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STUDY OF PNEUMATIC BRAKING SYSTEM WITH PNEUMATIC BUMPER PROTECTION

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ABSTRACT

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.

I. INTRODUCTION

Today India is the most important underdeveloped 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

It is the project which has been fully equipped and designed for auto vehicles. 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 on intelligent electronically controlled automotive bumper activation system is called "automatic pneumatic bumper and break actuation before collision". The project consists of IR transmitter and Receiver circuit, Control Unit, Pneumatic bumper system. The IR sensor senses the obstacle. There is any obstacle closer to the vehicle (within 1feet), the control signal is given to the bumper and break activation system. This bumper activation system is activated when the vehicle speed above 40-50 km per hour.

The speed is sensed by the proximity sensor and this signal is transfer to the control unit and pneumatic bumper activation system.

The structures and interiors of modern motor vehicles are designed to prepare for a crash full time although crashes are relatively rare events. Full time readiness for a crash has imposed stringent restrictions on the styling, design and utility of motor vehicles. With the advancement in sensing technologies, a new class of safety features, called crash preparation features, has shown great potential in relieving the design restrictions. "Crash preparation" is the timely reconfiguration of a vehicle's structure and interior to the crash-ready state before an imminent crash. If the threat of a crash subsides, the vehicle reverts to its normal driving state, i.e., a "less" crash-ready state. Crash preparation can offer the needed crash protection while allowing new styling, design and utility previously not possible due to the needs for crash protection. A conceptual crash preparation feature, called the extendable and retractable knee bolster (knee bolster), was previously presented . The knee bolster is intended to automatically extend in situations in which there is a high risk of frontal impact to help prepare the vehicle for crash and retract when the risk subsides. In this paper, another conceptual crash preparation feature, called extendable and retractable bumper , is presented. The bumper is normally in the stowed position. When a high-risk of frontal impact crash is detected, the bumper extends to provide additional crush space. Recall that in a frontal impact crash accident, the kinetic energy of a motor vehicle is rapidly converted into work by plastic deformation of vehicle structures. During this energy conversion process, the vehicle is decelerated in a relatively short time and distance. The stopping distance, which is a function of the available crush space and the crush efficiency of the front-end of a vehicle, is a good crash severity indicator. For vehicles involved in similar crash impact conditions, elementary physics ensures that those with less crush space and lower crush efficiency will have shorter stopping distances, higher average deceleration, and hence, more severe crash outcomes. As motor vehicles have become more compact to meet the ever-stringent fuel efficiency requirements, the available crush space of motor vehicles has been involuntarily reduced. The bumper is the only known safety feature that could provide the desired crush space only when a need appears. The additional crush space would allow the extended bumper structure to absorb additional crash energy to reduce the severity of the crash. The bumper automatically retracts when the risk subsides. In this paper the proof of concept of the bumper and its potential benefits are discussed in detail. Various vehicles are equipped with reverse brake assist systems used to help prevent a driver from backing into an object in the rearward drive path. Such systems sense the presence of an object in the rearward path of the vehicle and take an action in response to such detection. For example, it is known to activate a sensory alarm (e. g., audible or visual) to alert the driver of the presence of an object in the rearward drive path. It is also known for the vehicle to automatically apply the vehicle brake system when an object is sensed in the rearward drive path. Such systems that automatically apply the brake system do so for a particular pre-determined amount of time after detection of the object, which may normally be sufficient to stop the vehicle before coming in contact with the object. However, the inventors have recognized that such automatic breaking systems are not as effective on low friction surfaces (e.g., ice, snow or rain) or on downward inclines as they are on normal high friction road surfaces. It is desirable to have an improved reverse brake assist system that is more effective on low friction and downward inclined surfaces.

A method of deactivating a vehicle's reverse brake assist system that had been automatically activated in response to detection of an object in a rearward path of the vehicle is disclosed. The method comprises detecting when the rear ward motion of the vehicle has stopped and deactivating the vehicle brakes a pre-determined period of time after the rear ward motion of the vehicle has stopped. With regard to the processes, systems, methods, heuristics, etc. described herein, it should be understood that, although the steps of such processes, etc. have been described as occur ring according to a certain ordered sequence, such processes could be practiced with the described steps performed in an order other than the order described herein. It further should be understood that certain steps could be performed simultaneously, that other steps could be added, or that certain steps described herein could be omitted. In other words, the descriptions of processes herein are provided for the purpose of illustrating certain embodiments, and should in no way be construed so as to limit the claimed invention. Accordingly, it is to be understood that the above description is intended to be illustrative and not restrictive. Many embodiments and applications other than the examples provided would be apparent upon reading the above description. The scope of the invention should be determined, not with reference to the above description, but should instead be determined with reference to the appended claims, along with the full scope of equivalents to which such claims are entitled. It is anticipated and intended that future developments will occur in the technologies discussed herein, and that the dis closed systems and methods will be incorporated into such future embodiments. In sum, it should be understood that the invention is capable of medication and variation. For example, the above-described system and method could be used for forward motion (in addition to or instead of rearward motion). All terms used in the claims are intended to be given their broadest reasonable constructions and their ordinary meanings as understood by those knowledgeable in the technologies described herein unless an explicit indication to the contrary in made herein. In particular, use of the singular articles such as "a," "the," "said," etc. should be read to recite one or more of the indicated elements unless a claim recites an explicit limitation to the contrary.

1.1 Problem Statement

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.

1.2 Objectives

- 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.

1.3 Scope

•This system may be applicable in all types of light vehicles like cars, Rickshaws, Tempos.
•This system also successfully installed in the heavy vehicles like buses, trucks, trailers,etc.
•It able to Increase the sureness in braking system.
•Braking system able to give fast response.
•System able to increase the pre-crash safety.
•System able to provide more safety to the passengers.
•System plays an important role to save human life in road accidents.
•To avoid the percentage of passenger injury by using external vehicle safety.
•To reduce the requirement of internal safety devices like air bags.

II. LITERATURE REVIEW

The aim is to design and develop a control system based on pneumatic breaking system of an intelligent electronically controlled automotive braking system. Based on this model, control strategies such as an 'antilock braking system' (ABS) and improved manoeuvrability via individual wheel braking are to be developed and evaluated.

There have been considerable advances in modern vehicle braking systems in recent years. For example, electronically controlled ABS for emergency braking, electronically controlled hydraulically actuated individual brake-by-wire (BBW) systems for saloon cars and electronically controlled pneumatically actuated systems for heavy goods vehicles. The work of recent years shall form the basis of a system design approach to be implemented. The novelty of the proposed research programmed shall lie in the design and evaluation of control systems for achieving individual wheel motion control facilitated by BBW. In the case of BBW the brake pedal is detached from the hydraulic system and replaced by a 'brake pedal simulator'. The simulator provides an electrical signal for the electronic control system.

Preliminary modeling and simulation work considers a quarter cars initially followed by a natural progression to the half car and full four wheel station cases. The model is to be constructed in modular form thus allowing the replacement / interchange of the various blocks and their associated technologies. Upon completion of the full vehicle braking model, sensitivity analyses will be carried out. Once the preliminary simulation model has been thoroughly benchmarked and existing control system strategies evaluated, an audit of the technology used is to take place and this will provide a basis for comparison of iterative technologies / techniques.

The final phase of the new modern vehicle shall include:

- Development of improved ABS control systems
- Development and assessment of an electro-hydraulic-BBW (EH-BBW) system
- Individual wheel braking combined with traction control
- Assessing sensor failure and fault tolerant control system design
- Preliminary studies into an electrically actuated system.

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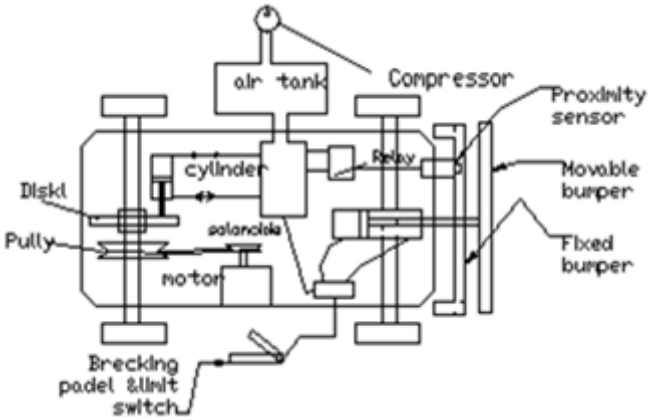

Design of system

2.1. Pneumatics

The word 'pneuma' comes from Greek and means wind. The word pneumatics is the study of air movement and its phenomena is derived from the word pneuma. Today pneumatics is mainly understood to means the application of air as a working medium in industry especially the driving and controlling of machines and equipment. Pneumatics has for long time using to carry out the simplest mechanical tasks in more recent times has played a more important role in the development of pneumatic technology for automation.

Pneumatic systems operate on a supply of compressed air which must be made available in sufficient quantity and at a pressure to suit the capacity of the system. When the pneumatic system is being adopted for the first time, it should necessary to deal with the question of compressed air supply. The key part of any facility for supply of compressed air is by means of using reciprocating compressor. A compressor is a machine that takes in air, gas at a certain pressure and delivered the air at a high pressure.

Compressor capacity is the actual quantity of air compressed and delivered and the volume expressed is that of that of the air at intake conditions namely at atmosphere pressure and normal ambient temperature. Compressor is working under the principle of Boyle's law. Boyle's law states that at constant temperature for a fixed mass, the absolute pressure and the volume of a gas are inversely proportional. The law can also be stated in a slightly different manner, that the product of absolute pressure and volume is always constant.

This can be written as

$PV = C$ (or) $P_iV_i = P2V2$

P denotes the pressure of the system.

V denotes the volume of the gas.

C is a constant value representative of the pressure and volume of the system.

Most gases behave like ideal gases at moderate pressures and temperatures. The technology of the 17th century could not produce high pressures or low temperatures. Hence, the law was not likely to have deviations at the time of publication. As improvements in technology permitted higher pressures and lower temperatures, deviations from the ideal gas behavior would become noticeable, and the relationship between pressure and volume can only be accurately described employing real gas theory. Any gas can be used in pneumatic system but air is the mostly used system now a days.

2.2. Pneumatic Power

Pneumatic systems use pressurized gases to transmit and control power. Pneumatic systems typically use air as the fluid medium because air is safe, low cost and readily available.

2.3. Brake System

In cars, the hand brake (emergency brake, e-brake, parking brake) is a latching brake usually used to keep the car stationary, and in manual transmission vehicles, as an aid to starting the vehicle from stopped when going up an incline - with one foot on the clutch (to disengage it smoothly), the other on the accelerator (to avoid stalling from the increased torque required by the incline), a third limb is needed for the brake (to avoid rolling backwards while moving a foot from brake to accelerator). Automobile e-brakes usually consist of a cable (usually adjustable for length) directly connected to the brake mechanism on one end and to some type of mechanism that can be actuated by the driver on the other end. The mechanism is often a hand-operated lever (hence the *hand brake* name), on the floor on either side of the driver, or a pull handle located below and near the steering wheel column, or a (foot-operated) pedal located far apart from the other pedals.

Although sometimes known as an emergency brake, using it in any emergency where the footbrake is still operational is likely to badly upset the brake balance of the car and vastly increase the likelihood of loss of control of the vehicle, for example by initiating a rear-wheel skid. Additionally, the stopping force provided by using the handbrake instead of or in addition to the footbrake is usually small and would not significantly aid in stopping the vehicle, again because it usually operates on the rear wheels; they suffer reduced traction compared to the front wheels while braking. The emergency brake is instead intended for use in case of mechanical failure where the regular footbrake is inoperable or compromised, hopefully with opportunity to apply the brake in a controlled manner to bring the vehicle to a safe, if gentle halt before seeking service assistance. Modern brake systems are typically very reliable and engineered with failsafe (e.g. dual-circuit hydraulics) and failure-warning (e.g. low brake fluid sensor) systems, meaning the handbrake is no longer often called on for its original purpose.

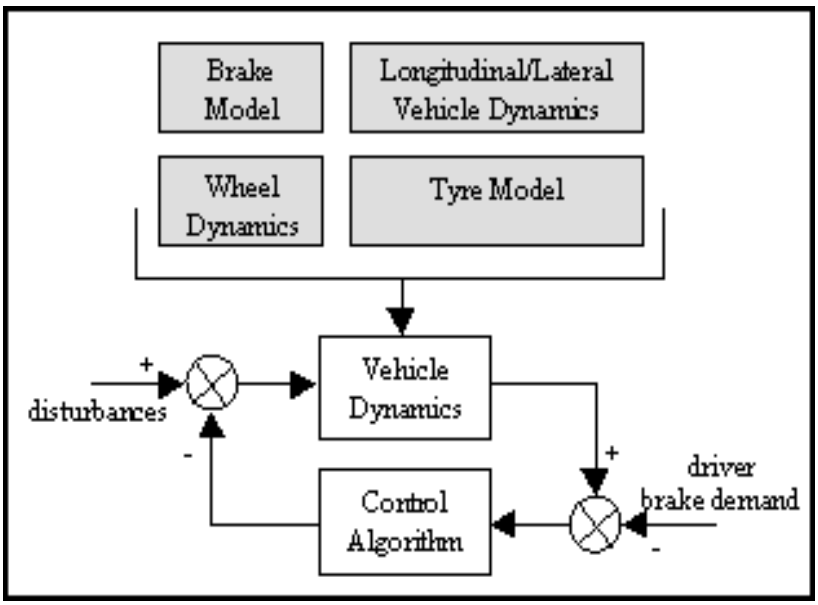

Fig.2.2 Basic principle of pneumatic system

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The most common use for an automobile emergency brake is to keep the vehicle motionless when it is parked, thus the alternative name, *parking brake*. Car emergency brakes have a ratchet locking mechanism that will keep them engaged until a release button is pressed. On vehicles with automatic transmissions, this is usually used in concert with a parking pawl in the transmission. Automotive safety experts recommend the use of both systems to immobilize a parked car, and the use of both systems is required by law in some places, yet many individuals use only the "Park" position on the automatic transmission and not the parking brake. It's similar with manual transmission cars: They are recommended always to be left with the handbrake engaged, in concert with their lowest gear (usually either first or reverse). The use of both systems is also required by law in some jurisdictions. However, when parking on level ground, many people either only engage the handbrake (gear lever in neutral), or only select a gear (handbrake released). If parking on a hill with only one system results in the car rolling and damaging the car or other property, insurance companies in some countries, for example in Germany, aren't required to pay for the damages.

IV. MERITS AND DEMERITS

MERITS

- Quick operation
- Accuracy is more
- It reduces the manual effort.
- Avoid tension of driver
- Less cost

DEMERITS

- Cylinder stroke length is constant
- Maintenance of the equipment components such as hoses, valves has to done periodically.

V. ADVANTAGES

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

VI. CONCLUSION

In this review paper we studied that vehicle accident is a major problem. For the prevention of accidentsbraking 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 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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