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Automatic Automobile Brake Failure Detection Indicator

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Abstract

Today, Machines are widely controlled by automated system. to satisfy the need of growing population economic, effective and reliable control of machines also as their system is vital. the need for the innovative ideas within the car sector is extremely demanded. Nowadays accidents are increasing, so safety has acquired a priority. Accidents are occurring because of tons of reasons, the one of the foremost reasons is breakdown, it caused to because of poor maintenance, improper use and merchandise defect, so on safeguard the valuable human for the accident the accident monitoring of brake is a particularly important issue within the automobile. The sudden recognition of any object ahead panics the drive and at things, even skilled drivers fail to use brakes correctly and this results in accidents. the whole system is developed taking into consideration the human tendencies, minimum efforts and efficient use of the whole braking system. The system consists of only a few components and requires the smallest amount amount of space. Special safety features need to be built into vehicles themselves for the safety of Occupants and vehicle. This break failure detector helps to point the breakdown to the rider. The breakdown indicator circuit may be a circuit that monitors constantly the condition of brakes and provides an audio-visual indication. A buzzer is employed to offer the indication to the driving force within the sort of sound. When the brake is applied so as to hamper or to prevent the vehicle the green LED blinks and therefore the piezo buzzer beeps for about one second if the brakes is accurate and dealing properly. If brakes fail the red LED glows and therefore the buzzer don't beep when the brakes are applied. the most advantage of the system is that it's very compact in size, and therefore the installation cost is extremely less. If this technique gets installed in vehicles, then the accident cases thanks to breakdown will certainly get reduced and human life loss are going to be also reduced. this technique is very cost-effective and efficient in purposes in industry.

Index Terms

Braking, Safety System, Drum Brakes, Limiter Switch.

I. INTRODUCTION

The braking systems within the automobiles across the world had come an extended way. Since the event of wooden block brakes within the 1800s, the vehicles of today inherit different and highly-advanced braking frameworks. The evolution of the braking systems from the straightforward caliper to complex electronic brakes have resulted in enhanced safety and reduced the danger of auto collisions worldwide.

Today, keeping in mind the vehicle characteristics and road conditions different set of braking systems are incorporated. Be it any quite braking – plain or sophisticated – the target behind the event of those braking

systems is to form the controlling of an in-motion vehicle workable for humans in every era. A brake may be a robot that hinder, restrain, or prevents motion, slowing or stopping a moving object or preventing its motion. Most of the brakes generally uses friction between two surfaces pressed together to vary the shape of the K.E. of the moving object into heat, despite the very fact that other methods of energy conversion could also be employed for an equivalent for instance, regenerative braking converts an outsized amount of the energy to electricity alongside the warmth energy, which can be stored or are often sent back to the source for later use. Other methods convert the K.E. into P.E. in such stored forms as pressurized oil or pressurized air. Magnetic fields are utilized in Eddy current brakes to convert K.E. into current within the brake disc, fin, or rail, which is converted into heat. Still there are other braking methods to rework K.E. into different forms, as an example by transferring the energy to a rotatingflywheel.

Brakes are generally applied to rotating axles or wheels, but also take other forms just like the surface of a moving fluid (flaps deployed into water or air). some vehicles use a mixture of braking mechanisms, like drag racing cars with both wheel brakes and a parachute, or airplanes with both wheel brakes and drag flaps raised into the air during landing. the aim of this work is to style a braking system with an indicator. breakdown occurs only due to worn-out of shoe and cuts within the liner. this technique provides an audio and visual alert when the brake fails.

TYPES OF BRAKES:

Depending on the vehicle, there are several kinds of brake systems. As an example, many modern passenger cars use an antilock braking system, whereas semi-trucks and trailers may require an air braking system.

1. Mechanical Braking System

One of the foremost widely used braking systems, under the mechanical braking technique the energy is absorbed and is converted to heat. Here, the first aim is to get enough force to carry up the shaft and eventually make the vehicle stop. And disperse or take in the warmth produced during the braking process. All the mechanical brakes have two surfaces rub against one another and generate frictional forces. Owing to the frequent friction, the mechanical brakes tend to wear and their durability relies on the usage of fabric at the shoe or pad. The mechanical braking system is employed within the emergency and therefore the hand brake of the many vehicles. To bring a vehicle to halt, its braking aspect involves many components like cylindrical rods, fulcrums, springs, etc.

There are two sorts of brakes found under mechanical braking – Disc and Drum.

Disc Brakes: Discbrake, alongside the drum brakes are the 2 hottest sorts of brake within the automotive market. the foremost distinguishing features of the disc brake system from the drum brakes is that it uses a rotor (or the brake disc). The wheel is going to be attached to the rotor. If the rotor is stopped then the wheels won't roll also. to prevent the wheels from running, the disc brake system will transfer the stopping power through the hydraulic wires to the brake pad which can squeeze against the rotor. The friction created between the pad and therefore the rotor will slow the wheel movement down.

Fig 1.1 Disc Brake

Drum Brakes: On the disc brake system, the wheels are attached to the disc or the rotor, while for the drum brakes system, the wheels are going to be attached to a drum. The drum rotation will cause the wheel running. to prevent the wheel the drum must be stopped, which is sort of almost like how things work on the discbrake. However, what makes the disk brake and drum brakes different is that every system will have a special thanks to stop the disc/drum. On the drum brakes system, there's no restraint or calliper. Instead, there'll be brake shoes which will stop the drum brakes from the side. When the pedal is pressed, the hydraulic pressure will push the brake shoes against the drum brakes from inside outwards. The friction between the drum brakes and therefore the brake shoes will make the car stop.

Fig 1.2 Drum Brake

2. Hydraulic Braking System

Invented within the early 1900s, the hydraulic braking mechanism functions on brake fluid, cylinders, and friction. By internal pressure application, the glycol ethers or diethylene glycol forces the vehicle's resistance brake pads to halt the wheels from advancing.

Quick facts about the hydraulic braking system

- Compared to another types and forms of braking, the force produced in the hydraulic braking is larger.
- Being a crucial braking system, hydraulic braking has very fewer chances of breakdown because it features a direct reference to the actuator and therefore the brake drum/disc.

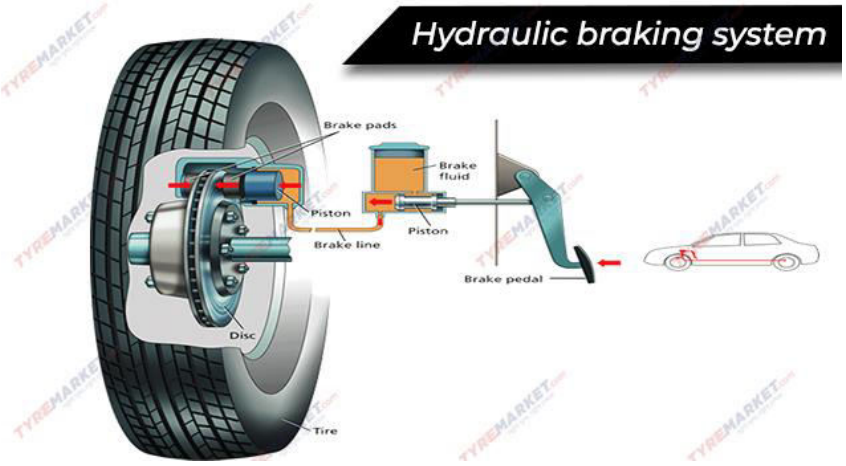

Fig 2.1 Hydraulic braking system

3. Electromagnetic Braking System

Most of today's contemporary cars and hybrid vehicles are often seen donning the electromagnetic braking system. because the name suggests, electromagnetic braking uses the idea of electromagnetism to get frictionless braking, which makes them more durable within the end of the day. the primary choice of hybrid vehicles, compared to the common quick magnetic brakes, it works without friction and lube. The compact size braking system, also utilized in trains, works when a magnetic inflow is passed during a spot perpendicular to the rotating direction of the wheel. This creates swift current flow during a direction opposite to the wheel rotation, which generates opposing energy to the rotation of the wheel and therefore the wheel is decelerated.

Quick facts about the Electromagnetic braking system

- Besides being rapid and cost-effective, it also involves no upkeep cost sort of a periodic replacement of brake shoes, etc.
- With electromagnetic braking, safe delivery of heavy loads at high speeds is formed possible.
- Unlike other sorts of braking systems, where massive heat is produced via shoe, very less amount of warmth is triggered which translates into the smallest amount chances of breakdown.

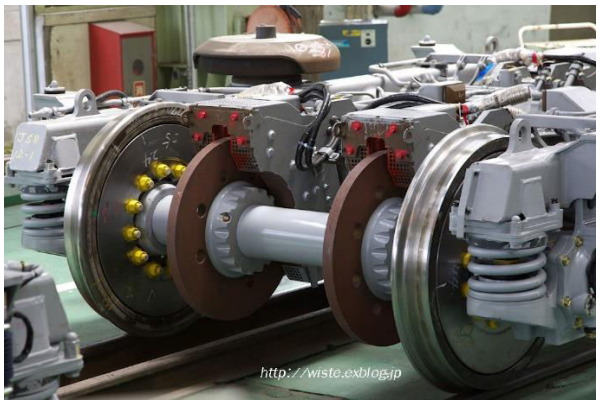

Fig 3.1 Electromagnetic braking system

4. **ServoBrakingSystem**

Servo braking is more of a braking system booster. during this sort of braking system also referred to as vacuum or vacuum-assisted braking, the pressure applied to the pedal by the motorist is amplified. The vacuum generated in petrol-fueled powertrains is employed by the air intake system within the powertrain's intake pipe, while the diesel powertrains use an air pump.

Quick facts about the Servo Braking System

- The braking system boosters are functional with the hydraulic brakes,and therefore vacuum boosters practically improve the braking force.
- When the pedal is pressed it releases the vacuum on the side of the booster. The atmospheric pressure disparity thrusts the diaphragm for braking at the wheel.

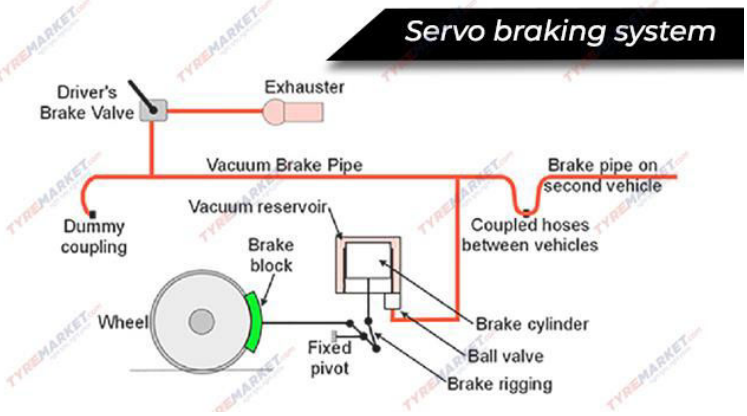

Fig 4.1 Servo braking system

II. LITERATURE REVIEW

With the passage of our time, today's generation is growing up with the dreams of high-speed vehicles. In the last 20 years, the number of vehicles has been increased and therefore the technology has tremendous changes which drives increment in speed. The speed plays a vital part to maintain time for longer distances. But, this speed also major problem for causes of road accidents. The problem is that because the birth ratio is increasing, the accidents are becoming in number which is one among the major problems faced during this era and it might be rapidly increasing within the coming period. So, everyone tries to avoid accidents while travelling but sometimes it's unavoidable. Accidents are happening at each nook of the streets round the world. Lakhs of life end in death as a facet of those accidents. Because the population is increasing, the number of vehicles is increasing within the same proportion. Which suggests there needs an active hood of the brakes giving out. The condition of brakes is often monitored by the breakdown indicator circuit. The breakdown condition is sensed by the sensors attached to the circuit through monitoring the brake switch. So, when the brake is applied it shows the condition of brake whenever. [1]

Studies from road safety surveys have asserted that even the skilled drivers fail to apply brakes completely during emergency situations. The main reason is that the stopping distance of the vehicle depends on the

deceleration when the driver applies brakes. Due to insufficient braking force applied, the stopping distance is more and hence this leads the vehicle to crash or collide with an obstacle. The work for modelling the system began with the method to detect the issue by considering the reaction time; hence detect the driver intention and capability to apply full brake during emergencies, detection of failure of primary brakes. The shortest and achievable time to interact the secondary braking system after failure detection through the sensing elements were taken under consideration considering the above reasons observed within the surveys. The trails are made to eliminate any shortcoming in achieving of successful and efficient braking.[2]

According to results, the deterioration of the brakes can be led back to thermal cyclic strain (related with the heating–cooling cycles developed during the brake action) superimposed to the mechanical strain caused by braking torque. The work analyses the aforesaid disc brakes investigating both the most causes and therefore the evolution of its deterioration so as to seek out possible solutions. The short lifespan of such discs has got to be ascribed to the rapid decay of the mechanical properties of the manufacturing material. Material decay is liable for starting cracks. Several actions might be chosen to face this problem. The choice of a specific chemical composition, which can be demonstrated to be unfit for the aim, produced an extreme tempering of the steel as an immediate result of its protracted exposure to high temperatures (a situation which can be considered usual referring to disc brakes).[3]

There are several limits that has got to be confine mind while driving a vehicle. The breakdown indicator circuit contains many electrical also as equipment like LED, sensors, piezo buzzers, ICs, transistors, etc. The breakdown indicator is employed to avoid major damage. It's a main advantage of breakdown indicator, and it operate in automatic mode that make it easy to use. At present many other instrument or system are often won't to warn before any accident condition but it's onlyuse to watch the braking system or any disturbances in circuit of the braking system, whenthe brake is applied to prevent or hamper the vehicle. But this project i.e.,Automatic breakdownIndicator uses sensors for constant monitoring of the braking switch and provides the entire condition ofbraking system of the vehicle. Many problems occur while using automatic braking system like somesays hydraulic pipes aren't connected tightly and temperature of braking system increases, it can giveadverse effect on brake pad and therefore the rotor.[4]

III. OPERATIONAL PROCESS

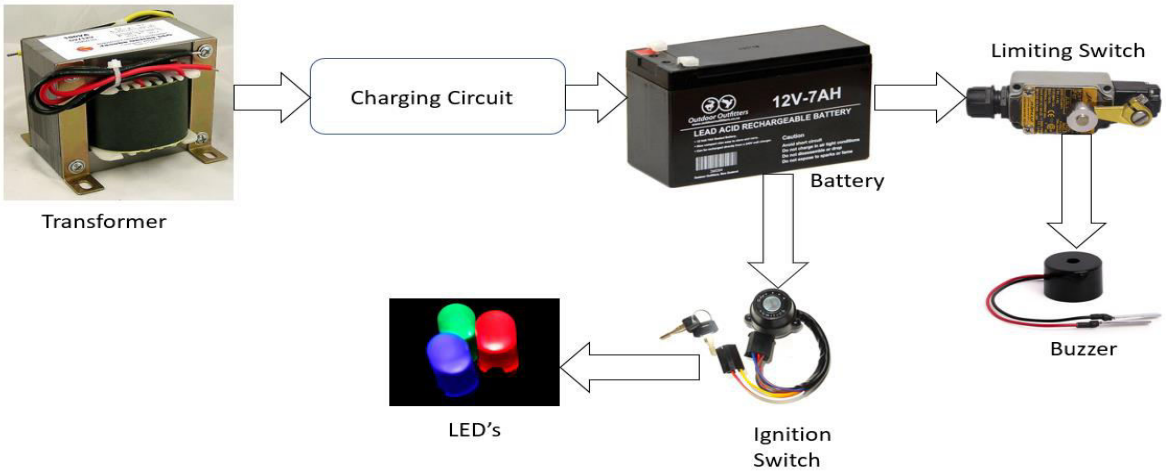

Fig 5.1 Block diagram

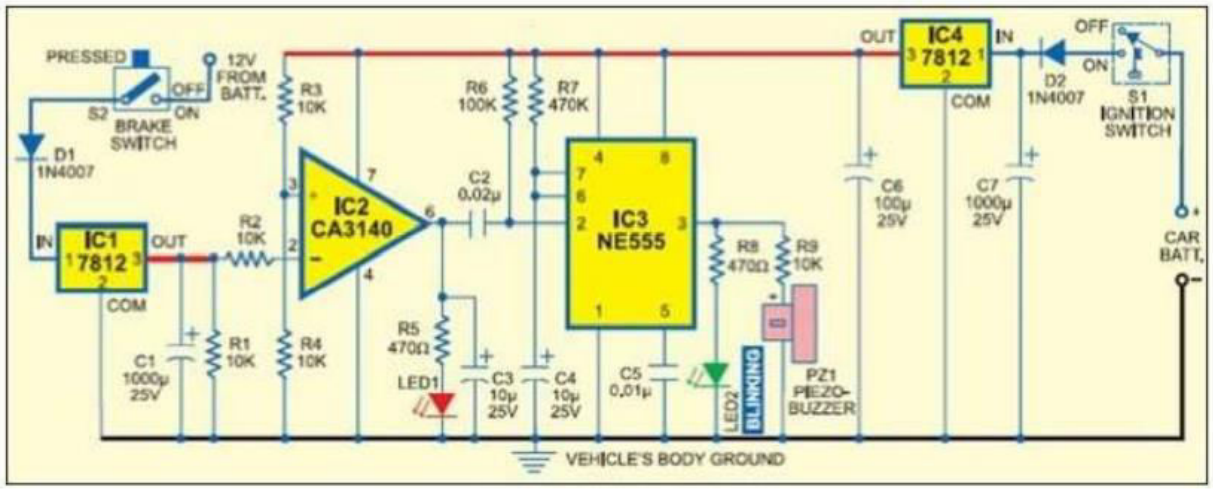

Fig 5.2 Circuit diagram

It is a device used for avoiding accidents. This circuit is continuously monitoring the conditions of brake and gives audio visual indication. If the brakes are unbroken then green LED blinks and for around one second piezo buzzer beeps and when the brake fails the buzzer don't beeps and also only red will LED glows. This circuit only works in vehicles with negative grounding. In nowadays as we allknow the hydraulic brakes system is implemented within the vehicle so a brake switch is mounted on hydraulic brake cylinder which will glow the rear brake lamps. This brake switch works on when pressure is maintained and if the pressure drops thanks to leakage, the brake switch isn't operatedand don't perform any function. The pressure drop can't be easily detected unless there would be an outsized pressure drop by the pedal of the vehicle. This is a high fluid leakage which may be sensed by the pedal only. This circuit performs its operation every time when the break is applied so that it can aware every time about the condition of the vehicle braking system. The circuit contains seven capacitors, seven resistors, two diodes, two LEDs, a piezo buzzer and 4 ICs. One of IC (IC2) is an operational amplifier which is employed as voltage comparator and sets the monostable configurations of timer for alarm, this IC2 sense the extent of voltage across break switch. It takes not inverting input which

gets half the availability voltage through voltage divider resistors of 10 kilo-ohms (R3 and R4). The brake switch is connected to the IC2 through diode D1, IC2 and resistor R2. When the brake is applied it receives a high voltage. Normally the red LED glows, because the output of IC2 remains high until the brake is applied. For input stability of IC2 the resistor R1 is employed, for ripple free regulated supply to the input of IC2, IC1 and C1 is employed. IC3 is employed as a monostable which provides pulse output of 1 second, also R7 and C4 timing element also are connected to form the output high for one second to activate the buzzer and therefore the green LED. Usually, the buzzer and therefore the green LED remains off because the trigger pin of IC is high thanks to RC. When the pressure is applied onthe pedal, the pin 2 of IC2 receives high voltage from the breakdown switch in order that the output of IC2 goes low and as a result the red LED is transitioned. Where the pressure is in braking system is dropped thanks to leakage, the pressure sensor works and activates the green LED and buzzer beeps for one second. Brake Failure Indicator circuit gets its power from the vehicle's battery and it areoften assembled on any general PCB (Project Circuit Board). To avoid the unwanted triggering while the charging of the battery, a well-regulated power supply is required. IC4, C6 and C7 provides the regulated 12V supply to the circuit and stop from unwanted triggering of the circuit. The supply is often taken from the switch as positive terminal and therefore the vehicle's body as a ground terminal.

IV. FUTURE SCOPE

1. Triggering or actuation mechanism for secondary braking can be changed to various means viz. using cam and follower arrangement, Magnetic arrangement, etc.
2. Sensor monitoring can be used instead of using two levers; a single lever may serve the purpose.
3. It can be used with high sensitivity pressure sensor.
4. By using micro-controller, we can extent its application in many aspects like controlling of vehicle's starting (vehicle starts only when all the parts of vehicle are in proper working condition).
5. If in case the brake fails, brake failure indicator can also be used in order to shut down the vehicle's engine.

V. CONCLUSION

This project setup reduces the probability of accidents and prevents loss of life. It improves the efficiency of vehicle and in turn decreases the chances of failure of mechanical systems. Brake failure detector indicates gives additional capability to the driver and to ensure prevention of damage to life and property. Brake failure indicating system is an early warning system. This system can prove to be advancement in mechanical and automotive industry. system endlessly monitors the condition of the brake wire and alerts the rider before it gets cut. The indication to the rider is given within the type of audio-visual sign. This system can prove to be advancement in mechanical and automotive industry.

VI. ACKNOWLEDGMENT

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