International Journal of Scientific Research in Science, Engineering and Technology
Print ISSN: 2395-1990 | Online ISSN : 2394-4099 (www.ijsrset.com)
doi : https://doi.org/10.32628/IJSRSET

Automatic Pneumatic Bumper System

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Article Info
Volume 9, Issue 3
Page Number : 258-263
Publication Issue :
May-June-2022
Article History
Accepted : 10 May 2022
Published: 24 May 2022

ABSTRACT
The technology of pneumatics has gained tremendous importance in the field of workplace rationalization and automation from old-fashioned timber works and coal mines to modern machine shops and space robots. It is therefore important that technicians and engineers should have a good knowledge of pneumatic system, an Ultrasonic operated valves and accessories. The aim is to design and develop a traffic control system based on an intelligent electronically controlled automotive bumper activation system is called "automatic pneumatic bumper" also incorporated with smart braking system. This system is consists of ultrasonic transmitter and Receiver, ultrasonic circuit, Control Unit, Pneumatic cylinders, wheels, brake drums and bumper system. The ultrasonic sensor is used to detect the obstacle. There is any obstacle closer to the vehicle, the control signal is given to the bumper activation system. The pneumatic bumper system is used to product the man and vehicle.

Keywords: Ultrasonic sensor, Pneumatic system, automotive bumper

I. INTRODUCTION

We have pleasure in introducing our new project AUTOMATIC PNEUMATIC BUMPER which is fully equipped by Ultrasonic sensor circuit and pneumatic bumper activation circuit. Vehicles accident is most common. The system include sensor arrangement for sensing an object in front of the vehicle that generates an object recognition single unit it sense an object within the range the bumper opens and protect the car from damage. The sensor arrangement include passive Ultrasonic sensor or reflected pulse sensor such as radar sensor on the front a control generates an accident prevention response signal and receiving an object recognition signal from the sensor arrangement. The project involves whenever the obstacle comes in front the car. The sensor senses the obstacle and command to the bumper extended out by which we can avoid damage of car .The road accident is caused by human. The cause of road accident is rash driving, over speed, and caused of injury and death are non-wearing seat belt. There are various steps taken by the experts to reduce the probability of accident. The pneumatic bumper system is used to product the man and vehicle the bumper activation system is only activated the vehicle speed above 40-50 Km per hour this vehicle speed is sensed by the proximity sensor and

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this signal is given to control unit and pneumatic bumper activation system.

II. SYSTEM BLOCK DIAGRAM

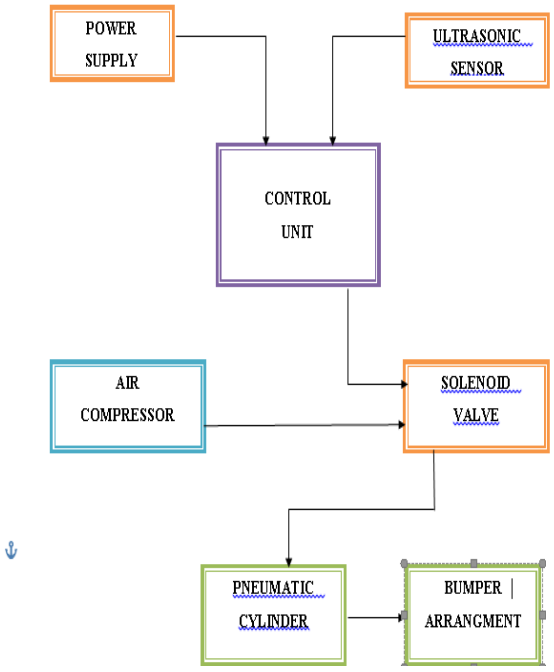

Fig1. Block Diagram Of System

III. SYSTEM DESCRIPTION

We propose an automated, pneumatic based vehicle bumper system project that uses sensor based system with pneumatic operated bumper in order to avoid car dents and scratches. Our system uses a pneumatic operate bumper frame that is supported using rods on 2 other sides. Our system uses a sensor based system that is used to detect if an object is just 10cm away. If any object comes that close the system pushes the pneumatic bumper to absorb the impact and stop it from coming too close to vehicle body. The system uses pneumatic based frame mounted on a supporting bed with 4 wheels used to demonstrate as a vehicle. We use pipes and valves in order to operate a piston which is used to control the bumper movement. This system is monitored and triggered by a sensor based electronic system that monitors for obstacles and instantly alerts the controller circuit which then operates the valves to operate bumper movement accordingly .Initially starting with air compresses, its function is to compress air from a low inlet pressure (usually atmospheric) to a higher pressure level. This is an accomplished by reducing the volume of the air .Air compressors are generally positive displacement units and are either of the reciprocating piston type or the rotary screw or rotary vane types. The air compressor used here is a typically small sized, two-stage compressor unit. It also consists of a compressed air tank, electric rotor and pulley drive, pressure controls and instruments for quick hook up and use. The compressor is driver by a 10HP motor and designed to operate in 145 – 175 PSI range. If the pressure exceeds the designed pressure of the receiver a release value provided releases the excesses air and thus stays a head of any hazards to take place. The compressed air pass through the solenoid valve and it is admitted into the front end of the cylinder block. The air pushes the piston for the cutting stroke. At the end of the cutting stroke air from the solenoid valve reaches the rear end of the cylinder block. The pressure remains the same but the area is less due to the presence of piston rod.

Initially starting with air compresses, its function is to compress air from a low inlet pressure (usually atmospheric) to a higher pressure level. This is an accomplished by reducing the volume of the air. The stored air from compressor is passed through an air fitter where the compressed air is filtered from the fine dust particles. However, before the suction of air into compressor a filter process take place, but not sufficient to operate in the circuit here the filter is used. Then having a pressure regulator where the desired pressure to the operated is set. Here a variable pressure regulator is adopted. Through a variety of direction control value are available, a hand operated solenoid Valve with control unit is applied. The solenoid valve used here is 5 ports, 3 positions. There are two exhaust ports,

two outlet ports and one inlet port. In two extreme positions only the directions can be changed while the Center is a neutral position and no physical changes are incurred. The 2 outlet ports are connected to an actuator (Cylinder). The pneumatic activates is a double acting, single rod cylinder. The cylinder output is coupled to further purpose. The piston end has an air horning effect to prevent sudden thrust at extreme ends. The compressed air from the compressor reaches the solenoid valve. The solenoid valve changes the direction of flow according to the signals from the timing device.

CIRCUIT DIAGRAM

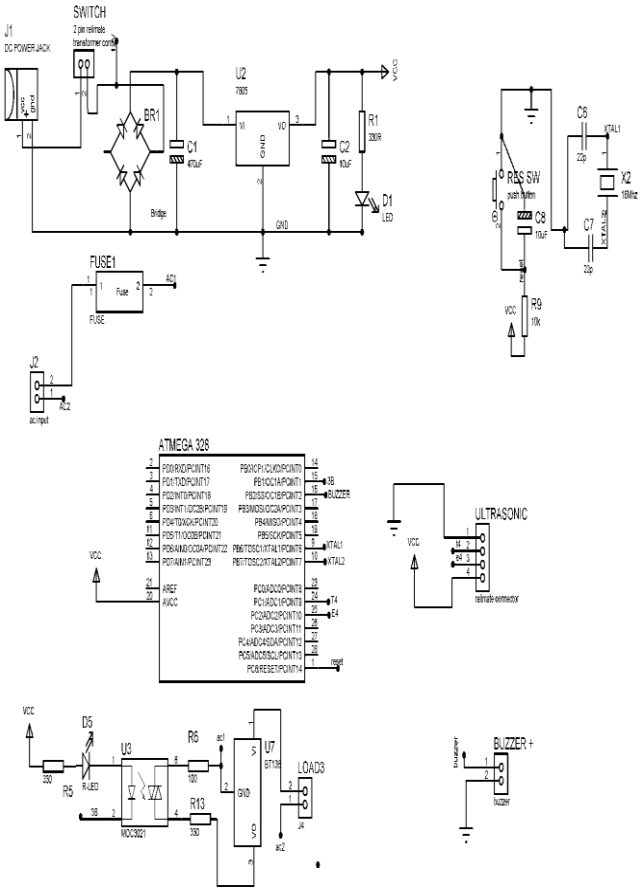

Fig 2. Circuit Diagram

IV. HARDWARE REQUIREMENT

4.1 ULTRASONIC SENSOR

Fig3. Ultrasonic Sensor (HC-SR04)

HC-SR04 is an ultrasonic ranging module that provides 2 cm to 400 cm non-contact measurement function. The ranging accuracy can reach to 3mm and effectual

Trigger Pulse Input

Echo Pulse Output

0V Ground

Timing diagram The Timing diagram is shown below. You only need to supply a short 10uS pulse to the trigger input to start the ranging, and then the module will send out an 8 cycle burst of ultrasound at 40 kHz and raise its echo. The Echo is a distance object that is pulse width and the range in proportion .You can calculate the range through the time interval between sending trigger signal and receiving echo signal. Formula: uS / 58 = centimeters or uS / 148 =inch; or: the range = high level time * velocity (340M/S) / 2; we suggest to use over 60ms measurement cycle, in order to prevent trigger signal to the echo signal A short ultrasonic pulse is transmitted at the time 0, reflected by an object. The senor receives this signal and converts it to an electric signal. The next pulse can be transmitted when the echo is faded away. This time period is called cycle period.

4.2 CONTROL UNIT:-

Control unit is hart of project in this project control unit gives input from ultrasonic sensor and processing on it than gives single to Solenoid valve.

Fig4. Control Unit.

4.3 SOLENOID VALVE:-

Fig5. Solenoid Valve

The 5/2-way pneumatic valve has five connection ports and two states. It has one pressure port (P,1), two ports (A,2) and (B,4) that connect to the device that needs to be controlled, and two exhaust ports (EA,3) and (EB,5).The two states of the valve are:

Pressure port (P,1) connects to port (A,2), while port (B,4) vents through exhaust port (EB,5)

Pressure port (P,1) connects to port (B,4), while port (A,2) vents through port (EA,3).

4.4 PNEUMATIC CYLINDER:-

Mechanization is broadly defined as the replacement of manual effort by mechanical power. Pneumatic is an attractive medium for low cost mechanization particularly for sequential (or) repetitive operations. Many factories and plants already have a compressed air system, which is capable of providing the power (or) energy requirements and the control system (although equally pneumatic control systems may be economic and can be advantageously applied to other forms of power). The main advantage of an all pneumatic system are usually economic and simplicity the latter reducing maintenance to a low level. It can also have outstanding advantages in terms of safety.

Fig6. Pneumatic Cylinder

4.5 AIR TANK (COMPRESSOR):-

Fig7. Air Tank Compressor

Pneumatic systems operate on a supply of compressed air, which must be made available in sufficient quantity and at a pressure to suit the capacity of the system. When pneumatic system is being adopted for

the first time, however it wills indeed the necessary to deal with the question of compressed air supply. The key part of any facility for supply of compressed air is by means using reciprocating compressor. A compressor is a machine that takes in air, gas at a certain pressure and delivered the air at a high pressure. Compressor capacity is the actual quantity of air compressed and delivered and the volume expressed is that of the air at intake conditions namely at atmosphere pressure and normal ambient temperature. Clean condition of the suction air is one of the factors, which decides the life of a compressor. Warm and moist suction air will result in increased precipitation of condense from the compressed air. Mechanization is broadly defined as the replacement of manual effort by mechanical power. Pneumatic is an attractive medium for low cost mechanization particularly for sequential (or) repetitive operations. Many factories and plants already have a compressed air system, which is capable of providing the power (or) energy requirements and the control system (although equally pneumatic control systems may be economic and can be advantageously applied to other forms of power). The main advantage of an all pneumatic system are usually economic and simplicity the latter reducing maintenance to a low level. It can also have outstanding advantages in terms of safety.

V. RESULT

Our main aim behind designing and manufacturing of this project was to reduce the number of accidents on the road, thus ensuring the safety of the passenger's .Our project also reduces the damage caused to the vehicle during a collision with the help of the pneumatic bumper. Compensating for the shortcomings of other already available systems, our work is not only of good feasibility and high reliability but also cost effective. Our work on this project has provided us with great experience, planning and making use of our practical and theoretical knowledge. We are proud that we have completed the work with the limited time successfully. The prototype we designed and manufactured is working with satisfactory conditions and is able to achieve all the objectives which we hoped to achieve

VI. HARDWARE RESULT

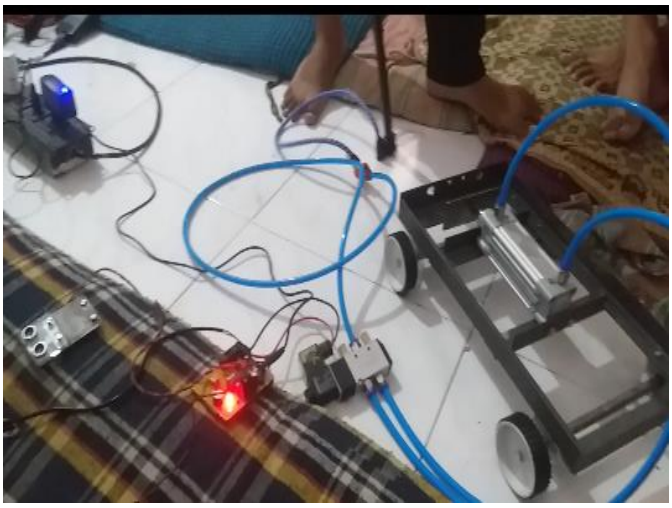

Fig 8. Hardware Result

VII. FUTURE SCOPE

We can implement the traditional medium used for Brake system (compressed air) can be now controlled with the speed and precision offered by modern electronic abilities. The previous research study clearly explains that Ultrasonic sensor and microcontroller action plays vital role in determining intelligent braking torque generated by brake actuation assembly Our future work deals with incorporating this system with various different features to provide enhanced protection by the intelligent braking system in real time application. For that, some of the possible changes are:

1) Regular bumpers can be replaced by hydraulic bumpers.

2) Infrared sensors can sense eye blinking and give signal to solenoid valve when driver sleeps.

3) Limit switch can be used to limit the minimum speed above which the system gets triggered.
4) PIC can be implemented in system for further modifications like gradual slowdown of vehicle.
5) Bumper design can further be enhanced to act as external air bags.
6) With some modifications, the project can be used with timer circuits so as to apply brakes and extend the bumper after a delay of few milliseconds so that the bumper does not extend unless the vehicle just reaches the crashing distance.

VIII. CONCLUSION

Our main aim behind designing and manufacturing of this project was to reduce the number of accidents on the road, thus ensuring the safety of the passenger's .Our project also reduces the damage caused to the vehicle during a collision with the help of the pneumatic bumper. Compensating for the shortcomings of other already available systems, our work is not only of good feasibility and high reliability but also cost effective. Our work on this project has provided us with great experience, planning and making use of our practical and theoretical knowledge. We are proud that we have completed the work with the limited time successfully. The prototype we designed and manufactured is working with satisfactory conditions and is able to achieve all the objectives which we hoped to achieve

VIII. REFERENCES

[1]. A.Arunkuma , T. Muthumani , V. Balasubramani "DESIGN AND FABRICATION OF ANTI ROLL BACK SYSTEM IN VEHICLES USING DRUM & SHOE MECHANISM" ISSN: 0976-1353 Volume 12 Issue 3 –JANUARY 2015.

[2]. Knorr-Bremse systems for Commercial Vehicle systems India Pvt. Ltd. (KBI-CVs)" ANTIROLL BACK SYSTEM FOR COMMERCIAL VEHICLES"

[3]. V. P. Bondaletov, "Pawl Motion in Free-Running Ratchet Gear at High Drum Speeds", ISSN 1068-798X, Russian Engineering Research, 2008, Vol. 28, No. 9, pp.

[4]. J. A. Kennedy, L. L. Howell, "The Drum & Shoe Ring (RaPR) Mechanism", 12th IFToMM World Congress, Besançon (France), June18-21, 2007.

[5]. Transport Research Wing, "Road Accidents in India", Ministry of Road Transport and Highways, India, 2011.

[6]. The New In-Depth, At-the-Scene, Accident Investigation Database in India by N.Rameshkrishnan, A. Sathyakumar, S.Balakumar, A. M. Hassan, R. Rajaraman, J. Padmanaban.

[7]. Erik Coelingh, etal, "Collision Warning with Auto Brake", Sweden, ppn: 07-0450.

Cite this Article
Chattar Ashis , Fatakade Pratik, Raykar Rushikesh, More Aishwarya, Prof. Divekr S. N, "Automatic Pneumatic Bumper System", International Journal of Scientific Research in Science, Engineering and Technology (IJSRSET), Online ISSN : 2394-4099, Print ISSN : 2395-1990, Volume 9 Issue 3, pp. 251-254, May-June 2022.
Journal URL : https://ijsrset.com/IJSRSET12293103