The Puzzling Perpetual Motion

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Abstract

Perpetual motion has a great history. It pulls people's attention especially physicists as it opposes physics fundamentals and also philosophers as they believe that we cannot get something from nothing. Ten centuries ago, the first perpetual motion machine was made. Then, we used it in generating electricity in an environmentally friendly way. Phun program helped in simulating mechanical perpetual motion machines. After that, a plot twist occurs and reconciling a reactionless propulsive drive with the first law of thermodynamics is proved under a relativistic analysis. Till now the existence of perpetual motion is not accepted as it is not applied to our real life but one day it may exist.

Keywords: Perpetual Motion Machine, Phun, thermodynamics, electricity.

I. Introduction

Can anything work forever? Actually, the answer is no because even humans do not live forever. Perpetual motion (PM) machines are machines supposed to work and generate energy perpetually. This totally violates fundamental laws of thermodynamics, but the thing is this concept has a long history and engineers do not give up searching it. Bhaskara's Wheels, as illustrated in figure (1), was the first documented perpetual motion machine described by the Indian author Bhaskara. It was a wheel with containers of mercury around its rim. As the wheel turned, the mercury was supposed to move within the containers in a way that the wheel would always be heavier on one side of the axle. Bishop John Wilkins compiled a book Mathematical Magick during a period in history when the "magical arts" were being overtaken by "scientific and mechanical arts", and people began to realize that many things once thought magical could be understood by science. He discussed the difficulty of achieving perpetual motion and considered in detail the Taisnierus' device mentioned in figure (2). It consists of two tilted ramps, an iron ball, and a magnetic lodestone fastened at the top. The lodestone at the top (A) pulled the ball (F) up the straight ramp, where it fell through the hole (B) to the lower ramp, rolled down, and through another hole (F) to the straight ramp where it was pulled up again. Clearly, this idea can't be easily understood and it raised many questions.

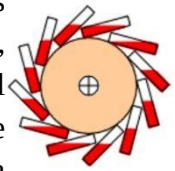

Figure 1

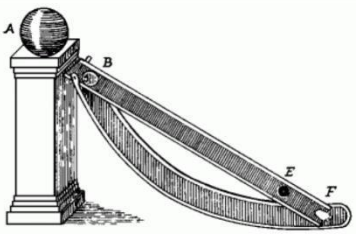

Figure 2

For example, why doesn't the ball simply remain at the top, held strongly against the fixed magnet?

And if it falls through the top hole, it would still be under the attractive influence of the magnet at the top.

Although the concept of perpetual motion seems to be impossible, perpetual motion enthusiasts still experiment with fantastic variations of "magnet motors" hoping that new magnet technology and stronger magnets will make them go. This review article will introduce how to study perpetual motion machines and discusses whether perpetual motion exists or not.

II. Using Phun to study perpetual motion

Understanding how perpetual motion machines work is challenging because it is too difficult to test them in our life conditions which is impossible to be ideal. So, a program called "Phun" is designed to simulate physical processes that we can use to easily simulate mechanical machines. They provide an intuitive graphical environment controlled with a mouse and no need for a programming language. This program works only with mechanical quantities such that we will focus on mechanical PM machines. Students often ask whether PM might work if there was no friction or air resistance. They often consider these losses as the only obstacle to its successful construction. Moreover, this is also a common explanation from PM inventors of why the machine does not work according to their desired results. These obstacles are solved by an important feature of Phun: its ability to provide ideal conditions (perfect elasticity, zero friction, and zero air resistance).

It is therefore possible to easily show that the impossibility of creating a working PM machine is not due to the technology or conditions, but rather to more fundamental reasons.

The machine shown in figure (3) was suggested by the Englishman Edward Sommerset. It was supposed to work based on the principle of unbalanced forces. As the top balls will be closer to the axis of rotation and the lower balls are unevenly distributed, Sommerset expected that after the system was shaken it would stay in perpetual motion.

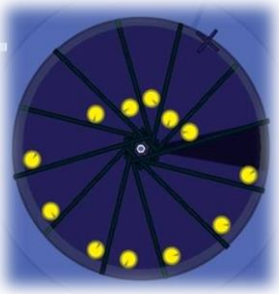

Figure 3

Method of testing using Phun: In Phun draw a circle and fix its center by pinning it to the background. The wheel will be able to rotate freely. Using drawing tools, insert the radial spokes as shown in the figure and put the balls into place. After that, turn off the air resistance and set the flexibility of the counters and balls. Regardless of how you set the wheel in motion, its movement will stop after some time. [1]

III. How perpetual motion machines generate electricity

Even though perpetual motion machines are impossible to be constructed, the concept of perpetual motion can help in generating electricity. The world's environmental pollution of fossil fuels can no longer be tolerated. Perpetual motion-based energy can be referred to as an alternative energy source. The goal to develop this energy option is to produce a machine that will run effectively at a lower cost and zero damage to the environment. Perpetual motion-based energy can be obtained from various sources such as biochemistry, thermodynamics, magnetic field, electrochemistry, and biology. Three of them will be mentioned.

A schematic of one of them shown in Figure (4) is using a pendulum. It consists of a pendulum attached to a horizontal body frame. It has two mainframes where two magnets are attached. Each side of the pendulum is attached by a magnet. A rod is connected to a rotating disc which is connected to a generator through the shaft. Once the pendulum is pulled sideways and then released, the repulsive force from permanent magnets and the pendulum's mass are combining and causing it to oscillate around its equilibrium position. This motion will be converted into the rotation and electrical energy will be generated.

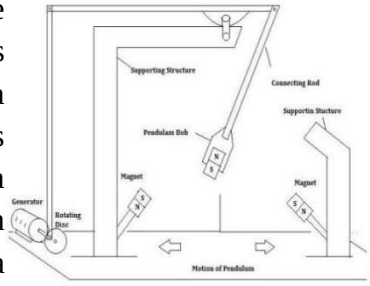

Figure 4

A mechanism of gravity power generation as illustrated in figure (5) is converting gravitational potential energy into kinetic energy. Positive torque is created by outward spreading single directional swing arms while reducing the negative torques by folding action of the single directional swing arms. Furthermore, kinetic energy will be converted into electrical energy.

Figure 5

Besides, the magnetic generator mechanism as found in figure (6) consists of magnets arranged on a wheel, each of them is facing the same pole of magnet on the stator. Due to a repulsive force, the magnets will rotate and cause a continuous motion of the wheel which is connected to a gear and a generator.

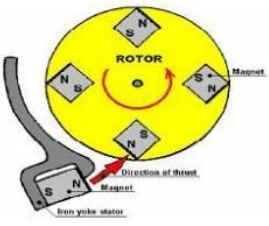

Figure 6

This idea provides low input energy which is available for free. A greater output can be achieved using a large scale of the project and proper magnet along with gear arrangement; thus, it will be more effective power generation. [2]

IV. Reconciling a reactionless propulsive drive with the 1st law of thermodynamics

Till now you must be convinced that perpetual motion is impossible to achieve but what if it really does exist? Don't panic, everything in physics is possible as well as relative.

A "space drive" is a hypothetical device that generates a propulsive force in free space using an input of power without the need for a reaction mass. Any device that generates photons (e.g., a laser) would qualify as a propellantless "photon rocket", but the force generated by emitting photons per power input is too small to be a practical propulsion device. The ability to generate greater force per power input would be highly desirable, such a device would be able to operate as a perpetual motion machine. Since applying a constant force results in constant acceleration, the kinetic energy of a mass driven by such a device increases quadratically with time, while the energy input increases only linearly with time. Thus, at some point, the kinetic energy of the device-driven mass exceeds the energy input, and if this energy is collected via decelerating the mass (via regenerative electromagnetic braking, for example), then there would be a net gain in energy. When relativistic effects are taken into account, it is shown that the photon rocket can only reach energy breakeven as the accelerated mass asymptotically

approaches the speed of light. Then, any device with a thrust-to-power ratio greater than the photon rocket would be able to operate as a perpetual motion machine, and thus should be excluded by the First Law of Thermodynamics.

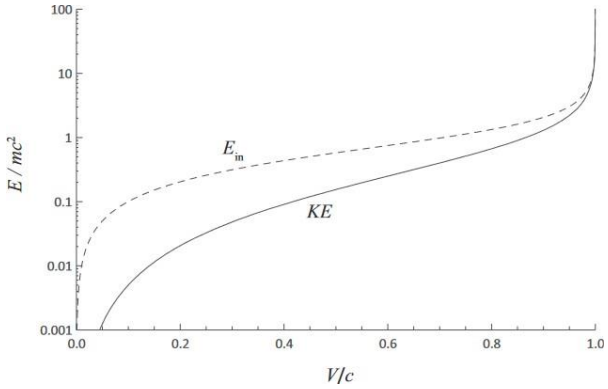

Figure 7

Figure (7) shows a comparison of the kinetic energy of a photon rocket as a function of velocity (normalized by the speed of light) compared to the energy input required to reach that velocity. Energy is normalized by the rest mass of the rocket and the speed of light.[3]

VI. Conclusion

It is obvious that if you enter a debate and agree that perpetual motion exists, you will lose in front of physics laws. The history of this concept is continuing to increase and oppose thermodynamics, on the contrary, it introduced many good ideas as the machine that generates electricity. In addition, enhancing technology and the conditions of testing these machines can widen the research in this field. Others would consider searching to be useless because we had nothing to do with fundamental laws but this might be considered as a narrow way of thinking because research would make use of this concept in a beneficial way that may apply to the real world. And finally, we still do not know if the perpetual motion does exist or not!

VII. References

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