DESIGN OF SOLAR POWERED INTELLIGENT BRAKING SYSTEM WITH PNEUMATIC BUMPER

Rohit Khadatkar[1], Pritish Giripunje[2], Devesh Yerne[3], Swapnil Khaparde[4], Rushabh Dhanwant[5], Prof. Mrs. S.G. Bawane[6]

[1,2,3,4,5]UG Student, Department of Mechanical Engineering, KDK College of Engineering, Nagpur, India
[6]Assistant Professor, Department of Mechanical Engineering, KDK College of Engineering, Nagpur, India

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Abstract - *In our project we come with inventive idea about intelligent braking system implementing with pneumatic bumper. The system comes up with solar plate that works on Non-conventional energy source so that this system also works on up coming solar vehicle which is future of automobile industry. The system is presented using prototype model for analyzing its various parameters and limitation for daily utilization. Intelligent braking system with application extended pneumatic bumper is the safest way to protect passenger from rough motion and harm. The main motive of this project is to protect passengers from the object that suddenly comes in way of vehicle and prevent the collision of obstacle with vehicle. Here ultrasonic sensor plays the crucial role for detecting the obstacle and activation of pneumatic bumper. Design and application of this braking system depends on produce capabilities of sensors and pneumatic bumper.*

Key Words: **Ultrasonic sensor, pneumatic bumper, solar, road safety.**

1.INTRODUCTION

The number of vehicle on road are increasing rapidly therefore chances of road accident also increases. The road accident are major problem in India especially in urban areas. According to report of Ministry of Road transport and Highways, Total number of accident on Road are 4,49,002 and 1,51,113 person are been killed due to road accident by the year of 2019. The braking system of commercial vehicle are having higher priorities. The Small error in braking System can lead to major accident. In our project we fabricate the prototype model of intelligent braking System That works on solar energy so that it can able to work in upcoming solar vehicle.

2.METHODOLOGY

2.1 Factors Considered

Factor considered in designing the System are:

- ➢ Braking distance
- ➢ Distance of obstacle in front Speed of vehicle
- ➢ Speed of vehicle

- • Braking Distance: It is distance between the point at which brakes are applied and the point at the vehicle completely stops

The formula of braking distance is given by,

Braking distance = $V^2/2\mu g$

Where ,

V= Velocity of the vehicle (m/s)

μ = Friction coefficient of road = 0.8

g = Acceleration due to gravity = 9.81(m/s²)

Velocity (km/hr)	Braking distance (m)
60	17.69
50	12.28
40	7.86
30	4.42

- • Distance of obstacle: The distance of obstacle may be it parked or moving vehicle is sensed by IR sensor and signal is fed to relay circuit

- • Speed of Vehicle: Braking distance of vehicle is extensively depends on speed of vehicle

2.2 Working Principle

An Proximity Sensor is fixed over in front of vehicle. 10 Watt Powered solar plate provide power to the whole circuit. As Solar plate connected to battery using MPPT (Maximum power point Tracker) charges battery. The speed of vehicle and distance of obstacle in front of vehicle calculated by proximity sensor gives real time input to the relay circuit. As soon as sensors detect the stationary or moving vehicle or obstacle in front of , if driver does not take necessary action or does not applied the brake of vehicle by the time relay circuit activate and it stops the DC Gear motor. Control flow valve is also gets activated and it supplies a required quantity of air in pneumatic cylinder. The pressure is built inside a cylinder which tends to push a rod outward and it avoid collision with the other vehicle.
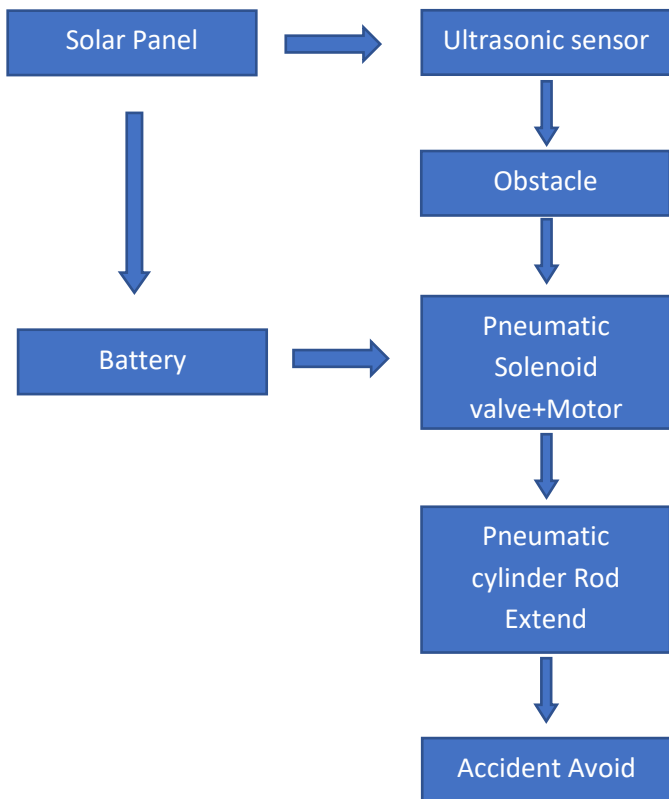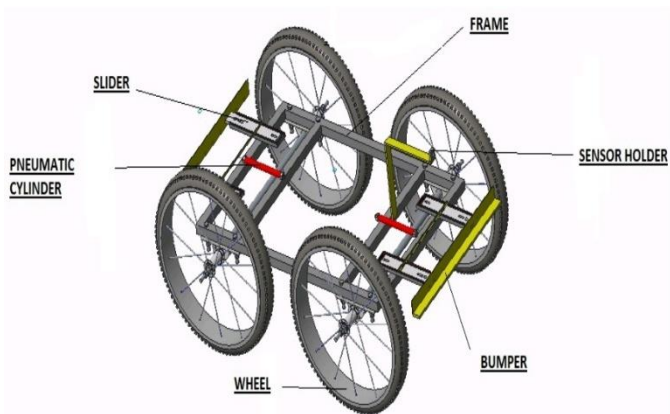
Fig1: Process Flow Chart

Fig2: Prototype 3D Model

System is implemented with pneumatic cylinder, control flow valve and proximity sensor for the working system. The proposed prototype 3D model is as follows:

3. COMPONENTS USED

3.1 Solar Panel

We use commonly used solar panel for charging a battery, the energy is supplied using solar panel. By using solar charge converter the battery gets charge.

Specification:

Max Rated Power : 10 watt

Voltage at max power : 17.3 volts

Current at max power: 0.59 Amp

Open circuit voltage: 21.8 volts

Short circuit current: 0.64 Amp

3.2 Pneumatic Cylinder

Pneumatic cylinder is mechanical device operates on compressed air. The compressed air gives require fore to piston rod to give it a reciprocating linear motion. A piston of pneumatic cylinder can be a rod type and disc type.

3.3 Control Valve

Directional control valve are most usable parts in hydraulic machines. It controls a flow of compressed air or , basically it permits a flowing fluid into different parts of machines from one or more source. Control valve contain a spool that can be mechanically or electrically controlled which permits fluid inside a cylinder.

3.4 DC Gear Motor

We used 60 RPM 12 Volts DC gear motor commonly used for robotic application. It is very easy to use and available in all standard sizes.

Specification:

60RPM 12V DC motors with Gearbox

3000 RPM base motor

6 mm shaft diameter with internal hole

125gm weight

Same size motor available in various rpm

2kgcm torque

No-load current = 60 mA(Max),

Load current = 300 mA(Max)

3.5 Relay Switch

Relay is electromagnetic switch that open or close the contact to perform operation of electrical circuits. It detects a unbearable and unwanted signal with an particular area and gives signal to circuit breaker to cut off contact with affected area. When the sensor senses a unwanted object in front of vehicle it sends signal to a relay circuit. It excite electromagnetic field which results in producing temporary magnetic field. This magnetic field move a armature of relay leads to stopping a motor and activate pneumatic cylinder.
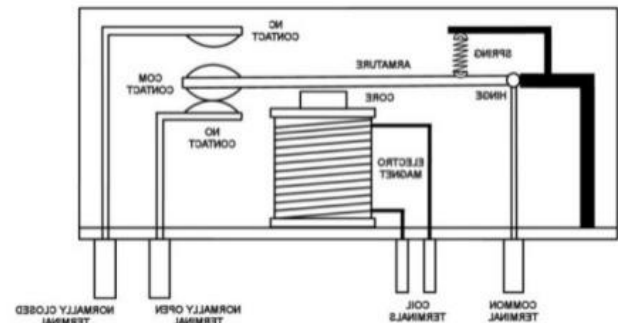

Fig3: Line diagram of Relay

3.6 IR Sensor

IR sensor commonly known as infra-red sensor is most popular and widely used sensor. It detects a obstacles in front of vehicle. This sensor gives real time results with accuracy.

4. FUTURE SCOPE

Intelligent braking system IBS will provide a comfort and safe driving to both passenger and driver. When driver unable to apply brake or do not judge a proper distance between obstacle and vehicle it automatically apply a brakes and prevent a vehicle from collision. In coming days the number of vehicle on the road will increase so this system is must require for vehicles to save human lives and economic loss.

5. Conclusion

The prototype model of intelligent braking system is successful. This system give glimpse to the future of automobile industry. This system can reduce a percentage of road accident by avoiding a collision. When this system integrated with another smart system can be more impactful for avoiding a accident.

6. REFERENCES

1. Abhay Bendekar, Abhijit Samanta, Arif Upletawala, Anup Chavan, "Intelligent Reverse Braking System by using Artificial Neutral Networks" International Journal of Engineering and Management Research, ISSN (Online): 2250-0758, ISSN (Print): 2394-6962, Volume-6, Issue-2, March-April 2016

2. Arun Chand, "A Case Study of Road Accidents in Kerala During 2010 to 2016" International Journal of Innovative Research in Science, Engineering and Technology, ISSN (Online) : 2319 – 8753, ISSN (Print) : 2347 – 6710, Volume 6, Special Issue 4, March 2017

3. Venkatesh Babu, R. Hariharan, "Fabrication of Sensor Operated Intelligent Braking System" International Journal of Pure and Applied Mathematics, ISSN: 1311-8080 (printed version); ISSN: 1314-3395 (on-line version), Volume 116, No. 14 2017, 307-313

4. Rajyalakshmi, M., Kumar, B. K., Vaibhav, A. K., Khan, M. A., & Sai, B. S. Design and Fabrication of Intelligent Braking System.

5. Deshmukh, A., Lande, S., Korde,A.,Mahale, M., Darade, P.(2018). A Review on Automatic (Intelligent) Braking System with Gas Sensor and Alcohol Detector. International Journal for Scientific Research & Development.6 (2).

6. Francis,A., Antoo, A., John, J., Sagar,A., Sreejith.(2018). Intelligent Braking System for Automobiles. International Research Journal of Engineering and Technology.5(3).