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BREAK FAILURE INDICATOR SYSTEM

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ABSTRACT

The braking system is one of several key safety-related items. Catastrophic brake failure, such as sudden air loss, may lead to loss of control and the driver's inability to recover. Progressive brake deterioration, such as brake shoe wear without corresponding adjustment, can be even more troublesome because it may appear innocuous during normal driving, but may precipitate an accident during emergency braking applications. When brakes are malfunctioning sometimes the driver may not realize and this may endanger the life of the people on board and other road users. Statistics shows that lots of lives are lost in road accidents and to some extent the brakes failed to function as expected by the driver. This arouses interest in getting a way of notifying the driver about the performance of the brakes. The design of 'Brake deterioration indicator' comes in play to bridge this lack. The working of the vehicle's braking system is given in the theory whereas in the design the brake system interface to the designed circuitry is a potentiometer which is assumed to vary directly as the brake performance varies.

INTRODUCTION

PROJECT OBJECTIVE

To Design and implement a system that will warn the driver when the vehicle braking system is failing using both audio and visual warnings.

BACKGROUND OF VEHICLE'S BRAKING SYSTEM:

Brake is a device by means of which artificial friction as resistance is applied to a

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moving machine member, in order to retard or stop the motion of a machine. Capacity of brake depends on: · The unit pressure between the braking surfaces · The coefficient of friction between the braking surfaces. · The peripheral velocity of the brake drum. · The projected area of the friction surfaces · The ability of the brake to dissipate heat equivalent to the energy being absorbed.

Characteristics of Materials for brake lining: ·

Coefficient of friction should remain constant with change in temperature. · Have low wear rate · Have high heat resistance · High heat dissipation capacity · Have adequate mechanical strength · Shouldn't be affected by moisture and oil.

TYPES OF BRAKES:

1. Hydraulic brakes; pumps or hydrodynamic brake and agitator brake.

2. Electric brakes; generator and eddy current brakes

3. Mechanical brakes Hydraulic and electric can not bring the member into rest they are used where large amounts of energy are to be transformed while the brake is retarding the load such as in laboratory 2 dynamometers, highway trucks and electric locomotives. These brakes are also used to control the speed or retarding the speed of a vehicle for downhill travel. Types of vehicle brakes:

We have two types of braking systems namely:

1. Parking Brake

2. Service Brake

; this type of braking system is sub-divided into two categories:

a) Hydraulic

i. Disc Brakes

ii. Drum Brakes

iii. Dual System

b) Antilock Brake System (ABS)

Parking brakes:

These are not used for "Emergency" Braking they are used specifically to keep a parked vehicle from moving and are usually

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on rear wheels only. They are mechanically operated.

Drum brakes In drum brakes, expanding shoes create force on the inner surface of the drum. They are normally used on the rear of some trucks. Self-energizing design requires less activation force though it requires periodic adjustment.

The Comparator stage

Practical operational amplifier voltage gains are in the range of 200,000 or more, which makes them almost useless as an analog differential amplifier by themselves. For an op-amp with a voltage gain (AV) of 200,000 and a maximum output voltage swing of +15V/-15V, all it would take is a differential input voltage of 75 µV (microvolts) to drive it to saturation or cutoff. One application of the op-amp is the comparator. The output of an op-amp will be saturated fully positive if the (+) input is more positive than the (-) input, and saturated fully negative if the (+) input is less positive than the (-) input. In other words, an op-amp's extremely high voltage gain makes it useful as a device to compare two voltages and change output voltage states when one input exceeds the other in magnitude. A comparator is a circuit that compares two input voltages and produces an output in either of two states, indicating the greater than or less than relationship of the inputs. A comparator switches to one state when the input reaches the upper trigger point. It switches back to the other state when the input falls below the lower trigger point. The comparator compares a reference voltage, fixed or variable, with an input waveform. If the input is applied to the non-inverting input and the reference to the inverting input, the comparator will be operating in the noninverting mode. In this case, when the input voltage is equal to (or slightly less than) the reference voltage the output will be at its lowest limit (near the negative supply) and when the input is equal to (or slightly greater than) the reference voltage the output will change to its highest value (near the positive supply). If the inverting and non-inverting terminals are reversed the comparator will operate in the inverting mode .

Hysteresis

A comparator normally changes its output state when the voltage between its inputs

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crosses through approximately zero volts. Small voltage fluctuations due to noise, always present on the inputs can cause undesirable rapid changes between the two output states when the input voltage difference is near zero volts

Caliper types

There are 2 types of Calipers ÿ Fixed: these are disc brakes that use a caliper that is FIXED in position and does not slide. They have pistons on both sides of the disc. There may be 2 or 4 pistons per caliper. Motorcycles and some import trucks and cars use this type, they are similar to bicycle brakes.

CONCLUSION

The objective of the project was achieved where implementation of the brake deterioration indicator was done. The implementation was achieved using locally available components hence making it easier to build. With guidance from the Supervisor, the concept was conceptualized and developed to a desirable achievement. The voltage regulator was used to ensure that the level of voltage that was fed into the comparator stage and the output stage especially the 555 timer part was within the design levels. The use of comparators, 555 timer, transistor and op amp as learnt during the course as among other electronics based lessons were practically exploited.

RECOMMENDATIONS ·

For interfacing of the circuitry with the vehicles brake system, an appropriate method to transduce the brake pedal travel into electric signal should be designed. This should be done via a push button that would enable the driver to engage or disengage the circuitry from its functions, a condition that is necessary especially when the brakes have deteriorated. When the system notifies the driver that the brakes have failed, he may disengage the indicator from power so as to eliminate the buzzing sound that would otherwise be a nuisance to the people on board. · The zener diode in the voltage regulator needs to be replaced by a voltage reference IC for a more stable and more precise output voltage.

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