Automatic Pneumatic Bumper With Backward Movement of Seat

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Abstract: This paper is based on the foremost requirement of safety in today's four-wheeler vehicles. It is for both the vehicle and humans inside the vehicle around the world. It will be an adjoin safety measure or feature in the present-day facilities such as Auto braking system, Air Bags, etc. The idea is to enhance the reduction in damage and injuries by adding an extendable auto pneumatic bumper with an emergency seat moving backward mechanism. This mechanism will improve the safety measures for humans traveling through a four-wheeler vehicle and also help to reduce vehicle damage during a collision. The assumption made in the concept is that the body or obstacle of impact would be perfectly rigid and stationary. The bumper is meant to absorb as much impact as possible during a collision and the seat moving backward will help to reduce injuries to the humans inside the vehicle

***Index Terms* – vehicle safety, pneumatic bumper, seat backward mechanism**

I. Introduction

India is the largest country in the use of various type of vehicles. As the available resources to run these vehicles like the quality of roads, and unavailability of new technologies in vehicles are causes for accidents. The number of peoples which are dead during vehicle accidents is also very large as compared to the other causes of death. Proper technology of bumper system and technology to reduce the damage during an accident are mainly effect on the accident rates. According to a study, we have found that head to head collisions are high in number compared to other types of collision. So today implementation of the proper bumper system and mechanism of the seat moving backward instantly during a collision to prevent the accidents and to reduce the damage is must for vehicles. The idea is to enhance the safety of a four-wheeler. Safety features like airbags are not reliable up to the mark because once the airbags mechanism is initiated it takes a lot of money and time in order to fix it. From the first airbag system and safety belt mechanisms to the latest collision-avoidance electronic materials and technologies, we continue to set the standard for performance in safety systems. The main concern and scope of the project are to improve safety measure in a vehicle and also to avoid severe accidents, which will result in a reduction of property damage and save more human lives. In order to implement this idea, we have considered alterations in the design of a vehicle and its manufacturing.

II. System description

It is a control system based on mechatronics which includes bumper activation system with seat moving backward instantly during a collision of the vehicle. This system consists of an IR sensor, Control Unit, Relay Pneumatic bumper system, rack and pinion with demo seats, DC motors, and batteries. The IR sensor is used for the detection of any obstacle or any subject of collision. If there is any obstacle closer to the vehicle (within 10 cm), the control signal is given to the bumper activation system. The pneumatic bumper system is used to protect both man and vehicle body. This signal is given to the control unit and pneumatic bumper activation system gets initiated with the help of relay. Also, the seats instantly move backward for safety in order to avoid a huge amount of injuries and lessen the impact. It is designed for reducing vehicle body damage and passengers injuries during an accident.

III. Literature survey

[1] J.T. Wang, General Motors Corporation," An Extendable and Retractable Bumper" United States Paper No. 05-0144, Jun. 6, 2005, An extendable and retractable bumper is introduced in this paper A practical exhibit vehicle and two test vehicles were worked with the E/R guard. Limited component models explanatory and nonlinear both were utilized to help in the structure of these vehicles and to foresee their accident execution in full, counterbalance and sideways effect tests. While the practical exhibition vehicle was utilized to think about its control and activity arrangements, the exploratory vehicles were slammed in a 56kph inflexible obstruction sway test and a 64kph 40% Offset Deformable Barrier sway test. These accident tests, together with a nonlinear limited component examination, demonstrated that the extra pound space acknowledged by broadening the guard could diminish the seriousness of the accident beat and the measure of auxiliary interruption to the vehicle compartment. Likewise, we are including an instrument of rack and pinion connected to the seats which will move the seats in reverse amid an impact so as to decrease wounds. Computerization can be accomplished through PCs, power through pressure, pneumatics, mechanical autonomy, and so forth., of these sources, pneumatics structure an appealing mode for ease robotization. The

fundamental points of interest of every single pneumatic framework are economy and effortlessness. We have planned this guard cylinder barrel get together as per the stroke length and weight of guard which must be lifted.

IV. Objectives

- To increase safety during pre-crash.
- To increase external safety to the vehicle body.
- To increase the distance of crashing during an accident.
- To decrease the level of passenger injury by use of rack and pinion system attached to seats

V. Methodology

We designed this bumper piston-cylinder assembly according to the stroke length and weight of bumper which has to be lifted. 2 flanges of 260mm×20mm, 2flanges of 70mm×20mm.Weight of bumper is 3.5 kg. The electric motor of 18watts and rpm of 1250 is used. The shaft is made of mild steel and its allowable shear stress is 42 MPa. A rectangular frame has been designed and fabricated according to the calculation. Plywood is attached to the frame. Motors are been welded to the frames and wheels are been attached to the motors. The pneumatic cylinder is been attached to the bumper and is fixed in the front position of the plyboard. Pipes are been attached from pneumatic cylinder to solenoid valve. The further pipe is attached from the solenoid valve to the source of compressed air. IR sensors are been fixed along with a relay and the controller. These electrical components are powered by 12 volts battery. The IR sensors will sense anything which will come close to the bumper and signal will be sent to the microcontroller to initiate the pneumatic cylinder action and move the bumper forward and the seats will instantly move backward with the help of rack and pinion mechanism and dc motor. The car will run through motors attached to the wheels and every operation will be sourced with the help of batteries.

Fig.1: Pneumatic bumper

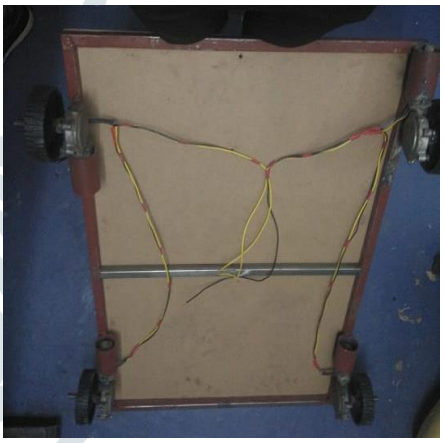

Fig2: Motors attached to the frame

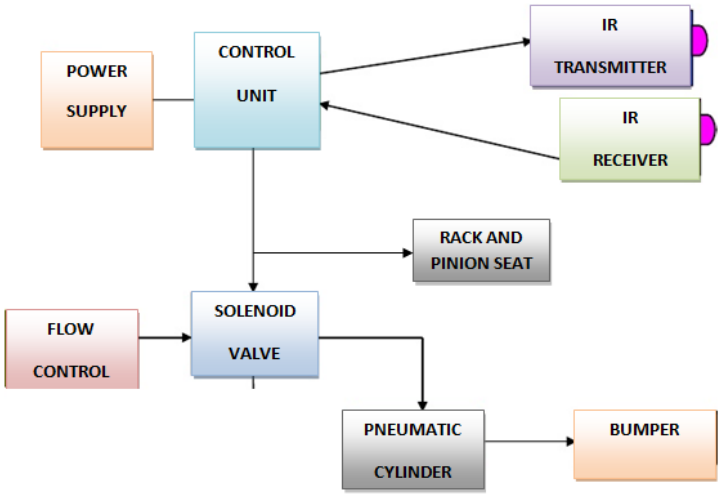

Fig 3: Block diagram of the system

The IR TRANSMITTER circuit is to transmit the Infra-Red beams. On the off chance that any snag is there in a way, the Infra-Red beams reflected. These reflected Infra-Red beams are gotten by the beneficiary circuit is called "IR RECEIVER". The IR collector circuit gets the reflected IR beams and giving the control flag to the control circuit. The control circuit is utilized to initiate the solenoid valve. On the off chance that the solenoid valve is enacted, the packed air goes to the Pneumatic Cylinder. The compacted air initiates the pneumatic barrel and moves the cylinder pole. In the event that the cylinder pushes ahead, at that point the guard game plan initiated. The cylinder speed is shifted by adjusting the valve is called "Stream CONTROL VALVE". In our venture, we need to apply this course of action in one wheel as a model. The packed air is drawn from the compressor in our venture. The compacted air is moved through the Polyurethane tube to the stream control valve. The stream control valve is associated with the solenoid valve as specified in the square outline

VI.
Components used and its design

a) Pneumatic Cylinder

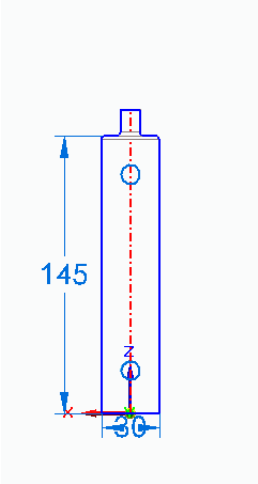

Fig4: pneumatic cylinder (Dimensions in mm)

b) Solenoid valve with control unit

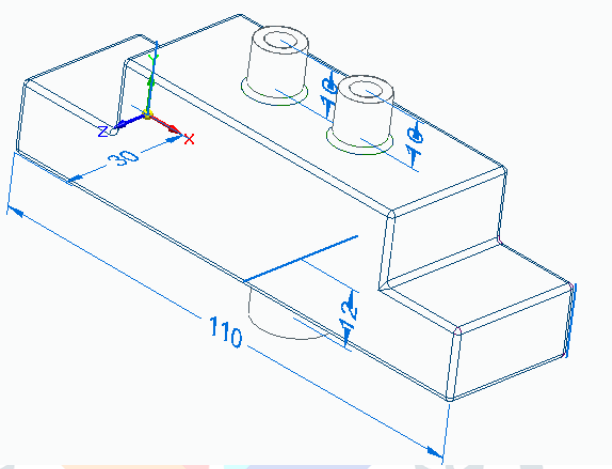

Fig5: solenoid valve (dimensions in mm)

c) Bumper

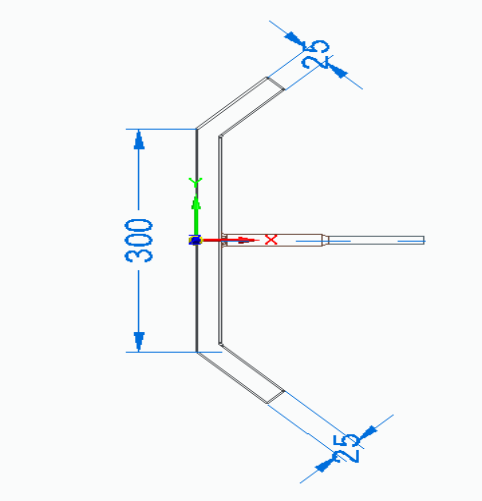

Fig 6: Bumper (Dimensions in mm)

d) Main frame

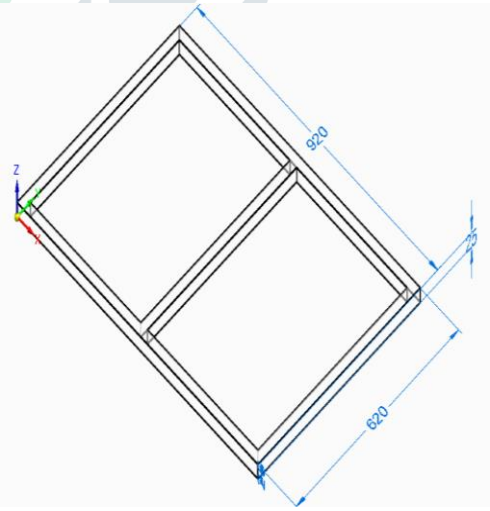

Fig 7: frame of the car (Dimensions in mm)

VII. MODEL

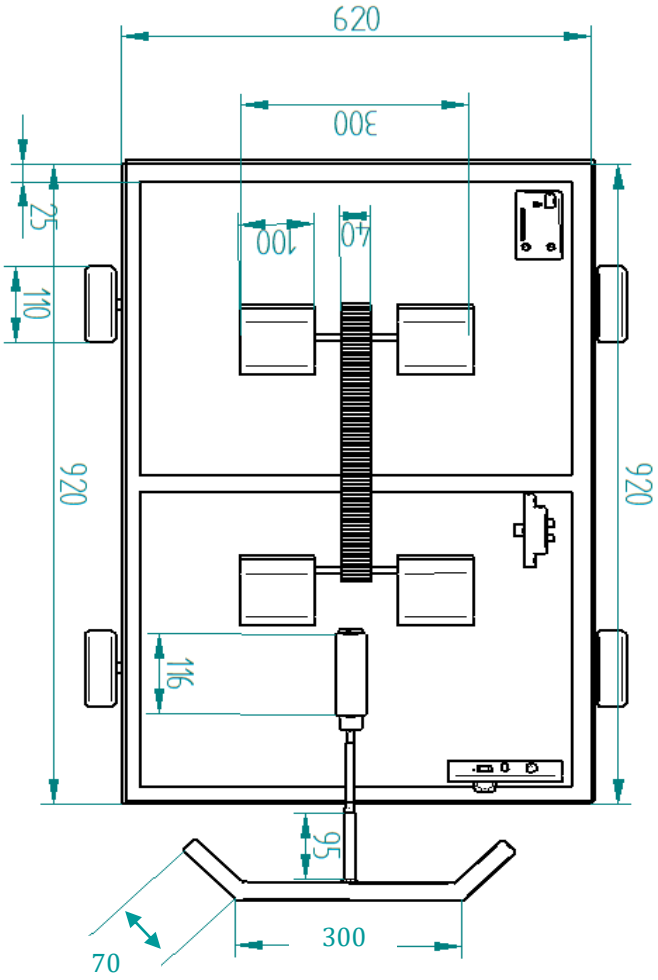

Fig8: 2D model Diagram (dimensions in mm)

VIII. Result and Conclusion

The car continues to move forward until an object is sensed in front of the vehicle within 10 centimeters. Once the object is sensed by the IR sensor the mechanism initiates the bumper to move forward and the seats to move backward. This will decrease the level of passenger injury during an accident and Increase external safety to the vehicle body. Also, reduce vehicle and property damage. It would decrease the number of severe accidents and saving more number of human lives. Use of the control unit also helps this mechanism as a reliable system. Also, the system will increase the weight of the vehicle, hence there is a requirement to balance the weight of the vehicle so as its C.G.(Centre of Gravity) does not alter. Mainly in order to implement this mechanism, alteration in the design of a car has to be considered.

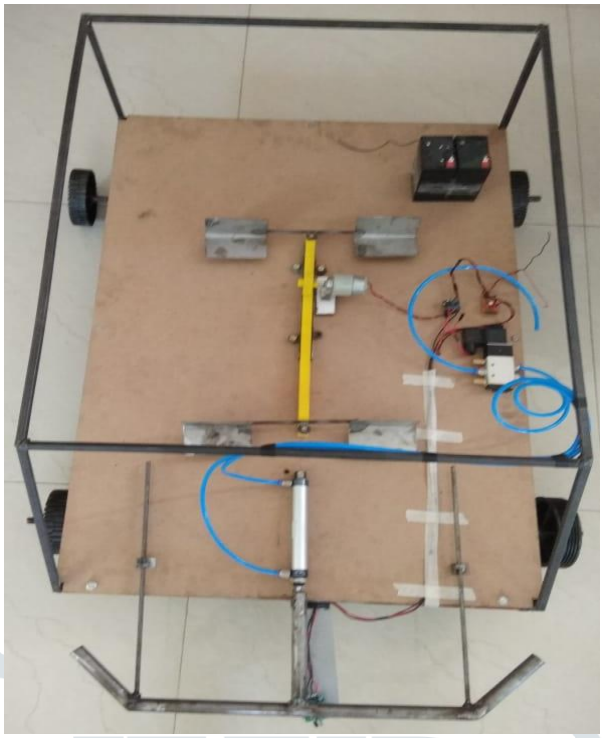

Fig9: Final assembled model

IX. REFERENCES

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