Magnetic levitation, based on the weakening of the effect of one of the magnetic fields on the source of another magnetic field when two magnetic fields interact.

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Abstract: The article discusses the device and method of creating an electromagnetic force having a strictly defined action vector. In conventional electromagnetic suspensions, the magnetic field created by the electric charges of one conductor acts on the electric charges of another conductor, while a force arises in it. The second conductor creates its own magnetic field, which acts on the charges of the first conductor and creates a counteracting force. In this case, two acting opposite forces balance each other in the system under consideration. The proposed design separates the paths of propagation of magnetic fields in such a way that the opposing force does not arise and does not manifest itself inside the device in question, and the principle of operation of the emerging force and counteraction to it is not fulfilled.

Keywords : magnetic levitation, acting and opposing forces; non-isotropic, inhomogeneous medium; diamagnet and superdiamagnet; separation of magnetic flux propagation paths.

The device described below relates to the field of physics and electrical engineering, namely, to a method of creating an electromagnetic force having a strictly defined action vector. Electromagnetic suspensions using the force of magnetic attraction or repulsion to create a holding force (magnetic cushion) They are described in diagrams of maglev trains. In such circuits, the electromagnets that create the effect of an electromagnetic cushion are arranged so that when they interact, a gap is formed between the poles of a moving object (electromagnet) and a fixed short-circuited circuit of an electromagnet or a non-magnetic metal sheet made of aluminum or copper. Such an arrangement of electromagnets requires a large number of fixed magnets involved in the movement of a moving object, high energy costs and a complex control scheme for a moving object. The scheme described below is fundamentally different from the above design schemes. In conventional electromagnetic suspensions, the magnetic field created by the electric charges of one conductor acts on the electric charges of another conductor, while a force arises in it. The second conductor creates its own magnetic field, which acts on the charges of the first conductor and creates a counteracting force. In this case, the two acting and reacting forces balance each other in the system under consideration. The proposed design dilutes the magnetic fields in such a way that no counteracting force arises or manifests itself within the considered device, but the principle of the resultant force acting and counteracting it is not fulfilled. This statement contradicts a well-known law that was discovered when ideas about the magnetic field had not even been formulated yet. In addition, the effect of the law has so far been considered for isolated cases in homogeneous and isotropic media and has not been considered at all for possible cases of interaction of magnetic fields in inhomogeneous and non-isotropic media. The proposed design represents such a nonisotropic and inhomogeneous medium. The proposed design consists of two DC electrical circuits. The first electrical circuit includes, in the simplest case: a low-voltage power source that can be used as a unipolar machine that generates high currents at low voltages (in other designs, you can abandon the use of a unipolar machine and use DC sources that generate low currents); a switch; a connecting element. wires (tires); a rectangular conductor 4 made of a non-magnetic sheet with good conductivity (for example, copper), having insulation, located in the gap of the magnetic circuit of the second electrical circuit. Also, the first electrical circuit has its own magnetic circuit consisting of two small U-shaped magnetic circuits 6 and two vertical spreading magnetic circuits 5. The second electrical circuit in the simplest case includes: a DC power supply; a switch; connecting wires; an electromagnetic coil with a winding. The second electrical circuit also has its own magnetic circuit consisting of a U-shaped magnetic circuit 2 made of a 0.3-0.5 mm thick ferromagnetic material and two horizontally arranged magnetic circuits 5, which are adjacent on both sides to the insulation of a rectangular 2 conductor 4. Between the vertical and horizontal magnetic circuits of the two magnetic circuits there are gaps filled with a diamagnet or superdiamagnet, isolating the magnetic circuit of one electrical circuit from the magnetic circuit of another electrical circuit.

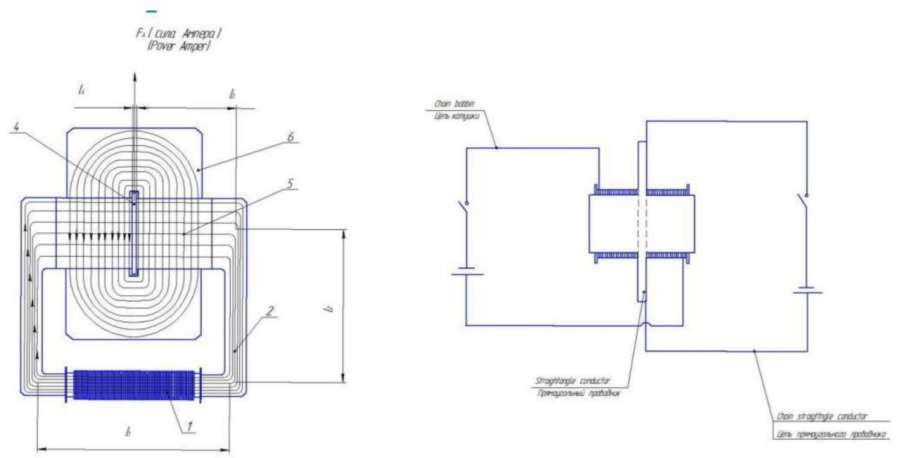

Fig.1 – Schematic diagram of a power electromagnetic device with a configuration of magnetic fields.

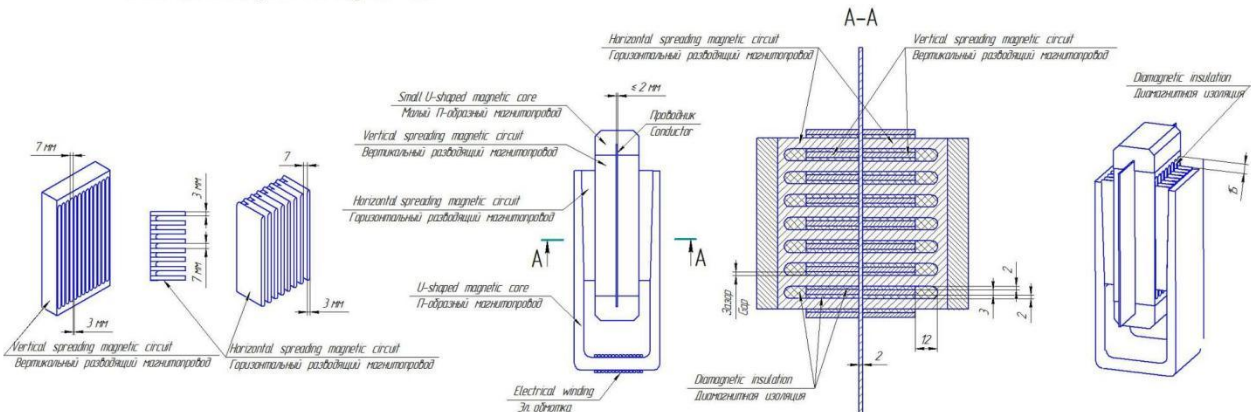

Fig.2. Mechanical part construction

In Fig. 1 schematic diagram of a power electromagnetic device with a configuration of magnetic fields is shown.

In Fig. F2 shows the mechanical part of the device design.

The operation of a power electromagnetic device is carried out as follows: an electric current from a DC source entering the winding of coil 1 creates a magnetic field. The magnetic field lines of the electromagnetic coil are closed to each other through a U-shaped magnetic core 2, ferromagnetic pins of a horizontal magnetic core 5 and a rectangular conductor 4. An insulated rectangular conductor 4 through which a direct current J pr. flows. It is made of diamagnetic material with good conductivity. It is located in the gap between the terminals of two horizontal magnetic conductors, which are closely adjacent to its insulation. As a result, a current strength in amperes arises in the rectangular conductor 4. There are w turns in the winding of the electromagnet, and a current of J volts flows through them. We believe that there are no gaps between the touching parts of the sections of the Ushaped magnetic circuit, the horizontally expanding magnetic circuit and the insulation of the rectangular plate. Consider a generalized magnetic circuit, where sections are highlighted: section 1 (L1 , S1) of the magnetic circuit; section 2 (L2, S2) of the magnetic circuit; section 3 (L3, S3) of the magnetic circuit (ferromagnetic contacts); section 4

(L4 , S4) of the magnetic circuit, the length of which is equal to the thickness of a rectangular conductor. Let's denote the average values of magnetic induction and magnetic field strength in individual sections of magnetic conductors and in a rectangular conductor, respectively: in section 1 – H1 and B1; in section 2 - H2 and B2; in section 3 - H3 and B3; in section 4 – H4 and B4. We neglect the scattering magnetic fields, so:

$$B1xS1 = B2xS2 = B3xS3 = B4xS4 = F1 \quad (1)$$

According to the law of total current for the contour of the middle power line, we have:

$$H1xL1+2H2xL2+2H3xL3+H4xL4 = w \times I\ ob., \quad (2)$$ where:

$$H=B/\mu , \quad (3)$$

the equation can be written as:

$$(B1xL1 + 2xB2x\ L2 + 2xB3xL3) \times k1/\mu 1 + B4xL4 /\mu 2 = w \times I\ ob. \quad (4)$$, where:

μ1 - is the magnetic permeability of the steel material in sections 1, 2, 3;

μ2 - is the magnetic permeability of the material at site 4;

k1 - is the filling factor of the steel material in sections 1, 2, 3;

S1 - is the cross-sectional area of section 1; 3

S2 - is the cross-sectional area of section 2;

S3 - is the cross–sectional area of section 3; S4 - is the cross–sectional area of section 4;

B1 – magnetic induction in section 1;

B2- magnetic induction in section 2;

B3 – magnetic induction in section 3;

B4 – magnetic induction in a rectangular conductor;

w - is the number of turns of the magnetization winding;

I ob. - this is the current strength in the magnetization winding.

From here we can find the value of the induction acting on a rectangular conductor 4:

$$B4 =(w \times I\ ob – (H1xL1+2xH2xL2+2xH3xL3) \times k1) \times \mu 2/L4 \quad (5)$$

The ampere force arising in this case in a rectangular conductor will be equal to:

$$F =B4 \times I\ pr. \times L \quad (6)$$, where:

F - is the ampere force in a rectangular conductor,

B4 – magnetic induction in a rectangular conductor,

I pr. – the current strength in a rectangular conductor located in a magnetic field,

L - is the length of a section of a rectangular conductor located in a magnetic field.

The rectangular conductor 4, through which a direct current flows, also creates a magnetic field. The intensity and induction vectors of this magnetic field will take the form of closed concentric ovals 4 relative to the conductor. With a conventional design of an electromagnet with a conductor 4 in the gap of the magnetic circuit of the electromagnetic coil, the Ampere force in the conductor 4 would be balanced by the force resulting from the action of the magnetic field of the conductor 4 on the ferromagnetic domains of the magnetic circuit of the electromagnetic coil. In this case, the magnetic field of the electromagnetic coil 1 will be distorted. In the areas of the magnetic circuit and in the electromagnetic coil, a counteracting force will arise, balancing the current strength in the conductor 4. For the above-described device, the effect of the magnetic field of a rectangular conductor 4 on the domains of the magnetic circuit of the electromagnetic coil and on the coil is significantly reduced (or even eliminated in the case of superdiamagnets) due to the fact that it is possible to maximally separate the propagation paths of two magnetic fluxes: the magnetic flux of the electromagnetic coil 1 and the magnetic flux of the rectangular conductor 4. This is done using isolation of the propagation paths of their magnetic fluxes from each other. The insulation is 4 carried out using diamagnets or, best of all, superdiamagnets. If there is still a slight effect on the domains of the magnetic circuit of the electromagnetic coil from the magnetic field of the rectangular conductor 4 (in the case of using diamagnets), then it will be significantly less than in a conventional electromagnet because the magnetic field of the conductor 4 will propagate along the path with lower energy costs, i.e. through the magnetic paths of the vertical magnetic circuit 5 and the small U-shaped magnetic circuits 6 of the magnetic circuit of the conductor 4 and will not fall into the magnetic circuit of the coil. Therefore, the Ampere force arising in a rectangular conductor 4 from the action of the magnetic field of the electromagnetic coil 1 on it will not be balanced by a force of the same nature, equal in modulus and opposite in direction in the electromagnetic coil from the action of the magnetic field of the conductor 4.

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