

## **Automobile Brake Failure Indicator**

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**Abstract**—*Nowadays accidents may occur due to various reasons, the foremost reason is brake failure and is caused due to poor maintenance as well as product defect. In order to safe guard the valuable human life from these accidents; there is a need for monitoring of braking system in automobiles. Vehicle safety is the avoidance of automobile accidents or the minimization of harmful effects of accidents, in particular related to human life and health. Special safety features have been built into vehicles occupants only, and some for the safety of others. This is a brake failure indicator circuit that constantly monitors the condition of the brake and gives an audio-visual indication to rider.*

**Keywords**— *Drum brake, Rechargeable battery, Voltage regulator, charging circuit, Buzzer, Limit switch*

### **I. INTRODUCTION**

A brake is a mechanical device that inhibits motion by slowing down a body or by slowing it. Brakes retard the motion of a body creating friction between two working surfaces and convert the kinetic energy of the moving body into heat. Sometimes brake failure may occur when the brake lining is cut-off. Most brakes commonly use friction between two surfaces pressed together to convert the kinetic energy of the moving object into heat, though other methods of energy conversion may be employed. For example, regenerative braking converts much of the energy to electrical energy, which may be stored for later use. Other methods convert kinetic energy into potential energy in such stored forms as pressurized air or pressurized oil. Eddy current brakes use magnetic fields to convert kinetic energy into electric current in the brake disc, fin, or rail, which is converted into heat. Still other braking methods even transform kinetic energy into different forms, for example by transferring the energy to a rotating flywheel.

Brakes are generally applied to rotating axles or wheels, but also take other forms such as the surface of a moving fluid (flaps deployed into water or air). Some vehicles use a combination of braking mechanisms, such as 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 design a braking system with indicator. Brake failure occurs only because of worn out of brake shoe and cut in liner. This system provides audio and visual alert when the brake fails.

### **II. LITERATURE SURVEY**

[1] Project is fully equipped and designed for safety of the automobile vehicles. Automatic brake failure indicator and braking system is the most effective solution to this problem. It is the most effective and the simplest methodology used to reduce the rate of accident due to brake failure. In this system the components used are two-way relay, buzzer, battery, motor, wiring system. And finally, the braking system installed in the two-wheeler by using these components the most effective system is to be generate. In this system, if brake failure is occurred then the buzzer gives the indication to the driver in the form of sound and simultaneously alternative braking system start their working and apply the secondary brakes by using motor fitted to the chassis, as the result of these the speed of the vehicle gets reduced and vehicle is stop in some second. The main advantage of the system is that it is compact in size, and the installation cost is very less. If this system is installed in vehicle then accident due to brake failure gets reduced, as the result of these the rate of accident due to brake failure get reduces.

[2] The braking system of a car is undoubtedly one of its more important features. The aim of this work is to create a better braking system with indicator. Brake failure occurs only because of worn out of brake shoe and cut in liner. It consists of two sensors. One sensor is connected with the brake shoe. The other sensor is the brake liner. The signal from the two sensors is given to a microcontroller. When the brake shoe is worn out, the sensor senses signal to the microcontroller. Also, if the brake liner is cut, the sensor sends signal to the microcontroller. The microcontroller analyses the signal and operates the corresponding indicator. If nothing wrong, the vehicle will move and if any one critical, the vehicle will stop and the screen shows the indication of brake failure. Since this indicates the status of the brake, the user can identify the condition of the brake and thus limiting the chances of malfunction.

### III. BRAKE

A brake is a mechanical device that inhibits motion by absorbing energy from a moving system. It is used for slowing or stopping a moving vehicle, wheel, axle, or to prevent its motion, most often accomplished by means of friction.

Depending on the vehicle, there are several types of braking systems. As an example, many modern passenger cars use an antilock braking system, whereas semi-trucks and trailers may require an air braking system and most cost effective vehicles use drum braking system.

#### DRUM BRAKE:

A Drum brake is a brake that uses friction caused by a set of shoes or pads that press outward against a rotating cylinder-shaped part called a brake drum. The term drum brake usually means a brake in which shoes press on the inner surface of the drum. When shoes press on the outside of the drum, it is usually called a clasp brake. Where the drum is pinched between two shoes, similar to a conventional disc brake, it is sometimes called a pinch drum brake, though such brakes are relatively rare. A related type called a band brake uses a flexible belt or "band" wrapping around the outside of a drum.

A basic drum brake (usually located at the rear of the vehicle) consists of a rotating drum that is attached to the wheels of the vehicle, and two expanding brake shoes. The brake shoes are so arranged that when the brake is applied they both are expanded in the opposite direction with respect to each other towards the drum of the wheels. The brake shoes are basically made up of the curved metal pads that are equipped with a fiber lining on the outer side of the arc of the brake pads. They are located at the non-rotating part of the wheel. When the brake pressure is applied at the brake pedal by the driver, the brake fluid goes through the hydraulic pipes of the brake system towards the wheel cylinder located at the brake shoes, which is then expands the brake shoes towards the outer side of the brake shoes and comes in contact with the inner side of the brake drum and due to this contact of brake shoes and drum, friction is created between them i.e. the rotating part and the non-rotating part of the wheel which slows down the vehicle and stops it after some time.

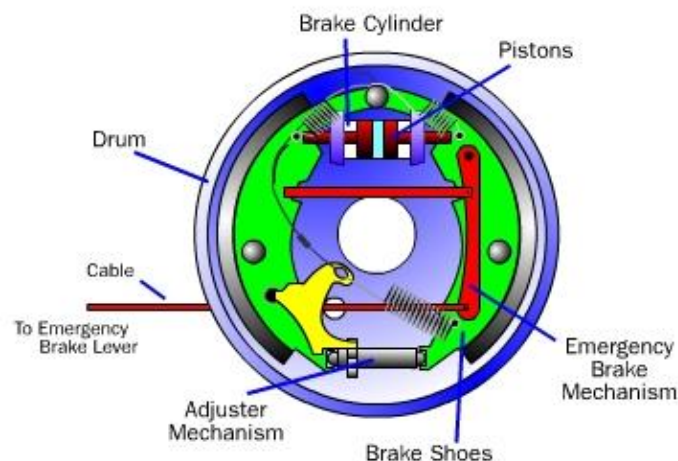


Fig. 1 Drum brake

#### IV. AUTOMOBILE BRAKE FAILURE INDICATOR UNIT

Most cost effective vehicles depend on wire braking mechanism to apply brakes on the vehicle. This mechanism involves a Brake wire which runs from the brake lever to the braking mechanism set-up of the vehicle. It is this wire that gets pulled when we apply brakes to stop our vehicle. Brake may fail due to various reasons such as worn out of brake pads, damaged in rotor disks, cut in brake wire etc., after a long use and tear these wires might get worn out and get cut at one point of time which eventually will cause a brake failure. So in this project a circuit is build that continuously monitors the state of the braking system and indicate the continuity of brake wire, the circuit will glow a green colour LED if everything is fine, whereas it will blink red colour LED if the wire fails and also beep a buzzer to indicate the rider.

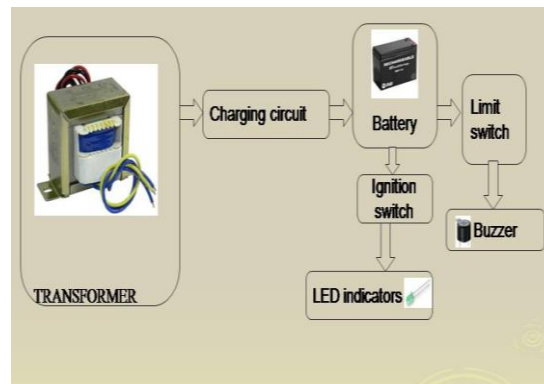


Fig. 2 Block diagram of Automobile brake failure indicator

The above block diagram represents the major components of automobile brake failure indicator and how they are connected to achieve the desired result of the project. In this project we are using rechargeable battery, storage battery, or accumulator it is a type of electrical battery. It comprises one or more electrochemical cells, and is a type of energy accumulator. Rechargeable batteries come in many different shapes and sizes, ranging from button cells to megawatt systems connected to stabilize an electrical distribution network. A charging circuit is used to charge the battery with the help of transformer. Charging circuit convert AC to pulsating DC which in turn is converted to smooth DC with the help of the capacitor. 18V Smooth DC is converted to 12V DC by the Voltage Regulator 7812. At the output of the regulator, we get some spikes which are not desirable. These spikes are removed with the help of another capacitor used. We can get 12V Steady DC at the output terminal which can be indicated if the LED glows. A voltage regulator converts a varying input voltage into a constant 'regulated' output voltage. It appears to be simple device with only three terminals, but it is in fact a very complex integrated circuit. Voltage Regulators are available in a variety of outputs like 5V, 6V, 9V, 12V and 15V. An electromagnetic buzzer is used to provide audio signals to the rider, the vibrating disk in a magnetic buzzer is attracted to the pole by the magnetic field. When an oscillating signal is moved through the coil, it produces a fluctuating magnetic field which vibrates the disk at a frequency equal to that of the drive signal and the buzzer beeps. LED indicator is used for visual signals, The structure of the LED light is completely different than that of the light bulb. Amazingly, the LED has a simple and strong structure. The light-emitting semiconductor material is what determines the LED's color. Limit switch is used for contacting the brake lever; a mechanical limit switch interlocks a mechanical motion or position with an electrical circuit. A good starting point for limit-switch selection is contact arrangement. The most common limit switch is the single-pole contact block with one NO and one NC set of contacts. The connections to all the components are given properly and carefully arranged.

#### V. EXPERIMENTAL SETUP



Fig. 3 Experimental setup of Automobile brake failure indicator

All the components of the Automobile Brake failure indicator such as brake pedal, brake wire, drum brake mechanism set up, limit switch, buzzer, rechargeable battery, charging unit and LED indicators are placed very carefully on the frame stand as shown in fig. 3 experimental setup. The existing model presents an Integrating feature of all the hardware components which has been used and developed in it. The Presence of each and every module has been reasoned out and placed very carefully.

## **VI. WORKING PROCEDURE**

Above block diagram and experimental setup represents the Automobile brake failure indicator. For doing experiment or to check the ability of the project, an experimental setup is created with the drum brake mechanism and all the required components are carefully connected. When the vehicle is in motion without brake failure at this condition the system will blink green colour LED indicating that everything is fine. This is done by transferring the signal voltage through the brake wire from one end to other. At the other end of the wheel the signal conditioning unit identifies the signal voltage and blink the respective LED. Brake fails due to various reasons such as worn out of brake pads, cut in the brake wire etc., after a long use and tear brake wires might get worn out and get cut at one point of time. So we are continuously monitoring the condition of the wire and alerting the rider before it gets cut, this is achieved by placing a limit switch at a distance from the brake lever. As the diameter of the wire decreases with continuous usage which results in the elongation of the wire. As the wire elongates the lever will move towards the limit switch and at some point it will contact the limit switch before it gets cut. The limit switch then switches the circuit and connects to buzzer circuit and power supply is given to the red LED through resistor. As well as the power supply is also given to buzzer. Whenever the lever touches the limit switch Red LED will blink and the buzzer beepsto indicate the rider. Brake cables /wires are thicker, typically 1.5/1.6mm in diameter, the following Table.1 shows the approximate diameter of the wire, condition of the brake and the LED indication.

<b>Approximate diameter (mm)</b>	<b>Condition of wire</b>	<b>LED indication</b>
1.5	Good	Green
1	Good	Green
0.4	Better to change	Red with Buzzer

Table.1 condition of wire with change in diameter

## **VI. INSTRUCTION TO USE**

- Always operate vehicles with proper negative grounding.
- Keep the volume of audio visual indicator sound high so it can be easily hear by vehicle operator.
- It is important and necessary to attach the sensor with brake switch.

## **VII. FUTURE SCOPES**

- It can be used with high sensitivity pressure sensor.
- 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 is in proper working condition).
- If in case the brake fails, brake failure indicator can also be used in order to shut down the vehicle's engine.

## **VIII. CONCLUSION:**

The main purpose of this project is to provide such a device to vehicles operator so that any harmful damage and accidents caused by failure of brake can be easily prevented by the proper indication of working condition of brake. This system continuously monitors the condition of the brake wire and alerts the rider before it gets cut. The indication to the rider is given in the form of audio visual signal. All the components are placed carefully, thus contributing to the best working of the unit. Thus the project has been successfully designed and tested.

### **IX. ACKNOWLEDGEMENT**

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