ELECTROMAGNETIC SLOWING STRUCTURE BY ULTRASONIC DEVICE & REFORMATIVE SCHEME

1Name of 1st Mr Kiran Parmar
[1]Designation of 1st Assistant Professor
[1]Name of Department of 1st Faculty of Engineering
[1]Name of organization of 1st Gokul Global University, Sidhpur, Patan, Gujarat – India

Abstract: The braking distance and obstacle distance, as well as the vehicle's speed, are taken into account in our work. The ultrasonic sensor detects the distance between the vehicle and the item in front.

Automatic breaking processes are accomplished by integrating breaking motors that activate the brakes. If the driver fails to detect the obstruction and apply the brakes at the appropriate time, the microcontroller activates the braking motor to apply the brakes automatically.

Key points: - Ultrasonic Sensor, Regenerative system, Electromagnetic flux, Micro-controller.

INTRODUCTION

Its upkeep and good functioning are critical for you, your family, and other drivers. You should not seek to maintain or fix brakes on your own. Specific tools and technical skills are required to service or repair the braking system. Auto tech Performance is just what you need. This section explains the basic principles of regular brakes as well as numerous alternate retardation mechanisms. Electromagnetic brakes' functioning concept and properties are then discussed.

The conversion of kinetic energy into thermal energy is the principle of braking in road vehicles (heat). The driver orders a stopping force several times as intense as the force that propels the automobile forward, and the associated kinetic energy is dissipated as heat. Brakes must be able to stop a vehicle's speed in a short period of time, regardless of how fast it is going. As a result, brakes must be able to generate high torque and absorb energy at extremely high rates for short periods of time. In other applications, such as a heavy vehicle down a long hill at high speed, the brakes may be engaged for a longer period of time. Brakes must have a system to maintain heat absorption capabilities for lengthy periods of time.

Between itself and a stationary steel disc, the steel disc presses a brake disc comprised of sintered asbestos material. As a result, the torque is 'grounded,' and braking action is initiated. The electromagnetic property is utilized in an electro-magnetic braking system to perform the braking action. Electromagnet iron plates, liners, tension springs, studs, and disc brake plates are all employed in this system. The brake lines are joined to each other using an electromagnet and an iron plate, and both plates insert the disc plate, which is permanently fastened to the wheels.

High currents aren't always possible, which is why a solenoid, or a loop of wire shaped like a coil, is used to achieve high self-induction.

When the current is turned off, the magnetic field vanishes, and the iron core ceases to be a magnet. An electromagnet's ability to attract provides a high magnetic force.

The shape and strength of the magnetic field created by electromagnets are determined by the shape geometry and material employed in their manufacturing. A shift to a new braking system is required in the direction of green technology, which emphasizes the need of environmental conservation. A new braking system to replace the current braking system that is used to reduce air pollution, realizing the need of a new braking system that can lead to environmentally friendly solutions and lessen frequent difficulties.

Problem Statement

In the path of green technology, which emphasizes the need of environmental preservation, a change to a new braking system is required. Recognizing the importance of an unique braking system that could lead to more ecologically responsible and fewer braking system problems. Eddy's current braking system is said to be environmentally friendly because it eliminates wear debris pollution on the brake pad. It does, however, provide resistance that is proportional to speed.

METHODOLOGY

It is a type of vehicle brake technology that automatically adjusts the amount of force given to each brake according on road conditions, speed, load, and other factors. EBD can deliver more or less braking pressure to each wheel to maximize stopping force while retaining vehicle control when used in conjunction with anti-lock braking systems. Because the front end of the vehicle carries the most weight, EBD applies less braking pressure to the back brakes, preventing the rear brakes from locking up and causing a skid. During initial brake application, EBD distributes more braking pressure to the rear brakes in some systems before the consequences of weight transfer become apparent.

The EBD, as a subsystem of the ABS system, is responsible for controlling the rear wheels' effective adhesion use. In a partial braking operation, the pressure of the rear wheels is approximated to the ideal brake force distribution. To accomplish this, the traditional brake design is tweaked in the direction of rear axle over baking, and ABS components are utilized. EBD relieves pressure on the vehicle's hydraulic braking force proportioning valve. In terms of adhesion utilization, driving stability, wear, temperature stress, and pedal force, EBD optimizes the brake design.

To reduce yaw accelerations during turns, EBD may be used in conjunction with ABS [6] and electronic stability control (ESC). The rotation of the vehicle around its vertical centre of gravity is called "yaw" (turning left or right). The car is under steering(over steering) if the yaw sensor detects less(more) yaw than the steering wheel angle should produce, and ESC activates one of the front or rear brakes to spin the car back into its planned route. If a car is performing a left turn and starts to under steer (ploughs Electronic brake force distribution (EBD or EBFD):

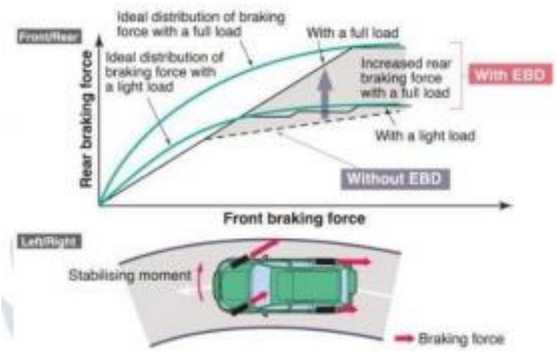


Fig. Electronic brake force distribution (EBD or EBFD)

Autonomous Emergency Braking (AEB)

It's an autonomous road vehicle safety system that uses sensors to detect circumstances where the relative speed and distance between the host and target vehicles signal a collision is likely. Emergency braking can be conducted automatically in this case to minimize or mitigate the collision's effects. According to recent research, installing the technology in all automobiles might cut accidents by up to 27% and save up to 8000 lives every year.

SYSTEM DESIGN AND COMPONENTS

We took a very cautious approach in our attempt to create a special-purpose machine; the overall design process was primarily divided into two components. System design is primarily concerned with physical constraints and ergonomics, space requirements, the arrangement of various components on the mainframe game of the machine, the number of controls, the location of these controls, ease of maintenance, and the weight of the machine from the ground, among other things. In mechanical design the component in two categories.

Design Parts Parts to be purchased Detail design is done for design parts, and the dimensions obtained are compared to the next highest dimension that is easily available in the market, simplifying assembly and post-production on servicing work. The manufacturing drawings specify the various tolerances on work, and process charts are created and sent to the production stage. Directly acquired parts are specified and chosen from standard catalogs.

SYSTEM DESIGN

System selection based on physical constraints

While choosing a machine, consider if it will be used in large-scale or small-scale industries. In our case, it will be utilized in small-scale industries, thus space is an issue. Because mechanical design has a direct connection with system design, the first goal is to regulate the physical parameters so that the distinction obtained after mechanical design must be well integrated.

Arrangement of Various Components Bearing the space constraints in mind, the components should be arranged in such a way that they can be readily removed or serviced. Furthermore, every component should be visible and none should be concealed, and every available space should be used in the component arrangement. Components of the System As originally said, the system should be compact enough to fit in a room corner. All moving parts should be securely fastened and compacted.

Man-Machine Interaction The compatibility of the machine with the process is a key design criterion. It is an anatomical application. Here are some examples of this section. Machine height design Hand operation requires a lot of energy. Machine lighting condition. Chances of Failure The damages sustained by the owner in the event of a component failure are essential to the design criterion. When designing the mechanical system, a high factor of safety is used to ensure that there are fewer risks of failure. Additionally, periodic maintenance is essential to keep the machine running smoothly.

Mechanical Design

From the perspective of the designer, the mechanical design phase is critical because the project's whole success is dependent on the accurate design analysis of the problem. The physical parameters of the material load's stresses, deformation, and failure should be well-understood by designers.

He should determine the external and internal pressures operating on the machine parts using theories and wear analysis. These forces may be classified as: Deadweight forces Friction Forces Inertia forces Centrifugal forces Forces generated during power transmission etc. if he doesn't have enough data to estimate them, he should create some sensible assumptions based on similar circumstances that would almost meet the functional requirements.

Material Selection

The basic goal is to choose the right materials for the various elements of a machine. In the machine's construction, It is essential for a design engineer to understand the impact of the manufacturing process and heat treatment on material properties. The following criteria influence material selection for engineering purposes:

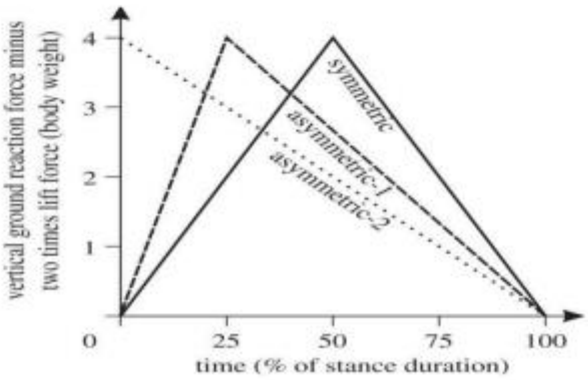
1. Materials are readily available. 2. Material suitability for the working conditions in service. 3. The material costs. 4. The material's physical and chemical properties. 5. The material's mechanical characteristics. The mechanical properties of metals are those that are related to the material's capacity to withstand mechanical forces and loads. These qualities will now be discussed as follows: A. Strength B. Elasticity C. Stress D. Plasticity E. Stress F. Ductility G. Brittleness H. Malleability

Hardness

It encompasses a wide range of qualities like as wear resistance, scratch resistance, deformation resistance, machinability, and so on. It also refers to the metal's ability to cut through another metal. The hardness is commonly measured in numbers, which vary according on the test method. The following test can be used to determine a metal's hardness. 1. Brinell hardness test 2. Rockwell hardness test Change of temperature 6. Lack of balance of moving parts The materials chosen are determined by the many sorts of stresses that occur during operation. It should be able to tolerate the chosen material. Another factor to consider when choosing metal is the type of load since a machine part resists load better than a live load and a live load better than a shock load. The material chosen is determined by the safety factor, which is determined by the following parameters. 1. Property depend abilities 2. The imposed load's dependability 3. The assurance of the specific failure model 4. The degree to which assumptions are simplified 5. The size of the localised 6. The amount of initial tension created during the production process 7. The number of people who will die if the system fails.

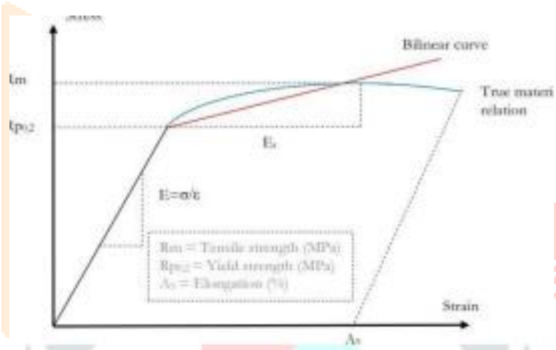
Asymmetric

symmetrical or asymmetrical contact condition exists. When the contact condition is symmetric, neither of the surfaces may penetrate the other; however, when the contact is asymmetric, only one of the surfaces can penetrate the other, i.e., the contact surface cannot penetrate the target surface but the contrary is feasible. The necessity of selecting the correct contact pair is illustrated in Figure.

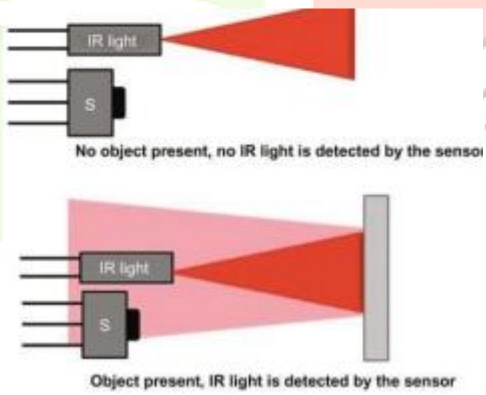


Bilinear stress-strain curve

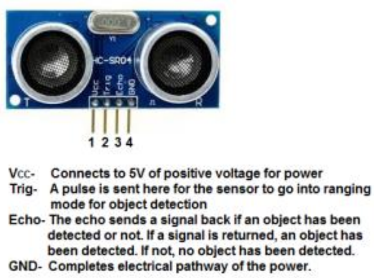
Ansys proposes a bilinear approximation of the stress-strain relationship in the context of the license version used, as shown in the figure. The yield strength and tangent modulus are two input values for the bilinear stress-strain curve. When plastics strain, the yield strength is measured, and the tangent modulus is the slope of the stress-strain curve after yielding.



Optical Sensor



Ultrasonic sensor



Devices that create or sense ultrasound energy are known as ultrasonic transducers and ultrasonic sensors. Transmitters, receivers, and transceivers are the three broad categories they fall under. Transceivers may both transmit and receive ultrasound. Piezoceramics are used in ultrasonic sensors to transmit and receive ultrasonic waves, converting electrical energy to acoustic energy during transmission and then back to electrical energy during reception.

By examining the timing, distortion, or absence of the echo, ultrasonic sensors can determine the existence or position of an object or estimate the distance to a target object. For industrial applications, there are three types of ultrasonic sensors: diffuse mode, retro reflective, and thru-beam. The ultrasonic sensor is the most popular variety. A single transducer is used to both transmit and receive ultrasonic waves in diffuse mode. A simple formula can be used to estimate the distance between the object and the transducer:

$$d = \frac{c \cdot t}{2}$$

Electromagnetic Brakes

Electromagnetic brakes (also known as electro-mechanical brakes) use electromagnetic force to apply mechanical resistance to slow or stop motion (friction). Originally known as "electro-mechanical brakes," their name was modified to electromagnetic brakes over time to reflect their actuation method. The range of uses and brake designs has risen greatly since becoming popular in the mid-20th century, especially in trains and trams, but the basic operation remains the same.InEddy current brakes, electromagnetic brakes both employ electromagnetic force, however, electromagnetic brakes rely on friction in the end, whereas eddy current brakes use magnetic force directly.

Construction and working Electromagnetic braking refers to the use of electronic and magnetic power to apply brakes. To achieve frictionless braking, we apply the electromagnetism principle. It also requires minimal upkeep and oiling. The suggested usage of these brakes in cars is primarily motivated by the fact that they are frictionless. Because there is no friction and no oiling, maintenance costs are significantly reduced.

Traditional braking systems might also slip, however this one will always apply brakes to the car. As a result, this technology is a favoured replacement for traditional brakes because it does not require friction or lubrication. When a magnetic flux is passed in a direction perpendicular to the rotational direction of the wheel, an eddy current flows in the opposite direction, which is how electromagnetic brakes function.

Scope Electromagnetic brakes have a number of advantages over frictional brakes. This brake is more successful due to its swirling present and attractive capabilities. This brake is frequently used as a vehicle's backup-stopping mechanism. Using a smaller-scale regulated electromagnetic framework, abs are frequently overlooked. It's frequently used as a network of train mentors to speed up the preparation process. The combination of these brakes increases brake life and functions like fully stacked brakes. Because these brakes are frequently used in rainy weather, there is little protection against slipping.

Because the plate cracks, the braking power provided during this brake isn't the maximum. Many new technologies are being introduced into the world. They produce several consequences. Because of the entrance of technology, almost every industry has a new look. One of them is the automobile industry. The global vehicle sector is booming. As a result, there is a lot of research going on here.

Conclusion

In both advance and reversing directions, the system performs admirably. When the sensor detects any incline of the car, our system and pawl ratchet unit is activated, allowing vehicles with such a system to travel safely in mountainous terrain. As a result, we have an "auto braking system" that aids in the understanding of low-cost automation. In addition to normal friction brakes, electromagnetic brakes are important additional retardation equipment. They've been employed in big vehicles like coaches, buses, and trucks to reduce speed on highways and trunk routes, as well as to brake for long periods during down slope operations. Electromagnetic brakes of new varieties are also being developed for lightweight automobiles. When kept cool, regular friction brakes offer a remarkable and crucial load-absorbing potential. By absorbing energy at a different location based on a distinct operating principle, electromagnetic brakes assist friction brakes in maintaining this capability under all conditions. We suggested a modified static mathematical model for electromagnetic brakes in this paper. For a nominal vehicle model, a sliding mode controller is constructed and simulated under various road surface conditions.

Reference

[1] Mr. TusharKavatkar, Mr. Harshal Salvi, "Design and Analysis of Intelligent Braking System" Department of mechanical Engineering, Finolex Academy of Management & Technology, Ratnagiri, 415639, Vol. 5 Issue 1 2017. [2] Millind S. Deotala, Hrishikesh Sivankar "Review On Intelligent Braking System" International Journal on Recent and Innovation Trends in Computing and Communications ISSN: 2321-8169 Volume: 4 Issue: 4 April 2016 [3] Literature review on Design Study in Single Disk Axial Eddy Current Brake. 2017 5th International Conference on Electric Vehicular Technology (ICEVT) October 30-31, 2017, Surakarta, Indonesia. [4] Literature review on Enhancement of Braking System in Automobile Using Electromagnetic Braking. Akshaya S. Putt war and Nagnath U. published in IOSR Journal of Mechanical and Civil Engineering (IOSR- JMCE), in 2009 [5] Literature review on electromagnetic brake. Inventors: Lindberg; Teppo (Nuppulinna, FI) Assignee: Kone Oy (Helsinki, FI) United States Patent 5,186,286. Lindberg February 16, 1993 [6] Literature review on contactless eddy current brake for cars. United States Patent, US 6,286,637B1, Kwangju Institute of Science & Technology (KR): Sep. 11, 2001 [7] Ming-Ji Yang, H.-L. J.-Y.-K. "A Cost-Effective Method of Electric Brake With Energy Regeneration for Electric Vehicles", IEEE TRANSACTIONS ON INDUSTRIAL ELECTRONICS, VOL. 56, 2203-2212, June 2009. [8] H. Wu, S. Cheng, and S. Cui, "A controller of brushless DC motor for electric vehicle", IEEE Trans, vol. 40, no. I, pp. 509- 513, January 2005 [9] A. Rufer and P. Barrade, "A supercapacitor-based energy storage system for elevators with soft commutated interface", The 36 IEEE Industry Applications Conference vol.2, pp.1413-1418, 2001.