International Journal of Engineering & Technology, 3 (2) (2014) 208-211
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www.sciencepubco.com/index.php/IJET
doi: 10.14419/ijet.v3i2.1831
Technical Paper

Design and fabrication of magnetic shock absorber

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Abstract

In a vehicle, shock absorber reduces the effect of travelling over rough ground, without shock absorber the vehicle would have a bouncing ride, as an energy is stored in the spring and then released to the vehicle, possibly exceeding the allow range of suspension movement [1]. Control of excessive suspension movement without shock absorption requires stiffer springs, which would intern gives a harsh ride. Shock absorber allows the use of soft springs while controlling the rate of suspension movement in response to bumps [2]. In this project a new suspension system based on magnetic power which can be used in automobile in future. The suspension system consists of magnets freely moving inside the cylinder with their same poles facing each other. Since the magnetic poles repel each other while moving closer, the up and down spring action is obtained.

Keywords: *Suspension System, Magnetic Power, Magnetic Poles.*

1. Introduction

At present shock absorber in a vehicle is done by a spring. Its size is larger and cost is high. We use magnetic shock absorber to overcome above. This improves the quality of ride and prevents wear and tear of the shock absorber. The construction of the magnetic suspension system is also a simpler process.
Functions of suspension systems are to prevent the road shocks from being transmitted to the vehicle frame, to preserve, stability of the vehicle in pitching or rolling, while in motion, to provide good road grip while driving, cornering and braking [1]. Requirements of suspension systems are minimize deflection consistent with required stability, wheel hop and tire wear. It should have low maintenance and operating cost.

1.1. Suspension system

The automobile chassis is mounted on the axles, not direct but through some form of springs. This is done to isolate the vehicles body from the road shocks which maybe in the form of bounce, pitch, roll or sway. These tendencies give rise on an uncomfortable ride and also cause additional stress in the automobile frame and body [1, 3]. All the parts which perform the function of isolating the automobile from the road shocks are collectively called a suspension system. It includes the springing device used and various mountings for the same.

1.2. Shock absorber

Shock absorber will not absorb road shocks efficiently if the suspension springs are highly rigid. They will be continuous vibrated for a long time if the springs are sufficiently flexible. To overcome this difficulty, a system having compromise between flexibility and stiffness should be used. Shock absorbers are used as a part of the suspension system. They provide more resistance to the motion of the spring and road wheel in order to damp out vibrations.

2. Magnetic shock absorber

In this project two magnets are placed in a piston. One magnet is fixed with piston. Another one is movable, which is connected with rod. With magnets are replaced by air.Our magnetic shock absorber works on the basic principle of magnet that "opposite poles attract each other and same poles repels each other". In this both magnets are facing same poles (both magnets are placed facing north and north or south and south). Both magnets are same pole. When the rod moves inside the piston movable magnet move towards the fixed magnet. Since both magnets are of same pole repulsion force is created between the magnets. So the movable magnet opposes the rod action and moves the rod up. The piston or cylinder is made up of non-magnetic material. The non-magnetic material will hold the magnet in both the sides. By using this type of shock absorbers the suspension will be more and the impact of vibration is very less compared with the spring loaded shock absorbers. Thus the magnetic shock absorber works.

When the weight of the vehicle increases or vehicle climbs irregular surface, the wheel goes upwards and shock absorber is compressed, at this time the piston moves downwards. The magnets are made closer to each other, due to the increase of weight, the piston rod containing magnet is made to compress to certain extent. At the same time, the stainless steel spring provided is freely inside the shock absorber. The additional support for magnetic shock absorber is provided by a helical coil spring, which was compressed at this stage. So the shocks and vibrations are prevented.

When the weight of the vehicle is decreased or it returns to its original position, the shock absorber gets expanded. In this position the piston moves from the bottom to top due to the magnetic flux power of the magnet. The stainless steel spring provided inside the shock absorber made the magnets inside the piston rod to return to its original position slowly. The coil spring return to its original position. Thus the magnetic shock absorber absorbs the shock and vibrations produced while running a vehicle on a irregular road surface.

2.1. Component details:

Magnet:

Outer diameter	= 52 mm
Inner diameter	= 24 mm
Thickness	= 11 mm

Stainless steel spring:

Outer diameter	= 30 mm
Inner diameter	= 25 mm
Thickness	= 3 mm
No of coil	= 14
Length	= 120 mm

PVC pipe 1:

Length	= 270 mm
Diameter	= 62 mm

PVC pipe 2:

Length	= 220 mm
Diameter	= 40 mm

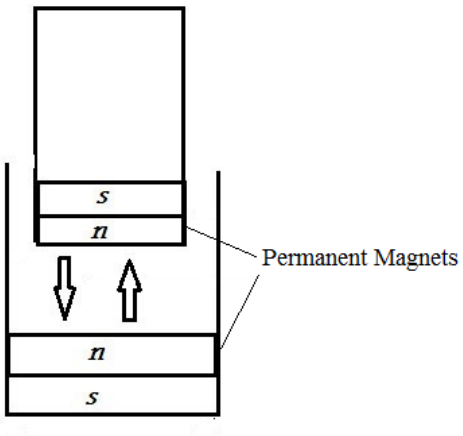

Fig. 1: Schematic View of Magnetic Shock Absorber

Fig. 2: Assembled View of Shock Absorber

Fig. 3: Exploded View of Magnetic Shock Absorber

Fig. 4: Skeleten View of Magnetic Shock Absorber

3. Conclusion

This project has provided us an excellent opportunity and experience to use our limited knowledge. We gained a lot of practical knowledge regarding planning, purchasing assembling and machining while doing our project work. We feel that the project work is a good solution to bridge the gate between institution and industries.

We are proud that we have completed the work with the limited time successfully. The MAGNETIC SHOCK ABSORBER is working well. We are also able to understand the difficulties in maintaining the tolerances and also quality. We have done to our ability and skill making maximum use of available facilities.

In conclusion remarks of our project work, let us add a few more lines about our impression on project work. Thus we have developed a "MAGNETIC SHOCK ABSORBER" which helps to know how to achieve low cost and minimize the size.

3.1. Merits

- Magnetic shock absorber will reduce the problems associated in the spring shock absorb due to friction and other factors.
- This will also reduce the maintenance cost as it does not need repairing.
- No leakage related issues like hydraulic shock absorber.
- Load carrying capacity of magnetic shock absorber is more.
- Improving no. of magnets that to make these magnetic shock absorbers even better, a chain of more than two magnets can be used to tolerate the shocks or weight and make the vehicle comfortable.
- Noiseless operation during functioning.
- Magnet can be re-magnetized to its originally strength.
- It improves the ride quality.

3.2. Demerit

- When both the magnets are in contact will reduce its magnetic strength.
- The magnetic power varies according to the earth magnetic field. So, it cannot be used in Polar Regions.

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