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Unsupported Motion Without Violating the Laws of Physics

Abstract

We are considering some speculative experiments with charges and currents, which demonstrate a breach of Newton's third law, i.e. an opportunity of unsupported movement. It is shown that these experiments do not violate the Law of momentum conservation. We describe a structure in which electric charges are driven into rotation. We show that this structure performs translational unsupported motion. We describe the mathematical model and the experimental results with a mathematical model of this structure. Some recommendations are given for the implementation of the design.

Contents

1. Introduction

Unsupported motion is usually considered to be impossible due to the fact that it violates Newton's third law, and following from it (in mechanics) the law of momentum conservation. The latter is more general law of the laws of physics. In electrodynamics, the law takes into account also the momentum of electromagnetic waves and therefore the impulses of material objects that interact with the wave, in total turn out to be not equal to zero [1].

In [2] the interaction of electric charges is considered, and it is proved that in this case there may be cases when the law of momentum conservation in mechanics is violated. Described below based on this experiments that demonstrate unsupported motion [3].

2. The Interaction of Moving Electric Charges

Let us consider two charges q_1 and q_2, moving with the speeds v_1 and v_2 accordingly. It is known [2], that the induction of the field created by the charge q_1 in the point where at this moment the charge is located, is equal to (here and further the system GHS is used)

$$\overline{B_1} = q_1\left(\overline{v_1} \times \overline{r}\right) / cr^3 . \tag{1}$$

The vector $\overline{r}$ is directed from the point where the moving charge q_1 is located. The Lorentz force acting on the charge q_2 is

$$\overline{F_{12}} = q_2\left(\overline{v_2} \times \overline{B_1}\right) / c . \tag{2}$$

or

$$\overline{F_{12}} = q_1 q_2\left(\overline{v_2} \times \left(\overline{v_1} \times \overline{r}\right)\right) / \left(c^2 r^3\right). \tag{3}$$

Similarly,

$$\overline{B_2} = -q_2\left(\overline{v_2} \times \overline{r}\right) / cr^3 , \tag{4}$$

$$\overline{F_{21}} = q_1\left(\overline{v_1} \times \overline{B_2}\right) / c \tag{5}$$

or

$$\overline{F_{21}} = -q_1 q_2\left(\overline{v_1} \times \left(\overline{v_2} \times \overline{r}\right)\right) / \left(c^2 r^3\right). \tag{6}$$

Here the minus sign appears because the vector remained the same.

In the general case $\overline{F_{12}} \neq \overline{F_{21}}$ i.e. the Newton's third law is not observed – there appear unbalanced forces acting on the charges q_1 and q_2 and contorting the trajectories of these charges motion.

If the charges q_1 and q_2 in the process of moving do not leave a certain general construction, then there is a force acting on this construction

$$\overline{F} = \overline{F_{12}} + \overline{F_{21}} \tag{7}$$

or

$$\overline{F} = \frac{q_1 q_2}{c^2 r^3}\left(\left(\overline{v_2} \times \left(\overline{v_1} \times \overline{r}\right)\right) - \left(\overline{v_1} \times \left(\overline{v_2} \times \overline{r}\right)\right)\right). \tag{8}$$

This force is capable of moving the construction. It can be assumed that such forces provide the flight of ball lightning.

3. The First Experiment

Let us consider two charges q_1 and q_2, rotating with a constant speed $v_1 = v_2$ along mutually perpendicular circular orbits - see Fig. 1. The rotation begins from a position shown on Fig. 1, and is provided by mechanical forces within the construction.

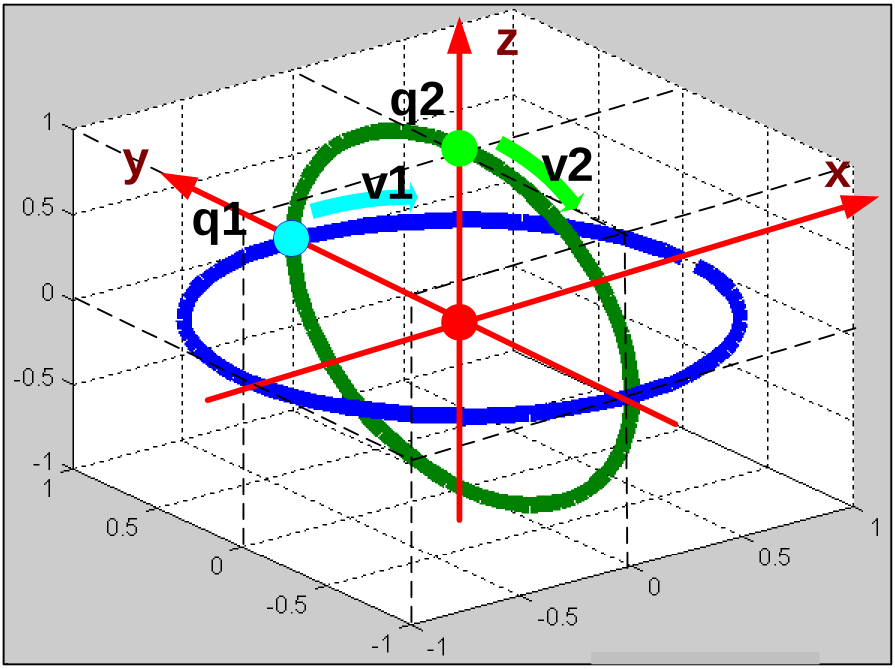

Fig. 1.

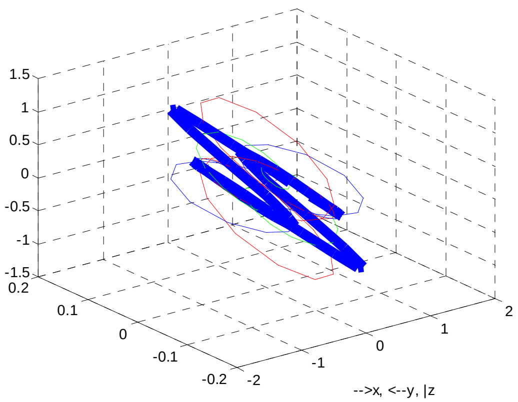

Fig. 2.

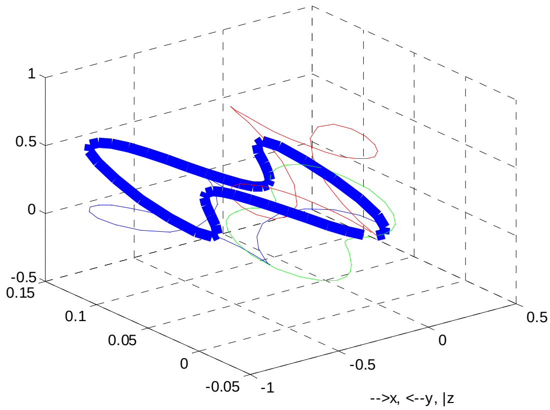

Fig. 3.

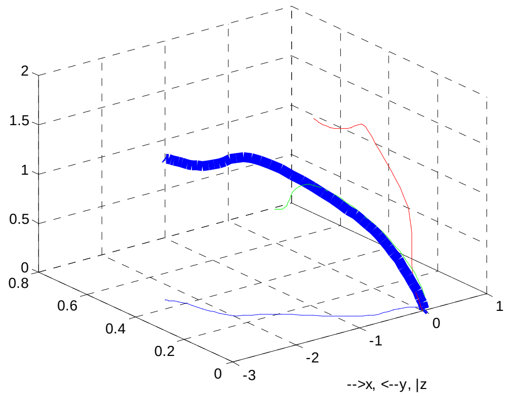

Fig. 4.

Using formula (8) we can find the force acting on the whole construction. Fig. 2 shows the special graph of this force's change during one revolution of the charges (the thick line) and the projection of this graph on the coordinate planes (thin lines). Here and further the projection lines are depicted so: the green one is xz, the blue one - xy, the red one –yz; the axes direction is shown under the graph.

For a known force and given zero initial conditions we find the speed and the trajectory of the construction for the given period -– see Fig. 3 and Fig. 4 accordingly. For this period the construction is shifted to the following distance `Rmax=2.8.` Fig. 5 shows the trajectory of the construction during two periods, when it has shifted to the distance `Rmax=5.6.`

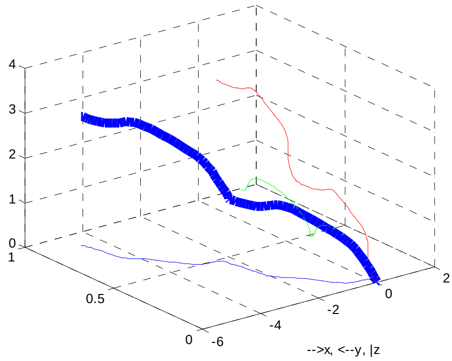

Fig. 5.

4. The Second Experiment

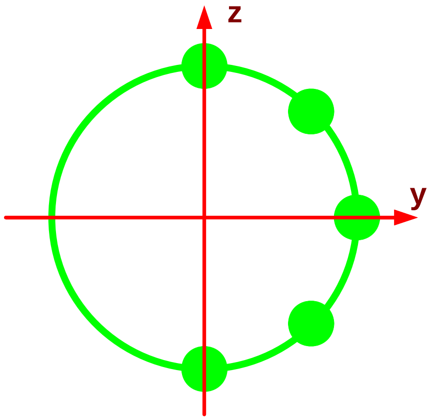

Fig. 5a.

In the construction depicted of Fig. 1, one charge was located on each circle. Now we shall consider a construction where several charges are located on each circle, but all of them are concentrated and are distributed uniformly along the half-circle – Fig, 5a. Here also with the formula (8) we may find the force acting on the construction as a whole. We find that the vector of this force lies on the plane xoz for any number of charges $a > 1$. The vector of speed and the trajectory are also on the plane xoz. Fig. 6 shows as an example the construction's trajectory for one period for the case when the construction contains 5 charges on each circle.

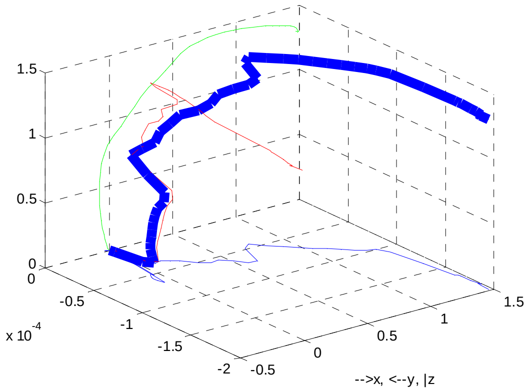

Fig. 6.

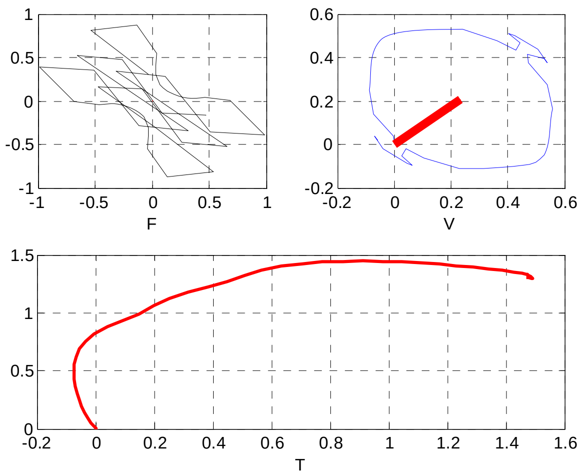

Fig. 7.

Fig. 7 shows for this same case the graphs of force change (window F) и скорости (window V) daring the time of one revolution of the charges and the trajectory of the construction (window T) in ***XOZ*** coordinates. In this and in the following figures it is assumed that the ***OX*** axis is directed horizontally, and the ***OZ*** axis– vertically.

On Fig. 7 we may see that during one period the construction is shifted by a certain distance `Rmax=2.`Fig. 8 shows the similar graphs for the same construction during two periods. Apparently, the construction shifts on the distance `Rmax=4.`

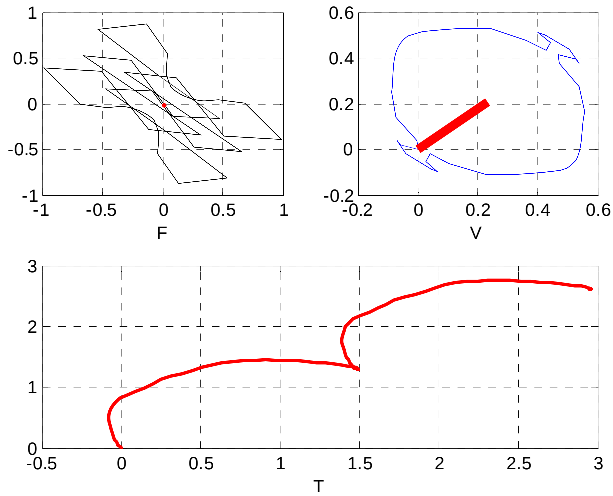

Fig. 8.

Fig. 9 and Fig. 10 show the same graphs for two periods for constructions containing 15 and 25 charges accordingly. For all constructions the magnitude of charge is chosen to be $q = 1/a$. Apparently, that in this case the graphs of force and speed change do not depend on the number of charges, and the trajectories are also independent from the charges number. Thus, such construction on increasing the number of charges "aims" to a construction with infinite number of charges. In it the linear distribution density of charges by the length l of charged half-circle is $\dfrac{dq}{dl} = \dfrac{1}{\pi R}$. As concerning the realization of such a construction, the charges in it must contact, but not merge into a single strip; for the functions of distribution density of the charges along the lane are not uniform (the charges are accumulated at the strip's edges). The charges of such construction may permanently recover from a source of DC voltage through brush contacts.

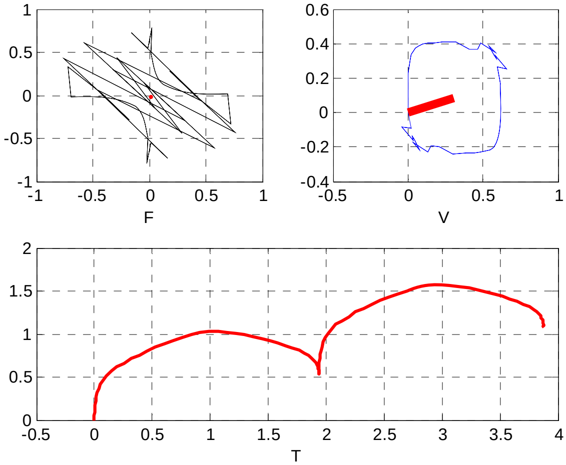

Fig. 9.

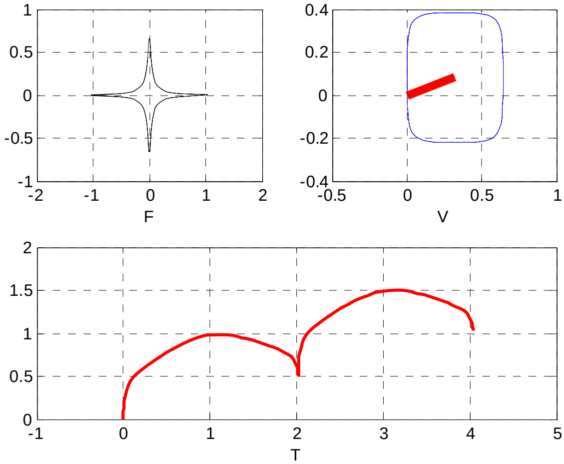

Fig. 10.

In conclusion let us consider the results of calculation for the same conditions that were used for calculation for Fig. 9, but for 20 periods– see Fig. 12. On this figure the red vector on the hodograph of speed depicts the average speed $V_s \approx 0.32$ of the construction's motion. After 20 periods the construction has shifted on $R \approx 40$.

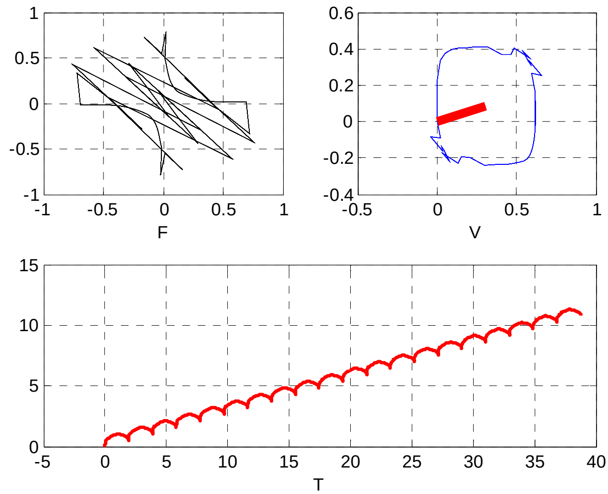

Fig. 12.

5. The Parameters of Motion

Let us consider in detail some characteristics of such motion. We shall not take into account the energy necessary for the construction's rotation with a permanent speed. The factors affecting the kinetic power P, expended by the construction for its motion, the average speed V_s and the construction's displacement, are :

- the speed of the construction as a whole $v = (v1, v2, v3)$,
- propulsive force $F = (f1, f2, f3)$, developed by the construction,
- the number of revolutions N,
- rotation frequency f or the angular rotation frequency $\omega = 2\pi f$,
- the construction's radius R_k,
- linear speed of the charges $v_o = R_k \omega$,
- summary charge q_o,
- the number a of charges, each of them having magnitude q_o / a,
- the mass of construction m.

We can prove that for $a > 4$ the number a of charges does not affect the motion parameters, and

$$P = (v, F), \tag{1}$$

$$V_s = (v_o, m, q, \omega), \tag{2}$$

$$R = (N, v_o, m, q, \omega). \tag{3}$$

Fig. 13 shows the graphs of instant motion parameters for $a = 5, N = 5, \omega = 1, v_o = 1, q_o = 1.$ Here

T - the motion trajectory,

$x1, x3$ - coordinates x, z depending on time,

V - hodograph of overall speed and average speed vector,

F - hodograph of the force,

$f1, f3$ the force projections f_x, f_z depending on time,

P - instant power depending on time,

P_s - average power,

$v1, v3$ - speed projections v_x, v_z depending on time,

vm - the speed amplitude.

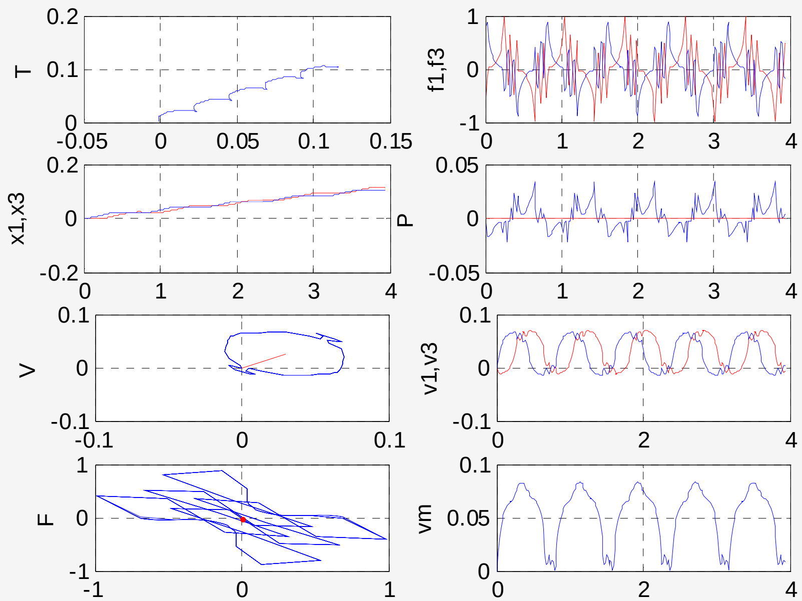

Fig. 13.

6. Resistance to Motion

The construction is always affected by the force F_T of resistance to motion – friction or useful load. Usually such force is proportional to the instant speed V, i.e.

$$F_T \approx F_t \cdot V\,, \tag{4}$$

where F_t is a known coefficient. The instant power f resistance to motion is

$$P_T = \left(F_T \cdot V\right) = F_t \cdot V^2\,, \tag{5}$$

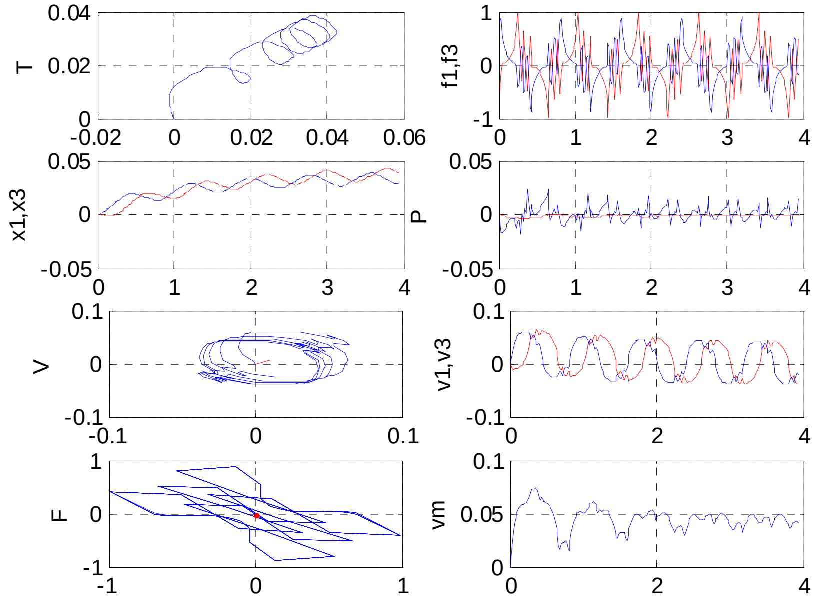

Fig. 14.

Fig. 14 shows the graphs of instant values of the motion parameters for $F_t = -0.75$ и $a = 5, N = 5, \omega = 1, v_o = 1, q_o = 1$. In the window "P" the horizontal line is the graph of power (5). We may note that

- the trajectory gradually turns into circular motion of all the construction "on the spot",
- the instant amplitude of speed aims to a certain constant value (as the motion turns into rotation "on the spot"),

Thus, the considered construction performs unsupported motion also with the resistance. The power of the construction's motor is expended on the rotation of charges and on overcoming the resistance.

References

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2. R.P. Feynman, R.B. Leighton, M. Sands. The Feynman Lectures on Physics, volume 2, 1964.
3. Khmelnik S.I. Unsupported Motion Without Violating the Laws of Physics. "Papers of Independent Authors", publ. «DNA», ISSN 2225-6717, Israel-Russia, 2012, issue 21, ISBN 978-1-300-33987-8, printed in USA, Lulu Inc., ID 13109103 (in Russian)