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Automatic Detection of Brake Failure in Train Brake System

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ABSTRACT:
Our research concentrates on detection of brake failure in train. In case of any failure in the total brake pipe, the signal will be intimated to control unit and also the range of mismatch condition is displayed at LCD .When the indication of a malfunction in a compartment is displayed then the locomotive operator manually pulls a lever that releases the compressed air which is stored in the auxiliary storage unit into the brake pipe which will reduce the mismatch and allows the brake disc to function properly to stop the train in motion. Finally if there is any malfunction in the train brake mechanism through our research we are able to stop the train without any problem to the whole train system.

KEYWORDS:
Brake pipe, Brake disc ,Compressed air ,Kinetic energy ,Differential pressure sensor.

INTRODUCTION:

From the invention of steam engines the brake system of trains have been improved a lot. The first system of brake included a chained mechanism to stop the wheels. Later innovations paved the way to air brakes and vacuum enhanced mechanism. When the train is in motion, and the brakes are to be applied compressed air which is transmitted along the brake pipe provides the needed pressure to the disc so that it goes in contact with the wheels and creates friction that slows down the motion of the wheels. A moving train contains energy, known as kinetic energy, which needs to be removed from the train in order to cause it to stop. The simplest way of doing this is to convert the energy into heat. The conversion is usually done by applying a contact material to the rotating wheels or to discs attached to the axles. The material creates friction and converts the kinetic energy into heat. The wheels slow down and eventually the train stops.

WORKING:

DETECTION OF MALFUNCTION:

When the brake is applied from the control unit pressured air flows through the brake pipe which moves the disc so that it goes in contact with the wheels. There are two sensors placed, one at the initial point of the brake pipe and the other being placed at the ending. When a malfunction occurs due to any leak in the pipe there will be mismatch which would be indicated through the sensors. The pressure at the first sensor and the second one matches only when the brake pipe functions properly. The compressed air will register a pressure in the first sensor, which will be take;n as the reference value, in case of any breakage or leak in the pipe, the reference pressure will not match the pressure that is shown in the second sensor. This will send an indication signal to the control unit about the pressure changes and the compartment where the malfunction has occurred will be displayed.

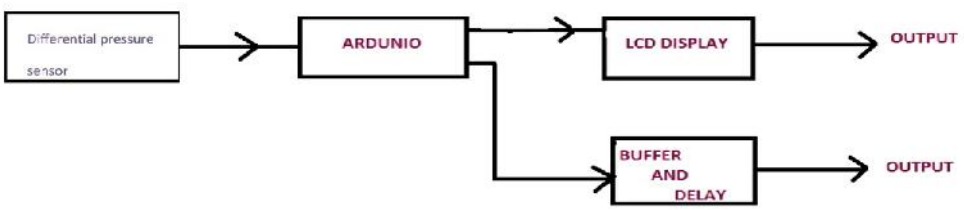

FIG 1: INTIMATION OF MALFUNCTION

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RECTIFICATION OF BRAKE FAILURE:

Each compartment has auxiliary cylinder filled with compressed air.After the indication of a malfunction in a compartment is shown then the locomotive operator manually pulls a lever that releases the compressed air into the brake pipe which will reduce the mismatch and allows the brake disc to function properly to stop the train in motion.

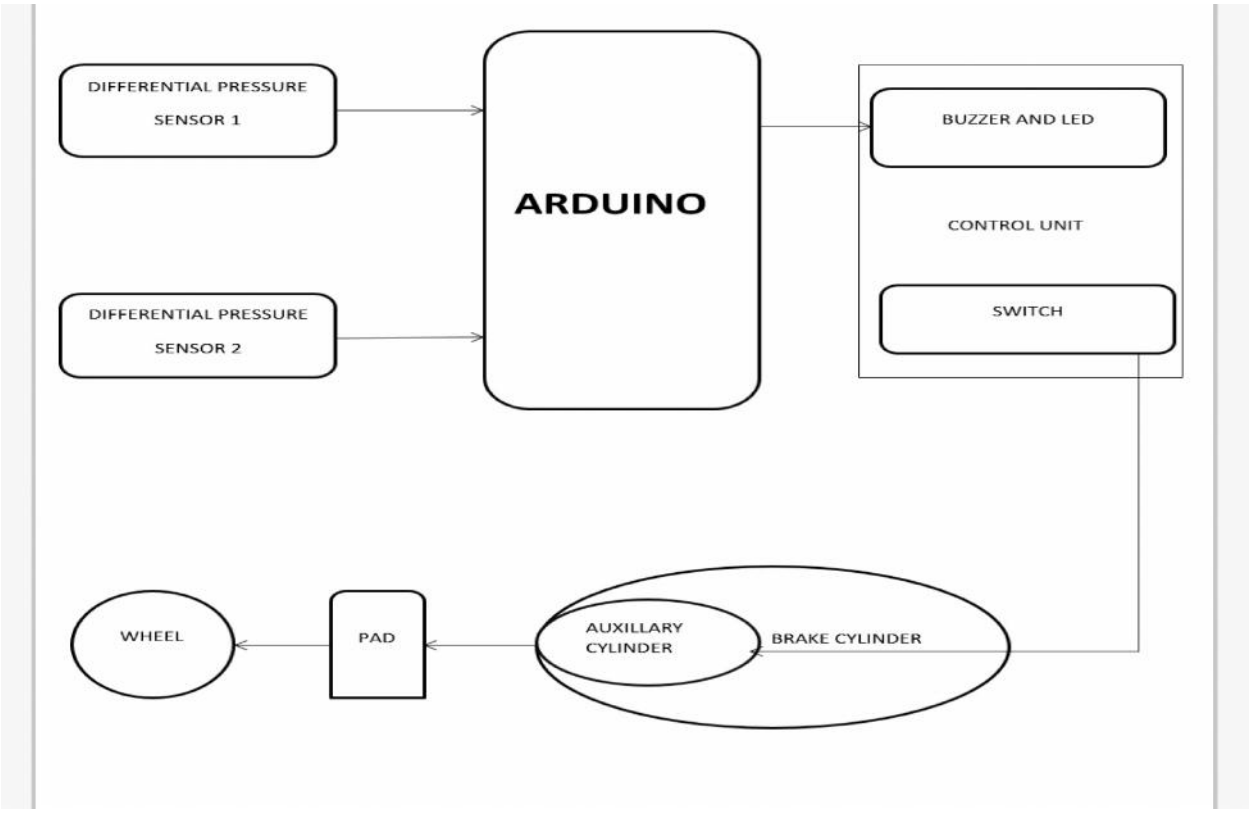

FIG:2 RECTIFICATION OF MALFUNCTION

ARDUINO:

The Arduino Ethernet Shield allows an Arduino Board to connect to the internet. It is based on the Wiz net W5500 Ethernet chip. The Wiz net W5500 provides a network stack capable of both TCP and UDP. It supports up to eight simultaneous socket connections. Use the Ethernet library to write sketches that connect to the Internet using the Shield. The Ethernet Shield 2 connects to an Arduino Board using long wire-wrap headers extending through the Shield. This keeps the pin layout intact and allows another Shield to be stacked on top of it. The Ethernet Shield 2 has a standard RJ-45 connection, with an integrated line transformer and Power over Ethernet enabled. The current Shield supports a Power over Ethernet module designed to extract power from a conventional twisted pair Category 5 Ethernet cable.

LCD DISPLAY:

Liquid crystal display (LCD) has material which combines the properties of both liquid and crystals. They have a temperature range within which the molecules are almost as mobile as they would be in a liquid, but are grouped together in an order form similar to a crystal.

DIFFERENTIAL PRESSURE SENSOR:

This sensor measures the difference between two pressures, one connected to each side of the sensor. Differential pressure sensors are used to measure many properties, such as pressure drops across oil

filters or air filters, fluid levels (by comparing the pressure above and below the liquid) or flow rates (by measuring the change in pressure across a restriction). Technically speaking, most pressure sensors are really differential pressure sensors; for example a gauge pressure sensor is merely a differential pressure sensor in which one side is open to the ambient atmosphere.

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