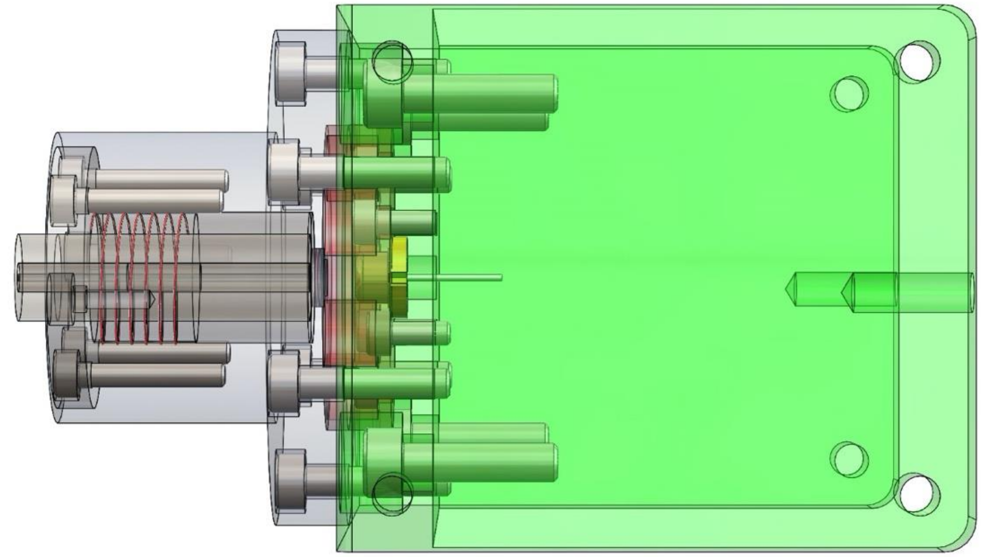

Рисунок 16, - *на рисунке также показана трёхмерная модель стыковочного узла лазерного эндоскопа для установки и идентификации одноразового инструмента. Модель показана в прозрачном варианте, вид сверху, где видна система функционального взаимодействия между лазерным диодом и оптическим кабелем, как осью одноразового инструмента. Просматривается и соленоид сенсора от сигнала которого осуществляется кодирование и декодирование одноразового инструмента*

3. КОНСТРУКТИВНЫЕ ВАРИАНТЫ ДИСКОВОДОВ:

3.1. Элементы защитной системы резонансного кодирования – декодирования могут без каких-либо конструктивных или схемных ограничений, быть встроены в любую существующую сегодня конструкцию дисковода, реализующую все известные технологии оптической памяти.

3.2. Существующие дисководы также могут быть модифицированы под монтаж системы микросенсоров, путём врезки сенсорного микромодуля в несущую конструкцию корпуса дисковода.

3.3. При необходимости покрытие может быть выполнено на уже существующих дисках.

4. ПРИМЕРНЫЙ ТЕХНОЛОГИЧЕСКИЙ МАРШРУТ ИЗГОТОВЛЕНИЯ ДИСКА С КОДИРУЮЩИМ ПОКРЫТИЕМ:

4.1. Для изготовления оптического диска с защитным кодирующим покрытием не требуется специальных технологий и оборудования.

4.2. Для изготовления может быть использовано модернизированное технологическое оборудование, которое используется в настоящее время.

4.3. Нанесение кодирующего покрытия можно совместить с изготовлением копии диска в прессформе с использованием мастер-диска с идентификационной точкой в отформатированной системе сервомаркировки, которые таким образом будут отпечатаны на каждом информационном треке, - а их в обычном оптическом диске более 37 000.

5. ВАРИАНТЫ ИСПОЛЬЗОВАНИЯ ДИСКОВ С ЗАЩИТНЫМ ПОКРЫТИЕМ В СИСТЕМАХ ОПТИЧЕСКОЙ ПАМЯТИ КОРПОРАТИВНЫХ КЛИЕНТОВ:

5.1. Примерная схема использования дисков с защитным кодированием-декодированием у корпоративных клиентов предусматривает изготовление для каждого такого клиента определённого количества дисков с присущими только для этого клиента параметрами толщины и координатами микро – сенсоров.

5.2. Конструкция и техническая характеристика сенсорного микромодуля также может быть модернизирована исходя из пожеланий клиента, но в соответствии с контрольными параметрами защитного кодирующего покрытия на дисках.

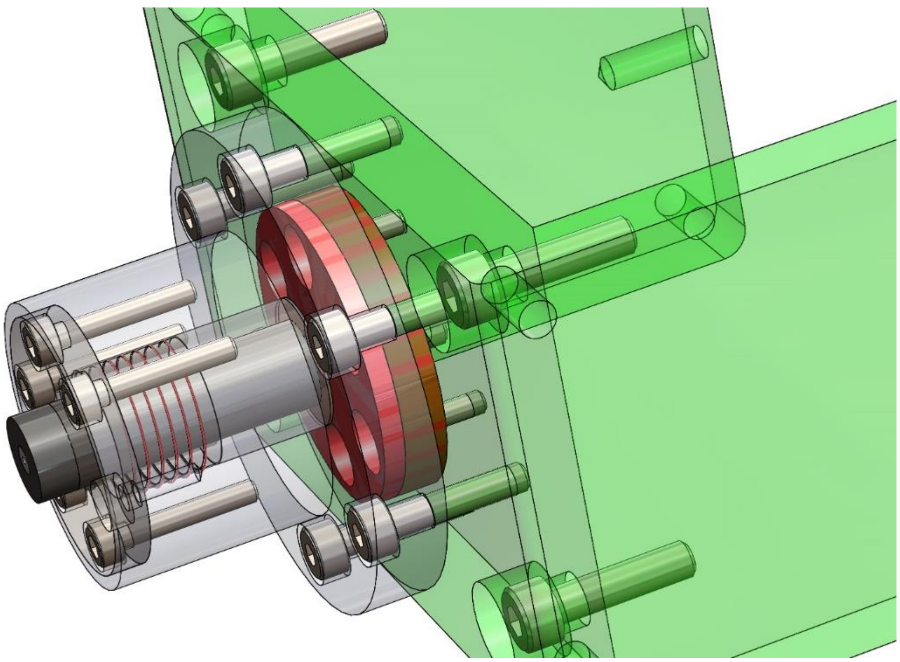

***Рисунок 17, -** на рисунке также показана трёхмерная модель стыковочного узла лазерного эндоскопа для установки и идентификации одноразового инструмента. Модель показана в прозрачном варианте, вид в изометрии, где видна система функционального взаимодействия между лазерным диодом и оптическим кабелем, как осью одноразового инструмента. Просматривается и соленоид сенсора от сигнала которого осуществляется кодирование и декодирование одноразового инструмента*

6. ВАРИАНТЫ ИСПОЛЬЗОВАНИЯ ДИСКОВ С ЗАЩИТНЫМ КОДИРОВАНИЕМ В СИСТЕМАХ БЫТОВОЙ РАДИОТЕХНИКИ:

6.1. Диски с защитным кодированием могут быть использованы в системах Blu-Ray и HD DVD.

Кроме этого, система защитного кодирования может быть применена в новых разработках и технологиях оптической цифровой памяти в том числе и дисках с особо высокой плотностью записи, многослойных дисках, монолитных оптических дисках с объёмом памяти в 1 и более терабайт.

6.2. При изготовлении дисков, необходимую индикацию в серво-маркировку, можно вносить в процессе прессования.

Сервопривод дисковода начинает ориентацию фокусной точки лазерного луча только при совпадении кодирующего сигнала от системы кодирования и декодирования, сформированного системой из трёх микро-сенсоров, которые при помощи методов магнитного резонанса, сравнивают толщину покрытия с эталоном и при совпадении параметров сигнала с эталоном хотя бы у двух сенсоров, добавляют полученный сигнал в систему символов и маркирующих точек серво-маркировки , считывая которые сервопривод дисковода начинает стабилизировать фокус лазера на необходимом треке на поле записи диска.

7. ВАРИАНТЫ ИСПОЛЬЗОВАНИЯ ДИСКОВ С ЗАЩИТНЫМ ПОКРЫТИЕМ В ПЕРСОНАЛЬНЫХ КОМПЬЮТЕРАХ:

7.1. Технология изготовления дисков для персональных компьютеров аналогична технологии изготовления такого рода дисков для других вариантов оптической памяти.

7.2. Методика использования дисков с защитным кодированием формируется исходя из типа компьютера, степени его насыщенности и мощности, быстродействия и т.п.

7.3. Особо важным становится возможность использования техники и технологии защитного кодирования в создаваемых гибридных дисках, сочетающих в себе жёсткий диск с оптическим диском.

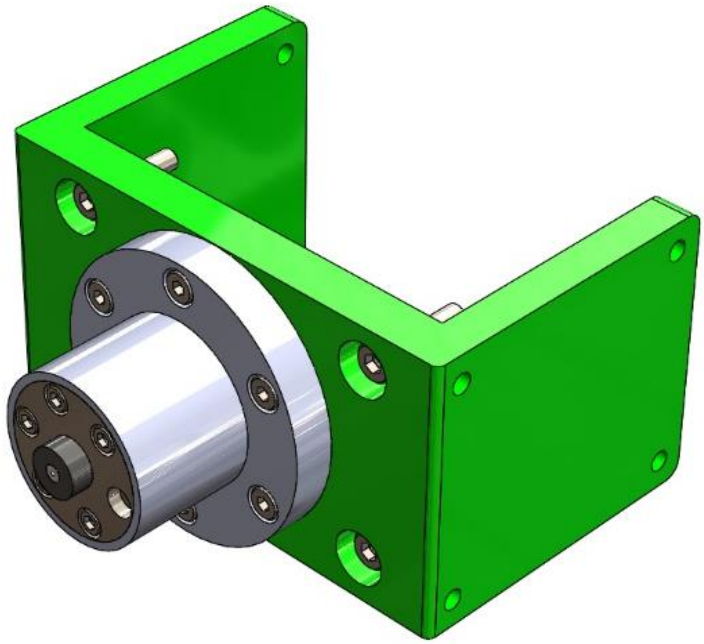

Рисунок 18, - *на рисунке показана трёхмерная модель корпуса штекерного разъёма пристыкованного к основной несущей лазерный диод детали (на рисунке обозначена зелёным цветом)*

Предложение по системе получения профессиональной информации из интернета

В качестве основного инструмента выступает оптический диск, на котором нанесено кодирующее покрытие в кольцевой зоне, в которой нет информационной записи.

В качестве вспомогательного инструмента выступает микросенсор, который встраивается в дисковод.

Сигнал от микросенсора формируется при измерении толщины покрытия; точность измерения, - 100 ангстрем и это величина на которую отличается каждая группа дисков от другой группы.

Сигнал от микросенсора является кодом для входа в массивы информации, размещённые в интернете.

Программное обеспечение должно давать возможность идентифицировать сигнал от микросенсора и в случае совпадения сигнала с эталонным открывать массивы информации и в процессе её скачивания продолжать контролировать достоверность сигнала до завершения процесса скачивания информации.

Это даёт возможность предотвратить замену диска во время записи на нелицензированный.

Подделать такой диск невозможно, так как толщина покрытия определяется при изготовлении и, даже имея такой диск, невозможно им воспользоваться, без микросенсора, настроенного на строго определённый характер сигнала.

Диски и сенсоры могут выпускаться на любом сегодня существующем производстве оптических дисков; диски могут выпускаться сериями по 100 – 250 штук с одинаковой толщиной кодирующей ленты и с комплектом сенсоров.

Каждый пользователь может приобрести одну или несколько серий дисков и использовать их при работе с интернетом.

По такому же принципу программы и другая информация могут рассылаться пользователям, только в обратном порядке, что гарантирует полную конфиденциальность и защиту при нахождении в интернете от несанкционированных посланий и вирусов.

Это конечно очень общая информация, если Вы читатели - сочтёте её заслуживающей внимания, то автор мог бы детализировать этот проект.

Ввиду того, что механическая часть этого проекта в принципе реализована, этот проект, — это программное обеспечение, что может быть станет основой проекта в этом направлении.

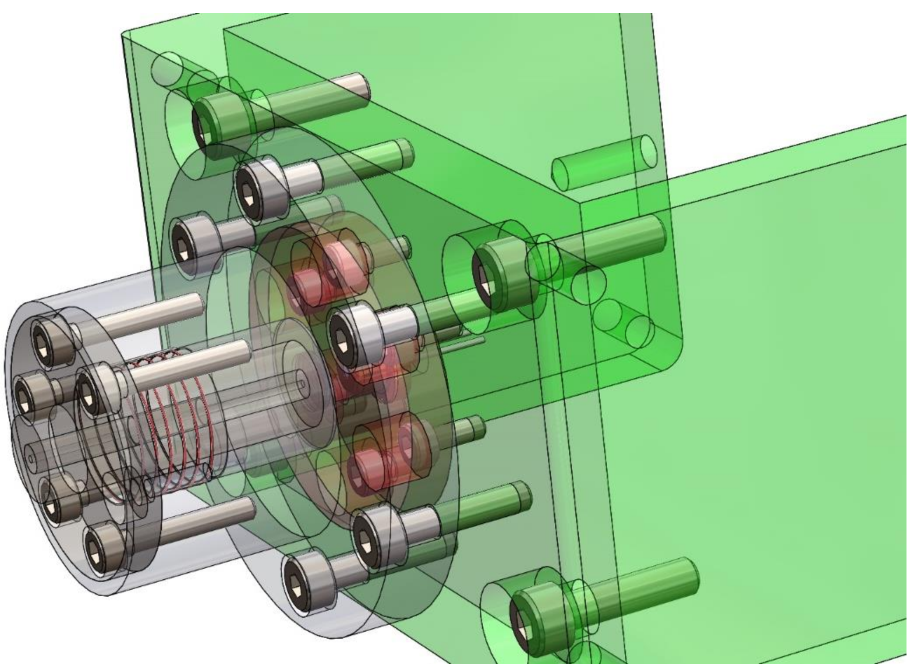

***Рисунок 19**, - на рисунке показан коаксиальный корпус штекерного разъёма с кодирующим и декодирующим устройством в виде коаксиально установленного соленоида, который совместно с импульсным генератором формирует кодирующий или декодирующий сигнал и после его прохождения сортирует и передаёт на аналитический блок резонансный сигнал*

Преимущества предложенной технологии, отвечающей на существо проблем, выявленных на рынке систем оптических носителей информации:

1. Имеется множество вариантов толщин кодирующих покрытий, которые позволяют иметь множество вариантов защитного кода, в отличие от известных технологий, которые имеют только один вариант кода.

2. В процессе нанесения покрытия применяется технология контроля полностью идентичная технологии декодирования, что позволяет полностью контролировать качество кодирования в процессе изготовления диска, без удаления диска с конвейера, в отличие от существующих технологий, в которых диск для контроля необходимо удалять с конвейера и устанавливать в контрольное приспособление.

   Таким образом контроль выборочный, а в предложенной технологии , - 100% контроль, что исключает выпуск бракованных дисков, которые в существующих технологиях обнаруживаются только во время эксплуатации.

3. В предложенной технологии имеется возможность кодирования всех категорий и типов дисков вне зависимости от формата записи и чтения, в отличие от существующих технологий, в которых кодирование зависит от формата записи и чтения диска.

4. В предложенной технологии кодирующее покрытие может служить основанием для персонального секретного кода или шифра, чего нет в существующих технологиях.

5. В предложенной технологии сенсор декодирования и идентификации является мобильным и может иметь несколько вариантов поставки, в том числе и автономный вариант, не связанный с дисководом, а в существующих технологиях система декодирования устанавливается только в дисководах; таким образом контролировать наличие и правильность кодирования можно только в процессе установки диска в дисковод, а в предложенной технологии контролировать и идентифицировать код можно вне дисковода, например в магазинах или на проходных предприятий и учреждений, что особенно важно для обеспечения полного режима конфиденциальности информации.

6. В предложенной технологии декодирование исключает какую либо зависимость от оптических систем дисковода, но результаты декодирования могут изменить работу

оптических систем, например серво – привода для ориентации и контроля положения фокуса читающего или записывающего лазера, в отличие от существующих технологий, в которых процесс декодирования полностью зависит от оптических элементов дисковода, что усложняет его конструкцию и резко снижает надёжность.

7. Предложенная технология имеет несколько иерархий принципиальной рабочей схемы, имеет гибкий алгоритм и может быть встроена в любую охранную систему оптической памяти в том числе и в гибридные носители информации, имеющие кроме оптического компонента и носители , построенные на других базовых принципах; существующие технологии не обладают указанной гибкостью.

8. Предложенная технология позволяет использовать код диска как вводный пароль для входа в профессиональные массивы информации интернета, чем не обладают существующие технологии.

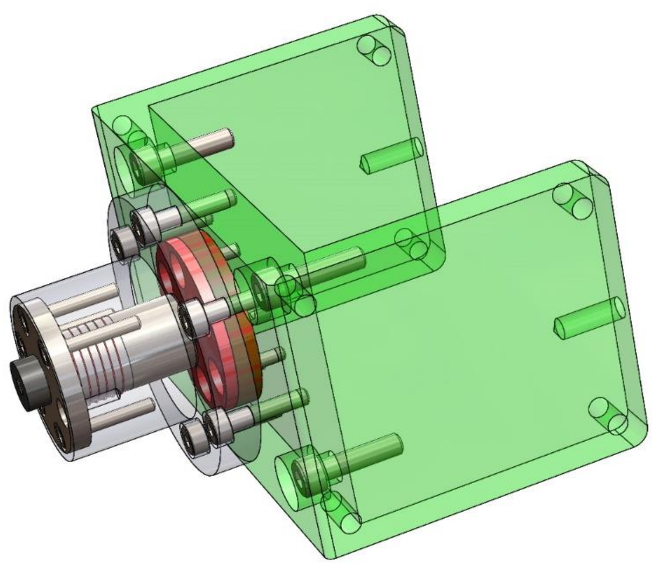

Рисунок 20, *- на рисунке показан модуль лазерного диода с кодирующей и декодирующей втулкой , содержащей сенсор-соленоид, расположенный коаксиально к штекеру одноразового инструмента, причём штекер выполнен в виде втулки, толщина стенки которой является ключом к шифрующему коду, который идентифицируют при помощи резонансной спектроскопии*

Технологическое и конструктивное решение такого интегративного сенсора, позволяет его встраивание в практически любую техническую систему, где подсоединение, например одноразового инструмента, ведётся при помощи штекерного разъёма.

По результатам комплексного анализа с применением алгоритмов патентной и лицензионной стратегии, предварительно разрабатывается следующая общая стратегия маркетинга.

Предварительное определение базового продукта проекта и его функциональных и эксплуатационных особенностей и характеристик:

1. Основной сектор рынка, - корпоративные клиенты:

   - Банки и финансовые компании;
   - Промышленные корпорации;
   - Научно – исследовательские лаборатории;
   - Транспортные компании, вокзалы, аэропорты и морские порты;
   - Крупные торговые сети;
   - Муниципальные службы;
   - Правительственные организации и учреждения;
   - Крупные медицинские учреждения;
   - Страховые компании;
   - Рода войск вооружённых сил;
   - Полиция и спецслужбы.

2. Характеристика продукта (как пример):

   - Продукт проекта (основной), – оптический диск с кодирующим кольцом и дисковод с встроенным сенсорным модулем, как правило состоящим из трёх микросенсоров;
   - В случае необходимости сенсорный модуль может поставляться без дисковода;
   - В случае необходимости компания, ведущая проект, может предоставлять услуги для корпоративных клиентов, организовывая ввод в действие системы кодирования и защиты информации, - под ключ;

СПИСОК ИСПОЛЬЗОВАННОЙ ЛИТЕРАТУРЫ, ПАТЕНТНОЙ И ЛИЦЕНЗИОННОЙ ИНФОРМАЦИИ

ПРИЛОЖЕНИЕ 1

United States Patent Application	**20190281321**
Kind Code	**A1**
ZHAO; Xin ; et al.	**September 12, 2019**

METHOD AND APPARATUS FOR VIDEO CODING

Abstract

Aspects of the disclosure provide method and apparatus for video ***coding***. In some examples, an apparatus includes processing circuitry. The processing circuitry determines an intra prediction mode for generating a prediction image of a current block, determines one or more primary transforms according to signaling information that is extracted from a coded video bitstream, and determines a secondary transform according to the determined intra prediction mode and the determined one or more primary transforms. The processing circuitry also reconstructs a residue image of the current block based on one or more coefficients of an input block extracted from the coded video bitstream, the determined one or more primary transforms, and the determined secondary transform. The processing circuitry then reconstructs an image of the current block based on the prediction image and the residue image of the current block.

ПРИЛОЖЕНИЕ 2

United States Patent Application	**20190281270**
Kind Code	**A1**
CHEN; Ying ; et al.	**September 12, 2019**

SHARING OF MOTION VECTOR IN 3D VIDEO CODING

Abstract

Joint ***coding*** of depth map video and texture video is provided, where a motion vector for a texture video is predicted from a respective motion vector of a depth map video or vice versa. For scalable video ***coding,*** depth map video is coded as a base layer and texture video is coded as an enhancement layer(s). Inter-layer motion prediction predicts motion in texture video from motion in depth map video. With more than one view in a bitstream (for multiview ***coding***), depth map videos are considered monochromatic camera views and are predicted from each other. If joint multiview video model ***coding*** tools are allowed, inter-view motion skip is used to predict motion vectors of texture images from depth map images. Furthermore, scalable multiview ***coding*** is utilized, where inter-view prediction is applied between views in the same dependency layer, and inter-layer (motion) prediction is applied between layers in the same view.

ПРИЛОЖЕНИЕ 3

United States Patent Application	**20190273948**
Kind Code	**A1**
Yin; Hujun ; et al.	**September 5, 2019**

METHOD AND SYSTEM OF NEURAL NETWORK LOOP FILTERING FOR VIDEO CODING

Abstract

A method, system, medium, and article provide neural network loop filtering for video ***coding*** with multiple alternative neural networks.

ПРИЛОЖЕНИЕ 4

United States Patent Application	**20190273932**
Kind Code	**A1**
HAQUE; MUNSI ; et al.	**September 5, 2019**

VIDEO CODING SYSTEM WITH TEMPORAL SCALABILITY AND METHOD OF OPERATION THEREOF

Abstract

A method of operation of a video ***coding*** system includes: receiving a video bitstream; extracting a video syntax from the video bitstream; extracting a hypothetical reference decoder (HRD) fixed syntax from the video syntax; extracting a HRD variable syntax from the video syntax; extracting a temporal layer from the video bitstream based on the HRD fixed syntax and the HRD variable syntax; and forming a video stream based on the temporal layer for displaying on a device.

ПРИЛОЖЕНИЕ 5

United States Patent Application	**20190268098**
Kind Code	**A1**
CHUN; Jinyoung ; et al.	**August 29, 2019**

DATA TRANSMISSION METHOD IN WIRELESS COMMUNICATION SYSTEM AND DEVICE THEREFOR

Abstract

A downlink (DL) multi-user (MU) transmission method in a wireless local area network (WLAN) system, the DL MU transmission method including receiving a DL MU physical protocol data unit (PPDU) including a physical preamble and a data field from STA (Station) and transmitting the ACK frames in response to the DL MU PPDU to STA. In addition, the data field includes at least one medium access control (MAC) protocol data unit (MPDU), the

at least one MPDU includes a MAC header and a MAC frame body, wherein the MAC header includes acknowledge (ACK) indication information, the ACK indication information includes frequency resource allocation information for an uplink (UL) MU orthogonal frequency division multiple access (OFDMA) transmission of ACK frames and modulation and ***coding*** scheme (MCS) level information, and the frequency resource allocation information includes an index value indicating a resource unit allocated for the UL MU OFDMA transmission of the ACK frames, and the resource unit corresponds to a 26-tone resource unit, a 52-tone resource unit, a 106-tone resource unit, a 242-tone resource unit, a 484-tone resource unit, or a 996-tone resource unit.

ПРИЛОЖЕНИЕ 6

United States Patent Application	**20190268016**
Kind Code	**A1**
JANSSON TOFTG RD; Tomas ; et al.	**August 29, 2019**

METHODS AND DEVICES FOR VECTOR SEGMENTATION FOR CODING

Abstract

A method for partitioning of input vectors for ***coding*** is presented. The method comprises obtaining of an input vector. The input vector is segmented, in a non-recursive manner, into an integer number, N.sup.SEG, of input vector segments. A representation of a respective relative energy difference between parts of the input vector on each side of each boundary between the input vector segments is determined, in a recursive manner. The input vector segments and the representations of the relative energy differences are provided for individual ***coding***. Partitioning units and computer programs for partitioning of input vectors for ***coding,*** as well as positional encoders, are presented.

ПРИЛОЖЕНИЕ 7

United States Patent Application	**20190261010**
Kind Code	**A1**
Luo; Ning ; et al.	**August 22, 2019**

METHOD AND SYSTEM OF VIDEO CODING WITH REDUCED SUPPORTING DATA SIDEBAND BUFFER USAGE

Abstract

Methods, systems, and articles of video ***coding*** with reduced supporting data sideband buffer usage.

ПРИЛОЖЕНИЕ 8

United States Patent Application	**20190253706**
Kind Code	**A1**
ZHAO; Liang ; et al.	**August 15, 2019**

METHOD AND APPARATUS FOR USING AN INTRA PREDICTION CODING TOOL FOR INTRA PREDICTION OF NON-SQUARE BLOCKS IN VIDEO COMPRESSION

Abstract

A method for video decoding includes determining whether an angular intra prediction mode for a current block is a wide angle mode that is spaced apart from a vertical mode and a horizontal mode by an angular distance that is more than a predetermined threshold. The method further includes, in response to the determination that the angular intra prediction mode is the wide angle mode, determining a non-wide angle mode that corresponds to the wide angle mode, the non-wide angle mode being spaced apart from the vertical mode or the horizontal mode by an angular distance that is less than or equal to the predetermined threshold. The method includes determining whether a ***coding*** tool is specified for the determined corresponding non-wide angle mode, and, in response to the determination that the ***coding*** tool is specified for the determined corresponding non-wide angle mode, using the ***coding*** tool in a decoding process.

ПРИЛОЖЕНИЕ 9

United States Patent Application	**20190181979**
Kind Code	**A1**
Wang; Ying ; et al.	**June 13, 2019**

ADJUSTED FRACTALLY ENHANCED KERNEL POLAR CODES FOR ACHIEVABLE SIGNAL-TO-NOISE RATIO SPIKE MITIGATION

Abstract

Methods, systems, and devices for wireless communications are described. In some systems, wireless devices may implement adjusted fractally enhanced kernel polar ***coding***. An encoder may receive a number of information bits and a block size for transmission, and may append an additional number of information bits to the information bits for transmission. The encoder may perform a recursive bit allocation process to allocate the aggregate set of information bits between a set of sub-blocks based on mutual information metrics. To obtain the correct number of information bits and block size, the encoder may remove a number of information bits equal to the number of appended additional bits (e.g., from a first half of the sub-blocks), assign the remaining information bits to bit channels in each sub-block, and block puncture a set of bits

(e.g., from the first half). The resulting codeword may mitigate occurrences of achievable signal-to-noise ratio (SNR) spikes.

ПРИЛОЖЕНИЕ 10

United States Patent Application	**20190182503**
Kind Code	**A1**
Tsai; Yi-Ting ; et al.	**June 13, 2019**

METHOD AND IMAGE PROCESSING APPARATUS FOR VIDEO CODING

Abstract

A method and an image processing apparatus for video ***coding*** are proposed. The method is applicable to an image processing apparatus and includes the following steps. A current ***coding*** unit is received, and the number of control points of a current ***coding*** unit is set, where the number of control points is greater than or equal to 3. At least one affine model is generated based on the number of control points, and an affine motion vector corresponding to each of the at least one affine model is computed. A motion vector predictor of the current ***coding*** unit is computed based on the at least one motion vector so as to accordingly perform inter-prediction ***coding*** on the current ***coding*** unit.

ПРИЛОЖЕНИЕ 11

United States Patent Application	**20190190578**
Kind Code	**A1**
Mittal; Udar ; et al.	**June 20, 2019**

CODING MAIN BEAM INFORMATION IN CSI CODEBOOK

Abstract

Apparatuses, methods, and systems are disclosed for preparing a channel state information ("CSI") codeword. One apparatus includes a processor and a transceiver configured to communicate 805 with a transmit-receive point ("TRP") over a radio access network using spatial multiplexing, wherein multiple transmission layers are transmitted at a time, each transmission layer comprising multiple beams. The processor identifies a main beam for each of the multiple transmission layers and determines whether the main beams of each transmission layer are the same. The processor prepares a CSI codeword, wherein the CSI codeword comprises a first bit indicating whether the main beams of each transmission layer are the same, a first set of bits ***coding*** the main beams, and a second set of bits ***coding*** the remaining beams. The transceiver transmits the CSI codeword to the TRP.

ПРИЛОЖЕНИЕ 12

United States Patent Application	**20190200025**
Kind Code	**A1**
Li; Bin ; et al.	**June 27, 2019**

CODED-BLOCK-FLAG CODING AND DERIVATION

Abstract

Techniques for ***coding*** and deriving (e.g., determining) one or more coded-block-flags associated with video content are described herein. A coded-block-flag of a last node may be determined when coded-block-flags of preceding nodes are determined to be a particular value and when a predetermined condition is satisfied. In some instances, the predetermined condition may be satisfied when log.sub.2(size of current transform unit) is less than log.sub.2 (size of maximum transform unit) or log.sub.2(size of current ***coding*** unit) is less than or equal to log.sub.2(size of maximum transform unit)+1. The preceding nodes may be nodes that precede the last node on a particular level in a residual tree.

ПРИЛОЖЕНИЕ 13

United States Patent Application	**20190222863**
Kind Code	**A1**
HANNUKSELA; Miska Matias ; et al.	**July 18, 2019**

VIDEO CODING AND DECODING

Abstract

There is disclosed a method, an apparatus, a server, a client and a non-transitory computer readable medium comprising a computer program stored therein for multi view video ***coding*** and decoding. View random access (VRA) pictures or access units are coded into a multiview bitstream. VRA pictures enable starting the decoding of a subset of the views present in the bitstream. The views selected to be accessible in VRA pictures are alternated in successive VRA pictures so that all views are gradually reconstructed when two or more VRA pictures have been decoded.

ПРИЛОЖЕНИЕ 14

United States Patent Application	**20190200026**
Kind Code	**A1**
LAINEMA; Jani ; et al.	**June 27, 2019**

APPARATUS, A METHOD AND A COMPUTER PROGRAM FOR VIDEO CODING

Abstract

There is disclosed an apparatus, a method and a computer program for video ***coding***. The apparatus comprises a selector configured for selecting a pixel for prediction; a projection definer configured for determining a projection of said pixel to a set of reference pixels; and a prediction definer configured for selecting one or more reference pixels from said set of reference pixels on the basis of said projection, and using said selected one or more reference pixels to obtain a prediction value for said pixel to be predicted.

ПРИЛОЖЕНИЕ 15

United States Patent Application	**20190208222**
Kind Code	**A1**
UGUR; Kemal ; et al.	**July 4, 2019**

APPARATUS, A METHOD AND A COMPUTER PROGRAM FOR VIDEO CODING AND DECODING

Abstract

There are disclosed various methods, apparatuses and computer program products for video ***encoding*** and decoding. In other embodiments, there is provided a method, an apparatus, a computer readable storage medium stored with code thereon for use by an apparatus, and a video encoder, for ***encoding*** a scalable bitstream, to provide indicating an ***encoding*** configuration, where only samples and syntax from intra coded pictures of base layer is used for ***coding*** the enhancement layer pictures. In other embodiments, there is provided an apparatus, a computer readable storage medium stored with code thereon for use by an apparatus, and a video decoder, for decoding a scalable bitstream, to receive indications of an ***encoding*** configuration, where only samples and syntax from intra coded pictures of base layer is used for ***coding*** the enhancement

ПРИЛОЖЕНИЕ 16

United States Patent Application	**20190222859**
Kind Code	**A1**
CHUANG; Tzu-Der ; et al.	**July 18, 2019**

METHOD AND APPARATUS OF CURRENT PICTURE REFERENCING FOR VIDEO CODING

Abstract

A method and apparatus for a video ***coding*** system with the current picture referencing (CPR) mode enabled are disclosed. According to one method, the luma and chroma blocks of the current image are jointly coded using a same ***coding*** unit (CU) structure if the CPR mode is selected for the luma and the chroma blocks. Alternatively, if the luma and chroma components are partitioned into the luma and the chroma blocks separately using separate CU structures, the luma and chroma blocks are encoded or decoded using a ***coding*** mode selected from a ***coding*** mode group excluding the CPR mode. According to another method, the luma and chroma blocks of the current image are coded separately using a different CU structure if the CPR mode is selected for the luma and chroma blocks. In yet another method, reconstructed reference data is disclosed for the CPR mode with CU equal to PU.

ПРИЛОЖЕНИЕ 17

United States Patent Application	**20190230365**
Kind Code	**A1**
Tanner; Jason ; et al.	**July 25, 2019**

VIDEO CLUSTER ***ENCODING*** FOR MULTIPLE RESOLUTIONS AND BITRATES WITH PERFORMANCE AND QUALITY ENHANCEMENTS

Abstract

Techniques related to video cluster ***encoding*** are discussed. Such techniques include ***encoding*** the video at a first resolution and first bitrate, translating block based ***coding*** parameters corresponding thereto to block based encode controls for encode of the same video at a second resolution or a second bitrate, and ***encoding*** the video at the second resolution and/or bitrate using the encode controls.

ПРИЛОЖЕНИЕ 18

United States Patent Application	**20190246126**
Kind Code	**A1**
Abbas; Adeel ; et al.	**August 8, 2019**

APPARATUS AND METHODS FOR VIDEO COMPRESSION USING MULTI-RESOLUTION SCALABLE CODING

Abstract

Apparatus and methods for digital video data compression via a scalable, multi-resolution approach. In one embodiment, the video content may be encoded using a multi-resolution and/or multi-quality scalable ***coding*** approach that reduces computational and/or energy load on a client device. In one implementation, a low fidelity image is obtained based on a first full resolution image. The low fidelity image may be encoded to obtain a low fidelity bitstream. A second full resolution image may be obtained based on the low fidelity bitstream. A portion of a difference image obtained based on the second full resolution image and the first full resolution may be encoded to obtain a high fidelity bitstream. The low fidelity bitstream and the high fidelity bitstream may be provided to e.g., a receiving device.

ПРИЛОЖЕНИЕ 19

United States Patent Application	**20190246118**
Kind Code	**A1**
YE; Jing ; et al.	**August 8, 2019**

METHOD AND APPARATUS FOR VIDEO CODING IN MERGE MODE

Abstract

A method for video ***coding*** using a merge mode by a decoder or encoder. An embodiment of the method includes receiving a current block having a block size, setting a grid pattern based on the block size of the current block, wherein the grid pattern partitions a search region adjacent to the current block into search blocks, and a size of the search blocks is determined according to the block size of the current block, and searching for one or more spatial merge candidates from candidate positions in the search blocks to construct a candidate list that includes the one or more spatial merge candidates.

ПРИЛОЖЕНИЕ 20

United States Patent Application	**20190034583**
Kind Code	**A1**
Kartalov; Emil P. ; et al.	**January 31, 2019**

SIGNAL ***ENCODING*** AND DECODING IN MULTIPLEXED BIOCHEMICAL ASSAYS

Abstract

This disclosure provides methods, systems, compositions, and kits for the multiplexed detection of a plurality of analytes in a sample. In some examples, this disclosure provides methods, systems, compositions, and kits wherein multiple analytes may be detected in a single sample volume by acquiring a cumulative measurement or measurements of at least one quantifiable component of a signal. In some cases, additional components of a signal, or

additional signals (or components thereof) are also quantified. Each signal or component of a signal may be used to construct a ***coding*** scheme which can then be used to determine the presence or absence of any analyte.

ПРИЛОЖЕНИЕ 21

United States Patent Application	**20170236521**
Kind Code	**A1**
Chebiyyam; Venkata Subrahmanyam Chandra Sekhar ; et al.	**August 17, 2017**

ENCODING OF MULTIPLE AUDIO SIGNALS

Abstract

A device includes an encoder and a transmitter. The encoder is configured to determine a mismatch value indicative of an amount of temporal mismatch between a reference channel and a target channel. The encoder is also configured to determine whether to perform a first temporal-shift operation on the target channel at least based on the mismatch value and a ***coding*** mode to generate an adjusted target channel. The encoder is further configured to perform a first transform operation on the reference channel to generate a frequency-domain reference channel and perform a second transform operation on the adjusted target channel to generate a frequency-domain adjusted target channel. The encoder is also configured to estimate one or more stereo cues based on the frequency-domain reference channel and the frequency-domain adjusted target channel. The transmitter is configured to transmit the one or more stereo cues to a receiver.

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PATENT PROTECTION OF INTEGRATIVE TECHNICAL SYSTEM – containing subsystems interconnected by elements of artificial intelligence and artificial neural networks. The use of analytical and algorithmic tools in the preparation of applications for the issuance of patent documents in the United States

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Abstract

The integration of software solutions and mobile applications into innovative technical systems of all levels in the current process of transforming classical technologies into smart technologies and transforming the entire hierarchy of technical systems and their interconnections into smart technical systems is the basis for the formation of such innovative products that are most in demand on the markets.
As the practice of such innovative development shows, the use of methods and techniques of the inventive process adapted to today's elemental base and modern composite materials from generating an idea to the complete formation of materials for an application for an invention can be successfully carried out with the well-known Theory and Algorithm for solving inventive problems.
Of particular importance in the innovation process are relations with investors and potential strategic partners in the commercial application of the created innovative product.

Keywords: Patent, Licensing, Artificial intelligence, AI, Neural networks, Smart technology, Business, USA

Интеграция программных решений и мобильных приложений в инновационные технические системы всех уровней в сегодняшнем процессе превращения классических технологий в умные технологии и трансформации всей иерархии технических систем и их взаимосвязей в умные технические системы, является основой для формирования именно таких наиболее востребованных на рынках инновационных продуктов.
Как показывает практика такого инновационного развития, использование адаптированных под сегодняшнюю элементную базу и современные композитные материалы методов и приёмов изобретательского процесса от генерирования идеи до полного формирования материалов заявки на изобретение могут успешно вестись с известными Теорией и Алгоритмом решения изобретательских задач.

Применение ТРИЗ и АРИЗ конечно является только одним из многих возможных аналитических инструментов при составлении заявки на выдачу патента.

Особое значение в инновационном процессе имеют отношения с инвесторами и потенциальными стратегическими партнёрами в деле коммерческого применения создаваемого инновационного продукта.

Для того, чтобы убедить инвестора в том, что вложения в предлагаемый проект принесут ему финансовый успех, необходимо детально изложить его экспертам суть проекта и раскрыть все технологические и инновационные секреты.

Сделать это невозможно без серьёзной защиты технических решений, положенных в основу инновационного продукта на всех этапах развития проекта.

Сейчас появились и успешно развиваются нетрадиционные виды и формы коллективного инвестирования и это также заставляет авторов проектов постоянно искать всё более и более надёжные формы защиты своих разработок.

Предварительная патентная заявка – Provisional Patent Applications, является и недорогим и надёжным вариантом защиты на период до 1 года.

Применение ТРИЗ и АРИЗ, как уже было сказано выше, при необходимом и достаточном обновлении основных приёмов и методов, является только одним из многих возможных инструментов при составлении заявки на выдачу патента и во многих случаях требует системной модификации и оптимизации с учётом новых инновационных обстоятельств.

Компанией заявителем или индивидуальным изобретателем, для каждого конкретного случая, с учётом всех обстоятельств, причин, целей и условий, с учётом результатов патентного прогнозирования, в полном соответствии с действующим патентным законодательством США (America Invents Act), может быть, а чаще всего необходима интегративная программа, в которой предельно точно разработана оригинальная система и структура заявки на выдачу патента.

Патентно-лицензионная стратегия, частью которой является последовательный процесс патентного прогнозирования, также может быть, а чаще всего – должна быть разработана для каждого конкретного заявителя или изобретателя.

Настоящая инструкция также полностью подходит и для составления заявочных материалов на подачу (Non Provisional Patent Application…, – Utility Patent Application).

APPARATUS AND METHOD FOR …

Название предполагаемого изобретения должно содержать не только краткое определение характера технического решения, но и предельно краткую коммерческую характеристику его влияния на рынок в пределах области использования предлагаемого технического решения. Название не должно содержать никаких рекламных характеристик…, – типа эффективный, наилучший и т.п.

Очень важно в названии изобретения учесть конъюнктуру рынка, существующую на момент подачи заявки. В случае, если в цели авторов и (или их компаний и финансовых партнёров) и заявителей входит в дальнейшем привлечение дополнительных инвестиций в развитие проекта, базой которого должно явиться заявляемое техническое решение, желательно учесть в названии известные технологические и коммерческие интересы потенциальных партнёров.

Так как для патентного эксперта в США очень существенное значение имеет доказательство неочевидности заявляемого технического решения, то предельно важно учесть критерии и характеризацию неочевидности в названии изобретения.

Технические системы, относящиеся к так называемым умным технологиям и оборудованию, как правило должны включать программную часть, которая сама по себе техническим решением не является и не может классифицироваться как техническая система.

Но так как программные решения являются основой систем управления и контроля любой современной умной технологии, то и в названии изобретения это должно быть учтено, то есть название изобретения должно быть представлено в виде: - Устройство, программа, система и метод; или - Аппарат, программа, система и метод.

Кроме того, при классификации технической системы, как умной системы, имеющей элементы искусственного интеллекта и искусственных нейронных сетей, необходимо иметь также накопители информации с соответствующим объёмом информации и соответствующим быстродействием.

Этот фактор должен быть отражён в названии, например…, – Аппарат, программа, система с накопителями памяти, и ассоциированный метод пользования.

REFERENCE TO RELATED APPLICATIONS

[0001] This application claims the priority benefit under 35 U.S.C. §119(e) of U.S. Provisional Application Nos. 61/, filed…; and 61/, filed… The entire disclosures of each of these applications are incorporated herein by reference…, – в этом разделе публикуется информация о всех предварительных патентных заявках, которые были поданы авторами изобретения или заявителем до момента оформления и подачи настоящей заявки.

В случае, если предварительные патентные заявки в США (Provisional Patent Applications) не подавались, то в этом разделе заявки приводится информация о всех предыдущих заявках по этой тематике и этому технологическому направлению, которые были поданы авторами изобретения или заявителем (от авторов настоящей заявки или от имени других авторов) до момента оформления и подачи настоящей заявки.

TECHNICAL FIELD

[0002] The invention relates to apparatus and methods for…, – в этом разделе приводят описание области техники и технологии к которым относится заявляемое техническое решение. Характер принадлежности к той или другой областям технологии должен быть предельно понятно аргументирован и связан с отличительными признаками заявляемого технического решения причинно-следственными связями, охарактеризованными и сформулированными понятными для средней квалификации специалиста в этой области. Если отличительные признаки заявляемого технического решения являются очевидными для одной области и неочевидными для другой, то необходимо остановиться на этом и постараться дать аналитическое объяснение этому явлению.

Особенно важно охарактеризовать проблемы и противоречия характерные и очевидные для выбранного для изобретения технологического поля и в развитие этого тезиса для области техники и технологии, к которым относится заявляемое техническое решение.

В связи с тем, что в отличие от Европейского патентного агентства, в США при выполнении определённых условий, патент может быть выдан и на компьютерную программу, если это возможно, желательно иметь интеграционное решение по заявляемому техническому решению по типу…, – Программа, система, метод и устройство для их применения.

DESCRIPTION OF THE RELATED TECHNOLOGY

[0003] – этот раздел состоит из двух частей. В первой части даётся более специфицированная, конкретная, локальная аналитическая оценка области техники и технологии, к которой относится заявляемое техническое решение. Даётся описание наиболее характерных особенностей технологии, её известных недостатков и преимуществ.

[0004] – в этой части раздела желательно начать поиск и предварительный анализ противоречий общего характера, которые являются общеизвестными и характерными для технологии к которым авторы изобретения его относят.

BACKGROUND OF THE INVENTION

[**0005]** – в этом разделе, который является одним из самых важных в заявке, даётся глубокий анализ результатов патентного поиска по всем вариантам и источникам опубликованной патентной информации, как минимум по Патентному ведомству США, лучше, если и по Европейскому патентному ведомству, и ещё лучше если привести сравнительный анализ известных технических решений и в завершение привести результаты структурного поэлементного анализа.

Необходимо после этого, используя инструменты ТРИЗ и АРИЗ провести поиск, формулировку и сравнительный анализ всех видов противоречий в известных технических решениях и определить и охарактеризовать возможный идеальный конечный результат.

После этого проанализировать возможность в заявляемом техническом решении принципиального достижения идеального конечного результата при использовании техники, технологии, материалов и средств контроля и управления, известных по состоянию на момент подачи заявки.

SUMMARY

[0006] According to some embodiments of the invention…, – в этом разделе даётся определение первой локальной конечной цели изобретения и даётся определение пути её достижения в рамках соответствия пунктам формулы изобретения; приводится идентификация поставленной локальной цели и определяется достаточно ли достичь поставленную цель, что бы констатировать достижение по крайней мере частичного или локального идеального конечного результата.

[0007] In some embodiments, programs, systems and methods of…, – в этом разделе даётся определение второй локальной конечной цели изобретения и даётся определение пути её достижения в рамках соответствия пунктам формулы изобретения; приводится идентификация поставленной локальной цели и определяется достаточно ли достичь поставленную цель, что бы констатировать достижение по крайней мере частичного или локального идеального конечного результата.

[0008] In some embodiments, further programs, systems and methods for…, – в этом разделе даётся определение третьей локальной конечной цели изобретения и даётся определение пути её достижения в рамках соответствия пунктам формулы изобретения; приводится идентификация поставленной локальной цели и определяется достаточно ли достичь поставленную цель, что бы констатировать достижение по крайней мере частичного или локального идеального конечного результата.

[0009] Also in some further embodiments, programs, systems and methods of…, – в этом разделе даётся определение первой интегральной локальной конечной цели изобретения и даётся определение пути её достижения в рамках соответствия пунктам формулы изобретения; приводится идентификация поставленной интегральной локальной цели и определяется достаточно ли достичь поставленную цель, что бы констатировать достижение по крайней мере частичного или локального идеального конечного результата.

[0010] In some embodiments, an apparatus is provided with…, – в этом разделе даётся определение первой локальной конечной цели изобретения, связанной причинно-следственной связью со второй локальной конечной целью изобретения и даётся определение пути достижения указанной целевой интеграции в рамках соответствия пунктам формулы изобретения; приводится идентификация поставленной локальной интегрированной цели и определяется достаточно ли достичь эту поставленную цель, что бы констатировать достижение по крайней мере частичного или локального идеального конечного результата.

[0011] – в этом разделе даётся определение первой локальной конечной цели изобретения, связанной причинно-следственной связью со второй и третьей локальной конечной целью изобретения и даётся определение пути достижения указанной целевой интеграции в рамках соответствия пунктам формулы изобретения; приводится идентификация поставленной локальной интегрированной цели и определяется достаточно ли достичь эту поставленную цель, что бы констатировать достижение по крайней мере частичного или локального идеального конечного результата.

[0012] In some embodiments, an apparatus for…, – в этом разделе даётся определение первой локальной конечной цели изобретения в части решений по аппарату, связанной причинно-следственной связью со второй локальной конечной целью изобретения, также отнесённой к аппарату и даётся определение пути достижения указанной целевой интеграции в рамках соответствия пунктам формулы изобретения ; приводится идентификация поставленной локальной интегрированной цели и определяется достаточно ли достичь эту поставленную цель, что бы констатировать достижение по крайней мере частичного или локального идеального конечного результата.

[0013] In some other embodiments, an apparatus is provided with a system for…, – в этом разделе к аппарату прибавляют одну из известных систем, которая необходима для его декларированного рабочего цикла и анализируют наличие или отсутствие скачка эффекта.

[0014] In some other embodiments, an apparatus is provided with a system for…, – в этом разделе к аппарату прибавляют вторую из известных систем, которая необходима для его декларированного рабочего цикла и анализируют наличие или отсутствие скачка эффекта.

[0015] In some embodiments of the various apparatus, the…, – в этом разделе к аппарату прибавляют сочетание из известных систем, интегрированных с аппаратом в интегративную систему, которая необходима для его декларированного рабочего цикла и анализируют наличие или отсутствие скачка эффекта.

[0016] – в этом разделе к аппарату прибавляют одну за одной комбинацию из известных систем, которая необходима для его декларированного рабочего цикла и анализируют наличие или отсутствие скачка эффекта.

[0017] The system for…, – в этом разделе проводят структурный анализ системы (систем) технического решения и отслеживают достаточность наличия в техническом решении сочетания всех необходимых систем для обеспечения достижения идеального конечного результата.

[0018] Structurally, the apparatus can be provided with a…, – в этом разделе проводят структурный анализ узлов и компонентов аппарата.

[0019] In the apparatus, the system for…, – в этом разделе показывают, как влияют конструктивные отличительные признаки на достижение идеального конечного результата.

[0020] The apparatus can also comprise a system for…, – в этом разделе рассматривают возможность включения в аппарат различных дополнительных функционально независимых и автономных систем, которые могут усилить эффект от использования предлагаемого изобретения и тем самым обеспечить более уверенное достижение идеального конечного результата.

[0021] In some embodiments, the method of operation of the device involves…, – в этом разделе анализируют локальные и интегральные цели в динамике или действии, анализируют методы достижения целей и сравнивают параметры после достижения указанной цели с идеальным конечным результатом.

[**0022]** An external…, – в этом разделе рассматриваются дополнительные возможные аспекты усовершенствования и модификации целей и способов их достижения и анализируется, и оценивается потенциал достижения дополнительных компонентов идеального конечного результата.

[0023] The following can be provided to…, – в этом разделе расцениваются различные действия и конструктивные усовершенствования способные дополнить сущность идеального конечного результата новым содержанием.

[0024] In some embodiments…, – в этом разделе даётся окончательное определение полностью интегрированной локальной конечной цели изобретения и даётся определение пути её достижения в рамках соответствия пунктам формулы изобретения ; приводится идентификация поставленной локальной, полностью интегрированной цели и определяется достаточно ли достичь поставленную цель, что бы констатировать достижение по крайней мере частичного или локального идеального конечного результата.

BRIEF DESCRIPTION OF THE DRAWINGS

[0025] The invention will be better understood from the Detailed Description and from the appended drawings, which are meant to illustrate and not to limit the invention. The Figures are not necessarily drawn to scale, nor are the relative sizes of parts within the Figures necessary in proportional to one another, – изобретение будет лучше понято из подробного описания и прилагаемых чертежей, которые предназначены для иллюстрации, а не для ограничения изобретения. Фигуры не обязательно должны быть изображены в масштабе, и относительные размеры частей внутри фигуры не должны быть пропорциональны друг другу.

[0026] Figure 1 is an example of a…, – в этой фигуре представляют общую принципиальную блок-схему технической системы/надсистемы, в которой представлены все подсистемы и их связи между собой и выходы и линии связи с надсистемой с концентрацией внимания на функциональных особенностях и отличиях интегрированных в надсистему программных элементов в совокупности с системами управления и контроля надсистемы содержащих элементы искусственного интеллекта и искусственные нейронные сети.

[0027] Figure 2 is an example of a …, – в этой фигуре представляют общую принципиальную блок-схему ведущей и центральной технической системы/подсистемы, в которой представлены все функционально связанные с ней подсистемы и их связи между собой и выходы и линии связи с надсистемой с концентрацией внимания на функциональных особенностях и отличиях интегрированных в надсистему и по возможности в подсистемы программных элементов в совокупности с системами управления и контроля надсистемы содержащих элементы искусственного интеллекта и искусственные нейронные сети.

Также отражаются технические детали и программные функции, и алгоритмы характеризующие неочевидность этих решений в сочетании с общими принципами применения элементов искусственного интеллекта и искусственных нейронных сетей.

[0028] Figure 3 shows an example…, – в этой фигуре представляют общую принципиальную блок-схему вспомогательной или локальной первой технической системы/подсистемы, в которой представлены все функционально связанные с ней подсистемы и их связи между собой и выходы и линии связи с надсистемой с концентрацией внимания на функциональных особенностях и отличиях интегрированных в надсистему и по возможности в подсистемы программных элементов в совокупности с системами управления и контроля надсистемы содержащих элементы искусственного интеллекта и искусственные нейронные сети.

Также отражаются технические детали и программные функции, и алгоритмы характеризующие неочевидность этих решений в сочетании с общими принципами применения элементов искусственного интеллекта и искусственных нейронных сетей.

[0029] Figure 4 shows an example of components of the…, – в этой фигуре представляют общую принципиальную блок-схему вспомогательной или локальной второй технической системы/подсистемы, в которой представлены все функционально связанные с ней подсистемы и их связи между собой и выходы и линии связи с надсистемой с концентрацией внимания на функциональных особенностях и отличиях интегрированных в надсистему и по возможности в подсистемы программных элементов в совокупности с системами управления и контроля надсистемы содержащих элементы искусственного интеллекта и искусственные нейронные сети.

Также отражаются технические детали и программные функции, и алгоритмы характеризующие неочевидность этих решений в сочетании с общими принципами применения элементов искусственного интеллекта и искусственных нейронных сетей.

[0030] Figure 5 shows an example of a…, – в этой фигуре представляют общую принципиальную блок-схему вспомогательной или локальной третьей технической системы/подсистемы, в которой представлены все функционально связанные с ней подсистемы и их связи между собой и выходы и линии связи с надсистемой с концентрацией внимания на функциональных особенностях и отличиях интегрированных в надсистему и по возможности в подсистемы программных элементов в совокупности с системами управления и контроля надсистемы содержащих элементы искусственного интеллекта и искусственные нейронные сети.

Также отражаются технические детали и программные функции, и алгоритмы характеризующие неочевидность этих решений в сочетании с общими принципами применения элементов искусственного интеллекта и искусственных нейронных сетей.

[0031] Figure 6 is a…, – иллюстрации к фигуре 1, выполненные как зависимые графические структуры к зависимым пунктам формулы изобретения, относящимся к независимому пункту 1.

[0032] Figure 7 shows an example of a…, – иллюстрации к фигуре 2, выполненные как зависимые графические структуры к зависимым пунктам формулы изобретения, относящимся к независимому пункту 2.

[0033] Figure 8 is an example of a…, – иллюстрации к фигуре 3, выполненные как зависимые графические структуры к зависимым пунктам формулы изобретения, относящимся к независимому пункту 3.

[0034] Figure 9 is an example of a…, – иллюстрации к фигуре 4, выполненные как зависимые графические структуры к зависимым пунктам формулы изобретения, относящимся к независимому пункту 4.

[0035] Figure 10 is an example of a…, – иллюстрации к фигуре 5, выполненные как зависимые графические структуры к зависимым пунктам формулы изобретения, относящимся к независимому пункту 5.

[0036] Figure 11 is an example of a…, – в этой фигуре представляют общую принципиальную блок-схему или алгоритм взаимодействия вспомогательной или локальной первой технической системы/подсистемы, в которой представлены все функционально связанные с ней подсистемы и их связи между собой и выходы и линии связи с надсистемой с концентрацией внимания на функциональных особенностях и отличиях интегрированных в надсистему и по возможности в подсистемы программных элементов в совокупности с системами управления и контроля надсистемы содержащих элементы искусственного интеллекта и искусственные нейронные сети.

Также отражаются технические детали и программные функции, и алгоритмы характеризующие неочевидность этих решений в сочетании с общими принципами применения элементов искусственного интеллекта и искусственных нейронных сетей.

[0037] Figure 12 is an example of an…, – в этой фигуре представляют общую принципиальную блок-схему или алгоритм взаимодействия вспомогательной или локальной второй по значимости технической системы/подсистемы, в которой представлены все функционально связанные с ней подсистемы и их связи между собой и выходы и линии связи с надсистемой с концентрацией внимания на функциональных особенностях и отличиях интегрированных в надсистему и по возможности в подсистемы программных элементов в совокупности с системами управления и контроля надсистемы содержащих элементы искусственного интеллекта и искусственные нейронные сети.

Также отражаются технические детали и программные функции, и алгоритмы характеризующие неочевидность этих решений в сочетании с общими принципами применения элементов искусственного интеллекта и искусственных нейронных сетей.

[0038] Figure 13 is an example of a…, – в этой фигуре представляют общую принципиальную блок-схему или алгоритм взаимодействия вспомогательной или локальной третьей по значимости технической системы/подсистемы, в которой представлены все функционально связанные с ней подсистемы и их связи между собой и выходы и линии связи с надсистемой с концентрацией внимания на функциональных особенностях и отличиях интегрированных в надсистему и по возможности в подсистемы программных элементов в совокупности с системами управления и контроля надсистемы содержащих элементы искусственного интеллекта и искусственные нейронные сети.

Также отражаются технические детали и программные функции, и алгоритмы характеризующие неочевидность этих решений в сочетании с общими принципами применения элементов искусственного интеллекта и искусственных нейронных сетей

[0039] Figure 14 is an example of a…, – в этой фигуре представляют общую принципиальную блок-схему или алгоритм взаимодействия вспомогательной или локальной четвёртой по значимости технической системы/подсистемы, в которой представлены все функционально связанные с ней подсистемы и их связи между собой и выходы и линии связи с надсистемой с концентрацией внимания на функциональных особенностях и отличиях интегрированных в надсистему и по возможности в подсистемы программных элементов в совокупности с системами управления и контроля надсистемы содержащих элементы искусственного интеллекта и искусственные нейронные сети.

Также отражаются технические детали и программные функции, и алгоритмы характеризующие неочевидность этих решений в сочетании с общими принципами применения элементов искусственного интеллекта и искусственных нейронных сетей

[0040] Figure 15 is an example of a…, – в этой фигуре представляют общую принципиальную блок-схему или алгоритм взаимодействия вспомогательной или локальной пятой по значимости технической системы/подсистемы, в которой представлены все функционально связанные с ней подсистемы и их связи между собой и выходы и линии связи с надсистемой с концентрацией внимания на функциональных особенностях и отличиях интегрированных в надсистему и по возможности в подсистемы программных элементов в совокупности с системами управления и контроля надсистемы содержащих элементы искусственного интеллекта и искусственные нейронные сети.

Также отражаются технические детали и программные функции, и алгоритмы характеризующие неочевидность этих решений в сочетании с общими принципами применения элементов искусственного интеллекта и искусственных нейронных сетей.

[0041] Figure 16 is an example of a…, – иллюстрации к фигуре 11, выполненные как зависимые графические структуры к зависимым пунктам формулы изобретения, относящимся к независимому пункту 11.

[0042] Figure 17 shows an example of…, – иллюстрации к фигуре 12, выполненные как зависимые графические структуры к зависимым пунктам формулы изобретения, относящимся к независимому пункту 12.

[0043] Figure 18 is an example of a…, – иллюстрации к фигуре 13, выполненные как зависимые графические структуры к зависимым пунктам формулы изобретения, относящимся к независимому пункту 13.

[0044] Figure 19 is an example of a……, – иллюстрации к фигуре 14, выполненные как зависимые графические структуры к зависимым пунктам формулы изобретения, относящимся к независимому пункту 14.

[0045] Figure 20 is an example of a…, – иллюстрации к фигуре 15, выполненные как зависимые графические структуры к зависимым пунктам формулы изобретения, относящимся к независимому пункту 15.

[0046] Figure 21 is an example of a…, – в этой фигуре представляют общую принципиальную блок-схему или алгоритм комплексной интеграции в центральную надсистему – вспомогательной или локальной первой по значимости технической системы/подсистемы, в которой представлены все функционально связанные с ней подсистемы и их связи между собой и выходы и линии связи с надсистемой с концентрацией внимания на функциональных особенностях и отличиях интегрированных в надсистему и по возможности в подсистемы программных элементов в совокупности с системами управления и контроля надсистемы содержащих элементы искусственного интеллекта и искусственные нейронные сети.

Также отражаются технические детали и программные функции, и алгоритмы характеризующие неочевидность этих решений в сочетании с общими принципами применения элементов искусственного интеллекта и искусственных нейронных сетей.

[0047] Figure 22 is an example of a…, – в этой фигуре представляют общую принципиальную блок-схему или алгоритм комплексной интеграции в центральную надсистему – вспомогательной или локальной второй по значимости технической системы/подсистемы, в которой представлены все функционально связанные с ней подсистемы и их связи между собой и выходы и линии связи с надсистемой с концентрацией внимания на функциональных особенностях и отличиях интегрированных в надсистему и по возможности в подсистемы программных элементов в совокупности с системами управления и контроля надсистемы содержащих элементы искусственного интеллекта и искусственные нейронные сети.

Также отражаются технические детали и программные функции, и алгоритмы характеризующие неочевидность этих решений в сочетании с общими принципами применения элементов искусственного интеллекта и искусственных нейронных сетей.

[0048] Figure 23 is an example of a…, – в этой фигуре представляют общую принципиальную блок-схему или алгоритм комплексной интеграции в центральную надсистему – вспомогательной или локальной третьей по значимости технической системы/подсистемы, в которой представлены все функционально связанные с ней подсистемы и их связи между собой и выходы и линии связи с надсистемой с концентрацией внимания на функциональных особенностях и отличиях интегрированных в надсистему и по возможности в подсистемы программных элементов в совокупности с системами управления и контроля надсистемы содержащих элементы искусственного интеллекта и искусственные нейронные сети.

Также отражаются технические детали и программные функции, и алгоритмы характеризующие неочевидность этих решений в сочетании с общими принципами применения элементов искусственного интеллекта и искусственных нейронных сетей.

[0049] Figure 24 is an example of a…, – в этой фигуре представляют общую принципиальную блок-схему или алгоритм комплексной интеграции в центральную надсистему – вспомогательной или локальной четвёртой по значимости технической системы – подсистемы, в которой представлены все функционально связанные с ней подсистемы и их связи между собой и выходы и линии связи с надсистемой с концентрацией внимания на функциональных особенностях и отличиях интегрированных в надсистему и по возможности в подсистемы программных элементов в совокупности с системами управления и контроля надсистемы содержащих элементы искусственного интеллекта и искусственные нейронные сети.

Также отражаются технические детали и программные функции, и алгоритмы характеризующие неочевидность этих решений в сочетании с общими принципами применения элементов искусственного интеллекта и искусственных нейронных сетей.

DETAILED DESCRIPTION

[0050] According to some embodiments, an…, – в этом разделе показывают элементы существенной новизны, содержащиеся в предполагаемом изобретении на уровне основного технического решения верхнего положения в иерархии новых или обновлённых технических решений и их интегративных сочетаний.

[0051] In some embodiments, a…, – в этом разделе показывают принципы интеграции программных решений в основном техническом решении.

[0052] In order to develop…, – в этом разделе показывают принципиальные элементы развития всех видов технических решений на уровне основного технического решения без интеграции с программными и контрольными решениями.

[0053] To develop a…, – в этом разделе показывают методы и процессы, а также алгоритмы предназначенные для глубокой интеграции программных решений всех видов в комплексе и иерархии основного технического решения и его интегративных сочетаний с техническими подсистемами.

[0054] It will be appreciated that some…, – в этом разделе показывают увязку и следствие ввода программных решений в принципиальную характеристику и связи во всех взаимосвязанных и взаимно интегрированных технических системах с учётом насущных элементов искусственного интеллекта и связанных с ними искусственных нейронных сетей.

[0055] In some embodiments, the…, – в этом разделе приводят характеристики и новые отличительные признаки, появившиеся при интеграции программных решений всех уровней в основное техническое решение.

[0056] It will be appreciated that the…, – в этом разделе показывают элементы существенной новизны, возникшие при интеграции программных решений в классические по типу технические решения всех уровней иерархии.

[0057] In some embodiments, the…, – в этом разделе приводят развёрнутые характеристики и рабочие связи элементов искусственного интеллекта с основной схемой работы технических систем всех уровней иерархии с привязкой принципов существенной новизны к алгоритму или принципам действия всей комплексной изобретённой технической системы.

[0058] In some embodiments, an…, – в этом разделе приводят развёрнутые характеристики и рабочие связи элементов искусственного интеллекта и искусственных нейронных сетей с основной схемой работы технических систем всех уровней иерархии с привязкой принципов существенной новизны к алгоритму или принципам действия всей комплексной изобретённой технической системы.

[0059] Reference will now be made to the figures, in which like numerals refer to like parts throughout.

[0060] In Figure 1…, – в этом разделе дают развернутое описание Фигуры 1 с расшифровкой всех условных обозначений и номеров позиций или цифровых обозначений. Все цифровые обозначения для этой фигуры должны иметь вид – 101, 102… The following reference numerals identify the following features.

[0061] Figure 2 shows an example of a…, – в этом разделе дают развернутое описание Фигуры 2 с расшифровкой всех условных обозначений и номеров позиций или цифровых обозначений. Все цифровые обозначения для этой фигуры должны иметь вид – 201, 202… The following reference numerals identify the following features.

[0062] Figure 3 shows a…, – в этом разделе дают развернутое описание Фигуры 3 с расшифровкой всех условных обозначений и номеров позиций или цифровых обозначений. Все цифровые обозначения для этой фигуры должны иметь вид – 301, 302… The following reference numerals identify the following features.

[0063] Figure 4 shows a…, – в этом разделе дают развернутое описание Фигуры 4 с расшифровкой всех условных обозначений и номеров позиций или цифровых обозначений. Все цифровые обозначения для этой фигуры должны иметь вид – 401, 402… The following reference numerals identify the following features.

[0064] Figure 5 shows a…, – в этом разделе дают развернутое описание Фигуры 5 с расшифровкой всех условных обозначений и номеров позиций или цифровых обозначений. Все цифровые обозначения для этой фигуры должны иметь вид – 501, 502… The following reference numerals identify the following features.

[0065] Figure 6 shows a…, – в этом разделе дают развернутое описание Фигуры 6 с расшифровкой всех условных обозначений и номеров позиций или цифровых обозначений. Все цифровые обозначения для этой фигуры должны иметь вид – 601, 602… The following reference numerals identify the following features.

[0066] Figure 7 shows…, – в этом разделе дают развернутое описание Фигуры 7 с расшифровкой всех условных обозначений и номеров позиций или цифровых обозначений. Все цифровые обозначения для этой фигуры должны иметь вид – 701, 702… The following reference numerals identify the following features.

[0067] Figure 8 shows an…, – в этом разделе дают развернутое описание Фигуры 8 с расшифровкой всех условных обозначений и номеров позиций или цифровых обозначений. Все цифровые обозначения для этой фигуры должны иметь вид – 801, 802… The following reference numerals identify the following features.

[0068] Figure 9 shows a…, – в этом разделе дают развернутое описание Фигуры 9 с расшифровкой всех условных обозначений и номеров позиций или цифровых обозначений. Все цифровые обозначения для этой фигуры должны иметь вид – 901, 902… The following reference numerals identify the following features.

[0069] Figure 10 shows a…, – в этом разделе дают развернутое описание Фигуры 10 с расшифровкой всех условных обозначений и номеров позиций или цифровых обозначений. Все цифровые обозначения для этой фигуры должны иметь вид – 1001, 1002… The following reference numerals identify the following features.

[0070] Figure 11 shows…, – в этом разделе дают развернутое описание Фигуры 11 с расшифровкой всех условных обозначений и номеров позиций или цифровых обозначений. Все цифровые обозначения для этой фигуры должны иметь вид – 1101, 1102… The following reference numerals identify the following features.

[0071] Figure12 shows …, – в этом разделе дают развернутое описание Фигуры 12 с расшифровкой всех условных обозначений и номеров позиций или цифровых обозначений. Все цифровые обозначения для этой фигуры должны иметь вид, -1201, 1202… The following reference numerals identify the following features.

[0072] Figure 13 shows a…, – в этом разделе дают развернутое описание Фигуры 13 с расшифровкой всех условных обозначений и номеров позиций или цифровых обозначений. Все цифровые обозначения для этой фигуры должны иметь вид – 1301, 1302… The following reference numerals identify the following features.

[0073] Figure 14 shows…, – в этом разделе дают развернутое описание Фигуры 14 с расшифровкой всех условных обозначений и номеров позиций или цифровых обозначений. Все цифровые обозначения для этой фигуры должны иметь вид – 1401, 1402… The following reference numerals identify the following features.

[0074] Figure 15 shows a…, – в этом разделе дают развернутое описание Фигуры 15 с расшифровкой всех условных обозначений и номеров позиций или цифровых обозначений. Все цифровые обозначения для этой фигуры должны иметь вид – 1501, 1502… The following reference numerals identify the following features.

[0075] Figure 16 shows a…, – в этом разделе дают развернутое описание Фигуры 16 с расшифровкой всех условных обозначений и номеров позиций или цифровых обозначений. Все цифровые обозначения для этой фигуры должны иметь вид – 1601, 1602… The following reference numerals identify the following features.

[0076] Figure 17 shows…, – в этом разделе дают развернутое описание Фигуры 17 с расшифровкой всех условных обозначений и номеров позиций или цифровых обозначений. Все цифровые обозначения для этой фигуры должны иметь вид – 1701, 1702… The following reference numerals identify the following features.

[0077] Figure 18 shows a…, – в этом разделе дают развернутое описание Фигуры 18 с расшифровкой всех условных обозначений и номеров позиций или цифровых обозначений. Все цифровые обозначения для этой фигуры должны иметь вид – 1801, 1802… The following reference numerals identify the following features.

[0078] Figure 19 shows a…, – в этом разделе дают развернутое описание Фигуры 19 с расшифровкой всех условных обозначений и номеров позиций или цифровых обозначений. Все цифровые обозначения для этой фигуры должны иметь вид – 1901, 1902… The following reference numerals identify the following features.

[0079] Figure 20 shows…, – в этом разделе дают развернутое описание Фигуры 20 с расшифровкой всех условных обозначений и номеров позиций или цифровых обозначений. Все цифровые обозначения для этой фигуры должны иметь вид – 2001, 2002… The following reference numerals identify the following features.

[0080] Figure 21 shows a…, – в этом разделе дают развернутое описание Фигуры 21 с расшифровкой всех условных обозначений и номеров позиций или цифровых обозначений. Все цифровые обозначения для этой фигуры должны иметь вид – 2101, 2102… The following reference numerals identify the following features.

[0081] Figure 22 shows an…, – в этом разделе дают развернутое описание Фигуры 22 с расшифровкой всех условных обозначений и номеров позиций или цифровых обозначений. Все цифровые обозначения для этой фигуры должны иметь вид – 2201, 2202… The following reference numerals identify the following features.

[0082] Figure 23 shows a…, – в этом разделе дают развернутое описание Фигуры 23 с расшифровкой всех условных обозначений и номеров позиций или цифровых обозначений. Все цифровые обозначения для этой фигуры должны иметь вид – 2301, 2302… The following reference numerals identify the following features.

[0083] Figure 24 shows a…, – в этом разделе дают развернутое описание Фигуры 24 с расшифровкой всех условных обозначений и номеров позиций или цифровых обозначений. Все цифровые обозначения для этой фигуры должны иметь вид – 2401, 2402… The following reference numerals identify the following features.

TEST RESULTS

[0084] В этом разделе демонстрируются результаты испытаний в виде показателей, таблиц, графиков и диаграмм.

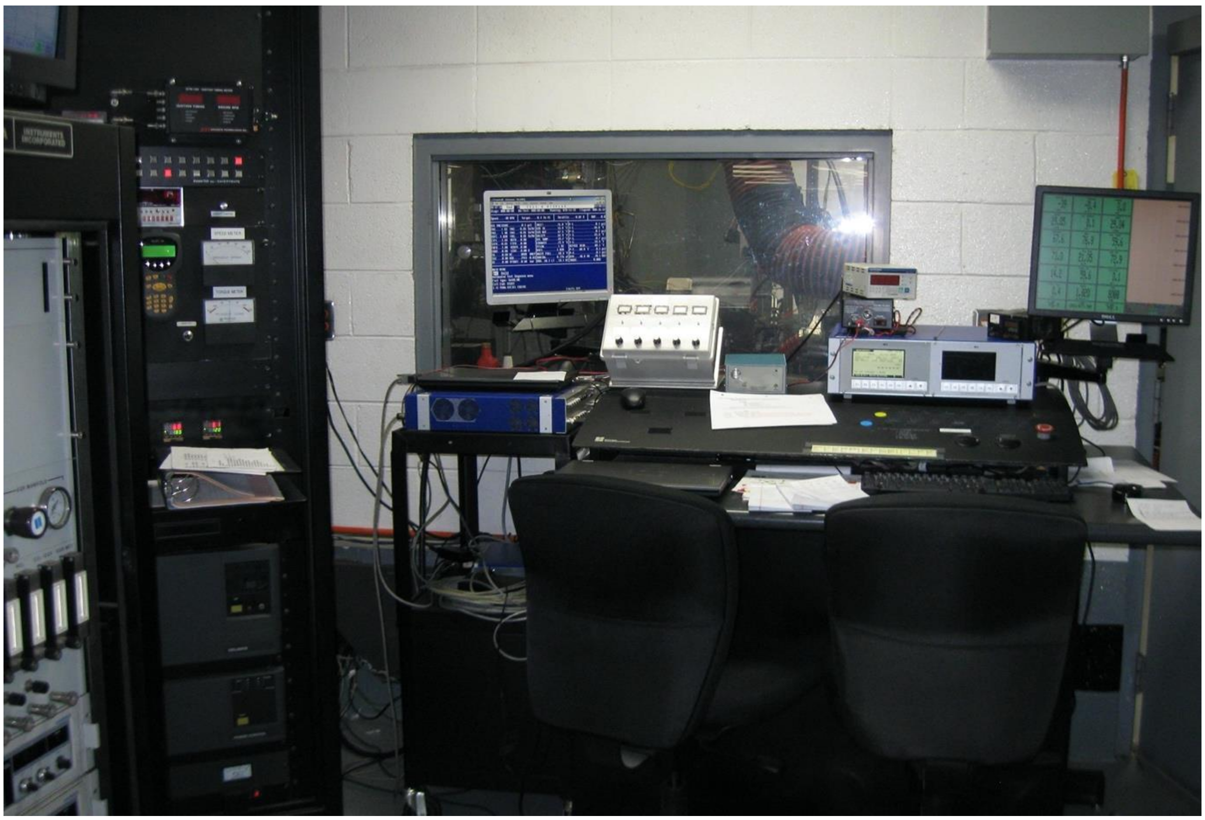

Рисунок 1, - *на рисунке показан пример расположения системы аналитического и контрольно-измерительного оборудования испытательного стенда, предназначенного для испытаний и аналитической оценки дизельного двигателя. Системы стенда включают элементы искусственного интеллекта и искусственные нейронные сети. Очень важно показать и раскрыть новизну применения этой системы для достижения идеального конечного результата или его эквивалента применительно к заявляемому материалу*

Рисунок 2, *- на рисунке показан пример фрагмента расположения системы аналитического и контрольно-измерительного оборудования испытательного стенда, предназначенного для испытаний и аналитической оценки дизельного двигателя. Системы стенда включают элементы искусственного интеллекта и искусственные нейронные сети. Очень важно показать и раскрыть новизну применения этой системы для достижения идеального конечного результата или его эквивалента применительно к заявляемому материалу, а также показать взаимодействие контрольно-аналитических компонентов системы с элементами искусственного интеллекта*

***Рисунок 3**, - на рисунке показан пример расположения системы аналитического и контрольно-измерительного оборудования испытательного стенда, предназначенного для испытаний и аналитической оценки дизельного двигателя. Системы стенда включают элементы искусственного интеллекта и искусственные нейронные сети. Очень важно в материалах заявки показать и раскрыть новизну применения этой системы для достижения идеального конечного результата или его эквивалента применительно к заявляемому материалу*

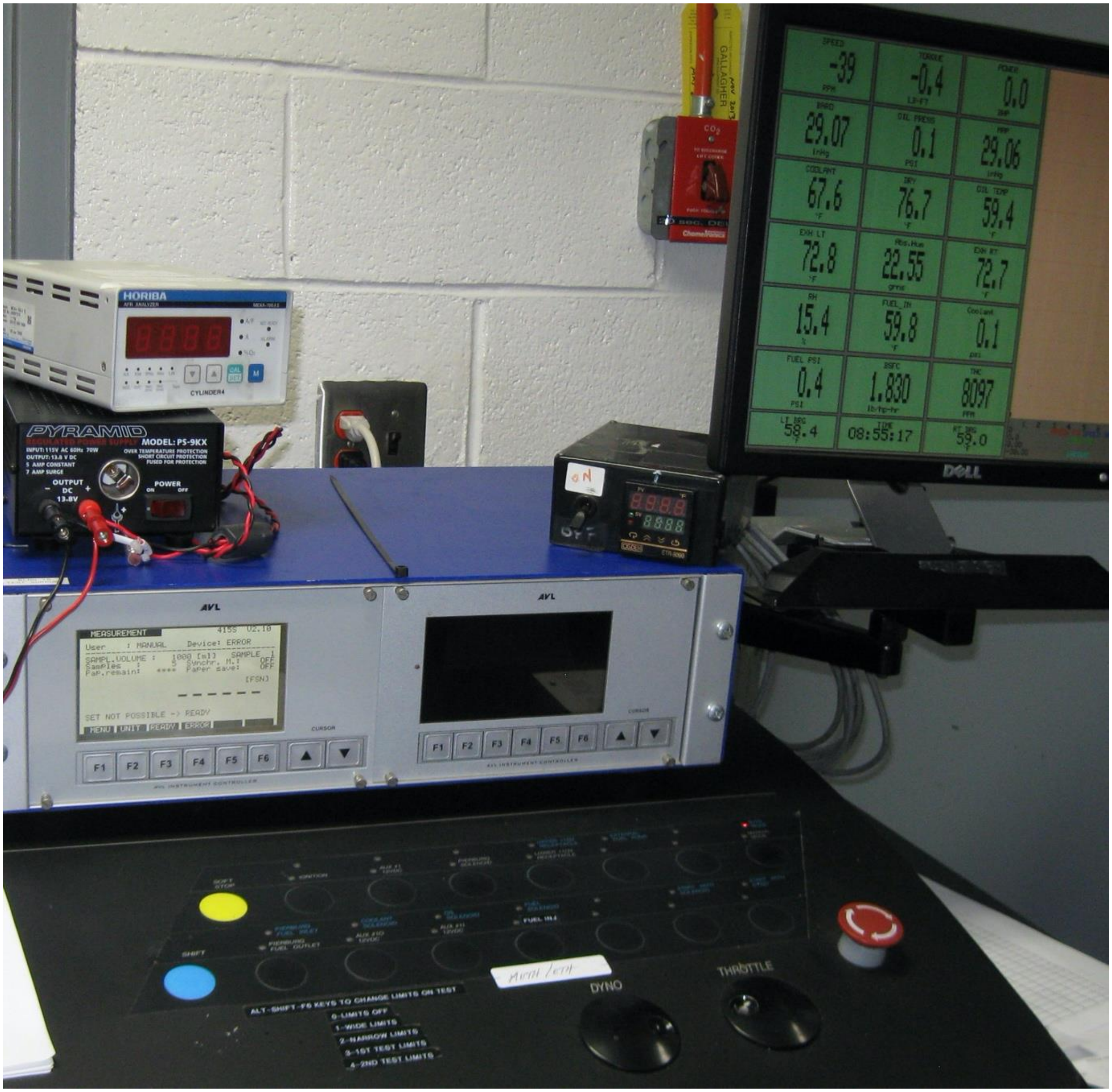

Рисунок 4, *- на рисунке показан пример фрагмента расположения системы аналитического и контрольно-измерительного оборудования испытательного стенда, предназначенного для испытаний и аналитической оценки дизельного двигателя. Системы стенда включают элементы искусственного интеллекта и искусственные нейронные сети. Очень важно показать и раскрыть новизну применения этой системы для достижения идеального конечного результата или его эквивалента применительно к заявляемому материалу, а также показать*

взаимодействие контрольно-аналитических компонентов системы с элементами искусственного интеллекта

Рисунки 5, 6, 7, *- на рисунках показаны примеры фрагментов расположения системы аналитического и контрольно-измерительного оборудования* *испытательного стенда, предназначенного для испытаний и аналитической оценки дизельного двигателя. Очень важно показать и раскрыть новизну применения этой системы, в том числе и контрольно-аналитических компонентов системы с элементами искусственного интеллекта*


IGTM-1000 IGNITION TIMING METER
IGNITION TIMING
ENGINE RPM
REFERENCE
ANGLE
TRIGGER
SPARK
MEASURE
CONFIGURE
PROGRAM
POWER
ACCURATE TECHNOLOGIES INC.
116.5
DSP PAR RST
Power-Tek Inc.–SAFETYMATE
TRANSDUCER AMPLIFIER
HUMIDITY CONTROL
POWER ON
DRIVE RUNNING
QUICK STOP
DRIVE FAULT
ALSTOM
SPEED METER
PERCENT SPEED
TORQUE METER
PERCENT LOAD
TORQUE POT
SPEED POT

Рисунок 8

На рисунках 8, 9, 10 и 11 показаны примеры фрагментов расположения системы аналитического и контрольно-измерительного оборудования испытательного стенда, предназначенного для испытаний и аналитической оценки дизельного двигателя. Очень важно показать и раскрыть новизну применения этой системы, в том числе и контрольно-аналитических компонентов системы с элементами искусственного интеллекта

Рисунок 9

Рисунок 10, - *на рисунке показаны в качестве примера компоненты контрольно-аналитической системы, позволяющие в процессе сравнительной эволюции результатов измерений и комплексного мониторинга всего комплекса технологических переходов применять возможности и характеристики элементов искусственного интеллекта и искусственных нейронных сетей*

Особенно это важно в постоянной координации основных рабочих параметров испытательного стенда и реакции от этих параметров последующей от испытываемых компонентов двигателя, установленного на динамометрическом столе стенда.

В разделе, в котором приводятся результаты испытаний необходимо связать элементы новизны модифицированных узлов двигателя с определением их реальных показателей и определением влияния этой новизны на характер показателей.

Рисунок 11, - *на рисунке также показаны в качестве примера компоненты контрольно-аналитической системы, позволяющие в процессе сравнительной эволюции результатов измерений и комплексного мониторинга всего комплекса технологических переходов применять возможности и характеристики элементов искусственного интеллекта и искусственных нейронных сетей*

В разделе, в котором приводятся результаты испытаний необходимо связать элементы новизны модифицированных узлов двигателя с определением их реальных показателей и определением влияния этой новизны на характер показателей.

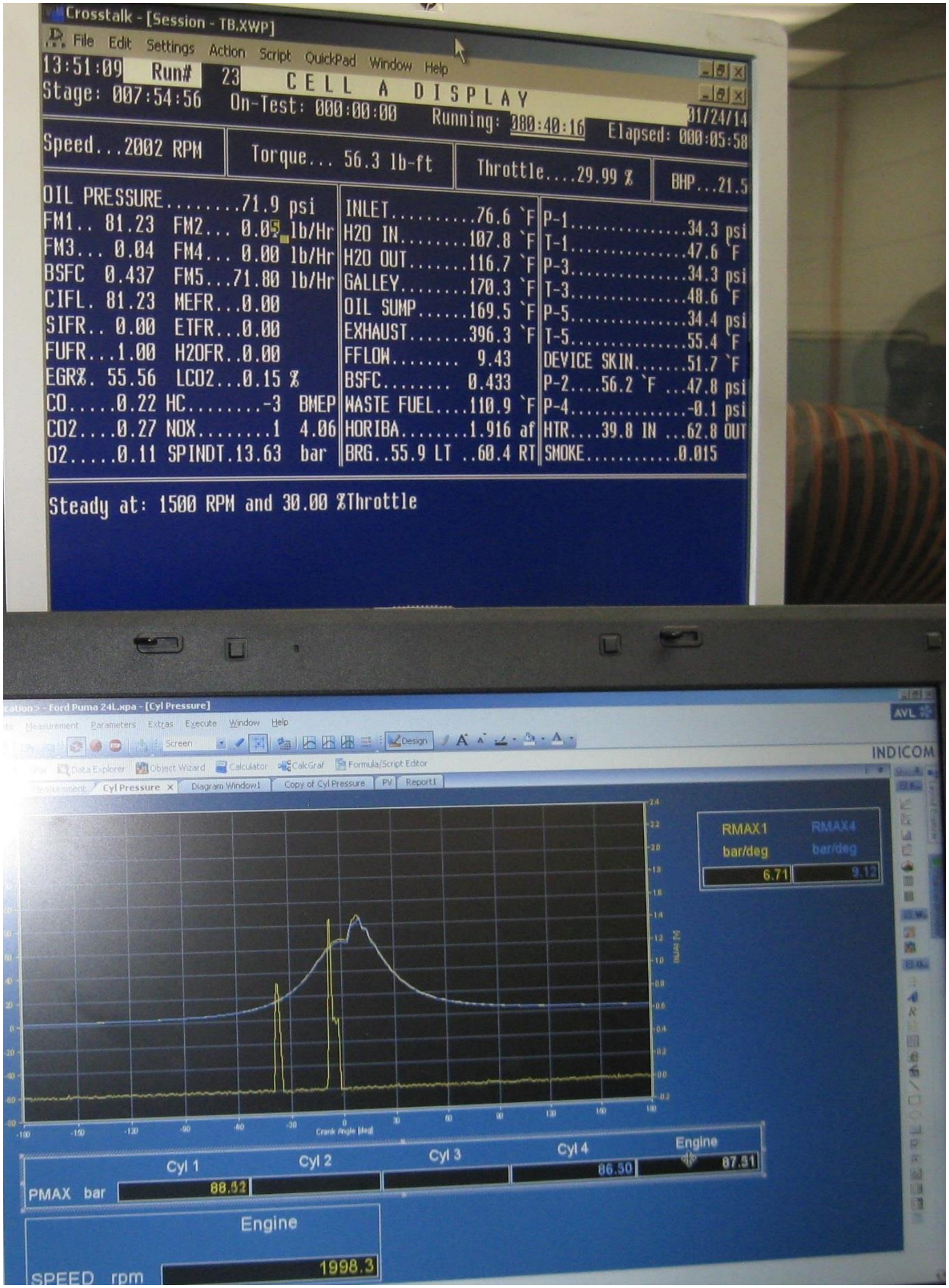
Crosstalk - [Session - TB.XWP]
File Edit Settings Action Script QuickPad Window Help
13:51:09 Run# 23 CELL A DISPLAY
Stage: 007:54:56 On-Test: 000:00:00 Running: 080:40:16 Elapsed: 000:05:58
01/24/14
Speed...2002 RPM
Torque... 56.3 lb-ft
Throttle....29.99 %
BHP...21.5
OIL PRESSURE........71.9 psi
FM1.. 81.23 FM2... 0.05 lb/Hr
FM3... 0.04 FM4... 0.00 lb/Hr
BSFC 0.437 FM5...71.80 lb/Hr
CIFL. 81.23 MEFR...0.00
SIFR.. 0.00 ETFR...0.00
FUFR...1.00 H2OFR..0.00
EGR%. 55.56 LCO2...0.15 %
CO.....0.22 HC........-3 BMEP
CO2....0.27 NOX........1 4.06
O2.....0.11 SPINDT.13.63 bar
INLET..........76.6 `F
H2O IN........107.8 `F
H2O OUT.......116.7 `F
GALLEY........170.3 `F
OIL SUMP......169.5 `F
EXHAUST.......396.3 `F
FFLOW........ 9.43
BSFC........ 0.433
WASTE FUEL....110.9 `F
HORIBA........1.916 af
BRG..55.9 LT ..60.4 RT
P-1..............34.3 psi
T-1..............47.6 `F
P-3..............34.3 psi
T-3..............48.6 `F
P-5..............34.4 psi
T-5..............55.4 `F
DEVICE SKIN.......51.7 `F
P-2....56.2 `F ...47.8 psi
P-4...............-0.1 psi
HTR....39.8 IN ...62.8 OUT
SMOKE...........0.015
Steady at: 1500 RPM and 30.00 %Throttle
- Ford Puma 24L.xpa - [Cyl Pressure]
Measurement Parameters Extras Execute Window Help
Design
AVL
INDICOM
Data Explorer Object Wizard Calculator CalcGraf Formula/Script Editor
Cyl Pressure Diagram Window1 Copy of Cyl Pressure PV Report1
RMAX1 bar/deg 6.71
RMAX4 bar/deg 9.12
Crank Angle [deg]
Cyl 1 Cyl 2 Cyl 3 Cyl 4 Engine
PMAX bar 88.52 86.50 87.91
Engine
SPEED rpm 1998.3

Рисунок 12

Рисунок 13

На рисунках 12, 13, 14 и 15 показаны контрольно-измерительные процессы, определяющие характер взаимодействия между различными приборами и системами измерений и их координацией с элементами искусственного интеллекта и искусственными нейронными сетями в части оптимизации основных параметров технической характеристики двигателя, включая и экологические показатели, сопряжённые с формированием топливных смесей, включающих метанол или биологические виды топлива.

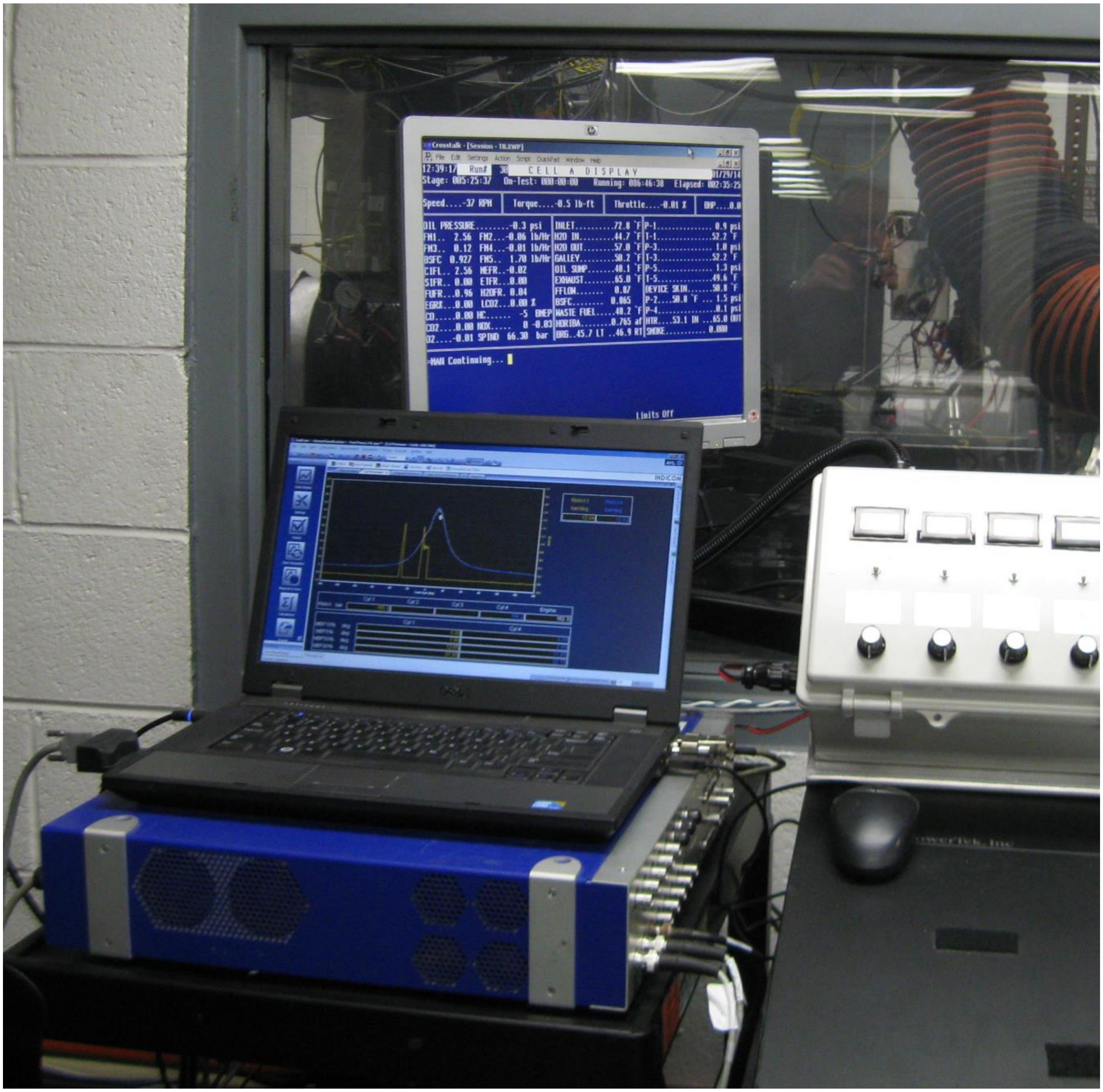

Рисунок 14

Для заявки на предполагаемое изобретение, важно показать влияние элементов и признаков существенной новизны предлагаемого технического решения в их активном сочетании с элементами искусственного интеллекта и искусственными нейронными сетями в сочетании с идеальным конечным результатом направленным на получение необычного результата испытаний, не имеющего места в известных технических решениях и характеризующих предложенное техническое решение.

Рисунок 15

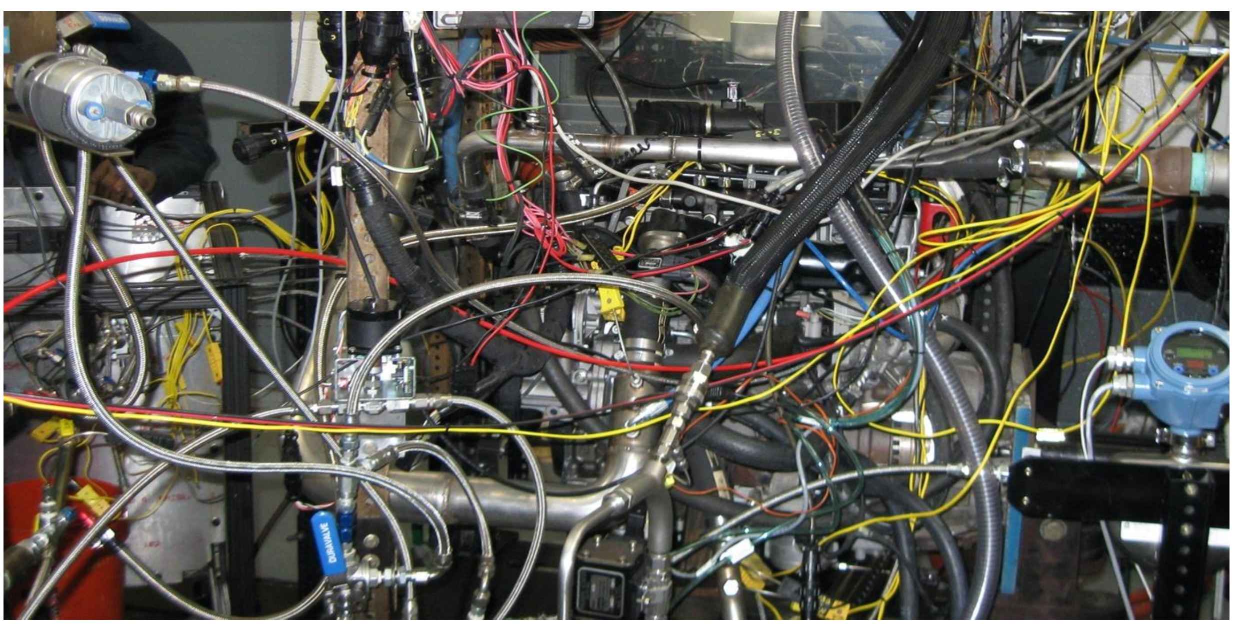

Рисунок 16

На рисунке 16 показан двигатель на стенде, на котором контролируются более 1200 параметров, обработка результатов измерений которых ведётся в режиме реального времени при помощи элементов искусственного интеллекта и искусственных нейронных сетей.

Рисунок 17, - *на рисунке показаны в качестве примера компоненты контрольно-аналитической системы, позволяющие в процессе сравнительной эволюции результатов измерений и комплексного мониторинга всего комплекса технологических переходов применять возможности и характеристики элементов искусственного интеллекта и искусственных нейронных сетей*

Особенно это важно в постоянной координации основных рабочих параметров испытательного стенда и реакции от этих параметров последующей от испытываемых компонентов двигателя, установленного на динамометрическом столе стенда.

В разделе, в котором приводятся результаты испытаний необходимо связать элементы новизны модифицированных узлов двигателя с определением их реальных показателей и определением влияния этой новизны на характер показателей.


MAIN POWER
LOCAL
REMOTE
WARNING
ELECTRIC SHOCK
AC OUTLET
120VAC
SVS
SD
RD
ALM
OPE
PWR
RESET
AIR
O2
N2
TO GDC
FROM GDC
BOTTLE
WARNING
AVOID LEAKAGE
SVS-1
SVS
SD
RD
ALM
OPE
PWR
RESET
AIR
O2
N2
TO GDC
FROM GDC
BOTTLE
WARNING
AVOID LEAKAGE
SVS-2
SGS
SD
RD
ALM
OPE
PWR
RESET

Рисунок 18

Рисунок 19

Рисунок 20

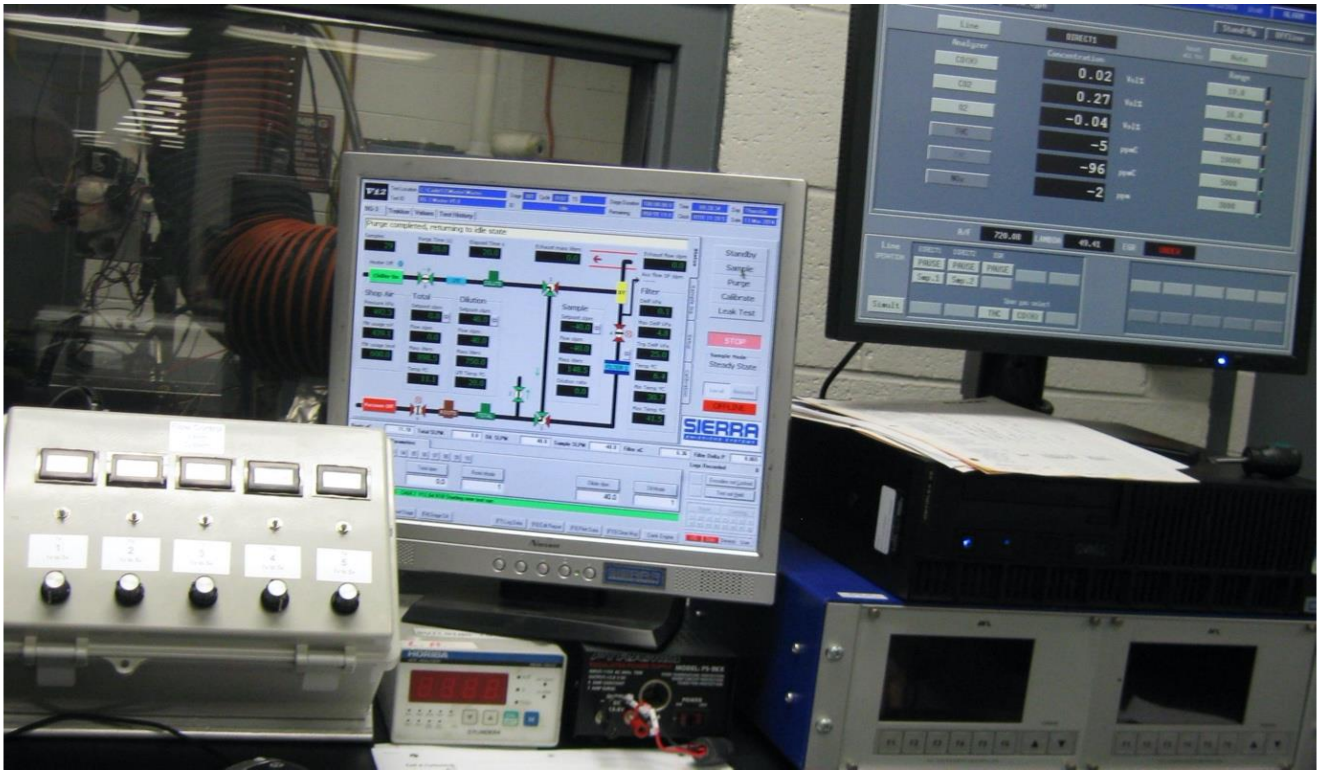

Рисунок 21

На рисунках 18, 19, 20, 21, 22, 23 и 24, – также показаны в качестве примера связанные функционально между собой и одновременно с элементами искусственного интеллекта и искусственными нейронными сетями компоненты контрольно-аналитической системы, позволяющие в процессе сравнительной эволюции результатов измерений и комплексного мониторинга всего комплекса технологических переходов также комплексно применять возможности и характеристики элементов искусственного интеллекта и искусственных нейронных сетей.

Особенно это важно в постоянной координации основных рабочих параметров испытательного стенда и реакции от этих параметров последующей от испытываемых компонентов двигателя, установленного на динамометрическом столе стенда.

В разделе, в котором приводятся результаты испытаний необходимо связать элементы новизны модифицированных узлов двигателя с определением их реальных показателей и определением влияния этой новизны на характер показателей.

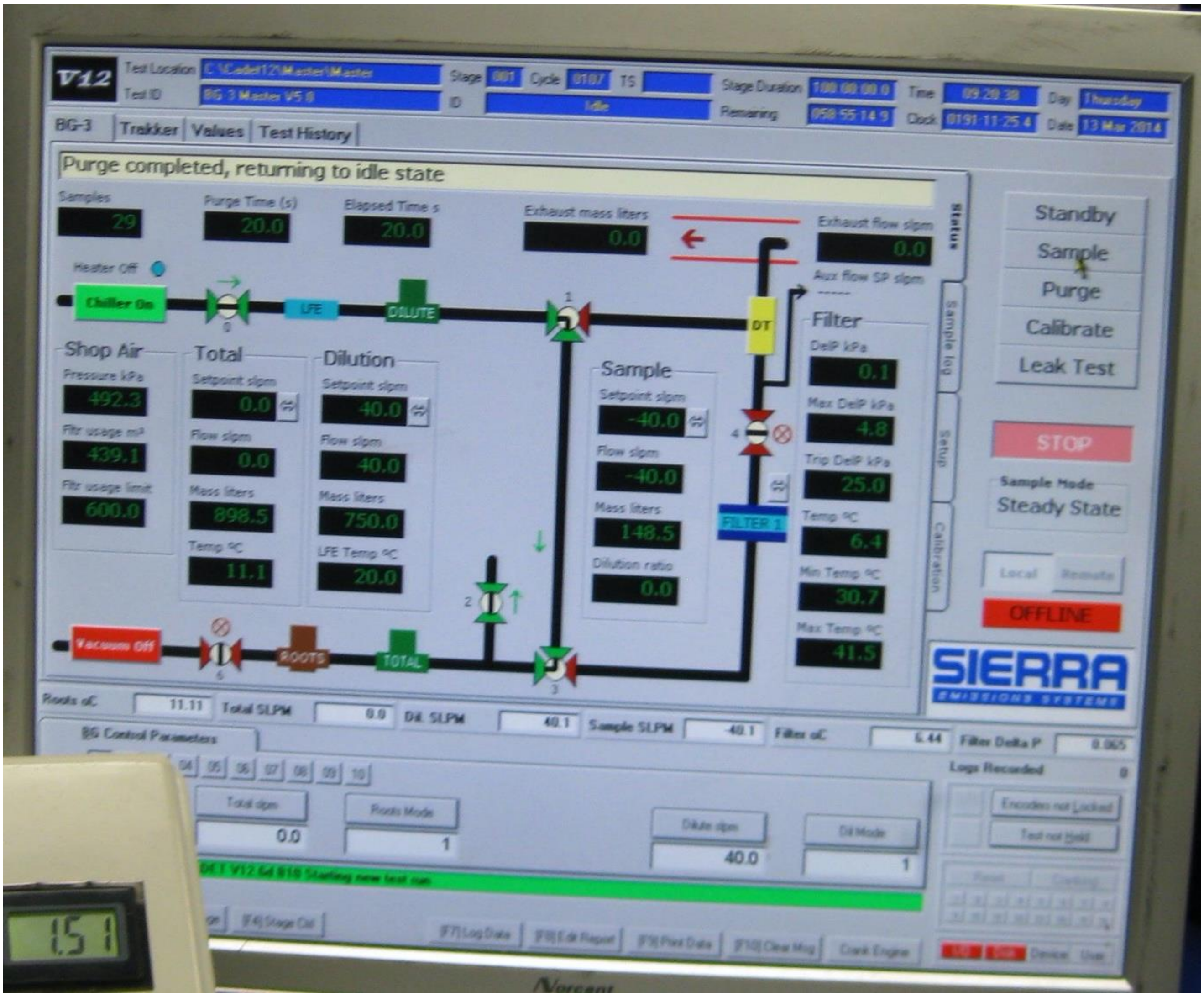

Рисунок 22

Для приведенного примера характерным являются показатели и сочетания результатов измерений различных, связанных между собой параметров работы двигателя, изменяющихся в зависимости от того фактора, который в максимальной степени влияет на результат, причём это может быть состав топливной смеси, включающий только жидкие компоненты, или жидкие и газообразные компоненты или только газообразные компоненты.

Постоянный анализ результативности всех элементов новизны и их влияния на степень или уровень достижения идеального конечного результата в максимальной степени зависят от включения или не включения в контрольно-аналитический комплекс элементов искусственного интеллекта и искусственных нейронных сетей.

Рисунок 23

Задачей включения и детального анализа влияния от такого рода включения является материал, который должен быть включён в описание заявки на изобретение, в раздел доказательства эффективности элементов существенной новизны и результатов их комплексных испытаний с применением вышеперечисленного оборудования.

В тексте заявки, относящегося к описанию процесса испытаний и характеризации результатов испытаний необходимо дать подробное детальное объяснение принципов построения испытательного процесса в сочетании с аналитической обработкой результатов испытаний и в том числе с связью с требованиями стандартов, действующих в период проведения испытаний.

Описание должно включать характеризацию общих отличительных признаков предполагаемого изобретения и их причинно-следственной связи с полученными результатами.

Также необходимо указать насколько новыми и неочевидными являются полученные результаты.

Рисунок 24

Важно показать связь изобретения с умными технологиями и возможностями комбинирования программных продуктов нового решения с элементами конструкции аппарата или системы, формирующими комплекс новых технических решений, положенных в основу предлагаемого изобретения.

[0085] Test results showed that in the…, – в этом разделе приведенные результаты испытаний идентифицируют и сравнивают с аналогичными результатами испытаний известных устройств или аппаратов.

[0086] В этом разделе доказывают, что полученные результаты испытаний соответствуют ожидаемым и декларируемым показателям идеального конечного результата.

ANALYSIS OF THE TEST RESULTS

[0087] Qualification test result analysis showed that the embodiments of the invention achieve the objective of…, – в этом разделе приводится структурный анализ и характеризация результатов испытаний опытных образцов изобретённого технического решения.

Далее необходимо проанализировать Общие отличительные признаки изобретения, которые отличают его от известных патентных материалов.

Как пример, рассмотрим изобретение – двигатель внутреннего сгорания, отнесённый к умным транспортным системам по всем элементам конструкции и принципов действия:

- двигатель внутреннего сгорания, в систему подачи и подготовки топливной смеси которого, интегрировано устройство для динамического смешивания жидкого топлива с другими компонентами топливной смеси;
- рабочий цикл устройства для динамического смешивания жидкого топлива с другими компонентами топливной смеси происходит в топливном трубопроводе при основных параметрах работы топливного трубопровода, которые имеют место в обычном рабочем цикле любого двигателя внутреннего сгорания;
- в работе двигателя с интегрированным устройством для динамического смешивания жидкого компонента топливной смеси с другими компонентами топливной смеси используются только материалы и вещества, которые принято использовать при работе серийных двигателей внутреннего сгорания;
- устройство для динамического смешивания компонентов имеет два последовательно расположенных по ходу движения топлива комплексных вводных устройств, завершающихся вихревыми генераторами, формирующими в пределах топливного трубопровода вихревую трубу;

- устройство для динамического смешивания компонентов топливной смеси имеет систему смешивания, которая при смешивании уравнивает уровень турбулентности в каждом поперечном сечении топливного трубопровода в центре поперечного сечения трубопровода и на его периферии;
- топливная смесь на выходе из устройства динамического смешивания компонентов топливной смеси, в зависимости от пропорции смешивания между компонентами, и в зависимости от характера и вида компонентов, может иметь различную структуру и состав:
  - эмульсии
  - вспененной эмульсии
  - вспененной топливной смеси
  - топливной пены
  - аэрозоли
  - газированного топлива.

Ни в одном из известных технических решений топливная смесь перед впрыском в цилиндр или камеру сгорания не имеет такой состав и структуру.

В случае, если в качестве компонента топливной смеси выступает газ, вследствие того, что в устройстве для динамического смешивания жидкого топлива с другими компонентами топливной смеси площадь контактной поверхности в пограничном слое – жидкость/газ увеличивается по сравнению с противопоставленными техническими решениями по крайней мере на порядок (как минимум в 10 раз) концентрация растворённого газа в жидкости увеличивается пропорционально увеличению площади контакта:

- для смешивания применяются только материалы и компоненты, как жидкие так и газообразные, которые традиционно применяются для приготовления топливных смесей;
- для приготовления топливных смесей в предлагаемом техническом решении применяются только известные технологические приёмы и действия…, – только гидродинамическое и аэродинамическое смешивание и не применяются технологические приёмы и действия, как в известных патентных аппликациях:
  - «Fuel converter», – декларируемый эффект достигается за счёт нагрева, испарения и катализа топливной смеси, а не за счёт только гидродинамического и аэродинамического смешивания, как имеет место в предложенном техническом решении. В известном материале отсутствуют признаки присущие техническому решению, положенному в основу настоящего изобретения и, исходя из этого,

известное техническое решение не является техническим эквивалентом заявленного технического решения ни по одному из признаков и критериев.

- «Heated catalyzed fuel injector for injection ignition engines», – декларируемый эффект достигается за счёт дополнительного сжатия и нагрева топливной смеси и дополнительного каталитического воздействия на топливную смесь, а не за счёт только гидродинамического и аэродинамического смешивания компонентов топливной смеси, как в предложенном техническом решении. В известном материале отсутствуют признаки присущие техническому решению, положенному в основу настоящего изобретения и, исходя из этого известное техническое решение не является техническим эквивалентом заявленного технического решения ни по одному из признаков и критериев.
- «Single nozzle direct injection system for rapidly variable gasoline/anti-knock agents mixtures», – декларируемый эффект является абсолютно отличающимся от эффекта у предложенного технического решения. Цель у известного технического решения…, – смешивание с топливной смесью антидетонационного агента, который снижает уровень детонации бензина. При этом смешивание осуществляется по технологии, абсолютно не равной и не эквивалентной ни по одному из признаков заявленному техническому решению; В известном материале отсутствуют признаки присущие техническому решению, положенному в основу настоящего изобретения, и, исходя из этого противопоставленное техническое решение не является техническим эквивалентом заявленного технического решения ни по одному из признаков и критериев.
- «Internal combustion engine/water sours system», – декларируемый эффект – охлаждение выхлопных газов с целью конденсации из них воды, предлагается осуществить при помощи сжатия выхлопных газов и формирования из них вихревой трубы. Исходя из материалов, изложенных в известном техническом решении, можно сделать вывод о невозможности в этом техническом решении снизить температуру выхлопных газов до такого уровня, когда возможна конденсация воды; Известное техническое решение абсолютно не работоспособно. В известном материале отсутствуют признаки присущие техническому решению, положенному в основу настоящего изобретения и, исходя из этого известное техническое решение не является техническим

эквивалентом заявленного технического решения ни по одному из признаков и критериев.

Исходя из результатов испытаний прототипа предложенного технического решения интегрированного в топливную систему серийного дизельного двигателя, полученный результат является новым для реальной практики эксплуатации дизельных двигателей и составляет, – 97% снижения уровня сажи, образовавшейся в результате горения топливной смеси в цилиндрах двигателя.

Такой результат является абсолютно новым как для дизельных так и для бензиновых двигателей, и ни одно из известных технических решений ни в одном из своих признаков, не решает эквивалентной технической задачи на таком уровне, а это значит, что известные технические решения по отношению к предложенному техническому решению с доказанной полной работоспособностью и, подтверждённой документально, эффективностью, для всех известных четырёх технических решений с неопределённой работоспособностью и с не доказанной эффективностью является с технической точки зрения неправомочным. Кроме того, предотвращение образования сажи в цилиндрах двигателя за счёт только гидродинамического и аэродинамического смешивания стандартных компонентов топливной смеси, не известного по предыдущим публикациям и изобретениям и также отсутствующего в известных технических решениях, является по отношению к каждому из, известных технических решений, отдельно и всем противопоставленным техническим решениям в совокупности, абсолютно новым.

EXAMPLES OF APPLICATIONS

[0088] In some embodiments…, – в этом разделе приводятся примеры различных вариантов применения изобретения или различных вариантов исполнения изобретения, если таковые имеются ; если разнообразие вариантов исполнений и множество вариантов применения не вошли в основные отличительные признаки формулы изобретения, то очень важно, что бы эти варианты были как можно более чётко и понятнее детально описаны. В дальнейшем при идентификации и проверке факта действительного использования изобретения, эти образцы и примеры применения помогают более убедительно доказать факты использования изобретения.

[0089] In some embodiments…, – в этом разделе приводятся примеры различных вариантов применения изобретения или различных вариантов исполнения изобретения, если таковые имеются; если разнообразие вариантов исполнений и множество вариантов применения не вошли в основные отличительные признаки формулы изобретения, то очень важно, что бы эти варианты были как можно более чётко и понятнее детально описаны. В дальнейшем при идентификации и проверке факта действительного использования изобретения, эти образцы и примеры применения помогают более убедительно доказать факты использования изобретения.

[0090] In some embodiments…, – в этом разделе указывается благодаря каким оригинальным признакам и сочетаниям признаков в каждом из рассмотренных вариантов, обеспечивается достижение идеального конечного результата, ожидаемое именно от этого исполнения.

[0091] In some embodiments…, – в этом разделе указывается благодаря каким оригинальным признакам и сочетаниям признаков в каждом из рассмотренных вариантов, обеспечивается достижение идеального конечного результата, ожидаемое именно от этого исполнения.

[0092] In some embodiments…, – в этом разделе указывается благодаря каким оригинальным признакам и сочетаниям признаков в каждом из рассмотренных вариантов, обеспечивается достижение идеального конечного результата, ожидаемое именно от этого исполнения.

[0093] In some embodiments…, – в этом разделе указывается благодаря каким оригинальным признакам и сочетаниям признаков в каждом из рассмотренных вариантов, обеспечивается достижение идеального конечного результата, ожидаемое именно от этого исполнения.

[0094] In some embodiments…, – в этом разделе указывается благодаря каким оригинальным признакам и сочетаниям признаков в каждом из рассмотренных вариантов, обеспечивается достижение идеального конечного результата, ожидаемое именно от этого исполнения.

[0095] In some embodiments…, – в этом разделе указывается благодаря каким оригинальным признакам и сочетаниям признаков в каждом из рассмотренных вариантов, обеспечивается достижение идеального конечного результата, ожидаемое именно от этого исполнения.

[0096] In some embodiments…, – в этом разделе указывается благодаря каким оригинальным признакам и сочетаниям признаков в каждом из рассмотренных вариантов, обеспечивается достижение идеального конечного результата, ожидаемое именно от этого исполнения.

[0097] In some embodiments…, – в этом разделе указывается благодаря каким оригинальным признакам и сочетаниям признаков в каждом из рассмотренных вариантов, обеспечивается достижение идеального конечного результата, ожидаемое именно от этого исполнения.

[0098] In some embodiments…, – в этом разделе указывается благодаря каким оригинальным признакам и сочетаниям признаков в каждом из рассмотренных вариантов, обеспечивается достижение идеального конечного результата, ожидаемое именно от этого исполнения.

[0099] An operating principle of the devices is…, – в этом разделе анализируются и сравниваются варианты оперирования аппаратом или устройством, анализируются варианты процессов управления, контроля и применение принципов формирования элементов обратной связи между исполнительными механизмами и системами или процессорами управления.

[0100] В этом разделе сравниваются возможности и особенности различных, перечисленных в разделе вариантов и примеров применения изобретения.

[0101] In some embodiments…, – в этом разделе указывается благодаря каким оригинальным признакам и сочетаниям признаков в каждом из рассмотренных вариантов, обеспечивается достижение идеального конечного результата, ожидаемое именно от этого исполнения.

[0102] In some embodiments…, – в этом разделе указывается благодаря каким оригинальным признакам и сочетаниям признаков в каждом из рассмотренных вариантов, обеспечивается достижение идеального конечного результата, ожидаемое именно от этого исполнения.

[0103] It will be appreciated that the…, – в этом разделе указывается благодаря каким оригинальным признакам и сочетаниям признаков в каждом из рассмотренных вариантов, обеспечивается достижение идеального конечного результата, ожидаемое именно от этого исполнения.

[0104] Various embodiments of the invention allow one or more of the following advantages…, – в этом разделе указываются и анализируются любые положительные результаты возникшие при реализации изобретения.

[0105] It will be appreciated by those skilled in the art that various omissions, additions and modifications may be made to the methods and structures described above without departing from the scope of the invention. All such modifications and changes are intended to fall within the scope of the invention, as defined by the appended claims.

Как пример аналитической оценки, приводим сравнительную Характеристику инновационного продукта, который в общем можно представить как, например – топливную смесь, заключается в следующем:

- продукт формируется в течение короткого промежутка времени – это время может быть равным как минимум нескольким миллисекундам, за которые продукт получает все необходимые характеристики и свойства и сразу становится пригодным к дальнейшему применению;
- продукт сохраняет свои свойства в течении длительного времени, если давление, под которым он сформирован не изменяется или если оно увеличивается;
- продукт способен сохранить свои свойства и характеристики и при резком повышении давления (при испытаниях получено давление продукта до 2000 бар и при этом никаких изменений в структуре и свойствах продукта не обнаружено);
- продукт имеет гибкую гидродинамическую структуру;
- продукт имеет гибкую химическую структуру;
- продукт может состоять полностью из однородных по свойствам жидкостей и газов, при этом все жидкие и газообразные компоненты могут быть смешаны в различных пропорциях и сочетаниях;
- продукт может состоять из неоднородных по свойствам жидкостей и газов, при этом все жидкие и газообразные компоненты могут быть смешаны в различных пропорциях и сочетаниях;
- к продукту после формирования могут быть добавлены различные химические вещества, не входящие в состав исходного продукта;
- к продукту во время формирования могут быть добавлены различные химические вещества, не входящие в состав исходного продукта.

Изобретённый продукт может иметь множество разновидностей. К разновидностям изобретённого продукта можно отнести:

- гомогенную смесь, состоящую из, как минимум, двух однородных жидкостей;
- гомогенную смесь, состоящую из, как минимум, двух разнородных жидкостей;
- смесь, состоящую, как минимум, из двух однородных жидкостей и, как минимум, одного газа;
- смесь, состоящую, как минимум, из двух разнородных жидкостей и, как минимум одного газа;

- смесь, состоящую из, как минимум, одного раствора из жидкостей и, как минимум, одной дополнительной жидкости;
- смесь, состоящую, как минимум, из двух однородных растворов жидкостей;
- смесь, состоящую, как минимум из двух разнородных растворов жидкостей;
- смесь, состоящую, как минимум, из двух однородных растворов жидкостей и, как минимум, одного газа;
- смесь, состоящую, как минимум, из двух разнородных растворов жидкостей и, как минимум, одного газа.

Химические реагенты могут вводиться в смесь как во время формирования, так и после формирования. Такие типы смеси также могут иметь множество разновидностей:

- смесь, состоящую из, как минимум, двух однородных жидкостей с добавлением после формирования, дополнительных химических реагентов;
- смесь, состоящую из, как минимум, двух разнородных жидкостей с добавлением после формирования, дополнительных химических реагентов;
- смесь, состоящую из, как минимум, одного раствора жидкостей и, как минимум, одной жидкости с добавлением после формирования, дополнительных химических реагентов;
- смесь, состоящую, как минимум, из двух однородных растворов жидкостей с добавлением после формирования, дополнительных химических реагентов;
- смесь, состоящую, как минимум из двух разнородных растворов жидкостей с добавлением после формирования, дополнительных химических реагентов.

Далее необходимо раскрыть суть технологии, которая положена в основу формирования нового продукта, – в качестве примера приведём смесь, суть технологии производства которой состоит в следующем:

- в момент формирования смеси уровень турбулентности во всех точках сечения потоков базовых компонентов смеси уравнивается, за счёт чего достигается необходимый уровень равномерности состояния по всему объёму и необходимый уровень размеров частиц компонентов смеси;
- кинетическая энергия частиц всех компонентов смеси консервируется, и эта энергия высвобождается в том случае, если давление, под которым находится смесь снижается или вообще становится равным атмосферному;
- высвобождение кинетической энергии компонентов смеси помогает (как например в процессе горения получить максимум распыления топливной жидкой составляющей смеси);

- количество компонентов в смеси практически не ограничено, так как аппарат для формирования смеси может быть адаптирован на необходимое количество компонентов без изменения принципиальных основ технологии;
- в случае, если в качестве одного или нескольких компонентов применяется газ или смесь газов, принципиальные основы технологии позволяют получить аэрозоль в виде смеси или позволяют смешать смесь с сжатым газом или воздухом;
- технология позволяет вести последовательный ввод дополнительных компонентов в смесь, причём количество таких компонентов и их химический состав не лимитированы;
- поскольку все параметры смеси зависят от давления в потоке компонентов смеси, регулирование свойств и параметров этой смеси может осуществляться при помощи регулировки давления.

WHAT IS CLAIMED IS…

1. Первый независимый пункт формулы имеет самое важное значение для заявки:

   Первый пункт формулы изобретения должен быть предельно кратким и при этом состоять из трёх частей:

   - В первой части даётся коммерческое название технического решения, которое должно охватывать как можно большую область коммерческого использования, и при этом давать представление о пределах распространения притязаний заявляемого технического решения, исключая рекламные обороты речи и парадоксальные утверждения;
   - Во второй части первого пункта даётся описание отличительных признаков, их совокупностей и взаимосвязей, которые известны и используются как базовые для реализации отличительных признаков;
   - В третьей части первого пункта даётся описание отличительных признаков, их совокупностей и статических и динамических связей отличительных признаков с базовыми известными признаками, которые в совокупности обеспечивают достижение идеального конечного результата.

Последующие зависимые пункты формулы должны более детально характеризовать отличительные признаки в как можно более общей форме. Все последующие пункты формулы должны раскрывать все возможные варианты применения отличительных признаков для формирования эффекта и достижения идеального конечного результата. Если идеальный конечный результат может быть достигнут в некоторых вариациях и при условии наличия различных вариантов сочетания отличительных признаков с базовыми признаками, в последующих пунктах указываются все возможные варианты.

Каждый последующий пункт формулы также состоит из трёх частей, требования к каждой из которых соответствует требованиям к первому пункту формулы.

2. Второй независимый пункт формулы изобретения.
3. Зависимый пункт от первого и третьего пунктов формулы изобретения.
4. Зависимый пункт от первого и третьего пунктов формулы изобретения.
5. Зависимый от первого и третьего пунктов формулы изобретения.
6. Зависимый от первого и третьего пунктов формулы изобретения.
7. Третий независимый пункт формулы изобретения:

   Если объект изобретения, – устройство или аппарат и названой, – например аппарат, то желательно иметь как минимум три независимых пункта формулы, чтобы первый пункт был, – аппарат для…, метод применения и ассоциированный способ изготовления.

   Третий пункт, – метод применения аппарата.

8. Восьмой пункт, – аппарат для… и ассоциированный способ его изготовления.

Всё указанное только пример, каждое техническое решение имеет свои оригинальные особенности и от этого могут меняться состав и структура построения пунктов формулы изобретения.

ABSTRACT OF THE DISCLOSURE

Аннотация в принципе не отличается чем-то особенным и рекомендаций к оформлению не требует.

СПИСОК ИСПОЛЬЗОВАННОЙ ЛИТЕРАТУРЫ, ПАТЕНТНЫХ И ЛИЦЕНЗИОННЫХ МАТЕРИАЛОВ

ПРИЛОЖЕНИЕ 1

United States Patent Application **20190199733**

Kind Code **A1**

AALTONEN; Janne ; et al. **June 27, 2019**

ARTIFICIAL INTELLIGENCE DATA PROCESSING SYSTEM AND METHOD

Abstract

There are provided a **system** that is capable of performing tasks associated with IPR procurement. The **system** employs a computing architecture that provides characteristics of **artificial intelligence** (AI). The computing architecture employs a configuration of pseudo-analog variable-state machines that is implemented by disposing the pseudo-analog variable-state machines in a hierarchical arrangement, wherein pseudo-analog variable-state machines higher in the hierarchical arrangement mimic behavior of a human claustrum for performing higher cognitive functions when processing information associated with one or more service requests and for performing quality checking of the one or more work products. Moreover, the computing architecture is susceptible to being implemented by employing a novel configuration of data processing devices, for example arrays of RISC processors.

ПРИЛОЖЕНИЕ 2

United States Patent Application **20190205606**

Kind Code **A1**

Zhou; Shaohua Kevin ; et al. **July 4, 2019**

METHOD AND SYSTEM FOR ARTIFICIAL INTELLIGENCE BASED MEDICAL IMAGE SEGMENTATION

Abstract

Methods and systems for **artificial intelligence** based medical image segmentation are disclosed. In a **method** for autonomous **artificial intelligence** based medical image

segmentation, a medical image of a patient is received. A current segmentation context is automatically determined based on the medical image and at least one segmentation algorithm is automatically selected from a plurality of segmentation algorithms based on the current segmentation context. A target anatomical structure is segmented in the medical image using the selected at least one segmentation algorithm.

ПРИЛОЖЕНИЕ 3

United States Patent Application	**20190206218**
Kind Code	**A1**
KUSENS; BRUCE HOWARD ; et al.	**July 4, 2019**

UTILIZING ARTIFICIAL INTELLIGENCE TO DETECT OBJECTS OR PATIENT SAFETY EVENTS IN A PATIENT ROOM

Abstract

Methods and systems are provided for detecting objects or patient safety events in a patient room. **Artificial intelligence** is utilized to enhance safety issue recognition capabilities by the methods and systems. Sensors collect a series of images and depth data in a room of a patient. Data (corresponding to images and depth data of an object or patent safety event) is received from the sensors and compared to stored data to identify the object or patient safety event. The images are communicated to a central video monitoring **system** and a user may be prompted to confirm if the object requires learning or a patient safety event occurred (or identify the object or patient safety event) or to provide additional parameters or actions. A patient safety learning **system** analyzes the data and incorporates the user response to enhance safety issue recognition capabilities of the **system** and reduce false alerts.

ПРИЛОЖЕНИЕ 4

United States Patent Application	**20190189236**
Kind Code	**A1**

Poliakov; Pavel ; et al. **June 20, 2019**

ARTIFICIAL INTELLIGENCE BASED MONITORING OF SOLID STATE DRIVES AND DUAL IN-LINE MEMORY MODULES

Abstract

In embodiments, a memory controller (MC) includes an output interface, and an execution engine (EE) to identify, based on field test results of a die coupled to the MC, initial test results of the die using an **artificial** neural network (ANN) trained to identify the die from a set of NVM dies based on initial test results of the set of NVM dies obtained at a time of manufacture of the set of dies. The initial test results include a first useful life prediction and the field test results include a second useful life prediction, and the initial test results are regenerated by the ANN to protect their confidentiality. In embodiments, the MC is further to compare the second useful life prediction with the first useful life prediction, to determine a deviation between the two, and output, via the output interface, the deviation to a user.

ПРИЛОЖЕНИЕ 5

United States Patent Application **20190205885**

Kind Code **A1**

Lim; Chern Jie ; et al. **July 4, 2019**

MACHINE LEARNING ENGINE FOR FRAUD DETECTION FOLLOWING LINK SELECTION

Abstract

A machine learning engine for fraud detection following link selection may be trained using **artificial intelligence** techniques and used according to techniques discussed herein. A buyer account may be used to establish and generate a digital gift card having a particular value specified by the buyer. The digital gift card may then be conveyed to another account, such as an email address. The digital gift card may be provided with an online electronic process for redemption and use of the value, for example, by selecting a link and navigating

to the process. When the claimer account attempts to utilize the value of the gift card by navigating to the process or otherwise engaging in the electronic process through a device, a risk and fraud analysis engine may execute to determine, based on real-time data of the claimer account, the buyer account, and/or device, whether the digital gift card was generated fraudulently or is being used fraudulently.

ПРИЛОЖЕНИЕ 6

United States Patent Application	**20190199549**
Kind Code	**A1**
PARK; Sang Bae ; et al.	**June 27, 2019**

DEVICE OF CONTROLLING RELATED DEVICE USING ARTIFICIAL INTELLIGENCE BASED ON OPERATION SITUATION, SCHEDULE BOT AND SERVER CONTROLLING THEREOF

Abstract

This application is a technology with regard to a device that controls a related device based on an operation situation using **artificial intelligence,** a schedule bot and a server that controls the same, and the device that receives a control of the related device based on the operation situation by an exemplary embodiment of this application includes a function unit that performs a physical function of the device, a communication unit that receives a time schedule and function information from a related device or a schedule management device, and control unit that controls the function unit to maintain a ready state so that a function unit performs a first function at a point that is indicated in the time schedule by using the time schedule and the function information that the communication unit receives.

ПРИЛОЖЕНИЕ 7

United States Patent Application	**20190197357**
Kind Code	**A1**

ANDERSON; GLEN J. ; et al. **June 27, 2019**

MISUSE INDEX FOR EXPLAINABLE ARTIFICIAL INTELLIGENCE IN COMPUTING ENVIRONMENTS

Abstract

A mechanism is described for facilitating misuse index for explainable **artificial intelligence** in computing environments, according to one embodiment. A **method** of embodiments, as described herein, includes mapping training data with inference uses in a machine learning environment, where the training data is used for training a machine learning model. The **method** may further include detecting, based on one or more policy/parameter thresholds, one or more discrepancies between the training data and the inference uses, classifying the one or more discrepancies as one or more misuses, and creating a misuse index listing the one or more misuses.

ПРИЛОЖЕНИЕ 8

United States Patent Application **20190187775**

Kind Code **A1**

Rotem; Nadav ; et al. **June 20, 2019**

DYNAMIC POWER MANAGEMENT FOR ARTIFICIAL INTELLIGENCE HARDWARE ACCELERATORS

Abstract

A computer-implemented **method** for dynamically managing the power usage and/or performance of an **artificial intelligence** (AI) hardware accelerator may include (1) receiving an instruction stream that includes one or more instructions for performing at least one AI-specific computing task, (2) identifying a plurality of special-purpose, hardware-based functional units configured to perform AI-specific computing tasks, (3) predicting, based on an analysis of at least a portion of the instruction stream, a power-usage requirement for at least one of the functional units when executing the instruction

stream, and then (4) modifying, based on the power-usage requirement, the power supplied to at least one of the functional units. Various other methods and systems are also disclosed.

ПРИЛОЖЕНИЕ 9

United States Patent Application	**20190188570**
Kind Code	**A1**
ALDEA LOPEZ; Sergio	**June 20, 2019**

METHODS AND APPARATUS FOR MODEL PARALLELISM IN ARTIFICIAL NEURAL NETWORKS

Abstract

The **method** according to an embodiment comprises automatically controlling allocation, to memories of available hardware resources, of parameters defining computational operations required to calculate an output of at least one layer of neurons of an **artificial** neural network. The allocation is controlled on the basis of previously-defined allocation data specifying how the operations required to calculate the output of the one layer of neurons are to be allocated to hardware resources to perform the operations. The allocation data is pre-defined using, at least partly, an automatic computer-implemented process, which may include checking before each iteration of the network which of the hardware resources are available to execute that iteration of the network and, if necessary, re-defining the allocation data for that iteration accordingly

ПРИЛОЖЕНИЕ 10

United States Patent Application	**20190192258**
Kind Code	**A1**
KANG; Je Hun ; et al.	**June 27, 2019**

AUTOMATIC STEPWISE TOOTH MOVEMENT SYSTEM AND METHOD USING ARTIFICIAL INTELLIGENCE TECHNOLOGY

Abstract

Disclosed is a stepwise automatic orthodontic **system and method** using an **artificial intelligence** technique. The **method** includes: scanning a dental state of a patient by using an intraoral scanner; allowing a server to determine to which group of grouped data of the database the scanned dental data belong; allowing the server to refer to data of the determined group, move a tooth needing orthodontics gradually, and generate a predictive digital orthodontic dental data set; allowing the server to transmit the orthodontic-processed digital orthodontic dental data set of a patient to a 3D printer, and allowing the 3D printer to generate and output a dental orthodontic model; and generating a clear aligner by vacuum-compressing a transparent synthetic resin plate to the generated dental orthodontic model through a vacuum former. In the exemplary embodiment of the present invention, the orthodontic patient is clustered or grouped through an unsupervised learning based on the good orthodontic data excluding personal information of the patient, and the tooth moving plan for orthodontics through repeated reinforcement learning satisfying the orthodontic limit condition suggested by the grouped data and the orthodontics textbook for respective steps.

ПРИЛОЖЕНИЕ 11

United States Patent Application	**20190188524**
Kind Code	**A1**
He; Lu ; et al.	**June 20, 2019**

METHOD AND SYSTEM FOR CLASSIFYING AN OBJECT-OF-INTEREST USING AN ARTIFICIAL NEURAL NETWORK

Abstract

Methods, systems, and techniques for classifying an object-of-interest using an **artificial** neural network, such as a convolutional neural network. An **artificial** neural network receives a sample image including the object-of-interest overlaying a background and a sample background image excluding the object-of-interest and corresponding to the background overlaid by the object-of-interest. The object-of-interest is classified using the

artificial neural network. The **artificial** neural network classifies the object-of-interest using the sample background and sample images. Prior to receiving the sample background and sample images the **artificial** neural network has been trained to classify the object-of-interest using training image pairs. Each of at least some of the training image pairs includes a first training image that includes a training object-of-interest overlaying a training background and a training background image excluding the training object-of-interest and corresponding to the training background.

ПРИЛОЖЕНИЕ 12

United States Patent Application	**20190171950**
Kind Code	**A1**
Srivastava; Kumar	**June 6, 2019**

METHOD AND SYSTEM FOR AUTO LEARNING, ARTIFICIAL INTELLIGENCE (AI) APPLICATIONS DEVELOPMENT, OPERATIONALIZATION AND EXECUTION

Abstract

Disclosed is a **method and a system a method and a system** for auto learning, **artificial intelligence** (AI) applications development, and execution. Various applications or operations may be associated with training environment-agnostic AI models, automated AI app application performance monitoring, fault, quality and performance remediation through prediction of failures or suboptimal performance, privacy and secure AI training and inference mechanism for data and AI model sharing between untrusted parties, and building auto learning applications that can automatically learn and improve.

ПРИЛОЖЕНИЕ 13

United States Patent Application	**20190171944**
Kind Code	**A1**

LU; Mingzhu **June 6, 2019**

INTEGRITY EVALUATION OF UNSTRUCTURED PROCESSES USING ARTIFICIAL INTELLIGENCE (AI) TECHNIQUES

Abstract

A process integrity evaluation **system** ensures integrity of unstructured processes. The process integrity evaluation **system** handles structured, semi-structured, and unstructured data at massive and large scale. The **system** provides scalability, secure storage, indexing, knowledge storage, and visualizations of processes by information retrieval, natural language processing, cloud computing, large scale machine learning, knowledge discovery, and other **artificial intelligence** techniques. Self-provided data, systematically gathered data, and potentially related data from additional sources are incorporated in the process integrity evaluation **system** which provides the core capabilities of data integrity checking, entity extraction, entity resolution, entity categorization, entity relationship extraction, processes extraction and reconstruction based on knowledge storage, such as knowledge graphs, inference functions, and evaluation computations. After extracting and reconstructing unstructured processes successfully, machine learning functions compute an integrity assurance score, e.g., a similarity, between extracted documents and the internal records in addition to an evaluation result, which can ensure the integrity of the unstructured processes.

ПРИЛОЖЕНИЕ 14

United States Patent Application **20190140913**

Kind Code **A1**

GUIM BERNAT; Francesc ; et al. **May 9, 2019**

TECHNIQUES FOR ARTIFICIAL INTELLIGENCE CAPABILITIES AT A NETWORK SWITCH

Abstract

Examples include techniques for **artificial intelligence** (AI) capabilities at a network switch. These examples include receiving a request to register a neural network for loading to an inference resource located at the network switch and loading the neural network based on information included in the request to support an AI service to be provided by users requesting the AI service.

ПРИЛОЖЕНИЕ 15

United States Patent Application	**20190171928**
Kind Code	**A1**
Young; Robin	**June 6, 2019**

DYNAMICALLY MANAGING ARTIFICIAL NEURAL NETWORKS

Abstract

In some embodiments, the disclosed subject matter involves using socket layers with a plurality of **artificial** neural networks in a machine learning **system** to create customizable inputs and outputs for a machine learning service. The machine learning service may include a plurality of convolutional neural networks and a plurality of pre-trained fully connected neural networks to find the best fits. In an embodiment, when the customized input or output data is not a good fit with the pre-trained **artificial** neural networks, a socket layer may automatically request additional convolutional layers or new training of a neural network to dynamically manage the machine learning **system** to accommodate the customized input or customized output. Other embodiments are described and claimed.

ПРИЛОЖЕНИЕ 16

United States Patent Application	**20190163714**
Kind Code	**A1**
MA; Yanjun ; et al.	**May 30, 2019**

SEARCH RESULT AGGREGATION METHOD AND APPARATUS BASED ON ARTIFICIAL INTELLIGENCE AND SEARCH ENGINE

Abstract

The present disclosure provides a search result aggregation **method** and apparatus based on **artificial intelligence** and a search engine. The **method** includes: obtaining a query; generating a plurality of search results according to the query; obtaining a plurality of corresponding demand dimensions according to the query; aggregating the plurality of demand dimensions according to the plurality of search results; obtaining an answer corresponding to each demand dimension, and aggregating the answers corresponding to the plurality of demand dimensions according to the aggregated demand dimensions to generate an aggregation result.

ПРИЛОЖЕНИЕ 17

United States Patent Application	**20190156222**
Kind Code	**A1**
Emma; Maria ; et al.	**May 23, 2019**

ARTIFICIAL INTELLIGENCE PLATFORM WITH IMPROVED CONVERSATIONAL ABILITY AND PERSONALITY DEVELOPMENT

Abstract

System, methods, and apparatuses for an **artificial intelligence** (AI) toy with improved conversational dialogue and personality development. The AI toy determines responses to stimuli based on user profiles and personality profiles that are developed through user interaction and external media inputs. Natural Language Processing (NLP) and other semantic interaction processing is paired with the profiles to develop AI personality and conversational ability.

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Society and Weapons: Civil Law, Criminal Law, and Historiographical Aspects

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Abstract

Weapons per se are a source of increased danger; their spread in the society is influenced by various economic, moral and other important factors, to be topped by such key factor as the Law of Ukraine "On Weapons". Great importance on the part of Ukrainian government authorities and civil-society organizations is attached in this context to the development and implementation of the national doctrine of supporting the security of man, society and the State, as well as to improving the efficiency and effectiveness of legislative, law enforcement and human rights activities.

Keywords: Constitution of Ukraine, society, weapons, civil law, criminal law, historiographical aspects, Law of Ukraine "On Weapons".

Introduction The current state of the Ukrainian society requires the development of an efficient and pragmatic concept of the State formation, therefore, the issues related to building a sovereign, democratic, social and law-based State to ensure comprehensive protection of human and civil rights and freedoms are acquiring particular relevance, novelty, and practical significance these days (Articles 1, 3, 17, 19 of the Constitution of Ukraine) [1]. For the first time during the last three centuries of building Ukraine's statehood, the 1996 Constitution of Ukraine formulated a human-centric conceptual basis on which the State and society's position towards the individual and the citizen is founded. For example, Article 3 of the Ukrainian State's Organic Law stipulates that "An individual, his life and health, honor and dignity, inviolability and security shall be recognized in Ukraine as the highest social value. Human rights and freedoms, and guarantees thereof shall determine the essence and course of activities of the State. The State shall be responsible to the individual for its activities. Affirming and ensuring human rights and freedoms shall be the main duty of the State" [1]. Ukraine's Organic Law thus defines the doctrinal framework for prioritized development of theory and methodology, diplomacy, and cultural studies, policies and strategies in the activities pursued both by the legislative, executive, judicial branches and by civil-society organizations.

Implementing constitutional provisions in education, science and practice of the Ukrainian statehood is relevant, since the country's domestic situation has been characterized by complexities and contradictions in the process of developing, building and ensuring the State doctrine of individual, public and national safety [2, 3].

Emergence of a new society where the relationships of private, communal and State property are to prevail necessarily requires a new approach towards protection of such property, individual rights, along with protecting the human beings themselves, their life, honor and dignity against criminal encroachments.

New patterns of relationships form a legal framework for the protection of individual and his/her interests, which is a positive phenomenon. However, against this positive backdrop, certain negative phenomena are emerging, such as the rise in crime, slackness in the operation of law enforcement agencies that fail to keep the pace with the ever growing negativity. In this situation, the public harbors a natural desire for self-defense, including the use of weapons or other means of combating crime.

Article 27.2 of Ukraine's Constitution declares that "Everyone shall have the right to protect his life and health, and lives and health of other people against unlawful encroachments" [1]. This constitutional provision has been enshrined in other areas of law. For example, the Criminal Code of Ukraine in its Article 15 "Necessary Defense" expressly refers to an actual possibility for an individual to employ a weapon when using this institute. One of the ways to protect the above-mentioned human rights is an individual's right to possess, carry, use and employ weapons. To a certain extent, the right of citizens to own weapons contradicts the right of other citizens to life and health, since it potentially entails deadly use of such weapons against other citizens. Weapons, especially firearms, when directed against a person, are capable not only of causing a certain harm to human health, but also of taking the life of the person against whom they are applied. The internal affairs authorities thus bear statutory responsibility for performing both licensing (granting licenses to own, use, and store weapons) and monitoring functions (verifying the legality of owning weapons, collecting information on the instances of deadly force used against humans and assessing the lawfulness of such use of firearms, etc.) functions. Furthermore, the internal affairs authorities maintain records of firearms held by both legal entities and citizens residing within Ukraine.

In the independent Ukraine, the legal regulation of firearms circulation began with the adoption on 06/17/1992 by the Verkhovna Rada of Ukraine of the Resolution "On Titles to Certain Types of property" whose Appendix 2 sets out a special procedure for acquisition by citizens of titles to specific types of property.

This special procedure for title acquisition applies to smooth-bore and rifled hunting weapons, gas pistols or revolvers and cartridges thereto filled with tear-inducing or irritating substances, edged weapons, as well as pneumatic weapons whose bullet velocity exceeds 100 mps and caliber — 4.5 mm. The next step in this field was the adoption by the Cabinet of Ministers of Ukraine on 10/12/1992 of the Resolution "On Licensing System" that directly addresses the firearms circulation in Ukraine. The Order No. 164 adopted on 25 March 1993 by the Ministry of Internal Affairs (MIA) of Ukraine approved the guidelines "On the procedure for manufacture, purchase, storage, keeping records, transportation and use of firearms, ammunition thereto, and explosives" (no longer effective under the new Order No. 622 adopted by the Ministry of Internal Affairs of Ukraine on 08/21/1998). In this country, social relations associated with firearms circulation are currently regulated by 89 legal acts (including laws, orders, resolutions, etc.). Regretfully, the key piece of legislation — the Law of Ukraine "On Firearms" — is missing among them. The expediency of adopting this Law was mentioned way back in the Regulations "On the 'Personalized Firearms' Presidential Decoration" adopted on 04/29/1995. Adopting this law and conducting this research are also relevant in view of the fact that, with the adoption of the Constitution of Ukraine in 1996, a new impetus was given to building a democratic, law-based State whose key objective and mission are to assert, safeguard and protect human and citizen's rights and freedoms against unlawful encroachment. Addressing this task entails resolving a number of complex political, economic, social and legal problems, as the actual state of affairs in the country and society is still far from meeting the dictates of the time.

It is well known that, over the last decade, the global community has been experiencing a certain boom of "armed" crime.

The underworld uses various weapons in its criminal activities, such as firearms, edged, projectile, pneumatic, tear gas, electric and other weapons.

Summarized findings of our experimental, sociological and historiographical studies (1930-2003) [4, 5, 6], statistics from the government institutions, legislative, executive and judicial authorities indicate that the complexity of addressing this problem is further exacerbated by the lack in Ukraine of a clear and efficient mechanism of legislative support for the circulation of firearms, at the same time being characterized by manifestations of latent illicit trafficking in these weapons as a real threat to rights and freedoms of man, society and the State [5, 7, 8, 9, 10].

Our generalized comparative analysis of modern criminal statistics on arms trafficking in the country shows that, in the course of special operations conducted by law enforcement units in Ukraine, 23,419 firearms were seized from illicit traffic between 1992 and 2000 only. Between 1992 and 1999, more than 1,491 firearms were stolen in Ukraine. 8,952 crimes were committed with these weapons throughout Ukraine in 1992–1999 [4].

Forestry statistics, however, indicate that, as of 01/01/2003, about 480 thousand hunters were registered in Ukraine, with the total area of hunting grounds covering 48m hectares, of which 37m hectares (77.4% of all Ukraine's hunting grounds) were made available to the Ukrainian Society of Hunters and Fishermen, 6.6m hectares (13.8%) — to the State Forestry Committee's enterprises, 1.1m hectares (2.3%) — to the Society of Military Hunters and Fishermen, 3.1m hectares (6.5%) — to more than 90 other users.

More than 5.3 thousand people are currently employed in Ukraine's hunting sector, including 560 hunters and 3,790 full-time game wardens [11].

As of 01/01/2000, 668,579 firearms owners were registered by the Ukrainian MIA's licensing system, who currently hold 754,694 own firearms.

Furthermore, findings of a generalized study conducted by a group of authors indicate that, between 1991 and 1995 only, in addition to smooth-bore hunting firearms, citizens of Ukraine purchased from business entities (shops, companies) 9,000 special-purpose smooth-bore and combat firearms whose performance is non-compliant with the standards and criteria established for hunting weapons in Ukraine or globally, and which, under the legal rules and statutory methodology, could not and should not have been imported and sold in this country as smooth-bore hunting weapons [12, 13, 14].

The police currently keep records of 116,000 special devices (gas sprays, pistols and revolvers) that are held by Ukrainian citizens and are allowed by the government only to individuals over 18 years of age, subject to the positive opinion of a relevant medical board and a licensing body decision.

According to the MIA of Ukraine, as of 12/01/2002, almost 25 thousand firearms were seized from the criminals — enough to arm 17 regiments, and almost four thousand kilograms of explosives — enough to manufacture more than five thousand anti-personnel mines.

Compared to 1997, the number of firearm murders dropped by 34% in 2002; nevertheless, there are still lots of weapons in circulation.

This is evidenced by a recent report of the Ukrainian MIA about a record arsenal of weapons stolen by the underworld for its criminal purposed from the government in the Kirovohrad Oblast. About 200 pistols and submachine guns, 44 anti-tank grenade launchers, 75 kg of TNT, and more than 17 thousand rounds were taken there from a guarded weapons depot by the criminals.

In 2002, police officers in the Rivne Oblast detained a group of gangsters whose hiding place was a storage for a machine gun, pistols with silencers, hand grenades, sawn-off hunting shotguns, ammunition, masks, shackles, poison ampoules.

Crime statistics from many countries show that the key negative trends in the "armed" crime manifestations include: 1) high social tensions prevailing in many regions across the globe, where weapons circulate (Afghanistan, Chechnya, Iraq, etc.); 2) a fairly high percentage of crimes committed with the use of firearms, mines and explosives; 3) a rapidly expanding range of various types of weapons used for criminal purposes (portable, maneuverable, simply designed and widely available weapons for private use, such as firearms, edged, projectile, pneumatic, tear gas, electric weapons); 4) the 9/11 attacks in the United States and recent global developments clearly show the growing trend towards the use of weapons in terrorist crimes; 5) there is a real threat that weapons of mass destruction (nuclear, chemical, biological, etc.) may be used in crime.

Below we present the findings of our own social research focused on current problems of weaponology and legal regulation of firearms circulation in Ukraine. They were obtained by surveying more than 200 persons from a certain category of population, including cadets of the Academy of the Ministry of Internal Affairs, secondary school teachers and university students, aged between 17 and 55.

These findings allow for the following conclusions:

1) only 5% of the MIA Academy cadets answered "yes", while the rest — 95% — answered "no" to the first question of the survey, "Is our society ready for free sale of firearms?" Only 4% of the surveyed secondary school teachers responded positively to this question.

Following the analysis of answers to the first question, it may be concluded that responses from university students differ from those given by the MIA cadets and secondary school teachers (15% of the students believe that the public is ready for free sale of firearms, while 85% think that the opposite is true). Summarized opinion of the respondents shows that our society is still not ready for free sale of firearms.

2) 42% of the MIA cadets responded positively to the question "How do you feel about buying and carrying a firearm?" This can be explained by the fact that their future occupation is associated with carrying and using firearms. Only 12% of the teachers responded positively. An explanation to this is that 80% of teachers are women, and carrying

weapons is not natural for women. 28% of the students also responded positively to the question.

3) findings of the survey show that, in response to the question “Does buying a firearm mean the exercise by a person of a right to protect his/her life?”, 65% of the MIA cadets expressed opinion that purchasing a firearm constituted the exercise of a constitutional right to protect one’s life. However, 35% of the cadets think otherwise. The same position is shared by the secondary school teachers, only 20% of whom support this suggestion, while 80% are against it. Various reasons could be cited to explain the teachers’ attitude. For example, the teachers are opposed to the idea of children below 18 bringing weapons to school. This may affect their outlook, interfere with the process of proper school education, etc.

4) as may be seen from the answers to the question “Do you think that crime rates will increase if free sale of firearms is allowed?”, 90% of the cadets believe that crime rates will increase because of this.

Secondary school teachers believe that the answer to this question may be fifty-fifty. In other words, half of the surveyed teachers think that crime rates will rise because of the higher circulation of weapons, while the other half believe that these rates will drop, since potential offenders will think that the victim might be carrying a weapon that can be used for self-defense. Of the total number of students participating in the survey, only 40% think that the crime rates will grow, whereas 60% believe that they will drop. There is no easy explanation to this; perhaps, the students were more concerned with their future than with crime rates.

5) as regards the next question, statistics show that 80% of the MIA cadets would buy firearms or some other weapons, if free sale of weapons were allowed. Teachers, meanwhile, do not want to do anything with guns. However, 15% of the surveyed teachers would still buy a firearm for personal use. Perhaps this can be explained by the expectations of these 15% of the teachers that, with firearms in their possession, they would guarantee themselves self-defense against offenders. The students, 60% of whom responded positively, believe that this is the only way to protect themselves. The remaining 40% merely share negative attitude towards guns.

6) when answering the survey question “Please list those categories of persons to

whom you would prohibit buying a firearm," opinions of the respondents differed, i.e., 9% believe that mentally ill persons must be prohibited from buying and carrying weapons. 17% believe that buying a weapon should be prohibited to mentally unstable individuals and to those who are registered with neuropsychiatric dispensaries. 25% of the respondents would ban selling weapons to persons with drug and alcohol addictions. 18% of the respondents believe that the sale of weapons must be prohibited to persons released from prison. 11% believe that such a ban should be extended to incapacitated persons. 20% of all the respondents believe that selling and carrying guns should be prohibited to everyone, save for those whose professional duties are associated with wearing and using firearms.

It should be noted generally that those were not the only categories of people mentioned in the survey responses. Another category included minors. Only 5% of all respondents voted in favor of them. Only one respondent suggested that "tear gas weapons should be sold only to those aged 20, while firearms — only to those above 25 years of age, except mentally sick, unstable, incapacitated and other persons."

7) all the respondents split into two categories when answering the question "What kind of weapon do you prefer?"; i.e., with the three groups (the MIA cadets, secondary school teachers, university students) being 100%, 80% spoke in favor of tear gas weapons. This can be explained by the unwillingness of the majority of the respondents to do serious harm to other people when using weapons. The other group, i.e., 20%, prefer firearms. In other words, they believe that firearms offer more protection.

8) replying to the survey question "What, in your opinion, should be the responsibility for illegal use of weapons?," the majority of the respondents said that illegal use of weapons must be criminalized irrespective of the circumstances or severity of the crime. When answering this question, the teachers (25%) and students (15%) expressed the opinion that some other responsibility should be imposed, without going into further details.

Our social research findings lead to the conclusion that our society is not inclined towards free sale and carrying of firearms. The reasons for this are both the specifics of our nation's economic development and a peculiar public mentality.

That is why today, against the background of growing arms trafficking, a significant number of respondents rightly emphasize the need for prosecuting the persons who illegally possess firearms.

Conclusions Weapons themselves are a source of increased danger; their spread in the society is influenced by various economic, moral and other important factors, to be topped by such key factor as the Law of Ukraine “On Weapons” [15, 16, 17]. Great importance on the part of Ukrainian government authorities and civil-society organizations is attached in this context to the development and implementation of the national doctrine of supporting the security of man, society and the State, as well as to improving the efficiency and effectiveness of legislative, law enforcement and human rights activities.

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International Experience of the U.S. Bureau of Alcohol, Tobacco and Firearms Operation (Civil Law and Criminal Law Relationship)

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Abstract

The U.S. Bureau of Alcohol, Tobacco and Firearms (ATF) is a tax-collecting, enforcement and regulatory arm of the U.S. Department of the Treasury [2, pp. 1–7]. In common with all other members of the executive branch, ATF's responsibility is established by congressional action. ATF cannot enact a law, nor can it amend the law. Charged as it is with fiscal oversight of some of the most controversial topics in Western civilization, ATF strives to maintain professional neutrality while giving a 35-to-1 return on every dollar it spends. ATF has the best cost-to-collection ratio in the federal family.

ATF is the youngest tax-collecting Treasury agency, separated from the Internal Revenue Service by

Treasury Department Order No. 120-1 (former No. 221), effective 1 July 1972. Notwithstanding, ATF traces its roots across two hundred years of American history.

Keywords: key provisions of U.S. laws regulating firearms; legal and institutional tools to monitor transactions between states, monitor transactions between countries; accounting and reporting of manufacturing, importing and dealing in firearms.

Introduction In 1789 under the new Constitution [1, pp. 19–21], the first Congress imposed a tax on imported spirits to offset a portion of the Revolutionary War debt assumed from the states. Administration of duties fell to the Department of the Treasury, whose Secretary, Alexander Hamilton, had suggested them. Congressional lawmakers were favorably impressed by the results. The imports tax was augmented by one on domestic production in 1791. Taxpayers had grumbled over import duties, while some of them greeted the domestic levy — as they do today — with political resistance, escalating in that early case to the short-lived Whisky Rebellion of 1794. Both revenue sources survived rebellion – as they do today. Although these particular taxes were eventually abolished, similar devices for revenue came and went as needed until 1862. By Act of 1 July 1862, Congress created an Office of Internal Revenue within the Treasury Department, charging the commissioner with collection, among others, of taxes on distilled spirits and tobacco products that continue, with amendments, today [6]. Because taxation so often does evoke public resistance, including criminal evasion, during 1863 Congress authorized the hiring by Internal Revenue of "three detectives to aid in the prevention, detection and punishment of tax evaders." Tax collecting and enforcement were now under one roof. Before decade's end, the Office of Internal Revenue had its own counsel, another component descending in unbroken line to ATF today.

In 1875, federal investigators broke up the "Whiskey Ring", an association of grain dealers, politicians and revenue agents that had defrauded the government of millions of dollars in distilled spirits taxes. Responding to the snowballing scandal, Congress undertook the first Civil Service reform acts, acknowledging formally that effectiveness of law depends on the quality of its administrators.

The commissioner's annual report for 1877 refers to his office as the Bureau of Internal Revenue, a title that it retained for the next seventy-five years. In 1886, a single employee from the Department of Agriculture came to the Bureau of Internal Revenue under authority of the Oleomargarine Act to establish a Revenue Laboratory [6]. The first samples received in the laboratory that 29 December were of butter suspected of adulteration with oleomargarine. In its second century, ATF's laboratory staff includes — but is not limited to — chemists, document analysts, latent print specialists, and firearms and toolmark examiners, supported by its own highly sophisticated facilities at Rockville, Maryland, Atlanta, Georgia, and Walnut Creek, California [7-11]. That first chemist would recognize some aspects of laboratory service today (analysis of alcohol and tobacco products, for instance) although tools such as chromatography and electrophoresis might seem magic. There was nothing in 1886 to foreshadow the Laboratory's sought-after forensic skills in arson, explosives, and criminal-evidence examination, a resource now available to law enforcement personnel worldwide [7-11].

Ratification of the Eighteenth Amendment to the Constitution in 1919, in combination with the Volstead Prohibition Enforcement Act of that year, brought to prominence those officers — "revenoors" — charged with investigating criminal violations of the Internal Revenue law, including illicit manufacture of liquors. By early 1920, these experts coalesced into the Prohibition Unit. Evolution of this unit reflects the difficulty of enforcing a nation-wide ban on "manufacture, sale or transportation of intoxicating liquors for beverage purposes." Internal Revenue's orientation has been toward collection throughout its history. Enforcement efforts, albeit necessary, never came easily. On 1 April 1927, Treasury elevated the Prohibition Unit to bureau status within the department. Congress was impatient with the results. On 1 July 1930, Congress transferred "the penal provisions of the national prohibition act" from Treasury's Bureau of Prohibition (which then ceased to exist) to the Department of Justice's new Bureau of Prohibition — with an important exception: tax-related and regulatory activities, "the permissive provisions," remained at Treasury, under a new Bureau of Industrial Alcohol. The most illustrious enforcer during that tumultuous era was Eliot Ness, the "T-man" who toppled Chicago's organized-crime king Al Capone on tax-evasion charges.

The Twenty-first Amendment to the Constitution, repealing Prohibition, achieved ratification with unanticipated speed by 5 December 1933, catching Congress in recess. As an interim measure to manage a burgeoning legitimate alcohol industry, by executive order under the National Industrial Recovery Act, U.S. President Franklin Roosevelt established the Federal Alcohol Control Administration (FACA). The FACA, in cooperation with the Departments of Agriculture and Treasury, endeavored to guide wineries and distilleries under a system based on brewers' voluntary codes of fair competition. The FACA was relieved of its burden — and effectively vanished from history — after just twenty months, when U.S.

President Roosevelt in August 1935 signed the Federal Alcohol Administration (FAA) Act. The new FAA received a firm departmental assignment: Treasury once more found itself regulating the alcohol industry.

Although Prohibition was officially over, the era's side effects continued for decades to mold the shape of ATF. On 10 March 1934, Justice's Prohibition enforcement duties folded into the infant Alcohol Tax Unit (ATU), Bureau of Internal Revenue, Department of the Treasury. At the same time, the FAA, functioning independently within Treasury, was carrying forward its mandate to collect data, to establish license and permit requirements, and define the regulations that ensure an open, fair marketplace for the alcohol industry and the consumer. In 1940, the FAA merged with the ATU. The FAA Act continues today as one foundation of ATF's enabling legislation.

National dismay over the weaponry wielded so conspicuously by organized crime during Prohibition led to passage in 1934 of the National Firearms Act, followed in four years by the Federal Firearms Act. The newly regulated articles might be firearms, but taxes were involved as ever. The Miscellaneous Tax Unit, Bureau of Internal Revenue, collected the fees. In 1942, enforcement duties for the "Firearms Program" fell to the ATU, which was accustomed to managing controversial industries. In a major Internal Revenue reorganization of 1952, the nearly-century-old Miscellaneous Tax Unit was dismantled. Its firearms and tobacco tax responsibilities went to the ATU. The Bureau of Internal Revenue became the Internal Revenue Service (IRS) we know today. Acknowledging a portion of ATU's new burden, IRS renamed it the Alcohol and Tobacco Tax Division. This incarnation lasted until 1968 passage of the Gun Control Act, which gave to the laboratory, among other things, responsibility for explosives. The division title shifted to Alcohol, Tobacco and Firearms (ATF) Division. Title XI of the Organized Crime Control Act in 1970 (Title XI) formalized ATF Division explosives expertise. In the same year, moved by a growing perception that the IRS's revenue-collecting bias did not reflect ATF Division's enforcement skills, overtures began toward ATF independence.

Treasury Department Order No. 120-1 (originally No. 221), effective 1 July 1972, transferred to ATF from IRS those functions, powers and duties related to alcohol, tobacco, firearms, and explosives. During the mid-1970s, at Treasury's direction, ATF briefly assumed responsibility for wagering laws. That task returned to the IRS in less than 3 years. Throughout the 1970s, based on determination that accelerants used in arson, when explosions might occur, meet Title XI's definition of explosives, ATF began demonstrating in court its ability to prove arson. In the Anti-Arson Act of 1982, Congress amended Title XI to make it clear that arson is a federal crime, giving ATF responsibility for investigating commercial arson nationwide.

The Bureau of Alcohol, Tobacco and Firearms (ATF) continues a mutually beneficial interface with its legitimate industries, while refining unique enforcement skills. With developments such as the state-of-the-art Integrated Ballistic Identification System (a computerized matching program for weapons and the ammunition fired from them), accelerant- and explosives/weapons-detection canines, and the Gang Resistance Education and Training (GREAT) program (which gives children the tools to resist membership in violent gangs), ATF leads and supports law enforcement internationally [7-11].

In its first quarter-century ATF has had only 4 Directors: Rex Davis, G.R. Dickerson, Stephen Higgins, and John Magaw. Under the law, the director is appointed by the secretary of the Treasury, and reports to the undersecretary (enforcement). ATF headquarters are in Washington, D.C., although most personnel and many ATF operations are decentralized throughout the country, with a few stations overseas. ATF agents, inspectors, and support staff are involved in investigating some of the most violent crimes in society, in responding to changes occurring in the U.S., and in collecting over $13 billion in annual revenue. ATF is a young federal agency, yet it is heir to the whole experience and proud tradition of the United States.

Key provisions of U.S. laws regulating firearms

Federal laws that regulate importation, exportation and transportation of firearms within the U.S. include the Gun Control Act of 1968 (GCA), 18 U.S.C. 44, the National Firearms Act (NFA), 26 U.S.C. 53, and the Arms Export Control Act (AECA), 22 U.S.C. 2778. The powers to implement these legal provisions and oversee their enforcement have been entrusted to the Secretary of the Treasury. The powers to enforce the GCA, NFA, as well as those AECA provisions that concern importation have been delegated by the Secretary to the Bureau of Alcohol, Tobacco and Firearms (ATF). The United States Customs Service has been charged with enforcing those AECA provisions that concern exportation. The objective of the Gun Control Act (GCA) is to impose certain restrictions on the number of individuals eligible to own guns, associated, first, with reaching a certain age; second, with a criminal background;

and, third, with disability. The GCA was developed and enacted to improve the efficiency of state laws defining the legal framework for the circulation of firearms, enshrining the rule whereby any sales of firearms covering a territory of more than one state shall be effected and licensed to entrepreneurs at the federal level, thus prohibiting sales of firearms by persons who do not hold a license within the state of their location. The National Firearms Act (NFA) contains provisions regarding certain types of firearms, such as machineguns, short-barrelled rifles, shotguns, silencers and explosive (destructive) devices [4, pp. 98-108]. The National Firearms Act stipulates that such firearms must be registered with the indication of their owner, manufacturer and the importer. The Act also provides for taxation of operations with such weapons. The Arms Export Control Act (AECA) (22 U.S.C. 2778) gives the U.S. President powers, in furtherance of world peace and the security and foreign policy of the United States, to control the import and the export of defense articles and defense services, including firearms and ammunition. Under the Arms Export Control Act, permits and licenses to import and export such articles must be available. The Act provides for complete ban on imports to and exports of weapons from certain countries indicated by the government. The powers to control import of weapons under the AECA are held by the Department of the Treasury which delegated them to the Bureau of Alcohol, Tobacco and Firearms. The U.S. State Department and Customs Service implement the AECA export control provisions and supervise compliance with them.

Legal and institutional tools to monitor transactions between states

The Gun Control Act (GCA) stipulates that any firearms transactions performed without the relevant license are illegal (18 U.S.C. § 922(a)(1), § 923(a)). Holders of a federal license entitling to sell firearms are generally prohibited from selling them to persons who do not reside in the state in which the licensee’s place of business is located (18 U.S.C. § 922(b)(3)). As a general rule, unlicensed persons are prohibited from dealing in firearms outside the territory of the state in which they reside or from delivering it to persons located outside the territory of such state (18 U.S.C. § 922(a)(1), § 922(a)(5)).

Legal and institutional tools to monitor transactions between countries

U.S. federal laws generally prohibit the importation of weapons regulated by the NFA, such as non-sporting firearms and ammunition, as well as military firearms and ammunition thereto (18 U.S.C. § 922(1), § 925(d)(3). 25 U.S.C. 5844).

Under the Arms Export Control Act, any import to the U.S. of defense articles, including firearms and ammunition thereto, as well as unlicensed export thereof from the U.S., are prohibited. An authorization to import or an export license shall indicate the relevant importer and exporter and specify the buyer. Provisions of the Arms Export Control Act (Code of Federal Regulations (CFR) 22, Parts 120–130, and 27 CFR, Part 47) stipulate than natural and legal persons engaged in importing or exporting of defense articles must be registered with the relevant authorities. Such registration is a prerequisite to engaging in the business of importing and exporting these articles [3].

Licensing the business of manufacturing, importing or dealing in firearms in the United States

Under the Gun Control Act (GCA), a license is necessary to engage in the business of importing, manufacturing, or dealing in firearms (18 U.S.C. § 923(a)(1), § 923(a)). A license application must include a photograph and fingerprints of the applicant. An application will be approved if the applicant: 1) is 21 years of age; 2) is not prohibited from transporting, shipping, or receiving firearms or ammunition in interstate or foreign commerce; 3) has not willfully violated any of the CGA provisions; 4) has not willfully failed to disclose any material information required, or has not made any false statement as to any material fact; 5) has, within a state, premises from which he conducts business; and 6) certifies that the business to be conducted under the license is not prohibited by State or local law, and that the relevant application was filed by him with the local law enforcement authorities (18 U.S.C. § 923(d)(1)). Licenses are issued for a 3-year term. A license may be revoked, and an application for renewal of a license may be denied, if a licensee has willfully violated any provision of the CGA (18 U.S.C. § 923(e)). An administrative decision to revoke a license or deny renewal of a license may be appealed at a federal court (18 U.S.C. § 923(f)(3)). Under the AECA, any exportation, temporary importation or temporary exportation of defense articles, including firearms and munition thereto requires a license. An application for a license may be filed by a person registered with the State Department. The application must contain detailed information about the supplied articles, destination, end user and end-use purposes. An import authorization from the end-use country must be attached to the application. Licenses are issued for a 4-year term, subject to subsequent review and audit to establish compliance with the terms of transactions with the license terms [3].

Accounting and reporting of manufacturing, importing and dealing in firearms in the United States

Licensees must keep records of the weapons on sale and of sold firearms, and must note in their records the buyer's name, age, and place of residence (18 U.S.C. §922(b)(5) and 18 U.S.C. § 923(g)(l)(A)). Licensed importers and manufacturers must identify imported or manufactured weapons by means of a serial number to be recorded in the licensee's accounts (18 U.S.C. § 923(i)). Licensees are required to respond promptly to ATF requests concerning the origin of firearms (18 U.S.C. § 923(g)(6)). Furthermore, regular reports are to be provided to ATF of two or more units of personal firearms sold at one time or during any five consecutive business days (18 U.S.C. § 923(g)(3)). Licensees who discontinue their business are required to deliver their records to ATF (18 U.S.C. § 923(g)(4)). These requirements enable the attainment by ATF of one of the Gun Control Act's key objectives: assist government officials charged with law enforcement functions, local authorities, as well as foreign law enforcement authorities in the quick determination of the origin of firearms used in the commission of crimes.

Conclusions The U.S. Government does not keep track of licensees' transactions with firearms, other than the above reporting delivered to the government upon discontinuation of the licensee's business, reports of two or more units of personal firearms sold, and reports of the origin of firearms. Processing the information contained in these reports enables identification of key areas of activities in the matters of identifying illegal suppliers of weapons and sources of firearms sold within the United States. 22 CFR § 122.5 stipulates that a licensee must maintain records concerning all transactions performed by it under export, temporary import or temporary export licenses for a period of five years. Such records must be provided to a U.S. Customs Service official upon his request. Computer record of such transactions is also maintained by the U.S. State Department and at customs terminals [5, pp. 90–100].

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Forensic, Social and Criminal Law Regulation of ATF Operation: Applicable Provisions for Record-Keeping, Investigation and Registration

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Abstract

For some time, the Bureau of Alcohol, Tobacco, Firearms and Explosives (ATF) [1, 2] was a unit of the Department of the Treasury, authorized to conduct inspections, once during any 12-month period and without a warrant, for compliance with statutory requirements, or in the course of a criminal investigation of a person other than the licensee, or where the disposition of firearms must be determined (the Gun Control Act (GCA), 18 U.S.C.

§ 923(g)(1)(B)). ATF is also authorized to inspect inventory and records by securing from a Federal magistrate judge a relevant warrant (18 U.S.C. § 923(g)(1)(A)). Customs officers may also inspect any firearms or related articles imported or exported from the U.S. Limitations on the rights of certain persons, associated with manufacturing, importing and dealing in firearms in the United States. Provisions of the Gun Control Act (GCA) stipulate that it is unlawful for certain categories of persons to ship, transport, receive or possess firearms (18 U.S.C. § 922(g)). It is also unlawful to sell or otherwise dispose of firearms to the persons (18 U.S.C. § 922(d)): who are under indictment for a crime punishable by imprisonment for a term exceeding one year; who have been convicted of a crime punishable by imprisonment for a term exceeding one year; who are fugitives from justice; who are unlawful users of or addicted to any controlled substance; who are illegally or unlawfully in the United States; who have been discharged from the Armed Forces under dishonorable conditions; who, having been a citizen of the United States, have renounced their citizenship; who are subject to a court order that restrains such person from harassing, stalking, or threatening an intimate partner of such person or child of such intimate partner or person, or have been convicted of a misdemeanor crime of domestic violence (as stipulated by the Omnibus Consolidated Appropriations Act, 1997, Pub. L. 104–208, effective 30 September 1996) (18 U.S.C. § 922(g), § 922(n)).

Keywords: types of firearms prohibited for free circulation, U. S. National Tracing Center, applicable provisions for record-keeping, investigation, registration.

Introduction Under the Arms Export Control Act (AECA), licenses may not be awarded to persons convicted under: Section 38 of the AECA, 22 U.S.C. § 2778; Section 11 of the Export Administration Act of 1979, 60 U.S.C. App. 2410; 18 U.S.C. §§ 793, 794, or 798 concerning military espionage or obtaining secret information; Section 16 of the Trading With the Enemy Act. 50 U.S.C. § 16; Section 30A of the Securities Exchange Act of 1934. 15 U.S.C. § 78dd-l, or Section 104 of the Foreign Corrupt Practices Act, 15 U.S.C. § 78dd-2; 18 U.S.C. Ch. 105: Sabotage; Section 4(b) of the Internal Security Act of 1950. 50 U.S.C. § 783(b) on communication of classified information; Sections 57, 92, 101, 104, 222, 224, 225, or 226 of the Atomic Energy Act of 1954. 42 U.S.C. §§ 2077, 2122, 2131, 2234, 2272, 2275 and 2276; Section 601 of the National Security Act of 1947. 50 U.S.C. § 421: Protection of identities of certain United States undercover intelligence officers, agents, informants, and sources; 17 U.S.C. § 371 on conspiracy to commit any of the offenses referred to above [13]; the International Emergency Economic Powers Act. 50 U.S.C. §§ 1702 and 1705.

Types of firearms prohibited for free circulation in the United States. Federal firearms laws prohibit possession and transactions with certain types of firearms, namely: to transfer or possess a machinegun (18 U.S.C. § 922(o)); to manufacture, import, sell, or possess any firearm that is not detectable as the Security Exemplar (18 U.S.C. § 922(p)); to manufacture, transfer, or possess any semiautomatic assault weapons (18 U.S.C. § 922(v)); to receive or possess a firearm [3] which is not registered in the National Firearms Registration and Transfer Record (26 U.S.C. § 5861(d)).

U.S. statutory provisions prohibiting certain actions concerning firearms and

ammunition thereto. Federal firearms laws also contain criminal law rules that prohibit certain actions concerning firearms and ammunition thereto. It is unlawful, for example: for any person in connection with the acquisition of any firearm [3] from a licensee, knowingly to make any false or fictitious statement or to furnish any false, fictitious, or misrepresented identification (18 U.S.C. § 922(a)(6)); for any person to manufacture or import armor piercing ammunition, and for any manufacturer or importer to sell or deliver such ammunition (18 U.S.C. § 922(a)(7), § 922(a)(8)); to steal firearms (18 U.S.C. § 922(i), § 924(k), § 924(l)); to transport, ship, possess, or transfer any stolen firearm or stolen ammunition (18 U.S.C. § 922(j)); to transport, ship, or receive any firearm which has had its serial number removed (18 U.S.C. § 922(k)); to possess firearms in school zones (18 U.S.C. § 922(q)); to sell or transfer a handgun to a juvenile (under 18 years), and for any person who is a juvenile to knowingly possess a handgun (18 U.S.C. § 922(x)); to use or carry weapons during and in relation to any crime of violence or drug trafficking crime (18 U.S.C. § 924(c)); to export illegally shotguns or ammunition thereto, which are controlled by the Department of Commerce (50 U.S.C. App. 2410A); to smuggle goods into the United States (18 U.S.C. § 545); to enter goods by means of false statements (18 U.S.C. § 542); to enter goods upon a false classification (§ 541) [4].

Penalties for non-compliance with applicable laws regulating the circulation of firearms in the United States. Federal laws impose stricter penalties on repeat offenders for carrying or using a firearm when committing a crime of violence or drug trafficking crime. 18 U.S.C. § 924(c) provides for a term of imprisonment of not less than 5 years for carrying or using a firearm when committing a crime of violence or drug trafficking crime. The person is sentenced to a term of imprisonment of not less than 10 years if a short-barreled rifle, short-barreled shotgun, or semiautomatic assault weapon was used; or to a term of imprisonment of not less than 30 years if a machinegun or a destructive device, or if a firearm equipped with a firearm silencer or firearm muffler was used. In the event of numerous convictions, the person is sentenced under the same subsection to a term of imprisonment of not less than 20 years, and if the firearm involved is a machinegun or a destructive device, or is equipped with a silencer or muffler — to imprisonment for life. 18 U.S.C. § 924(e), concerning offenses committed by persons who use firearms professionally, imposes a minimum term of imprisonment of not less than 15 years for persons violating section 922(g), persons convicted of three grave offenses or serious drug offenses [5].

The National Instant Criminal Background Check System (NICS) for persons intending to buy firearms in the United States. The Brady Handgun Violence Prevention Act (Brady Act) is a public law that provides for the establishment of the National Instant Criminal Background Check System (NICS) (30 Novemer 1998). Mandated by the Brady Act, NICS was established for Federal Firearms Licensees (FFLs) to contact by telephone, or other electronic means, for information to be supplied immediately on whether the transfer of a firearm to a potential buyer would be in violation of Section 922 (g) or (n) of title 18, United States Code, or state law. The NICS is a national system that checks available records on persons who may be disqualified from receiving firearms. The FBI developed the system through a cooperative effort with ATF and local and state law enforcement agencies. The NICS is a computerized background check system of potential firearms buyers, designed to respond instantly on most background check inquiries, which are processed for 30 seconds, so the FFLs receive an almost immediate response [6].

Firearms. Under the law (section 921(a) of title 18, United States Code), they include the following: any weapon (including a starter gun) which will or is designed to or may readily be converted to expel a projectile by the action of an explosive; the frame or receiver of any such weapon; any firearm muffler or firearm silencer; any destructive device; the firearm frame or receiver. That part of a firearm which provides housing for the hammer, bolt or breechblock, and firing mechanism, and which is usually threaded at its forward portion to receive the barrel (27 CFR § 178.11). This definition does not apply to the term “antique firearm” [7].

The U. S. National Tracing Center. ATF’s National Tracing Center (NTC), located in Falling Waters, West Virginia, is the world’s only organisation capable of tracing a firearm seized at the scenes of juvenile crimes, at the request of any federal, state, local and foreign law enforcement agencies. Furthermore, the NTC collects and analyzes data on large-scale sales of firearms, suspicious weapons, stolen weapons, and firearms with obliterated serial numbers. The center also maintains a data archive of previously issued federal firearms licenses. Firearms tracing is the systematic tracking of the movement of illegally circulated firearms used in crime or recovered from minors, beginning with their first sale by the manufacturer or importer through the distribution chain (wholesaler/distributor/retailer) to the first retail purchaser. Tracking the stages in firearms circulation allows the law enforcement officers to identify suspects, find stolen firearms and determine their owners. The NTC applies the most effective and productive technique of legislative investigation into the ways of firearms distribution. Firearms manufacturers, importers, wholesalers and retailers in the U.S. and abroad join their efforts to identify the channels of weapons distribution, responding to any queries with specific information available in their archives about the manufacture, import or sale of weapons. Thanks to its licensing powers, ATF is the only federal agency that has access to such information. Under the law, licensed firearms sellers are required to provide information about firearms movement at ATF's request. Besides, the NTC stores more than 100 million records of transactions performed by out-of-business licensed firearms sellers. These records may reveal illegal supply channels for firearms and to search for such firearms in the event of crime. The law requires that all licensed firearms sellers transfer their records to the NTC after they go out of business. Recently, cooperation between the firearms manufacturers and ATF has evolved in the establishment of a hotline between firearms retailers, wholesalers, and the NTC. This has contributed to higher efficiency of tracing the firearms distribution. The section below focuses on the information that may be useful for law enforcement officials from the INTERPOL member countries in preparing trace requests for specific firearms, should they have any questions related to weapons trace, or when seeking assistance from the NTC that was established to facilitate investigative operations by law enforcement agencies, especially on any complex issues associated with weapon circulation in the United States [8].

Firearms tracing procedures in the United States. Requests to trace firearms may be submitted to the NTC by any federal, state, or local law-enforcement agency. Requests may be relayed through a local ATF office or sent directly to the center by means of NLETS (National Law Enforcement Telecommunications System), the mail, telephone, or fax. The NTC will conduct a trace to the individual purchaser; to a licensee in the originating state; to a government or law-enforcement office; or to a point where all possibility for a successful trace has been exhausted, whichever comes first. Provisions of title 18, United States Code, chapter 44 stipulate that licensed firearms manufacturers and dealers are required to report the weapons registration, acquisition and disposition. Until 1968, dealers had virtually kept no records, therefore it is believed that the circulation of firearms manufactured or imported before 1968 cannot be traced. For ATF to be able to trace the firearms movement and to obtain the required information from federally licensed manufacturers, importers and dealers, it is essential that an accurate and complete description of firearms is provided. Law enforcement officers and investigators must ensure the completeness and accuracy of the firearms description in the trace request forwarded to the NTC [9].

When using the NTC services, the following should be kept in mind:

Checklist for tracing firearms: 1. Firearms cannot be traced without a serial number, although at times they may be traced with a partial serial number. Ensure that any letter adjacent to the serial number are also recorded on the trace form. In the case of a partial serial number, contact the NTC for guidelines. 2. Most firearms cannot be traced without a model. Therefore, always include the model. 3. Foreign-made firearms cannot be traced if the importer's name is not reported. Licensed importers are required to mark the firearm with their name, city and state, and the country of origin. In many cases, this information will appear on the barrel in an abbreviated form. 4. Surplus military firearms are generally untraceable, unless the firearm is marked with an importer's name. Many foreign and domestic surplus military firearms have been imported in recent years and can be traced if the importer's name is reported [10]. ATF Form 3312.1, Crime Gun Information Request/Referral Form, should be used to request a firearms trace. It is important that the information on the form be as complete as possible. Forms may be obtained from any ATF office or from the NTC directly. Below are some basic guidelines for completing this form to make a request for identifying the channels of movement for a specific firearm. All markings on firearms are essential and should be included in ATF Form 3312.1. Where necessary, any special instructions may be noted in the REMARKS box of the request form. For example, if you wish the trace to be stopped at the wholesaler, or if the trace is only needed to prove interstate movement, this should be stated. (Note: Specify manufacturer, wholesaler, or retailer when referring to type of dealer). The requester must list his/her name, full departmental address (including postcode), telephone number (including area code), email address, and organization code for law-enforcement officers [11].

Always indicate the priority in accordance with the following standards: Urgent, if the firearm was used to attack a law enforcement officer, in a crime of violence and/or information is essential to apprehend or hold suspect. A reason for urgency must accompany this category, or this priority will not be initiated. All urgent requests have the highest priority; Routine, if a firearm trace is needed to complete investigation. All routine requests are processed on a first come, first served basis. The National Criminal Information Center (NCIC), Treasury Enforcement Communication Systems (TECS), and/or State computer systems should be checked prior to the submission of the trace. If the firearm is considered stolen, the information about its disappearance is entered in the REMARKS box [11, 12].

The following list of detailed weapon characteristics will have a significant impact on the successful search outcome

Manufacturer. Always include the entire name of the manufacturer shown on the firearm. If manufacturer is unknown, all the markings that appear on the weapon should be provided. Sometimes the manufacturer can be determined by the country and city of manufacturer or by the proof of other marks.

Importer. The importer's exact name and the weapon marking should be also included.

Type. Indicate pistol, revolver, shotgun. Any handgun that does not have a cylinder is classified as a pistol. Also indicate if single-action or double-action capability. Differentiate between rifle and carbine. If it is a shotgun or rifle, indicate when multi-barrel or combination gun.

Model. The model designation can be a letter or numerical designation, brand name or a combination thereof.

Caliber or gauge. Always specify .22 short 22 LR, or .22 Magnum caliber; 9mm short (380) or 9mm Parabellum caliber. Be sure to include any names with the caliber, since 9mm Corto and 9mm Kurz indicate 9mm short (380) caliber.

Serial number. Always include letter prefix, suffix, code numbers or letters over or under the serial number. If a different serial number appears in several places, indicate location of each.

Country of origin. This information may appear on the frame or receiver, under the grips or other hidden locations. The country of origin is extremely helpful when requesting foreign firearms traced.

Recommended firearms trace request options are given below.

Requesting a firearms trace through the National Law Enforcement Telecommunications System (NLETS). Standard electronic forms for NLETS firearms requests are available to all users. In the event that standard electronic request forms are unavailable in any state, the agency may forward such requests to the NTC through NLETS using a free-form NLETS notice. By using the NCIC code for ATF Headquarters (DCATFOOOO), the message in the following format is sent:

FROM: Los Angeles, California, Police Department. TO: ATF National Firearms Tracing Center SUBJ: Request for Firearms Trace

PRIORITY:

URGENT. Please trace the following firearm:

1. Rohm. 2. RG Industries, Miami, Fl. 3. Revolver. 4. RG-3. 5. 38 caliber. 6. 6-shot. 7. 4 inches. 8. Blue. 9. Serial number 163802. 10. Germany. If additional information is needed, or when returning trace results, forward to Inspector (full name), Precinct No. 1, telephone (number with area code) [13].

Requests may be sent by facsimile machines. Using a facsimile machine, a trace request may be forwarded to the NTC directly at a specially designated telephone number. Where necessary, an NTC representative may also be contacted by telephone If any problems with identifying the type of firearm or obtaining other necessary information about the weapon occur, it is important to contact the NTC for help. Advice on these matters may also be provided by ATF's Firearms and Ammunition Technology Division. Making firearms trace requests is recommended even if minimal information about such firearms is available.

The batch-uploading firearm-trace request enables law enforcement agencies or their branches to export batches containing necessary data to the NTC directly.

Conclusions Law enforcement authorities that seize large numbers of criminal firearms each year may use this option to reduce the time spent on transmitting firearms-related information requests. In order to become eligible for using the batch uploading feature, agencies or divisions must have detailed and authentic data about firearms, including their description, as well as about the owner and the place of seizure entered in the agency (unit) computer database. The NTC-provided simple software is used for batch uploading, allowing for "batches" of data to submitted electronically from the designated agency (unit) to the NTC, thereby automatically initiating data search across all criminal firearms included in the transmitted "batch". Thanks to the batch uploading feature, the NTC can provide the agency (unit) with a complete picture of illicit transactions involving crime firearms seized within their jurisdiction. For any additional information about batch uploading, ATF's National

Tracing Center should be contacted.

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Application of Innovative Technologies in the Art Education Lessons

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Abstract

The article reveals the peculiarities of using the rectangular drawing method for developing the creative potential of gifted children. The essence of the method of rectangular drawing is covered. The technique of using the rectangular drawing method for the artistic preparation of children is presented. The mechanisms of development of the creative potential of the child by means of rectangular drawing are revealed and the ways of further researches in this field are outlined.

Keywords: right-handed drawing, creative potential, artistic training, brain, exercises.

Introduction. The development of the creative potential of the individual is one of the most urgent tasks of modern society. Accordingly, there is a need to make drastic changes to the content, forms and methods of educational work of young people, in particular students of pedagogical institutions of higher education, where a creative approach to the development of personality, the formation of creative - transforming position, creative potential.

Despite the fact that various innovative processes are being introduced that allow to obtain positive results in the field of children's creative development, innovative technologies of teaching should be used to activate cognitive activities. Problem-solving, communicative-learning technologies, game-learning technologies, technologies, information-communication technologies, project technologies that contribute to an effective learning process aimed at improving the quality of education, developing creative abilities, ability to make decisions independently. Increasingly popular in the modern world are unconventional techniques for developing creative talents. You can learn how to draw in a short time using innovative rectangular drawing techniques.

The degree of elaboration of the problem. The analysis of the scientific literature on the topic of the study suggests that the problem of creative potential formation was considered in the research from the point of view of future teacher's professional training. This contributed to the accumulation of some positive experience in the development of basic theoretical provisions on this problem. Thus, the philosophical aspect of creativity was considered in their works by V. Bibler, Y. Boroday, M. Danilov, K. Kedrov, P. Kopshchin, O. Korshunov and others. Psychological and logical foundations of this problem are outlined in the works of D. Bogoyavlenskaya, L. Vygotsky, V. Davydov, D. Elkonin, O. Leontiev, A. Luke, Y. Ponomaryov, S. Rubinstein, and others. The pedagogical aspect of the problem of formation and development of creative activity is considered in the works of V. Andreev, D. Vilkeev, M. Danilov, N. Kichuk, M. Makhmutov, I. Ogorodnikov, N. Polovnikova, I. Rodak, S. Sisoeva, M. Skatkin , T. Shamova, G. Shchukina and others.

Insufficiently lit parts of the problem. At the same time, positively evaluating the achievements of the aforementioned scholars, it should be noted that the problem of forming the creative potential of future teachers is still partially covered. Existing works reveal only some ways to improve student preparation.

The purpose of the article is to reveal the creative potential of the rectangular drawing method for the development of children's creative potential. To justify the position that you can learn how to draw in a short time, using an innovative method of rectangular drawing.

The main content (research methodology). From our own pedagogical experience of recent years, we can note the following negative tendency in the level of general visual literacy of children: creative stiffness, pattern pattern, low level of basic artistic and pictorial abilities: visual memory, artistic and imaginative thinking, spatial representations, imagination.

To enhance cognitive activity, it is necessary to use innovative teaching technologies in the lessons. Problem-solving, communicative-learning technologies, game-learning technologies, technologies, information and communication technologies, project technologies that contribute to an effective learning process, aimed at improving the quality of education, developing students' creative abilities, ability to make their own decisions.

The main content (Discussion). Increasingly popular in the modern world are unconventional techniques for developing creative talents. You can learn how to draw in a short time using innovative rectangular drawing techniques. The popularity of this method is increasing every day. The basis of the method of rectangular drawing is the activation of the right hemisphere of the brain in the mode of creativity. Using special techniques developed by highly skilled specialists, creative activity and intuition of any person are activated.

Children tend to engage in creative activities, but, as a rule, the education system is formed in such a way that much more time is spent on learning the exact sciences than on creative processes. All this contributes to the stimulation of the left hemisphere, which is known to be responsible for logical processes and analytical thinking. The smooth operation of both hemispheres ensures efficient brain work. The use of methods of right-hemispheric drawing allows to bring harmony to the work of the left and right hemispheres of the brain, which helps to reveal the creative potential of the child. In addition, it helps to protect it from stress and stress, and also helps with the assimilation of the material.

In our opinion, during the exercise of right-handed drawing there is a change in the perception of the world, developing the ability to visualize, break stereotypes. Attitude to life as a creativity is formed and intuitive thinking develops. All these processes occur at the expense of temporary suppression of the left hemisphere and the child, ignoring the logic, transfers to the paper his vision of the subject. Kids just draw what they see without thinking about how to draw properly. Disconnecting logic and rational judgment are the result of such an intuitive method of creativity.

From the history of the problem it follows that the method of "intuitive drawing" was invented and tested in the United States in the 60s of the twentieth century. American teacher Betty Edwards founded a surprisingly effective teaching technique on drawing, and called it "Drawing on the Right Side of the Brain". The Betty Edwards method offers the following possibilities: to perceive light and shadow; perceive space; determine the ratio of objects and their parts; perception of the edges of the object; drawing objects by memory; to draw with the help of imagination [1].

To attract the attention of modern children in the classroom it is necessary to use innovative technologies, non-standard drawing techniques. At Fine Arts classes, I create an atmosphere for children of art therapy, fairytale therapy, and play therapy as an integral part of creativity.

Our method was based on Roger Sperry's concept of functional specialization of the cerebral hemispheres. Since our brain is divided into two hemispheres, it uses two ways of processing information. One hemisphere uses a verbal and analytical mode of thinking - it processes sounds, algo rhythms, mathematical calculations, and language. The other hemisphere uses the figurative mode - size comparisons, color perception, perspectives of objects that it sees completely. Subsequently, in Betty's writings, these modes were named "L-mode" and "P-mode", respectively [2].

The essence of the method of rectangular drawing is to temporarily suppress the work of the left hemisphere and transfer the leading role in drawing the right, more suitable for this activity. At work, thoughts from memory of how the object should look like are ignored. Instead, the artist "sees the object in reality" - comparing its size as a whole, the size of the individual elements, the ratio of space, light and shadow, and combining all of this into a single painting.

Intuitive drawing leads to the activation of the right hemisphere, which is responsible for ideas, images, creativity. Whereas in adults, the left is mostly dominant - it is logic, calculation, restriction. On this basis, the method of intuitive drawing is nowadays widely used in the practice of art therapy - it is a great method to avoid internal censorship, to remove emotional blocks and to look at the world and yourself from the other side.

Based on our experience, it follows that the technique and technique of right-handed drawing for children involves the following generalizations. Contour drawing is the first technique of right-handed drawing. The peculiarity of the method is that the picture must be drawn, keeping upside down. And, part of the picture should be closed. Such manipulations will result in images of bars, lines, and color spots. These images must be drawn. The misunderstanding of what is happening will cause the brain to shut off the left hemisphere and right here will be actively involved. And the brain will not even detect logic trying to understand the drawn symbols. And a complete surprise will be a picture that will be an exact copy of what the child was drawing. A huge plus of the lessons of right-handed drawing is the ability to distract children from the computer and TV. Modern children have become dependent on these facilities. Creativity is a very exciting process and can be motivating at any age.

The technique of right-handed drawing involves a set of different exercises that at first glance seem very unusual. It is the originality and incomprehensibility of these exercises that helps to disable logic. Drawing using the right, then left hand, spelling the letter in the mirror allows you to reveal to the children the world of the magic flight of fantasy.

Drawing in the right-hemisphere mode relieves psychological fatigue, removes internal criticism, increases self-confidence. Children begin to learn better, adults make non-standard decisions and tasks that are not solved in 10 years, are solved. Right-handed technique immerses a person very well in the process of meditation, the state of the Here and Now. It completely abstracts from the external problems of the child, switches attention, relieves psychological stress.

Conclusions. On the basis of the analyzed material it is possible to make certain generalizations and conclusions.

Rectangular drawing for children is a natural activity. The first drawings are more developed in their own way. No matter what comes out and what doesn't, what matters is the process of creativity and the pleasure of leaving a brush or pencil on the paper. Often the baby transfers to the paper not the image of the object, but his perception or feelings associated with it. Drawing in this technique helps: to get rid of the fear of "I can't draw"; relieve tension; go beyond stereotypes; unleash your creative potential; increase self-esteem; reduce anxiety and remove anxiety; to feel confident in their abilities; to feel the world bright and diverse.

Therefore, the use of rectangular drawing means that you can unlock your child's potential for creative imagery. Intuitive drawing techniques help beginners discover themselves and thus enhance self-confidence.

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Determining the Structure of Project Competence of Future Bachelors of Social Work

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Abstract

In the general structure of competence, the components of theoretical knowledge, transformative activity, moral and spiritual values and self-organization are considered, and two marginal levels are distinguished: a higher level of competence and a minimum acceptable level of competence. Taking into account the specific professional activity of future bachelors of social work, the structure of project competence is detailed as follows. In the theoretical knowledge component, the marginal levels differ in the limited knowledge at the minimum permissible level only by the management aspect, and the cross-sectoral understanding of the concepts of “project” and “project management” - at the highest level of competence. The transformative activities for the highest level of competence include methods for substantiating contradictions, to which the project is directed, determining the ideal end result, formulating a realistic project goal, decomposing the project, executing the project, introspection, as well as methods of managing teamwork. For minimal competence, only certain project management methods are foreseen, in particular, excluding teamwork management methods. In the component of moral and spiritual values, it is obligatory for both levels to act on the basis of the value attitude to the client of social work as a subject of self-government. As part of self-organization component, we consider projects developed by students as means of self-organization of their further transformative professional activity, but a higher level of competence (as opposed to minimum competence) involves taking into account the activities of other students and environmental events.

Keywords: competence, theoretical knowledge, transformative activity, moral and spiritual values, self-organization, higher level of competence, minimum acceptable level of competence, future bachelors of social work, project, project management.

The world is changing and making new demands on the education system:

- the increasing amount of information and technology and future specialists have to absorb it, not by expanding the content of the bulk disciplines and increasing the workload, but by ensuring the effectiveness of teachers and students;
- employers express dissatisfaction with the quality of professional training of young professionals, and this should be addressed through dialogue and cooperation of higher education institutions with potential customers of staff and through development of a certain “common language”;
- the world is globalizing and in need of harmonization of educational systems, in particular through the Bologna process, implementation of relevant provisions at the university level,

ensuring the development of a certain “common language” for the description of higher education programs based on the harmonization of educational structures [1];

- in the international educational space, competition between higher education institutions is increasing and entrants demand transparency of the education process and its results and increase their comparability, and graduates want to accelerate the international recognition of their diplomas [1].

The concept of “competence” is also interpreted as a coherent language to describe academic and professional achievements, ensuring the comparability of learning outcomes.

Analysis of recent research and publications. In this article, we will focus on the project competency structure of future bachelors of social work as project competence and project method are often featured in various studies, in particular in the structure of preparation for professional mobility of future social workers (H.A. Ridkodubska), in the classification of research skills of social workers (O.S. Povidaychik), as the basis of professional mentality in the methodological work (L.Z. Rebukha), in the formation of social and legal competence of future social workers (O.V. Lisovets), in psychological formation of the personality of a specialist (V.V. Balakhtar), in health preserving activities of a social worker (L.E. Kloss), in preparation for conflict resolution in professional activity (S.M. Kalaur), and in the professional training of future social workers to work in local communities (H.I. Sozanska).

The purpose of the article. The purpose of the article is to determine the structure of project competence of future bachelors of social work.

Presenting main material. Competence as a whole has a complex structure that has already been sufficiently researched and described. So, in the documents of the European project TUNING the concept of “competence” is revealed as knowledge and understanding (theoretical knowledge of the subject area, the ability to know and understand), knowledge how to act (practical application of knowledge to a specific situation), and knowledge how to be (values as an integral part of perception and living and interacting with others in a social context).

Competence is a system of knowledge in action, and since the acquisition, transformation and use of knowledge implies not only cognitive but also active cognitive activity, emotional- volitional and motivational components are also distinguished in the competence structure, but what creates meaning is an activity component - procedural knowledge [2].

Considering the competence approach, I.D. Beh pays particular attention to the concept of “theoretical knowledge”, which, unlike empirical, has internal relations, connections, and regularities. Theoretical knowledge involves subjective actions with knowledge that is thinking. Within the competency approach, I.D. Beh calls attention to the need to teach thinking, seeing the way of such learning in dialectics. The learner should be aware that any truth (knowledge) is born in response to a difficult problem that a person faces as a need and contradiction. Any ready-made knowledge is a previously settled contradiction. That is, it is necessary to assimilate not only the ready result of thinking but also the way of thinking by which this result was obtained [3]. I.D. Beh also reveals the content of practical activities in the development of higher level competencies, emphasizes the need to expand the narrow application of fragments of practice as a means of using the learned scientific knowledge, solving practical problems, the criterion of truthfulness of knowledge. The purpose of the competence approach is to ensure a consistent transformation of the subject of learning into a subject of practical activity as a purposeful transformation of reality [3].

The competency-based approach by I.D. Beh includes a person-centered approach. “This educational approach is, first of all, considered as a unit of a person’s personal development, which is motivated by a certain moral and spiritual value as a self-worthy form of activity. Therefore, it is only in this educational approach that it is possible to speak without any reservations about the spiritual and practical development of the world by the person, about his moral and spiritual practice in relation to the world of people and the world of things ”[3]. Important is the author’s indication of the way to implement this approach through joint vocational training.

According to I.D. Beh, “gaining experience requires the management of the teacher not only individually performed student’s educational activity but also types of joint vocational training, i.e., interaction of the student with the teacher and peers. It is necessary, because the development of the individual is carried out not only by improving his individual subject activity but also by improving his relationships and types of communication with the environment. It is in the group types of work that “ conditions arise for interaction actions, in which the moral and spiritual spheres of the student, his basic sensory-value orientations are improved” [3].

Thus, in the structure of competence scientists distinguish components of theoretical knowledge, transformative activity, and moral and spiritual values.

V.I. Baidenko draws attention to the fact that in modern conditions problematic decisions are made and the necessary actions are implemented in complex and dynamic systems; competences can be properly understood and explored in the context of modern theory of self-organization, using synergetics. Abilities, readiness and knowledge are associated with values and realized through volitional impulses by dispositional prerequisites of purposeful behavior under the massive unreliability of decisions [4]. That is, we must also distinguish a component of self-organization in the structure of competence.

It is clear that a person can possess each of these components at one level or another.

I.D. Beh distinguishes two levels of personality competence: 1) lower, when the subject through trial and error or through a mechanism of imitation masks certain practical ways of acting in certain situations, being motivated by the need for cultural (normative) functioning in the social environment. During the formation of the practical skill of modes of action, appropriate empirical knowledge about these methods is assimilated; but there is no theoretical basis for both knowledge and modes of action. The competences of this level are not sufficiently generalized and limited in the transfer of the learned practical ways of action to other objects, limited in view of the specifics of the new circumstances; 2) higher level of competence is based on scientific (theoretical) property; motivation basis of competence of this level is striving for self-affirmation as well as experiencing feelings of dignity and broad social motives [3].

It is important to note that in the US, in the context of society’s demands for improving the quality of national education, a minimum competency study is also conducted, that is, not only any level of training is recognized but only one that is not below a certain minimum [5]. Note that we consider minimal competence not in the sense of a lower level of competence of the individual as possessing certain practical ways of acting in a certain limited set of situations, but as a certain level of competence on the basis of theoretical knowledge.

Further, detailing project competence, we will distinguish a level of minimum competence and a higher level of competence in each of its components.

To detail project competence, we refer to the concept of “project activity” and carry out its theoretical analysis in the aspect of various sciences.

The project by M.S. Hagan is the perfect image of what is not but what can and should be created [6, p. 359]. According to the scientist, designing activity provides real, material and practical activity with advance and guiding programs. The scientist draws attention "to the first question of any project activity: Do we have guarantees that this ideal image will turn from subjective reality to objective?" [6, p. 159-160]. In practice, it happens that ideas are not implemented precisely because of their low-level competence.

Nowadays, with the mastery of project activity, experts connect the possibilities of solving the issues of planning and realization of certain works, attracting funds from external sources of financing as the best use of their own resources. Let us turn to the definitions of "project" and "project management" activities in the aspect of management. K.F. Gray and E.U. Larson cite the following definition: "A project is a complex, one-step, non-recurring event, limited in time, budget, resources, and clear implementation instructions designed for the needs of the customer" [7, p. 16].

Project Management is the process of managing and coordinating human, material and financial resources throughout the project lifecycle through the use of modern management methods and techniques to achieve the results defined in the project in terms of composition and scope of work, cost, time, and quality, meeting the interests of project participants [8, p. 18].

M. Grashina and V. Duncan define project management as an orderly approach to activity in a disordered environment [9, p. 17].

H.M. Tarasyuk in project management identifies issues of team and resource management and draws attention to the availability of specific methods and techniques that ensure the successful achievement of the goal [10, p. 14].

Thus, by distinguishing the component of theoretical knowledge in the structure of project competence, we include in this structure the knowledge about the project as the ideal way of what does not exist but what is needed, and that can be created as a leading and guiding program with appropriate guarantees to achieve a given ideal image. By distinguishing theoretical knowledge about project management activities in the project competence structure, we include in this structure the knowledge about the following characteristics of project activity: focus on achievement of certain results, complexity, nonrepetitiveness, time constraint, limited budget and other resources, manageability even in conditions of disordered environment, knowledge of clear instructions for execution, and appropriate methods and techniques, including methods and techniques for managing teamwork. Higher level of competence implies having a complete list of this knowledge; for the minimum level of competence, knowledge of methods and techniques of managing teamwork, in our opinion, may be excluded. And at this level, students are allowed to have a minimal set of other methods and techniques of project activity.

Regarding the set of methods and techniques of the higher level of project competence of future bachelors of social work, the previous works of the author substantiate the following: 1) the implementation of factor approach to justify the contradiction, to which decrease the project isdirected; 2) the use of the "magic wand" of H.S. Altshuller to determine the perfect end result; 3) clarification of the realistic idea of the project through SWOT analysis; 4) the use of SMART criteria for formulating the project objective; 5) assessing project completion for all entities and identifying project products; 6) decomposition of the project to determine its activities; 7) implementation of activities on the own-developed project; 8) introspection and report on the results of the project implementation. The following set of methods has been empirically established for the minimum level of project competence of future bachelors of social work: 1) the use of SMART criteria for formulating the purpose of the project; 2) decomposition of the project to determine its activities; 3) implementation of activities on the own-developed project; 4) self-examination and project implementation report.

Let us consider the specifics of professional projects of future bachelors of social work. V.A. Lukov defines social design as "the construction of an individual, group or organization of action aimed at achieving socially significant goals and localized by place, time and resources" [11, p. 7]. The scientist emphasizes that "the project's desire for comprehensive results (all-encompassing happiness, etc.) contradicts the peculiarities of the modern world" [11, p. 30]. Local action based on global systemic thinking and knowledge of the target group and social environment is required.

The subject of social design may be: a new thing; new properties of the old thing; service; organization; event; intangible properties or attitudes; a bill [11, p. 37-49]. It has been empirically established that for future bachelors of social work, the subject of projecting a higher level of project competence may be a new thing (such as a board game) or an event of a complex nature. For example, our students have created a board game on combating human trafficking, designed and implemented, taking into account the specifics of regional topics and such complex measures as employment hacking, forum of violence, various activities of leisure in the city and outside the city. For the minimum level of project competence of future bachelors of social work, a simple measure may be the subject for social design.

In conclusion, we take into account another specificity of social design. A social worker in his activity proceeds from the fact that receiving assistance in overcoming one crisis state by socially unprotected layers of the population may be accompanied by subsequent crises. If the subjective potential - the internal resources of the people themselves in crisis - can be activated, then the emergence of a certain part of new problems can be prevented, and additional opportunities will be created to overcome others, because according to V.I. Kurbatova and O.V. Kurbatova, consumers of social services “usually have a supply of internal social resources that can be mobilized to solve a particular social problem” [12, p. 9]. However, it is clear that a certain social problem therefore arises, since some people in certain conditions can not (without outside help) become the subject of activity. Therefore, the job of a social worker is to help clients become self-governed.

In the table below we summarize the structure of project competence of future bachelors of social work.

Table 1 - Matrix of components of project competence of future bachelors of social work

Theoretical knowledge	Transformative activity	Moral and spiritual values	Self-organization and synergy
Higher level of competence			
Content of the concepts of "project", "project activity" in aspects of various sciences	1) Implementation of factor approach to justify the contradiction, to which decrease the project is directed; 2) use of the “magic wand” of H.S Altshuller to determine the perfect end result; 3) clarification of the realistic idea of	- The ability to act on the basis of the value of local action, which relies on global thinking; - the ability to act on the values of the past,	Own project analysis and the results of its implementat ion, taking into account

	the project through SWOT analysis; 4) the use of SMART criteria for formulating the project objective; 5) assessing project completion for all involved entities and thereby identifying project products; 6) decomposition of the project to determine its activities; 7) implementation of activities on the own-developed project; 8) introspection and report on the results of the project implementation; methods and techniques of teamwork management and leadership	present, and future; - the ability to act relying on the value-based attitude towards a social work client as a self-governing entity	activities of other students and events of the external environment
Minimum permissible competence			
Content of the concept of "project", "project activity" in the aspect of management	1) The use of SMART criteria to formulate the project objective; 2) decomposition of the project to determine its activities; 3) implementation of activities on the own-developed project; 4) introspection and report on the project implementation results	The ability to act relying on the value-based attitude towards a social work client as a self-governing entity	Own project analysis and the results of its implementation

Conclusions and prospects of research. Considering the project competence of future bachelors of social work in the article, we proceeded from the allocation in the structure of such competence the components of theoretical knowledge, transformative activity, moral and spiritual values, and self-organization. Taking into account the specific professional activity of future bachelors of social work within this structure, the relevant knowledge, actions and values are detailed both at the highest level of project competence and at the minimum acceptable level. In the component of theoretical knowledge, these levels are distinguished by limited knowledge - the aspect of management at the minimum acceptable level of competence, and the intersectoral understanding of the concepts of “project” and “project management” at the higher level of competency. The component of transformative activity for the higher level of competency includes methods of substantiation of contradictions: the project, determining the ideal end result, the formulation of a realistic goal for the project, decomposition of the project, the implementation of the project, introspection as well as methods for managing teamwork are aimed to reduce those contradictions. For minimal competence, only certain project management methods are foreseen, in particular, excluding teamwork management methods. An integral part of moral and spiritual values is required at both levels to be able to act relying on the value-based attitude towards a social work client as a self-governing entity. In the component of self-organization, we consider the projects developed by students as a means of self-organization of their further transformative professional activity within the limits of a certain act, but at the same time a higher level of competence (as opposed to minimum competence) involves taking into account the activities of other students and events of the external environment.

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Formation of Artistic Competence of Future Specialist of Decorative and Applied Art in the Field of Paper Plastic

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Abstract

The paper reveals the role of paperoplasty as the main method of modeling in creative workshops, which cannot be overstated. The importance of papyroplasty in the process of competence formation, as a system of means of artistic expression, which provides ample opportunity for the development and demonstration of the basics of the formal composition. It is emphasized that the architectonics of paper structures gives a special sound to the formal language of projects, which in turn influences the world of real things formed by artists, architects, sculptors, engineers. Paper compositions reveal the special logic of designing from sheet materials, therefore, in addition to artistic, also develops technical thinking.

The findings justify that paper is one of the most readily available materials to date, a tuning fork of independent creative pursuits and experiments. Accessibility, ease of use of paper serve as a guarantee of crystallization of three-dimensional spatial ideas, as this material gives wide possibilities for experimental searches. The properties of the material, its structural, shaping, and design capabilities determine the directions and conditions for the passage of such experimental activity. Shaping from paper implies a developed level of abstract thinking, which is required in artistic creativity and developing the discipline of paper science.

Keywords: paper, plastic, decorative art, competence.

Introduction. The concept of artistic and aesthetic education of students in secondary schools involves the solution of a number of problems, among which are the tasks of "formation of artistic competence - the ability to be guided by the acquired artistic knowledge and skills, the willingness to use ready-made experience in independent activity in accordance with universal universal values spiritual outlook. "

As a kind of decorative art, working with paper makes it possible to more actively develop aesthetic feelings and engage in transformative work according to the laws of beauty and harmony, to shape the need for artistic creativity.

Specificity of work with paper involves mastering the artistic means of creating decorative products, design, paper, design and other modeling techniques of paper and cardboard. Creativity in this field of artistic activity can be successfully developed only with the purposeful guidance of the teacher. Issues of didactic support for the process of teaching this type of art can be solved only by a teacher with a high level of methodological training.

Recently, the importance of paper as fine material in decorative and applied, design, decorative art, in design and architectural modeling, due to the fact that paper is the most accessible artistic material, both in terms of simplicity in work and its value .

Techniques for the implementation of paper products have greater educational and educational opportunities. On the example of working with paper students learn a number of fine arts. In the course of artistic and labor activity they learn to analyze the phenomena and objects of the world around them, they develop imagination, arbitrary attention, compositional thinking, visual and figurative memory, a sense of rhythm, beauty of form, its spatial and structural features, color perception and its transformation. .

In the course of training, knowledge and skills in the field of stylization and generalization of real forms to figurative reproduction, organization of architectonics of flat and volumetric forms, their expressive harmony, which allows to master: from the initial sketch through full-scale sketches to the design of the design in the material; methods and techniques of decorative-plastic surface treatment of a sheet of paper; expressive means of product formation; compositional regularities of filling the surface of the sheet (the rhythmic organization of the image by the way of repetition and grouping of elements, objects by alternating elements close in shape, color, size); the concept of shape and its basic characteristics (proportions of the ratio of size, height and their influence on the figurative decision of the model, conditional structure and construction); basic concepts of spatial phenomena and their transfer on the plane and volumetric form in applied art, in design, as well as to form knowledge and skills in the field of color (the concept of dark and light colors, nuance and contrast, local, monochromatic, heterogeneous, related -contrast, additional colors, associative color rendering).

It must be constantly developed and improved in the continuous process of pedagogical practice. He must have a high level of artistic and pedagogical competence, that is, be able to teach students literacy and creative approach to the organization of educational process [1]. Thus, the real teacher-artist in the eyes of students emerges as the authoritative guide of the artistic picture of the world, an ideal model for imitation in the field of fine arts. Therefore, the development of artistic and creative competence is an important aspect in the work of a fine arts teacher.

An analysis of recent research and publications indicates that many scholars have explored problems of creative and artistic competence. The theoretical positions of the competence approach are substantiated in the works of I. Bekh, L. Alekseeva, A. Bidenko, N. Bibik, T. Brage, I. Zazyun, I. Ermakova, O. Kononko, O. Ovcharuk, Rodrigina, O. Savchenko, A. Markova, A. Khutorsky and others. L. Masol, G. Padalka, O. Rostovsky, G. Sotska, O. Rudnitskaya, O. Shcholokova and others studied the professional competences of teachers of artistic disciplines. Instead, despite the considerable array of dissertation robits and publications on creative (O. Kaidanovskaya, S. Konovets, I. Muzhikova, G. Sotskaya, O. Music, O. Poddubna, L. Pokrovschuk, M. Stas, O. Stashuk and others) and artistic (L. Basanets, A. Marchenko, Y. Mohireva, I. Pastir, V. Shcherbina, etc.) aspects of the professional activity of the teacher of fine arts, the problem of forming his artistic and creative competence has not yet been the subject of separate study.

The purpose of the article is to determine the meaning, role and place of papyroplasty in the process of art training and to reveal the essence of artistic and creative competence of the future teacher of fine arts.

The main content (research methodology). Possessing fine techniques only at the reproductive level inhibits his creative thinking, limits the range of professional functions to the level of the consumer or translator of artistic values. Instead, the active embodiment of his ideas in the material of various types of fine arts enriches his artistic and aesthetic experience. Communication of students with the author's compositions of the teacher positively influences their motivation for creative activity, understanding of the spiritual and material world under the laws of beauty.

The main content (Discussion). In his research, P. Paidukov considers the professional competence of the future teacher of fine arts as an integrative and personal formation of the subject, which ensures his readiness for conscious and high-quality pedagogical and artistic activity, successful organization of art education of students. According to the researcher, its content includes such leading competencies as pedagogical, visual, design, research and reflexive [2, p. 5]. All of them in their unity attest to the most integrative category of artistic and aesthetic competence of a specialist in the field of art.

In their research, L. Masol and O. Haydamak interpret artistic competence as a certain experience of the individual in the field of art, the ability to co-organize in the field of artistic activity on the basis of value aesthetic orientations and to develop their own artistic and creative potential. According to scientists, this concept has a personality-activity and integrative character, as a multifaceted indicator of the effectiveness of art education and self-education, which integrates all components: content (knowledge), procedural (ability), axiological (values, orientation), self-realization (activity)), creative (creativity) [3, p. 6].

Despite the fact that paper formations have existed for more than ten years, there is no direct use of the term "paper plastic" in the literature. Traditionally, the following terms have been used in theory: "paper plastics", "ornamental structure", "paper construction", "structural space with guide surfaces", "transformation of a flat sheet". Of course, the term "paper plastic" reflects both the artistic and creative features and the specifics of the genre itself, it is broader than just "the use of folded or other structures of paper in graphic design." With the introduction of this term, it becomes possible to historically build the evolution of paper as a material of modeling, the development of techniques and techniques of modeling, to show the continuity of the genre of experimental modeling. This term reflects the specifics of the author's approach to the study of compositional, structural, structural and technological laws.

The compositions themselves are not just samples of paper plastic, but also an analytical material that allows you to get into the basics of shaping patterns. This is a kind of modern "designer folklore", the secrets and techniques of which are transmitted directly in the process of live work and are the shaping baggage of art laboratories.

Paper-plastic as a system of means of artistic expression provides ample opportunities for mastering and demonstrating the foundations of a formal composition. Laws of rhythmic organization of form, principles of symmetry, dynamic fundamentals in the processing of folds of paper planes or in the formation of paper volume, understanding the elements of the composition as a single structural system, its combinatorial transformations, the series of software formations that integrate paper compositions into kinetic structures, The example of paper plastic is to discover the wide variety of compositional possibilities for sheet materials. Paper plastic is an intellectual asset of artistic modeling that allows you to find bright compositional solutions.

From our experience, it follows that the formation of artistic competence of future specialists of decorative and applied art in the field of paperoplasty is outlined as follows. In the empirical study of the formation of artistic and aesthetic competence of future teachers of fine arts, we relied on the criteria we have developed for the formation of artistic and aesthetic competence, taking into account that artistic and aesthetic competence is a holistic personal characteristic of a specialist in the field of artistic and pedagogical education in the components of unity: cognitive (knowledge of the content of competence in the form of facts, concepts, theories, technologies), motivational-value (reveals attitude to the content of artistic and aesthetic competence in the system of needs, motives, ideals, interests, values), activity-practical (experience of expression of artistic and aesthetic competence in various standard and non-standard situations), reflexive (emotional-volitional evaluation of the process and result of expression of artistic and aesthetic competence) aesthetic competence), personality development component (manifestations and development of personal qualities). In particular, we have defined the following criteria: epistemological, axiological, praxiological, autopsychological, creative. The epistemological criterion for the formation of artistic and aesthetic competence reflects the existence of a system of knowledge of the visual and decorative arts; the degree of development of artistic and pedagogical thinking, manifested in the combination of visual-figurative and theoretical thinking; Formation of perceptual, research, innovative skills; availability of a system of psychological and pedagogical knowledge regarding the organization of artistic and creative activity and aesthetic education. Axiological criterion takes into account the degree of awareness of artistic and aesthetic values, their importance for contemporary artistic, creative and educational activities; formation of needs for systematization and updating of artistic knowledge; Positive motivation for artistic and aesthetic activity; interest in arts and crafts; striving to solve problems on their own; attitude to decorative arts [1].

It is characteristic that the creative criterion reveals the possession of the techniques of personal expression and self-development in the sphere of artistic and aesthetic activity by means of decorative and applied art, techniques of self-realization and development of individuality within the profession (as an artist, as an educator); readiness for professional growth; persistence in achieving the set goals; ability for individual self-preservation, taking into account the specifics of artistic and aesthetic activity. To identify the state of formation of artistic and aesthetic competence of future teachers of fine arts and problems that arise in this process, we conducted a survey of students of different courses. According to the results of the questionnaire of students, we have made the following conclusions: in the classes of arts and crafts, sufficient attention is paid to the formation of motivational, value and activity-practical components of artistic and aesthetic competence of future teachers of fine arts; students point out enough different types of works used in traditional teaching, with the aim of stimulating and organizing practical activities in various techniques and types of decorative arts; the formation of the cognitive component due to the use of explanatory and illustrative teaching method plays a significant role in the teaching of arts and crafts; It is worrying that the practice of teachers of arts and crafts is not sufficiently used to systematically form the reflective and personal-developmental components of artistic and aesthetic competence of future teachers of fine arts.

Thus, the introduction of the technology developed by us for the formation of artistic and aesthetic competence of future teachers of fine arts contributed to their awareness of the importance of decorative and applied art for self-development as an artist and as a teacher, for their future professional activity, the development of a sense of artistic and aesthetic values, statements.

Conclusions. On the basis of the conducted research it is possible to draw the following generalizations and conclusions:

The development of paper formation involves the advanced level of abstract thinking that is required in artistic creativity and which, in turn, advances during the mastery of paper. Paper in the context of contemporary art and design becomes a kind of "instant response corps", a creative ground.

Paper plastics today is a promising area of design formation, which influences the development of project culture and arts and crafts. In this field, age-old experience is concluded, and yet, the creative potential of papyroplasty is not exhausted.

Paperoplasty is an intellectual asset of artistic modeling that allows you to find bright compositional solutions.

The essence of the artistic and creative competence of the teacher of fine arts, as his ability to continuously enrich his own visual experience, the development of aesthetic taste and special abilities, the completion of knowledge, the improvement of skills and skills of artistic shaping by means of composition in the practice of active production of original content and content value-added works, which becomes a solid foundation for achieving the pinnacle of artistic and pedagogical professionalism.

Formation of artistic and aesthetic competence of future teachers of fine arts in the process of studying arts and crafts is effective in the implementation of technology of its formation, which involves the implementation of the following stages: value-oriented, information-cognitive, interpretive, reflexive, personal. We see further prospects in specifying the system of tasks offered at each stage of technology, taking into account regional peculiarities of national culture.

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Social Upbringing of University Students as a Complicated and Multi-Faceted Process

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Abstract

The concept «social upbringing» of the personality is presented in the article. The directions, stages and the aim of the students' social upbringing are analyzed; the preconditions of effective social upbringing organization are described; the multidimensional functions realizing in the socio-upbringing environment of the higher education institution are considered.

Social upbringing is considered by various scholars based on perception of the essence of the "sociality" phenomenon.

Stressed on the transition to a democratic and humanistic education specified by the transformation of social situation, cultural changes and educational innovations. The author points out that this process requires the changing in the aims' concretization and the ways to upbringing process.

Key words: social upbringing, components of upbringing process, social component, pedagogical component, socio-upbringing institution.

Актуальність статті. Соціальне виховання – складний і суперечливий процес включення й адаптації підростаючого покоління в життя суспільства у різних його аспектах життєдіяльності. В такому процесі реалізуються ідеали, духовні цінності суспільства на тому чи іншому етапі його розвитку. У свою чергу, ідеали і цінності трансформуються в цілі виховання, які, у свою чергу, визначають його зміст, форми і методи.

Проте комплексний підхід до вирішення питання щодо перехідних етапів розгортання процесу соціального виховання у закладах вищої школи та можливих механізмів його реалізації ще недостатньо встановлено в педагогічній науці.

Аналіз наукових джерел дозволив спиратися на загальнонаукові положення про системність соціального виховання, розроблені Б. Купріяновим, Є. Юдіним; питання соціального виховання студентів у позанавчальній діяльності знайшло своє відображення у працях вчених-педагогів, зокрема: Л. Ази, М. Білобородова, Т. Бондаренко, Т. Бурцевої, М. Гавриленко, О. Гладковської, Т. Логвиновської,
Т. Ромм та ін.

Метою даної статті є спроба розкрити сутність соціального виховання студентів та довести його багатоаспектність як процесу, і як результату, і як педагогічного феномена впливу на студентів

Виклад основного матеріалу. Основні теоретичні положення щодо соціального виховання молоді успішно розроблені у наукових школах українців А. Капської (Київ), С. Савченка (Луганськ), Л. Міщик (Глухів), М. Євтуха (Київ) тощо. Загалом науковці розглядають «соціальне виховання» як цілісний соціально – педагогічний комплекс, який виникає в результаті взаємодії різних факторів виховання та взаємозв'язку компонентів процесу виховання (мета, структура, зміст, управління і результати функціонування) для досягнення мети соціального виховання особистості, її соціальної адаптації й захисту.

Адже від того, яким стане молоде покоління найближчим часом, від рівня його освіченості, вихованості, підготовленості до життя у швидкоплинних умовах, від сучасності мислення, відповідальності, ініціативності їх соціальної участі у справах держави, від його готовності до політичного і соціального вибору – сьогодні залежить майбутнє країни.

Перший багатоаспектний варіант виховання привів науковців до поступового руху соціально-педагогічних процесів. Лише в 60-х роках XX ст. почала розвиватись соціально-педагогічна робота. Це був відгук на потреби суспільства, вимоги оновленого життя, необхідність удосконалення виховної діяльності і, в першу чергу, на вимоги до взаємодії освіти і життя.

Наступний етап становлення соціального виховання набуває сили в 70-80 роках XX ст. Цей період можна назвати етапом педагогізації соціального середовища, оскільки у всіх регіонах і республіках колишнього Радянського Союзу створювалась розгалужена мережа різних установ, основною метою їх діяльності було вдосконалення виховної роботи з молоддю. Такі установи об'єднували у своїй структурі різні напрями виховної роботи: освітньо-виховні, фізкультурно-оздоровчі, соціально-педагогічні.

Своє друге народження соціальне виховання пережило у 90-ті роки.

Цілком закономірно, що крах комуністичних ідеалів, теорії комуністичного виховання спонукали до перегляду співвідношення виховання й освіти, закріплення за освітніми установами в основному освітніх цілей і функцій. І саме в цей час переноситься центр виховання в сім'ю (яка, до речі як інститут не була до цього готовою).

Окрім того, в цей період досить впевнено заявляють про себе і свої ідеї психологи і педагоги стосовно розуміння суті поняття «соціальне виховання», здійснюється перехід до створення в державі цілісної системи соціальних служб, розробляється концепція соціального виховання, розгортається активна підготовка кадрів соціальних педагогів і соціальних працівників.

Останній етап активізував продуктивні пошуки в педагогіці і місце соціального виховання у позанавчальній діяльності в різних освітніх закладах I–II та III–IV рівнів акредитації.

В науковій літературі існує три основні значення поняття «виховання»: перше трактує дане поняття досить широко, розуміючи під ним такі процеси, як «виховує життя», «виховує сім'я і школа», «виховує рідна земля» тощо. Мається на увазі вплив середовища на людину, при цьому передбачається можливість реалізації набутих цінностей, знань, традицій, набутих у суспільстві, наступному поколінні, іншій соціальній групі [1, с. 5–6].

Звідси можна погодитись з позицією М. Плоткіна, в якій наголошується на тому, «що соціальне виховання пронизує всі сфери виховання, які часто виходять за межі конституційного середовища і в яких наявний в тому чи іншому виді соціальний компонент – фактори макро- і мікросередовища, які мають вплив на процеси соціалізації особистості, соціальні відносини між соціальними інститутами і суб'єктами соціалізації [2, с. 32–35].

Поступово від чистого виховання науковці переходять до соціального виховання. На думку ряду вчених (Б. Бітінас, Т. Бондаренко, М. Гавриленко, А. Іванченко), можна виокремити деякі першочергові позиції: соціальне виховання проникає у побут, працю, дозвілля людей, у різні сім'ї, виводиться виховний процес в реальне життя за межі школи і вузу. При цьому цілком можна погодитись з позицією А. Корнілової, яка доводить, що «ефективність соціального виховання можна забезпечити у процесі роботи з об'єктами виховання: кожний вихованець потребує до себе індивідуальнодиференційованого підходу залежно від особистісних характеристик та від ситуації і обставин; у становленні його як особистості, як громадянина відіграє значну роль його активно – діяльнісне становлення до навколишнього світу» [3, с. 23].

Значно ширше розглядає соціальне виховання А. Мудрик. Він розуміє соціальне виховання як «цілеспрямований процес засвоєння певної системи знань, норм, цінностей, відносин, способів поведінки, які дозволяють людині функціонувати в якості повноцінного члена суспільства, громади, групи» [4, с. 9]. І якщо говорити про соціальне виховання студентської молоді, то варто сказати, що це є:

− спеціальне формування якостей загальнолюдської поведінки та певного типу особистості, яка засвоїла соціальний досвід життя в конкретному суспільстві і може активно брати участь у продуктивній діяльності та взаємодіяти з іншими людьми;

− це процес і результат стихійної взаємодії людини із найближчим середовищем й умовами цілеспрямованого виховання (сімейного, громадянського, правового);

− це процес спільного вирішення завдань активного пристосування людини до певних ролей, нормативних установок та зразків соціального прояву [5, с. 69; 6; 8].

Головною метою соціального виховання вчені вважають формування соціальності як інтегративної якості особистості у процесі планомірного створення умов для її відносно цілеспрямованого саморозвитку як суб'єкта соціального виховання. У даному разі соціальне виховання виступає як засіб створення певного простору, який дозволяє реалізувати особистісні потенціали, забезпечити включення особистості у проектування власних життєвих планів і перспектив та власної життєдіяльності.

Слід зазначити, що за останні два десятки років під час трансформації соціального становища, культурних змін і освітніх новацій простежується перехід у вихованні до демократичного і гуманістичного стилю. А відтак змінюються й конкретизуються цілі і способи виховного процесу: як свідчить практика, замість формування молодого покоління за заздалегідь розробленим ідеологічними зразком сьогодні пріоритетним завданням є формування вільної у своєму життєвому виборі особистості на основі її ознайомлення з різноаспектними політичними, соціальними й економічними традиціями суспільного і світового розвитку. І згідно з Законом України «Про вищу освіту» (2014 р.) змінюються способи організації навчально-виховного процесу: розвиток набуває варіативності в освіті, в інноваційній педагогічній технології, деідеологізації виховання [9; 7].

Отже, потреба в соціальному вихованні обумовлена, з одного боку, особливостями соціально-педагогічної ситуації сучасної молоді (відсутність уваги до проблем молоді з боку громади, суспільства, поширенням явища байдужості, ігнорування інтересів молоді, поява явища наркоманії, обмеження можливостей в отриманні вищої освіти, працевлаштування, відпочинку), а з другого боку – розуміння того, що всі свої кризові проблеми українського суспільства можна вирішувати лише завдяки діям вихованої (соціалізованої і культурної) людини. Адже соціальне виховання охоплює і відповідно розглядає з педагогічних позицій практично всі сфери соціального життя і діяльності молодої людини: сімейний соціум, специфіку великого міста і мікрорайону, сільської громади й навчальних закладів, різні групи ризику тощо. Тому можна стверджувати, що в організації і змістовому забезпеченні соціального виховання рівнозначно зацікавлені особистість, суспільство і держава.

Аналізуючи соціальне виховання як багатоаспектний процес, В. Штифурак [10] доводить, що це цілеспрямований процес формування соціально значущих якостей особистості, необхідних для успішної соціальної діяльності. При цьому, можна визнати те, що соціальне виховання у всіх модифікаціях, моделях і технологіях об’єктивно служить суспільно-державним інструментом стабілізації позицій і норм поведінки молодого покоління в сучасних умовах і саморозвитку
молодої людини як суб’єкта діяльності.

Тому можна стверджувати, що соціальне виховання студентської молоді є завданням всього суспільства, а не лише університету. Особливо важливою умовою ефективності діяльності у цій сфері є співпадіння цілей і завдань соціального виховання зі стратегією розвитку суспільства. Зміст соціального виховання – це забезпечення процесів саморозвитку, самовдосконалення, самореалізації на основі технологій і засобів педагогічної підтримки. Що передбачає такі напрямки діяльності: посилення виховуючого характеру навчання, створення у всіх типах освітніх установ ефективних гуманістичних систем; гармонізація вихованця; педагогізація середовища, в радіусі дії освітньої установи; розгортання клубної, дозвілєвої та любительської діяльності, стимулювання нових молодіжних об’єднань; розвиток і заохочення демократичного потенціалу в управлінні освітніх і виховних інститутів; збереження і розширення мережі установ і підструктур для розвитку і реалізації інтересів та потреб молоді, які одночасно спрямовані на використання соціального замовлення щодо реалізації різноаспектних програм для молоді.

Таке бачення завдань соціального виховання дозволяє вести мову про інтегрований результат даного процесу, який проявляється у соціальності людини як її здатність взаємодіяти з соціумом, яка є джерелом власної активності, проявом індивідуального творчого ставлення до суспільного буття.

Враховуючи таку багатозначність і багатофункціональність соціального виховання, доцільно визначити окремо функції соціального виховання у закладі вищої освіти як виховної соціальної інституції.

1. *Ціннісно-орієнтована функція* передбачає формування морально-етичних якостей і установок, які узгоджуються з нормами і традиціями суспільства.

2. *Комунікативна функція* університету відображається в оволодінні студентами досвідом інтегративної педагогічної взаємодії, яку можна розуміти як цілеспрямовану міжособистісну комунікацію сучасників соціально-виховного процесу.

3. *Третьою функцією* в діяльності закладу вищої освіти є *актуалізуюча* функція, мається на увазі усвідомлена діяльність у створенні суб’єктами нового змісту соціально-виховного процесу завдяки їх взаємодії, рефлексії явищ дійсності, власної діяльності.

4. Однією із багатовекторних функцій вищого навчального закладу як соціально – виховного інституту є *організаційна функція*. Дана функція реалізується на різних організаційних рівнях вищого навчального закладу – студентська група, факультет, соціально-виховні і громадські структури.

5. *Діяльнісна функція* закладу вищої освіти загалом відображає єдність різних видів діяльності: освітньої, науково-дослідної, соціально-педагогічної.

Таким чином, наповнення освітньої діяльності резервами соціально – виховної діяльності є важливим шляхом підвищення її престижу, створення значних можливостей для самоформування і самореалізації студентів у різних соціально-виховних ситуаціях чи реальних умовах праці.

На основі вище викладеного можна зробити такий висновок: *соціальне виховання, як процес соціально керованої соціалізації, є по суті педагогічно орієнтованою і цілеспрямованою системою соціальної допомоги, яка здійснюється у спеціальних виховних організаціях і спрямована на розвиток духовно-ціннісних орієнтацій, можливостей молодої людини(її знань, здібностей, моделей поведінки, відносин) з метою її включення у соціально значуще життя. У цьому розумінні соціальне виховання передбачає використання суспільством всього арсеналу засобів і методів освітньо-виховного процесу, які б сприяли формуванню особистості та її успішному входженню в соціум*.

Сказане загалом дозволяє зазначити, що соціальне виховання здійснюється в основному за такими напрямками: 1) створення умов з метою передачі соціального досвіду через організацію і стимулювання життєдіяльності членів суспільства; 2) формування виховуючого, особистісно розвиваючого середовища для певної самореалізації і самовдосконалення кожної людини; 3) освіта, навчання, просвітництво виступають складовими соціального виховання, в результаті чого відбувається оволодіння знаннями, уміннями, навичками, особистісними якостями, досягається інтелектуально-моральна свобода; 4) організація індивідуальної соціальної допомоги людині, процесів реалізації і потреб, і соціальної реабілітації, що сприяє вирішенню певних проблем і забезпеченню нормальної її життєдіяльності.

Висновки. Все вищевикладене дозволяє зробити певний висновок про те, що соціальне виховання як соціально-педагогічна проблема є складним інтегративним явищем, вивчення й аналізу якого дає змогу виявити орієнтири і напрямки у практичній діяльності, сприяючи загалом підвищенню ефективності соціально-виховного процесу у закладах вищої освіти. Наші наукові пошуки в майбутньому зосереджуються на практичному аспекті, формах і методах соціального процесу в умовах позанавчальної діяльності студентів в закладах вищої освіти.

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Translation of the Title, Abstract and References to the Author's Language

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Лю Сюнь. Соціальне виховання студентів університетів – складний багатогранний процес.

У статті представлено змістовий аспект поняття «соціального виховання» студентів як особистісно-орієнтований процес, що реалізується в умовах вищого закладу освіти.

Соціальне виховання розглядається різними науковцями на основі сприйняття суті феномена «соціальність». Автор доводить необхідність оптимізації процесу соціального виховання студентів та утверджує думку про залежність змісту, форм і

методів даного процесу від цілей, і деталей, і цінностей на конкретному етапі розвитку суспільства.

Ключові слова: соціальне виховання, соціальність, процес, заклад вищої освіти, студенти.

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Cross-Cultural Competence of Personality and Adaptation to Polycultural Environment: Approaches and Techniques

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Abstract

The article considers the cross-cultural competence of an individual as an important factor influencing the success of adaptation of various categories of people immigrants, refugees and internally displaced persons, returnees, representatives of ethnic and cultural minorities, as well as representatives of multicultural societies. Based on foreign studies, different approaches to the development of practical programs aimed at increasing intercultural competence and the effectiveness of socio-cultural adaptation are analyzed.

In many cases, the fate and career of a person depends on successful intercultural interaction. Cultural differences become a particularly important factor when a person is forced or voluntarily in another socio-cultural environment, where he must deal with various life and business tasks. Ignorance of cultural values, roles, norms and rules of conduct can be a major obstacle in international political and business negotiations, on the way to survival in a new culture and achievement of goals and education. In addition to knowledge of another culture, the skills and abilities that will determine the realization of this knowledge, as well as the desire to overcome all obstacles and to succeed in activities in intercultural interaction are necessary.

The combination of knowledge, personality traits, motives and specific skills that contribute to the effective achievement of goals in intercultural interaction, was called intercultural competence. This complex theoretical construct, extremely needed in practice, has attracted the attention of a huge number of researchers and developers of practical programs.

Thus, the approaches discussed give a broad opportunity to choose methods and technologies for solving problems that arise in intercultural interaction. Despite the general tendency to develop complex methods, the specific approaches, as shown above, continue to exist and develop, taking into account the latest advances in this field. Traditional methods, such as lectures, case studies, role-playing games, game simulators, the method of critical incidents are enriched with video materials, the use of computer self-diagnosis, interactive video and online learning.

Key words: cross-cultural competence, sociocultural adaptation, training programs, techniques, personality, ethnic minorities.

1. ВСТУП

Постановка проблеми. У сучасному світі знання іноземних мов та особливостей інших культур стають життєвою необхідністю для величезної кількості людей. Причини зрозумілі. За останні п'ятдесят років сталася низка подій, що прискорило спілкування між різними народами, культурами та країнами: це і розпад колоніальних систем, і розширення міжнародних контактів у виробничій сфері, торгівлі та науці, що сформувалися завдяки розвитку нових технологій загальному інформаційному простору, безперервному руху мігрантів з одних країн до інших.

У багатьох випадках від успішної міжкультурної взаємодії залежить доля і кар'єра людини. Культурні відмінності стають особливо важливим фактором, коли людина вимушено або добровільно опиняється в іншому соціокультурному середовищі, де їй необхідно вирішувати різні життєві і ділові завдання. Незнання культурних цінностей, ролей, норм і правил поведінки може виявитися значною перепоною у міжнародних політичних і ділових перемовинах, на шляху виживання в новій культурі та досягнення поставлених цілей й отримання освіти. Крім знань про іншу культуру необхідні вміння та навички, що визначатимуть реалізацію цих знань, а також бажання подолати всі перешкоди і досягти успіху у діяльності в міжкультурній взаємодії.

Сукупність знань, особистісних особливостей, мотивів і конкретних навичок, що сприяють ефективному досягненню цілей в міжкультурній взаємодії, отримала назву міжкультурної компетентності. Цей складний теоретичний конструкт, надзвичайно потрібний в практиці, привернув увагу величезної кількості дослідників і розробників практичних програм.

Мета статті. На основі аналізу зарубіжних досліджень щодо різних підходів до розробки практичних програм, які впливають на успішність адаптації особистості виявити можливі методи і технології спрямовані на підвищення міжкультурної компетентності та ефективності соціокультурної адаптації.

Аналіз останніх досліджень і публікацій. Термін «компетентність» був введений в теорію і практику міжкультурної комунікації дослідниками, які почали вивчати діяльність іноземного технічного персоналу і добровольців Корпусу миру [31].Упродовж півстоліття дослідження проводилися в контексті теорій адаптації і акультурації різних категорій мігрантів в іншому культурному середовищі [9; 13; 49], концепції культурного шоку [1; 6; 7; 18; 19; 45; 47], в практичних підходах до крос-культурного навчання [33], консультування та психотерапії іноземців в іншій культурі [2; 29; 39; 40; 46], в дослідженнях міжнародних відносин і ділової взаємодії різних культур [4; 10; 14; 40].

2. РЕЗУЛЬТАТИ ДОСЛІДЖЕННЯ

Окремі риси сучасного світу призвели до усвідомлення педагогами, психологами, культурологами, лінгвістами, антропологами необхідності розробки спеціальних програм, спрямованих на оптимізацію міжкультурної взаємодії. Не тільки вузькі фахівці, а й представники найрізноманітніших сфер, почали усвідомлювати важливість розробки практичних програм з підвищення міжкультурної компетентності, зокрема педагоги, які навчають представників різних етнічних груп, керівники підприємств, де працюють фахівці з різних країн, фахівці і співробітники різних служб, які працюють з різними категоріями мігрантів.

За кілька десятиліть зарубіжними фахівцями були накопичені ґрунтовні дані, які свідчили про те, що більшість людей, залучених до кроскультурної взаємодії, отримують істотну користь від певного виду систематичної підготовки і тренінгів, які допомагають їм впоратися зі стресом і культурним шоком. Занурення людини в нову культуру без спеціальної підготовки може мати занадто високу ціну як з фінансової, так і з особистісної сторони.

Однією зі значних проблем для міжнародних компаній і організацій нерідко стає масове передчасне повернення працівників і членів їх родин. Є дані,
що від 20% до 50% людей, які виїжджають працювати за кордон, повертаються раніше терміну закінчення контракту [16; 17; 20; 48]. Це приносить великі збитки. Так, за даними американських дослідників, у фінансовому плані для всієї індустрії США загальна вартість робітника може досягати двох мільярдів доларів на рік [15; 24], що у

3−5 разів може перевищувати його зарплату; ціна кожної невдачі може коливатися в межах від чверті до мільйона доларів США на одного працівника [11; 27; 35].

Ця проблема не обмежується тільки експатріацією співробітників різних організацій. Наприклад, аналіз діяльності представників Корпусу миру, організації де працюють волонтери, які на старті проходять психологічне обстеження і консультування [34], показав, що показник відсіву за період з 1961 −1971 рр. склав 40−50% [36; 37]. Також іноземні студенти з поганою успішністю є сумнівним вкладенням коштів для своїх країн, сімей і університетів. Навіть у тих людей, які на постійній основі включаються в нову культуру – іммігрантів і біженців, можуть виникати додаткові труднощі, що перешкоджають успішній адаптації. У всіх випадках невдалої адаптації, крім соціальних втрат, є ще й особистісна ціна для кожної окремої людини у вигляді зниження самооцінки, уповільнення професійної кар'єри і відчуття себе невдахою. При цьому страждають не тільки конкретні індивідууми, але також і їх сім'ї [12; 15; 26; 29]. Є ще й прихована ціна, зокрема кумулятивний вплив таких подій на міжнаціональну і міжгрупову гармонію.

Відтак, наразі є досить багато емпіричних і юридичних підстав, що визначають надзвичайну важливість організації систематичних міжкультурних програм для людей, що включаються в незнайому культуру. Однак, більшість з них або взагалі не отримують ніякого формального навчання, або тільки отримують поверхневі знання, недостатні для інтелектуальних і особистісних ресурсів, необхідних для успішної адаптації. Існують вагомі причини, чому така підготовка відсутня. Для багатьох країн культурний тренінг виявляється дорогим заняттям. Є також причини, що перешкоджають проведенню таких тренінгів. Наприклад, у людей, що опиняються в іншій культурі, може бути відсутня мотивація до участі у тренінгу або можуть виникати серйозні організаційні труднощі. Прикладом можуть служити біженці. Прагнення змінити місце проживання, необхідність їх термінового переселення, небезпека для їхнього життя і здоров'я, звичайно, не залишає можливості для їх попередньої культурної орієнтації.

Студенти, які навчаються за кордоном за фінансової підтримки урядів своїх країн або університетів, іноді проходять попередню підготовку. Але у зв'язку із дефіцитом фахівців, що володіють необхідною теоретичною і емпіричною базою, таке навчання часто не приносить очікуваної користі.

Зараз найбільша увага приділяється підготовці до міжкультурної взаємодії, яка здійснюється в сфері бізнесу, так як все більше число керівників мультинаціональних компаній усвідомлюють, що це підвищує ефективність їх функціонування. У той же час інші категорії людей, які опиняються в іншому культурному середовищі, – біженці, співробітники благодійних організацій, технічний персонал – залишаються практично без уваги [27].

Коло людей, яким необхідні практичні міжкультурні програми, досить широке. Це – іммігранти, вимушені переселенці і біженці, репатріанти, представники етнічних і культурних меншин, а також представники мультикультурних суспільств з високим рівнем міжетнічної напруженості і ксенофобії. Наведемо ці категорії людей, які змінюють своє місце проживання вимушено або добровільно, на нетривалий час або на все життя, з точки зору можливостей їх спеціальної підготовки до життя в новому соціокультурному середовищі з метою більш успішної адаптації.

1. Іммігранти – категорія людей, яка в першу чергу, потребує серйозної підготовці до життя в новому соціокультурному середовищі. У такій ситуації ефективні культурно-специфічні програми, що дозволяють їм пристосуватися до нових соціокультурних умов. Іммігранти, як і люди, які приїжджають в іншу країну на певний термін, переживають особливий стан, що отримав назву «культурний шок». Згаданий феномен уперше описав Карл Оберг, який стверджував, що входження в нову культуру для кожної людини є заплутаним, турбуючим і дезорганізуючим переживанням. Таке сильне нервове збудження може статися під впливом нових умов, коли сенсорні, символічні, вербальні і невербальні системи, які безперебійно забезпечували б нормальне життя на батьківщині, відмовляються адекватно працювати.

Концепція культурного шоку в тому вигляді, в якому вона була сформульована Карлом Обергом, спиралася на так званий клінічний підхід до вивчення процесів адаптації в іншій культурі. Його прихильники вважали, що невдачі і проблеми іммігрантів – це симптоми прихованої патології, що потребує лікування. У вітчизняній психіатрії розлади адаптації також нерідко пов’язували з поняттям «Ситуаційного розладу» і розглядалися як «неправильні» реакції на події та обставини життя. Карл Оберг виділив шість основних психологічних ознак культурного шоку: напруга, яка супроводжує зусилля, необхідні для психологічної адаптації; відчуття втрати або позбавлення (статусу, друзів, батьківщини, професії, майна); відчуття знедоленої людини (неприйняття новою культурою) і відчуття відкидання (неприйняття нової культури); збій у рольовій структурі (ролях, очікуваннях); плутанина в самоідентифікації, цінностях, почуттях; відчуття тривоги, засноване на різних емоціях (здивування, відраза, обурення), що виникають в результаті усвідомлення культурних відмінностей; відчуття неповноцінності внаслідок нездатності впоратися з новою ситуацією [43].

Проте надалі культурний шок стали розглядати як нормальну реакцію, як частину звичайного процесу адаптації до нового культурного оточення. Багато дослідників намагалися уточнити розуміння культурного шоку, підкреслюючи різні сторони перебування в іншій культурі. Для цього використовувалися терміни «культурне стомлення» [34] «мовний шок» [45], «рольовий шок» [23] та ін. Зокрема, П. Бок описав культурний шок як емоційну реакцію, що виникає внаслідок нездатності зрозуміти, проконтролювати і передбачити поведінку інших [19]. До подібних переживань призводить недостатнє знайомство як з новими фізичними умовами (наприклад, вид будинків, магазинів, установ), так і з соціальним оточенням (наприклад, звичаї, етикет, ритуали). Інші автори пов'язували культурний шок із невизначеністю норм та очікувань, отже, з труднощами контролю над ситуацією і її прогнозуванням. У зв'язку з цим виникає тривожність, замішання і апатія, що тривають доки, поки не сформуються нові когнітивні конструкти для розуміння іншої культури і вироблення відповідних моделей поведінки.

Пом'якшення і подолання культурного шоку, допомога в соціальній і психологічній адаптації – основні завдання практичних міжкультурних програм для іммігрантів, біженців та вимушених переселенців.

2. Біженці і вимушені переселенці. Будь-яка людина, що опинилася в іншокультурному середовищі, може переживати стрес акультурації, культурний шок, проте стан біженців і вимушених переселенців погіршується через травми, отримані до переїзду і невизначеністю їх стану в сьогоденні. Тому при розробці міжкультурних

програм для цієї категорії осіб необхідно враховувати специфіку їх психологічного стану і паралельно з програмами міжкультурної взаємодії здійснювати програми реабілітації і психологічної допомоги в груповій або індивідуальній формі. Специфіка даної категорії людей у порівнянні з іммігрантами полягає також в тому, що невідомо, на який термін вони залишаться в країні, чи будуть вони репатрійовані або переселені до іншої країни, тому в програмах міжкультурної взаємодії для біженців акцент повинен бути зміщений в бік меншої культурної специфічності, і більш важливим виявляється розвиток загальної культурної сенситивності.

3. Особи, які перебувають тимчасово. Так називають зазвичай людей, що приїжджають в іншу країну на певний термін – від декількох місяців до декількох років. До цієї категорії осіб в першу чергу відносяться студенти, які навчаються за кордоном, співробітники міжнародних організацій, іноземних фахівці та члени їх родин. До цієї категорії входять і представники бізнесу. В умовах все більшої глобалізації економіки від рівня міжкультурної компетентності сучасного бізнесмена залежить не тільки його суб’єктивне відчуття комфорту міжкультурної комунікації, – на карту поставлена успішність міжнародної угоди, благополуччя організації, а часом – й економіка регіону.

Завдання, які стоять перед особами, які тимчасово перебувають, полягають в тому, щоб впоратися з вимогами нових культур і розвинути певний рівень соціокультурної компетентності, необхідний для успішної адаптації. У практичних програмах, розрахованих на дану категорію людей, необхідно враховувати різні аспекти, пов’язані зі специфікою когнітивних, афективних і поведінкових процесів. У когнітивному плані новоприбулі потребують інформування про політичні, соціальні та адміністративні приписи країни перебування, особливо про ті, які безпосередньо впливають і регулюють їх життя. Вони повинні усвідомити, що ці правила можуть мати як формальні, так і неформальні прояви. Емоційно вони повинні навчитися долати відсутність звичних місць, соціальних зв’язків і практик, з тривогою, яка визначається цими втратами, і намагатися знаходити приємне, що задовольняє їх в нових обставинах. У поведінковому аспекті вони повинні засвоїти новий репертуар міжособистісних і соціальних навичок, щоб ефективно взаємодіяти з партнерами з приймаючої культури [18; 30; 50].

4. Репатріанти. До цієї категорії осіб відносяться люди, що повертаються додому після тривалого перебування в іншій країні. Повернувшись в свою рідну культуру, до колишніх зв’язків, колишньої роботи, вони нерідко потребують спеціальних програм репатріації [38]. Ці програми необхідні, щоб сприяти так званому «зворотньому переходу» – поверненню до своєї культури, і особливо важливі для тих осіб, які тимчасово перебувають в іншій країні та довго були за кордоном і, що парадоксально, були успішні в соціокультурній адаптації. Окрема і важлива тема в контексті реадаптації репатріантів – професійна інтеграція. Адже після кількох років, проведених за кордоном, умови на роботі на батьківщині можуть після повернення здатися більш незвичними, ніж ті, що були в іншій країні.

5. Представники етнічних і культурних меншин. У літературі описані тренінги для членів груп меншин в мультикультурних суспільствах, включаючи аборигенів в країнах, які були масово заселені представниками колонізаторів. Міжкультурні програми для корінних мешканців і меншин спрямовані на розвиток мультикультурної компетентності, тобто на сприяння ефективному функціонуванню як у власній культурі, так і в домінуючій культурі, яка їх поглинула. Основна мета таких програм полягає в тому, щоб їх учасники не втратили вихідної культурної ідентичності, і щоб вони не прагнули до заміни однієї культури на іншу [42].

6. Представники мультикультурних суспільств. Як правило, представники приймаючої культури або етнічної більшості не отримують будь-якої освіти щодо інших культур. У даний час в більшості мультикультурних країн, в тому числі, і в Україні, поки не є можливим і фінансово доцільним повсюдно проводити таке навчання. Однак там, де є для цього ресурси, має сенс впровадження програми для зацікавлених учасників. Обов’язковою ж представляється підготовка до міжкультурного взаємодії тих представників приймаючого суспільства, які за родом своєї діяльності працюють в тісному контакті з представниками інших культур. До них відносяться співробітники служб і організацій для мігрантів і біженців, медичні працівники та психологи, що працюють з відповідними клієнтами, представники туристичного бізнесу, співробітники мультинаціональних організацій.

Особливу групу в цій категорії складають педагоги, які працюють в багатонаціональних освітніх установах. Педагог грає провідну роль в процесі соціалізації студента, виступаючи в якості посередника між суспільством і тим, хто навчається в процесі засвоєння культурно-історичного досвіду. Від викладача залежить створення сприятливої соціальної ситуації розвитку, необхідної для успішної життєдіяльності, індивідуального самовираження кожного студента і всебічного розвитку кожної особистості, збереження неповторності та розкриття її потенційних здібностей, формування моральних цінностей і духовних орієнтирів. Педагог здатний чинити серйозний вплив на формування толерантної, полікультурної особистості студентів, ефективно функціонуючої в системі міжетнічних і міжконфесійних відносин.

Варто взяти до уваги, що педагогічний колектив несе в собі величезний потенціал підвищення міжкультурної компетентності та сприяння адаптації студентів з сімей мігрантів і етнічних меншин до освітнього середовища. Від професійності викладачів, їх світоглядних позицій і особистісних рис часто залежить те, наскільки комфортно в закладі освіти будуть відчувати себе студенти з різних соціокультурних груп. Готовність викладача прийняти інших такими, якими вони є і взаємодіяти з ними на основі згоди, його стійкість до різноманіття світу, до етнічних, культурних, соціальних і світоглядних відмінностей створює передумови для підвищення міжкультурної компетентності студентів.

Відтак, стає очевидною необхідність спеціальної роботи з педагогами, психологами та адміністрацією освітніх закладів, спрямованої на забезпечення працівників освіти знаннями і навичками, що сприяють зростанню їх міжкультурної компетентності [5; 8].

Досвід, накопичений в різні періоди розвитку практичних програм з підвищення міжкультурної компетентності та сприяння соціокультурній адаптації, ставить перед дослідниками завдання їх систематизації. Спираючись на закордонні і вітчизняні спроби аналізу даної проблеми (Солдатова, Шайгерова, Каліненко, Кравцова; Стефаненко; Brislin, Landis, Brandt; Gudykunst, Hammer; Ward, Bochner, Furnham), виділимо п’ять підходів до розробки міжкультурних програм, спрямованих на підвищення міжкультурної компетентності та ефективності соціокультурної адаптації: університетський, порівняльно-культурний, емпіричний, атрибутивний і комплексний.

Університетський підхід. Головне завдання даного підходу – надання учасникам різної інформації про ту чи іншу культуру. Знайомство з особливостями приймаючої культури може здійснюватися за допомогою методичної літератури, лекцій, групових дискусій, відеофільмів, за допомогою використання комп'ютерних засобів. Надана інформація може включати дані про економіку приймаючої країни, клімат, умови життя, повсякденну поведінку, стилі прийняття рішень, а також про типовий досвід і проблеми людей, які опинилися в іншій культурі.

Головна перевага даного підходу полягає в тому, що всі технології, на які він спирається, досить добре розроблені. Однак, його ефективність обмежена наступними моментами: інформація про культуру часто носить загальний характер і важка для застосування в конкретних умовах; пред'явлена інформація, як правило, екзотична, при цьому ігноруються звичайні, повсякденні ситуації; нерідко створюється помилкове враження, що культура може бути засвоєна за декілька занять; навіть якщо отримані факти зберігаються в пам'яті, вони зовсім не обов‘язково забезпечують адекватну поведінку. Однак, незважаючи на всю критику, університетський підхід в силу багатьох причин досі залишається популярним. Означене одночасно охоплює багато людей, він простий, гнучкий і відносно недорогий.

Порівняльно-культурний підхід. Головне завдання даного підходу –досягання культурної обізнаності через порівняння з цінностями і нормами інших культур. Формування та підвищення міжкультурної компетентності особистості в рамках цього підходу відбувається шляхом ознайомлення з відмінностями між власними культурними цінностями і нормами і цінностями іншої культури. Програми, засновані на ідеї культурної сенситивності, покликаної не тільки забезпечити учасників інформацією про іншу культуру, а й посилити у них усвідомлення власної культури. Метою програм такого роду є порівняння і протиставлення двох культур, розгляд відмінностей в поведінці з огляду кожної з двох культур і розвитку на цій основі усвідомлення культурної відносності. Програми культурної сенсибілізації і самоусвідомлення мають такі ж обмеження, як і побудовані тільки на інформуванні, зокрема, щодо перенесення отриманих в аудиторії знань на «польові умови» [18; 30; 50].

Атрибутивний підхід. У цьому підході основна увага спрямована на пояснення поведінки з точки зору представника іншої культури. Його мета – навчити учасників тренінгу тим атрибуціям, які використовуються в досліджуваній культурі, і пояснити їх причини. Найбільш поширеним методом у рамках даного підходу є культурний асимілятор. Культурний асимілятор включає описи епізодів зустрічей двох індивідів з різних культур, які заздалегідь оцінюються експертами (мандрівниками, знавцями даних культур) як проблемні ситуації. Кожна з описаних интеракцій завершується непорозумінням, нерозумінням або міжособистісною ворожістю. Учаснику пропонується потім чотири або п'ять альтернативних обґрунтувань невдалої взаємодії, відповідних типів атрибуції спостережуваної поведінки. Тільки одна з цих атрибуцій є адекватною і коректною з погляду культурного навчання. Учасники вибирають відповіді, які вони вважають вірними [21; 22]. Недолік цього методу у тому, що він пов'язаний із когнітивним навчанням і страждає від уже згаданих обмежень, властивих інформаційному підходу.

Емпіричний підхід. Емпіричні методи стали відповіддю на обмеження всіх попередніх підходів, що носять інформаційно-орієнтований характер. Незадоволеність практиків використанням методів тільки такого роду привела до різних спроб розробити психотехнології, спрямовані на усвідомлення і спостереження реальних або штучно створених переживань, пов'язаних із засвоєнням іншої культури. Ключова відмінність навчання, заснованого на досвіді, полягає в тому, що його учасники максимально залучені в процес. Мета емпіричного навчання – ознайомити учасників з життям в іншій країні шляхом активного отримання досвіду всередині чужої культури або в ситуації її імітації. Перевага такого підходу полягає в тому, що він дозволяє учасникам на власному досвіді засвоювати навички, необхідні для життя в приймаючій культурі.

Комплексний підхід. З огляду на недоліки всіх перерахованих підходів, фахівці в даній практичній галузі все більше віддають перевагу розробці комплексних інтегративних програм, в яких поєднуються різні технології, запозичені з вищевказаних підходів. Однією з перших була комплексна модель формування та підвищення міжкультурної компетентності особистості, запропонована Гудіканстом і Хаммером [32], яка заснована на двох вимірах: з одного боку, це вибір дидактичного (університетського) або емпіричного (досвідченого) методу розробки групових психотехнологій. З іншого – вибір культурно-спільних або культурно-загальних технологій.

У контексті розробки спеціальних тренінгових програм співвідношення цих вимірів утворює чотири варіанта тренінгів [32]:

1. Емпіричний тренінг, що не орієнтований на конкретну культуру. До цього типу відносяться тренінги відносин. Згідно розробок Фостер і Данієлян, в результаті такого тренінгу здобуваються навички, які не можуть бути отримані в умовах навчальної аудиторії. Ще один варіант програм цього типу –міжкультурні семінари. Вони навчають міжкультурній взаємодії через дискусії в малих групах, що складаються з людей різних культур. У методах загальнокультурного моделювання, які також відносяться до цього типу, загальною характеристикою є активне залучення учасників тренінгу в моделювання культурних відмінностей [22; 51].

2. Емпіричний культурно-специфічний тренінг. Програми, що входять в цю категорію, включають модифікації традиційного тренінгу відносин і біхевіорально-когнітивного тренінгу в контексті певної культури, а також семінари на тему міжкультурних комунікацій, організовані в контексті двох культур [25].

3. Дидактичний загальнокультурний тренінг. Такі тренінги фокусуються на дидактичних або оглядових методах навчання, щоб навчити загальнокультурним принципам. З зазначених вище, два основні підходи відповідають цьому типу технологій: традиційний інформаційний підхід – лекції з міжкультурної комунікації, культурної антропології та кроскультурної психології [3; 44] і метод культурного самоусвідомлення [41].

4. Дидактичний культурно-специфічний тренінг. У цю категорію можна включити традиційне навчання іноземної мови, інструктаж з огляду місцевості (орієнтування), культурні асимілятори та ін.

3. ВИСНОВКИ

Таким чином, розглянуті підходи дають широку можливість вибору методів і технологій для вирішення проблем, що виникають в міжкультурній взаємодії. Незважаючи на загальну тенденцію до розробки комплексних методів, специфічні підходи, як було показано вище, продовжують існувати і розвиватися, враховуючи новітні досягнення в цій сфері і традиційні методи, такі як лекції, case-study, рольові ігри, ігри-симулятори, метод критичних інцидентів збагачуються відеоматеріалами, застосуванням комп'ютерної самодіагностики, інтерактивним відео та інтернет-навчанням.

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Костенко Д., Карам А., Гончар Л., Тернопільська В., Чернуха Н.

Міжкультурна компетентність особистості та адаптація до полікультурного середовища: підходи та технології.

У статті розглядається міжкультурна компетентність особистості як важливий фактор, що впливає на успішність адаптації різних категорій людей, зокрема, іммігрантів, біженців та вимушених переселенців, репатріантів, представників етнічних і культурних меншин, а також представників мультикультурних суспільств. На основі зарубіжних досліджень аналізуються різні підходи до розробки практичних програм, спрямованих на формування міжкультурної компетентності та ефективності соціокультурної адаптації. Описано п'ять підходів до розробки міжкультурних програм, спрямованих на підвищення міжкультурної компетентності та ефективності соціокультурної адаптації: університетський, порівняльно-культурний, емпіричний, атрибутивний і комплексний.

Ключові слова: міжкультурна компетентність, соціокультурна адаптація, тренінгові програми, технології, особистість, етнічні меншини.

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Specificity in Music-Pedagogical Training Future Music Teacher's to Conducting Woodwind Ensemble

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Abstract

The research looked for new ways to improve the management of ensembles and to formulate the readiness of the future leader for the educational process. Students' readiness for professional activity is presented as a complex personal formation. It covers a set of pedagogical influences aimed at different aspects of individual activity. They include mental processes and emotional-volitional reactions that regulate the degree of human activity, motives for its behavior; their awareness creates favorable conditions for the effective formation of the state of "readiness". In the future, the students' organizational skills will depend on the artistic, creative and pedagogical results, which are of particular importance for the conductor of the ensemble. In order to complete the rehearsal task, the conductor must carry out considerable preliminary organizational work. The analysis of its organizational activity makes it possible to distinguish such areas as: pedagogical, artistic, performing, figurative-content and technical.

Keywords: *music teacher, music-pedagogical training, ensemble, wind instruments.*

Актуальність дослідження. Підготовка майбутнього керівника в різних галузях науки розглядається під певним кутом зору. Якщо, скажімо, розглядати категорію «готовність» у психологічному аспекті, то передусім головною буде мотиваційна сфера особистісних якостей людини, її потреби, інтереси, ідеали, засоби самовираження. При соціологічному аспекті найістотнішим є дослідження «готовності» не лише як одного з компонентів психологічної структури, а й середовища. Останнє безпосередньо впливає на суб'єкт, його діяльність, мотивацію поведінки, в ньому розвивається якісний напрямок. Педагогічний підхід здебільшого включає аналіз навчально-виховного процесу та визначення його ролі у формуванні особистості. Таким чином, ці три аспекти – психологічний, соціологічний і педагогічний – є важливими чинниками формування готовності, що створює передумови до керування ансамблями.

Актуальність нашого дослідження полягає у пошуку нових шляхів удосконалення керування ансамблевими колективами та формування готовності майбутнього керівника до навчально-виховного процесу. Це передбачає розв'язання поставленої проблеми в педагогічному аспекті, адже підготовка студентів до самостійної музично-педагогічної діяльності вимагає нової стрижневої якості –

професійної готовності. Вона виховується завдяки цілеспрямованим зусиллям викладачів, які використовують певну програму та систему знань із теорії і закономірностей педагогічного процесу, а також врахуванню суті, внутрішньої структури, місця і ролі духового колективу в житті суспільства, розкриттю законів його становлення в сучасних умовах.

Виклад основного матеріалу. Оскільки категорія «готовність» в інших аспектах може бути логічним доповненням до розуміння її як теоретичної передумови керування ансамблями, виникає потреба ширше розглянути це поняття.

Цікавим щодо цього, на нашу думку, є трактування готовності до певної діяльності, яке належить Н. Левітову [5], і визначається як психічний стан особистості (короткочасний або тривалий), що залежить від індивідуальних особливостей людини та умов, за яких відбувається діяльність суб'єкта.

Інший підхід до розуміння компонентів «готовності» пропонує К. Дурай-Новакова. Вона розглядає структуру останньої в безпосередньому зв'язку із удосконаленням психічних процесів, необхідних для успішної діяльності вчителя. На переконання дослідниці, важливими елементами «готовності» є також розвиток професійної спрямованості, ознайомлення з професією, професійне виховання, самовиховання і самовизначення [1; 6; 7; 9; 11; 12; 13].

Отже, на думку згаданих вище дослідників, готовність студентів до професійної діяльності – складне особистісне утворення. Воно охоплює комплекс педагогічних впливів, спрямованих на різні сторони індивідуальної діяльності. Вони включають психічні процеси та емоційно-вольові реакції, що регулюють ступінь активності людини, мотиви її поведінки; усвідомлення їх створює сприятливі умови для ефективного формування стану «готовності».

Принагідно зауважимо, що інший автор – В. Крутецький – розуміє «готовність» як синтез властивостей особистості, що визначають її здатність до діяльності. До них вчений відносить: низку характерологічних рис і стійких інтелектуальних почуттів; певний фонд знань, умінь і навичок у відповідній галузі; психологічні особливості розумової сфери, що визначаються вимогами до конкретної діяльності [4].

Варто звернутись і до концепції Л. Кондрашової. Вона досліджує механізм становлення професіоналізму студентів і намагається розкрити складні зв'язки між професійними установками, переконаннями і діяльністю та інтелектуальними, емоційно-вольовими і мотиваційними компонентами підготовки структури «готовності». За висновком ученої серед найважливіших якостей, які потрібно формувати в студентів, є організаторські здібності. Саме вони – першооснова створення та діяльності будь-якого колективу [3].

Також від рівня сформованості у студентів організаторських умінь залежатимуть в майбутньому художньо-творчі і педагогічні результати, що має для керівника ансамблевого колективу виняткове значення. Щоб виконати репетиційне завдання, керівник повинен здійснити значну попередню організаційну роботу. Аналіз його організаторської діяльності дає змогу виділити такі напрямки, як: 1) педагогічний; 2) художньо-виконавський; 3) образно-змістовний; 4) технічний.

Надамо характеристику згаданим напрямкам.

При педагогічній організації керівник повинен уміти визначити на основі ідеальної моделі кінцеву мету колективу та етапи її реалізації.

Своєю чергою, *художньо-виконавська організація* передбачає забезпечення нормального творчого процесу, вдумливу роботу над твором. Цей вид організаторської діяльності вимагає від майбутнього керівника великого емоційного напруження, органічного поєднання емоційного піднесення з високим інтелектуальним рівнем.

Образно-змістовний напрямок – це методика репетиційних занять та концертних виступів, приведення в дію відповідних засобів, визначення шляхів реалізації поставленої мети, що охоплює такі поняття, як організація виконання твору, розміщення учасників, методика роботи над оркестровою партією, художньо-технічні прийоми творчого процесу.

Технічна організація передбачає вирішення питань, не пов'язаних із творчо-виконавською діяльністю. Її мета полягає в організаційно-педагогічному забезпеченні навчально-творчої діяльності ансамблю.

Отже, без глибоких знань та умінь правильно побудувати роботу в цих напрямках, що є елементом готовності студентів до такої діяльності, практично неможливо, а також важко розраховувати на успіх будь-якого творчого колективу та його керівника.

Практика показує, що організаторський аспект часто є визначальним при формуванні творчого обличчя колективу. Тому до рівня організаторських умінь студентів (майбутніх керівників оркестрових колективів) потрібно ставити високі вимоги, особливо у плані створення духових ансамблів та керування ними. Слід також постійно, наполегливо і послідовно вдосконалювати організаторські здібності, збагачувати свою роботу новими прийомами, що врешті-решт забезпечує динаміку і перспективу розвитку колективу, його мистецьке та художньо-виконавське зростання.

Як вважає А. Каргін [2], існують різні типи керівників: 1) авторитарний; 2) ліберальний; 3) демократичний. Авторитарний тип відзначається сухістю, суворим ставленням до підлеглих. Такий керівник здатний затискувати ініціативу, чинити психологічний тиск на колектив чи окрему людину, підвищувати голос, гримати. Відомий психолог К. Платонов [8] характеризує авторитарний стиль як діяльність керівництва, яка «ґрунтується на авторитеті керівника. Авторитарний стиль керівника легко переростає в командування і прояв волюнтаризму – зайвого нав'язування своєї волі там, де без цього можна обійтися».

У специфічних умовах духового ансамблю, де все будується на засадах добровільності й інтересі учасників, *авторитарний стиль керівника* заважає взаєморозумінню й виробленню потрібного тону при спілкуванні, не враховує особливостей поведінки і діяльності дітей у даній сфері. Нерідко учасники на знак незгоди з методами керівництва такого наставника залишають колектив.

Ліберальний керівник відрізняється протилежними. Його вплив на колектив є мінімальним. Він малопомітний серед учасників, діє найчастіше через прохання або умовляння, не виявляючи достатньої твердості й послідовності. Може залишити поза увагою порушення, невиконання учасником свого завдання. Він не є офіційним лідером ансамблевого колективу, хоча від авторитету керівника залежить дуже багато, передусім його вміння забезпечити нормальну і змістовну роботу кожного учасника.

Керівникові *демократичного типу* властиве уміння впливати на людину через неформальну групу і колектив. Його авторитет ґрунтується на таких різнопланових якостях, як м'якість і вимогливість, поступливість і непримиренність. Він може вимагати і просити, карати і підтримувати, тобто демократичний стиль керівника відрізняється широтою і гнучкістю прийомів та методів роботи і ставленням до колективу.

З наведених характеристик видно, що найбільше до керування ансамблевим колективом придатний керівник демократичного типу. Однак це не означає, що з колективом не можуть працювати керівники авторитарного або ліберального типів. Але в цьому разі вони мають враховувати особливості керівництва інструментальними ансамблями, постійно працювати над собою, виховувати якості демократичного типу керівників, наполегливо оволодівати різними методами роботи.

Перелічені вище психологічні якості і типи керівників потрібно враховувати при підготовці студентів до керування музичними колективами. Крім того, у вищих навчальних закладах слід також розвивати специфічні психологічні риси майбутнього вчителя під час роботи в конкретному виді творчої діяльності.

Здійснюючи репетиційну і концертну роботу, майбутній керівник інструментального ансамблю вирішує також педагогічні завдання. Відтак його спеціальна підготовка у ВНЗ має поєднуватися з набуттям різнобічних педагогічних знань. Педагогічна майстерність керівника ансамблевого колективу являє собою сукупність об’єктивних (психолого-педагогічних), суб’єктивних (культурно-особистісних) факторів, що включають знання з педагогічної діяльності, основних її форм, методів, засобів, соціально-психологічних особливостей учасників ансамблю. Іншими словами, це набуття відповідних умінь і навичок, необхідних для всебічного виявлення себе як спеціаліста, здатного вирішувати організаційні, педагогічні і художньо-творчі завдання колективу.

Відповідно до сучасного бачення підготовки студентів до керування ансамблями доцільно виділити такі напрямки майбутньої професійної діяльності: 1) *методичний,* включає найважливіші аспекти професії керівника, якому передусім доводиться розпочинати діяльність з організації колективу, створення органів самоврядування, шукати ефективні форми і методи проведення репетиційних занять. Потрібно враховувати важливі методичні основи, оскільки керування ансамблевим колективом в позашкільних закладах відрізняється від керування професійним. Робота має ґрунтуватися на зацікавленні учасників творчою діяльністю і включати проведення репетицій, організацію навчально-виховної діяльності, залучення нових учасників тощо. 2) *Психолого-педагогічний.* Музично-педагогічна діяльність із ансамблевим колективом вимагає постійного зацікавлення учасників, врахування їхніх вікових інтересів і здібностей. Для ефективної роботи та досягнення поставленої мети доводиться використовувати всі можливі засоби психолого-педагогічного впливу на особистість учасників. Цей напрямок особливо актуальний при роботі з творчим колективом, адже поряд із виконанням функцій музиканта та диригента керівник повинен бути також педагогом і психологом, що сприятиме зростанню його професійного та морального авторитету. 3) *Музичний.* Навчання учасників гри на інструменті є дуже важливим для керівника, бо від результатів виконавської діяльності безпосередньо залежить і «закріпленість» учасників у колективі. *4) Діагностико-прогностичний* містить діяльність, пов'язану із вивченням об'єкта педагогічного впливу, тобто ансамблевого колективу і кожного з його учасників, що дає можливість визначити оптимальні шляхи і методи виховного впливу. За В. Соловйовим, надзвичайно важливим є вміння виявити музичні здібності учасників і нахили до певного виду музичної діяльності, вивчити особливості учасника, інтереси і мотиви його діяльності.

З'ясувавши початковий рівень підготовки учасників колективу, керівник ставить перед собою цілі і завдання діяльності, накреслює шляхи і методи їхньої реалізації. Пізніше він переходить до планування педагогічного процесу в колективі, під час якого визначає етапи і послідовність педагогічних дій, вибирає репертуар, який відповідав би навчальній програмі. Важливою умовою діяльності керівника та дотримання належного рівня його «готовності» є вивчення педагогічного досвіду кращих керівників, використання передової методики роботи з духовими колективами та методів педагогічного впливу.

Аналіз професійно-педагогічної діяльності, пов'язаної з керуванням інструментальним ансамблем, показав, що поставлені творчі завдання, які доводиться вирішувати керівнику, буде реалізовано за умови сформованої готовності виконувати певну систему дій. Умовно останні можна звести до чотирьох напрямків: методичний, психолого-педагогічний, музичний та діагностико-прогностичний.

Висновки. Підсумовуючи треба відзначити, що готовність студентів до керування інструментальними ансамблями формується поряд з умінням виховувати в учасників відчуття логічного співвідношення у звучанні усіх партій. Адже незалежно від оркестрового викладу музичної тканини твору її голоси, мелодичні лінії, гармонічний супровід завжди перебувають у нерозривному співвідношенні. При переході мелодії від однієї групи до іншої учасники ансамблю повинні знати, провідну чи допоміжну роль вони виконують у цьому разі. Необхідно навчити кожного слухати, від якої групи інструментів переходить мелодія чи фраза, створюючи єдиний цілісний образ у виконуваному музичному творі.

Таким чином, тільки знання специфічних особливостей музично-педагогічної діяльності дає можливість визначити умови вдосконалення підготовки студентів до керування інструментальним ансамблем. Здобуті у ЗВО вміння і навички забезпечують впровадження нових форм і методів роботи в ролі керівника ансамблевого колективу, а це, своєю чергою, сприятиме підвищенню естетичного і художнього рівня його учасників.

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Ван Цізі. Специфіка музично-педагогічної підготовки майбутнього вчителя музики до роботи з інструментальним ансамблем духових інструментів.

У дослідженні здійснено пошук нових шляхів удосконалення керування ансамблевими колективами та формування готовності майбутнього керівника до навчально-виховного процесу. Готовність студентів до професійної діяльності розглядається як складне особистісне утворення. Воно охоплює комплекс педагогічних впливів, спрямованих на різні сторони індивідуальної діяльності. Вони включають психічні процеси та емоційно-вольові реакції, що регулюють ступінь активності людини, мотиви її поведінки; усвідомлення їх створює сприятливі умови для ефективного формування стану «готовності». Від рівня сформованості в студентів організаторських умінь залежатимуть у майбутньому художньо-творчі і педагогічні результати, що має для керівника ансамблевого колективу виняткове значення. Щоб виконати репетиційне завдання, керівник повинен здійснити значну попередню організаційну роботу. Аналіз такої організаторської діяльності дав змогу виділити такі напрямки, як: педагогічний, художньо-виконавський, образно-змістовний та технічний.

Ключові слова: *вчитель музики, музично-педагогічна підготовка, ансамбль, духові інструменти.*

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The Main Methodological Approaches to the Personal-Creative Development of Elementary School Pupils in the Process of Music Education

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Abstract

In the article the importance of personal and creative development of elementary school pupils in the process of teaching music is actualized. The views of scientists on this problem are investigated and generalized. The author's understanding of the creativity of elementary school pupils is presented. The issue of aesthetic orientation of pupils' creative activity in the process of learning music is emphasized. The role of pedagogical leadership in the educational process for the development of creative abilities of elementary school pupils is emphasized. The main methodological approaches to the personal-creative development of elementary school pupils in the process of teaching music are considered. Applying a personal approach contributes to the identification and disclosure of the personal potential of pupils, the establishment of subject-subject relationships. It is noted that the creativity of students is manifested in educational activities, so for the personal and creative development of younger students in the process of teaching music is important to use the activity approach. An integrated approach provides students with a holistic picture of the world, solving musical and creative tasks with the knowledge of all subjects of the aesthetic cycle and other subjects.

Key words: music teaching, creativity, development, elementary school pupils, personal approach, activity approach, integrated approach.

Актуальність дослідження. Результат діяльності вчителя в процесі навчання музики молодших школярів ми вбачаємо (в контексті процесів реформування освіти в Україні, які спрямовані на становлення особистості учня, здатної до творчої діяльності, саморозвитку та самовдосконалення на шляху до мети) в їх особистісно-креативному розвитку, що набуває на сучасному етапі особливої актуальності. Особистісно-креативний розвиток людини вчені пов'язують з розумінням природи здібностей та механізму їх розвитку у процесі діяльності.

Питання здібностей розглядалися вченими з найдавніших часів, зокрема праці Аристотеля, Платона, Спінози поклали початок вивчення означеної проблеми у філософському аспекті. У психологічному аспекті питання здібностей висвітлювали І. Бех, В. Бутенко, Е. Клапаред, Г. Костюк, Е. Мейман, Ч. Спірмен, В. Штерн та інші науковці. Взаємодію трьох напрямків: психології діяльності, психології здібностей і проблеми їх розвитку розглядав В. Шадриков. У соціальному та діяльнісному аспектах питання здібностей розкривали В. Дружинін, Л. Виготський, С. Рубінштейн, К. Платонов, Б. Теплов.

Проблему творчих здібностей та розвитку творчої особистості, розглядали В. Клименко, А. Козир, О. Кульчицька, О. Лук, О. Музика, Я. Пономарьов, Т. Равлюк, В. Роменець, О. Савченко, В. Сухомлинський та ін.

Питання креативності досліджувалися багатьма науковцями, зокрема: Д. Богоявленською, Е. де Боно, Дж. Гілфордом, В. Дружиніним, Є. Ільїним, А. Маслоу, В. Моляко, Л. Петько, Р. Стернбергом, Е. Торренсом, В. Юркевич.

Вченими (Л. Божович, Л. Виготський, В. Давидов, Л. Дранков, Д. Ельконін та ін.) підкреслено сенситивність молодшого шкільного віку для креативного розвитку дітей, для художньо-творчого розвитку (С. Жупанин, А. Мелік-Пашаєв, А. Щербо) та музично-творчого (Л. Беземчук, Т. Дорошенко, К. Орф, З. Рінкявічюс, Т. Тютюннікова, О. Щолокова та ін.). Увагу інших сучасних науковців привертає проблема розвитку творчих здібностей у процесі навчальної діяльності (Н. Волошина, Л. Момот, Л. Шелестова та ін.).

Але, незважаючи на вагомий теоретичний та практичний внесок у вирішення проблеми розвитку творчих здібностей у процесі навчальної музичної діяльності (О. Коваль, О. Лобова, Л. Масол, Е. Печерська, В. Рагозіна, О. Хижна та ін.), до сьогодні існує протиріччя між прогресивною музично-педагогічною теорією та її впровадженням у практику шкільної музичної освіти. Подальшого вивчення потребують питання особистісно-креативного розвитку молодших школярів у процесі навчання музики.

Метою статті є визначення методологічних підходів до особистісно-креативного розвитку молодших школярів у процесі навчання музики.

Виклад основного матеріалу. Основний напрямок змін у змісті освіти в Україні згідно з положеннями «Нової української школи» передбачає орієнтацію на ключові компетентності випускників школи [6]. У процесі набуття ключових компетентностей формуються вміння мислити критично і системно; уміння обґрунтовувати і відстоювати свою позицію; комунікативні вміння, спрямовані на здатність працювати у команді; розвиваються творчі здібності.

За Л. Виготським, розвиток творчої особистості передбачає єдність навчання та внутрішніх процесів розвитку: формування особистості, яка набуває нових якостей відбувається тоді, коли орієнтується «не на вчорашній, а на завтрашній день дитячого розвитку» [1, с. 234]. Концепція Л. Виготського про «зону найближчого розвитку» ґрунтується на педагогічному керівництві процесом подолання відстані між наявними можливостями та потенційним рівнем розвитку дитини в процесі навчання, що особливо актуально для молодшого шкільного віку. В цей період діти ще прагнуть наслідувати дорослих, для них вчитель – беззаперечний авторитет. Важливо тільки, щоб те наслідування було осмисленим. Цьому сприяють вікові психологічні особливості молодших школярів: водночас із «слухняністю» (Н. Лейтес) у них швидко збільшується обсяг мислення, розвиваються переключення, вибірковість.

Із віковими особливостями дитини пов’язано і твердження О. Савенкова про те, що основним фактором розвитку креативності дитини є не стільки його включення в креативну діяльність, скільки наявність в його оточенні «зразка креативної діяльності» [10].

Отже, розвитку креативних здібностей молодших школярів сприяє педагогічне керівництво навчальним процесом. Якщо у дітей віком 3–5-ти років прояв творчості є природною потребою (Д. Богоявленська, Е. Торренс, В. Юркевич), і з 13-ти – розвиваються схильності до певного роду занять (спеціальні здібності), то період, який називається молодшим шкільним віком, треба максимально використати для особистісно-креативного розвитку. Науковці відзначають залежність розвитку творчих здібностей у процесі навчання молодших школярів «не тільки від низки внутрішніх факторів (психофізіологічні та соціальні надбання, інтелектуальний, практичний та емоційний досвід дитини), але і зовнішніх (наявність відповідної системи й навчальних програм, педагога-творця і відповідного педагогічним запитам розвивального середовища)» [5, с 84].

Одним з основних завдань оновлення освітнього простору, вважає І. Лапшина, розглядаючи шляхи формування творчих здібностей молодших школярів, потрібно вважати «максимальне створення комфортних умов для становлення і розвитку творчої особистості юних громадян, оскільки саме такі особистості швидше і легше адаптуються до соціальних та виробничих новацій, ефективніше їх використовують для задоволення власних потреб і можливостей, а з часом – для розвитку всього суспільства у цілому» [4, с. 108].

У зв'язку з цим на чільне місце виходить проблема виокремлення методологічних підходів до розв'язання проблеми особистісно-креативного розвитку молодших школярів у процесі навчання музики, як складової їх мистецької освіти.

Мистецтво в концептуальних державотворчих документах розглядається як суттєвий компонент загальної освіти, що сприяє розвитку музичної культури як частини загальної культури школярів. Саме цілісність сприймання культурного простору «в його багатогранності і художній образності» є метою уроків мистецтва у закладах загальної середньої освіти. Що стосується уроків музичного мистецтва, вони покликані навчити дітей повноцінного спілкування з музикою, при якому «відбувається виникнення художньо-образних асоціацій, стимуляція уяви, фантазії, емоційно-чуттєвого ставлення до музичних творів, збагачується суб'єктивне світовідчуття і світосприймання, розвивається емоційна й інтелектуальна сфери особистості тощо» [11, с. 2]. Як зазначає Л. Степанова, увесь цей комплекс повинна розвивати уже початкова ланка музичної освіти. Адже кінцевою метою музичних занять є формування музичної культури учня як частини його духовної культури (Д. Кабалевський).

Навчання музики передбачає наявність музично-творчої діяльності. У процесі цієї діяльності формуються особистісні якості молодших школярів, чим забезпечується їхній особистісно-креативний розвиток. Творча діяльність сприяє подальшому розвитку в учнів креативності як «ядра її особистості» (С. Сисоєва).

Креативність як загальну здатність до творчої діяльності розуміють науковці Я. Пономарьов і В.Дружинін [6; 2]. Проте, на основі загальної розвивається спеціалізована креативність – здатність до творчості у визначеній сфері людської діяльності [3; 7; 8; 14; 15].

Креативність молодшого школяра ми розуміємо як здатність до конструктивного, нестандартного мислення, яка, на основі набуття особистістю різнобічних знань, усвідомлення власного досвіду, в процесі творчої діяльності уможливлює створення нового.

Наявність творчих можливостей є головним показником становлення особистості. Рівень розвитку індивида проявляється через творчий розвиток, потребу в активному творенні (В. Давидов, О. Ткаченко). Сучасні психологи (зокрема, Я. Пономарьов) підкреслюють, що в кожній людині закладена здатність до творчості. Акцент у XXI ст., як зазначає І. Лапшина, ставиться «не стільки на вихованні особистості, здатної до оригінальних проявів, скільки до характеру творчих проявів. Вони повинні бути ініціативними і незалежними від зовнішніх обставин, не спонукатися батьками чи вчителями, а мати самостійний характер» [4, с. 109].

Творчість школярів проявляється у діяльності, що пов'язана із засвоєнням нових знань, а результат такої творчої діяльності характеризується суб'єктивною новизною (В. Моляко). Водночас, знання про світ, про об'єктивну реальність, здатність розв'язувати задачі, які вона висуває, набуваються тільки в процесі творчої діяльності. При цьому знання є не самоціллю, а засобом навчання з метою здійснення діяльності.

Отже, у процесі особистісно-креативного розвитку молодших школярів ми виділяємо *діяльнісний* підхід, який реалізовується в процесі навчання музики. Навчальна робота охоплює такі напрямки: набуття слухового та виконавського досвіду; формування вокально-хорових навичок, творчих навичок, зокрема, навичок імпровізації, розвиток образно-асоціативного мислення; розвиток естетичного смаку.

Розвиток естетичного смаку заслуговує на особливу увагу. Як відзначає В. Степанов, естетичні потреби особистості виступають основним мотивом навчальної діяльності за умови її спрямування на свідоме та глибоке розуміння музичного мистецтва. Музично-естетичне спрямування навчання має охоплювати зміст усієї музично-творчої діяльності «від формування позитивної мотивації навчальної діяльності до створення власного творчого продукту» [13, с. 66].

Зважаючи на це, деякі науковці в процесі розвитку креативності виділяють особистісно-мотиваційний підхід (О. Шиман). Водночас, музична творчість дітей пов'язана з самостійними діями та уміннями оперувати відомими їм музично-слуховими уявленнями (Л. Степанова). Це дає можливість вченим виділяти особистісно-діяльнісний підхід, що ґрунтується на виявленні індивідуальних особливостей як суб'єкта пізнання, так і предметної діяльності (Т. Тихонова). Але, в будь-якому разі, створення умов для «різнобічного прояву і відповідного розвитку особистісних можливостей, наприклад творчих здібностей, а не формування особистості із заданими спроможностями» [12, с. 91], вимагає застосування особистісного підходу.

Застосування особистісного підходу сприяє виявленню і розкриттю індивідуальності школяра та його особистісного потенціалу, дає можливість досягти у процесі навчання суб'єкт-суб'єктних взаємовідносин, яких потребує творчий розвиток особистості. Оскільки в його основі лежать теоретичні положення про розвиток особистості через становлення системи цінностей самосвідомості, суб'єктивності, через свободу самовираження, саморозвиток та самоорганізацію (М. Лук'янчук), особистісно-креативний розвиток молодших школярів у процесі навчання музики потребує саме *особистісного* підходу.

Як уже зазначалося вище, спрямованість на розвиток естетичних орієнтацій визначає напрямок усієї педагогічної роботи з молодшими школярами: розвиток їх інтелектуальної та емоційної сфер, набуття культурологічного досвіду, досвіду музично-творчої діяльності, духовне становлення. Реалізація цього напрямку відбувається завдяки *інтегрованому* підходу до особистісно-креативного розвитку молодших школярів у процесі навчання музики, що співпадає з концепцією НУШ. Інтегроване навчання забезпечує отримання учнями цілісного уявлення про світ, вивчення кожного явища різнобічно, у різних аспектах, розв'язування творчих завдань та реальних проблем за допомогою знань з різних навчальних предметів.

У контексті нашого дослідження таке поєднання відбувається на інтегрованих уроках музики та мистецтва, які включають знання з усіх предметів естетичного циклу та інших предметів з метою їх систематизації і застосування у творчій діяльності. В умовах інтегрованого навчання завдяки взаємопроникненню й систематизації знань відбувається особистісно-креативний розвиток особистості, здатної бачити нове, особливе у буденному; створювати нове, оперуючи відомим; використовувати вже набуті знання в нових ситуаціях.

Висновки. Отже, основними методологічними підходами до особистісно-креативного розвитку молодших школярів у процесі навчання музики визначаємо діяльнісний, особистісний та інтегрований. Наступні наукові розвідки ми вбачаємо у розробці педагогічних умов, що сприятимуть ефективності означеного процесу.

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Translation of the Title, Abstract and References to the Author's Language

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Хоу Імей. Основні методологічні підходи до особистісно-креативного розвитку молодших школярів у процесі навчання музики.

У статті актуалізовано значення особистісно-креативного розвитку молодших школярів у процесі навчання музики. Розглянуто основні методологічні підходи до особистісно-креативного розвитку молодших школярів у процесі навчання музики. Застосування особистісного підходу сприяє виявленню і розкриттю особистісного потенціалу школярів, встановленню суб'єкт-суб'єктних взаємовідносин. Відзначено, що творчість школярів проявляється у навчальній діяльності, тому для особистісно-креативного розвитку молодших школярів у процесі навчання музики важливе застосування діяльнісного підходу. Інтегрований підхід забезпечує розв'язування музично-творчих завдань за допомогою знань з усіх предметів естетичного циклу та інших навчальних предметів.

Ключові слова: навчання музики, креативність, розвиток, молодші школярі, особистісний підхід, діяльнісний підхід, інтегрований підхід.

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The Last Theorem of Pierre de Fermat. A short and Simple Proof.

Of course Mr. Pierre de Fermat did not know the ABC hypothesis, let alone hypothesis Taniyama-Shimura. He simply wrote that there is no solution in integers $x^n + y^n = z^n$ if n $\succ 2$ He understood the essence of the proof, but did not even begin to uncover it, assuming it is elementary.

Perhaps like this:

Option 1

$$x^n + y^n = z^n \quad \mathbf{(}x,y,z,n \in N\ \mathbf{),}$$

a) $\sqrt{x^n} = \sqrt{z^n - y^n}$ if $n \succ 2 \Rightarrow \sqrt{x^n} = x\sqrt{x^{n-2}}$

$\sqrt{y^n} = \sqrt{z^n - x^n}$ if $n \succ 2 \Rightarrow \sqrt{y^n} = y\sqrt{y^{n-2}}$

$\sqrt{z^n} = \sqrt{y^n + x^n}$ if $n \succ 2 \Rightarrow \sqrt{z^n} = z\sqrt{z^{n-2}}$

b) $\dfrac{x\sqrt{x^{n-2}}}{y\sqrt{y^{n-2}}} = \dfrac{\sqrt{z^n - y^n}}{\sqrt{z^n - x^n}} \Rightarrow \dfrac{x}{y} = \dfrac{\sqrt{y^{n-2}}\sqrt{z^n - y^n}}{\sqrt{x^{n-2}}\sqrt{z^n - x^n}}$

$\dfrac{z\sqrt{z^{n-2}}}{y\sqrt{y^{n-2}}} = \dfrac{\sqrt{x^n + y^n}}{\sqrt{z^n - x^n}} \Rightarrow \dfrac{z}{y} = \dfrac{\sqrt{y^{n-2}}\sqrt{x^n + y^n}}{\sqrt{z^{n-2}}\sqrt{z^n - x^n}}$

c) kx= $\sqrt{y^{n-2}}\ \sqrt{z^n - y^n} \Rightarrow$ k= $\dfrac{\sqrt{y^{n-2}}\sqrt{z^n - y^n}}{x}$

ky= $\sqrt{x^{n-2}}\ \sqrt{z^n - x^n} \Rightarrow$ k= $\dfrac{\sqrt{x^{n-2}}\sqrt{z^n - x^n}}{y} = \dfrac{\sqrt{y^{n-2}}\sqrt{z^n - y^n}}{x}$

$k \neq K$

$\Rightarrow$ **K**y=x $\Rightarrow K = \dfrac{x}{y}, but (x,y) = 1 \Rightarrow K \notin N \Rightarrow K = 1 \Rightarrow x = y$,but $x \neq y$

K$=1 \Rightarrow \sqrt{y^{n-2}}\ \sqrt{z^n - y^n} = \sqrt{x^{n-2}}\ \sqrt{z^n - x^n} \Rightarrow y^{n-2}x^n = x^{n-2}y^n \Rightarrow \dfrac{y^n x^n}{y^2} = \dfrac{x^n y^n}{x^2}$

$\Rightarrow x = y$ **but** $x \neq y$

Q.E.D.

Option 2

$$x^n + y^n = z^n$$

a) $\sqrt{x^n} = \sqrt{z^n - y^n}$ if $n \succ 2 \Rightarrow \sqrt{x^n} = x\sqrt{x^{n-2}}$

$\sqrt{y^n} = \sqrt{z^n - x^n}$ if $n \succ 2 \Rightarrow \sqrt{y^n} = y\sqrt{y^{n-2}}$

$\sqrt{z^n} = \sqrt{x^n + y^n}$ if $n \succ 2 \Rightarrow \sqrt{z^n} = z\sqrt{z^{n-2}}$

b) $\frac{x\sqrt{x^{n-2}}}{y\sqrt{y^{n-2}}} = \frac{\sqrt{z^n - y^n}}{\sqrt{z^n - x^n}} \Rightarrow \frac{x}{y} = \frac{\sqrt{y^{n-2}}\sqrt{z^n - y^n}}{\sqrt{x^{n-2}}\sqrt{z^n - x^n}}$

c) $\frac{x\sqrt{x^{n-2}}}{z\sqrt{z^{n-2}}} = \frac{\sqrt{z^n - y^n}}{\sqrt{y^n + x^n}} \Rightarrow \frac{x}{z} = \frac{\sqrt{z^{n-2}}\sqrt{z^n - y^n}}{\sqrt{x^{n-2}}\sqrt{y^n + x^n}}$

d) $(\sqrt{z^n})^2 = (\sqrt{x^n})^2 + (\sqrt{y^n})^2 \Rightarrow \frac{\sqrt{x^n}}{\sqrt{z^n}} = \cos\beta$

$$\frac{x}{z} = \frac{\sqrt{z^{n-2}}\sqrt{z^n - y^n}}{\sqrt{x^{n-2}}\sqrt{y^n + x^n}} = \frac{\sqrt{z^{n-2}}}{\sqrt{x^{n-2}}}\cos\beta \Rightarrow$$

$$kz = \sqrt{x^{n-2}}, \Rightarrow k = \frac{\sqrt{x^{n-2}}}{z}, (x,z) = 1 \Rightarrow k \notin N \Rightarrow z = \sqrt{x^{n-2}}, but (x,z) = 1 \Rightarrow Q.E.D.$$

$and:$

$$kx = \sqrt{z^{n-2}}\cos\beta \Rightarrow k = \frac{\sqrt{z^{n-2}}\sqrt{x^n}}{x\sqrt{z^n}} \Rightarrow \frac{\sqrt{x^{x-2}}}{z} = \frac{\sqrt{z^{n-2}}\sqrt{x^n}}{x\sqrt{z^n}}, \sqrt{x^{n-2}} \prec \sqrt{z^{n-2}}\sqrt{x^n} \Rightarrow$$

$k \neq K$

$$\sqrt{z^{n-2}}\sqrt{x^n} = K\sqrt{x^{n-2}} \Rightarrow K = \frac{\sqrt{z^{n-2}}\sqrt{x^n}}{\sqrt{x^{n-2}}} = \frac{\sqrt{z^{n-2}}}{x} \notin N \Rightarrow K = 1$$

but

$(x,z) = 1 \Rightarrow Q.E.D.$

$and:$

$$x\sqrt{z^n} = Kz \Rightarrow K = \frac{x\sqrt{z^n}}{z} \Rightarrow \frac{x\sqrt{z^n}}{z} = \frac{\sqrt{z^{n-2}}}{x} \Rightarrow x^2\sqrt{z^{n-2}} = \sqrt{z^{n-2}} \Rightarrow x^2 = 1$$

but

$x \succ 1 \Rightarrow K = 1$

AND:

If $K = 1 \Rightarrow \sqrt{z^{n-2}}\sqrt{x^n} = \sqrt{x^{n-2}} \Rightarrow \frac{\sqrt{z^n}}{z} = \frac{\sqrt{x^{n-2}}}{\sqrt{x^n}} \prec 1 \Rightarrow \frac{\sqrt{z^n}}{z} \prec 1,$

But $n \succ 2$

Q.E.D.

I am convinced that there can be still be many ways found how to define the relationship between x, y and z, proving that Mr. Fermat is correct.

Also Andrew Beal's hypothesis cannot be forgotten, his genius statement cannot be left without awe. How he managed to do it I cannot comprehend – beautifully and with elegance! This proof confirms that Andrew Beal's hypothesis is true.

Edvins Kozlovskis
Jurmala, LATVIA
30.10.2016

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1. All submitted papers **must** contain the Title, Name of author(s), Affiliation (if any), Abstract and List of References (Literature) **written in English**. The Abstract must count not less than 100 and not more than 300 words and must be the good representation of your article. Optionally paper may also contain this information duplicated in another language.

2. **Font faces.** Arial, Times, Times New Roman, Courier New and Helvetica.

3. **Language.** You may use any language for your paper text, however English is MUCH preferable.

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