

“Literature Review on Automatic Electromagnetic Braking System”

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ABSTRACT:

An electromagnetic brake is a new and revolutionary concept. These are totally friction less. Electromagnetic brakes are the brakes working on the electric power & magnetic power. An Electromagnetic Braking system uses Magnetic force to engage the brake, but the power required for braking is transmitted manually. A break is a device which is used to offer resistance to the motion of a body. Breaks are used to slowdown the moving body or to completely bring the body to the state of rest. Breaks are very important components in an automobile. Electromagnetic braking system makes use of magnetic force to attain breaking. Electromagnets are powered externally using batteries. In our approach ultrasonic sensor is placed in the front of the vehicle. Sensors are used to detect the obstacle and the distance between the vehicle and the obstacle. Microcontroller is used to trigger the electromagnetic braking system if there are any obstacles. This method helps to prevent the accidents caused due to negligence of the drivers.

Keywords: -Electromagnet, Ultrasonic Sensor, Relay, Microcontroller.

I. INTRODUCTION:

Electromagnetic brakes (also called electro-mechanical brakes or EM brakes) slow or stop motion using electromagnetic force to apply mechanical resistance (friction). The original name was "electro-mechanical brakes" but over the years the name changed to "electromagnetic brakes". In recent time death rate due to automobile accidents are very high. The two major contributors for the accidents are break failure and inability of the driver to apply the break at right instant. Our system is used along with regular breaks of the automobile as emergency break. By this approach the above-mentioned reasons for accidents can be addressed. The ultrasonic sensor is placed at the front end of the vehicle. These sensors can be used to detect the obstacles in front of the vehicle and

also the distance between the vehicle and the obstacle. The microcontroller controls the velocity of the vehicle based on the distance from the obstacle. The ultrasonic waves generated by the ultrasonic sensor can't be heard by humans. The ultrasonic sensor has a good range and is normally anti-interfering but its accuracy is less compared to other higher end sensors. So, the ultrasonic sensors can be used for low end automobiles. Our system starts to function only when the vehicles velocity exceeds 40 kmph. This is because the driver can control the vehicle relatively easily at lower speeds and also to avoid unnecessary breaking at high traffic region. Electromagnetic braking system is more efficient than regular friction brakes. After wide literature survey

II. LITERATURE REVIEWS:

After reviewing the various research paper relevant to automatic Electromagnetic system, the conclusions are stipulated below.

[1] **Mr. Akshaya S. Putt war and Nagnath U. et al.:** - In this paper author analyse that Electromagnetic braking system is found to be more reliable as compared to other braking systems. In oil braking system or air braking system even, a small leakage may lead to complete failure of brakes. While in electromagnetic braking system as four-disc plates, coils and firing circuits are attached individually on each wheel, even any coil fails the brake does not completely fails remaining three coil works properly.

This enhanced braking system not only helps in effective braking but also helps in avoiding the accidents and reducing the frequency of accidents to a minimum. the electromagnetic brakes can be used as an auxiliary braking system along with the friction braking system to avoid overheating and brake failure. ABS usage can be neglected by simply using a micro controlled electromagnetic disk brake system. When these brakes are combined with mechanical brakes, it increases the

life of brake and act like fully loaded brakes. These electromagnetic brakes can be used in wet conditions which eliminate the anti-skidding equipment. Hence, the braking force produced in this is less than the disc brakes if can be used as a secondary or emergency braking system in the automobiles.

[2] **Surakarta, Indonesia:** - As per the author it is found that, in daily life the role of brake is very important. In generally vehicle is used conventional braking like disc brake drum brake etc. Eddy current brake can be alternative for conventional brake ECB is an electromagnetic brake which use the principle of eddy current brake. This research aim to investigate the relationship between braking torque with the amount of coil and the air gap in single disc axial brake ECB. FEM is used in ECB performance modelling. The eddy current brake has many parameters that need to be developed. In this paper by changing the air gap and number of conductors the torque is also changed. by using FEM, we can find this. The braking torque is strongly affected by the parameter of eddy current brake. By result of this research, we can conclude that smaller air gap increases the braking torque and also number of conductors is improving the performance of eddy current brake also by change in design the braking torque is also change. Better braking performance is obtained when using 0.5mm air gap and 360 conductors.

[3] **Akshaya S. Putt war et.al.:** - In this research paper authors found that, two main functions of a braking system are to maintain control of the car/vehicle at a vertiginous inclination or a declination and to stop the vehicle in the shortest distance possible. Electromagnetic brake is a new idea. It is discovered that electromagnetic brakes can build up a power which is almost double the most extreme power yield of a normal motor, and no less than three times the braking energy of a fume brake to stop the vehicle. These results of electromagnetic brakes make them essentially more focused possibility for elective hindrance hardware's contrasted and different retarders. This project expects to limit the brake inability to stay away from the street mis happenings. It additionally diminishes the support of stopping mechanism. Preference for this mechanism is that it can be used in any vehicle and is less problematic.

[4] **Stephen Z. et.al.:** -Autor's suggested that A magnetic brake provides braking or locking capability and is remotely controlled by electric power. The magnetic brake comprises a rotatable

shaft and a brake disc mounted on the shaft. A non-rotating core housing assembly located around the shaft includes a permanent magnet and a bipolar solenoid. A magnetic armature adjacent to the core housing assembly is capable of movement toward the core housing assembly and toward and into engagement with a brake disc to prevent rotation of the shaft. A spring urges the armature away from the core housing assembly and into engagement with the brake disc. The brake does not use any electric power to maintain the brake in the set mode with the rotating shaft fully locked or in the released mode with the rotating shaft fully released. The permanent magnet is of sufficient strength to hold the armature against urging of the spring until an opposite polarity is supplied by the solenoid.

[5] **Karl Erny, et.al.:** -Author says that, an elevator drive has a brake device with compression springs to actuate brake levers, and brake linings on a brake drum creating a braking force. A sensor is provided to detect the movement of a brake magnet armature tappet. A bracket is attached to the brake magnet tappet on one end and a distance piece carrying the sensor housing is arranged on the other end. A restoring lug is attached to the existing mechanical indicator. A monitor evaluates the sensor signal and turns off the elevator drive in the event of dangerous operational states via a safety circuit. The system allows the state of the brake device to be monitored. The more the brake linings wear off due to abrasion, the smaller the distance between the armature and the brake magnet housing. If the armature is in contact with the brake magnet housing, the braking ability of the brake linings is completely void.

[6] **Hung-Chi Wu, et.al.:** -As per the authors, this invention relates to an adjustable magnetic brake and in particular to one including an aluminium fan, a magnetic conducting ring enclosing the aluminium fan, a permanent magnet disposed within the aluminium fan, a fixing seat for keeping the permanent magnet in position, a sliding seat mounted in the fixing seat and provided with a bearing, a housing, bolts provided on one side of the fixing seat and extending out of the housing, a mounting plate connected with the bolts and a wire connected with the mounting plate such that when the wire is pulled outwards, the permanent magnet will be moved outwards.

[7] **Jae-Woong Lee, et.al.:** -In this research paper authors suggested that, disclosed is a magnetic brake system for a vehicle. comprising: a plurality of brake disk solenoids for generating the magnetic

force; a plurality of brake pad solenoids for generating the magnetic force; a braking sensor for detecting whether a brake pedal is applied; a wheel speed sensor for detecting wheel speed; a magnetic polarity sensor for detecting magnetic polarity of the brake disk solenoids; and a control unit for controlling the brake pad solenoids using signals from the braking sensor. The wheel speed sensor and the magnetic polarity sensor.

[8] **Lindberg; et.al.**:-As per the opinion of authors, a vehicle braking system having a Brake disk structure defining an annular surface and having axis, annular magnet support assembly, an annular pole piece support assembly the system is an adjustment mechanism for producing relative angular movement between the magnet support and the pole piece support assembly, so as to change the circumferential alignment between each of the pole pieces and the pair of permanent magnets adjacent there to.

The invention is a vehicle braking system including a brake disk structure defining an annular surface means and having an axis, an annular magnet support assembly disposed adjacent to the annular surface means in the direction of the axis, a plurality of circumferentially spaced apart pairs of circumferentially spaced apart permanent magnets mounted on the magnet support and circumferentially spaced apart thereon, each pair Arranged with like polarities facing the annular surface means and the polarities of the pairs of permanent magnets facing the annular surface means alternating circumferentially, an annular pole piece support assembly, and a plurality of ferromagnetic pole pieces mounted on the pole piece support assembly and circumferentially spaced apart in positions between the annular surface means and the permanent magnets, each pole piece disposed adjacent to a pair of the permanent magnets and having a circumferential length substantially greater than the circumferential length of either of the adjacent pair of permanent magnets. Also included in the system is an adjustment mechanism for producing relative angular movement between the magnet support and the pole piece support assembly so as to change the circumferential alignment between each of the pole pieces and the pair of permanent magnets adjacent thereto. Selective braking and non-braking periods are established by changing the alignment between the pole pieces and magnets. eddy braking can be used as a safety brake. Eddy braking also find application in high-speed vehicles as braking force is proportional to speed of vehicle.

[9]**Albert E,et.al.**:- In this research paper authors says that, a contactless eddy current brake for car is disclosed in the brake two cores are arranged the edge of the brake disc while being spaced apart from each other at an angle of 90 each of the cores is wound with a coil thus forming and electric magnet A control units calculates Dc or Ac control in response to a speed signal output from the sensor thus outputting control current value to the coils, while the AC current is variable in the frequency in accordance with the pedalling force As well known to those skilled in a art known contact brakes for cars are designed to be operated by hydraulic or pneumatic pressure thus pressing against the brake disc of a wheel using frictional brake pads are frictionally in that the brake pads and making a car go slow or stop. However, such known contact brakes in are problematic in that the brake pads with the brake disc. Another problem experienced in the known brake the wheels while driving a car at high speed.

[10] **Sumit Patel, et.al.**:-Authors says that, Engineering complications in actual sense incorporate linguistic information process that proves complex to enumerate through conventional calculations since it is a representation of subjective knowledge. Failure to quantify linguistic information results, therefore, to assumptions in developing mathematical models. Moreover, in transportation engineering, several values are described through improbability, subjectivity; imprecision's as well as ambiguity. The electromagnetic braking system uses magnetic strength to decrease or stop the speed in wheel rotation.

The idea of electromagnetic braking comes with the advantages and disadvantages of stresses incallipers and dissipation of heat. The electromagnetic braking system entirely depends on magnetic power to move the parts of the braking system. The system indulges the principle of if a magnetic field is induced in the rotating disc, then the otherminimum. Furthermore, the electromagnetic brakes prevent the danger that can arise from the prolonged use of brake beyond their capability to dissipate heat. Production costs, time required for product development, time required for process development are all significantly reduced by the proper utilization of tools. Not only the abovementioned benefits but also the simulation techniques that are involved in braking systems give a boost to quality assurance of the final part. Side produces the eddy current of the movement or rotation of the disc brake.

The major parts of an electromagnetic braking system are braking discs, solenoid, circuit board, step-down transformer and battery power. In other words, human operators, dispatchers, drivers, as well as passengers, gauge the context of a situation through idiosyncratic knowledge or linguistic evidence in regular decisions. Electromagnetic braking system is classical example of increased effectiveness of braking system while minimizing losses. In this paper the focus is provided on comparison between Electromagnetic braking system and conventional exhaust braking system. The focus of Electromagnetic system is to increase the safety of the device meanwhile keeping the losses to minimum. The sole aim of the research study lies on providing advantages of both the systems as well as clearly mentioning their ambiguities.

[11] **P, Nirmal Kannan Vet.al.**: -Authors says that, an Electromagnetic Braking system uses Magnetic force to engage the brake, but the power required for braking is transmitted manually. The disc is connected to a shaft and the electromagnet is mounted on the frame. When electricity is applied to the 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. As a result, it develops a torque and eventually the vehicle comes to rest. In this project the advantage of using the electromagnetic braking system in automobile is studied. These brakes can be incorporated in heavy vehicles as an auxiliary brake. The electromagnetic brakes can be used in commercial vehicles by controlling the current supplied to produce the magnetic flux. Making some improvements in the brakes it can be used in automobiles in future. The electromagnetic diffusion and the electromechanical phenomena arising in a solid cylinder rotating inside a magnetic field are here analysed. The study is developed through a time stepping Finite Element voltage-driven formulation, employing the sliding mesh technique for handling the cylinder motion. The influence on the dynamic behaviour and energy dissipation of the material electric and magnetic properties, the geometrical parameters and the supply conditions is investigated considering a model problem. 2006 Elsevier Inc. All rights reserved.

[12] **McConnell, H.M, et.al.**: -Authors says that, most of the braking systems utilize friction forces to transform the kinetic energy of a moving body into heat that is dissipated by the braking pads. The overuse of friction-type braking systems causes the temperature of the braking pads to rise, reducing

the effectiveness of the system. An Electromagnetic Braking system uses Magnetic force to engage the brake, but the power required for braking is transmitted manually. The disc is connected to a shaft and the electromagnet is mounted on the frame. When electricity is applied to the coil a magnetic field is developed across the armature. The eddy-current is created by the relative motion between a magnet and a metal (or alloy) conductor. The current induces the reverse magnetic field and results in the deceleration of motion.

The proposed mechanism implements this phenomenon in developing a braking system. The potential applications of the braking system can be a decelerating system to increase the safety of an elevator or any guided rail transportation system as a result it develops a torque and eventually the vehicle comes to rest. In this project the advantage of using the electromagnetic braking system in automobile is studied. These brakes can be incorporated in heavy vehicles as an auxiliary brake. The electromagnetic brakes can be used in commercial vehicles by controlling the current supplied to produce the magnetic flux. Making some improvements in the brakes it can be used in automobiles in future. . It also reduces the maintenance of braking system. An advantage of this system is that it can be used on any vehicle with minor modifications to the transmission and electrical systems.

[13] **Tatsuya YAMASAKI, et.al.**: - In this research paper authors says that, an automatic brake system for a vehicle consists of an electric motor, related to the motor for transmission motion from the motor to a brake lever that pushes the restraint. This project provides a brand-new idea style of the EMPB (electro mechanical parking brakes) system that has straightforward and cheap characteristics.

This project deals with coming up with and fabrication of EMPB system. Mechanical device hand brake system conjointly remarked as brake by-wire, replace typical parking braking systems with a totally electrical part system. This happens by replacement typical linkages with electrical motor-driven units. The braking force is generated directly at every wheel by high performance electrical motors and automobile management, that area unit controlled by an ECU. The electronic hand brake replaces the traditional handbrake. It's operated by a switch within the centre console. The mechanical device hand brake provides the subsequent edges over the traditional handbrake: easy use-the hand brake is applied totally no matter the strength of the driving force. Safety-the

electrical hand brake applies mechanically once the key is off from the ignition.

III.CONCLUSION:

By taking the source of above stated research paper modification has been done and have introduced new technology regarding Breaking System.

The system which we have put forth is only secondary braking system which is only for emergency circumstances. Our braking system cannot replace regular brakes but when used along with the regular brakes can improve the safety of the vehicle by great margins.

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