

Air Brake Hoses Fail Detection with Safety Braking System

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Abstract: Now a day, Machines are widely controlled by electronics system. To meet the need of exploding population economic and effective control of machines is necessary. The main reason is brake failure, it caused to due to poor maintenance as well as product defect, in order to safe guard the valuable human for accident the accident monitoring of brake is very important thing in automobile Vehicle safety is the avoidance of automobile accidents or the minimization of harmful effects of accidents, in particular as pertaining to human life and health. Special safety features have been built into vehicles occupants only, and some for the safety of others. We have pleasure in introducing our new project "Air Brake Hoses Fail Detection with safety Braking System.". This is equipped by sensors and auxiliary braking unit. It is genuine project which is fully equipped and designed for automobile vehicles. The aim is to design and develop a control system based an electronically operated automatic break failure indicator by using pressure sensor. Automatic break failure indicator and auxiliary braking system is consisting of sensor circuit, control unit and frame. The sensor is used to detect the break pneumatic hoses, the control signal to the electronic unit. Similarly, the auxiliary brake fluid line is fixed to the vehicle and this can apply bypass fluid supply to the brake and stop the fluid leakage in vehicle. A pressure transducer sensor monitors the pressure in brake fluid lining. When the primary disc brake fails, the sensor detects the pressure loss and gives signal to the Activates power supply to the secondary braking hoses unit which will further operates the brake. This functions as a secondary braking unit and helps the driver to stop the vehicle and thus ensures safety of the passengers.

Keywords: Brakes, fluid leakage, detection, secondary brakes line, safety

I. INTRODUCTION

A brake is mechanical devices that 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 change the form of the kinetic energy of the moving object into heat, despite the fact that other methods of energy conversion may be employed for the same. For example, regenerative braking converts a large amount of the energy to electrical energy along with the heat energy, which may be stored or can be sent back to the source for later use. Some other methods convert the kinetic energy into potential energy in such stored forms as pressurized oil or pressurized air. Magnetic fields are used in Eddy current brakes to convert kinetic energy into electric current in the brake disc, fin, or rail, which is converted into heat energy. Still there are other braking methods to transform kinetic energy into different forms, for example by transferring the energy to a rotating flywheel.

Today, Machines are widely controlled by automated control system. To meet the need of growing population economic, effective and reliable control of machines as well as their control system is necessary. The main objective of this project is to continuously monitor the braking system at each and every time during the operation of the vehicle. Now a days, accidents are occurring due to lot of reasons, the one of the main reasons is brake failure, it caused to due to poor maintenance, improper use and product defect, in order to safe guard the valuable human for accident the accident monitoring of brake is very important issue in automobile. The brake failure indicator circuit is a circuit that monitors constantly of the condition of brakes and provides an audio-visual indication. When the brake is applied in order to slow down or to stop the vehicle the green LED blinks and the piezo buzzer beeps for about one second if the brake system is accurate and working properly. If brake system fails the red LED glows and the buzzer do not beep

when the brakes are applied. In addition, this system prevents the fluid leakages from brake & continue the bypass in case of primary brake line failure.

II. PROBLEM STATEMENT OF PROJECT

It is generally observed that due to brake line breakage or leakage during running vehicle may cause a failure of brake in vehicle due to this accident may happened. To overcome this problem our aim to make a safety braking system which will activate secondary safety braking supply line to reduce fluid loss & to activate brake regularly without fail. The statement of project is "Air Brake Hoses Fail Detection with safety Braking System" for used in safety brakes of automobile.

III. OBJECTIVES

The main objective of this project is to avoid accidents due to brake failure. The specific objectives of this project were:

- 1) Protect the lively hood.
- 2) To reduce accidents of vehicle due to the brake failure.
- 3) To sense the change in hydrostatic pressure difference while brake failure.
- 4) In order to indicate the failure of brake.
- 5) It can operate and monitor all the brake units in the vehicle by using auxiliary brake bypass line.
- 6) It can sense the leakage of the fuel.
- 7) To connect the indicator with a sensor to indicate the brake failure.

IV. SCOPE OF PROJECT

The brake developed by us is pneumatically operated. Thus, in old braking system it is needed to give full attention of worker to operate the brake during starting stops the vehicle in case of brake failure. This brake can be modified to fully automate pneumatic controlling brake by using automation. This automated brake with brake failure prevention system can perform specified work in minimum time, speed, reliably and with high accuracy so that it does not need any regular attention for braking in case of brake failure.

V. LITRATURE REVIEW

1. K.Mohan and G.Pugazhendhi, done the work on, Accidents Avoiding System Indicator. Due to Brake Failure, according to his work, Brakes are implemented in cars to stop the vehicle. The increase in number of deaths and accidents is due to brake failure. Hydraulic Brake failures mainly occur due to oil leakage and results in pressure loss. The aim of our paper is to diagnose faulty braking system and application of an auxiliary secondary braking system in case of brake failures. This project helps in ensuring the safety of the passengers before the failure occurs and helps in preventing accidents. The brake failure alarming system is empowered by electronic control unit. The project also includes the stopping of vehicle by switching off the supply of the ignition to the engine. Future scope of this project is to implement the regenerative braking system in spite of Ratchet Paul mechanism in secondary braking system which gives the way for usage of brakes in efficient manner.[1]

2. Javed Ahmed. K, Shri Ram.K.S, Akshay Kumar.B, santosh.J, done the work on, Brake Failure Detection with Auxilary Braking System in Cars, according to his work, Brakes are implemented in cars to stop the vehicle. The increase in number of deaths and accidents is due to brake failure. Brake failures mainly occur due to brake lining failures and results in pressure loss . The aim of our paper is to diagnose faulty braking system and application of an auxiliary secondary braking system in case of brake failures. We can achieve it by using sensors and dual braking units. The main purpose of this paper is to ensure drivers safety by using a dual braking system.[2]

3. Dr.N.Venkatachalapathi, V. Mallikarjuna, done the work on, Automatic Brake Failure Indicator and Over Heating Alarm, according to his work, 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. It constantly monitors the condition of the brake and give audio visual indication.[3]

4. Abhishek Chaudhary, Kapil Jariya, Mohit Kumar Sharma, Mr. Vikas Kumar, done the work on, Automatic Brake Failure Indicator, according to his work, today, Machines are widely controlled by automated control system. The main objective of this project is to continuously monitor the braking system at each and every time during the operation of the vehicle. The main purpose of this project is to provide such a device to vehicles operator so that any harmful damage and accidents cause by failure of brake switch can be easily prevented by the proper indication of working condition of brake switch.[4]

5. Anant W. Nemade, Samir A. Telang & Dr. Arvind L. Chel, done the work on, Vehicle Brake Failure and Road Accidents- An Investigation, according to his work, Road accidents are an outcome of the interplay of various factors. The paper investigated the Air Brake Hoses Fail Detection with safety Braking System various modes of failure in hydraulic braking system. The failure of brakes can be avoided, if the mechanical component of braking system works properly. The modern invention may provide the safety from modern equipment but if the basic parts are synchronised then the number of accidents can be reduced.[5]

VI. BRAKE TYPES

6.1. Drum Brake:

On all models using drum brakes on the rear, the cable pulls the parking brake lever. The lever is attached to the secondary shoe at the top and transfers the lever action to the primary shoe through the shoe strut. When released, the brake shoe springs return the shoes to their retracted position.

6.2. Disc Brakes:

There are two types of rear wheel parking brake systems for disc brakes. The first uses the brake calliper assembly to mechanically apply pressure to the disc. The second type is an exclusive drum brake assembly that applies pressure to an inside drum, which is an integral part of the disc rotor. Calliper Parking Brake The parking brake is built into the calliper housing and is provided with an automatic adjusting mechanism to compensate for piston movement as the brake pads wear.

When the brake pedal is depressed, hydraulic pressure forces the piston to move to the left. The movement of the Piston exerts pressure on the Thrust Plate and Thrust Bearing against the Sleeve Nut causing it to be screwed out from the stationary Adjusting Bolt. The Sleeve Nut can be easily screwed out because the Clutch Spring unwinds and therefore does not prevent the Sleeve Nut from rotating. The distance that the Sleeve Nut screws out from the Adjusting Bolt is equal to the amount of pad wear.

6.3.Exclusive Parking Brake:

The exclusive parking brake is found on the Land Cruiser, Supra, Celica, Previa, Avalon and Camry. As illustrated below, a drum brake is cast into the disc rotor. The shoes and other components are similar to a conventional dual-servo drum brake system but smaller and with no wheel cylinder. Activating the parking brake is similar to applying the parking brake on conventional drum brakes. Adjustment to the exclusive parking brake is done manually at the Shoe Adjusting Screw Set (Star Wheel) and must be done periodically.

VII. SEQUENCE OF METHODOLOGY IS AS FOLLOWS

- Methodology 1 – Problem Definitions
- Methodology 2 – Basic Information & literature survey
- Methodology 3 – Design of Components
- Methodology 4 –Selection of material & standard parts.
- Methodology 5 – Manufacturing process & testing.
- Methodology 6 –Cost Estimation & Report writing.

VIII. CONSTRUCTION

It consists of mainly:-

8.1. Frame:-

The frame is of MS material. The frame of our machine is basically used to support the pneumatic components mounted on it. That is Piston cylinder, D. C. V. , flow control valve, switches are mounted on frame.

8.2. Double acting cylinders:-

Cylinders are linear actuators which convert fluid power into mechanical power. They are also known as JACKS or RAMS. Hydraulic cylinders are used at high temperature and produce large forces and precise movement. For this reason, they are constructed of strong materials such as steel and designed to withstand large forces. Consequently, they are constructed from lighter materials such as aluminum and brass.

8.3. Pneumatic pipe fittings:-

Pneumatic tubing is also available in a number of other materials both with and without reinforcement for use in standard applications. Tubing is available in sizes of 1/8", 5/32", 3/16", 1/4", 5/16", 3/8", and 1/2". Metric tubing sizes of 3.2, 4, 6, 8, 10, 12, and 16mm are available.

This can be used for connection of pneumatic system with total drill assemble.

8.4. 2/2Solenoid valve:-

A valve is a device that regulates the flow of fluid (gases, liquids, fluidized solids or slurries) by opening and closing or partially obstructing passage ways. A 2/2-way directional valve from the name itself has 2 ports equally spaced and 2 flow positions. It can be used to isolate and simultaneously bypass a passage way for the fluid which for example should retract or extend a double acting cylinder.

8.5.Disc brake:-

A disc brake is a type of brake that uses callipers to squeeze pairs of pads against a disc in order to create friction that retards the rotation of a shaft, such as a vehicle axle, either to reduce its rotational speed or to hold it stationary.

8.6. Ball bearings:-

This type of bearing consists of i) a cast iron pedestal, ii) gun metal, or brass bush split into two halves called "brasses", and iii) a cast iron cap and two mild steel bolts. The detailed drawing of a pedestal bearing is shown in image below. The rotation of the bush inside the bearing housing is arrested by a snug at the bottom of the lower brass. The cap is tightened on the pedestal block by means of bolts and nuts.

8.7. Shaft:-

Shaft is a common and important machine element. It is a rotating member, in general, has a circular cross-section and is used to transmit power. The shaft may be hollow or solid. The shaft is supported on bearings and it rotates a set of gears or pulleys for the purpose of power transmission.

Material for Shafts :

Ferrous, non-ferrous materials and nonmetals.

8.8. Washer:-

Washers are usually metal or plastic. High quality bolted joints require hardened steel washers to prevent the loss of pre-load due to Brinelling after the torque is applied. Rubber or fiber gaskets used in taps (or faucets, or valves) to stop the flow of water are sometimes referred to colloquially as *washers*; but, while they may look similar, washers and gaskets are usually designed for different functions and made differently. Washers are also important

8.9. Nut and Bolt

As nuts and bolts are not perfectly rigid, but stretch slightly under load, the distribution of stress on the threads is not uniform.

8.10. Relay board:

In most of the high-end industrial application devices have relays for their effective working. Relays are simple switches which are operated both electrically and mechanically. Relays consist of an electromagnet and also a set of contacts. The switching mechanism is carried out with the help of the electromagnet. There are also other operating principles for its working. But they differ according to their applications. Most of the devices have the application of relays. The main operation of a relay comes in places where only a low-power signal can be used to control a circuit. It is also used in places where only one signal can be used to control a lot of circuits. There are only four main parts in a relay. They are:-Electromagnet , Movable Armature, Switch point contacts, Spring.

It is an electro-magnetic relay with a wire coil, surrounded by an iron core. A path of very low reluctance for the magnetic flux is provided for the movable armature and also the switch point contacts. The movable armature is connected to the yoke which is mechanically connected to the switch point contacts. These parts are safely held with the help of a spring. The spring is used so as to produce an air gap in the circuit when the relay becomes de-energized. The basics for all the relays are the same. Take a look at a 4 – pin relay shown below. There are two colours shown. The green colour represents the control circuit and the red colour represents the load circuit. A small control coil is connected onto the control circuit. A switch is connected to the load. This switch is controlled by the coil in the control circuit.

IX. DESIGN

Design consists of application of scientific principles, technical information and imagination for development of new or improvised machine or mechanism to perform a specific function with maximum economy and efficiency. Hence a careful design approach has to be adopted. The total design work has been split up into two parts. System design mainly concerns with various physical constraints, deciding basic working principle, space requirements, arrangements of various components etc. Following parameters are looked upon in system design. Selection of system based on physical constraints. The mechanical design has direct norms with the system design hence system is designed such that distinctions and dimensions thus obtained in mechanical design can be well fitted in to it. Arrangement of various components made simple to utilize every possible space. Ease of maintenance and servicing achieved by means of simplified layout that enables quick decision assembly of components. Scope of future improvement. In mechanical design the components are listed down and stored on the basis of their procurement in two categories. Design parts & Parts to be purchased. For designed parts detailed design is done and dimensions there obtained are compared to next dimensions which are already available in market. This simplifies the assembly as well as the post production and maintenance work. The various tolerances on work are specified. The process charts are prepared and passed to manufacturing stage. The parts to be purchased directly are selected from various catalogues and are specified so as to have ease of procurement in mechanical design at the first stage selection of appropriate material for the part to be designed for specific application is done.

9.1 Brake Failure Indicator

9.1.1. Background:-

With the passage of time, today's generation is growing up with the dreams of high-speed vehicles. The problem is that as the birth ratio is increasing, the accidents are getting in number which is one of the major problems faced in this era and it would be rapidly increasing in the coming period. So, everyone tries to avoid accidents while travelling but sometimes it is unavoidable. Accidents are happening at each nook of the streets around the world. Lakhs of life result in death as an aspect of these accidents. As the population is increasing, the number of vehicles is increasing in the same proportion. Which suggests there needs a lively hood of the brakes giving out. The condition of brakes is regularly monitored by the brake failure indicator circuit. The brake failure 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 every time.

9.1.2. Rationale:-

There are several limits that must be kept in mind while driving a vehicle. The brake failure indicator circuit contains many electrical as well as electronic equipment such as LED, sensors, piezo buzzers, ICs, transistors, etc. The brake failure indicator is used to avoid major damage. It is a main advantage of brake failure indicator, and it operates in automatic mode that makes it easy to use. At present many other instruments or systems can be used to warn before any accident condition but it is only used to monitor the braking system or any disturbances in electrical circuit of the braking system when the brake is applied to stop or slow down the vehicle. But this project i.e. Automatic Brake Failure Indicator uses sensors for constant monitoring of the braking switch and gives the whole condition of braking system of the vehicle. Many problems occur while using automatic braking system like some say hydraulic pipes are not connected tightly and temperature of braking system increases, it can give adverse effect on brake pad and the rotor.

X. WORKING

Automatic brake failure indicator and auxiliary braking system is consisting of pressure differential sensor circuit, control unit and frame. The sensor is used to detect the brake fluid line, the control signal to the braking valve unit. Similarly, the auxiliary brake is fixed to the wheel frame and as this air leakage is prevents from primary port valve automatically secondary valve can on which can apply the brake and stop the vehicle regularly. A pressure transducer sensor monitors the pressure in brake lining. When the primary air disc brake fails, the sensor detects the pressure loss and gives warning signal to the driver and also Activates power supply to the secondary braking unit which is a hub motors in wheels.

This functions as a secondary braking unit and helps the driver to stop the vehicle and thus ensures safety of the passengers. The main reason is brake failure, it caused to due to poor maintenance as well as product defect, in order to safe guard the valuable human for accident the accident monitoring of brake is very important thing in automobile Vehicle safety is the avoidance of automobile accidents or the minimization of harmful effects of accidents, in particular as pertaining to human life and health. Special safety features have been built into vehicles occupants only, and some for the safety of others. We have pleasure in introducing our new project “Automatic Braking Fluid Leakage Detection with safety bypass Braking System”. This is equipped by sensors and auxiliary braking unit. It is genuine project which is fully equipped and designed for automobile vehicles.

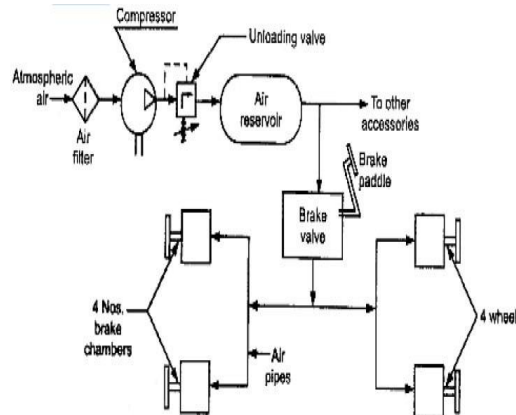
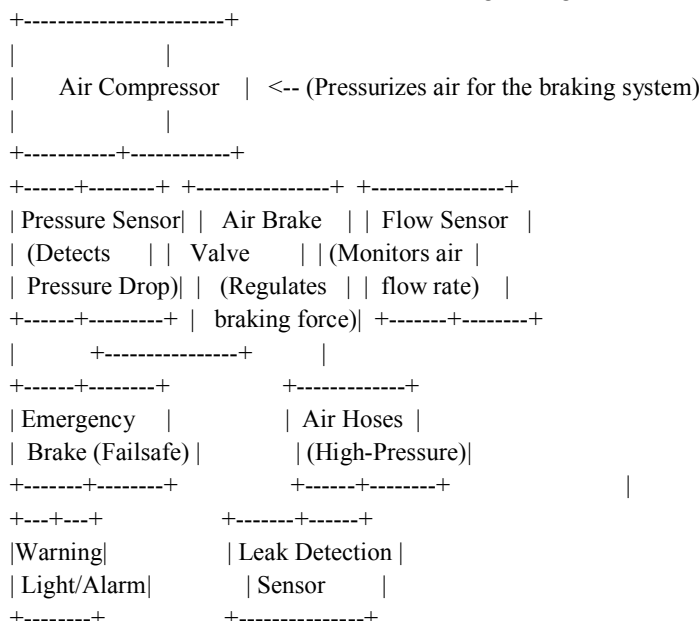


Fig.9.1.Fig. Air Brake System



XI ADVANTAGES

1. No need of external power supply it can be powered from the vehicle's battery itself.
2. Power consumption is comparably less and cost is less.
3. Does not depend on the petrol level.
- 4.. Installation is simplified very much and Operating principle is very easy.
5. The safety of driver is ensured.
6. The regenerative braking recovers energy and stores it in battery.
7. Brake failure is notified to the surrounding traffic via parking lights.

XII. APPLICATIONS

- 1) This system may be applicable in all types of air brake vehicles to avoid the accidents due to the brake failure & prevent fluid leakages during brake hose bursting or leakages.
- 2) This system also successfully installed in the heavy vehicles like buses, trucks, trailers, etc.

XIII. CONCLUSION

With all the advantages of brakes failure prevention over conventional braking, this system has been used on vehicles where the „brake failure“ problem exists. The same concept is being developed for application on hydraulic & pneumatic vehicles. The concept designed by us is just a prototype and needs to be developed more because of some limitations. These braking systems can be used as an auxiliary braking system along with the conventional braking system to avoid brake failure. The cost of modification of this brake system is cheaper. Hence the braking force produced in this is as equal & without any interpretation than the conventional brakes if can be used as a bypass or secondary or emergency braking system in the automobiles. Hence, we are satisfied with our project work.

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