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Design and development on brake fail indication and emergency braking system

by

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Abstract: This paper overviews Design of brake fail indication as well the emergency braking system, as per the study in review paper Ghana has seen dramatic increase in the vehicle growth, With the increased socio – economic activities & with so many cars on the road accidents has also been increased, Law enforcing agencies should ensure vehicle users maintained their vehicles most especially the brakes by regularly holding a campaign to check brake servicing in the country. A better braking system will improve safety while driving, Friction occurs in disk pad & rotor, which causes damage on the braking component, It requires regular maintenance, its used to maintain performance of brakes, Brakes wear on the rapid braking process, Heat generated will be released in to the atmosphere, but the dissipation capabilities will be decreased, Therefore material change is necessary as its capable of improving the braking performance in this material as well as design is also important. Even ventilated discs can be used which helps to provide additional 10% heat reduction. Even introducing the new system which been used In the train locomotives to stop the train in an emergency state. In this the passenger would get the alert and the vehicle can be stopped completely the main advantage of this kind of system is that while the vehicle is on the slope in a mountain or bridge the vehicle can be completely stopped to rest without any movement and the movement only occurs when the valve is been released by the driver. Regenerative brakes are used to slow down the vehicle, it converts kinetic to any other useful energy which is stored until required, This system helps to provide more efficiency from the vehicle as it uses the energy which was been lost as friction between the shoes and the wheel, which uses to light the rear car side light and not use any support of the car battery. Normally when we apply the brake in car the light system tends to glow, but due to this innovation we can provide intensity to the light system that how much intensity we can apply the brakes with the force or pressure applied on the brakes.

I. INTRODUCTION

As in of today in the era of smart vehicles and modern engineering, which is been observed around us. Just about a decade ago where technology was just in growing there were very few types of sensors based on automobile working. But as of today we use about 60 – 100 sensors, and its even assumed that its number might double over the year according to the technological advancements. Basically these involves sensors used for human safety and human comfort. Even due this there is a huge possibility of accidents causing human injuries or even deaths, which in most cases are observed due to rash driving or malfunctioning of automobile parts. Other than that there is Poor anticipation, Distraction, Traffic law violation, Poor lane marking, Unclear traffic signs, Bad road quality with dense potholes and so on. Accidents now occurs due to various reasons foremost is the equipment failure which is due to improper maintenance of the products, In this new system deals with circuit model which checks the condition of the brake wire in an automobile, alerts the driver by sending an audio or visual signal, which in turn activates the baking system which act as an emergency to avoid accidents. Thermal stresses developed in brake discs have been studied extensively but mechanical stresses in the same field has been given less attention, Now the brake disk material used are grey cast iron and steel. New materials & designs are been used to reduce temperature, thermal stresses and mass, Mechanical loading onto brake pads onto a brake disc are separated into compressive stresses due to clamping load and shear stresses due to applied braking torque, which are measured experimentally using strain gauges mounted on a solid brake disk. Results obtained on the clamping load test were. Compressive stresses are concentrated and negligible elsewhere. The disk shear stresses are distributed throughout the circumference of the disk but are the maximum at its contact interface. Even increasing the overall efficiency of the automobile by utilizing the energy this would normally be lost between the brake shoes and its wheel, developing a novel car braking not only helps to save the battery as it gives less load to it, but it even helps the rear car passenger to identify that how much pressure of brake is applied on the car so that he gets appropriate time to react. Two types of safety methods: 1) Active safety (Pre-Impact) 2) Passive safety (Post-Impact) Active system helps to reduce the impact or make it null so that it does not occur, some of them are Anti-lock braking system which prevents loss of traction & control, Electronic stability and control helps the car from skidding and losing control in corners, Autonomous emergency system decelerates the car when a vehicle ahead of it having certain issues and avoids collision, Lane keeping assistance alerts the driver when the vehicle is moving out of lane, Drowsiness and attention detection helps if the driver is tired of continuous driving and would warn to take a brake. This safety manly involves sensors, radars, cameras, global position sensors, lasers. Passive system reduces the consequences during and after the impact, which has seatbelts also considered as primary restraint system in which there is an opposing force to driver and passenger to prevent them from falling out, airbags which opens up an inflated air filled cushion bag which protects head and other upper part during collision, crumpled zone located in front parts used to withstand an impact during collision by controlled deformation. Even after this many precautions the road accidents on today`s dates are keep on increasing without any control there are many factors such as Poor anticipation, Distraction, Traffic law violation, Poor lane marking, Unclear traffic signs, Poor quality roads. The need of going for this new technique.

II. NEED OF GOING FOR THIS NEW SYSTEM

According to a data in USA 5% of car crash are due to brake failure that comes to about 5.6 million. Even if USA being such a developed country so many accident occur due to this so think of Other countries how many accidents might have occurred over there. No doubt that there are many preventive methods or steps being taken for this but even then vehicle crash possibilities are high. With the introduction of this new system we don’t aim to completely stop the accidents because due to different conditions going in tense movement but it`s can definitely decrease the possibility of the accident with this new system. If the driver stays calm and wisely use this system.

III. VEHICLE NEEDS TO BE COMPLETELY STOPPED

Need to completely stop the vehicle as under certain conditions If the vehicle is in slope or in a normal road with less slope and if we have immense Load on the vehicle and suddenly the vehicle losses its brakes then with the help of EBS we can definitely make the car stop. But if use the principle of normal braking system in this. Then at slope while the brakes have been shot and no time to prepare it can be dangerous towards life and damages to nearby property or other moving vehicle. This system is been inspired by the chain pulling mechanism used in he trains as when we pull the chain in train it

completely comes to the stop and won`t move unless the assistant loco pilot comes and releases the pressure and the brakes manually.

IV. BRAKE FAIL DETECTION & EMERGENCY BRAKING SYSTEM

As shown in figure 1 this is the proposed model of the circuit which provides the audio and visual outputs to the red light and buzzer sound, which in turn activates the emergency braking system in which the motor rotates the wheel at 90°, due to which the hydraulic system lowers the emergency wheels which make it synchronized to the wheel velocity. Hence we can activate the EBS by pressing the clutch so that the vehicle does not get powered by the engine, it can be made in a simple PCB bread board, in which the copper wire operates brake wire is cut timer operates in a stable mode

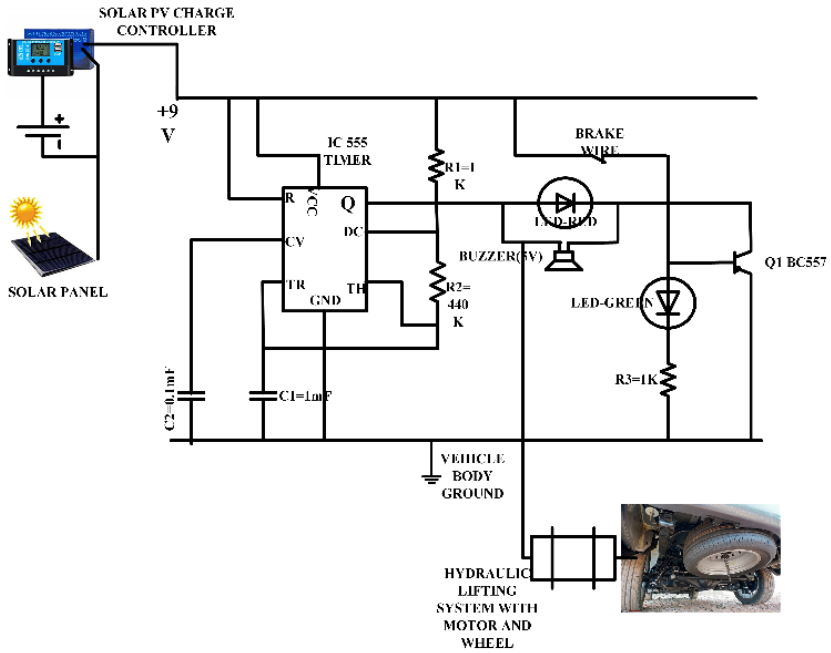
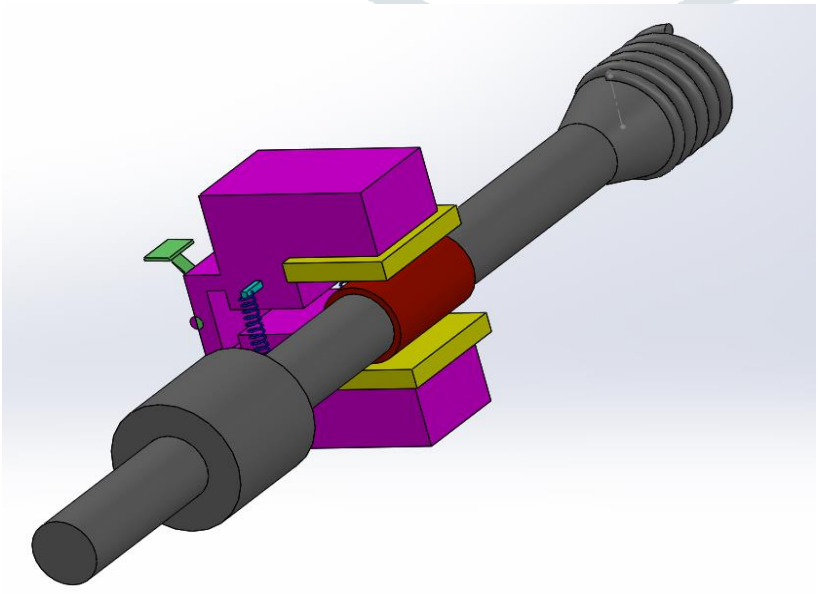


Figure 1 Circuit diagram of the proposed model

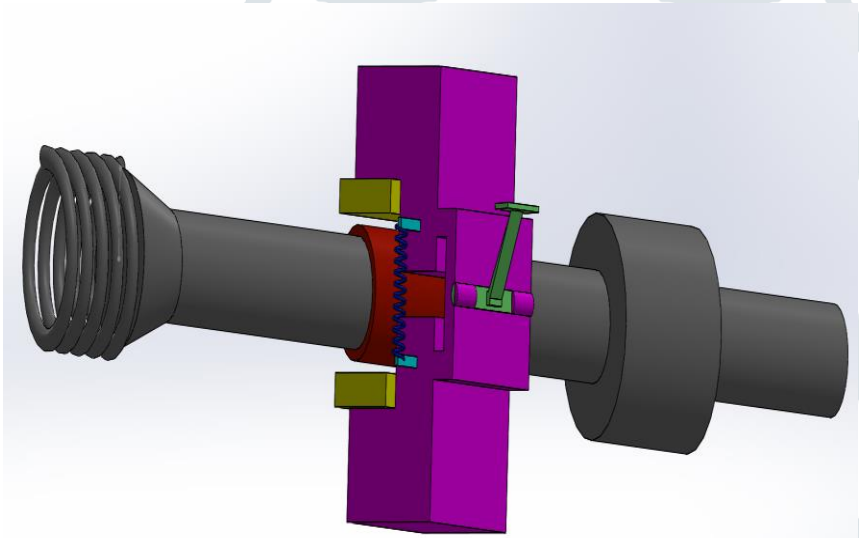
555 Timers in a stable mode helps timer to control of turning on and off led`s. Conditions to use When Good Green led on, EBS will be in off state. When slightly damaged, green led with slightly red led output, EBS will be in off state. When wire disconnection or cut, Red led with buzzer sound, EBS will be on state that is fully activated

V. PROPOSED MODEL



Before enabling this system in a manual or automatic cars this switch will provide an indication to turn the vehicle into neutral gear, else this system won't be activated, The following system shown will be placed between the constant velocity joints and between the power transmitting differential rod.

The above given diagram is actual representation of the vehicle Drive shaft in which the extreme left consists of the Drive shaft boots via which the power Is been transmitted to the shaft from the vehicle Engine and the extreme left is the constant velocity joints which is been used to circulate the rotary power to the wheel using one other shaft. In this the center portion which is in red color acts as the braking medium which is considered to be a disk ring, which is made up of cast iron but can be made up of composites such as reinforced carbon or ceramic matrix composites. In this the yellow color acts as the brake pads in which Ceramic brake pads or Organic (Contains Asbestos) can be used. The pink object Is the holder in which its fits onto which can be controlled by the springs and piston cylinder arrangement needs to be provided by which in time of its use can be applied with principle of Anti-lock braking system as well as chain pulling system. The green portion consists of the circulating rod which will be fixed on the car body but It will move vertically in free flow manner so that when the vehicle hit a speed breaker it won`t be damaged.



VI. CONCLUSIONS

The above work provided a thorough analysis of the relevant literature as well as latest research in this field. The conclusions are as follows.

1) Motor vehicle accidents can be fetal and constitute a high economic burden. Study recommends that there should be regulations to maintain the vehicle especially the brakes.

2) Accidents caused by brake failure can be prevented by correct indication of operating condition of brake. System endlessly monitors condition of brake wire and alerts the rider before it gets cut indication given is in form of audio sign.

3) Good braking system provides safety and comfort in its use but the temperature increase is influential in reducing brake performance, which can be overcome by providing proper cooling system by providing externally using cooling fluid or holes and fins.

4) System includes peripherals and an android application, provides a secure and efficient emergency stopping procedure. During emergencies having better control. Implementation in the regions where the chain pulling cases are the highest.

5) Loading mechanism of solid brake disk has been done using custom rig. Mechanical stresses developed are due to applied brake disk were characterized in term of compressive stresses due to clamping load as well as the shear stresses due to applied braking torque.

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