

Accident Prevention System by Automatic Pneumatic Bumper

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Abstract - In today's world vehicle accident is a major problem. To avoid this we have developed an automatic impact reducing system in our project. The system is based on intelligent electronically control system known as "Automatic pneumatic-bumper system". Automatic pneumatic bumper system uses infrared sensor (IR), which is used to sense the vehicle coming is front of our vehicle which is responsible for an accident. As soon as any object or vehicle is sensed by the sensor the sensor sends feedback signal to engine through the relay control to activate the Solenoid Valve which allows the flow of compressed air to the cylinder. During the working of Automatic Pneumatic Bumper system simultaneously the driver also try to stop the vehicle by applying brake pedal which somewhat slows down the engine. The compressed gas flowing through the solenoid valve will activate the cylinder which in turn activates the Bumper. This system provides pre-crash safety to the vehicle. As well as it improves the response time of vehicle braking to keep safe distance between the vehicles. By using this system we can obtain control over the speed of vehicle in short distance

Key Words: Automatic Pneumatic Bumper System, IR Receiver, IR Transmitter, Electromechanical System, Solenoid Valve

1. INTRODUCTION

India is the developing country. India is a densely populated country with the vehicle usage being really diverse. While the available resources which are used to run the vehicles like road quality & new technologies in vehicles are being developed to avoid accidents. The number of people expired during vehicle accidents is very large as compared to the other causes of death. Though there are different causes for accidents but proper technology of braking system and technology to reduce the damage during accident should be developed. Hence there is need of Impact Reduction system to prevent the accidents and to reduce the damage to vehicle and also the driver. To achieve this goal, we design this Automatic Pneumatic Bumper system. Our main aim is to design & develop automatic control system based on intelligent

electronic control automotive bumper activation system called "AUTOMATIC PNEUMATIC BUMPER SYSTEM".

2. OBJECTIVES

The future of any industry is more than just developing new technology. It is integrating the approach towards achieving safety. Impact Reducing System approach represents considerable shift from the traditional approach to safety, by considering safety in terms of, Firstly avoiding the possibility of accidents, and secondly, protecting occupants when a crash is unavoidable, we can prevent more accidents, save more lives, decrease material damage to vehicles and reduce medical costs.

Following are the main objectives of Impact Reduction System with Pneumatic Bumpers:

- To ensure the braking of vehicle in time.
- To increase the crashing distance during accident.
- To increase the safety during pre-crash.
- To increase external safety to vehicle body.
- To decrease the level of passenger injury by use of external vehicle safety device.
- To reduce the requirement of internal safety devices like air bags.

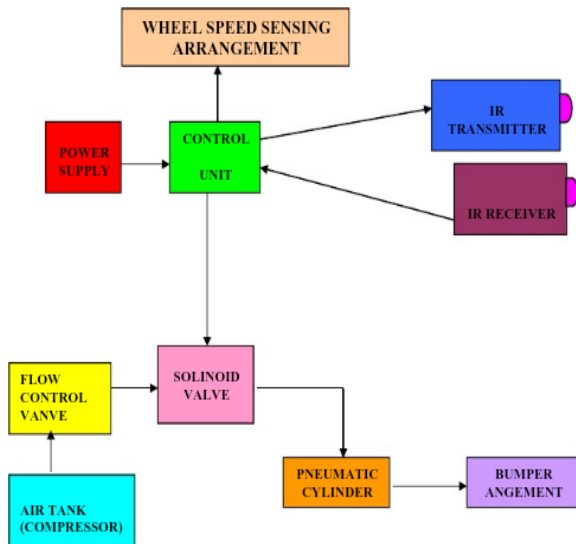
3. CURRENT TRENDS

In conventional vehicles there are different mechanism operated for braking system like hydraulic, pneumatic, or mechanical system. But in all these braking mechanisms the input signal is to be given directly from the driver by applying the brake pedal. Thus, braking of vehicles is totally manual operated. So, if the driver fails to see the obstacle in front of his driving vehicle or fails to apply proper braking force on the brake pedal, he may lose the control of his vehicle, leading to accident. Also the driver may not able to pay complete attention when driving at night. So there are many chances of accidents. Urgent application of brakes may also result in imbalance by skidding of the tyres of the vehicle.

So, There are no arrangements to prevent or minimize the damage on the vehicle or the passengers.

4. CONSTRUCTION AND WORKING

As this system is used at the time of emergency during work. In normal travelling of vehicle this system can be switched of with the help of a switch and it will not affect the normal working of the vehicle



When any obstacle, human, animal or vehicle comes in front of the vehicle then the installed infrared sensor senses the obstacle. The range of distance between the vehicle and obstacle is variable. This range is varied according to the density of vehicles or humans on road. The received signal by IR sensor is provided to the control unit. When any obstacle, humans, animals or vehicle is came in front of the vehicle then the installed infrared sensor senses that obstacle. The range of distance between the vehicle and obstacle is variable. This range is varied according to the density of vehicles or humans on road. The received signal by IR sensor is provided to the control unit. The control unit then activates the Solenoid Valve which will allow the flow of compressed air through it. Compressed air is provided as an Input to the Solenoid Valve which has two Outputs both connected to the Double Acting Pneumatic Cylinder.

This pneumatic force of the compressed air through the Solenoid Valve is transferred to the Bumper System. The pneumatic force provides forward motion to the Bumper and it also retracts the bumper slowly reducing the impact.

Hence, when the external body is kept safe, there will be no chance of internal damage.

4. COMPONENTS AND DESCRIPTION

A. DOUBLE ACTING PNEUMATIC CYLINDER

The cylinder is a Double acting cylinder, which means that the air pressure operates on the forward and backward

strokes. The air from the compressor is passed through the solenoid valve which controls the pressure to the required amount by adjusting its knob.



Fig. Double acting pneumatic cylinder

TECHNICAL DATA: Double Acting Pneumatic Cylinder with dimensions 20x60

B. SOLENOID VALVE



Fig. Solenoid Valve

It is a flow control device used in pneumatic system to change the direction of air flow. Solenoid valve is used in automatic bumper system to control the compressed air towards the pneumatic cylinder during the extraction of the bumper. Different types of solenoid valves are available in market. But most common is 1/2 solenoid valve and 2/5 solenoid valve. 1/2 means one way operation and two ports and 2/5 means two way operation and five ports.

C. AC MOTOR



Fig. Electric Motor

An electric motor is an electrical machine that converts electrical energy into mechanical energy. Electric motors are used to produce linear or rotary force (torque).

Gears will be attached to the motor which will help driving the chain drive which in turn will move our vehicle.

D. IR SENSOR UNIT



Fig. IR Sensors

This unit consists of two components : IR Receiver and IR Transmitter.

The IR transmitter transmits the signal from sensor. The IR Receiver after detecting any object sends signal to the control unit in order to activate the Solenoid Valve.

E. RELAY

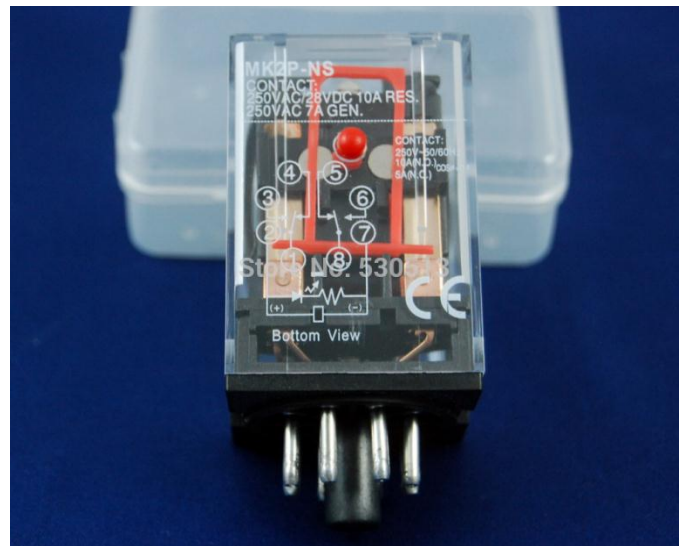


Fig. Relay

It is a control unit having certain specifications. This control unit acts according to the sensor signal to activate the Bumper with the help of compressed air through solenoid valve.

5. FABRICATION

A. FRAME WITH AXLE AND WHEELS

Initially frame is constructed in rectangular shape by welding angle bar. Then the four angle bars are welded to the main rectangular frame in order to mount all other components.

Pedestal bearings are mounted on both end of the axle to give support to the axle and reduce frictions for rotation. The wheels are mounted on both ends of the axle as shown in figure.

We have used Nylon Wheels here.



B. ASSEMBLING ALL THE COMPONENTS

All the components are assembled at their proper position. A proper mounting method is used to mount the components. Wiring can be done later.



Fig. Final Assembly

6. ADVANTAGES AND LIMITATIONS

A. ADVANTAGES

- 1) Simple construction of the prototype vehicle.
- 2) It provides safety to passengers in the vehicle as well as to the vehicle body.
- 3) It reduces accident intensity and impact.
- 4) This system increases the response time of vehicle braking by keeping safe distance between two vehicles.
- 5) The design also increases the crashing distance by providing extra space due to extension of the bumper, decreasing the chances of injuries to commuters.

B. LIMITATIONS

- 1) IR sensor range is small.
- 2) Proximity sensors may sense obstacle due to presence of dirt.
- 3) Sensors may stop working due to random reasons.

7. CONCLUSION

Behind the designing of this system, our main aim is to improve the technique of prevention of accidents and also reducing the hazard from accidents like damage of vehicle, injury of humans, etc.

This project work has provided us an excellent opportunity and experience, to use our limited knowledge. We have gained practical knowledge regarding, planning, purchasing, assembling and machining while doing this project work.

In conclusion remarks of our project work, we have developed an "ACCIDENT PREVENTION SYSTEM BY AUTOMATIC PNEUMATIC BUMPER" which helps to achieve low Impact damage. We are proud that we have completed the work with the limited time successfully. We have done the project to our ability and skill making maximum use of available facilities and we are able to understand the difficulties in maintaining the quality. We have also observed that the prototype manufactured is working with satisfactory conditions and our work is able to achieve all the objectives which are necessary.

ACKNOWLEDGEMENT

It indeed is a great pleasure and moment of immense satisfaction for us to have successfully completed the project of "Accident Prevention System by Automatic Pneumatic Bumper" and we take the opportunity to thank all those who provided us inspiring guidance and encouragement, we take the opportunity to thanks those who gave us their indebted assistance.

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