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Design and fabrication of electromagnetic braking system for four wheeler

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ABSTRACT

These brakes designed by controlling for equipment, automobiles and movers are suitable for AC&DC power supplies up to 12v to 220v and are suitable for wide range of drum sizes 10 to 380mm diameter these brakes are suitable with a rated torque range from 100kg-cm for the smallest brake upto 2000kg-cm for a 380mm dia at 50% coil rating, the coil remains in circuit for a maximum 5min out of every 10min. Since these brakes are closed position, the release of brake shoes is affected by energizing the electromagnetic coil which over comes the spring force and shoes are moved clear of drum by lever system so that the drum is free to rotate without any friction. When the power given to the electromagnetic coil the coil gets energized and in turns the plunger pulls down. The plunger in turn operates the arm of the brake and the brake opens. When specified brake drums both pin bush type and flexible geared type can be supplied along with the brakes.

Keywords: Brake, Automobiles, Electromagnet, Friction.

INTRODUCTION

A car has three braking system- the accelerator, the gears and brakes themselves. A control will be anticipated and unhurried act of slowing down or stopping will involve the use of all the three and with proper observation of the road and the traffic ahead, a driver can see the need for a reduction in speed long before he has to apply the brakes. The accelerator becomes a brake as soon as the foot is lifted it. The period of deceleration should ideally, always precede the use of the foot brake. Gear becomes a braking system while the vehicle is shifted to a lower gear.

When approaching a hazard the procedure has to be followed is first to decelerate and then application of foot brakes and finally changing to a lower gear. The third part of the braking system consisting of the brakes themselves is the most

important part and it is only with this part a vehicle can be brought to rest if needed. With the other to the accelerator and the gear the vehicle loses its momentum very slowly. The electric brakes a type of the braking system not very popular can be used commercially. Most magnetic braking relay on is an attractive force generated within a gap magnetic circuit which produces magnetic flux in the circuit. In this magnetic flux used to stop the motion of the vehicle.

LITERATURE SURVEY

Abhijeet N. Naikwadi et al, investigated the design and Analysis of Electromagnetic Disc Brake for Automobiles. The design of an electromagnetic disc brake requires a multi discipline approach. Its performance is an outcome of usage of concepts from various fields' is

mechanical, electrical, magnetic and material engineering. This paper describes a new type of electromagnetic disc brake for retarding the motion of a vehicle. In this study, of a comprehensive design procedure for electromagnetic disc brake is presented to ensure maximum efficiency along with effective braking. Varied magnetic materials are discussed in the terms of minimizing the cost while meeting electromagnetic performance characteristics. The analytical model has developed to optimize braking effort with combination of input current and voltage using sensors and voltage regulator, wear and tear of brakes, maintenance. Also, structural analysis of the nodal forces on the cross-structure and brake disc is also carried out to ensure reliability. The analytical results so obtained are within the acceptable range for braking. [1]

Akshyakumar S. Puttewar et al, investigated the enhancement of Braking System in Automobile Using Electromagnetic Braking. Electromagnetic braking system is a modern technology braking system used in the light motor & heavy motor vehicles like car, jeep, truck, busses etc. This system is the combination of electro-mechanical concepts. The frequency of the accidents is now-a-days increasing due to inefficient braking system. In this research work, with a view to enhance the braking system in automobile, a prototype model is fabricated and analyzed. It is apparent that the electromagnetic brake is an essential complement to the safe braking of heavy vehicles. The aim is to minimize the brake failure to avoid the road accidents. It also reduces the maintenance of braking system. The advantage of this system is that it can be used on any vehicle with minor modifications to the transmission and electrical systems. [2]

Krunal Prajapati et al, described a electromagnetic Braking System. An electromagnetic braking system is a new concept. Electromagnetic braking system are the new braking system it is used in LMV and HMV like jeep, buses, car, truck, train and motor bikes. The electromagnetic braking system are also called electro-mechanical brake. In the future they are highly produced accident to use this braking system to avoid the accidents. The braking systems are described in working of prototype model. An

electromagnetic braking system had used magnetic force while applied the force on brake, but the power is transmitted on manually to operate the brake. The rake disc is connected in to the shaft and electromagnetic kit are attach in a frame. The electric power is applied in the magnetic coil to develop the magnetic field in the armature coil and that attracts the electromagnet aluminum disc. They applied the brake and to stop the road wheel and vehicle. [3]

Oscar Rodrigues et al, developed a design and Fabrication of Eddy Current Braking System. Major of the braking systems had work on the principle of dissipation of kinetic energy to heat energy. This method has its own drawbacks and must be replaced with a more reliable braking system that is quick in response, doesn't heat up and is maintenance free. In the design, the eddy current braking system and optimization for various operational parameters has been done. These parameters have been previously iterated in cited projects and papers and also in the simulation models and are to be cross-checked with the experimental setup. [4]

Priya Bhosle et al, studied on the electromagnetic Braking System. In this paper we had developed the electromagnetic braking system. Braking System should to ensure the safety and comfort of the passenger, driver and other road user. The brake must strong enough to stop the vehicle during emergency within shortest distance. The conventional braking system is bulky and power of the ratio is low. Electromagnetic braking system is the high-tech braking system to find its use in small & heavy vehicle like car, jeep, truck, busses etc. This paper said about that we minimize the brake failure in order to avoid the accident. It also reduces the maintenance of braking system. The effectiveness of brake should remain constant. The proper cooling brake gives anti fade character and efficient operation of brake. Lubrication and maintenance must be done to operate brake safe, effective and progressive with minimum fatigue to driver. [5]

Rhythm Dhoot et al, investigated the design & Theoretical Study of Electromagnetic Braking System. The electromagnetic brake system used the magnetic force to engage the brake, but the power is required for braking are transmitted

manually. The disc has connected to a shaft and the electromagnet is mounted on the frame. When the electricity is applied to the coil of a magnetic field is developed across the armature because of the current flowing area has across the coil and causes the armature to get attracted towards the coil. As a result it developed the torque and eventually the vehicle comes to rest. The behavior of the two different materials to be used as brake disc which are aluminium & copper was studied. It aim to see the effects of increasing the current induced into electromagnet which produce drag force that will slow down the motion. A few graph has been presented to show the best material to be used as the brake disc for electromagnetic braking system using eddy current project. [6]

Sevvel P1 et al, developed the innovative Electro Magnetic Braking System. The Electromagnetic Brake system had used the magnetic force to engage the brake, but the power had required for braking is transmitted manually. The armature because of the current flowing area across the coil and causes the armature to get attracted towards the coil. In the result it had developed the torque and eventually the vehicle comes to rest. These brakes are incorporated in heavy vehicles as an auxiliary brake. [7]

ELECTROMAGNETIC BRAKING

Electromagnetic brakes operate electrically, but transmit torque mechanically [2]. This is why they used to be referred to as electro-mechanical brakes [2]. Over the years, electromagnetic brakes are referring to their actuation method. Since the brakes had started to become a popular over the sixty years ago, the variety of applications and brake designs have increase the dramatically, but

the basic operation remains the same. Single face electromagnetic brakes make up approximately 80% of all of the power applied the brake applications. Electromagnetic brakes have been used to supplement the retardation equipment in addition to the regular friction brakes on heavy vehicles. Various Other types of Electromagnetic Braking System are, Electromagnetic Braking System With Brake Pads, Eddy-Current Braking System [2].

A. D.C MOTOR

The DC generators and DC motor have the general construction.

B.MOTOR PRINCIPLE

An electric motor is a machine which converts the electrical energy to mechanical energy.

All D.C machines have five principal components viz (i) Field system (II) armature core (iii) armature winding (iv) Commutate (v) brushes.

WORKING OF ELECTROMAGNETIC BRAKING SYSTEM

The electromagnetic brake consists of a round disc plate in which small and it is made to rotate by means motor coupled to it. The centre shaft of the motor is connected to the shaft from the round disc plate. The copper coil is winded over the iron piece.

When, the motor start running, the disc plate will also rotate tin the same direction to the motor. While it reached the certain speed, the proximity sensor senses the speed of vehicle and send signal to the control unit. The control unit give supply to the coil then it will get magnetized, due to electromagnetic attraction the rotating disc will slower down and finally speed level is maintained.

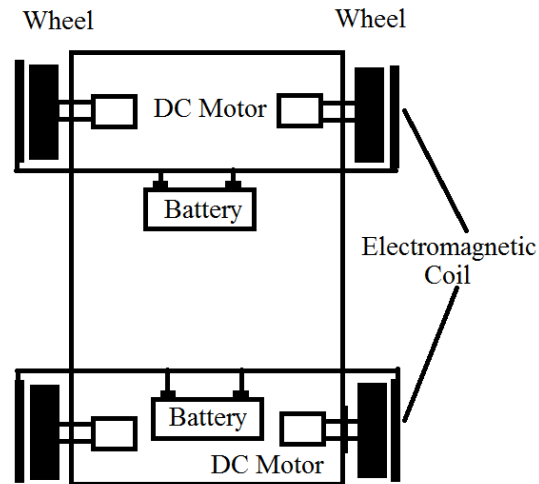


Fig. 1 Electromagnetic Braking system

Electromagnetic coil

An electromagnetic coil is formed in conductor solid copper wire is wound around a core or form to create an inductor or electromagnet. One or more loop of wire is usually referred to as a turns. Used in an electronic circuit, electrical connection terminals called taps are often connected to a coils. Coils are often coated with varnish and wrapped

with insulating tape to provide additional insulation and secured in place. A full coil covered with taps etc. is often called a windings. A transformer is an electromagnetic device has a primary winding & a secondary winding that transfer energy from one electrical circuit send to another magnetic coupling without moving parts.



Fig. 2 Electromagnetic Coil

The term tickler coil usually refers to a third coil placed in attract to a primary coil and secondary coil. A coil tap is a wiring specific found on electrical transformers, inductors and coil pickups, which all sets of wire coils. The coil tap is point in a wire coil where a conductive patch has been exposed. As own induction is larger for larger coil diameter the current in a thick wire tries to

continue flow on the inside. The ideal use of copper is completed by foils. This means spiral is a better alternative more then coils have the problem of interlayer capacitance, so when more then layers are needed the shape needs to be radically changed to a short coil with more layers so that the voltage between consecutive layers is lower.

Material-square steel



Fig. 3 Square steel

Steel square tubing combines strength and durability with affordability, and is easy to bend, form, cut. It is available in a broad range of size

and length, in welded or seamless styles, and in a variety of finishes and alloys.

MODELING

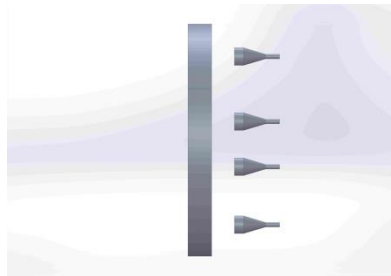


Fig. 4 Disc and Electromagnetic coil without engage (Brake do not apply)

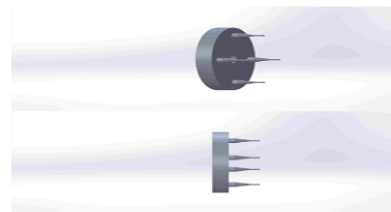


Fig. 5 Disk and Electromagnetic coil with engage (Brake apply)

OUTCOME OF THE PROJECT

We are using the electromagnetic brake in vehicle the life time of the braking system is increased and also no need to change the brake components and also oil leakages are not occurring in this braking system. Reduced working temperature due to minimum wear and tear.

CONCLUSION

The project carried out by us has made an impressing task in the field of automobile. It is very useful for driver while drive the vehicle without tension. This project have reduce the cost involved in the concern. Our project has been designed to perform the entire requirement task which has also been provided.

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