International Research Journal of Innovations in Engineering and Technology (IRJIET)

ISSN (online): 2581-3048

Volume 6, Issue 4, pp 108-111, April-2022

https://doi.org/10.47001/IRJIET/2022.604023

Automatic Pneumatic Bumper for 4 Wheeler

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***Abstract* - The technology of pneumatics has gained tremendous importance in the field of workplace rationalization and automation from old-fashioned timber works and coalmines to modern machine shops and space robots. It is therefore important that technicians and engineers should have a good knowledge of pneumatic system, air operated valves and accessories. The aim is to design and develop a control system based an intelligent electronically controlled automotive. Bumper activation system is called "AUTOMATIC PNEUMATIC BUMPER" This system is consists of Ultrasonic transmitter and Receiver circuit, Control Unit, Pneumatic bumper system. The Ultrasonic sensor is used to detect the obstacle. There is any obstacle closer to the vehicle (within 4 feet), the control signal is given to the bumper activation system. The pneumatic bumper system is used to product the man and vehicle. This 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 this signal is given to the control unit and pneumatic bumper activation system. In a modern world, the technologies are developed in the field of automation that integrates heavy growth of vehicles for public transport. According to Indian road transport situation the Accident are major problem to the Vehicles that considered for Modern braking system in recent years. This project aims to design and develops the technology of break activation system which is electronically controlled and automatically operating the bumper protection mechanism by Pneumatic Power. Our project consists due to the reliable of Pneumatic system and this is used to activate the Bumper when the Ultrasonic sensor indicates the Presence of Obstacles / Human / Any Vehicles in specified range of distance. Simultaneously the control unit transmits the Signals to apply the brake by Activation of the Solenoid Valve.**

Keywords: Automatic pneumatic bumper, Intelligent Electronic, Technology.

I. INTRODUCTION

The aim is to design and develop a control system based an intelligent electronically controlled automotive bumper activation system is called "AUTOMATIC PNEUMATIC BUMPER". This system is consists of Ultrasonic transmitter and Receiver circuit, Control Unit, Pneumatic bumper system. The Ultrasonic sensor is used to detect the obstacle. There is any obstacle closer to the vehicle (within 4 feet), the control signal is given to the bumper activation system. The pneumatic bumper system is used to protect the man and vehicle. We have pleasure in introducing our new project "AUTOMATIC PNEUMATIC BUMPER", which is fully equipped by Ultrasonic sensors circuit and Pneumatic bumper activation circuit. It is a genuine project which is fully equipped and designed for Automobile vehicles. This forms an integral part of best quality. This product underwent strenuous test in our Automobile vehicles and it is good. Automatic pneumatic bumper is used to prevent the driver and vehicle from collisions. This design converts the impact load into a gradual load. Design has a Ultrasonic sensor which senses the obstacles and receiver which sends the signal to the control unit which has a compressed air cylinder, lever our velocity sensor. Velocity sensor measures the speed. When the speed is above the limit automatic lever opens which the compressed air cylinder which actuate the piston cylinder so the bumper is open bumper has a sleeve on which a spring is attached which converts the impact load into gradual load.

This design came to our mind because the green report of vehicle 2014 shows that more accidents happen due to high speed when vehicle collision happens all impact loads applied but our design converts the impact load into a gradual load which reduce the death rate. Our design provides the total life safety of driver and passenger. Automobile vehicles have become integral part of our lives. With growing number of vehicles on road, the numbers of traffic accidents are also increasing. It is important to prevent the chances of accidents and to protect the passengers when accidents occur. Air bags provide safety, but they are costly. Safety, being a matter of prime importance, cannot be compromised for cost. Hence our attempt is to provide a reliable and safe system at low cost.

Today India is the most important under developed country in the world. India is the largest country in the use of various types of vehicles. As the available resources to run these vehicles like quality of roads, and unavailability of new technologies in vehicles are causes for accidents. The number of peoples which are dead during the vehicle accidents is also very large as compared to the other causes of death. Though there are different causes for these accidents but proper

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technology of braking system and technology to reduce the damage during accident are mainly affects on the accident rates. So today implementation of proper braking system to prevent the accidents and pneumatic bumper system to reduce the damage is must for vehicles. To achieve this system modification goal, design this "Automatic Pneumatic Bumper system". We have pleasure in introducing our new project "Automatic Bumper System for Four Wheelers", which is fully equipped by Ultrasonic sensors circuit and Pneumatic bumper activation circuit. It is a genuine project which is fully equipped and designed for Automobile vehicles. This forms an integral part of best quality. This product underwent strenuous test in our Automobile vehicles and it is good. air, mechanical, etc. But all these braking mechanisms receive the signal or input power directly from the driver so it totally manual operated. When the driver saw the obstacle or any vehicle in front of his driving vehicle, he was irritated or becomes mazy. Due to this the driver fails to give the proper input to braking system and proper working is not occurs. Also the driver may not able to pay the full attention during night travelling so there are many chances to accidents. After the accident occurs, there is no any provision to minimize the damages of vehicles. In currently used vehicles generally bumpers used are of rigid types. These bumpers have specific capacity and when the range of the accidental force is very high then the bumpers are fails and these force transferred towards the passengers. So this system never reduces the damage of both vehicle and passengers. To overcome these unwanted effects design the Automatic Pneumatic Bumpers is important.

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.

II. METHODOLOGY

Design concept generation refers to the actual conceptual design where the design concept is an approximate description of the technology, working principles and form of the product. It has a detailed description on how the product will satisfy and meet customer requirements. Existing design constraints may even be solved by having a good development in the design concept.

For this project, many alternative concepts have been generated. The various generated concepts were then individually evaluated to find the most appropriate concept for the product. The concepts that gave the most advantages were considered as the best concept and a waits further evaluation. The product sketch for the chosen concept was further drafted.

Design concept generation is usually expressed in the form of sketches or rough 3-D model sand often accompanied by a brief textual description for the overall design concepts.

The English word pneumatic and its associate noun pneumatics are derived from the Greek "pneuma" meaning breath or air. Originally coined to give a name to the science of the motions and properties of air. Compressed air is a vital utility- just like water, gas and electricity used in countless ways to benefit everyday life. Pneumatics is application of compressed air (pressurized air) to power machine or control or regulate machines. Simply put, Pneumatics may be defined as branch of engineering science which deals with the study of the behavior and application of compressed air. Pneumatics can also be defined as the branch of fluid power technology that deals with generation, transmission and control of power using pressurized air. Gas in a pneumatic system behaves like a spring since it is compressible. Any gas can be used in pneumatic system but air is the most usual, for obvious reasons. Exceptions are most likely to occur on aircraft and space vehicles where an inert gas such as nitrogen is preferred or the gas is one which is generated on board. Pure nitrogen may be used if there is a danger of combustion in a work environment. In Pneumatic control, compressed air is used as the working medium, normally at a pressure from 6 bar to 8 bar. Using Pneumatic Control, maximum force up to 50 kN can be developed. Actuation of the controls can be manual, Pneumatic or Electrical actuation. Signal medium such as compressed air at pressure of 1-2 bar can be used [Pilot operated Pneumatics] or Electrical signals [D.C or A.C source- 24V – 230V] can be used [Electro pneumatics].

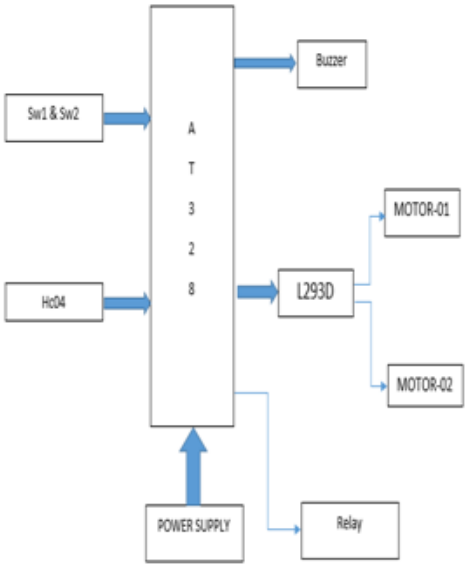

Figure 1: Block Diagram

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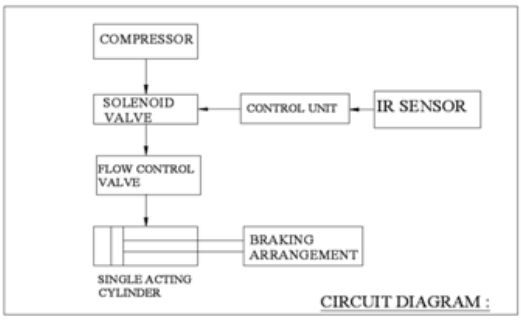


Figure 2: Circuit diagram on automatic pneumatic bumper system

We design a basic frame for a prototype by mild steel channel (L beam), L Channel- MS Angles are L-shaped structural steel represented by dimension of sides & thickness. For e.g. 25x25x3 means, both the sides of angles are 25 mm & thickness is of 3 mm. There are various sizes of angles which are as follows: (there are also equal & unequal angles). Equal angles: - They are angles having both the sides of equal dimensions. For e.g. refer below given diagram, in which both the sides are of dimensions "a".

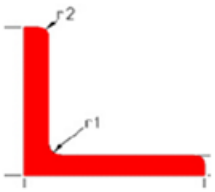


Figure 3: L-angle bar dimensions

By standard available sizes we select the 25 mm so because that will be easily available and have appropriate size for frame.

Calculations for pneumatic system:

Assumption: Maximum force acting on bumper is assumed to be 90N

Considering factor of safety as 1.25, we design bumper for 90x1.25 =112.5N force

Also, pressure used is 6 bars=0.6 N/mm^2

For Bumper:

For out-stroke

F o/s = P x A

112.5 = 0.6x 0.7854 D^2

D2 = 238.73 mm^2

So, D =15.45bmm

Selecting standard value of 20mm bore diameter, we calculate inner diameter.

Assuming In-stroke force to be equal to outstroke force, we assume in stroke force to be 90N.

For factor of safety of 1.25, in stroke force is 90x1.25=112.5N.

For in-stroke,

Piston rod area = $\pi/4$ x d^2

Effective area = $\pi 4$ x (D^2-d^2)

= 0.7854 (202-d^2) mm^2

So,

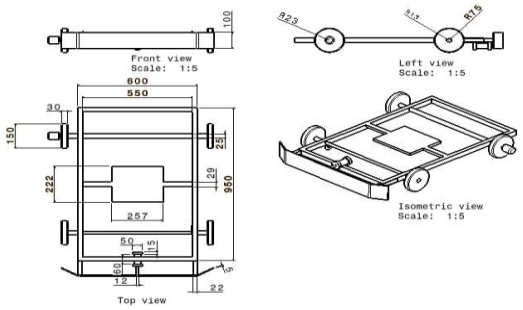
F i/s = 0.6 x 0 .7854(202-d^2)

112.5 = 0.4712(202-d^2)

On solving, we get d= 12.67 mm

Hence, selecting from standard values, inner diameter is 12.67 mm so, for both the double acting pneumatic cylinders, bore diameter is 25 mm. To increase the crashing distance in case of accidents, we increase the stroke length of cylinder used for extending the bumper. So, for bumper, cylinder stroke of 100 mm is suitable.

Figure 4: System Implementation



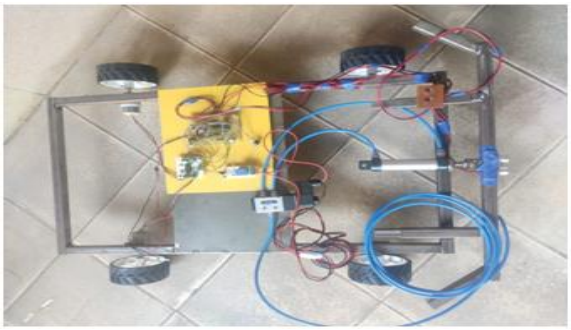


Figure 5: System Full Implementation

III. RESULTS AND CONCLUSION

In this project we studied that vehicle accident is a major problem. For the prevention of accidents braking system introduced with innovative idea usually seen in restricted roadways. The system controlling is done automatically by using proximity sensor and relay coil. We also studied that use

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of pneumatic system improves the operation of breaking. The selection hence it is referred as pneumatic braking system with pneumatic bumper protection. The system uses of two mechanisms, a proximity sensor is provided which senses the vehicle come in front of our vehicle system which may cause the accidental damaged. In this paper we also studied the various protection systems for avoiding the accident.

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Citation of this Article:

Prof. Ms. Megha M Shete, Shubham Pattewar, Rajesh Solankar, Abhishek Jadhav, Rohan Jadhav, "Automatic Pneumatic Bumper for 4 Wheeler" Published in *International Research Journal of Innovations in Engineering and Technology - IRJIET*, Volume 6, Issue 4, pp 108-111, April 2022. Article DOI https://doi.org/10.47001/IRJIET/2022.604023

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