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DESIGN AND FABRICATION OF ELECTROMAGNETIC BRAKING SYSTEM

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Abstract- An Electromagnetic Braking framework utilizes magnetic power to connect with the brake. However the plate is associated with a pole and the electromagnet is mounted on the edge .When power is connected to the curl anattractive field is created over the armature in light of the present streaming over the loop and makes armature get pulled in towards the curl. Subsequently it builds up a torque and in the end the vehicle stops. In this task the upside of utilizing the electromagnetic slowing mechanism in car is contemplated.

Key word- Electromagnetic, Belt Drive, Braking System, Eddy Current, Iron Frame

1. Introduction

A brake is a device which hinders movement. Its contrary part is a clutch. Most ordinarily brakes use rubbing to change over active vitality into warmth, however different techniques for vitality transformation might be utilized. For instance regenerative braking changes over a significant part of the vitality to electrical vitality, which might be put away for later use. An electromagnet is a sort of magnet in which the attractive field is delivered by an electric flow. Electromagnets as a rule comprise of wire twisted into a curl.

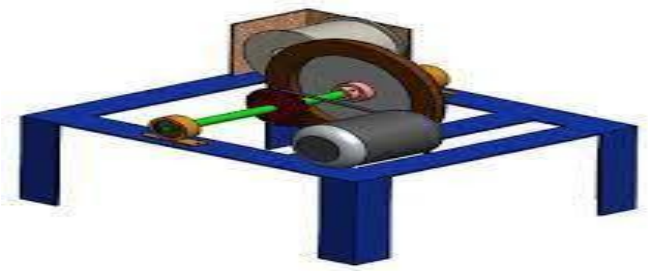

Fig.1 CAD MODAL

1.1 Overview of project

- This work intends to the design and implementation of new system of retardation (braking) for automobiles. The design of the new brakes relies upon the development of electromagnetic induction and eddy currents. The design primarily consists of terribly robust magnet and rotating wheel. The motion energy of the wheel as heat bringing the wheel to a stop. The eddy current development obeys maxwell's law of electromagnetic induction and lenz's law of direction of induced current.

Fig.2 Electromagnet

1.2 Objectives

- **Primary Objective**

➢ The main objective of our work is to design and fabricate an Electromagnetic Braking System model .

- **Secondary Objective**

Besides the main objective, following are our secondary objectives:

1 To understand project planning and execution.

2 To understand the fabrication techniques in a mechanical workshop.

3. To understand the usage of various mechanical machine tools and also measuring tools.

4.To make day to day human life more easier by proper use of technology.

2. Design and Fabrication

2.1 Design and Calculations

- Centre distance between the pulleys(C)= 0.362 m
- Diameter of the driving pulley(d) =0 .15 m
- Diameter of the driven pulley(D) = 0.35 m

- Speed of the driving pulley N1 = 1400 rpm
- Speed of the driven pulley N2 = 6000 rpm
- Material of the belt = POLYMER
- Material of the pulley = MS IS277
- Length of the belt (L)= 1.14m
- Current required to drive the motor =0.847A

2.2 DETERMINATION OF SPEED OF THE DRIVEN PULLEY

- N1d=N2D
- I=N1/N2 =D/d
- N2= (D/n)*N1
- N2= 0.15/ 0.035 (1400) =6000 RPM

2.3 CHECKING FOR CENTRE DISTANCE

- "The centre distance between the two pulleys must be greater than the average value of the diameters of both the pulleys."
- C ≥ (D + d) / (2)

  = 0.15 + 0.35 / (2)

  = 0.09m
- C = 0.36
- 0.36m >0.09m
- Therefore C≥ (D + d) /(2)

2.4 DETERMINATION OF THE LENGTH OF THE BELT

$$L_0 = 2C + \frac{\pi}{2}(D+d) + \frac{(D-d)^2}{4C}$$

= 1.16m/s

2.5 ACTUAL LENGTH OF THE BELT

= L-(1% of Lo)

= 1.16-(0.01*1.16)

= 1.14m

2.6 CURRENT REQUIRED TO DRIVE THE DISC TO AC (0.25hp) MOTOR

- POWER EQUATION
- P=I × v
- P= 0.25 HP
- V= 220v
- I = ?
- 1HP=745.7 watts
- 0.25 Hp = 186.425 watts
- I=p/ v

  = 186.452 / 220

  = 0.847Amp
- Heretheminimumcurrentrequiredtothemagnettostopthediscwhichisrunning with AC motor with **0.847 Amp** current
- It means for electromagnets minimum current required is **0.847A** and maximum we can select as per requirement

2.7 MAGNETIC FIELD TO BRAKE THE DISC

- F = v.B2.A / (p/t)

  Where
- *v=velocity of the disc =2.5m/s (Assumed)*
- B=magnetic field = μ0. H
- *μ0 – Relative permeability of the air =* ***1.257 x 10^{-6}H/m***
- H=strength of the magnetic field = (I×N)/L
- *I=current flowing through coil A =1.2A (Since current ≥0.8A)*
- *N= number of turns =1200(Assumed)*
- *L=length of the coil = 10m(Assumed)*
- H=(1.2*1200)/10000 = 0.144 (Amp-turns)/meter
- B= 1.257 x 10^{-6} x 0.144 = 0.181 x 10^{-6}
- A=Area of the magnetic patch = π x 10^2 = 0.3142 m^2

  Where
- *Considering the magnet diameter = 20mm*
- *R = D/2= 10mm*
- *P=Volume resistivity=1.68 x 10^{-8}Ω-m (Wire winding is copper)*
- *T =Thickness of the disc= 5m So*
- *Finally force required equation becomes:*
- *F=v.B2.A/(P/T)*
- = (2.5*0.181*10^-6*2*0.3142 m^2)/(1.68*10^-8 ohm m/5)

3 MERITS AND DEMERITS

3.1 Merits

- Problems of drum twisting at generally differing temperatures. Which is regular for rubbing brake

drums to surpass 500°C surface temperatures when subject to overwhelming braking requests, and at temperatures of this request, a decrease in the coefficient of contact ('brake blur') all of a sudden happens.

- This is decreased fundamentally in electromagnetic plate slowing mechanisms.
- Potential danger of tire weakening and blasts because of erosion is killed.
- There is no compelling reason to change brake oils normally.
- There is no oil spillage.
- The functional area of the retarder inside the vehicle anticipates the immediate impingement of air on the retarder brought about by the movement of the vehicle.
- he retarders help to expand the life expectancy of the standard brakes and keep the ordinary brakes cool for crisis circumstance.
- The electromagnetic brakes have great warmth scattering productivity inferable from the high temperature of the outside of the plate which is being cooled.
- Due to its exceptional mounting area and warmth scattering instrument, electromagnetic brakes have preferable warm powerful execution over standard rubbing brakes.
- Burnishing is the wearing or mating of contradicting surfaces .This is decreased essentially here.
- In the future, there might be deficiency of unrefined petroleum, henceforth results, for example, brake oils will be in much interest. EMBs will defeat this issue.
- Electromagnetic stopping mechanisms will decrease support cost.
- The issue of brake liquid vaporization and solidifying is killed.

3.2 Demerits

- Dependence on battery capacity to invigorate the stopping mechanism depletes down the battery a lot quicker.
- Due to left over attraction present in electromagnets, the brake shoe returns opportunity to arrive to its unique position.
- A uncommon spring component should be accommodated the speedy return of the brake shoe.

4. Application

- This rendition of the standard is utilized in two correlative uses of Ampere's circuital law:
- An electric flow goes through a solenoid, bringing about an attractive field. When folding the correct hand over the solenoid with the fingers toward the traditional current, the thumb focuses toward the attractive north post.
- An electric flow goes through a straight wire. Snatching the wire focuses the thumb toward the ordinary current (from positive to negative), while the fingers point toward the attractive transition lines. The heading of the attractive field
- counterclockwise rather than clockwise when seen from the tip of the thumb is a consequence of this show and not a hidden physical wonder. The thumb focuses heading of current and fingers point bearing of attractive lines of power.

5. Conclusion

With every one of the benefits of electromagnetic brakes over grating brakes, they have been generally utilized on substantial vehicles where the 'brake blurring' issue exists. A similar idea is being produced for application on lighter vehicles. The idea structured by us is only a model and should be grown more in view of the previously mentioned inconveniences. These electromagnetic brakes can be utilized as a helper braking framework alongside the grating braking framework to abstain from overheating and brake disappointment. ABS use can be dismissed by basically utilizing a miniaturized scale controlled electromagnetic plate slowing mechanism .These find immense applications in overwhelming vehicles where high warmth scattering is required.

In rail mentors it can utilized in mix of circle brake to bring the trains moving in rapid. At the point when these brakes are joined it builds the life of brake and act like completely stacked brakes. These electromagnetic brakes can be utilized in wet conditions which wipe out the counter slipping gear, and cost of these brake are less expensive than different kinds. Thus the braking power created in this is not exactly the plate brakes if can be utilized as an auxiliary or crisis braking framework in the cars.Electromagnetic braking framework is observed to be increasingly dependable when contrasted with other braking frameworks. In oil braking framework or air braking framework even a little spillage may prompt total disappointment of brakes. While in electromagnetic braking framework as four circle plates, loops and terminating circuits are joined independently on each wheel, even any curl fizzles the brake does not totally

comes up short staying three curl works appropriately. What's more, this framework needs next to no of support. Also, it is discovered that electromagnetic brakes make up roughly 80% of the majority of the power connected brake applications. Electromagnetic brakes have been utilized as strengthening impediment hardware notwithstanding the customary grinding brakes on overwhelming vehicles. The contacts brakes can be utilized less every now and again and in this manner essentially never achieve high temperatures. The brake linings would last extensively longer before requiring support and the possibly "brake blur" issue could be maintained a strategic distance from. This upgraded braking framework helps in compelling braking as well as aides in staying away from the mishaps and diminishing the recurrence of mishaps to a base. Besides the electromagnetic brakes avoid the peril that can emerge from the delayed utilization of brake past their capacity to scatter heat.

6. Future scope

This exploration think about arrangements with electromagnetic-obstruction issue identified with car weight sensor. Correspondingly, the exploration can be done for different electronic parts, installed frameworks, restorative supplies. The impediment of inquire about work is reproduction, in light of MATLAB. The car weight sensor is secured utilizing miniaturized scale strip channel and protecting. Different electronic gadgets can be shielded from Electromagnetic-obstruction.

The brakes are significant for cars, the powerful braking plays a crucial job in mishaps. The majority of the substantial vehicles depend on air or vacuum braking framework. the pneumatic force must be kept up to its limit level, else there is a splendid possibility of gathering a mishap. An inserted framework is created to screen the weight level of air tank utilizing weight sensor. To lessen the impact of EMI on weight sensor we need to ensure the weight sensor utilizing channels and shields.

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