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Fabrication of Electromagnetic Braking System

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Abstract: The main objective of this project is for security system. If vehicle moves very near to the opposite Vehicle, then it applies brake automatically. It is used for avoiding accident over by racing in highways and parking or busy traffic areas through Electronic braking.
Electronic braking system works faster when compared to other devices. So we can achieve the high efficient operation by programming the microcontroller.
They are often applied to the rear wheels since most of the stopping happens in the disk. Front of the vehicle and therefore the heat generated in the rear is significantly less. Drum brakes are also occasionally fitted as the parking (and emergency) brake even when the rear wheels use disk brakes as the main brakes. In this situation, a small drum is usually fitted within or as part of the brake.

Keywords: Security System, Electromagnetic Braking System, Brake, Microcontroller

I. INTRODUCTION

A brake is a device for slowing or stopping the motion of a machine or vehicle, or alternatively a device to restrain it from starting to move again. The kinetic energy lost by the moving part is usually translated to heat by friction. Alternatively, in regenerative braking, much of the energy is recovered and stored for later use.
As the standard of living people increased together with the human population it resulted in a drastic increase in the number of moving vehicles on the road. This means that the probability of the number of accidents also increase which resulted in heightened need of safety systems in automobiles. Keeping this fact in mind we have developed a unique way of preventing accidents, by sensing the vehicle which is moving in front measure the distance between the two and if the distance is close enough for a contact, the sensor will immediately send signal to the ECU which actuates the electro-magnetic to apply brakes. Thereby preventing a possible accident.

II. LITERATURE REVIEW

Motor:

An electric motor uses electrical energy to produce mechanical energy. The reverse process which of using mechanical energy to produce electrical energy is accomplished by a generator or dynamo. Traction motors used on locomotives and some electric and hybrid automobiles often performs both tasks if the vehicle is equipped with dynamic brakes. Electric motors are found in household appliances such as fans, refrigerators, washing machines, pool pumps, floor vacuums, and fan-forced ovens. They are also found in many other devices such as computer equipment, in its disk drives, printers, and fans; and in some sound and video playing and recording equipment as DVD/CD players and recorders, tape players and recorders, and record players. Electric motors are also found in several kinds of toys such as some kinds of vehicles and robotic toys.

The principle of conversion of electrical energy into mechanical energy by electromagnetic means was demonstrated by the British scientist Michael Faraday in 1821 and consisted of a free-hanging wire dipping into a pool of mercury.
A permanent magnet was placed in the middle of the pool of mercury. When a current was passed through the wire, the wire rotated around the magnet, showing that the current gave rise to a circular magnetic field around the wire. This motor is often demonstrated in school physics classes, but brine (salt water) is sometimes used in place of the toxic mercury. This is the simplest form of a class of electric motors called homopolar motors. A later refinement is the Barlow's Wheel. These were demonstration devices, unsuited to practical applications due to limited power.
The first real electric motor, using electromagnets for both stationary and rotating parts, was demonstrated by Ányos Jedlik in 1828 Hungary. He built an electric-motor propelled vehicle in 1828.
The first English commutator-type direct-current electric motor capable of a practical application was invented by the British scientist William Sturgeon in 1832. Following Sturgeon's work, a commutator-type direct-current electric motor made with the intention of commercial use was built by the American Thomas Davenport and patented in 1837. Although several of these motors were built and used to operate equipment such as a printing press, due to the high cost

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of primary battery power, the motors were commercially unsuccessful and Davenport went bankrupt. Several inventors followed Sturgeon in the development of DC motors but all encountered the same cost issues with primary battery power. No electricity distribution had been developed at the time. Like Sturgeon's motor, there was no practical commercial market for these motors.

The modern DC motor was invented by accident in 1873, when Zénobe Gramme connected the dynamo he had invented to a second similar unit, driving it as a motor. The Gramme machine was the first electric motor that was successful in the industry.

In 1888 Nikola Tesla invented the first practicable AC motor and with it the polyphase power transmission system. Tesla continued his work on the AC motor in the years to follow at the Westinghouse Company.

Brake and Braking Distance:

Braking distance refers to the distance a vehicle will travel from the point where its brakes are fully applied to when it comes to a complete stop. It is affected by the original speed of the vehicle, the type of brake system in use and the coefficient of friction between its wheels and the road surface. The modern automobile drum brake was invented in 1902 by Louis Renault, though a less-sophisticated drum brake had been used by Maybach a year earlier. In the first drum brakes, the shoes were mechanically operated with levers and rods or cables. From the mid-1930s the shoes were operated with oil pressure in a small wheel cylinder and pistons (as in the picture), though some vehicles continued with purely-mechanical systems for decades. Some designs have two-wheel cylinders.

The shoes in drum brakes are subject to wear and the brakes needed to be adjusted regularly until the introduction of self-adjusting drum brakes in the 1950s. In the 1960s and 1970s brake drums on the front wheels of cars were gradually replaced with disc brakes and now practically all cars use disc brakes on the front wheels, with many offering disc brakes on all wheels. However, drum brakes are still often used for handbrakes as it has proven very difficult to design a disc brake suitable for holding a car when it is not in use. Moreover, it is very easy to fit a drum handbrake inside a disc brake so that one unit serves as both service brake and handbrake.

Early type brake shoes contained asbestos. When working on brake systems of older cars, care must be taken not to inhale any dust present in the brake assembly. The United States Federal Government began to regulate asbestos production, and brake manufacturers had to switch to non-asbestos linings. Owners initially complained of poor braking with the replacements; however, technology eventually advanced to compensate. A majority of daily-driven older vehicles have been fitted with asbestos-free linings. Many other countries also limit the use of asbestos in brakes.

Self-applying characteristic:

Drum brakes have a natural "self-applying" characteristic. The rotation of the drum can drag either or both of the shoes into the friction surface, causing the brakes to bite harder, which increases the force holding them together. This increases the stopping power without any additional effort being expended by the driver, but it does make it harder for the driver to modulate the brakes sensitivity. Disc brakes exhibit no self-applying effect because the hydraulic pressure acting on the pads is perpendicular to the direction of rotation of the disc. Disc brake systems usually have servo assistance ("Brake Booster") to lessen the driver's pedal effort, but some disc braked cars (notably race cars) do not need to use servos.

Drum brake designs:

Drum brakes are typically described as either leading/trailing or twin leading. Rear drum brakes are typically of a leading/trailing design, the shoes being moved by a single double-acting hydraulic cylinder and hinged at the same point. In this design, one of the brake shoes will always experience the self-applying effect, irrespective of whether the vehicle is moving forwards or backwards. This is particularly useful on the rear brakes, where the footbrake must exert enough force to stop the vehicle from travelling backwards and hold it on a slope. Provided the contact area of the brake shoes is large enough, which isn't always the case, the self-applying effect can securely hold a vehicle when the weight is transferred to the rear brakes due of the incline of a slope or the reverse direction of motion. Front drum brakes may be of either design in practice, but the twin leading design is more effective. This design uses two actuating cylinders arranged so that both shoes will utilize the self-applying characteristic when the vehicle is moving forwards. The brake shoes pivot at opposite points to each other. This gives the maximum possible braking when moving forwards, but is not so effective when the vehicle is travelling in reverse.

The optimum arrangement of twin leading front brakes with leading/trailing brakes on the rear allows for more braking force to be deployed at the front of the vehicle when it is moving forwards, with less at the rear. This helps to prevent the rear wheels locking up, but still provides adequate braking at the rear when it is needed.

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Advantages:

- Drum brakes are still used in some modern cars because of some engineering and cost advantages. Drum brakes allow simple incorporation of a parking brake. They are often applied to the rear wheels since most of the stopping happens in the front of the vehicle and therefore the heat generated in the rear is significantly less.
- Drum brakes are also occasionally fitted as the parking (and emergency) brake even when the rear wheels use disk brakes as the main brakes. In this situation, a small drum is usually fitted within or as part of the brake disk.
- In hybrid vehicle applications, wear on braking systems is greatly reduced by energy recovering motor-generators (see regenerative braking), so some hybrid vehicles such as the Toyota Prius use drum brakes.

Disadvantages:

- Drum brakes are designed to convert kinetic energy into heat energy via the process of friction. This heat is intended to be further transferred to atmosphere, but can just as easily transfer into other components of the braking system.
- Brake drums have to be substantial pieces of steelor cast-iron to cope with the forces that are involved which can retain a lot of heat. Heat transfer to atmosphere can be aided by incorporating fins into the design of the drum (see heat sink). However, excessive heating can occur due to heavy or repeated braking which can cause the drum to distort, leading to vibration under braking.

The other consequence of overheating is brake fade. This is due to one of several processes or more usually an accumulation of all of them.

1. When the drums are heated by hard braking, the diameter of the drum increases slightly due to thermal expansion of the material, this means the brakes shoes have to move further and the brake pedal has to be depressed more.
2. The properties of the friction material can change if heated, creating less friction. This is usually only temporary and the material regains its efficiency when cooled, but if the surface overheats to the point where it becomes glazed the reduction in braking efficiency is more permanent. Surface glazing can be worn away with further use of the brakes, but that takes time.
3. Excessive heating of the brake drums can cause the brake fluid to vapourise, which reduces the hydraulic pressure being applied to the brake shoes. Therefore, less retardation is achieved for a given amount of pressure on the pedal. The effect is worsened by poor maintenance. If the brake fluid is old and has absorbed moisture it thus has a lower boiling point and brake fade occurs sooner.

Brake fade is not always due to the effects of overheating. If water gets between the friction surfaces and the drum, it acts as a lubricant and reduces braking efficiency. The water tends to stay there until it is heated sufficiently to vapourise, at which point braking efficiency is fully restored.

Disc brakes are not immune to any of these processes, but they deal with heat and water more effectively than drums.

Re-arc'ing:

Before 1984, it was common to re-arc brake shoes to match the arc within brake drums. This practice, however, was controversial as it removed friction material from the brakes and caused a reduction in the life of the shoes as well as created hazardous asbestos dust. Current design theory is to use shoes for the proper diameter drum, and to simply replace the brake drum when necessary, rather than perform the re-arcing procedure.

Adjustment:

Early drum brakes (before about 1955) required periodic adjustment to compensate for drum and shoe wear. If not done sufficiently often long brake pedal travel ("low pedal") resulted. Low pedal can be a severe hazard when combined with brake fade as the brakes can become ineffective when the pedal bottoms out.

Self-adjusting brakes may use a mechanism that engages only when the vehicle is being stopped from reverse motion. This is a traditional method suitable for use where all wheels use drum brakes (most vehicles now use disc brakes on the front wheels). By operating only in reverse it is less likely that the brakes will be adjusted while hot (when the drums are expanded), which could cause dragging brakes that would accelerate wear and increase fuel consumption.

Self-adjusting brakes may also operate by a ratchet mechanism engaged as the hand brake is applied, a means suitable for use where only rear drum brakes are used. If the travel of the parking brake actuator lever exceeds a certain amount, the ratchet turns an adjuster screw that moves the brake shoes toward the drum.

The manual adjustment knob is usually at the bottom of the drum and is adjusted via a hole on the opposite side of the wheel. This requires getting underneath the car and moving the click wheel with a flathead screwdriver. It is important and tedious to adjust each wheel evenly so as to not have the car pull to one side during heavy braking, especially if on the front wheels. Either give each one the same amount of clicks and then perform a road test, or raise each wheel off the ground and spin it by hand measuring how much force it takes and feeling whether or not the shoes are dragging.

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III. DESIGN OF EQUIPMENT AND DRAWING

Electromagnetic Brake Components and Its Specification:

The electromagnetic braking system machine consists of the following components to full fill the requirements of complete operation of the machine.

1. Dc motor
2. Brake pad
3. Wheel
4. DC gun

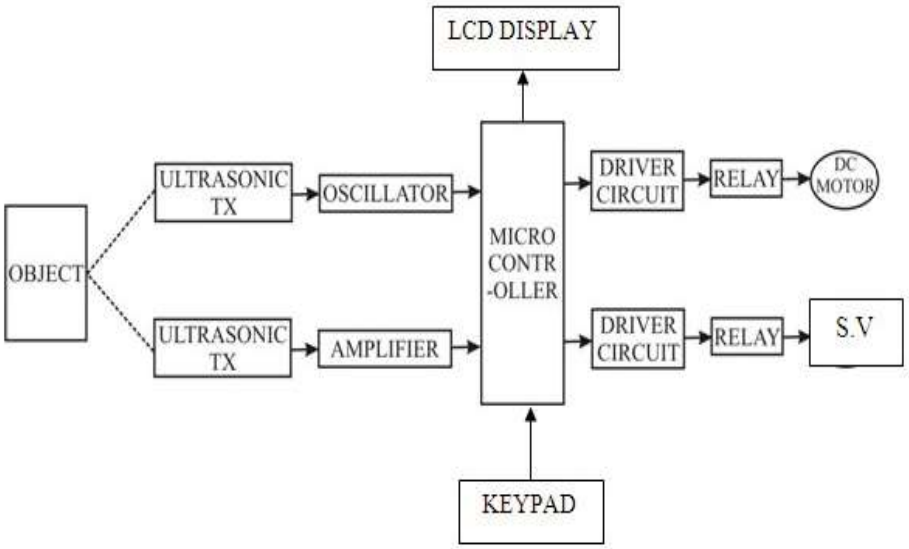

Fig 1: Block Diagram of Electromagnetic Braking System

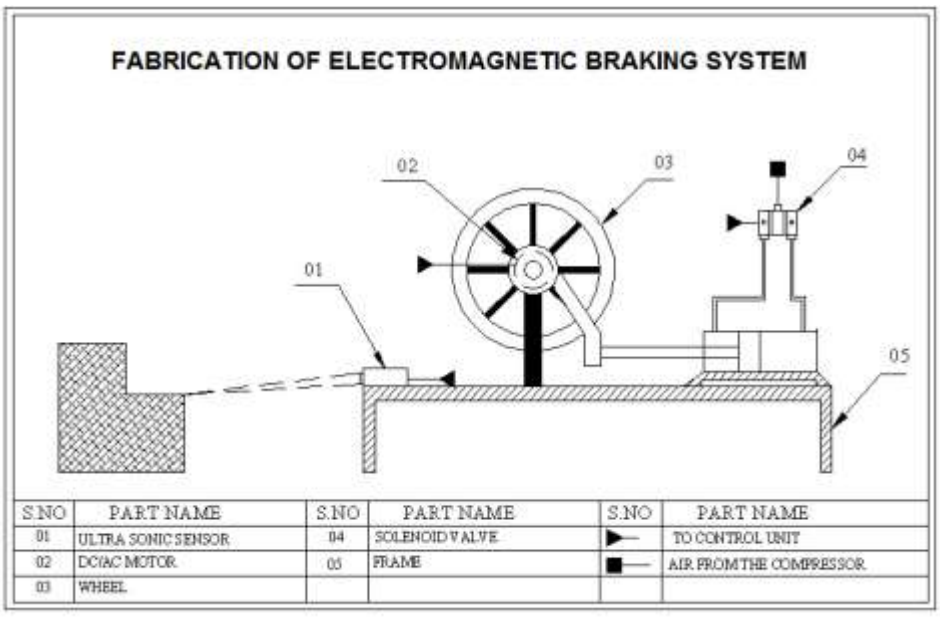

Fig 2: Fabrication of Electromagnetic Braking System

IV. WORKING PRINCIPLE

In this project we are using ultrasonic sensor for detecting the objects or vehicles in front of our vehicle. It also measures the distance of the vehicle in front of ours. It consists of ultrasonic transmitter and receiver. The transmitter

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always transmitting the waves, the receiver receives the reflected waves and converts it in to digital pulse. The ultrasonic sensor sends the output to the controller. The pulse time will vary depends on the closeness between the sensor and the object. Using this pulse timing the controller measures the distance. When the distance becomes low, the controller will switch on the relay for applying braking. Before applying braking, the controller will display the alert in the LCD display. Here the electromagnetic braking mechanism is used for applying brake in the wheel.

V. CONCLUSION

The project carried out by us will make an impressing mark in the field of automobile. It is very usefully for drivers to drive the vehicle without tension. This project has also reduced the cost involved in the concern. The project has been designed to perform the required task taking minimum time.

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