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# Design & Development of Electromagnetic Braking System- A Review

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**ABSTRACT:** This paper is on new idea that work on the principle of eddy current. Electromagnetic braking system is a new braking system that is used in LMV and HMV like car, buses, jeep. These brakes slow down a moving wheel by means of electromagnetic induction, in which resistance is created. The power required for braking is transmitted through current source. It aims to minimize the brake failure to avoid the road accidents. It also reduces the maintenance of braking system. The goal is to lessening the lifetime maintenance of several items. Making a few upgrades in the brakes can be utilized as a part of vehicles in future.

**KEYWORDS:** Eddy current, Electromagnet, Frictionless, Heat, Innovative.

## I. INTRODUCTION

In this project we will be dealing with the braking system. The braking system used are drum brake, disc brake, hydraulic brakes and also magnetic brakes. The braking system should provide retardation. Most commonly brake use friction to convert kinetic energy into heat to stop the vehicle. The new technology has been developed in automobiles called has electromagnetic braking system. The main principle of electromagnetic braking is that it uses eddy current to induced kinetic energy into heat energy. This type brake mainly working principle is one rotating metal disc in between two magnets to apply the brake to induced electric current in circuit to induced magnetic field in armature to attract the magnet to the rotating disc and stopped the rotation of wheel when applied brake.

### A. Principle of working

The principle of electromagnetism is used in electromagnetic braking system. This brake operates electrically, but transmit torque mechanically. When stepped on the brakes, the certain amount of current is passed through a round conductor then it produces magnetic field which is uniform all over the conductor.

The magnetic strength depends on the current flowing through conductor and number of turns wounded, more the number of turns higher the current flowing through conductor higher the magnetic field created.

### B. Electromagnetism

Electromagnetism is one of the four principal collaborations in nature. The other three are the solid cooperation, the frail association and attraction. Electromagnetism is the constrain that causes the communication between electrically charged particles; the zones in which this happens are called electromagnetic fields

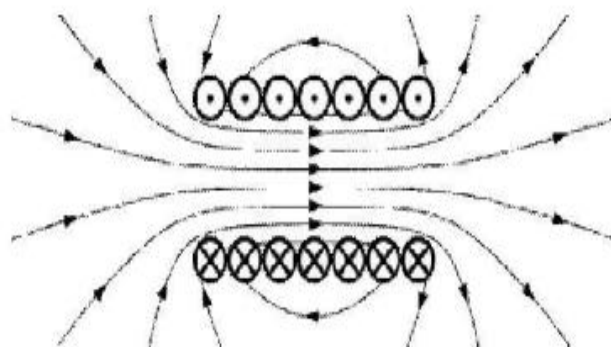


Fig. 1 Magnetic Field Line

### C. Magnetic Effect of Current

The expression "Magnetic effect of current" implies that "a current flowing in a wire delivers a Magnetic field around it". The Magnetic impact of current was found by Oersted in 1820. Oersted found that a wire conveying a current could avoid a Magnetic needle

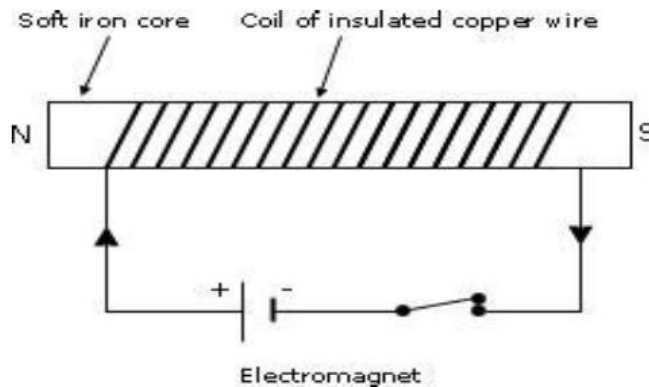


Fig. 2 Magnetic Field Lines

### D. Factors affecting strength of an Electromagnet

The nature of an electromagnet is:

- Directly corresponding to the quantity of turns in the loop.
- Directly proportional to the current flowing in the coil.
- Inversely proportional to the length of air gap between  $B_y$  and large,
- An electromagnet is frequently viewed as superior to a perpetual magnet since it can create exceptionally solid attractive fields and its quality can be controlled by fluctuating the quantity of turns in its curl or by changing the present moving through the loop.

## II. CONSTRUCTION AND DESIGN OF ELECTROMAGNETIC BRAKING SYSTEM

The main components used in this system are battery, metal disc, coil, alloy wheel, electromagnet, brake pedal.

### 1) Alloy wheel

This wheel is made from alloy of aluminium or magnesium. They are lighter in weight for same strength and provide better heat conduction and improve good appearance over steel wheels. Most alloy wheels are made from casting.

### 2) Battery

The battery is the main power source of the system. It is 12V that we are using. The current is sent through wire to the conductor that produces magnetic field.

### 3) Metal Disc

The metal disc is the important component been used. It is made up of cast iron plate of 2 mm thickness. The reason behind using cast iron is that it has good magnetic property.

### 4) Electromagnet

It is the device which gets magnetized when the current is feed into it. It is the metal wounded with coil fixed near to the rotating disc. Amount of current flows more the powerful is the brake.



5) Design

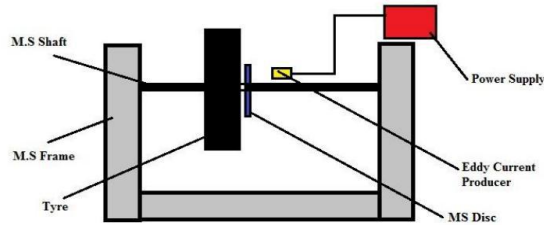


Fig -3: Magnetic Braking System

III. WORKING FLOW CHART

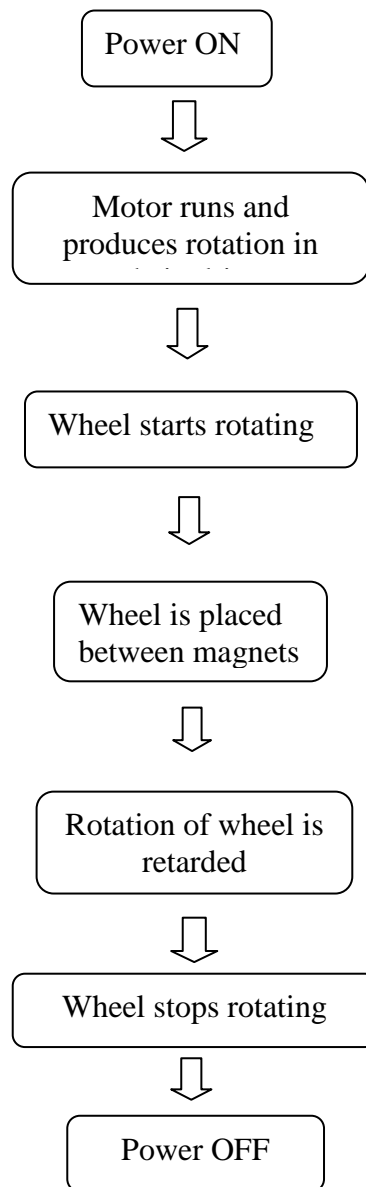


Chart 1: Flow chart on working mechanism

#### IV. ADVANTAGES AND DISADVANTAGES

##### A. Advantages

- Low maintenance.
- There is no need to use of costly brake oils.
- Potential hazard of tire deterioration and bursts due to friction is eliminated.
- Easy individual wheel braking control.
- Electromagnetic brake systems will reduce maintenance cost.
- The problem of brake fluid vaporization and freezing is eliminated.
- Can be utilized as a part of industry to stop or decelerate turning parts.

##### B. Disadvantages

- Depending on the battery power to energize the brake system drains down the battery much faster.
- A special spring mechanism need to provide for quick return of the brake shoe.
- It cannot use greases or oils.

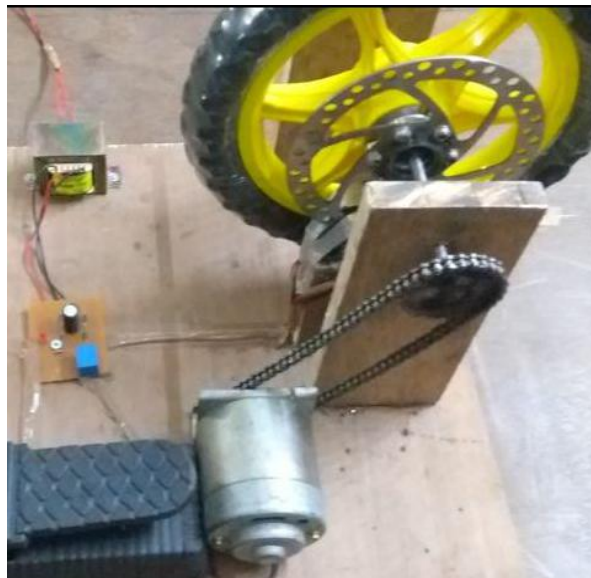


Fig -4: Braking System Arrangement

#### V. CONCLUSIONS

- Electromagnetic brakes have numerous preferences over frictional slowing mechanism. Bringing this technology to market would create extra revenue for automobile companies, and could increase client base.
- These electromagnetic brakes can be used as an auxiliary braking system along with the friction braking system to avoid overheating and brake failure. The utilization of abs can be dismissed by utilizing a smaller scale controlled electromagnetic framework.
- It reaffirms the company's commitment to safety and quality. Electromagnetic braking system represent the future of brake technology.

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