WWW.IJRPR.COM

International Journal of Research Publication and Reviews

Journal homepage: www.ijrpr.com ISSN 2582-7421

Automatic Electromagnetic Braking System

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ABSTRACT :

Electric brakes are a new and flexible concept.Electromagnetic brakes work with electric force and magnetic field. The Electromagnetic Braking system uses Magnetic force to hold the brakes, and the voltage required for electromagnetic braking is transmitted automatically. The Electromagnetic braking system is a state-of-the-art braking system used for light and heavy vehicles. This project is a combination of electro-mechanical ideas. Accidents are now increasing due to an ineffective braking system. Clearly, the electromagnetic brake brake is an important factor in the safe braking of heavy vehicles. It aims to reduce brake failure to avoid road accidents. It also reduces the maintenance of the braking system. The advantage of this system is that it can be used on any vehicle with minor changes in transmissions and electrical systems. The Electromagnetic Braking system uses Magnetic force to hold the brakes, but the force required for braking is transmitted automatically. The disc is attached to a shaft and an electromagnet is attached to the frame. As a result, it produces torque and eventually the car relaxes. These brakes can be applied to heavy vehicles such as auxiliary brakes. Electric brakes can be used on commercial vehicles with current controls provided to produce magnetic fluctuations. Making some improvements to the brakes could be used on cars in the future

Compared with the old days the longevity of a person decreases. The death toll from the accident is rising sharply as car use increases daily. Due to brake failure there are many accidents that occur so if we control the brake automatically we can minimize the effect of the accident. Ultrasonic setup is placed in front of the car and that set consists of emitter and receiver. Ultrasonic emitter always emits ultrasonic waves, whenever a disturbance is detected when a wave appears and the receiver receives a signal. The wave signal sends a signal to the Aurduinouno from that based on the distance of the object moving the buzzer or brakes. The brakes operate using. The UBS car offers a glimpse into the future of car safety. With the UBS program we can prevent many accidents and save many lives

PRINCIPLE AND OBJECTIVE

1 Principle

The principle of Electromagnetism is applied to the Electromagnetic Braking system. If a certain amount of current is capable of a circular conductor then it produces a magnetic flux, similar to the rest of the conductor. The force of the magnetic field depends on the flow of the conductor and therefore the amount of rotation exceeds the curve and increases the current flowing through the conductor above the magnetic flux created. Solenoid is that the coil does not have many curves and seeks to produce the maximum magnetic force used during Braking Electromagnetic Braking.

2 objective

The main purpose of designing and modeling the Electromagnetic Braking System. Apart from the main purpose, the following are the second objectives: 1. To understand the planning and execution of the task. 2. Understanding construction techniques in a workplace. 3. Making human life easier by using technology.

III. CONSTRUCTUION AND WORKING OF AUTOMATIC CIRCUIT

The components used in the circuit are the ultrasonic sensor, arduinouno, led screen: fig 3 shows the circuit diagram of the sensor circuit. Electronic analog circuits are those in which the current or electrical energy may vary continuously over time to match the information represented. The analog circuit is made up of two key building blocks: series and parallel circuits. In a series cycle, currently the same goes through a series of components. The string of Christmas lights is a good example of a series of picks: when one goes out, everyone does it. In the same circuit, all the components are connected at the same voltage, and currently differentiate between different components according to their resistance.

1 ULTRASONIC TRANSDUCERS

Ultrasonic transducers are used to extract high frequency ultrasonic waves. These transducers operate using electrical power. In this project ac voltage is used to replace the source.

Distance = Time x Sound Speed is divided by 2 Time = the time between the ultrasonic wave being transmitted and the receiving point divides this number by 2 because the sound wave has to travel to the object and back.

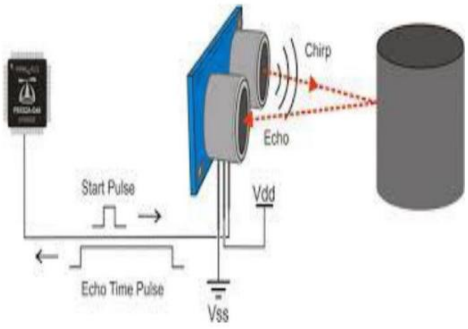

Fig 1: ultrasonic sensor working

2 AURDUNIO UNO

Arduino has a small, complete, and easy-to-use pcb board based on ATmega328 (Arduino Nano 3.x). It has the same or less functionality of Arduino Duemilanove, but in a different package. It only needs a DC power jug, and it works with the Mini-B USB cable instead of the standard. C. Power The Arduino uno can be powered by a Mini-B USB connector, 6-20V outdoor uncontrolled power (pin 30), or 5V external power supply (pin 27). The power source is automatically selected from the highest power source. Memory The ATmega328 has 32 KB, (it also has 2 KB used for boot loading. The ATmega328 has 2 KB of SRAM and 1 KB of EEPROM. digital in Nano can be used as input or output, using pinMode (), digitalWrite (), and digitalRead () functions.

Fig 2: arduinouno microcontroller

They operate at 5 volts. Each PIN can provide or accept a maximum of 40 mA and has an internal (automatic disconnected) resistor of 20-50 kOhms. In addition, some anchors have special functions. The Arduino uno has a number of computer, Arduino, or other small controls. The ATmega328 provides the UART TTL (5V) serial connection, which is available on digital pins 0 (RX) and 1 (TX). The FTDI FT232RL board drives this serial connection via USB and the FTDI drivers (included with Arduino software) provide virtual com port software on the computer. Arduino software includes a serial monitor that allows easy text data to be sent to and from the Arduino board. RX and TX LEDs on board will illuminate when data is transmitted via FTDI chip and USB connection to computer (but not via serial connections on pins 0 and 1).

IV. CONSTRUCTION OF ELECTROMAGNETIC BRAKES

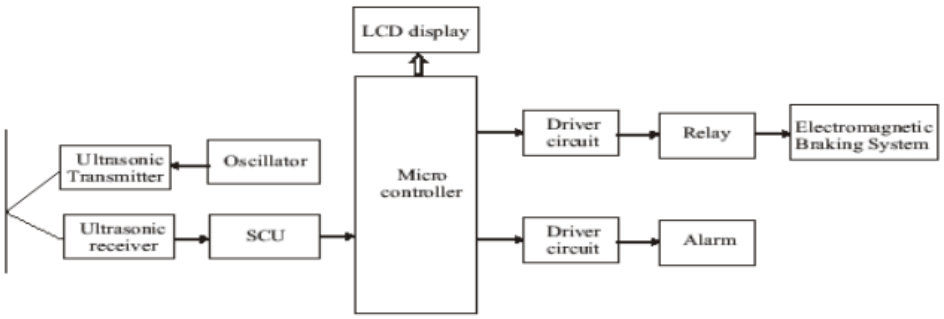

Fig 3 : block diagram of sensor unit

1 METAL DISC

The metal disc is one of the most important parts used here. It is made of cast iron plate with a thickness of 5 mm. The reason for using cast iron plate is that the plate should be a magnetic material. The disk diameter is 255 mm and has a hole 90 mm wide to lose weight. There are four holes drilled with a 4 mm screw. The holes are drilled in the reference circle 65 mm wide. Finally the disc is fitted with a pulley using 4 mm screws.

2 ELECTROMAGNET

Electromagnet is device which uses a magnetic field that gets produced when a current flows through a field. Here the electromagnetic is designed by the conversion of a conventional transformer. Transformers have two sides which are 'E "' the outer shape is the middle shape. This outside of the "E" transformer context is removed and sorted as one side. It now operates as electromagnetic.

The construction of the system is done as follows. The system contains vertical wheel support. The pulley is mounted on top of a straight column. This set is mounted on a wooden board that serves as a base. On the other side of the base, the motor is fitted with the help of bolts. The drive pulley (motor) and the steering wheel pulley fastened with a standard metal chain. A metallic disc is placed in front of the driven pulley. The electromagnetic is mounted on the front of the metallic disc mounted on a driven pulley. What is important is that the electromagnetic should be fitted with very little clearance through the metallic disc. The ON / OFF switch and controller are connected electromagnetic and motor respectively with the help of power cords to control the current supply to them. The basic function of an electromagnetic brake is to reduce the speed of the car using magnetic force to generate opposite mechanical friction which in deed stops the wheel

V. WORKING METHODOLOGY

When the power supply is supplied to the driving member, the pulley is driven by a chain. Now the pulley rotates continuously. As the metal plate is connected opposite the pulley so it is rotated in front of the electric magnet. When braking is required a voltage signal is sent by the control unit. Therefore, the current or voltage is applied to the electromagnet. The magnetic field is produced out of a coil that gets power supply from circuit. This coil enhances the magnetic fields of rotation between the metal disk thus attracting armature to the surface of the metal disk. When the current or voltage is removed from the brake (electromagnet) the metal disk is free to rotate. Here the springs are used as a medium to hold the electric magnet away from the disc. Wheel rotation is achieved by changing the coil supply controls. Smooth only occurs during descent only when the brakes are applied, there should be no slip when the brakes are fully stopped.

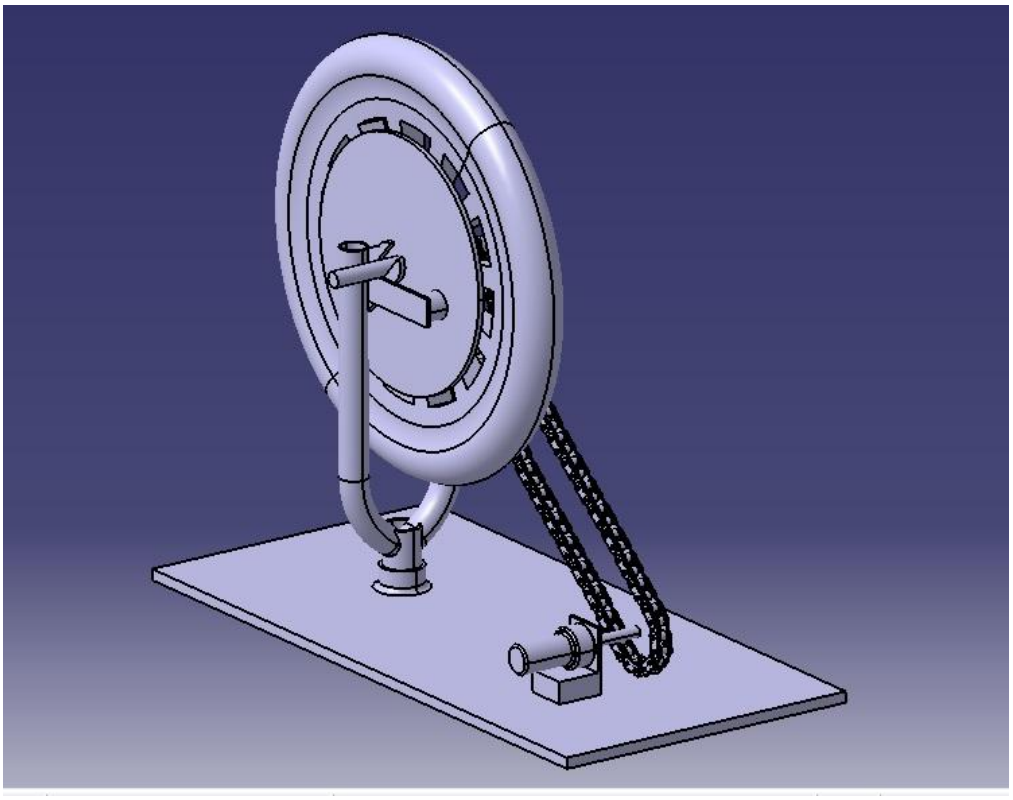

Fig 4: CAD model of braking assembly

VI. RESULT AND DISCUSSION

• Electromagnet area = 12.4 m
• Current & Power supply (I / V) = 7 amp/230volts.
• Magnetic magnet length (L) = 90 mm
Assume plate & wheel assembly the maximum weight should be considered approx.
2kg. which is 19.62N so that would be F is the power of Newton.
B is magnetic field in tesla.
A surface area of a pole in square meters.
μ is the permeabilityof free space.
In the case of free space (air) 19.62 = B 2 (12.4) 2x4πx10-7 B = 0.00199wb / m2
THE ENTIRE MAGNETIC FLUX IN THE CORE:
Ø = B × A Ø = 0.00199 × 12.4 Ø = 0.0246 wb.
VI.1. THE MAGNETISING FORCE:
H = B / μ = 0.00199 / 4π × 10 ^ -7 = 1583.59 AT / m.
An air gap of 0.5 mm of magnetic force is provided between the magnet and the plate.
484 AT = H × L = 1583.59 × 90 × 10 ^ -3 = 142.52 AT
Manually detecting magnetic field
Assuming N = the value of electromagnetic rotation
= 800 F = (NxI) 2 /a / (2xg)
g = air gap between the magnetic field and the plate
F = (8x1) 2 4πx10-7 x0.00199 / (2x0.5) 2 F = 16.045N on each magnet
VI.2. PERFORMANCE TESTING
At a fixed speed of taking 2000 rpm
r = sex radius
V = r ώ = 0.9 × 2πn / 60 = 0.9 × 2π × 2000/60
V = 188.4 m / s
According to Newton's law of motion
V = u + at a = (v-u) / t when the initial speed of the wheel
u = 188.4 m / s once
final speed v = 0 so a = (0-188.4) / 1 = -188.4 m / s ^ 2 a = (0-188.4) / 3
= -62.8 m / s ^ 2
VII. APPLICATIONS
• Electromagnetic brake brakes were previously used in rail installations where the set was a drum brake that is completely different from current designs and operates with the same principle and is best used on high-speed electric trains.
• The electromagnetic braking system is used not only in automobiles but also in industrial areas where slow or slow moving parts are delayed by other standard means.
• Nowadays these types of braking systems are used in the motorsports sector where they are very responsive and efficient and are used in cars like the Mclaren P1, La Ferrari.
• When electric magnet brakes are used even as clutches in some fields where high grip strength in other parts will make it easier to transfer work.
• An electric brake system is also used in industrial robot systems where the need to suspend operations.
• This type of braking system is also used for recreational purposes where the example of the mounting brackets where the cord is locked somewhere with the help of an internal brake.

VIII. RESULT

By using the electromagnetic brake as an retarding device, the friction brakes are often used sparingly and thus do not reach high temperatures. Brake linings will last longer before they need to be maintained, so a potential “brake fade” problem can be avoided. In a study conducted by a truck manufacturer, it was proven that the electric brakes take up 80 percent of the work that may be required for a standard service brake (Reverdin 1974). In addition, the electromagnetic brake brake prevents the risk of future use of the brakes in excess of their heat dissipation capabilities. This often happens when a car drops a recipe that has been extended at high speed. Installing an electric brake is not very difficult. It does not require a ground cooling system. It does not affect the efficiency of the engine. Electromagnetic brakes also have better control. The thermal stability of electromagnetic brakes is achieved by convection and radiation of heat energy when heated. Electromagnetic brakes have a very good cooling effect. Electromagnetic brakes have better thermal performance than normal.

IX. CONCLUSION AND FUTURE PLAN

Electromagnetic brakes have more options to be used than a collision reduction machine. The combination of current swirl and attractive power makes this brake effective. This brakes should be used as an primary device to a car stop. The use of ABS is usually eliminated using a low-frequency

electromagnetic control. It is often used as a place for train advisors to reduce the work of preparation quickly. The combination of these brakes extends the life of the brakes and works as fully applied brakes. These brakes are often used as part of the wet state, so there is no use of a smooth, fully controlled metal that causes a few errors.

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