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A REVIEWS OF PNEUMATIC BRAKING SYSTEM IN AUTOMOBILES

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Abstract - *Accidents are becoming increasingly common in India, due to the inability of drivers to apply brakes at the appropriate time. This is also due to an increase in the number of vehicles on the road which if not managed properly could make driving difficult.so a system must be designed to eliminate incidents that can compensate for drivers not being able to apply braking on time. The aim of this research is to design a system that can effectively scan the environment when driving and apply brakes to stop a vehicle front-end collision, as well as bumper extension. These operations were carried out using a pneumatic braking circuit and infrared sensors. The presence of the obstacle is detected by an IR sensor on the vehicle's front end. Due to its simplicity and ease of operation, pneumatic systems can be useful in automation. This is a pneumatic breaking circuit-based setup that can be used in cars as a smart vehicle assistant to help with safe driving.*

***Key Words*: Pneumatic bumper, IR sensor, pneumatic brake system.**

1.INTRODUCTION

Vehicles account for about one-third of India's population. As a result, fatalities caused by automobile collisions undoubtedly lead to the majority of deaths. Though there are many reasons for these collisions, one of the most frequent is the driver's inability to apply brakes at the appropriate time. As a result, installing and incorporating an automatic bumper and braking mechanism is important for vehicles to avoid accidents. We created an Automatic Pneumatic Bumper and Braking Mechanism to accomplish this system.

The bumper, which is completely fitted with an infrared sensor and a pneumatic bumper control circuit, is the main part of this system. We give a collision control system called the extractable and retractable bumper (E/R bumper) in this project. The E/R bumper is usually stowed, but when a high probability of a frontal impact collision is observed, the bumper extracts to provide more crush space. The kinetic energy of a motor vehicle caused by a collision is then quickly transformed into work by plastic deformation of the bumper's structure. The car is decelerated in a comparatively short time and distance during this energy conversion phase.

The IR sensor on the E/R bumper detects the barrier, and if the obstacle is within 1-1.2 feet of the car, a control signal is sent to the bumper and split triggering device. This bumper activation device is triggered only when the vehicle speed exceeds 40-50 km/h. To detect this speed, a proximity sensor is mounted in the system, and the signal is transmitted to the control unit and pneumatic bumper activation system, respectively, and the bumper removes, preventing damage to the vehicle's body.

2. LITERATURE REVIEW

Srinivasa Chari.V et al (2018) reported that, if an obstacle is within 3-4 feet of the vehicle, a control signal is sent to the bumper activation system and the pneumatic braking system at the same time. Only when the vehicle speed exceeds 30-40 km/h is this bumper and braking system enabled.[1]

Shinde Aniket S et al (2017) have conducted a study that the control signal is provided if there is some obstacle closer to the vehicle. braking machine with bumper activation system This smart braking system is a groundbreaking project aimed at avoiding or reducing the effects of frontal accidents that occur on congested roads. This system is built on the "Smart braking system with pneumatic bumper," a smart electrically controlled automatic bumper and brake activation system. This device also improves vehicle braking response time to maintain a healthy gap between two vehicles.[2]

Mr. Lakhan Thombare et al (2016) studied and determined the failure to apply the brakes at the appropriate time is the most common reason given. Accidents can be avoided if the brakes are applied at the appropriate time. When compared to fully manual braking, automation will ensure greater braking efficiency. Because of its simplicity and ease of operation, pneumatic systems can be useful in automation. As a result, the aim is to design and implement a system based on vehicle automatic control. As a result, our aim is to create an "Intelligent Braking Device with Pneumatic Bumper."[3]

Mayur K. Gadhave et al (2017) observed and reported, the aim is to design and build a control system based on "Intelligent Braking with Pneumatic Bumper," an intelligent electronically controlled automotive bumper activation system. The IR transmitter and receiver circuits, the Control

Unit, the pneumatic bumper system, and the braking unit are all part of this system. The obstacle is detected using the infrared sensor. The control signal is sent to the bumper activation device braking unit if there is some obstacle closer to the vehicle. The pneumatic bumper system protects both the man and the car. Vehicle collisions are a big issue nowadays.[4]

Mr. Kushal V. Gawande et al (2017) they did some research on in recent years, vehicle collisions have been all too common. Because of the strong demand for cars, there has been a significant growth in the population of vehicles. They are a major danger to people and land. Accidents must be mitigated by a device. The aim of this research is to create a system that can effectively scan the environment when driving and apply brakes to stop a vehicle front-end collision, as well as bumper extension.[5]

AAYUSH CHAWLA et al (2018) have conducted a study, as a result our goal is to design and create an electronically intelligent braking system that can detect obstacles ahead of the vehicle and apply brakes automatically to avoid a collision. If the crash still occurs, we will incorporate a new retractable/extractable bumper technology that can be used in the event of a collision, preventing damage to the vehicle's body. This bumper can be extracted or retracted using Pneumatics technology, which is much simpler to incorporate and has a wide range of applications. As a result, our goal for this project is to design and build an "Automatic Pneumatic Bumper and Braking System."[6]

A research was done by Bu, Fanping, and Han-Shue Tan (2007). This article discusses the Indirect Adaptive Robust Control (IARC) design for a pneumatic braking system, as well as the successful execution of a bus precision docking demonstration.. [7]

Patil Pratik et al (2016) states that the proximity sensor and relay coil are used to automate the control of this system. A proximity sensor is included in the system, which detects when a vehicle approaches our vehicle system, potentially causing damage. The pneumatic cylinder is actuated and brake is applied in the disc brake sense as a result of feedback from the sensor via the relay coil. Another pneumatic cylinder is fitted with a bumper to provide protection in the event of an accident. Pre-crash vehicle safety is also provided. As a result, this system is secure.[8]

Mrs. Palak Desai et al (2017) the paper describes a method for assisting a driver when parking in reverse and reducing blind spots around a vehicle that are not visible while facing ahead or through side or rear-view mirrors. The vehicle will be regulated by the automatic reverse braking system with blind spot reduction technology, which will process sensor data and avoid accidents caused by reckless driving or trouble sensing obstacles on the reverse direction and on the road while driving. This is an integrated circuit-based setup that can be used in cars as a smart vehicle assistant for safe driving.[9]

Tejsinh Pisal et al (2017) the paper describes, aim is to design and create an intelligent electronically controlled automotive bumper activation device dubbed "AUTOMATIC PNEUMATIC BUMPER." Ultrasonic transmitter and receiver ultrasonic circuit, control unit, and pneumatic bumper system make up this system. The obstacle is detected using an ultrasonic sensor. When an obstacle is within 2 feet of the car, the bumper activation device receives a control signal.[10]

Vinay Gahtori et al (2015) reported that while braking, the anti-lock braking system allows the wheel to interact continuously with the ground surface as indicated by the driver's driving feedback. This keeps the wheels from locking up (rotating at a steady speed) and avoids skidding. We worked on the PCABS anti-lock braking system, which is pneumatically controlled, in this study. The purpose of this article is to give a quick understanding of how the ABS system works with 555 pneumatic systems. ABS is hydraulic in concept, but we've been working on a pneumatic version.[11]

S. Suresh et al (2017) states this paper focuses on an Intelligent Braking (IBS) device that uses a variety of sensors to respond to emergencies. An ultrasonic wave emitter on the front of the car is used. The signal is also supplied with an ultrasound receiver. The wave reflected makes it possible to distance the barrier from the vehicle. The pulses are then detected by a microcontroller and the brakes are placed on the car. IBS Car offers an overview of the car's potential. By IBS, more deaths can be avoided and more lives saved.[12]

Mr.Piyush Walke et al (2017) observes, there are a variety of reasons for these accidents, proper braking equipment and technology to minimize harm during an accident (such as a pneumatic bumper system) may have a significant impact on accident rates. As a result, a pre-crash system is needed. The pre-crash device uses a sensor network to locate unseen vehicles that will be tracked by autonomous on-vehicle sensors, preventing accidents on roads with low visibility. To avoid collisions and accidents caused by reckless driving, the pre-crash system processes sensor data and controls the vehicle. Since the pneumatic system is simple and easy to use, it can be used in the automation industry.[13]

Mr. Tushar Kavatkar et al (2017) observes, the majority of accidents occur as a result of the driver's failure to touch the brakes in a timely manner. As a result, in this

project work, a braking system is created that, when enabled, can apply brakes based on the object sensed by the ultrasonic sensor and the vehicle's speed. Vehicles are more often fitted with active protection systems to reduce the risk of collisions, which are common in urban areas. Antilock Braking Systems (ABS), Traction Control, and Stability Control are the most common. All of these systems use various types of sensors to continuously track the vehicle's conditions and respond in an emergency.[14]

Lu Yi, Xu Bowen and Guo Bin (2015) proposed Experimental Verification, this study laid the groundwork for more structural brake component optimization and a fitness review of the pneumatic brake system.[15]

S.Mithun et al (2014) the full modelling of each brake system products, including actuation valves, control valves, actuators, and foundation brakes, is described in this work. The response time of a typical 4X2 heavy commercial vehicle has been predicted. A comparison of the transient torque generated by the existing drum brake with an equivalent disc brake model was also conducted. The layout was created using the bond graph technique and a lumped system in one of the commercially available multi-domain physical modelling applications. [16]

Kun, Zhou, et al (2017) The braking effect of the emergency braking system is theoretically calculated and analyzed by finite element software ANSYS line of brake system crash simulation analysis of its structure optimized to improve the braking system in unexpected braking reliability and safety when falling, pneumatic balancer emergency braking system is described in this article.[17]

Dr.J.Hameed Hussain et al (2017) describes, Sensors with an IR transmitter and receiver unit, a control unit, and a pneumatic braking system operate the pneumatic brakes and clutches. The IR sensor is used to locate the resisting area as well as any obstacles. If there is some resistance in the passage, the IR sensor detects the presence of an obstacle and sends a control signal to the brake and clutch systems. The pneumatic breaking and clutch system is used to stop the vehicle and the clutch system is used to change the gears.[18]

Ketan H. Mhatre (2018) proposed a method, while running at high speeds the circuit will destroy the vehicle in seconds. Two-wheelers would be safer with an automatic brake with an electro-pneumatic system. This project was created to complete the necessary task in the shortest amount of time while also bringing some creativity to the automotive industry.[19]

Kadole Pavan Prabhakar et al (2020) determined, When the driver sets a desired speed limit, the tachometer senses any rise above that limit and uses the pneumatic braking system to apply enough braking to bring the speed back to the set limit, minimizing the driver's mental and physical pressure.[20]

Fanping Bu and Han-Shue Tan (2005) states that, Precision stopping is a vital automated vehicle control mechanism for applications like automated truck or bus fuelling and precise bus docking. The precision stopping problem is described in this paper, as well as the Indirect Adaptive Robust Control (IARC) design for a bus with pneumatic brakes and the successful implementation of a bus precision docking demonstration.[21]

Manikandan. S et al (2019) describes, ratchet locking mechanism in a traditional handbrake device keeps it engaged before a release button is pressed. Accidents can occur when the driver fails to activate the handbrake. An Automatic Hand Brake Engaging and Disengaging Device is proposed as a solution to this issue. This project proposes a brand-new pneumatic parking brakes system design that is simple and inexpensive.[22]

Amol karad et al (2017) have observes, in order to avoid collisions on restricted roads, the breakup scheme employs a revolutionary method. The purpose of this system is a smart electronic bumper system control system known as "Automatic braking systems with pneumatic bumpers." This helps us to prevent injuries in our car. In addition, this device helps to keep the two vehicles secured. We can monitor the vehicle velocity with this device. [23]

Subhasis Sarkar et al (2020) have conducted a study, ABS provides advanced vehicle control and reduces stopping distance on slick and dry surfaces; but, on loose surfaces such as asphalt or snow-covered pavement, ABS can significantly improve braking distance while also improving vehicle control. Due to its simple and ease of use, the use of the pneumatic method can prove useful in automation. In particular, pneumatics spring as brakes is actuated, thus demonstrating reduced disc jamming in heavy vehicles with large loads.[24]

Yash G. Kulkarni et al (2018) are based on the smart automatic bumper and brake activation mechanism electrically controlled. This device also enhances the vehicle brake reaction time, to maintain a reasonable distance between two cars.[25]

Experiment was suggested by Shriram Pawar et al (2018). A pneumatic tank holds the engine's exhaust gas. The pneumatic cylinder and brake lever are both powered by the exhaust gas pressure. A non-return valve is used to charge the air tank in the machine. Diesel and gasoline engines might be included in this study. The main objective of this research is to minimise engine driving workloads while utilising the air compressor. The pneumatic brake would be controlled in this plant by pressured air from the exhaust..[26]

Amol B Chaudhari et al. (2018) discussed, the process is smooth thanks to the pneumatic system. The system can be adjusted and improved according to the applications by employing further techniques. The key benefit of the device is that when approaching an obstacle, the bumper and brake are both enabled at the same time.[27]

A. Giridharan et al. (2018) developed an automatic braking system to prevent a vehicle frontal collision due to the driver's inattention. For an automatic braking system, an algorithm is proposed. Experiments are used to test the proposed working model. The ultrasonic sensor has been validated for distance estimation, and it estimates distance with a 3.31 percent error rate.[28]

Dineshkumar C et al. (2017) proposed this system because is cost-effective, and the brake cable is powered by a stepper motor. The system's purpose is to reduce the vehicle's speed and slow it down before a collision occurs. In a critical situation, the vehicle's impact is minimized, and braking performance is improved. This device saves the lives of the driver and co-passengers while reducing injury. This proposed scheme should be beneficial to middleclass individuals and low-cost automobiles.[29]

He, Ren et al (2019) discussed, An AMESim model of the semitrailer braking system involving the relay emergency valve (REV) and chambers was developed on the basis of systematically analyzing the working characteristics of the braking system in different braking stages: feedback braking, relay braking, and emergency braking, in order to predict and monitor the response time of the braking system of semitrailers.[30]

Pranav, A. S et al (2019) discussed, when compared to fully manual braking, automation will ensure greater braking efficiency. As a result, in today's world, cars must have a proper (automatic) braking mechanism in place to avoid accidents. As a result, a pre-crash system is needed. Using ultrasonic sensors, such a device can avoid accidents on roads with low visibility.[31]

M.N KAILASH et al (2019) states, that the majority of bumpers used in today's automobiles are rigid. These bumpers have a particular capacity, and when the range of the accidental force is very large, the bumpers fail, transferring the force to the passengers. As a result, this device never reduces vehicle and passenger damage. It is critical to develop Automatic Pneumatic Bumpers to counteract these undesirable effects.[32]

S. Praveen Balaji et al (2019) analyzed that the pneumatic mechanism, which applies the vehicle's brake and extends the bumper, is operated by the intelligence of an electronically controlled system, which also switches off the prime mover's power supply. The driver may also use the brake pedal to try to stop the car. When the vehicle's speed exceeds 40-50 km/hr., the entire device is triggered. The machine detects speed through a simple link to the speedometer. The vehicle's precrash protection is provided by this system. It improves the reaction time of decelerating vehicles in order to maintain a safe distance between them.[33]

J.V.Sai Ram et al (2017) proposed experimental verification that, an ultrasonic setup is mounted before the car and consists of an emitter and a receiver. When an obstacle is detected, the wave is still reflected, and the signal is detected by the receiver. From a distance, the reflected wave delivers a signal to the Arduino Nano, which activates the buzzer or brakes. Using a solenoid valve, the brakes are actuated. Electrical signal driven solenoid valve and the brakes are pneumatically actuated. [34]

Prabu P et al (2019) establish a control system for an intelligent electronically driven automotive braking system based on a pneumatic braking system Control technique such as 'PNEUMATIC BREAKING' and enhanced maneuverability via individual wheel braking will be developed and tested based on this model. Our initiative has a means of avoiding low-speed collisions. It also served to lower the vehicle's impact power. It also saves the lives of travellers and reduces the transmission of force to humans. [35]

Duguta Rajashekar et al (2019) A dynamics analysis was performed between the Normal bumper Design and the Pneumatic bumper Design for maximum energy absorption, according to the statement. [36]

Miller et al (2013) reported, As opposed to other trucks, heavy goods vehicles have low brake efficiency in emergency circumstances. For pneumatically braked heavy goods vehicles, a new braking mechanism is added. As a result, air consumption found in hardware-in-the-loop experiments on this surface reflects the possible reduction in reservoir size that the current device might achieve. [37]

Mr. Sagar B. Sonawale et al (2020) to avoid the accidents have become a major concern in recent years as a result of poor road and track design. To address this problem, this project aims to reduce the number of incidents and the severity of the harm to people who are involved in them. [38]

Gangyan, L., & Fan, Y (2017) This paper suggested the idea of intelligent braking and pneumatic automatic braking in order to satisfy the specifications of autonomous driving, and then developed a pneumatic automatic braking circuit. The pressure shift rate is a new metric for assessing automatic braking and control systems. [39]

Abhinav Chaudhary et al (2020) reported that, distraction driving is a major contributor to accident death. By using automotive bumper activation system, it's easy to install and easy to use and its cost is very low so there would

be no difference in the cost of the vehicle after or before installing it. This system can be used for good safety assistance. It can help and make vehicle more features in today world. [40]

N. Sreeraman et al (2020) proposed structure for automobile braking systems has a wide range of applications, especially in developing countries where smart vehicle and intelligent highway research is gaining traction. When the system is combined with other subsystems such as automatic traction control, intelligent throttle, and auto cruise control, the result is a smart vehicle man oeuvre. In modern industry, material handling trolleys and machinery are also required, and industries need them. [41]

Jadhav Amol D et al (2018) reported that, the Automation is the key to improving the safety of the automobile industry. The car brakes automatically when an obstacle is close by. The IR sensor senses the obstacle and gives the braking system a signal. The pneumatic braking system is used to brake the car. It is incontestable, statistically proved fact, that 20-30% of all reported work-related injuries or fatalities are caused by car crashes. [42]

Steven Rodrigues (2017) describes, Regenerative braking system is one such technology used in automobiles to recover the energy that is wasted to slow down or stop the vehicle. In this paper the regenerative brakes restore the kinetic energy of the vehicle into pressurized air. The fuel consumed by the vehicles is not completely utilized. Lot of energy is dissipated in the environment in the form of heat. [43]

Jordan Lewis et al. (2019) spoke about, Vehicle accidents pose a serious risk to both life and property. Accidents must be minimized by the design of a system. An ultrasonic sensor located on the vehicle's front end detects the direction of the obstacle. A pneumatic braking mechanism applies the brakes and brings the vehicle to a stop. [44]

Sandeep Thorat et al (2016) discussed, ASS (active safety systems) is being researched and developed to prevent accidents and target mitigation. AEBS (Advanced Emergency Braking Systems) successfully avoids collisions while also reducing deaths, and the project's goal is to create a demonstration system that can be used in production cars. [45]

P.Balashanmugam et al (2013) an attempt has been made in this project to reduce such mishaps. A high-speed indication is given and automatic braking is applied by cutting off the fuel supply to the engine. In our project, we have used a solenoid valve and an operational amplifier circuit using LM324IC. [46]

Dinesh kumar.S et al (2019) have designed and developed the new method, two pneumatic cylinders are triggered as a result of this, which extends the bumpers from their original position to a certain distance and also activates the brakes. Simultaneously, to lessen the damage on the car caused by the crash. [47]

Dmitriy Nikitin et al (2018), In this article we suggest a way to enhance the efficiency of the pneumatic blocking mechanism in a vehicle using pneumatic compressor rings with better operating features, low development costs and good production adaptability. [48]

Chetan Tembhurkar et al (2018) preferred this method, Additional protection for vehicle braking is the automatic brake system. The goal of the project is to develop car accidentavoidance techniques and reduce the risks posed by accidents such as automotive damage, human injury etc. Such a machine can easily be made in thick air. Activating and breaking mechanism by pneumatic bumper. [49]

Karan.M. Kewalramani et al (2020), The purpose of this project is to create and build an automotive bumper-activation device by implementation of proper braking system to prevent the accidents and pneumatic bumper system to reduce the damage is must for vehicles and it's a genuine project which is fully equipped and designed for Automobile vehicles. [50]

3. CONCLUSION

In this review paper we studied that vehicle accident is a major problem. For the prevention of accidents, braking system introduced with innovative idea usually seen in restricted roadways. The system controlling is done automatically by using a pneumatic braking circuit and infrared sensors We also studied that use of pneumatic system improves the operation of braking. Due to the use of pneumatic system the operation is smooth. The main objective is to improve technique of prevention of accidents and to reduce damaged caused to the vehicle. By using more techniques, the system can be modified and developed according to the applications. The use of extension bumper helps to reduce the vehicle damage. In further, by implementing these we can reduce cost of high-end cars by giving similar kind of safety.

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