



Automatic Braking System with Pneumatic Bumper

Abhishek Bhalerao, Vishal Dhawaskar, Shubham Kshirsagar and Tejaswini Barve

EasyChair preprints are intended for rapid dissemination of research results and are integrated with the rest of EasyChair.

July 20, 2022

“Automatic braking system with pneumatic bumper”.

Abhishek Balasaheb Bhalerao
Mechanical Engineering
Matoshri collage of Engineering And
Reserch Centre
Nashik , India
bhaleraoabhishek1411@gmail.com

Vishal sanjay dhawaskar
Mechanical Engineering
Matoshri collage of Engineering And
Reserch Centre
Nashik , India
vishaldhawaskar073@gmail.com

Shubham Ankush Kshirasagar
Mechanical Engineering
Matoshri collage of Engineering And
Reserch Centre
Nashik , India
shubhamkshirasagar8066@gmail.com

Tejaswini Barve

Mechanical Engineering
Matoshri collage of Engineering And
Reserch Centre
Nashik , India
tejaswiniabarve@gmail.com

Abstract

Now, a automobile accident day is that the main downside. This braking system used AN innovative style to forestall accidents on restricted traffic roads. The aim of this method is predicated on AN intelligent electronic management with automatic bumper activation system, called the "Pneumatic Bumper Automatic Braking System". This method is mounted on four-wheel vehicles.

Generally, this method consists of 2 mechanisms and therefore these or the automated braking system and the gas bumper system. The automatic braking system uses the detector that detects the vehicle that's approaching our system. And that may be the reason behind an accident. Then the detector sends data to the engine through the relay to prevent the engine from running throughout parallel operation of the automated braking system, the motive force of the vehicle conjointly tries to prevent the vehicle by pressing the treadle. The limit switch is provided beneath the treadle that at the same time activated the gas bumper and therefore the hydraulic brakes to scale back the injury that happens to our vehicle if each vehicles strike one another. This ensures pre-accident safety for the vehicle additionally this method improves the vehicle's brake time interval to keep up a secure distance between 2 vehicles. Using this method, we have a tendency to check the speed of the vehicle over tiny distances. Therefore, we have a tendency to try to hold out the project on the "**emergency brakes with automatic bumper system**".

Using this method, we have a tendency to check the speed of the vehicle

Keywords: Parking, emergency, bumper, accident bar

Introduction

A brake may be a device that inhibits movement. Its opposite part it is a clutch. most typically, brakes use friction to convert kinetics energy into heat, though different strategies of changing energy will be used. Effective braking depends totally on response temporal arrangement of the complete system and therefore the feeling of the motive force. response time is determined because the time between the beginning of the exploit of the management pedal and therefore the moment once the pressure in the mechanism reaches seventy five p.c of its straight line price.

The brake the system project configuration ought to be styled in such a way that time interval should meet vehicle safety standards rules the brakes design of significant industrial vehicles is meant whereas maintaining varied vehicle parameters like gross vehicle Weight, wheelbase, center of gravity of the vehicle, no boards etc. System layout style is very advanced implies the quantity of valves that has got to operate during a logic sequence throughout the various braking phases (Normal, Emergency, and Fault condition of a circuit). Conventionally, the system stylethe design came when several iterations supported field tests and knowledge.

I Objective

To overcome these unwanted effects, we've to vogue the machine-controlled Braking System with gas Bumpers that have following objectives

- To increase the sureness of braking application whereas automotive parking.
- To shrink the latency of braking system & to require care of the accuracy in reverse braking system.
- To performed the foremost rigid operation with high speed braking.
- To improve the pre-crash safety.
- To avoid the proportion of rider injury & vehicle injury by practice external vehicle safety.

II Problem Statement

In typical vehicles there ar whole completely different mechanism operated for braking system like hydraulic, pneumatic, air, mechanical, etc. but of those braking mechanisms receive the signal or input power directly from the actuation so it all manual operated. once the actuation saw the obstacle or any vehicle before his driving vehicle, he was irritated or becomes labyrinthine. attributable to this the actuation fails to convey correct|the right|the correct} input to braking system and correct in operation is not happens. Also, the actuation won't able to pay the whole attention throughout night movement so there ar many chances to accidents. once the accident happens, there is not any any provision to scale back the damages of vehicles. In presently used vehicles typically bumpers used ar of rigid varieties. These bumpers have specific capability and once the vary of the accidental force is very high then the bumpers ar fails and these forces transferred towards the passengers. So, this system never reduces the injury of every vehicle and passengers. The braking is that the key operation performed in automobile used to management & reduced the speed of a vehicle and to perform most rigid operation in automobile safety. the accuracy of braking is can increase by practice automation in system, so we've a bent to try to do to to a chunk on new system in **“emergency brakes with automatic bumper system.”**

III System Element

3.1. Frame:

The frame is of MS material. The frame of our machine is essentially used to support the gas components mounted

on it. that is Piston cylinder, d.c.v, flow management valve, switches ar mounted on frame.

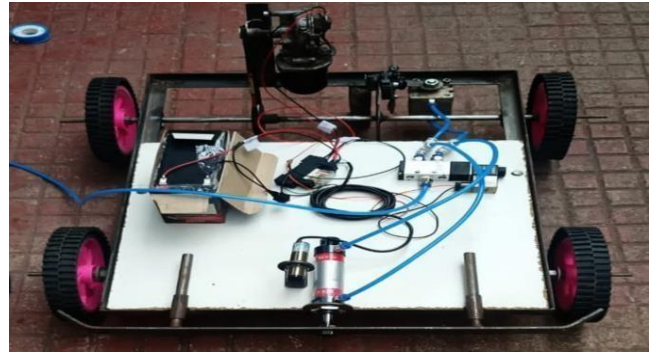


Fig.3.1. Frame

3.2. Double acting cylinders:

Actuators ar output devices that convert energy from controlled hydraulic oil or gas into the required reasonably action or motion. In general, hydraulic or gas systems ar used for riveting and/or moving operations in business. These operations ar allotted by practice actuators. the event of hydraulic and gas linear actuators is comparable. However, they dissent at their operational pressure ranges. Typical pressure of hydraulic cylinders is regarding 100 bar and of facility is around 10 bar.

Actuators could also be classified into three varieties.

- Linear actuators: These devices convert hydraulic/pneumatic energy into linear motion.
- Rotary actuators: These devices convert hydraulic/pneumatic energy into movement.
- Actuators to work flow management valves: these ar used to management the flow and pressure of fluids like gases, steam or liquid.

The main elements of a hydraulic double acting cylinder are: piston, piston rod, cylinder tube, and end caps. These ar shown in Fig. The rod is connected to piston head and additionally the various end extends out of the cylinder. The piston divides the cylinder into two chambers notably the rod end aspect and piston end aspect. The seals stop the outpouring of oil between these two chambers. The cylindrical tube is fitted with end caps. The controlled oil, air enters the cylinder chamber through the ports provided. at intervals the rod end covering, a wiper seal is provided to forestall the outpouring of oil and entry of the contaminants into the cylinder. the mixture of wiper seal, bearing and protection ring is known as as cartridge assembly. the highest caps might even be connected to the tube by rib association, welded association or rod association. The piston seal prevents metal to metal contact and wear of piston head and additionally the tube. These seals ar standardized. end whole is in addition provided to forestall the impactwith end caps.

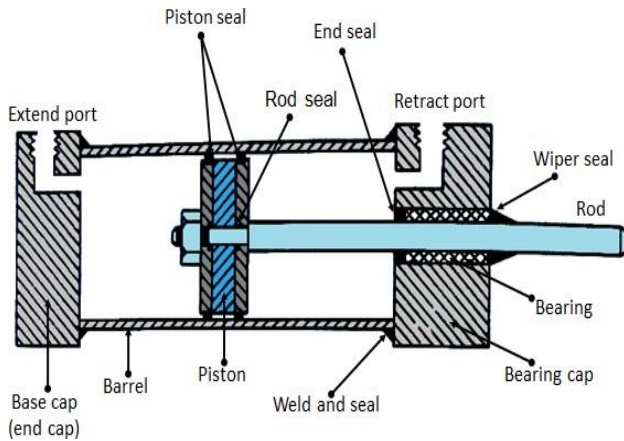


Fig.3.2. Double acting cylinder.

3.3. Pneumatic fittings:

Pneumatic tubes are gettable in numerous materials with and whereas not reinforcement to be used in ancient applications SMC fittings incorporate a positive tube seal while the the affiliation is harried, that enables the compound tube to undertake to the current Used. The tubes area unit gettable in sizes 3.2, 4, 6, 8, 10, 12 and

Sixteen mm are available.

Tubing Series:

Polyurethane Tubing: TAU, TCU, TFU, TIUB, TU

Nylon Tubing: T, TAS, TIA, TISA, TRS, TS

Spark Resistant Tubing: TRB, TRTU

Coaxial Tubing: TW

Polyolefin Tubing: TP

Moisture management Tubing: IDK This could be used for connection of pneumatic system with total drill assemble.



Fig.3.3. Pneumatic hoses and fittings.

3.4. 5/2 Solinoid valve:

A valve is additionally a tool that regulates the flow of fluid (gases, liquids, fluidized solids or slurries) by gap and shutting or 0.5 obstructing passage ways in {which} during which throughout which. A five/2-way directional valve from the name itself has five ports equally spaced and a handful of flow positions. it ought to be accustomed isolate and at an identical time bypass some way for the fluid that for instance have to be compelled to retract or extend a double acting cylinder. There's variety of ways in which during which in which to own this valve motivated.

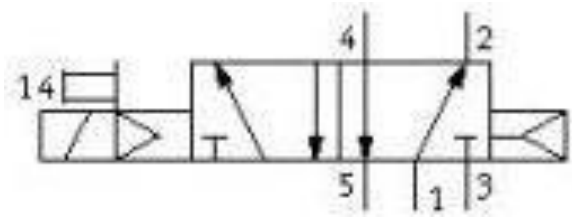


Fig.3.4. 5/2 solenoid valve.

3.5. Pneumatic connectors, reducer and hose collector:

Two kind of connectors area unit used in our gas system; and so the selection is that the reducer.



3.6. and pipe fitting receiver sensor:

The IR transmission circuit is employed in several comes. The IR transmitter sends forty kHz (frequency is additionally adjusted) carrier below 555 timer management. IR carriers at around forty kHz carrier frequencies unit wide used in TV remote dominant and ICs for receiving these signals unit quite just gettable. The transmitted signal mirrored by the obstacle and so the IR receiver circuit receives the signal and giving management signal to the management unit. The management unit activates the gas braking system, so break was applied.



Fig.3.6. IR sensor.

3.7. Disc brake:

A hydraulic brakes is additionally a kind of brake that uses calipers to squeeze pairs of pads against a disc therefore on kind friction that retards the

rotation of a shaft, like [vehicle shaft](#), either to cut back its motility speed or to carry it stationary.



Fig.3.7. Disc brake:

3.8. Pedestal bearings

This bearing subsists of i) a forged iron pedestal, ii) gun metal, or brass bush separated into two components referred to as “brasses”, and iii) a forged iron cap and two m s bolts. The careful diagram of a pedestal bearing is displayed in image below. The rotation of the bush inside the bearing housing is in remission by a snug at the lower of the lower brass. The cap is tightened on the pedestal block by means that of bolts and nuts. The precise half drawings of another Plummer block with quietly varied dimensions are display in image below.



Fig.3.8. Pedestal bearing.

1.9. Shaft:

The tree is a familiar and essential component of the machine. it is a press member, in general, has a circular cross section and is used for transfer the power. The tree can be hollow or solid. the axis is sustained on bearings and rotates a set of gears or pulleys for the function of power transfer.

Shaft material:

Ferrous, non-ferrous or non-metallic materials are used as the axis material depending on the uses.



Fig.3.9. Shaft.

3.10. Washer

A washer may be a fragile plate (typically disk-shaped) with a gap (typically within the middle) that’s usually wont to transfer the load of a threaded fastener like as a screw or nut. Completely different uses are as a spacer, spring (wave washer), wear pad, preload showing device, locking device, and to cut back vibration (rubber washer). Washers usually have associate outer diameter (OD) regarding doubly the dimension of their inner diameter (ID). Washers are typically metal or plastic. Prime quality bolted connection require hardened steel washers to avoid the loss of pre-load due to Brinelling once the torque is applied. Rubber or fiber gaskets employed in faucets in taps (or faucets, or valves) to dam the flow of water are frequently referred to callously as *washers*; however, whereas they’ll read comparable, washers and gaskets are usually designed for various functions and create otherwise. Washers are essential for avoiding galvanic corrosion, or by insulating steel screws from aluminum area.



Fig.3.10. Washer

3.11. Nut and Bolt

Already the nuts and bolts don’t seem to be utterly stiff, they stretch gently covered load, the voltage sharing within the wires is irregular. In fact, in an exceedingly in theory abundantly long bolt, the primary thread necessary a third of load, the first three threads took three quarters of the load and also the first six threads essentially take all the load. Above the first six threads, the remaining threads are essentially dumped in all. So, a nut or bolt with six threads behaves very likely to an very much long nut or bolt.



Fig. 3.11. Nut and Bolt.

3.12.12 Volt Battery:

An electric battery may be a equipment aggregating one or additional chemical science cells that convert saved chemical energy into electrical energy. Each cell cincorporates a positive terminal, or cathode, and a negative terminal, or anode. Electrolytes enables ions to vary between the electrodes and terminals, which permits current to pass out of the battery to complete the perform.



Fig.3.12. 12 Volt Battery.

IV. Methodology

The below Methodology shows the orderd operation/steps that may be performed throughtout the project method.

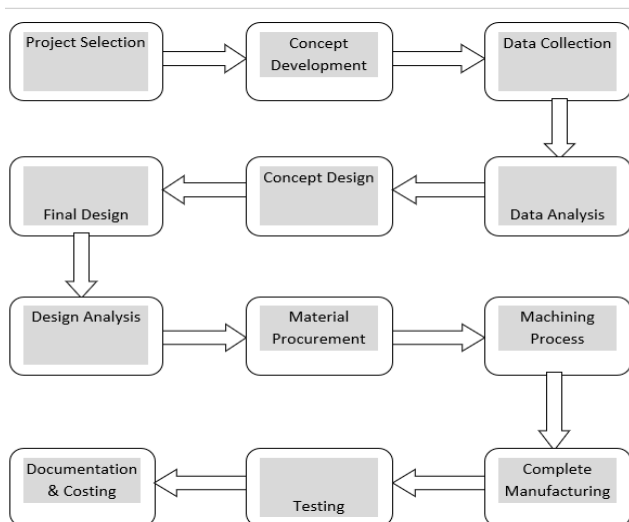


FIGURE :BLOCK DIAGRAM OF THE SYSTEM

Already this method is wor at the time of the emergency throughtout jobs. During traditional vehicle driving, this method is off and never work on traditional operation. Once any hurdle or obstacle, humans, animals or the vehicle come back on the subjected of the vehicle, then the infrared put in the detector detects that hurdle or obstacle. The space vary between vehicle and obstacle is often changes. This vary is dynamic in keeping with the density of vehicles or individuals on the road. The signal received from the IR sensor is transfer to the management unit.

This control unit works the relay counting on the input signal. The relay works the solenoid valve to operate the brake and the bumper. At the similar time

working The IR detector additionally used the brake, therefore the brakes the versatile.

V. Result

- Motor selection:

Thus, choosing a motor of the subsequent specifications Single phase AC motor

Power = 1/15hp=50

wattSpeed= 60 rpm

- Power is transfer from the motor shaft to the input shaft by suggest that of associate degree an open V-belt drive, Motor pulley-block diameter $d = 20$ mm IP _ shaft pulley diameter $D = 60$ mm, $d =$ diameter of rope = 5 mm
- Shaft design: To find diameter of shaft by ASME code forcommercial steel shaft. select $d=20$ mm
- Bearing selection: As shaft dia. – is 20mm thus we have choice a pedestal bearing having shaft outer dia. – 20mm.
- Design of Pneumatic Cylinder: Clavarino’s equation for closed end cylinder at both ends. For ductile material use to work out the thickness of cylinder. Double acting cylinder $\text{Ø}25 \times 50$ (Diameter X Stroke)

VI. Advantage

- Easy to construction of the paradifim vehicle.
- It provides additional safety to passengers within the vehicle as well also the vehicle body.
- It minimizes the accident intensity and impact.
- This system maximizes the feedback time of car braking by keeping safe distance between two vehicles.
- The design additionally increases the unmitigated distance byproviding further house because of extension of the bumper, minimizing the injuries to commuters.

VII. Disadvantage

- More price is required for doing modification.
- This system have some limitations in densely traffic road.

- This system has no arrangement to avoid accidents from back side of vehicle.

VIII. Price Estimation

The comparative price need for the completion of this project is noted within the table below:

Part Name	Quantity	Total Price (Rs)
Wheel	1	1750
Solenoid Cylinder	2	2400
Solenoid Valve	2	1600
Small Wheel	4	800
Bearing	6	330
Shaft(m)	3	285
Clamp	6	360
Battery(12V)	1	850
Electronic Circuit	1	1200
Pneumatic Pipe(m)	2.5	300
Square Pipe(ft)	2	1100
Total		15000

Table: Price Evaluation of the Project.

Conclusion

Our main aim behind the look and manufacture of this project was to minimize the amount of road accidents, so assure the traveler safety. Our style additionally minimizes destruction caused to the vehicle throughout an accident with the assistance of the pneumatic bumper. Form up for the shortcomings of others systems already offered, our work isn't with reference to sensible workability and additional thrustworthiness, however additionally price effective .

OUR WORK ON THIS PROJECT HAS PROVIDE US WITH SENSIBLE EXPERTISE, DESIGNING AND CREATING USE OF OUR SENSIBLE AND THEORETICAL KNOWLEDGE.WE ARE PROUD THAT WE HAVE GOT COMPLETED THE PROJECT WITH THE RESTRICTED TIME WITH SUCCESS.

This example we tend to designed and made operating with satisfy all circumstances and is capable to perform all the objectives that we tend to hoped to realize.

ACKNOWLEDGEMENT

The satisfaction and joy that accompany the sure-fire completion of any perform would be deficient while not the popularity of the those who build it happen. Because after all

success is the apotheosis of hard work, dedication and most of all those guidance and assistnce crowned our achievement and accomplishment.

We owe a debt of because of our guide **Prof. Y. S. Khadke**, who stood as a backbone to our project, having worked meticulously for the duration of with special attention and avidity. This contribution to the project is limitless and mere words don't seem to be enough to delibrate our deepest sense of feeling.

We give thanks academic **Prof. J. H. Bhangale**, Head of the Department for his constant encouragement throughout the year. His recommendation and co-operation within the completion of project is basically lingering. We extremely indebted to him.

We would avail this chance to give thanks our beloved principal academic **Prof. G. K. kharate**, who has continually been tremendous supply of inspiration and strength to us.

We are grateful to all teaching staff of our department who helped directly and indirectly and lent us useful suggestions in our project work

Project Associates:

Students name:

Mr. Abhishek Bhalerao
 Mr. Vishal Dhawaskar
 Mr. Shubham Kshirsagar
 Ms. Tejaswini Barve

REFERENCES

<https://www.irjet.net/archives/V2/i4/Irjet-v2i4171.pdf>
<http://israse.com/digital/assets/papers/FIESTA126.pdf>
<http://v3i2.ardigitech.in/AUTOMATIC%20BRAKING%20WITH%20PNEUMATIC%20BUMPER%20SYSTEM%20.pdf>
<http://www.ijsrd.com/articles/IJSRDV4I10782.pdf>
http://www.jrtr.net/jrtr20/pdf/F52_Tech.pdf
<http://www.eng.uwaterloo.ca/~samir/ka/files/brakesafe.pdf>
<http://inform.wabco-auto.com/intl/pdf/815/00/57/8150100573-04.pdf>
<http://www.adam-europe.eu/prj/2047/prd/5/1/p2182e1800f1.pdf>
<http://iosrjournals.org/iosr-jmce/papers/vol11-issue1/Version-2/A011120109.pdf>
<http://www.ijsrd.com/articles/IJSRDV4I40131.pdf>
<http://www-nrd.nhtsa.dot.gov/pdf/esv/esv19/05-0144-O.pdf>