Automatic Braking System With Pneumtic Bumper

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Abstract- *Now a day's vehicle accident is the major problem. This breaking system used an innovative project for the purpose of preventing accidents happens in the restricted roadways. The purpose of this system is based an intelligent electronically control with automatic bumper activation system is known as "Automatic braking with pneumatic bumper system". This system is assembled on four wheeler vehicle. Generally this system consists of two mechanisms and these are automatic braking system and pneumatic bumper system. Automatic braking system uses the infrared sensor (IR) which senses the vehicle which come in front of our system and which may be cause for accident. Then sensor gives feedback to electric motor through relay to stop the working of engine. During the working of Automatic braking system simultaneously the driver of vehicle also try to stop the vehicle by pressing brake pedal. Limit switch is provided below the brake pedal which used to activate the pneumatic bumper and disc brake simultaneously to reduce the damage our vehicle which occurs if both vehicles collapse on each other. This provides pre-crash safety for vehicle. As well as this system improve the response time of vehicle braking to keep safe distance between two vehicles.*

Keywords- Pneumatic cylinder, solenoid valve, IR sensor, Bumper actuation, Automatic braking system.

I. INTRODUCTION

Today India is the most important under developed country in the world. India is the largest country in the use of various type of vehicles. As the available resources to run these vehicles like quality of roads, and unavailability of new technologies in vehicles are cause 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 technology of braking system and technology to reduce the damage during accident are mainly affect 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, we design this Automatic Braking with Pneumatic Bumper system.

We have pleasure in introducing our new project "AUTOMATIC PNEUMATIC BUMPER", which is fully equipped by IR 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. NEED FOR AUTOMATION: Automation can be achieved through computers, hydraulics, pneumatics, robotics, etc., of these sources, pneumatics form an attractive medium for low cost automation. The main advantages of all pneumatic systems are economy and simplicity. Automation plays an important role in mass production. For mass production of the product, the machining operations decide the sequence of machining. The machines designed for producing a particular product are called transfer machines. The components must be moved automatically from the bins to various machines sequentially and the final component can be placed separately for packaging. Materials can also be repeatedly transferred from the moving conveyors to the work place and vice versa. Nowadays almost all the manufacturing process is being atomized in order to deliver the products at a faster rate

II. LITERATURE REVIEW

N.Dileepan and R.Rathish , March 2017 [1] 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

PROF. M. B. BANKAR and PROF. S. K. PAWAR, NOV 16 TO OCT 17 [2] 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. Though there are different causes for these accidents but proper 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". the work is a good solution to bridge the gates between institution and industries And able to understand the difficulties in maintaining the tolerances and also quality.

Dr.venkatesh P.R and Dr.Prasanna Rao N.S, July 2015, [3] The technology of pneumatics plays a major role in the field of automation and modern machine shops and space robots.. The aim is to design and develop a control system based intelligent electronically controlled automotive bumper activation and automatic braking system is called AUTOMATIC PNEUMATIC BUMPER AND BREAK ACTUATION BEFORE COLLISION. This project consists of IR transmitter and Receiver circuit, Control Unit, Pneumatic bumper system and pneumatic braking system. The IR sensor senses the obstacle. There is any obstacle closer to the vehicle (with in 3-4 feet), the control signal is given to the bumper activation system and also pneumatic braking system simultaneously.

Prof. Harshal Rahate , January 2018 [4] 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, 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 sensor, Control Unit, Pneumatic bumper system. The Ultrasonic sensor is used to detect the obstacle. There is any obstacle closer to the vehicle (within 90 cm), the control signal is given to the bumper activation system

Tejsinh Pisal and Akshay Patil , April 2015 [5] 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 ultrasonic circuit, Control Unit, Pneumatic bumper system. The ultrasonic sensor is used to detect the obstacle. There is any obstacle closer to the vehicle (with in 2 feet), the control signal is given to the bumper activation system.

Patil Pratik and PitaleChetan ,23rd March 2016 [6] Now a days vehicle accident is a major problem. This braking system introduced innovative idea for the prevention of accidents usually seen in restricted roadways. In this system controlling is done automatically by using proximity sensor and relay coil. It further actuates pneumatic cylinders which results in braking and bumper movements. Hence it is referred as pneumatic braking system with pneumatic bumper protection. The system consists 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. With the feedback from sensor through the relay coil, actuation of pneumatic cylinder take place and brake gets apply in disc brake sense. While another pneumatic cylinder is attached with bumper which provide safety in case of accident. And provide precrash safety to vehicle. As we all know, compressors are generally used in many vehicles, hence the working medium for pneumatic system is easily available in the system. Hence this system is a reliable system.

III. OBJECTIVES

In conventional vehicles there are different mechanism operated for braking system like hydraulic, pneumatic, 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 we have to design the Automatic Braking System with Pneumatic Bumpers which have following objectives.

As this system is used at the time of emergency during work. In normal travelling of vehicle this system is off and it never impact on the normal working. 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. This control unit operates the relay according to the input signal. The relay operated by control unit cut off the electric power supply given to the electric motor so the working of motor is stop. When the
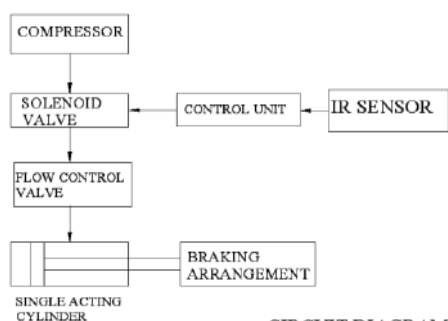
motor stops the working the motion of vehicle suddenly reduces. At the same time of working of IR sensor the driver also applied the brake so braking system works by two methods.

There is some incidence when the working of automatic braking works and motor running is also stop but due to the moment of inertia on vehicle tries to forward motion of the vehicle. This inertia motion cause for accident. During such incidence the driver also uses manual braking system.

This pneumatic force used to forward motion of the bumper. By receiving the impact of accidental force bumper try to deflects. The flexible nature of the bumper able to sustain the force and so the impact of this force on vehicle is reduces. When the external body is kept safe then there is no chance of inner damage

IV. METHODOLOGY

The compressed air from the compressor at the pressure of 5 to 7 bar is passed through a pipe connected to the Solenoid valve with one input. The Solenoid Valve is actuated with Control Timing Unit. The Solenoid valve has two outputs and one input. The air entering into the input goes out through the two outputs when the timing control unit is actuated. Due to the high air pressure at the bottom of the piston, the air pressure below the piston is more than the pressure above the piston. So these moves the piston rod upwards which move up the effort are, which is pivoted by control unit. This force acting is passed on to punch/rivet which also moves downwards. The IR TRANSMITTER circuit is to transmit the Infra-Red rays. If any obstacle is there in a path, the Infra-Red rays reflected. This reflected Infra-Red rays are received by the receiver circuit is called "IR RECEIVER". The IR receiver circuit receives the reflected IR rays and giving the control signal to the control circuit. The control circuit is used to activate the solenoid valve. The operating principle of solenoid valve is already.

CIRCUIT DIAGRAM :
Figure 1

SPECIFICATIONS:

PNEUMATIC CYLINDER

- Stroke length – 5 inches
- Diameter – 12 mm
- 10 Pascal Pressure
- 35 mm Bore
- Double acting cylinder

BATTERY

- 12 Volts
- 7.2 Ah
- Rechargeable Lithium Ion Battery

FRAME

- 1 Section
- $32 \times 32 \times 5$ (in mm)
- Grade – 1S277 MS Mild Steel

SHAFT

- Dimension – $40 \times 60 \times 2$
- Grade – MS Mild Steel

WHEEL

- Standard Activa Wheels
- Rail Wheel Transmission

DC MOTOR

- 12 Volt
- 5 amps
- Automotive Wiper Motor

CHAIN SPROCKET

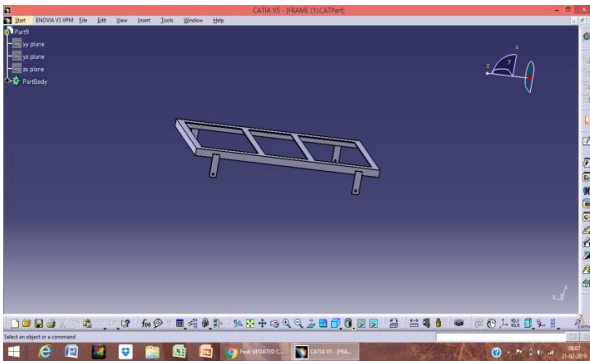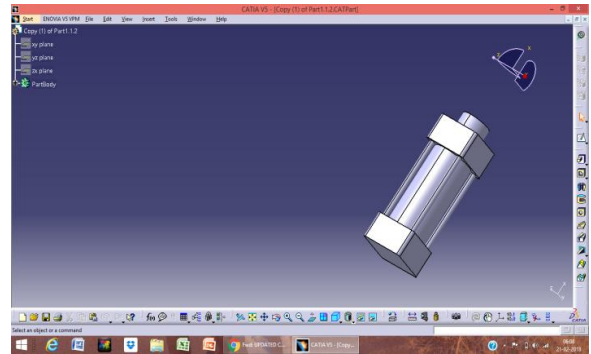- Sheet Thickness - 1.2 m
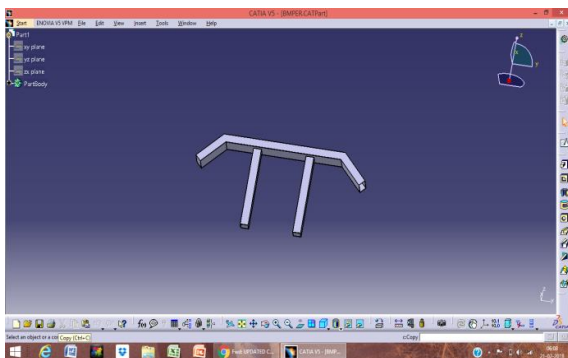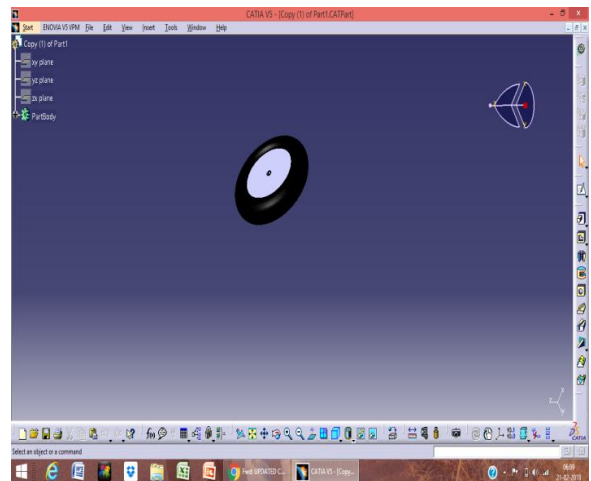
V. CATIA-V5 DESIGN

Figure 2

Figure 6

Figure 3

Figure 7
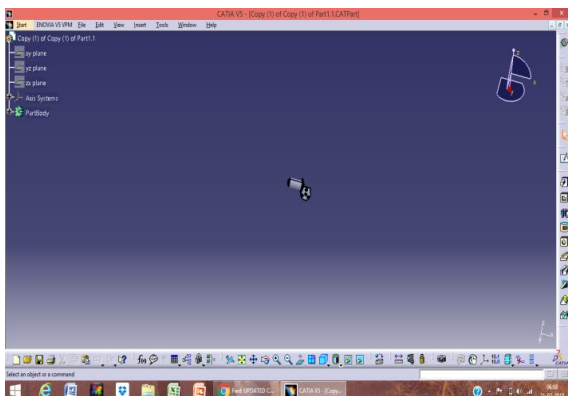
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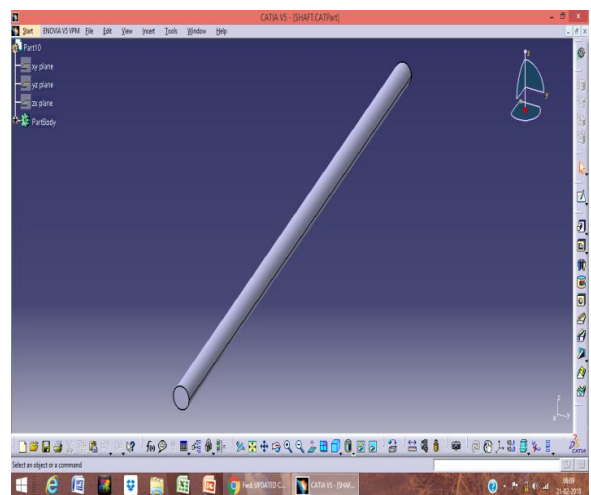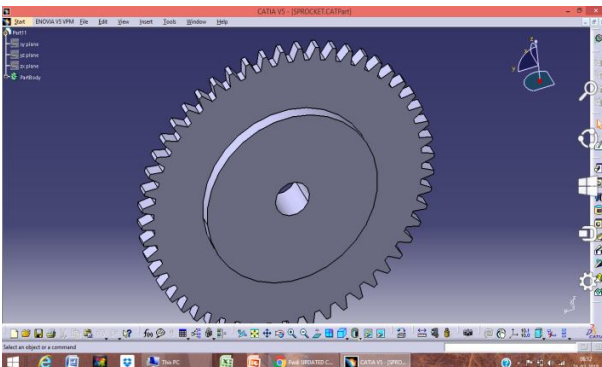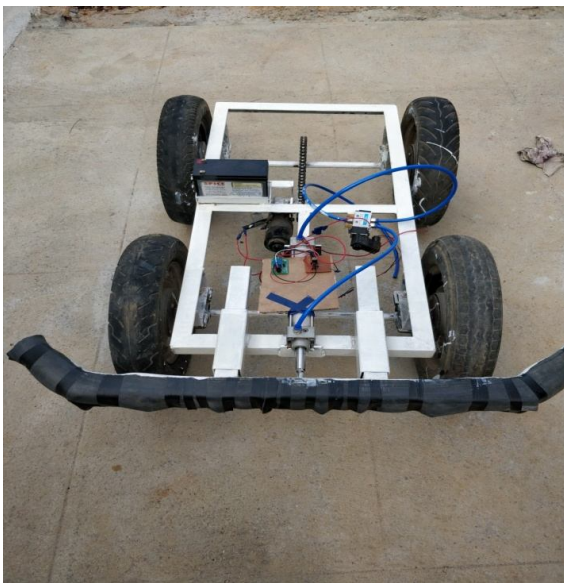

Figure 8

Figure 5

Figure 9

Figure 10

V1.CALCULATIONS

The total stopping distance of a vehicle is made up of 4 components. They are, Human Perception Time Human Reaction Time Vehicle Reaction Time and Vehicle Braking Capability

The human perception time is how long the driver takes to see the hazard, and the brain realize it is a hazard requiring an immediate reaction. This perception time can be as long as 1⁄4 to 1⁄2 a second.

Human Reaction Time Once the brain realizes danger, the human reaction time is how long the body takes to move the foot from accelerator to break pedal. Again this reaction time can vary from 1⁄4 - 3⁄4 of a second.

Once the brake pedal is applied there is the vehicles reaction time which depends on the brake pedal free-play,

hydraulic properties of the brake fluid and working order of the braking system.

Since it is an automatic braking system the time taken to actuate the solenoid valve after sensing the obstacle should be taken into account. This time is called as the system response time. The response time of our system is 1msec.so the distance travelled in 1msec is very less hence it is ignored.\

Total stopping distance = Human perception distance

Braking distance + distance covered in 1 msec = 1.26 m Here the human perception time and human reaction time are equal to „zero" because it is an automatic braking system.

Bumper actuation length= 1.26

0.100 = 1.36 m hence the sensors sensing range is set at 1.5 m

VII. IMPACT FORCE CALCULATION

Mass of the vehicle = 22 kg
Velocity of the vehicle = 15
Braking distance = 1.26 m by motion equation
2as =Braking
Braking distance, D
Braking
Total braking distance = 1.26D
Braking
Total stopping distance = 1.26 m
Human reaction distance= 4.167
Where, v = final velocity u = initial velocity
a = acceleration & s = braking distance 2
151.58 N F = 151.58 N

VIII. BENEFITS

1. It able to Increase the sureness in braking system.
2. Braking system able to give fast response.
3. System able to increase the pre-crash safety.
4. System able to provide more safety to the passengers.
5. System plays an important role to save human life in road accidents.

IX. APPLICATIONS

1. In bikes.
2. In four wheels.
3. For automobile application
4. This system also successfully installed in cars, Rickshaws, Tempos & heavy vehicles like buses, trucks, trailers, etc.

X. CONCLUSION

The compressed air from the compressor at the pressure of 5 to 10 bar is passed through a pipe connected to the Solenoid valve with one input. The Solenoid Valve is actuated with Control Timing Unit. The Solenoid valve has two outputs and one input. The air entering into the input goes out through the two outputs when the timing control unit is actuated. Due to the high air pressure at the bottom of the piston, the air pressure below the piston is more than the pressure above the piston. So these moves the piston rod upwards which move up the effort are, which is pivoted by control unit. This force acting is passed on to punch/rivet which also moves downwards. The IR TRANSMITTER circuit is to transmit the Infra-Red rays. If any obstacle is there in a path, the Infra-Red rays reflected. This reflected Infra-Red rays are received by the receiver circuit is called "IR RECEIVER". The IR receiver circuit receives the reflected IR rays and giving the control signal to the control circuit. The control circuit is used to activate the solenoid valve. The operating principle of solenoid valve is already explained in the above chapter. If the solenoid valve is activated, the compressed air passes to the Single Acting Pneumatic Cylinder. The compressed air activates the pneumatic cylinder and moves the piston rod. If the piston moves forward, then the breaking arrangement activated. The breaking arrangement is used to break the wheel gradually or suddenly due to the piston movement. The breaking speed is varied by adjusting the valve is called "FLOW CONTROL VALVE". In our project, we have to apply this breaking arrangement in one wheel as a model. The compressed air drawn from the compressor in our project. The compressed air flow through the Polyurethane tube to the flow control valve.

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