ACTUATION OF FUEL PUMP USING STRAIN GAUGE INDUCED SEAT BELT

N.K.B. Ravi*, S.Rajendra Kumar*, K. Vinodh*, B. Abinath*

* UG Students of IV year Mechanical, Velammal Institute of Technology
Panchetti

nkbravi@gmail.com

abinathkumar@gmail.com

Mr. D.Balamurali[#]
Assistant Professor Mechanical, Velammal Institute of Technology

Abstract—**The seat belt in heavy vehicles like trucks is not used by the drivers commonly. People think that it is of less importance to wear a seatbelt in truck. But the fact is that the seatbelt in truck is of equally important as in light vehicles. Between 1996 to 2001 over 120 truck occupants, the vast majority drivers, were killed in crashes in New South Wales. In that less than 10% were reported to have been wearing a seat belt. Thus, this project aims in emphasizing the usage of seat belts in the heavy vehicles. The seat belt is implanted with strain gauge so that the tension in the gauge will generate electric pulse and this electric pulse is given to the pump to operate. Thus, the seat belt is made mandatory in heavy vehicles by implementing strain gauge.**

I.BACKGROUND OF THE PROJECT

Keeping safety measures in mind, generally, seat belts are provided in an automobile for securing an occupant on a seat of the automobile. Conventional seat belts are generally designed to secure the occupant against injuries that may result from sudden movements or accidents of the automobile. More often than not, many occupants may forget to fasten the conventional seat belts while driving. Some other occupants may refuse to fasten the conventional seat belts while driving. Such negligence of forgetting or refusing to fasten the conventional seat belt may lead to serious injuries to the occupants in case of the sudden movements or the accidents of the automobile.

Accordingly, there exists a need of a safety system that encourages the occupants to fasten the conventional seat belts for operating an automobile, to avoid serious injuries that may cause during sudden movements or accidents of the automobile.

II SUMMARY OF THE PROJECT

In view of the disadvantages of the current system, the general purpose of the present invention is to provide a strain gauge induced seat belt controlled fuel pumping system configured to include the advantages of the current art and to overcome the existing drawbacks of the system.An object of the invention is to promote the usage of seat belts in heavy vehicles thereby preventing serious injuries caused due to sudden movements or accidents while driving the vehicle.

To achieve the above object in the present invention a fuel pump actuated by a strain gauge induced seat belt is used for supplying fuel from the fuel tank to the injectors. The actuation of fuel pump using strain gauge induced seat belt comprises of a seat belt with a strain gauge and an electronic circuit. The electronic circuit consists of an Arduino board, amplifier and a relay. Furthermore, the electronic circuit is adapted to connect the seat belt and the fuel pump. So, when the driver straps the seat belt the electronic circuit initiates the fuel pump, thereby pumping the fuel from the tank to the injectors.

III LITERATURE SURVEY

In [3]Development of Helmet Detection and Smart Seat Belt by S. Anil Babu, Sumathi Ayyalusamy, Rejin Ranjit Singh, Sreejin Dharmarijan, Jason James, Mohamed Anas said that "In UAE Road accidents have increased significantly with an average of two people killed on the roads every day. The impact of accidents is further more in dune buggy, specifically when the driver involves in a high-speed accident without wearing seat belt. It is highly dangerous and can cause death. Wearing a seat belt can reduce shock from the impact and may save a life". The aim of this research work is to development of seat belt detection system for dune buggy to avoid or reduce the accident fatigue on drivers during accident. Driver will be unable to start vehicle without wearing seat belt.

In [4]Design and Development of Seat Belt Alert System with Ignition interlocking in Four-wheeler by R. Karthik, Prof. S. Karpagarajan, R. Gopi said that "Most of the accidents are occurred because of violation of rules. Result of this major accident happened. In our day-to-day life we are careless in our safety while driving in vehicles for this we have to introduce some techniques to do these precautions compulsory. More injuries for driving person and near person only than back sitting persons. The technique is to detect that the seat belt was installed successfully or not. If the driver tries to start the any kind of heavy vehicle the controlling system checks that the driver worn seat belt or not if he / she worn then car will start if no, HMV will not start. Then the controlling system checks that the near passenger is seated or not. If nobody was there then HMV will start. If anybody was seating then the controlling system checks that the person worn seatbelt or not if yes car will start if not HMV will not start."

[5]Robin preece (manager, roads and traffic authority of NSW) has concluded that "Based on the results of NSW crashed vehicles study, somewhere between 27%and 77% of truck driver fatalities could be prevented by the use of seat belts" in his paper "The safety benefits from seat belt use by heavy truck occupants" at the 25th Australasian transport research forum.

[2]Debbie Stearns (workplace safety road transport programme manager, accident compensation corporation, Auckland, New Zealand) said that "The drivers revealed that it was uncomfortable to them to wear seat belt when the seat is moved front towards the mirror. However, if it is in a cost of life it should be made it compulsory to wear seat belts".

[6]A Nigerian medical journal has quoted the importance of seat belt in limiting the severity of injuries in patients. They concluded that a total of 57% patients used seat belts while 42.1% did not. Among these, 13.6% patients died as a result of injuries. In those 13.6% the people who did not worn seat belt was found to be 79%.

IV WORKING OF EXISTING SYSTEM

The general working of an automobile when the key is plugged is illustrated in the fig shown below
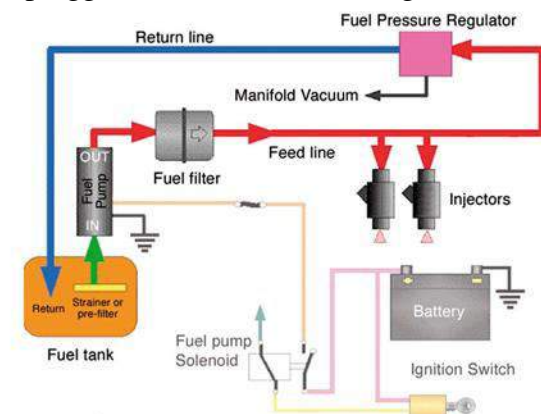
Fig .1

It consists of an ignition switch, battery, a fuel pump solenoid, a fuel tank, fuel pump, fuel filter, injector, fuel pressure regulator. When the ignition switch is turned is with the help of a key the battery is turned on and the fuel pump starts to pump the fuel form the tank to the injector through the fuel filter, the pump operates through the fuel pump solenoid. The fuel is sent to the injector which helps in combustion as a result of which the vehicle moves.

V BRIEF DESCRIPTION OF THE COMPONENTS USED

STRAIN GAUGE

A strain gauge is a device used to measure strain on an object. The most common type of strain gauge consists of

an insulating flexible backing which supports a metallic foil pattern. The gauge is attached to the object by a suitable adhesive, such as cyanoacrylate. As the object is deformed, the foil is deformed, causing its electrical resistance to change. This resistance change, usually measured using a Wheatstone bridge, is related to the strain by the quantity known as the gauge factor.
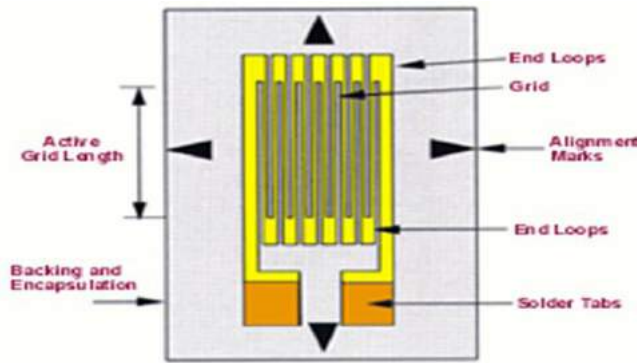

Fig.2

From the measured electrical resistance of the strain gauge, the amount of induced stress may be inferred. A typical strain gauge arranges a long, thin conductive strip in a zig-zag pattern of parallel lines such that a small amount of stress in the direction of the orientation of the parallel lines results in a multiplicatively larger strain measurement over the effective length of the conductor surfaces in the array of conductive lines—and hence a multiplicatively larger change in resistance—than would be observed with a single straight-line conductive wire.

The variation of a strain gauge based on the type of load applied is represented below
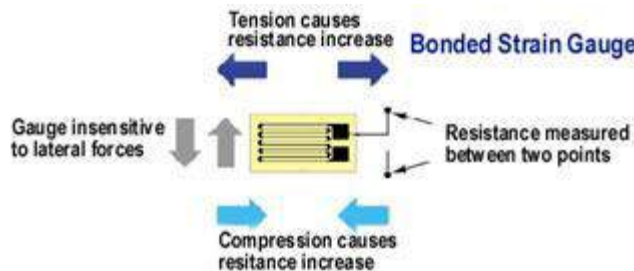

Fig.3

The figure clearly represents the direction of variation of the strain gauge with respect to various loads applied to it.

AMPLIFIER

An amplifier, electronic amplifier or (informally) amp is an electronic device that can increase the power of a signal (a time-varying voltage or current). An amplifier functions by taking power from a power supply and controlling the output to match the input signal shape but with a larger amplitude. In this sense, an amplifier modulates the output of the power supply based upon the properties of the input signal. An amplifier is effectively the opposite of an attenuator: while an amplifier provides gain, an attenuator provides loss.

RELAY

A relay is an electrically operated switch. The term Relay generally refers to a device that provides an electrical connection between two or more points in response to the application of a control signal. The most common and widely used type of electrical relay is the electromechanical relay or EMR.

ARDUINO BOARD

Arduino boards uses different types of microcontrollers and processors. The boards are furnished with sets of analog and digital input and output pins that are used for interfacing the board with other external components such as amplifier, sensors etc. The boards are provided with serial communication interfaces including USB used for loading programs from a computer. The microcontrollers are usually programmed using C, C++ programming languages. In addition to using traditional compilers the boards are provided with integrated development environment(IDE). An Arduino board is shown below.
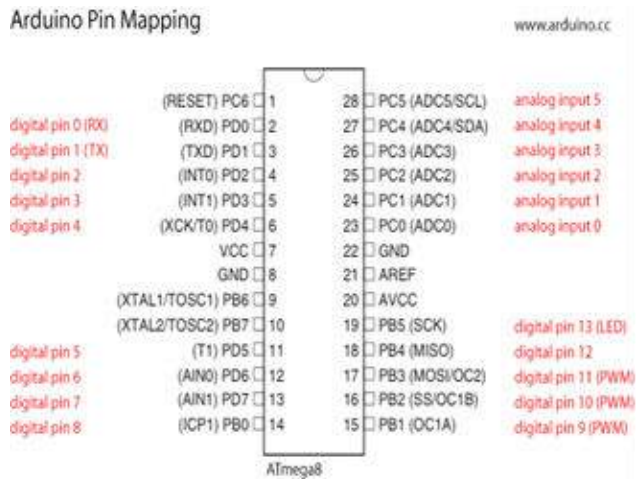
Fig.4

VI WORKING OF NEW SYSTEM

The strain gauge is implemented in the seat belt. When the seat belt is fastened by the driver, the foil in the gauge elongates and results in tensile force. Hence, there will be change in the resistance which is proportional to the strain or force developed. The resistance force is then passed to the Wheatstone bridge and as a result, there will be a voltage difference across the terminals. The output of the sensor is fed to the Arduino board. The board is programmed in such a way that it produces an output only when the input is between a fixed range. But the output of voltage is very small and it is amplified by using amplifier.

Amplifier is provided in order to increase the attained voltage to about 12v. This amplifier is connected with relay. Here relay is used to actuate the fuel pump. Thus, the pumping process from the tank to the injector starts.

Here pump will work only when the strain resistance produced in seat belt i.e. driver must have to wear seat belt. If strain not produced in seat belt, pump will not be actuated. The purpose of Arduino board is to detect whether the person is fastened the seat belt over him or to the seat. When he fastens the belt over him the strain produced will be of appreciable level thereby falling within the prescribed range.
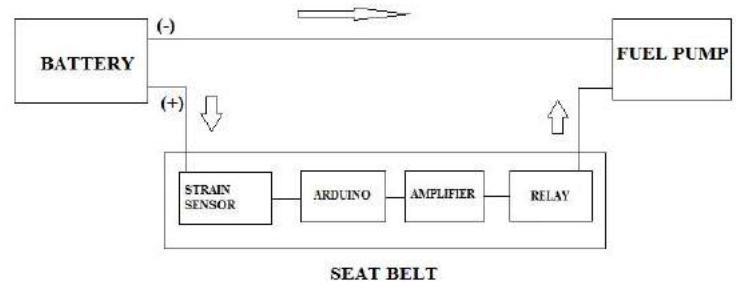

Fig.5

The new system is represented in the form of a block diagram above. From the figure the negative terminal from the battery is connected to the negative of the fuel pump. The positive line is broken at the middle in order to attach the seat belt setup.

VII DISCUSSION

In this section, discussion on this project is seen which includes advantages, disadvantages and future work of the project.

A. Advantages

According to [1]statistics every year the lives of almost 1.24 million people are cut short as a result of a road traffic crash. Between 20-50 million more people suffer non-fatal injuries, with many incurring a disability as a result of their injury.

- Seat Belt is the initiator of the system.
- No issues with engine efficiency.
- Power consumption is low.
- Cost is low when compared to other systems.
- Less space is required.
- Automobile does not stop suddenly so that no
- damages are occurred to the automobile when
- the seat belt is loosened or removed

B. DISADVANTAGES

Maintenance is the major concern.

VIII CONCLUSION

An ounce of prevention is worth a pound of cure. The road accidents are now proving to be one of major losses of human resources although the accident is not fully solved but the losses from the accident can be avoided by wearing the seat belts. Actuation of fuel pump using strain gauge

induced seat belt ensures the safety of the passengers by controlling the fuel pump which will not supply the fuel to the engine unless or until the passenger fastens his seatbelt. By ensuring the seat belt it can be used very effective in saving the man life. Over 95% accidents are caused mostly due to human errors.

ACKNOWLEDGEMENT

REFRERENCES:

[1] World Health Organization, "Global status Report on Road Safety: Time for Action, "Geneva, WHO, pp. 1-3, and 2009.

[2] Debbie Stearns, Workplace Safety Road Transport Programme Manager Accident Compensation Corporation, Auckland, New Zealand.

[3] Development of Helmet Detection and Smart Seat Belt by S. Anil Babu, Sumathi Ayyalusamy, Rejin Ranjit Singh, Sreejin Dharmarijan, Jason James, Mohamed Anas

[4] Design and Development of Seat Belt Alert System with Ignition interlocking in Four-wheeler by R. Karthik, Prof. S. Karpagarajan, R. Gopi

[5] Nigerian Medical Journal "The impact of seat-belts in limiting the severity of injuries in patients presenting to a university hospital in the developing world"

[6] "The safety benefits from seat belt use by heavy truck occupants" by Robin preece (manager, roads and traffic authority of NSW)

[7] U LEVY, "Seat belt detection system for vehicle,"USA, US2007195990-A1