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Magnetic Wheel Shaft

M. Anantha Kumar

Department of Aeronautical Engineering, SREC, Coimbatore.

Abstract

Requirement in development for any engine to operate with fewer sources is increasing day by day. For the ever expected break-through, the alteration that I propose is Magnetic attraction force, as an alternate fuel to drive the shafts. As the petroleum products are in demand and producing lots of pollution to the atmosphere, the research is focused to make an alternate fuel also to reduce fuel consumption by making modification in shafts system of an automobile. Here we have designed a system which makes a shaft to rotate automatically with the use of magnetic force of suitable Gauss power and right incident angle of force direction. This system needs a lower energy from the engine in case of higher loads comparatively with the existing internal combustion engines. This paper also has various parameters and way of approach in a better explained way. I assure that this would be elite for the future in effective operation of any engine.

Keywords: magnetic force, gauss, shaft.

1. Main Introduction

Today, magnet is used in transportation for high speed, high efficiency, and friction less and free from pollution. The best example for magnetic application is **Bullet train**. The bullet train was invented by Japanese in the year 1994; still run in many developed countries only like japan, France, etc. But not run in developing and under developed countries because bullet train construction is very expensive, difficult, construct a new track for bullet train, and difficult program for create small moving friction. For this reason, I was designed a new magnetic rotator wheel. Magnetic rotator wheels are overcomes the bullet train disadvantages.

In my project, magnetic rotator wheel is used instead of fuel engine for locomotive process. In this paper, Number of magnetic rotator wheels produces the horse power of engine is theoretically proved. In magnetic rotator wheel, quantity of magnet is based on width of the automobile. For example, width of the automobile is two meter means one and a half meter is used for placing the magnet and other half meter is used for other purposes. By using this magnetic rotator wheel means easily constructible compare to bullet train, free from pollution, and increases fuel efficiency. Magnetic rotator wheel construction, working, theoretical calculations, and breaking process are discussed in details are given below. Procedure for paper submission.

2. Magnetic Polarity

Magnetic poles arrangement determines, if the magnets are attract or repel. In magnetic rotator wheel, poles arrangement is must important for rotational operation.

3. Construction

In magnetic rotator wheel, we use two types of magnets are hollow circular magnet and rectangular block magnet.

3.1. Circular hollow magnet

In magnetic rotator wheel, shaft is inserted tightly to the circular hollow magnets without any air gap for proper rotational operation occurs by magnetic attraction and the shaft ends are connected with wheel. Maximum numbers of circular hollow magnets are present on the shaft, not only at the same dimensions but also arranged in opposite poles. We choose power of the circular hollow magnet is only less than 1000 Gauss for increase the efficiency of the pull force for rectangle block magnet.

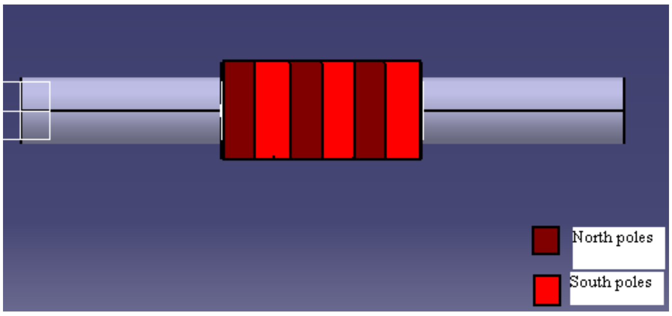


Fig. 1

3.2. Rectangular block magnet

Rectangular block magnet is placed at each corner (four sides) of the circular hollow magnet. In each corner of the circular magnet, a pairs of rectangular block magnet is placed perpendicular to each other in an opposite poles. And magnetic shielded material is placed between two block magnets. In one corner side, 20 pieces of block magnet is placed. In magnetic rotator wheel has four corner means, 4×20=80 magnet pieces are used. In 80 block magnetic pieces, 40 magnet pieces for attraction and remaining 40 magnet pieces for repulsion. In shaft, circular hollow magnet is placed three by fourth of the area and remaining area is arranged by circular hollow disc with a certain gap, the support is given to the disc by the base of the automobiles, which is used for disc brake. Maximum two disc brakes are used at the end of the hollow magnets, for our safety.

4. Working

We are known about how to arrange both two magnets in detail. Let, we discuss about working of the magnetic rotator wheel. In figure 2, shows magnetic shielded material by brown and the other colours are represent magnet.

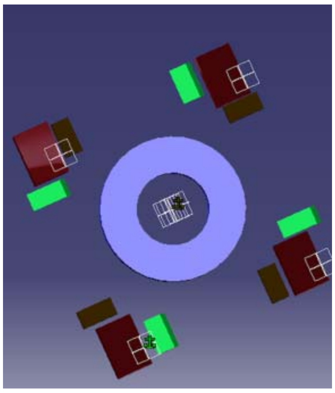


Fig. 2

Take one corner of the block magnets; It has a pair of magnet with opposite polarity. In pairs, one magnet is placed vertical, it is denoted as "A" and the other magnet is placed horizontal, it is denoted as "B". If the hollow magnet and magnet "A" are arranged in same poles means, magnet "B" is arranged in opposite poles compare to magnet "A". Due to this arrangement, hollow magnet is attracted by the magnet "B" and repelled by the magnet "A". By this continuous operation, hollow magnet contain shaft is rotate in one direction. Direction of the shaft rotation changed is achieved by using stepper motor. That above operation is happened in each corner of the circular hollow magnet.

5. Magnetic Dimension Selections

In magnetic wheel rotator, both the circular hollow magnet outer radius and rectangular block magnet length dimension is must important for rotational operation compare to other dimensions of both magnet. Because, both the hollow magnet outer radius and block magnet length is determine the rotational operation. Magnetic dimension selection formula for magnetic wheel shaft***, I.e.*** $L = \frac{r}{5} + 1mm$

Where, L=Length of the block magnet in mm, r=Radius of the hollow magnet in mm.

For example, we select outer radius of the hollow magnet is 250mm.Therefore, length of the block magnet = $\frac{r}{5}$ +1mm = $\frac{250}{5}$ + 1= 50+1 = 51mm.

6. Pull Force Concept

"When two magnets are involved in attraction, one magnet must have less power than the other then only gets the maximum pull force". That same concept is followed in my project. In my project, circular hollow magnet has less gauss power than the rectangular block magnet.

6.1. Pull force calculation

We already know about, pull force formula for two identical rectangular block & disc magnet at a certain distance. In my project, I choose two different types of magnet (circular hollow and rectangular block magnet) in different size. Pull force formula between two different magnets in a different size is not available. For this reason, we choose one is powerful magnet (rectangular block magnet) and the other one is magnet (circular hollow magnet) but not a powerful, which is less than 1000 gauss. This time, we need not calculate pull force between two magnets. Just calculate pull force for a powerful magnet at a certain distance which is distance between two magnets. Pull force calculation for a block magnet at a certain distance is calculated into two steps,

i) Calculate the magnetic flux density at a required distance,
ii) Calculate pull force for a calculated magnetic flux density value.

6.2. Magnetic flux density calculation:

Magnetic flux density formula for a block magnet at a certain distance is,

Magnetic flux Density=$\frac{Br}{\pi}\left(\tan^{-1}\left(\frac{LW}{2Z\sqrt{(4Z^2+L^2+W^2)}}\right)-\tan^{-1}\left(\frac{LW}{2(D+Z)\sqrt{4(D+Z)^2+L^2+W^2}}\right)\right)$Gauss

Where, Br=Remanence field, W=Width of the block magnet, L=Length of the block magnet, D=Thickness of the block magnet, Z=Distance from the block magnet.

Relation between distance in cm and magnetic flux density in gauss are given below by using magnet (N48), with length 2 inch, width 2 inch and thickness 2 inch are given below,

Distance in CM	1	2	3	4	5	6	7	8	9
Magnetic Flux in gauss	3943	2420	1496	961	645	451	326	243	186

i.e.) Magnetic flux density $\propto \frac{1}{distance\ from\ the\ magnet}$

6.3. Pull force calculation

$$\text{Pull force}=0.576\times(\boldsymbol{Br})^{\mathbf{2}}\times\text{TH}\times\sqrt{\boldsymbol{Area}} \text{ in lbs.}$$

Where, Br= magnetic flux density in Kilo gauss, TH=Thickness of the magnet in inches,

$\sqrt{Area}$ = Area of the magnet in inches. (L*W).

Relation between thickness and pull force by using magnetN52, with length (2”), width (2”)

Thickness in Inches	1	2	3	4	5	6	7	8	9
Pull force in Pounds	1.460	4.594	7.928	11.306	13.899	16.596	19.184	21.713	24.207

i.e., Pull force $\propto$ thickness of the magnet

7. Theoretical proof

We need to calculate both pull force and repulsive force for a block magnet. In magnet, pull force is nearly equal to repulsive force. So, we calculate only magnetic pull force for a block magnet. Magnetic pull forces are calculated below,

Rectangular block magnet dimensions: N52 magnet: 14800 gauss with dimension (2×2×2):

The value of magnetic flux density at a 1 inch distance is calculated by using online calculator (magnetic flux density vs. distance) is 1994.78 gauss. By using calculated magnetic flux density, to find the pull force for a block magnet.

Pull force= $0.576\times Br^2\times$TH$\times\sqrt{Area}$= $0.576\times(1.994)^2\times 2\times\sqrt{(2\times 2)}$ =9.1608 lbs.

8. Torque and horse power calculation:

Torque = (sum of the pull force of the block magnet in lbs and weight of the hollow magnet in lbs.)× Radius of the circular hollow magnet in meter.

Radius of the hollow magnet=(length of the block magnet $-$ 1)×5mm,

= (50.8-1) × 5 = 49.8×5 =249mm. [2 inch=50.8mm]

And then weight of the hollow magnet is also used to calculate torque. Magnetic wheel required size circular hollow magnet is not available there, so we just consider weight of the circular hollow magnet is 10kg.we required magnet value in pounds, so we convert hollow magnet in kg to pounds. One kilogram is equal to 2.205 pounds and then 10kg is equal to 22.05 pounds. Therefore, **Torque = pull force for a block magnet + weight of the hollow magnet**

=9.1608+22.05 = 31.2108 lbs. = (31.2108 × 4.448) N = 138.8256N.

Torque radius=Torque in N × Radius of the hollow magnet in meter

=138.8256 × 0.249 = 34.568Nm.

Assume normal speed of the train is $70 Km/hr$.

$$\textbf{Speed} = \frac{\left(speed\ in\ \frac{km}{hr} \times 1000\right)}{(2 \times \pi \times r \times 60)}\ \textbf{in rpm.}$$

Where, r= radius of the train wheel in meter= 0.5 m

$$\text{Speed} = \frac{(70 \times 1000)}{(2 \times \pi \times 0.5 \times 60)}\ \text{rpm} = 371.36\text{rpm}.$$

We know that, Horse power= $\frac{(torque\ in\ Nm \times speed\ in\ rpm)}{5252} = \frac{(34.57 \times 371.36)}{5252}$ = 2.44hp.

Finally, we concluded one block magnet is produced 2.44hp by pull force. We use 40 magnets for pull force means, magnet produced total horse power by using pull force is,

$=40 \times 2.44 = 97.6$ hp.

We know that**, pull force is nearly equal to repulsive force**. Therefore, we consider repulsive force is 2hp.Therefore, magnet produced total horse power by using repel force is,

$=40 \times 2$ =80hp.

Total horse power= hp produced by pull force magnet + hp produced by repulsive force magnet,

=97.6+80 =177.6 hp.

Theoretical calculated, one magnetic wheel shaft is achieved **177.6hp**.

9. Magnetic Shielding Material

Magnetic shielding material is also used for magnetic wheel rotational operation properly. The function of the magnetic shielding material is redirecting the power to the magnet (or) saturate within them. Rectangular block magnet is fully covered with magnetic shielding material expect the operational side. If the magnet not fully covered, all the attracted materials are attracted by the block magnet.

Magnetic shielding property $\propto \frac{1}{permeability\ value\ of\ a\ material}$.

9.1. Magnetic shield material selection

Attenuation is used to select the magnetic shielding materials. In magnet, Attenuation means “weakening the strength of the magnetic flux density”. By using attenuation, we also calculate how much magnetic flux density shielded by the material.

Attenuation (A) = $\frac{(permeability\ value\ of\ material \times diameter\ of\ the\ material)}{Thickness\ of\ the\ material}$ in dB

By using Attenuation value, calculate how much magnetic flux density presents inside the material, Br= $\frac{H_O}{A}$ gauss.

Where, Br= Magnetic flux density presents inside the shielded material,

H_0= Magnetic flux density presents outside the shielded material, A=Attenuation.

In my project, we use the magnetic shielding material is **ultra-low carbon steel**, because it has a permeability ranges from 1000 to 4000 and its saturation level is 22,000 gauss.

9.2.Theoretical calculation for magnetic shielded material:

First, we calculate the attenuation for a selected magnetic shielded material using formula, Attenuation=$\frac{(permeability\ of\ the\ material \times thickness\ of\ the\ material\ in\ inch)}{diameter\ of\ the\ material\ in\ inch}$

Ultra low carbon steel: Permeability =1000, Thickness=0.016, Diameter=2.

Attenuation=$\frac{(1000 \times 0.016)}{2}$ = 8 dB

By using calculated attenuation value, to find how much magnetic flux density is present in the ultra-low carbon steel.

Magnetic flux density is present inside the material in gauss (Br)

$=\frac{\boldsymbol{magneticfluxdensityispresentoutsidethematerial(H_0)ingauss}}{\boldsymbol{Attenuation(A)\ indB}}$

Magnetic flux density is present outside the material is calculated by using magnetic flux density vs. distance using online calculator is 1994 gauss at a distance one inch. Using magnet for calculating magnetic shield is magnet N52 with a dimension is (2×2×2).

Therefore, Br= $\frac{H_0}{A} = \frac{1994}{8}$ = 249.25 gauss.

Final magnetic flux density is calculated by using formula,

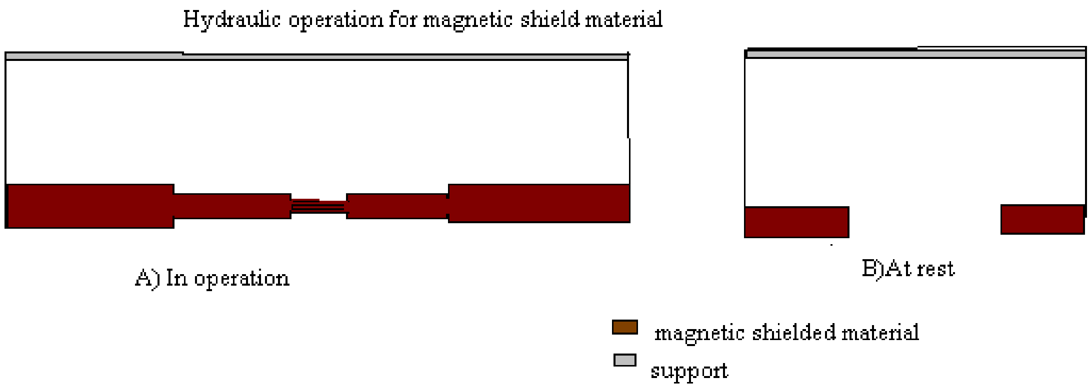
Final magnetic flux density= (Normal magnetic flux density at a required distance Magnetic flux density is present inside the material) in Gauss.

= 859.52-249.25 =610.27 Gauss.

10. Braking process: In my magnetic rotator wheel, braking process occurs in two steps:

Step 1: In first step, we are trying to decreases the magnetic flux density value. The only way to decreases the magnetic flux density value is, increases the distance between circular hollow magnet and rectangular block magnet because magnetic flux density value is inversely proportional to the distance. In my magnetic rotator wheel, increases the distance between circular hollow and rectangular block magnet is achieved by some hydraulic operation. In, a tank is filled with the hydraulic fluid is called oil sump. All the hydraulic oils are enter through the filter for filtering the oil and then reach the pump. Pump is used to pull the hydraulic oil at a certain force to the operation area (A) which is situated below the lower magnet area. Both the upper and lower magnet area is fixed with strengthened rod say steel and is inserted into area A and B. If the oil moves to the upper magnet side, lower magnet area is comes down and at the same time, upper magnet area is pulls upward. Finally, an increase the distance between two magnets is achieved. And another one is speed also controlled by the above operation.

Step 2: And then, we use some hydraulic operation, moves the magnetic shield material between the circular hollow and rectangular block magnet to cut the magnetic force partially, and the shape of the shielded material is circular. By this method, we will decreases approximately half of the magnetic power and then normal hydraulic braking applied by the help of circular hollow disc.



90°Rotation is achieved by the stepper motor. Stepper motor is connecting to the strengthened rod through the bevel gear.

10. Conclusion

The magneto rotator wheel shows that there is a way to obtain the required horse power for automobiles to fly with different speed that don't need any fuel. So that the cost of transporting is reduced as there is no need of fuel. This paper shows the main issue of fuel efficient automobile can be satisfied using magnet. The main fact depends on the arrangement of magnet in such a way that the repulsive and attractive force is properly used for the continuous transportation.

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