Quantum flights

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The principles of quantum motors based on Casimir platforms (thin-film nanostructures are at issue) are discussed in plain language. The generation of quantum propulsion is caused by the noncompensated integral action of virtual photon momenta upon a configuration unit cell in the platform. The cells in a Casimir platform should be situated in a certain order with optimal geometric parameters. The evaluation of the quantum propulsion shows that, for example, ten square meters of ideal Casimir platforms (it is a complex single-layer structure) could make Cheops pyramid move!

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INTRODUCTION

Quite recently the idea of the creation of Casimir platforms has been suggested [1]. They can be the nucleus of universal quantum propulsion devices in the nearest future. What is at issue is a far more serious and universal quantum effect than quantum levitation [2] (the hovering of one body over another). The platform motion is based on the Casimir expulsion effect [3] which can make it possible that people would fly wherever they want with whatever speeds even with the speed of light; and not only fly but perform a great variety of useful and wonderful actions (without any magic) [1]. Strictly speaking, the platforms can be referred to non-fuel motors. It does not mean that they can be called “perpetuum mobiles”; however, there is something perpetual in them. What is the difference? According to the definition [4] a perpetuum mobile is “an imaginary device allowing obtaining useful work larger than the energy given to it”. The Casimir platforms get the energy from virtual photons continuously appearing in physical vacuum.

However, will the platforms perform more work than they get the energy from the “boiling” physical vacuum? Of course, they will not. How will the energy, which we decide to use for the Casimir platforms, be transformed? The answer is trivial: it will be transformed into kinetic energy and heat.

Another question that can arise is: what about the law of momentum conservation in the system? Remember that the above law is valid only for closed systems. A system is called a closed system when no external forces act upon it or when the action of the above forces is compensated. We have a system which is open to all the virtual photon “winds”. Therefore, photons will give their momenta to our wings for an indefinitely long period.

And since the energy of the Universe (of the large known to us part of the Universe) is rather large and is not consumed yet (by anyone or anything), using the Casimir platforms we ourselves can quickly bring the Universe to heat death. However, let us not worry before the time comes; the energy is free but we need to spend it economically like oil and gas. Will we be able to save it? For how long will it last? If such questions arise it means that we are discussing a limited source of energy with the capacity of several billion years and not a perpetuum mobile.

And why is the Universe the source of limited energy? Here we should agree with Steven Hocking [2] that we just live in a certain fluctuation or, perhaps, “layer” of the space where a “heap” of positive energy has appeared and at some other place there is a “hole” of negative energy. Anyway, the sum of the energies is zero. And we are going to use our “heap” of energy until it itself disappears in some “quantum jump”. How can it be done? Recently I have understood that it is not very complicated. Here I will try to explain the principle of the performance of such platforms in details without using formulae as far as possible. Those who wish may read articles [3, 6, 7] and appreciate their simplicity.

WHAT IS CASIMIR EXPULSION?

Well, what are the Casimir platforms and why should they perform in the way we want them to perform? Let me remind you here of something concerning classical Casimir effect. At present almost everyone knows that two perfectly conducting parallel metal plates should attract to one another if they are placed at nanometer distances relative to one another. This effect has already been found experimentally [8] and it proves that the mechanical action of virtual photons upon solid matter is real.

Developing the theory of the effect in 1948 [9], Hendrik Casimir made several approximations in the model. It was necessary at that time when nobody was dreaming of having a laptop with packages of mathematical programs for all cases of life. First, for the simplicity of the performance of his mathematical calculations Casimir made the approximation that the plates are strictly parallel and infinite. Second, he assumed that the incidence of virtual photons upon the plates is normal; and photons that are incident to the normal at angles mutually compensate their action in the direction parallel to the plates, because, for example, for any photon incident at any angle there is always a symmetrically incident photon.
FIG. 1. The scheme with two very thin plates (wings); the arrows imitate the rays with virtual photons. The projections of the rays $D$, $C$ and $D^*$, $C^*$ upon the plates compensate one another. The projections of the rays $B$, $A$ and $B^*$, $A^*$ at the ends of the plates are not compensated. As a result, the Casimir expulsion force acts upon the plates from both ends tending to make "washboards" from the parallel plates.

This suggestion refers both to external and internal virtual photons between the plates (see Fig.1). Casimir also thought that at different frequencies the intensity of the photon production in vacuum was the same. In spite of the above approximations it is believed that Casimir's resultant formula is quite valid for the calculation of Casimir pressure between the parallel plates. There were several attempts to find Casimir pressure for the cases with nonparallel and finite plates; however they did not lead to any results which would be important and useful for further progress. The above attempts did not allow to find Casimir expulsion forces possible in such systems either.

The calculation of Casimir pressure values for more complex systems than parallel plates is still a very intricate problem. Even for joint configurations such as a ball and plane, two balls, two cones, a cone and plane, a trapezoid and plane, and others it is necessary to use rough approximations (see [10, 11]); for example, the approximation by Deryagin which he developed in the 30s of the XXth century for Van der Waals forces between particles in liquid dispersed mixtures. The concept of the similarity of Casimir forces and Van der Waals forces is still used at present and it is even being improved for approximate calculations of Casimir forces for many configurations. Without mentioning the details of the Deryagin method, let us note that Van der Waals forces between inner opposite surface layers of figures are different. Van der Waals forces act between inner opposite surface layers of figures. In contrast to them, Casimir forces are caused by the difference between the action of virtual photons upon external and inner surfaces of configurations.

The understanding of the drawbacks and roughness of the early calculation methods has allowed to develop some optical approximation for the calculation of Casimir forces. In this approximation, nonparallelism and finiteness of two plates (wings) and all possible angles of the incidence of virtual photons upon external and inner surfaces are taken into account. Scientists have succeeded in calculating the Casimir pressure along the entire length of plates and at the ends as well. Moreover, using the above approximation the Casimir expulsion force has been found, which is directed perpendicularly to the Casimir pressure (see Fig.2).

The calculations result in finding amazing things. For example, it is found that Casimir forces tend to press parallel plates to one another and, moreover, to rumple them into "washboards". It can happen due to the action of expulsion forces at the ends of the plates in the direction toward one another as in Fig.2a. Certainly it is not the most impressive manifestation of expulsion forces. In the case when the plates are slightly nonparallel, the expulsion forces at different ends will become unequal and opposite in their direction. As a result, the configuration from two plates fixed relative to one another will be influenced by noncompensated expulsion force as shown in Fig.2b. The magnitude of the force will depend on the angle $2\varphi$ between the plates. There are certain average angles, at which the expulsion force is maximal. In this case, for getting maximum of vacuum energy for the generation of expulsion forces, there is no need to make the plates infinitely long. There are optimal lengths $R$ for wings, and when the wings are made longer than those lengths, the expulsion forces in the configuration do not increase.

It turns out that everything found for a single configuration (see Fig.3a) is valid for periodically situated figures. A certain phenomenon has been found; when plates are placed at absolutely equal distances $d = a$ from one another, there is no expulsion in the entire configuration (see Fig.3b). However, when the relation of the distances of the smallest sections of figures is different.
we wish! It means that the force can be whatever linearly dependent on the number of wings in a periodic configuration (Fig. 3c). The force will be \( \sum F \) for lifting, for example, Cheops pyramid. Combined finding of maxima using all possible parameters according to formula (8) in Ref. [6] allows to find for the angle of maxima using all possible parameters according to optimal relations \( \frac{d}{a} \rightarrow 1.65 \) and \( \frac{R}{a} \rightarrow 1.8 \) for given geometry of the configuration of planes.

Let us find the number of nano-planes \( n \), which can be placed along the length \( Y = 1 \) m if the minimal distance between the wings is taken equal to the distance between the atoms of gold in the crystal lattice \( a = 4.0 \times 10^{-10} \) m [13]. We find

\[
n \approx \frac{Y}{d + a + 2R \tan(\varphi/2)}.
\]

It means that for the optimal parameters

\[
n \approx 6.7 \times 10^8.
\]

Assuming that the length of trapezoid cavity profiles is \( L = 1 \) m and taking into account that each cavity has two wings, we find the propulsion force developed by a platform having an area of the order of \( L \times Y = 1 \) m\(^2\)

\[
\sum F \approx 6 \times 10^9 \text{ newton}.
\]

Certainly, this value \( \sum F \) is obtained for structures in certain ideal conditions and with rough approximations (however, in some respects the approximations are not rougher than those made by Casimir) which we have made developing the theory of the calculation of expulsion forces. It seems that we need several tens or even hundreds of layers with such structures to develop such propulsive force. It is still difficult to determine the exact number of the layers. However, we are going to make approximate estimates based on the obtained value \( \sum F \).

We have received a pretty large value for the propulsive force. The mass of a body which can be balanced by such force (at the acceleration of free fall on the surface of the Earth \( g \approx 9.8 \text{ m/s}^2 \)) is

\[
M \approx \frac{\sum F}{g} = 6.5 \times 10^5 \text{ tons}.
\]

It means that Cheops pyramid (6.25 \( \times \) 10\(^6\) tons) will be balanced in the gravity force field by about 10 m\(^2\) of the monoatomic layer of our platforms!

Now let us estimate the amount of ideal metal (let it be gold) which is necessary for lifting and giving acceleration to all people inhabiting our planet. Let us assume that for one person a platform with the propulsive force capable of balancing 200 kg is sufficient. First, let us find what the area of single-layer (monoatomic layer) gold should be for all people. Let us calculate it using the mass of Cheops pyramid. If the mass of an average person is 70 kg and the total number of people is 7 \( \times \) 10\(^9\), we obtain that all the people on the planet weigh about 78 masses of Cheops pyramids! It means that we need only about 780 m\(^2\) of Casimir platforms for all the people for balancing in the Earth gravity field. And we need thrice as much (2400 m\(^2\)) if we need to fly in personal capsules wherever we want and with whatever speed. Let us also take into consideration that the platform consists of cavities; each cavity has two wings of the length \( R \approx 1.8 \times a \).

Thus, the area of the platform surfaces is determined as

\[
\sum F \approx 6 \times 10^9 \text{ newton}.
\]
the quantum flight of the pyramid, is it? And for the flight of one person, less than 10 square millimeters of one-layer structures will be necessary with regard to all possible corrections!

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