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Electromagnetic Braking System in Two Wheeler Vehicles

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Abstract
The principle of braking in road vehicles involves the conversion of kinetic energy into heat. This high conversion therefore demands an appropriate rate of heat dissipation to maintain reasonable temperature. This project aims in designing a system which makes use of electromagnetism effect for applying the brake in two wheeler vehicle.

Keywords: ***Electromagnetic Effect***

Introduction

Electromagnetic damper (also called electro-mechanical damper or EM brakes) slow or stop motion using electromagnetic force to apply mechanical resistance). The original name was "electro-mechanical brake" but over the years the name changed to "Electromagnetic brakes", mention to their motive method. Since becoming popular in the mid-20th century especially in trains and, the variety of applications and brake designs has increased dramatically, but the basic operation remains the same.

Both electromagnetic dampers and eddy current brakes use electromagnetic force but electromagnetic damper ultimately depend on friction and eddy current dampers use magnetic force directly.

LITERATURE SURVEY

Technologies and resources

Need of Electromagnetic damper arises where the brake remains in engaged position for more time than in disengaged position, thus saving a lot of electricity power that is being used in the standard Electromagnetic Brake. Moreover machine designers are more awake to and desirous of building machines with a high level of safety. Machines that remain safe, even in a power failure can be a strong selling point in some industries.

In applications where the damper is engaged more than it is disengaged, an electrically released damper can be an energy saving device. It uses no energy to be engaged, only to be released.

Benefits of Electromagnetic damper

1. Spring Set Electromagnetic damper would increase the reliability while the number of parts and the weight, relative to a prior commercially available Electromagnetic damper.

2. The reductions of weight and the number of parts could also lead to a reduction of cost. So the effective production cost decreases.

3. As a fail-safe, power-off damper, the Brake is ideally suited for such load Stopping and holding applications as conveyors, machine tools (e.g. Lathes), Robotics, scooters and overhead doors.

4. The damper instantly stops the load when the electric power is removed or the motor fails. Hence preventing the further damage.

5. In industries where the damper is engaged more than it is disengaged, an electrically released damper can be an energy saving device. It uses no energy to be engaged, only to be released.

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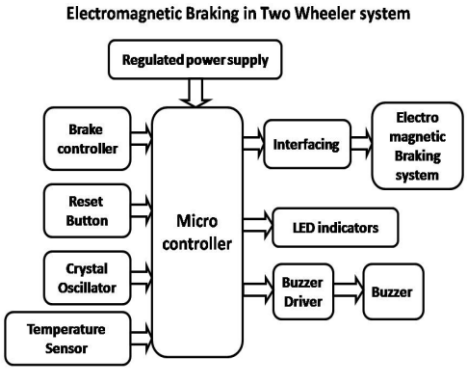
3. IMPLEMENTATION:



Block Diagram

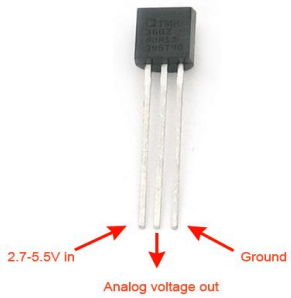
The main controlling device of the whole system is a Micro controller. Brake controller and Electromagnetic braking system are interfaced to Micro controller. The Micro controller continuously monitors the brake controller input and takes the decision of switching ON/OFF the electromagnetic braking system connected to vehicles wheel. The system also checks the engine heat using temperature sensor and when the vehicle engine gets over heating then the system automatically alerts using buzzer alarm. To perform the task, Microcontroller is loaded with an intelligent program written in embedded 'C' language.

4. RELATED WORK:

LM 35: (TEMPERATURE /FIRE SENSOR):

The LM35 sensors are precision integrated-circuit temperature sensors, whose output voltage is linearly proportional to the (Centigrade) temperature.

To detect the heat produced during fire occurrence we use temperature sensor.



LM 35 Temperature sensor

The Temperature Sensor LM35 sensors are precision integrated-circuit temperature sensors, whose output voltage is linearly proportional to the (Centigrade) temperature.

Brake controller

A damper controller is usually an OEM or after market installed device or module. It is mounted to the tow vehicle's driver's-side dashboard area, and engages a trailer's electrical braking system either time delayed, or in proportion to the tow vehicles damper engagement when slowing down or coming to a halt. A damper controller is not needed with a trailer surge damper system unless using modern electric over hydraulic devices. The trailer in this case usually has either electric friction dampers or electric hydraulic trailer brake actuators.

Most basic damper controllers will generally have a +/- gain adjustment. The tow vehicle operator would set the gain as high as possible but without the trailer brakes locking up after making a few test stops. The heavier the trailer, the higher the gain adjustment would be set and therefore the less chances of wheel lock-up.

A wide range of trailers will contain trailer damper (for example; larger boat trailers, horse trailers, covered utility trailer, enclosed trailer, travel trailer including small 10-foot and longer tent trailer and car carriers). Smaller trailer may not contain trailer brakes (for example; basic 4'x8' utility trailers). It is highly recommended that, if the total trailer weight is over a couple thousand pounds, the trailer has some sort of braking system, and the tow vehicle is equipped with a brake controller.

Types:

There is a different type of brake controllers that are currently or previously on the market.

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Air-actuated electric brake controller

This controller uses the air pressure of the brake system on a vehicle with pneumatic brakes to provide a current to control the electric brakes of a trailer.

Hydraulic over electric controller

This controller uses the hydraulic pressure of the brake system on a vehicle with hydraulic brakes to provide a current to control the electric brakes of a trailer. Some truck manufacturers offer this as an OEM option, like Ford with its Ford Tow Command.

Pedal-mounted pressure pad proportional controller

A different sensor is mounted on the brake pedal to connect to the controller

Proportional brake controller

Senses the deceleration of the vehicle through a pendulum or similar device to apply a suitable current for braking of the trailer

Surge brake

When the tow vehicle slow down the trailer pushes against it an actuator applies force to its master cylinder and the hydraulic pressure is transferred to the brake

Time-delayed brake controller

Apply brake current with a ramp-up over time to a certain level set by the driver.

Electromagnetic braking system

Electromagnetic damper (also called electro-mechanical brakes or EM brakes) slow or stop motion using electromagnetic force to apply mechanical resistance. The original name was "electromechanical brakes" but over the years the name changed to "electromagnetic brakes", referring to their actuation method. Since becoming popular in the mid-20th century Braking Motor especially in trains and the variety of applications and brake design has increased dramatically, but the basic operation remains the same.

Both electromagnetic brake and eddy current brake use electromagnetic force but electromagnetic brakes ultimately depend on friction and eddy current brakes use magnetic force directly.

Theory and Main Concept

The idea of using an electromagnet as a brake has been mainly used in large vehicles and machines. There are several main types, most of which relay on using magnetism to move a mechanical part or parts.

Motor with electromagnet

The mechanical part can be used to produce friction with a moving part, thereby reduce speed. However, this process is rather inefficient. Electromagnets can also be used to make friction less brakes which is what we are interested in. Further, we are interested in reducing the rotation of a bicycle wheel and hence, angular velocity. Thus, the desire brake involves dissipating rotational energy. In theory, if a magnetic field is induced in a rotating disc, it produces eddy current within the disc. These currents will then oppose the rotation of the disc by dissipating kinetic energy in the form of heat (causing the temperature of the disc to increase).

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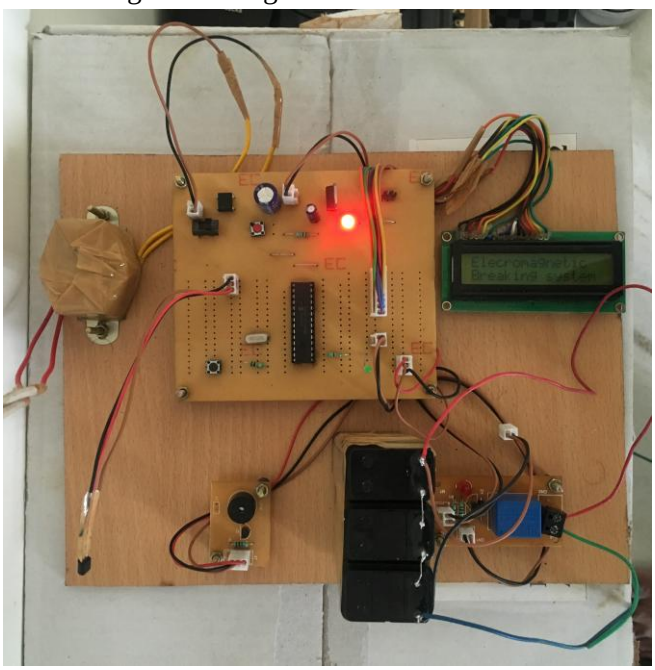
Prototype

To me, this concept did not seem intuitive, so decided to test it. The magnetic field usually generated by an electromagnet. Hence, I was interested to know if an electromagnet could really affect the rotation of the wheel. Also, I want to determine whether increasing the voltage running through the electromagnet would cause a larger retarding force.



Microcontroller board

4. ACKNOWLEDGEMENT

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