

AUTOMATIC HANDBRAKE SYSTEM FOR AUTOMOBILES

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Abstract: The use of pneumatic system for engagement and disengagement of handbrake reduces the effort needed for a driver and lesser the possibility of brake wearing. The pneumatic system is use for operation of handbrake also replace the traditional method for the use of handbrake. This method gives noiseless, smooth operation as well as save the energy of beneficiary. This mechanism provides totally application of handbrake without human manipulation which utilize the space in vehicle. Taking this criterion into consideration, the results have been found efficient for the automatic handbrake system in the present paper.

Index Terms- automatic handbrake, pneumatic handbrake, parking brake automation system

I. INTRODUCTION

In vehicles, the handbrake is generally used for keeping the vehicle stationary. Usually, handbrake consists of conventional mechanism of wire or cable associated with brake system of rear wheels. It is operated by hand lever which is located near the gear shift lever that is very useful for parking of the motor vehicle. Considering the critical situation where driver no longer have control over foot brake in this use of handbrake define as 'Emergency Brake'. Sometimes Handbrake is purposely use in case of drifting of vehicle. But in broader sense handbrake is used when there is collapse of mechanical operated linkage or mechanism to bring back vehicle safe zone. Automobile safety experts recommended the use of both systems as per rules & regulations of the government of respective region or country. Most of automatic transmission vehicles are provided with only system of park position instead of parking brake.

Relevance

Now-a-days, most accidents occur due to the carelessness of drivers. The new design mainly focuses on the prevention of such accidents caused by improper engagement and disengagement of the handbrake. This system can be installed in existing vehicles and upcoming vehicles. this design also acts as a park assist. This system can ensure safety for the passengers as well as pedestrians.

II. NEED OF AUTOMATION

The main objective of automation is to reduce error of up to the zero tolerance while increasing safety and flexibility of operation. Automation increases the reliability of system. Automation eliminates the chances of human errors. This directly affects the operation of the braking system. Sometimes, it is necessary that the system returned to its position in quick timing, thus automation is recommended.

Safety System

The aim of the present paper is to prototype a pneumatic braking system work with the help of electronic system. In past few years research and development shown tremendous growth incorporating pneumatic braking system. Thus system does not failed in all type of operating conditions.

Pneumatic System

Pneumatic system is quick response-based system which helps for sudden and quick operation of handbrake apply and release mechanism. During operation of braking system the smooth and reliable braking accomplished by pneumatic system

III. OBJECTIVES

To develop an automatic handbrake for engaging and disengaging handbrake automatically with a pneumatic system. This also acts as a park assist thus reduce the driver error subjected to handbrake. It is proposed to be done with the help of a proximity sensor and double acting pneumatic cylinder. Also provide braking as like avoid slow speed accidents. It minimizes the chance for the driver to drives the vehicle with engaged handbrake. This also helps in applying handbrake automatically thus reduce the accidents caused by the rolling of the vehicle at the stationary condition. This will increase the life of brake pads and shoes.

IV. CONSTRUCTION

The automatic hand brake is consisting of the following components.

- Microcontroller
- Pneumatic double acting cylinder
- Solenoid valve
- Compressor
- Ultrasonic Sensor

Microcontroller



Fig 1-Microcontroller

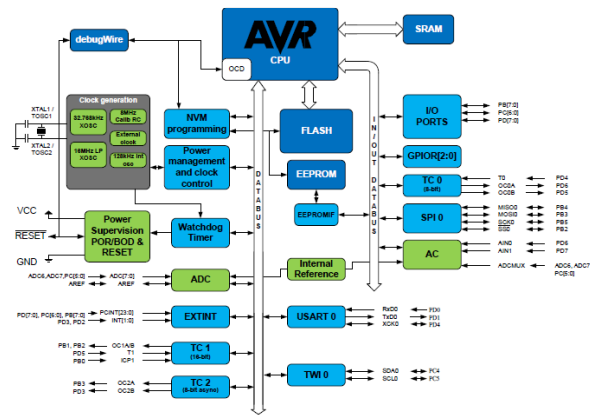


Fig 2- Block diagram of microcontroller

A microcontroller is basically integrated circuit consists different types of electronic parts. It is work as a small computer. Microcontrollers are used in autonomous devices used for various purposes. The Atmel® Pico Power® AT mega 328/P is a energy saver microcontroller. CMOS 8-bit architecture microcontroller provided into pneumatic handbrake system.

It has been designed to optimize the device low energy consumption with respect to processing of system. Arduino is an open-source computing platform. Arduino is accustomed to developing complete interactive objects either it is connected to the software system on the computer. The ASCII text file IDE is downloaded for gratis (generally for Windows, and Linux operating system).

Features

- Microcontroller model name: ATmega328
- Operating Voltage: 05 Volts
- Input Voltage: 7-12V
- Digital Input output pins: fourteen (of that 6 give PWM output)

Pneumatic double acting cylinder

The Double Acting cylinder means that the pneumatic pressure operates in forward direction and spring returns backward. The pneumatic pressure from the compressor is flow through the regulator. Regulator controls the amount of pressure which is needed for system with the help of adjusting knob. For showing the pressure of line, a pressure gauge provided on pressure regulator. After that, the compressed pneumatic is flows through solenoid valve. The 3/2 solenoid valve is used for supplying the pneumatic to one side of cylinder.

Solenoid valve



Fig 3- 3/2 solenoid valve

The 3/2 solenoid valve fulfilled the requirement of high speed operations and to decreases the human efforts. It is also helps for the modification of the conventional system into an automatically operated system. A solenoid valve is an device working on principle of energy conversion. It is electrically operated device used for converts the electrical energy into liner motion. Solenoid valve also used in mechanical operations for turning of various components' motion. Solenoid valves may be pull-push type operating manner. In push type solenoid valve, the plunger is pushed when the solenoid is powered by electrical source whereas in pull-type solenoid valve, the plunger is pulled when the solenoid is electrically charged.

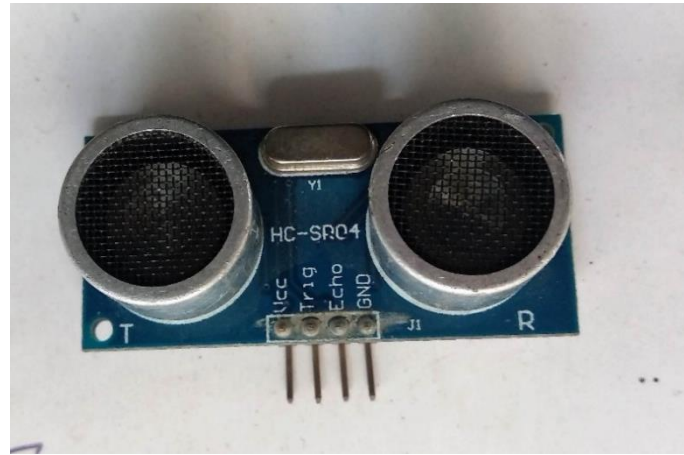


Fig 4- HC SR04 ultrasonic sensor

The diagram shows the architecture of ultrasonic sensor. For measuring the distance, Trig of sensor required to receive a charge of 5 volts for time period of minimum 10us, it is eligible for initiate the sensor. It will transmit eight cycles of ultrasonic waves at frequency of 40 kHz and wait until reflection of respective waves. As the sensor recognize ultrasonic wave from the receiver, it will be settled up the Echo pin to 05 volts and delay for a period of respective distance travelling time. To obtain the distance is calculated with echo pin's width. Ultrasonic sensor able to detect objects without direct contact. An electromagnetic field emitted by proximity sensor which look for changes in the field. The object being detected is referred to as the target of target. Different targets demanded by different sensors.

V. BLOCK DIAGRAM OF SYSTEM

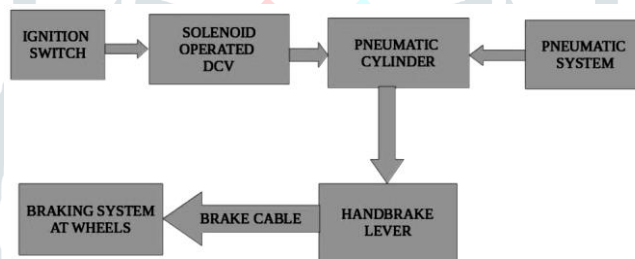


Fig 5- Block diagram of automatic handbrake system

VI. METHODOLOGY

- Studying and identifying the present mechanisms used in vehicles.
- Identifying the potential problem through abstraction.
- Collecting helpful information.
- Interpreting data as the problem definition.
- Developing a conceptual design and selecting based on the digital logic approach procedure of product design and development.
- Finally, preparing the enhanced design of the product.

VII. WORKING

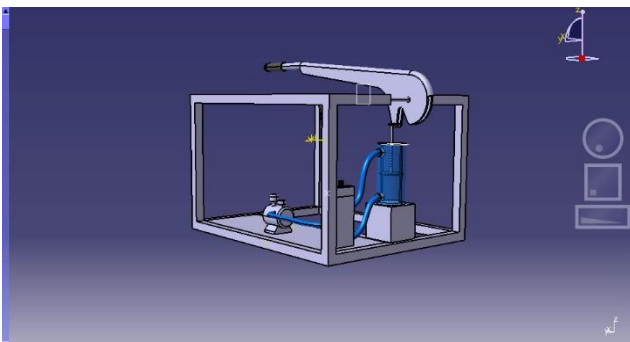


Fig 6- Computer aided drawing of system



Fig 7- Actual model of automatic handbrake system

The conventional handbrake system is a manually operated and uses a hand lever and cables for its operation. At the time of engagement, the hand lever is pulled upwards creating tension on the cable eventually creating the braking force required for locking the wheels. The system has been designed which eliminates the use of pawl and ratchet mechanism and thus, making it possible to completely automate the working of the handbrake system.

The use of electro-pneumatically operated components and sensors automatically engages and releases the handbrake in various predefined conditions. Various sensors are placed in the system at different places which sense the current position of the vehicle E.g. When the wheels are in motion, when they are not in motion etc. and depending on this feedback is sent to the Adriano controller which decides whether to actuate the pneumatic cylinder which in turn engages or disengages the parking brakes.

With the help of ultrasonic sensor system can detect an object within certain distance for collision resist to avoid slow speed accidents. Thus system becomes full proof.

VIII. CONCLUSION

It has been concluded that the use of a conventional hand brake system can be eliminated using this system and the error occurring due to the operator can be eliminated completely. It can clearly be seen that this system is completely safe and it may be used in automobiles even in the lower price range as this system is not too expensive.

This system can also be used in luxury cars instead of the expensive electronically controlled system as they use automatic parking brakes to reduce overall cost of the vehicle. Use of Pneumatic system allows fast engagement and disengagement of the handbrake and it makes the vehicles safer. By using this system, the manual load on the operator has been reduced and eliminated the error which induce while operation of the system.

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