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Pneumatics Bumper with Steering Headlamp

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ABSTRACT
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 system based on pneumatic principle which provides cushioning effect at time of impact under the name of Pneumatic Bumper. This system consists of pneumatic cylinder, solenoid valve, Pneumatic bumper system and brake pedal. The driver of vehicle when pressed the brake pedal in emergency condition, then the solenoid valve is get operated by brake pedal and which consecutively operate the pneumatic bumper system. The pneumatic bumper is at front of vehicle will subjected to first impact which minimize the shocks transfer to passengers. The highest fatal traffic accident rate occurs on curved roads at night-time. In most cases, the late recognition of objects in the traffic zone plays a key role. These facts point to the importance of the role of automobile forward- lighting systems. In order to provide enhanced night time safety measures, this work aims to design and build a prototype of steerable headlights by adapting a conventional static headlamp with a very close eye on cost and reliability. Components that are easily available in the market are considered and the design has been done to provide the steering mechanism for the headlamps which are actuated along with the steering.

Keywords
Headlamp, Steering Mechanism, Adjustable Headlamps, Safety, Blind Turns Pneumatic Bumper, braking system, wheels, Piston, Solenoid valve.

1. INTRODUCTION
Today India is the developing country in the world. Its population is large and uses various types of vehicles. The available resources to run these vehicles like quality of roads, and unavailability of new technologies in vehicles are causes for accidents. Road Traffic Accidents says, an event that occurs on a way or street open to public traffic; resulting in one or more persons being injured or killed, where at least one moving vehicle is involved. It is the collision between vehicles, pedestrian, animals, architectural obstacles etc. Main causes of accidents are distracted driving, accelerating the vehicle, drunken drive, careless driving, night driving, rain, wrong way driving, improper turns, late application brake, teenage drivers, road crossing etc. The number of people who dies 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 mainly affects 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. This is achieved by means of solenoid operated valve. The aim is to design and develop a control system which is working by operating the brake pedal. The project consists of 5×2 solenoid operated valve, brake pedal, pneumatic bumper system. The solenoid valve is operated by a brake pedal. There is any obstacle closer to the vehicle the driver applies the brake so that solenoid valve get operated which then pushes pneumatic bumper in forward position. The oldest headlamps were fueled by acetylene and oil and were introduced in the late 1880s. The first electric headlamps were introduced in 1898 on the Columbia Electric Car from the Electric Vehicle Company, and were not mandatory. The concept of swiveling headlamps is actually old one. An old innovation in lighting was to vertically tilt the beams high-beam-to- low-beam (dipped) switching dating back to 1917. Automatic high/low beam system firstly existed in 1952 by general motor called "Aortic Eye". More recently, automatic self-leveling has become an increasingly common requirement as the light sources have become brighter and glare has increased. Horizontal swiveling is important in the automotive industry. The current static headlamp provides illumination in tangent direction of the headlamp without any consideration towards the steering shaft angle and the distance between incoming vehicle and subject vehicle. The AFS controls the aiming direction and lighting distribution of the low beams according to the amount of turn applied to the steering wheel during cornering or turning and distance between the incoming and subject vehicle. AFS therefore improves driver's visibility during night driving by automatically turning the headlamp in the direction of travel according to steering wheel angle and the distance between two vehicles. The aim of this project is to build a cost effective Adaptive Front Light System, that will help to achieve increase safety, comfort and reliability. The new design and build should modify and fit into an existing fixed headlamp with a very close eye on cost and reliability. Use of existing headlamps will also allow the AFS addition to maintain the vehicle's conformity to existing vehicle aesthetics as well as government regulation. The objective is to achieve of this project are achieve horizontal movement of the headlamp in related to angle of steering shaft, thereby focusing in the right direction and achieve vertical movement

of the headlamp in accordance to the distance between the subject vehicle and the incoming vehicle, thereby enhances drivers visibility and reduce glare to oncoming vehicles in various traffic scenarios. Although, in the conventional headlamp control system, driver has control of the headlight which can be switched from high beam (bright) to low beam (dim), this is insufficient while driving on curved roads.

Over 50% of all road traffic accidents occur at night time. The focus is to improve visibility for the driver, thereby increasing driving safety. Various studies on swivel beam headlamp have shown up to 300% increase in illumination of the driver's gaze point as the vehicle turns on a corner. The additional corner illumination results in 58% increases in the driver's ability to recognize an obstacle. The requirement of headlight is a necessity during night travel. The same headlight which assists the driver for better vision during night travel is also responsible for many accidents. The driver has the control of the headlight. Presently, studied changes are unfolding in automotive lighting technology. Automobile manufacturers together with suppliers and representatives currently aspire to develop the headlights of tomorrow. Free form headlamp is one of the popular design which offers great flexibility and compactness. Some of the systems proposed that, the new standard for cornering light system allows not only the conventionally approved ON/OFF control mode interlocked with the operation of the turn signal switch but also an automatic ON/OFF control according to the steering wheel angle. Objective of the this kind of invention is to provide a steering wheel controlled car light pointing system which automatically turns the lights of the vehicle to coincide the projection of them lights with the steering direction of the vehicle . Some researcher suggested that, the apparatus for automatically adjusting a direction of a light axis of a vehicle headlight includes a steering angle sensor detecting a steering angle of a steering wheel of a vehicle and a swivel control unit performing swivel control by which the direction of the light in axis of the vehicle headlight is adjusted to the target direction in accordance with the steering angle detected by the steering angle sensor. Some systems proposed automatic optical-axis adjusting device for automatically adjusting direction of optical axes of front lights with respect to steering angle of steering wheel. Preventive and active safety of road vehicles is one of the top priorities in car design and development nowadays. Passive and active safety systems have been developed in R & D activities to produce vehicles that will perform at the highest level of safety and ensure comfortable driving under various conditions. Moreover, researchers have been trying to develop preventive.

1.1 Problem Statement

Due to increasing demands of vehicle and also increasing population of people there is high quantity of vehicles being use. Vehicle should be safe to drive and simple to operate. Now a day's vehicle accident is the major problem. Sometimes driver fails to apply brake of the vehicle also due to non-metallic body of vehicles are not able sustain the accidental force. Our Automatic Pneumatic Bumper system is an innovative project for the purpose of preventing accidents that happens in the restricted roadways. Also provides safety to vehicle before collision.

An aim of development in active safety is to reduce the reaction time of the driver by improving visibility and thus achieve a significant increase in road safety and driving comfort. Alexander and Lunen Fed mentioned that driving an automobile primarily a visual task because vision contributes as much as 90% of the information needed to drive. Good visibility contributes to driver confidence and enables more relaxed and safer driving. Moreover, statistics clearly show that the majority of accidents take place at night or in bad weather because of low visual conditions. Under such conditions, or in bad weather, drivers have difficulty in being able to see traffic control devices, lanes, other vehicles, pedestrians, animals, and other potential hazards. The traditional vehicle headlamp light system does not provide illumination in right direction and at precise angle on curvature road, due to these constraints, a need of alternative solution and advancement in the traditional technology arises which will focus light in all the required sides of the vehicle during taking a turn. The general problem is to design a system which can analyze road conditions to identify situation in which adaptive road illumination system could enhance visibility, and thereby substantially improve safety and/or comfort for road users. The main goal of this proposed project is to discuss ways in which the present, static vehicle illumination systems could be improved by making them dynamic more adaptable to the ever-changing road conditions, mainly curves.

1.2 Objective

The future of any industry is more than just developing new technology. It is integrating shifting the approach to achieve safety. Intelligent Braking System approach represents considerable shift from the traditional approach to safety, by considering safety in terms of firstly, avoiding the possibility of accidents, and secondly, protecting occupants when a crash is unavoidable, we can prevent more accidents, save more lives, decrease material damage to vehicles and reduce medical costs to society.

The objective of this project includes,

- To increase the sureness of braking application.
- To increase the response time of braking system.
- To improve the pre-crash safety.
- To avoid the percentage of passenger injury by using external vehicle safety.
- To reduce the requirement of internal safety devices like air bags.
- To move the headlight along with steering on sharp turning.
- To keep the headlight, beam parallel to road turning as possible as can.
- To change the place of area illuminated by headlight and direct illumination area of headlight in useful direction.
- To improve the visibility area of driver at night so that driver can judge road turning well.
- To prevent road accidents on sharp turning at night especially in hilly areas.
- To increase safety at night.

1.3 Scope

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. Forthat, some of the possible changes are:

- Regular bumpers can be replaced by hydraulic bumpers.
- Infrared sensors can sense eye blinking and give signal to solenoid valve when driver sleeps.
- Limit switch can be used to limit the minimum speed above which the system gets triggered.
- Bumper design can further be enhanced to act as external air bags.
- 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.
- Vehicle will stop at right time by this mechanism and prevent from accident.
- System also able to protect the car before collapse and protect the life of people.
- This system play very important role to protect from damaging the cars and also helpful for saving human life.

1.4 Methodology

The system of pneumatic bumper consists of pneumatic cylinders, impact member, 5 × 2 solenoid operated valve, brake pedal and pneumatic hoses. If vehicle is running on the road and suddenly an obstacle comes in front of the vehicle, then the driver will apply the brakes. As soon as brakes applied, this will operate the 5× 2 solenoid operated valve which then sends signal to the pneumatic cylinders. The pneumatic cylinders get operated and pressurized air moves the bumper forward. Bumper strikes the obstacle and absorbs shock by retracting. The system of steering headlamp consist of rack and pinion steering mechanism, headlights and linkages. When driving around a bend in the road, standard headlights continue to shine straight ahead, illuminating the side of the road and leaving the road ahead of you in the dark. Adaptive headlights, on the other hand, turn their beams according to your steering input so that the vehicle's actual path is lit up.
Similarly, when a vehicle with standard headlights crests a hill, the headlight beams temporarily point upwards towards the sky. This makes it difficult for driver to see the road ahead and for oncoming motorists to see the driver approaching. In contrast, adaptive head- lights use a self-levelling system that points the light beam up or down, according to the position of the vehicle.

2. DESIGN

Design consists of application of scientific principle, technical information, and imagination for development of new mechanism to perform specific function with maximum economy and efficiency. Hence careful design approach has to be adopted. The total design work has been split into two parts.

2.1 System Design

System design is mainly concerns the various physical constraints and ergonomics, space requirements, arrangement of various components on frame at system, man-machine inter- action, no. of controls, position of controls, working environments, of maintenance, scope of improvement weight if machine from ground level, total weight of machine and a lot more. In system design we mainly concentrated on the following parameter:-

- System selection based on constraints

  The machine is used in small-scale so space is major constrain. The system is to be very com-pact so that it can be adjusted in small space.

- Arrangement of various components

  Keeping into view the space restrictions all components should be laid such that their easy re-moval or servicing is possible. Every possible space is utilized in component arrangements.

- Man machine interaction Friendliness of machine with the operated that is operating is an important criterion of design.
- Chances of failure

  Losses incurred by owner in case of any failure are important criterion of design. Factor of safety while doing design should be kept high so that there are less chance of failure. Moreover periodic maintenance is required to keep unit healthy.

- Servicing facility

  Layout of components should be such that easy servicing is possible. Those which require fre-quent servicing can be easily disassembled.

- Scope of future improvement

  Arrangement should be provided in such way that if any changes have to be done for future scope for improving efficiency of machine.

- Height of machine elements from ground

  All the elements of the machine should be arranged to the height from where it is simple to operate by operator. Machine should be slightly higher than the waist level, also enough clearance should be provided from the ground for cleaning purpose.

- Weight of machine

  Total weight depends on the selection of material of all components as well as their dimensions. Higher weight will result in difficulty in transportation; it is difficult to take it to workshop be-cause of more weight

2.2 Mechanical Design

In mechanical design the components are listed down and stored on the basis of their procurement, design in two categories namely. 1. Designed parts 2. Parts to be purchased Mechanical design phase is very important from the view of designer as whole success of project depends on the correct design analysis of the problem. Many preliminary alternatives are eliminated during this phase. Designer should have adequate knowledge about physical properties of material, load stresses and failure. He should identify all internal and external forces acting on machine parts. These forces may be classified as,

a) Dead weight forces

b) Friction forces

c) Inertia forces

d) Centrifugal forces

e) Forces generated during power transmission etc.

Designer should estimate these forces very accurately by using design equations. If he does not have sufficient information to estimate them he should make certain practical assumptions based on similar conditions which will almost satisfy the functional needs. Assumptions must always be on the safer side. Selection of factors of safety to find working or design stress is another important step in design of working dimensions of machine elements. The correction in the theoretical stress values are to be made according in the kind of loads, shape of parts and service requirements. Selection of material should be made according to the condition of loading shapes of products environment conditions and desirable properties of material pro-vision should be made to minimize nearly adopting proper lubrication method.

3. COMPONENTS

3.1 Frame

A frame is the main supporting structure of a mechanism on which all other components are attached. The main functions of a frame is

- To deal with static and dynamic loads, without undue deflection or distortion.
- To support the components and body.

3.2 Pneumatic Cylinder

Pneumatic cylinders are mechanical devices which use the power of compressed gas to produce a force in a reciprocating linear motion. These are also called as air cylinders. Piston inside cylinder transfers the force to pneumatic bumper which is attached to the piston rod. Because the operating fluid is a gas, leakage from a pneumatic cylinder will not drip out and contaminate the surroundings, making pneumatics more desirable where cleanliness is a requirement.
According to movement of piston there are two types of cylinders, single acting and double acting. In single acting cylinders the pressurized fluid is used to move the piston in one direction and spring used to move it in other direction. But, in double acting cylinders the pressurized fluid is used for both extraction and retraction.

3.3 5×2 Solenoid Operated Valve

A solenoid valve is an electromechanically operated valve. The valve is controlled by an electric current through a solenoid. Solenoid valves are the most frequently used control elements in fluidics. The valve body must be compatible with the fluid; common materials are brass, stainless steel, aluminum, and plastic. The seals must be compatible with the fluid. Solenoid valves are used in fluid power pneumatic and hydraulic systems, to control cylinders fluid power motors or larger industrial valves. Solenoids offer fast and safe switching, high reliability, long service life, good medium compatibility of the materials used, low control power and compact design. A 5×2 solenoid operated valve has 2 ports and 5 positions.

3.4 Pneumatic Hoses

A hose is a flexible hollow tube designed to carry fluids from one location to another. The shape of a hose is usually cylindrical having a circular cross section. Hose design is based on a combination of application and performance. Common factors are size, pressure rating, weight, length, straight hose or coil hose, and chemical compatibility. Applications mostly use nylon, polyurethane, polyethylene, PVC, or synthetic or natural rubbers, based on the environment and pressure rating needed. In recent years, hoses can also be manufactured from special grades of polyethylene (LDPE and especially LLDPE). Other hose materials include PTFE (Teflon), stainless steel and other metals.
Hoses can be used in water or other liquid environments or to convey air or other gases. Hoses are used to carry fluids through air or fluid environments.

3.5 Brake Pedal

In modern cars the four-wheel braking system is controlled by a pedal to the left of the accelerator pedal. There is usually also a parking brake which operates the rear brakes only. On manual cars this is a lever between the front seats, but can be a pedal on some automatic transmission vehicles. Driver applies the force on the brake pedal, which then transmits the motion to the wheels through linkages to stop the vehicle.

3.6 Pneumatic Bumper

Pneumatic bumper acts as impact member attached to the piston through piston rods. Due to ex-traction and retraction movement of piston it moves forward and backward. The bumper is operated by a brake pedal. It is attached on the front side of the vehicle to absorb the shock due to impact of an obstacle.

Pneumatic bumper has to take a shock load applied due to an obstacle. If there is impact of any obstacle on the bumper, it moves backward and retracts the double acting pneumatic cylinder which absorbs the shock and reduces the intensity of hitting. The first member which comes in contact with an obstacle is pneumatic bumper.

3.7 Rack and Pinion Steering Mechanism

Steering is the collection of components, linkages, etc. which allows any vehicle like car, motor-cycle, bicycle to follow the desired course. The primary purpose of the steering system is to allow the driver to guide the vehicle.
The most conventional steering arrangement is to turn the front wheels using a hand operated steering wheel which is positioned in front of the driver, via the steering column. The basic aim of steering is to ensure that the wheels are pointing in the desired directions. This is typically achieved by a series of linkages, rods, pivots and gears.
BMW began to use rack and pinion steering systems in the 1930s. Many modern cars use rack and pinion steering mechanisms, where the steering wheel turns the pinion gear; the pinion moves the rack, which is a linear gear that meshes

with the pinion, converting circular motion into linear motion along the transverse axis of the car (side to side motion). This motion applies steering torque to the swivel pin ball joints that replaced previously used kingpins of the stub axle of the steered wheels via tie rods and a short lever arm called the steering arm.
The rack and pinion design has the advantages of a large degree of feedback and direct steering feel. A disadvantage is that it is not adjustable, so that when it does wear and develop lash, the only cure is replacement.

3.8 Headlamp

A headlamp is a light attached to the front of a vehicle to light the road ahead. Head- lamps performance has steadily improved throughout the automobile age, spurred by the great disparity between daytime and nighttime traffic fatalities. The US National Highway Traffic Safety Administration states that, nearly half of all traffic-related fatalities occur in the dark, despite only 25% of traffic traveling during darkness. Modern headlamps are electrically operated, positioned in pairs, one or two on each side of the front of a vehicle. A headlamp system is required to produce a low and a high beam, which may be achieved either by an individual lamp for each function or by a single multifunction lamp.

3.9 Linkages

A mechanical linkage is an assembly of bodies connected to transform a given input force and movement into a desired output force and movement. Linkages are important components of machines and tools. Linkages may be constructed from open chains, closed chains, or a combination of open and closed chains. Each link in a chain is connected by a joint to one or more other links.

3.10 Bolts and Nuts

Nut and bolts are generally used for fastening purpose. A nut is a type of fastener with a threaded hole. Nuts are almost always used in conjunction with a mating bolt to fasten multiple parts together. A bolt is a form of threaded fastener with an external male thread. The two partners are kept together by a combination of their threads friction, a slight stretching of the bolt and compression of the parts to be held together. The most common shape today is hexagonal, because six sides give a good granularity of angles for a tool to approach from.

4. WORKING

4.1 Working of Pneumatic Bumper

When the vehicle is subjected to accidental condition that is whenever the some obstacle is coming in front of vehicle the driver suddenly applied brake due to this braking action the solenoid valve is operated.
The brake pedal is connected to solenoid valve. The air supply from compressor is sup-plied to solenoid valve and from valve the air is passed to pneumatic cylinders. This pneumatic cylinders are connected to the bumper (impact member).The braking action makes provision to the solenoid valve to supply the air and actuate the pneumatic cylinder due which the pneumatic cylinders rod extend in front of vehicle. The extended portion, that is bumper is firstly comes in contact with the obstacle and absorb all the impact and reduce the shocks which is transmitted to the passengers. Due to this absorption of shocks and force the vehicle and inside passengers get adequate amount of safety which reduce the chances of loss of human life.

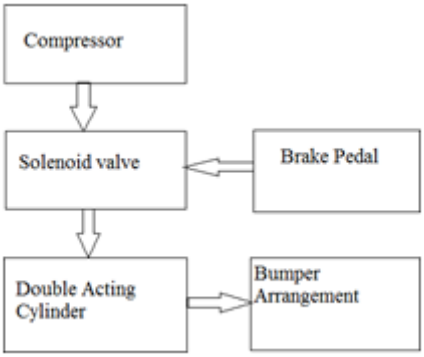

Fig. No 1 Circuit Diagram of Pneumatic Bumper

4.2 Working of Steering Headlamp

On the normal straight road the steering wheel of vehicle is kept straight by driver due which headlamp of vehicle is also in straight position. In other hand when the vehicle is moving on curve road the, suppose on curve road the driver taking right turn due which the driver supposed to move the steering wheel in clock-wise direction in required angle to fulfill the turning conditions. As the driver turn the steering wheel, the wheels of vehicle is also turning in required ratio, the linkages connected to the steering links move in desired in direction and passes the motion toward another small link and this small link turns the headlamp according the steering wheel rotation. This system provide better vision to driver on hill curve road and on turning road.

CONCLUSION

In this paper we take the review of System, this system consists of pneumatic cylinder, solenoid valve, Pneumatic bumper system and brake pedal. The driver of vehicle when pressed the brake pedal in emergency condition, then the solenoid valve is get operated by brake pedal and which consecutively operate the pneumatic bumper system.

REFERENCES

[1] Tushar Kale, Vaibhav Kute, Sandeep Pokharkar, Shubham Rakshe, Anil Katarkar “A Review Pneumatic Bumper for Four Wheeler Using Two Cylinder” Interna- tional Journal of Advance Engineering and Research Development Volume 4, Issue 3, March – 2017

[2] Srinivasa Chari.V, Dr. Venkatesh P.R, Dr.Prasanna Rao N.S, Adil Ahmed S “Au- to-matic Pneumatic Bumper and Break Actuation before Collision” International Re-search Journal of Engineering and Technology (IRJET) Volume: 02 Issue: 04 July-2015.

[3] Shubham Wasnik, Ketan Gedam, Aamir Sayed, Shubham Mashankar, Shubham Lash-kare, Vipin Raut “ International Research Journal of

Engineering and Tech- nology (IR-JET)" Volume: 04 Issue: 02 Feb -2017.

[4] Prof. M. B. Bankar, Prof. S. K. Pawar, Prof. R. V. Lalge "Design and Development of Automatic Pneumatic Bumper System" Journal Of Information, Knowledge And Re- search In Mechanical Engineering ISSN 0975 – 668x| Nov 16 To Oct 17 ,Volume –04, Issue – 02.

[5] Mangesh A. Jadhav ,Tushar S.Borkar, Nilam B. Narote, Pratik D.More, RajendraS. Chaudhari "Design of Head Light Moving Mechanism With Steering" Interna- tional Journal of Modern Trends in Engineering and Research e-ISSN No.:2349-9745, Date: 28- 30 April, 2016.

[6] Gadhave Yogesh V., Jadhav Chakradhar R., Aher Ravindra T., Sonawane Umesh A., Mali Praveen K "Front Wheel Steering System With Movable Headlights"Vol-3 Issue-2-2017.

[7] Rajesh.G "Automatic Headlamp Steering System" IJEDR Volume 2, Issue 2 ISSN: 2321-9939 -2014 V. B. Bhandari "Design of Machine Elements"