Intelligent Braking System using Electromagnetic Actuators

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Abstract-Our paper is designed to prevent accidents due to loss of control, drunken driving, using circuitry aided by a microcontroller kit. The sensor detect speed of movement of the vehicle and the ultrasonic sensor senses the distance of the object in front of vehicle. Using sensor the system will sense the speed of the vehicle and with the microcontroller, it will calculate the distance required to stop the vehicle to a complete stop for that speed. The system helps if the driver doesn't sense the obstacle and applies the brake at the right time then the microcontroller initiates braking motor to apply the brakes automatically.

1. INTRODUCTION

The Braking System is the most critical system in vehicle. In braking system kinetic energy converted into thermal energy. In electromagnetic brake the coil attracts a steel disc. In electro-magnetic braking system electro-magnetic property is used to apply brakes. In this system electromagnet iron plate, liners, tension spring, stud, disc brake plate are used. Electromagnet consists of wire wound over a soft iron core. This ability of an electromagnet provides a strong magnetic force of attraction.

A. PROBLEM STATEMENT

The statement of the project is "Design & Fabrication of Intelligent braking system" to decrease the rate of accidents caused due to driver's irresponsibility, Alcohol consumption & much more. In our project work we going to solve this solution to this problem by using intelligent braking system.

B. OBJECTIVES

- To manufacture cane sowing machine which can be operated by the single operator.
- To set fertilizer with sowed cane.
- To level the ground in small extent
- To enable the machine for the sowing of several of cane like maize, wheat etc.
- To maintain the same distance between two cane at the time of sowing process.

2. LITERATURE REVIEW

I. LITERATURE REVIEW

Work on braking system was designed and applied on a car to make the driving process safety using embedded system design. Most of the accident occurs due to the delay of the driver to hit the brake, so in this project work braking system is developed such that when it is active it can apply brake depending upon the object sensed by the ultrasonic sensor and speed of vehicle [1]. In Indian scenario normally vehicles are equipped with ABS (Anti-Lock Braking System), traction control, brake assist etc. for driver's safety. This paper focuses on a system known as 'Intelligent braking system' (IBS) which employ several sensors to respond when emergency conditions occur. The system includes an infrared wave emitter provided on the front portion of the car. An infrared receiver is also fitted to receive the signal. The reflected wave gives the distance between the obstacle and the vehicle [2].

A. SCOPE

When in future sensors is used for the detection of alcoholic humans or when parking a car it senses object behind the car and send signal to driver if driver doesn't respond then it automatically stop the car .In this future chances of accident are decrees are prevention in this project. More humans are can saved from accidents when they are drink and drive. In late night cases if driver get sleep then car can go outside of the road and chances of car to strike on the obstacles so driver can gets serious injuries or may death also.

3. DESIGN PROCEDURE

Force Calculation of shaft :

Material selection : -

DESIGNATION	ULTIMATE TENSILE STRENGTH N/mm^2	YEILD STRENGTH N/mm^2
EN 24	800	680

According to ASME code permissible values of shear stress may be calculated form various relations.

$= 0.18 \times 800$

$= 144\ N/mm^2$

OR

$fs_{max} = 0.3\ fyt$

$=0.3 \times 680 \quad =204\ N/mm$

Considering minimum of the above values ;

$\Rightarrow \mathbf{fs_{max} = 144\ N/mm^2}$

Shaft is provided with key way; this will reduce its strength. Hence reducing above value of allowable stress by 25%

$\Rightarrow fs_{max} = 108\ N/mm^2$

This is the allowable value of shear stress that can be induced in the shaft material for safe operation.

TO CALCULATE DRIVE SHAFT TORQUE

Note that torque at the DRIVE shaft is 200 X120 =2400N-mm

$\Rightarrow$ T design = 2.4N-m

Assuming minimum section diameter on input shaft =14mm , Note that this dimension is the smallest section of the main shaft where the lobe plate is mounted, hence,(manufacturing consideration).

$\Rightarrow$ d = 14 mm

$Td = \Pi/16 \ X fs_{act} X\ d^3$

$\Rightarrow fs_{act} = \frac{16\ XTd}{\Pi\ X\ d^3}$

$= \frac{16\ X\ 2.4\ X10^3}{\Pi\ X\ 14^3}$

$\Rightarrow fs_{act} = 4.45\ N/mm^2$

As $fs_{act} < fs_{all}$ $\Rightarrow$I/P shaft is safe under torsional load.

III. PROPOSED DIAGRAM

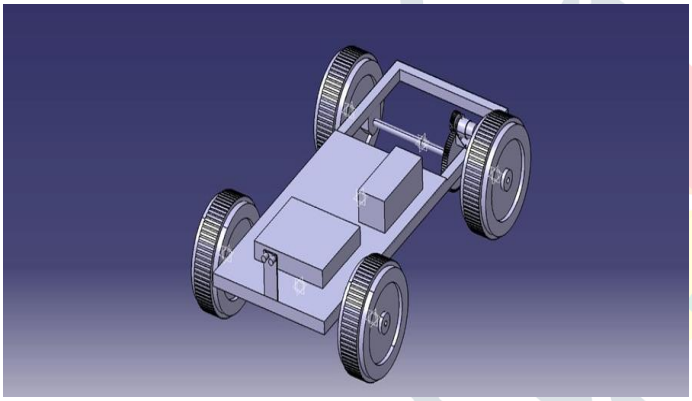

Fig. 1: Experimental setup of Intelligent Braking System

IV. WORKING

Intelligent braking system consist an ultrasonic sensor provided on the front side of the car producing and emitting ultrasonic waves. An ultrasonic receiver also placed on the front side of the car receiving ultrasonic wave signal.. The microcontroller is used to control the speed of the vehicle based on the detection pulse information to push the brake pedal and apply brake to the car sudden for safety purpose. The quick response time provided by the electronic control can be used for shorten the braking distance by introducing advance control of braking system operation. The control of commercial vehicle braking system operation is related not only to vehicle speed but also to yaw moment control and significantly reducing the possibilities of the vehicle rolling over.

a) *Ultrasonic Sensor*

This sensor is fitted in front side of the vehicle. Thissensor gets switched on once the vehicle is startedand the sensor gives out the analog output 3continuously depending on the position of obstacle.Specification:

Range : 0.005-4 m
Resolution: 12 inches
Signal Output: 0-5 V
Excitation Voltage: 12-24 V

b) *Microcontroller*

The whole control of the system is in the hands of ATMEGA- 60 microcontroller. A microcontroller is a computer on a chip. It is a type of microprocessor is cost effectiveness, in contrast to a general purpose microprocessor.

c) *Brake*

Disc brakes will be utilized for breaking the vehicle. Here we use the principle of electromagnetism to achieve friction less braking. This tends to increase the life and reliability of brakes since no friction to less wearing out of brakes. Also it requires less maintenance and oiling. This is an upcoming technological replacement for traditional braking systems.This is less maintenance cost due to no friction and no oiling.

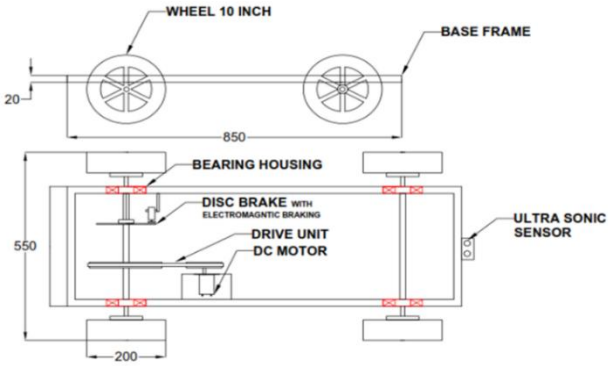

Fig.2:Line diagram Intelligent Braking System

NOMENCLATURE

Table No. 1: Nomenclature

Sr. No	Description
M.S	Mild Steel
D	Diameter of shaft
Fs	Shear stress
T	Torque
d	Inner diameter of bearing
D	Outer diameter of bearing
P	Power
L	Life of bearing
C	Dynamic Capacity

III. CONCLUSION

The system is working efficiently in both modes forward and reverse direction. When the sensor senses any obstacle behind and in front of the vehicle, it sends signals to the control unit which allows the vehicle to stop the running wheel. Thus we have an "intelligent braking system" which helps in understanding how to achieve low cost automation.

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