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Design and Fabrication of Automatic Braking System Using Obstacle Detecting Sensor : A Review

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ABSTRACT

Maximum accidents in vehicles happen because of failure of braking systems. The manual technique of applying brakes is always hazardous as it leads to accidents. Oblivion of the driver, letdown in the connections of braking systems, road situations, the uncontrollable speed of the vehicle and manual process of braking systems are the causes of accidents. It is essential to control brakes automatically through electronics devices to reduce the accident problems. In this research paper we recommend an operational methodology for automatic control of braking method to avoid accidents. This project describes about an electromagnetic braking system which is controlled by sensor and microcontroller. The project is made using sensor and it is controlled by microcontroller. Sensor fixed in front portion of the model. The sensor gets the data from surrounding area through fixed sensors on the model. The sensor sense the obstacle and actuate the electromagnetic brake.

Keywords: Automatic Braking System, Electromagnetic Brakes , Sensors.

I. INTRODUCTION

The most reliable braking system available today are the disc braking system .Electromagnetic Braking System is high-tech braking system use in small & heavy vehicle like car, jeep, truck, busses etc. Electro-magnet braking system is a combination of electro-mechanical Concepts. In this project we minimize the brake fail to avoid the accident. It also reduces the maintenance of our braking system. It is our new idea & new concept those we present in model form.

In driving cars , brake pipe leakages may occurs major accidents because all the liners are not in condition to work properly due to their low oil pressure to expanding the liners. But in our electro-magnetic brake system we performing individual braking system .This method is very protective method for avoiding accident .In case of any individual brake fail the whole braking system does not fail which is not possible in case of oil braking and air braking system. This is biggest advancement in our project so we implement it in prototype model and explaining our project idea and concept with the help of model.

The major components which are going to be use in our project are disc brake plate, disc liner, braking coil, tension spring, battery(minimum 12 volt), SCR, transformer, led, relay, diode, bridge rectifier, transistor, capacitor .

The objective of the invention is to provide efficient and fail proof reliable braking. In November 1988 layh invented electro magnetic braking system. In our project we are using SCR which was not in Layh's system as additional modified component. Due to SCR we are able to control the braking force in a proportionate manner.

II. METHODS AND MATERIAL

The electromagnetic braking work on the electromagnetic principle. The principle of braking in road vehicle involves the conversion of kinetic energy into thermal energy (heat).Electromagnetic brake work in a relatively cool condition and satisfies all the energy requirement of braking at high speed, completely withought the use of friction.

At the initial condition the supply from battery come to SCR but not reaching to electromagnet due to SCR properties. Which in off condition unless and until it recames the gate supply, when we will press the brake pedal or lever, it move the plunger in potentiometer. Which causes the resistance in the circuit are decreases. Which result in get current flow due to the characteristics of SCR as the gate current increases the output SCR also increases in the directly proportional manner. This implies that more press the pedal the more current will flow through the circuit. This is received by electromagnetic field developed. Which causes the iron plate to get attract to each other. Due to SCR, the suddenly braking is prevented, so gradually braking is possible.

As the current is circulated through the coil. It converts the soft iron core in to an electromagnet. The plate attached to the electromagnet also get magnetized which causes the iron plate to attract towards each other as the magnetic force exceed the spring force. The movable plate starts moving toward the fixed plate. Due to this moment liners get in contact with the disc. As the liner and disc comes in contact with each other the frictional force is developed which result in braking action to take place.

In electro-magnetic braking system we used silicon control rectifier (SCR) TYN 612 of (2.5 Amp) in our project we fired the gate pulse of SCR and gives the output of SCR to electro-magnet for performing the brake on disc. This SCR provides high current to our electro-magnetic attract the iron brake pad onward .this method rotating motion of wheels. In our project we design electro-magnetic coil attach with liner system.

In this braking system, individual braking is used which minimize the failure of braking system. This method is very protective method for avoiding accident. In case of brake fail, other brake works but in oil brake system & air brake system it is not possible. This is biggest advancement in this electromagnetic brake system. so we implement this idea in prototype model and explaining our project ideas and concepts

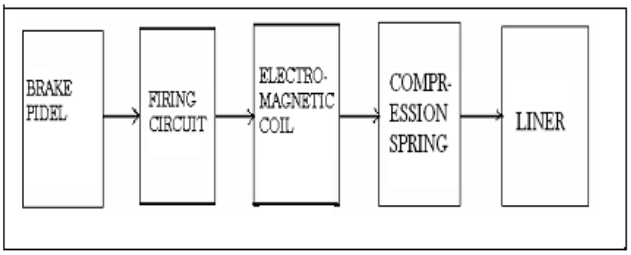

Figure 1

COMPONENTS USED IN ELECTRO- MAGNETIC BRAKE

- **DISC**

The disc brake is a device for slowing or stopping the revolution of the wheel. A brake disc typically made of cast iron or ceramic composites(including carbon, kevlar and silica), is connected to the wheel . To stop the wheel, friction material in the form of brake pads is force mathematically, hydraulically, pneumatically, or electromagnetically against both side of the disc. Friction causes the disc and attach wheel to slow or stop.

Various higher performance brakes have holes drilled through them. This is recognized as cross-drilling and was initially done in the 1960s on racing cars. Brake pads will outgas and under use may create boundary layer of gas between the pad and the disc hurting braking performance. Cross-drilling was created to

deliver the gas someplace to escape. Although modern brake pads seldom suffer from out gassing problems, water residue may build up after a vehicle passes through a puddle and impede braking performance. For this reason, and for heat intemperance purposes, cross drilling is still used on some braking components, but is not favoured for racing or other hard use as the holes are a cause of stress cracks under severe situations.

Discs may also be positioned, where narrow channels are machined into the disc to aid in eliminating dust and gas. Slotting is the preferred method in most racing environments to eliminate gas, water, and de-glaze brake pads. Some discs are together drilled and slotted. Slotted discs are generally not used on standard vehicles because they rapidly wear down brake pads; however, this elimination of material is helpful to race vehicles meanwhile it keeps the pads soft and evades vitrification of their surfaces.

On the road, drilled or slotted discs still have a positive effect in damp conditions because the holes or slots avoid a film of water building up among the disc and the pads. Cross drilled discs will ultimately crack at the holes due to metallic fatigue. Cross-drilled brakes that are factory-made poorly or subjected to high stresses will crack ample faster and further severely.

New technology now permits minor brake systems to be fitted to bicycles, mopeds and nowadays even mountain bikes. The market for mountain bike disc brakes is very huge and has enormous variety, ranging from simple, mechanical (cable) systems, to highly costly and too powerful, and 6-pot hydraulic disc systems, usually used on downhill racing bikes. Improved technology has seen the formation of the first vented discs for usage on mountain bikes. The expelled discs are similar to that seen on cars and have been introduced to help stop heat fade on fast alpine descents. The first use of disc brakes on mountain bikes utilized mechanical braking systems which did not offer solid braking power, which is why disc brakes were not popular among mountain bikers until hydraulic disc brakes were presented. Most mountain bike brake rotors are made from stainless steel and are very thin. Some use a two-piece floating rotor style and some lightweight rotors are made from aluminium.

Disc brake discs are generally manufactured out of a material entitled grey iron. The SAE keeps a specification for the manufacture of grey iron for various applications. For normal car and light truck applications, the SAE specification is J431 G3000 (superseded to G10). This specification orders the accurate range of hardness, chemical configuration, tensile strength, and other properties necessary for the future use.

Discs are usually broken in one of four methods: warping, scarring, cracking, or excessive rusting. Service shops will sometimes respond to any disc problem by exchanging out the discs totally, this is done mainly where the cost of a new disc may actually be lower than the cost of labour to reappear the original disc. Mechanically this is pointless if the discs have not yet got manufacturers minimum thickness and it is risky to use them, or vane rusting is not simple (ventilated discs only). All leading vehicle manufacturers indorse brake disc skimming (US: rotor turning) as a solution for lateral run-out, vibration issues and brake noises. The milling process is performed in a brake lathe, which eliminates a very thin layer off the disc surface to clean off minor damage and restore uniform thickness. Milling the disc as necessary will make the most of the mileage out of the present discs on the vehicle.

1) Warping
2) Scarring
3) Cracking
4) Rusting

- **BRAKE PAD**

The brake pads are intended for high friction with brake pad material rooted in the disc in the process of bedding while wearing consistently. Though it is usually thought that the pad material contacts the metal of the disc to stop the car, the pads work with a very thin layer of their individual material and produce a semi-liquid friction borderline that creates the genuine braking force. Of course, dependent on the properties of the material, disc wear amounts may diverge. The properties that control material wear include trade-offs between performance and permanency.

The brake pads must usually be swapped regularly (depending on pad material), and most are well-found with a method of warning the driver when this needs to take place. Approximately thin piece of soft metal that causes the brakes to squeal when the pads are too thin, while others have a soft metal tab rooted in the pad material that closes an electric circuit and lights a warning light when the brake pad gets thin. Further expensive cars may use an electronic sensor.

While almost all road-going vehicles have only two brake pads per calliper, racing callipers consume up to six pads, with varying frictional properties in a staggered pattern for optimum performance.

Initial brake pads (and linings) contained asbestos. When working on an older car's brakes, care must be taken not to inhale any dust existing on the calliper (or drum). While newer pads can be made of exotic materials alike ceramics, Kevlar and other plastics, care to circumvent inhalation of brake dust produced during operation should still be practiced no matter what materials are employed.

- MAGNETIC COIL

An electromagnetic coil (or simply a "coil") is made when a conductor (usually a solid copper wire) is coiled around a core or form to generate an inductor or electromagnet. One loop of wire is usually referred to as a turn, and a coil consists of one or more turns. For use in an electronic circuit, electrical connection terminals called taps are often connected to a coil. Coils are frequently coated with varnish and/or wrapped with insulating tape to provide additional insulation and protected them in place. A completed coil assembly with taps etc. is often called a winding. A transformer is an electromagnetic device that has a primary winding and a secondary winding that transfer's energy from one electrical circuit to another by magnetic coupling without moving parts. The term tickler coil generally refers to a third coil placed in relation to a primary coil and secondary coil A coil tap is a wiring feature establish on some electrical transformers, inductors and coil pickups, all of which are sets of wire coils. The coil tap(s) are points in a wire coil where a conductive patch has been visible (usually on a loop of wire that extends out of the main coil body). As self initiation is larger for larger coil diameter the current in a thick wire tries to flow on the inside. The ideal use of copper is achieved by foils. Sometimes this means that a spiral is a better alternative. Multilayer coils have the difficult of interlayer capacitance, so when multiple coatings are needed the shape needs to be radically changed to a short coil with many layers so that the voltage among consecutive layers is smaller (making them more spirals like).

- SOFT IRON CORE

The magnetic core is a key factor in electrical and electromechanical devices such as electromagnets, transformers, and inductors. A magnetic core is a magnetic material with a high magnetic absorptivity, but are usually chosen to be magnetically 'soft', that is, they are made of materials that do not sustain a significant magnetic field when outside field is detached, unlike 'hard' magnetic materials.

The use of a magnetic core can extremely concentrate the strength and rise the effect of magnetic fields produced by electric currents and permanent magnets. The properties of device will rest on crucially on the following factors:

a. The geometry of the magnetic core.
b. The amount of air gap in the magnetic circuit.
c. The properties of the core material
d. The operating temperature of the core.

III. RESULTS AND DISCUSSION

The general braking system used in today's vehicle of pneumatic or hydraulic. But in hydraulic and pneumatic there is chance of failure by leakage in tube or pipe carrying air or hydraulic fluid. These cause an thousand of accident on roads every year. This causing dead and economical loss .thus we decide to overcome this problem by using electromagnetic principle. Replace hydraulic or pneumatic system by electro magnetic system. In electromagnetic braking system there is less failure as no chance of leakage.

In this project we decide to use general disc brake. Which operate by electromagnetic force to run this system, we use the system consist of electromagnetic coil aligned with the disc brake arrangement circuit control the current flow to the electromagnetic which is control by brake pedal. Electromagnetic arrangement produces the force according to the current it receives. Brake gets applied according current given.

IV. CONCLUSION

The electromagnetic braking system can be implemented in the bike, car, bus, truck etc. It is mostly implemented in the places where braking at high speed is needed. It is also used with the combination of ABS (anti lock braking system). It is definitely overcome the drawback of the hydraulic, pneumatic and mechanical braking system. It is very effective due to its individual braking system. The chances of breakdown are very less compare with other braking systems.

V. ACKNOWLEDGMENT

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