Analysis of 'free energy' perpetual motion machine system based on permanent magnets

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Abstract

Claims of "Free Energy" generation using Perpetual Motion Machines (PMM) are usually discounted by the scientific community since PMMs are considered impossible, as a direct corollary of the Law of Conservation of Energy. However for the scientifically inquisitive mind, the urge to distill reasons which make some systems appear as PMMs, remains a factor. Recently a system on permanent magnets has been observed by the author, whose designer claimed that his system can provide 'free energy'. i.e., the output of the system is greater than the input. This system comprises of eight magnets arranged at equal distances at the rim of a circular disk and a ring magnet at the centre of the disk as shown in Fig. 1. The first magnet at the rim of the circular disk has its north aligned with axis of rotation and facing towards it. The next magnet placed after 1/8th of the circumference is rotated by an angle of 450 around z-axis such that after traveling half circumference the magnet rotates through 1800 as shown in Fig 2. The input is ring magnet which has an inner radius of 31.75 mm and an outer radius of 50.8 mm as shown in Fig. 3. The ring magnet is positioned at an angle between 300- 400, from the horizontal upper surface of the disk. The lower face of the ring magnet is North Pole and the upper face acts as South Pole or vice versa. In either case the face of the bar magnet facing the ring magnet is such that there is a repulsive force between the two. As the disk rotates initially, the ring magnet is positioned manually by rotating it around it's z-axis at an angle of 300-400 to an axis parallel to the upper surface of the disk such that at an instant there exists a repulsive force between a pair of bar magnets (separated by 1/2th of the circumference) and the ring magnet. The system has been analyzed using theoretical calculations and simulation with PRO ENGINEER Wildfire 5.0 which shows that it is not a free energy system.

Keywords: Perpetual motion machine (PPM), magnetic repulsion, moment of inertia, center of gravity (COG).

1. Introduction

(With rapid growth in population and greater demand of energy, fossil fuels are rapidly depleting and renewable energy is becoming the only alternate solution to the energy deficiency, the world is facing today. Research is going on to find better ways using sun, wind, biomass and geothermal source to generate more sustainable energy. There are many motives for renewable energy which include financial benefits, political and economical sustainability, environment friendly power production, finding solution to deplete conventional energy resources such as fuel and c oal [1]. Since renewable energy is the focus of the world and attractive because of many reasons mentioned earlier, there are many enthusiasts who are presenting 'novel' ideas to produce cheap energy or more suitably may be labeled as 'free energy' because in one form or the other such schemes are those of Perpetual Motion Machines (PMM). These schemes vary from simple to very complex. It may not be possible and even useful to analyze each and every such system since the fact that a PMM is not possible, is itself a sufficient ground to reject such claims [2] although, there are many technically sound applications of electromagnets and permanent

magnets [3]–[9]. Such a system comprising of permanent magnets has been observed, whose designer claimed for 'free energy'. Similar arrangement as proposed by the designer can also be found on many Internet websites, including youtube.com [10]–[15]. In this paper the 'free energy system' claimed by the designer has been analyzed theoretically and using simulation in PRO/ENGINEER Wildfire 5.0 which shows that if all factors are taken into account, there is no 'free energy system' or PMM as claimed by the designer.
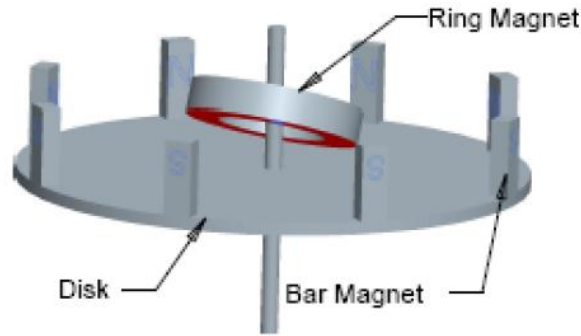

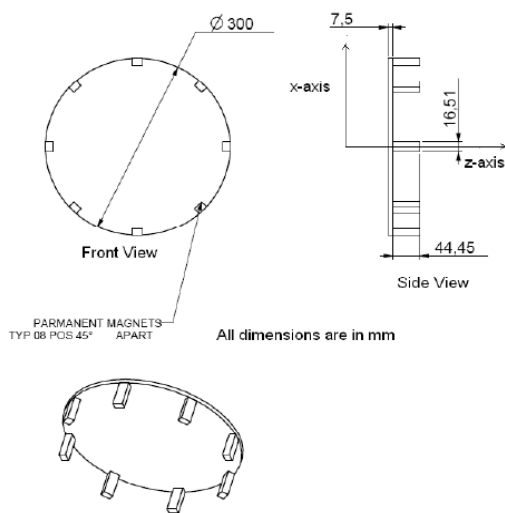Fig. 1. Free energy system model

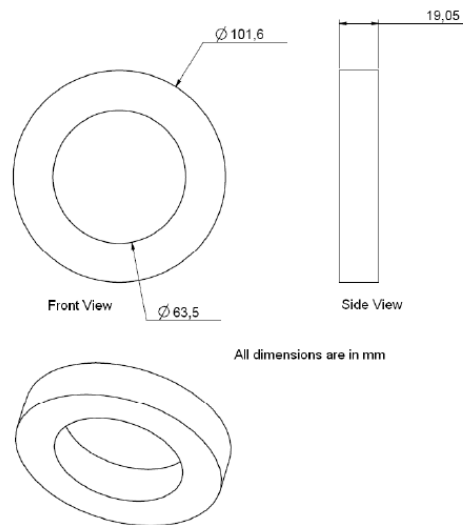Fig. 2. Disk with bar magnets

Fig. 3. Ring magnet

2. Free Energy System

The system claimed by the designer comprises of a ring magnet and a disk with bar magnets as shown in Fig.3. The working of the system can be explained by 3-D diagrams as shown in Fig. 4. Initially ring magnet faced parallel to the "disk with bar magnets" and no motion pragmatic in this condition. The upper surface of ring magnet is the north and the lower surface is south. Similarly, the inner surface of bar magnet is the north and the outer surface is the south. In order to rotate the disk, ring magnet is placed inclined at an angle of 30^0 to disk at different positions for continuous rotation. When the north of ring magnet faces north of bar magnet and south of ring magnet faces south of bar magnet a force couple is generated which starts rotation of the disk as shown in Fig. 4. The greater the magnetic repulsion between the magnets, the higher is the speed of the disk. To accelerate the speed of the disk, the ring magnet is to

face each bar magnet at an angle of 30^0 in the same direction of rotation as shown in Fig.5, Fig.6 and so on as Fig. 7. Ring magnet is controlled and positioned manually for continuous rotation of "disk with bar magnets".
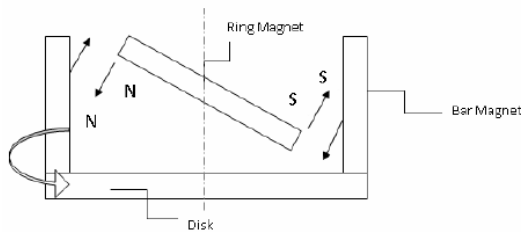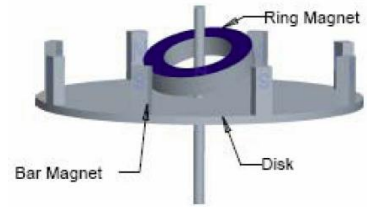

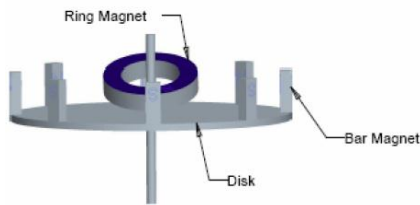Fig. 4. Working principle
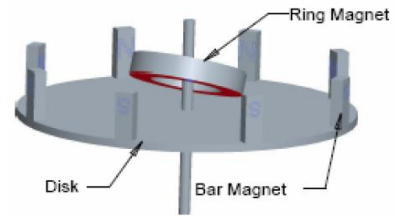

Fig. 5. Simulations (a)

Fig. 6. Simulations (b)

Fig.7.Simulations(c)

3. Simple Theoretical Analysis and Simulation Using Pro Engineer Wildfire 5.0

3.1. Theoretical Analysis of the System

First assume that the ring magnet is to achieve a speed of 2-rev/sec, in one second. So the power required to rotate the ring magnet is calculated by (1).

$$P = 2\pi NT \tag{1}$$

Here torque is the only unknown quantity which is calculated by (2).

$$T = I\,\alpha \tag{2}$$

I and α both are unknown. I, is calculated by (3)

$$I = \tfrac{1}{2}m(r_1{}^2 + r_2{}^2) \tag{3}$$

where m is the mass of the ring magnet which is 0.4525 Kg and r_1=63.5mm and r_2= 101.6mm α is calculated by (4).

$$2\,\alpha\,\theta = \omega_f{}^2 - \omega_i{}^2 \tag{4}$$

where, θ is known which is 4π radian ω_f is 2 rev/sec and ω_i= 0 so α can be calculated. By putting all the values of unknown in (1) power for the ring magnet is calculated as 0.064 watts (whereas I=0.000811 Kg.m2, α = 6.28rad/sec2, T= 0.0051 N.m). The results exactly match to the results simulated on PRO ENGINEER Wildfire 5.0 as shown in Fig.9. Similarly, inertia, torque and power in the case of 'disk with bar magnets', rotating at a speed of 2 rev/sec, is calculated by (1), (2), (3) and (4). The results are I= 0.01611 Kg.m^2, α = 6.28rad/sec^2 T= 0.1012 N.m and P= 1.27 watts. The above results do not match to the experimental results simulated on PRO ENGINEER Wildfire 5.0 as shown in Fig.10. These results were based on following assumptions:

1. Mass considered to be uniformly distributed over the disk.
2. Center of gravity is assumed to coincide with the center of the disk.
3. Combined mass of bar magnets and disk taken to be 1.432 kg.

$$I_o = I_g + md^2 \tag{5}$$

$$I_g = \tfrac{1}{2}\, m\, (a^2 + b^2) \tag{6}$$

To get true results, bar magnets and disk were analyzed separately by considering both bar magnets and disk rotating at a same speed of 2 rev/sec. Power required for the bar magnets rotation is calculated by (1), torque by (2), α by (4) whereas Inertia of the bar magnet is calculated by (5) and (6). The results obtained for bar magnets are I= 0.001125 Kg.m^2, α = 6.28rad/sec^2, T= 0.056 N.m and P= 0.70 watts. For the disk power is calculated by (1), torque to rotate the disk is calculated by (2) and inertia of the disk is calculated by (7) and the results obtained for the disk were calculated as I= 0.01125 Kg.m^2, α = 6.28rad/sec^2, T= 0.07065 N.m and P= 0.89 watts. The sum of torques for the disk and bar magnets comes out to be 126.6 N.mm, which exactly matches to the results simulated on PRO ENGINEER Wildfire 5.0 as shown in Fig.10. Inertia of bar magnets about its own axis of rotation (I_g, as given in 6), passing through Center of Gravity (COG) is negligible as compared its inertia about an axis parallel to its center of gravity (I_0, as given in 5), 0.001125 kg.m^2.

$$I = \tfrac{1}{2}\, mR^2 \tag{7}$$

Total inertia is the sum of inertia of bar magnets and inertia of the disk. Sum of the powers for bar magnets and disk as calculated above (i.e. 0.70 watts and 0.89 watts respectively) is 1.59 watts. Assuming 100 percent efficient system i.e. a frictionless system input power and output power should be 0.064 watts and 1.59 watts respectively. In this condition this seems to be a free energy system as output is greater than input and the designer may claim that this is a free energy system but actually the ring magnet does not rotate simply as such it takes different positions at an angle of 30^0 to horizontal to rotate the disk. The input power hence required will be the sum of power required for the motion of ring magnet in addition to the power required to overcome the effect of magnetic couple exerted by the bar magnets on the ring magnet. Torque on the disk including only two bar magnets is calculated as 0.084 N.m and force (F) on the disk is 0.56 N as shown in Fig.8. From repeated experiments it is observed that angle 'C' in Fig.8 is $\geq$ 22^0 approximately. However the value assumed is one that is equal to 22^0 and provides 100% efficiency. This value is about 22^0 and 'c', 'B' and 'D' as calculated for Fig.8 are 104.55 mm, 10.40 and 79.60 respectively.
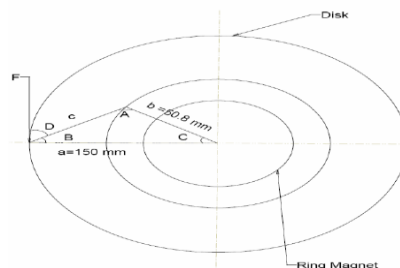

Fig. 8. Force on disk exerted by ring magnet

Applying same force couple on ring magnet on the opposite side, we get torque on ring magnet due to its own arm length i.e. 50.8 mm as 0.0776 N.m. Sum of input torques (i.e., torque for rotation of ring magnet and torque to overcome magnetic couple exerted by bar magnets on the ring magnet) is 0.084. Hence output powers and input powers are equal as the ring magnet and bar magnets are rotating with same angular velocity i.e., 2-rev/sec. Therefore efficiency of the system obtained is 100%. This was

expected because the system is almost lossless. However it is clear from the analysis that the system cannot provide any 'free energy' and in case of losses in the system, the efficiency will drop from 100%.

3.2. Simulation of system on PRO Engineer Wildfire 5.0

In order to validate the theoretical results, the system is simulated by using PRO/ENGINEER Wildfire 5.0. The torque required to rotate the ring magnet at a speed of 2-rev/sec is simulated as shown in Fig.9. For torque and other calculations angular acceleration (α) is required as input parameter in PRO ENGINEER Wildfire 5.0. Here we have (α) as 6.28 rad/sec^2, calculated by (7). The corresponding value of the torque as simulated by the software is 0.0051 N.m for the case of ring magnet which is graphically shown in the Fig. 9 and power is simulated as 0.064 watts which is exactly same as calculated theoretically. Torque required to rotate the disk including bar magnets at a speed of 2 rev/sec is simulated and results are as shown in Fig. 10. The mass of the disk is taken as 1 Kg and mass of each bar magnet is taken as 0.0543 Kg and all other dimensions are shown in Fig. 1. For torque calculation in all cases α is calculated as 6.28 rad/sec^2. By putting the value of α in the design software torque can be simulated graphically as shown in Fig.10 which thus verifies the results obtained from theoretical calculations.
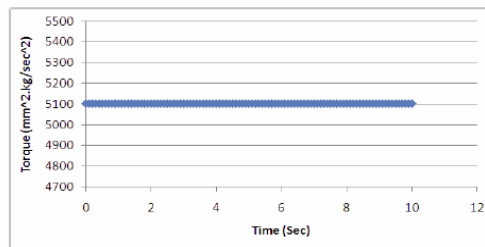

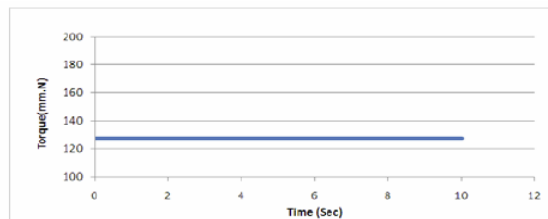Fig. 9. Torque required for simple rotation of ring magnet

Fig. 10. Torque required for rotation of disk with bar magnets

4. Conclusion

The designer of this system claims it as a 'free energy system' without any theoretical analysis or experimental evidence. In almost all 'free energy' systems claimed by enthusiasts there is some hidden object that is consuming energy/power but is not being accounted for. In this case also, the power consumed by ring magnet (the basic excitation source of system that puts the disk in rotation) was not being included. If all the factors are taken into account and the system is analyzed properly the claim of the system designer is proven false. In this paper detailed theoretical analysis of the system is done and it is simulated in PRO ENGINEER Wildfire 5.0 to validate the theoretical analysis that shows that the system does not provide any 'free energy'.

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