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DESIGN AND FABRICATION OF ELECTROMAGNETIC ACTUATING MECHANISM FOR DRUM BRAKE

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Abstract - *In this present work, an attempt is made to design and fabricate an electromagnetic actuating mechanism for a drum brake which will reduce the driver effort required during braking action. An electromagnetic actuating brake is an auxiliary braking system designed to function apart from the regular brake, it can be operated without disturbing the regular brake. An experimental setup is made and the breaking response is calculated.*

1. INTRODUCTION

In cars, hand brakes are provided which is used as parking brake and can be used as auxiliary braking system when the vehicle's primary braking system fails. Primary drum brake systems usually consist of a cable or a mechanical linkage connecting to brake mechanism which is actuated by the driver with a help of a lever using physical force.

Experimental setup of electromagnetic actuating mechanism for a drum brake is fabricated which will be used as a secondary brake system for emergency braking and parking. It makes use of electromagnetic coil to actuate the brake shoes in the conventional drum brake.

2. WORK DONE

2.1 METHODOLOGY

- Study of different type of braking system and its actuating mechanism.
- Design electromagnetic actuating mechanism for drum brake.
- Design of frame work using solid works.
- Selecting the electromagnetic coil and motor for wheel rotation.
- Fabrication and assembling of the dc motor, wheel, electromagnetic coil to the frame.
- Testing of the electromagnetic actuating mechanism for drum brake.

2.2 COMPONENTS OF BRAKING SYSTEM:

Experimental Setup Frame:

Frame to accommodate the various components required for the setup is designed and modeled using CAD package. CAD model of the frame is shown in fig. 1.
Mild steel square tubing is used to fabricate the frame.

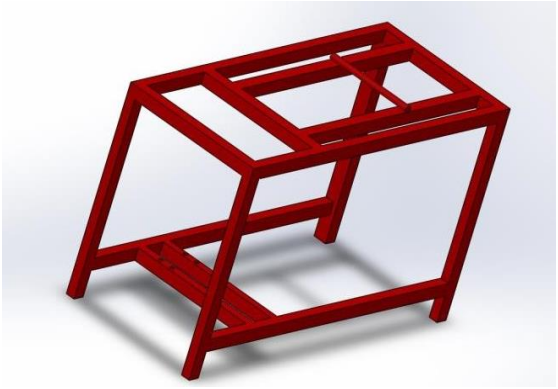

Fig. 1: CAD- Frame design

Electric Motor: AC motor is used to rotate the wheel in the experimental setup, to mimic the rotation of the wheel on a vehicle. A 220v, 1250 rpm, 0.5 H.P motor was used for the purpose.

Fig.2: Electric motor assembled to frame

Toggle Switch: While applying brake in a vehicle. The engine is decelerated, to mimic the same in the experimental setup; the motor speed has to be reduced before braking. Toggle switch is used to cut off the power supply to electric motor which reduces the wheel speed and at the same time supply power to electromagnetic coil.

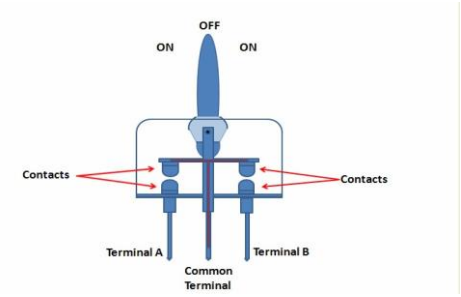

Fig.3: Toggle switch

Electromagnetic Coil:

An electromagnet is a type of magnet in which the magnetic field is produced by an electric current. The magnetic field disappears when the current is turned off.
Actuating wire connected to the brake is attached to the electromagnetic coil plunger, which is actuated when current runs through electromagnetic coil wire. Electromagnetic coil used is shown in fig. 4.
Specification of Electromagnetic coil:

Voltage = 24V
Current = 5A
Force = 19.62N
Displacement = 10MM

Fig.4: Electromagnetic Coil

Drum Brake Wheel:

A regular drum brake wheel of motor scooter is used for the experimental setup.

2.2 Working:

The system consists of dual actuating mechanism in which the fulcrum consists of two slots where one is connected to conventional actuating mechanism (hand brake or mechanical Operate) and other connected electromagnetic actuating braking system (electromagnetic coil) as shown in fig.5 . When driver operates the conventional braking system, Electromagnetic actuating braking is not functional. An electromagnetic actuating braking system uses magnetic force to apply the brake, the power required for actuating the electromagnetic coil is manually regulated. Brake shoe assembly of the drum brake is connected to the plunger of the electromagnetic coil with a wire, when electricity is applied to the electromagnetic coil a magnetic field is developed across the armature because of the current flowing across the coil and causes armature to get attracted towards the coil, which pulls the plunger, which in turn pulls the brake wire actuating the brake shoe mechanism. As the result, it develops a breaking force and eventually the vehicle comes to rest.

Fig. 5: Dual actuating system

2.4 Testing:

The regulator controls the speed of the wheel or sets the wheel rotation at a certain RPM. The tachometer is used to check the rpm of the wheel. Stopwatch is used to calculate the taken time to stop the wheel.

Table 1: Test Tabulation

Sl. No.	Wheel speed (RPM)	Stopping Time (Sec)
1	250	0.80
2	500	1.30
3	750	1.60
4	1000	2.30

3. CONCLUSION:

In this project, the advantage of using electromagnetic actuating braking system in automobile is studied; these brakes can be incorporated in heavy vehicles as an auxiliary brake. The electromagnetic actuating coil is controlling the current supplied to produce the magnetic flux. Making some improvements in the brake it can be used in automobiles in future.

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