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Khmelnik force

Abstract

It is shown that from the existence of electromagnetic momentum flow and from the law of momentum conservation there follows the existence of a previously unknown force. The author suggests to experimenters to verify the generation of Khmelnik force and to supplement its name by their own names.

In [1] it is shown that the Lorentz and Ampere forces can be defined as the consequences of the existence of electromagnetic momentum flow and of the law of momentum preservation. They are defined in the form (in SI system):

$$F = V \cdot S \cdot \sqrt{\varepsilon\mu} / c, \qquad (1)$$

where

- S - the energy flow density,
- V - volume of body, which is penetrated by the flow of electromagnetic field,
- ε - relative permittivity of body,
- μ - relative permeability of body,
- c - light speed in vacuum.

Based on this form it can be asserted that there exists an additional force which we shall call for short "Khmelnik force" (if, of course, nobody had considered previously this force). In particular, it can be the Lorentz force or the Ampere force. But in other cases it is not equivalent to these forces. Consider some of these cases.

2. Faraday motor

The most striking example of such a force can be observed in the design shown in the following Fig. 1. "The inventor of this motor took disc of neodymium magnet with nickel coating, magnetized along the axis, in the center attracted to it by magnet a screw with a sharp end, and that end attracted by magnet to the positive terminal of round battery. Then he connected the negative terminal of the battery by thin wire (like a brush) with cylindrical surface of the magnet. Thus, between the tip of the screw and the positive terminal a bearing with very low friction was formed. When the negative terminal of the battery was connected to the magnet circle, the magnet spun immediately and within a couple of seconds has reached a top speed of the order of 15,000 rev / min, and then due to imbalance broke from the screw and flew away!" The quote and Fig. 1 are taken from [2], but one can easily replicate this experiment. Earlier in [2] a brief explanation of the experiment was given.

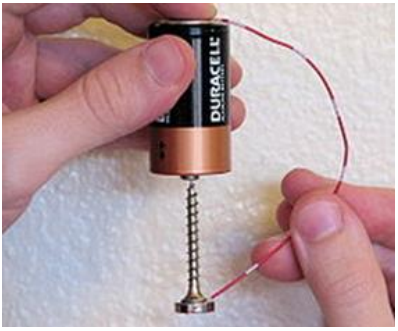

Fig. 1.

In essence, it is - a special case of Faraday motor - see Fig. 2. It has a electroconductive magnet with induction B, the line of current I passing along the vertical axis (vertical screws on Fig. 1), along the magnet's radius and the fixed contact. On electroconductive radius has electric intensity

$$E = j\rho, \tag{2}$$

where j - the current density, ρ - resistivity. Magnetic intensity H is proportional to the induction B. Vectors of these intensities are mutually perpendicular and therefore there flows of electromagnetic energy

$$S = EH \tag{3}$$

arises. Note that this flow occurs in a static electromagnetic field. Flow of static field is closed (due to the law of conservation of energy) and therefore is shown in Fig. 2 as cylinders. Radius of the magnet, where the current I flows, is the line of contact of these cylinders. Flow vector, lying on the surface of the magnet, is perpendicular to said radius. This flow S creates a force, that directed opposite to the flow vector S and that rotates the magnet at a speed v. This force is neither Lorentz force nor the Ampere force.

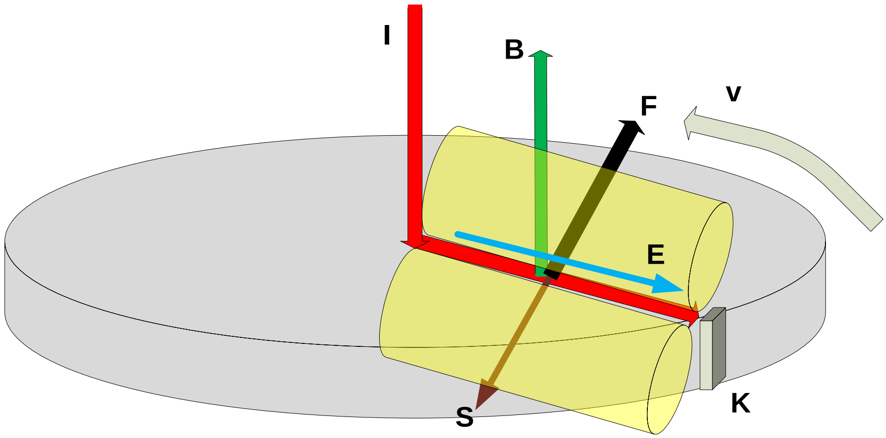

Fig. 2.

3. New Device

Let us consider the construction presented of the Figure, that shows a body located inside the solenoid with current I. The body has covering electrodes under voltage U. In this case, the body creates electromagnetic stationary field with electric field intensity E and magnetic field intensity H. In the body appears a flow of electromagnetic energy with density (3), which is shown in the Fig. 3 by circles. It can be presented in the form of two spheres united in a body and threading it in the vertical direction. This flow creates force (1) acting on the body.

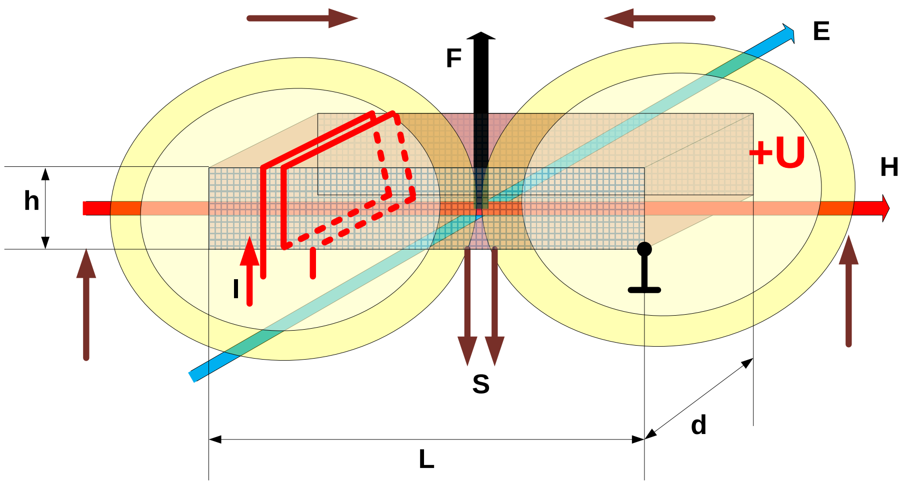

Fig. 3.

Let us discuss in detail the calculation of force (1), using the notations of the body dimensions shown in the Fig. 3 ure: L, d, h. We have:

$$E = U/d, \tag{4}$$

$$H = Iw/L, \tag{5}$$

$$V = hdL. \tag{6}$$

Also

$$F = V \cdot E \cdot H \cdot \sqrt{\varepsilon\mu}/c, \tag{7}$$

or

$$F = hUIw\sqrt{\varepsilon\mu}/c. \tag{8}$$

The example. Let in SI system

$\mu = 1,\ \varepsilon = 4,\ c = 3 \cdot 10^8,\ U = 30000,\ I = 20,\ h = 0.2,\ w = 100.$

Then $F = 0.2 \cdot 30000 \cdot 20 \cdot 100\sqrt{4 \cdot 1}/3 \cdot 10^8 = 0.08[N]$. Thus, we may expect that the device can be implemented.

References

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