

FABRICATION OF MODIFIED ELECTROMAGNETIC ACTUATING BRAKE

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Abstract - In this present work, an attempt is made to fabricate an electromagnetic actuating mechanism for a drum brake. Also rectifying the disadvantage of electromagnetic actuating brake by using thermoelectric generator. Which will provide the power during the battery drains down and also reduce the driver effort required during braking action. It can be operated as a regular brake by connect the brake wire at two different length to a brake drum. An experimental setup is made and the braking response is calculated for two actuating brake.

Keywords— *electromagnetic actuating, drum brake, thermoelectric generator, connect brake wire at two different length, used as regular brake.*

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 regular brake system for 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 pore software.
- Selecting the electromagnetic coil. Thermoelectric generator and IC engine for wheel rotation.
- Fabrication and assembling of the IC engine, thermoelectric generator, wheel, electromagnetic coil to the frame.
- Testing of the electromagnetic actuating mechanism for drum brake.

2.2 COMPONENTS OF BRAKING SYSTEM:

Experimental Setup Frame:

The setup is designed and modeled using PRO-E package. PRO-E model of the frame is shown in fig. 1. Mild steel rectangular solid is used to fabricate the frame.



Fig 1: frame using proe

IC ENGINE

IC engine is used to rotate the wheel in the experimental setup. the rotation of the wheel on a vehicle. 1250 rpm IC engine was used for the purpose.



Fig 2: IC engine with bick setup

Electromagnetic actuating 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 figure3.

Specification of Electromagnetic coil:

Voltage = 24V

Current = 5A

Force = 19.62N

Displacement = 10MM



Fig 3: electromagnetic actuating coil

Drum Brake Wheel:

A regular drum brake wheel of motor scooter is used for the experimental setup. In this setup two brake wire is connected at the different length to the drum brake.

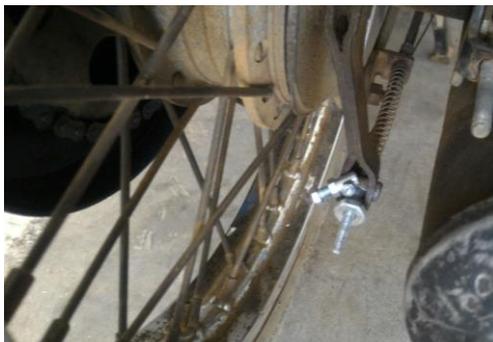


Fig 4: drum brake with brake drum setup

Thermoelectric generator:

It is used to provide power during battery drain down. It's produced power by seek back effort, it is fixed at the silencer then one side of thermoelectric generator and another side of thermoelectric generator with fin.



Fig 5: thermoelectric generator setup



Fig 6: thermoelectric generator module

2.3 DESIGN CALCULATION

Displacement distance of brake drum stroke length is=10mm

First actuating distance =3.35mm

Second actuating distance =5mm

Third actuating distance =10mm

Distance between the actuating and brake drum at rest=300mm

Length of Brake wire for first actuating is =normal distance + First actuating distance =300+7.53

Length of brake wire for first actuating is =307.53mm

Length of brake wire for second actuating is = normal Distance + second Actuating distance

Length of brake wire for second actuating is =305mm

Length of brake wire for third actuating is = normal distance + third Actuating distance

Length of brake wire for third actuating is = 300mm

2.4 Working:

During acceleration wheel is start rotated by IC engine. The power produced in the IC engine is transmitted through the chain drive. Depend upon the acceleration the engine speed is varied. During acceleration hand brake is normally at the resting position.

Here use two wire connection in the drum brake as shown in below diagram. Similarly two actuating coil is used. The two wire is connected in the three different magnetic actuating at two different distance. When press the hand brake slowly at that time first magnetic actuating is get Energies to press the drum brake for (1/2) distance of drum brake is press. When

leave the hand brake then that first magnetic actuating get de-energies to come back to original position. When press the hand brake pull and hold in a full brake distance then second magnetic actuating is get activated to pull the second brake wire connection to hold the brake drum at the full holed position. When leave the hand brake then second, first magnetic actuating coil is get de-energies to leave the brake in a normal resting position. This two magnetic actuating coil is used to make the electromagnetic actuating brake as the normal brake. Disadvantage like the electromagnetic actuating brake is used as the emergency brake is get rectified by using two actuating coil is connected to the different brake wire length.



Fig 7: front view



Fig 8: left side view



Fig 9: right side view

2.5 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 (First actuator)

Sl. No.	Wheel speed (RPM)	Stopping Time (sec)
1	250	2
2	500	2.45
3	750	3
4	1000	4.5

Table 2 test tabulation (Second actuator)

Sl. No.	Wheel speed (RPM)	Stopping Time (sec)
1	250	0.70
2	500	1.20
3	750	1.6
4	1000	2

ADVANTAGES

- There is no need to change brake oils regularly.
- There is no oil leakage.
- Electromagnetic brake systems will reduce maintenance cost.
- The problem of brake fluid vaporization and freezing is eliminated.
- The operating linkage is much simplified in this brake. Instead of complicated linkage as in mechanics brake. This brake requires only one cable for each drum.
- Also in this of brake master cylinder as well as wheel cylinder are not needed which reduces the initial cost of brake system.
- As there are no complicated component such as master cylinder, wheel cylinder the maintenance.
- Cost is also low.
- In this system the brake is operated by a regulating knob which reduces driver's effort. These brakes require less time for operation.

- Brake is supplied from battery this disadvantage is also rectified by using thermoelectric generator
- Operation is simple.

DISADVANTAGE

- Thermoelectric generator make the design complicated
- It required high power when compare to single electromagnetic actuating coil.
- Three actuating coil make high cost of the brake.

CONCLUSION

With the above study we can conclude that this new mechanism results in its can be used as a normal braking system. This electromagnetic actuating brake use both battery and thermoelectric generator for power so the disadvantage like battery get drain down faster is rectified. Still this brake system is not actual use in vehicle this is a future concept of the brake by using this techniques of brake it was save the effort of the human being at the maximum level which provide the comfort to the rider of the vehicle and also used as a normal brake.

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