IOSR Journal of Mechanical and Civil Engineering (IOSR-JMCE)
e-ISSN: 2278-1684, p-ISSN: 2320-334X
PP 11-14
www.iosrjournals.org

Design of Automatic Speed Control System in 4 – Wheelers for Avoiding Accidents

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ABSTRACT : *Many accidents are at least partially caused because of rash driving. This can happen due to many reasons: poor judgment on the part of the driver, poor driving by the driver. Once the driver has lost control it is very difficult to drive the vehicle. To avoid rash driving and to prevent losing of valuable property we need some safety systems in the vehicles. We can make this true by controlling the flow of fuel to the Engine using sensors and other mechanical arrangements and this can bring the vehicle to the intended course. This simple system provides safety, and avoids rash driving in highly populated regions.*

Keywords: *formatting, insert, style, styling, sensors.*

I. INTRODUCTION

For avoiding rash driving by drivers, we provide safety systems within the vehicles especially for 4-wheelers.. The main conclusion of their report is the crucial importance of seat belts and padded dashboards. Since then many important inventions such as automatic braking, electronic stability control, adaptive cruise control, traction control systems, antilock braking, etc. Our work is on a same pathway. In this system there is one power source (battery) as an input, one controlling element (toroidal coil with controlling rod arrangement), micro controller and small modifications in the already existing conventional designs of S.I & C.I engines.

1.1 Description

It is the system, which mainly uses photoelectric sensor, electrical power source and micro-controller for controlling the vehicle speed. The arrangement of the components used in this system. By using this simple system we can control automatically the speed of the vehicle. The vehicle will move with designated speed (low speed) of the control system even though the driver wants to drive the vehicle with high velocities.

1.2 Incremental Rotary Encoder

It is an incremental rotary encoder, also known as a quadrature encoder or a relative rotary encoder. In the optical type there are two gray coded tracks. The fact that incremental encoders use only two sensors does not compromise their accuracy. There can be an optional third output reference, which happens once every turn. This is used when there is the need of an absolute reference, such as positioning systems. The optical type is used when higher RPMs are encountered. Incremental encoders are used to track motion and can be used to determine position and velocity.

1.3 Photo Electric Sensor

A photoelectric sensor is a device used to detect the distance, absence, or presence of an object by using a light transmitter, often infrared. A retro-reflective arrangement places the transmitter and receiver at the same location and uses a reflector to bounce the light beam back from the transmitter to the receiver[1]. An object is sensed when the beam is interrupted by the same [1]. Diffuse reflection is the reflection of light from an uneven or granular surface such that an incident ray is seemingly reflected at a number of angles. It is the complement to specular reflection. If a surface is completely non-specular, the reflected light will be evenly spread over the hemisphere surrounding the surface.

1.4 Microcontrollers

A microcontroller (also microcomputer, MCU or µC) is a small computer on a single integrated circuit consisting internally of a relatively simple CPU, clock, timers, I/O ports, and memory. Program memory in the form of ROM is also often included on chip, as well as a typically small amount of RAM. Microcontrollers are designed for small or dedicated applications[1]. Embedded systems are very sophisticated; many have minimal requirements for memory and program length, with no operating system, and low software complexity. Typical input and output devices include switches, relays, solenoids, LEDs, small or custom LCD displays, radio frequency devices, and sensors for data such as temperature, humidity, and light level.

1.5 Interrupt

Microcontrollers must provide real time (predictable, though notnecessarily fast) response to events in the embedded system they arecontrolling. When certain events occur, an interrupt system can signal

theprocessor to suspend processing the current instruction sequence and tobegin an interrupt service routine[1].Inthis Interrupt function the photoelectric sensor output is connected. Thus Microcontroller givespriority to the object detection.

1.6 Relay

A relay is an electrically operated switch. Many relays use an electromagnet to operate a switching mechanism.Relays findapplicationswhere it is necessary to control a circuit by a low- powersignal,or whereseveral circuits must be controlled by one signal.

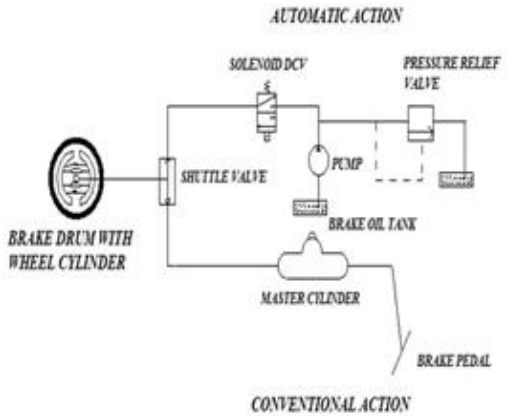

Figure 1: Automatic Action

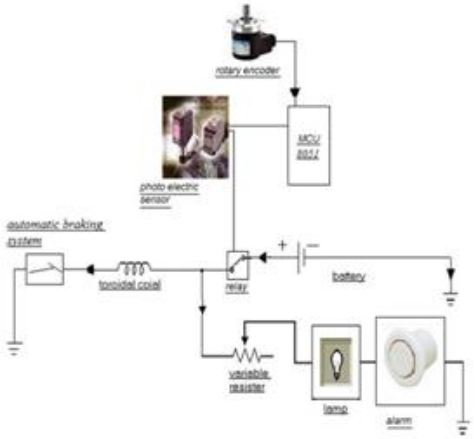

Figure 2: Conventional Action

1.7Solid State Relays

Solid-state relays (SSR) control power circuits with no moving parts,instead using a semiconductor device triggered by light to perform switching. A SSR is a solid state electronic component that provides a similar function to an electro mechanical relay but doesn't have any moving components, increasing long-term reliability.

1.8 Toroidal Coil

It is an electromagnetic coil, which is used for pulling the controlling bar. It is energized by the electrical energy, which is gained from battery. It storesthe energy and generates magnetic field around it. Thisattracts the controlling bar with some force. This movement of bar is used for controlling other components. The stored energy will be consumed by alamp, which is connected to this toroidal coil which is incircularshape, which will generate magnetic field in circular manner, which is easy to pull the controlling rod.

1.9 Lamp and Alarm system

It is used for giving indication to the driver. It acts as a freewheeling path for the discharge of energy stored in the coil.

1.10 Battery

It is the main power source, which will give the required power supply to the toroidal coil for activating it and also to the sensor system.

1.11 Controlling rod

It is the plain metal rod of some diameter, which is used for controlling the fuel flow rate in S.I. engine carburetor or C.I. fuel induction pump. It just attracted by the magnetic field in toroidal coil with some force. This force will give a movement to the controlling road. This controls the other equipment.

II. MODIFICATIONS IN FUEL CONTROL SYSTEMS

We are giving small modifications to the already existing fuel supply system in S.I. engine and also in C.I. engine. But these modifications are very small.

2.1 In S.I engine

In this fuel supply system I am just using the control rod movement to force a metering rod element in to the main jet pipe that will restrict the flow area. So for given pressure depression in the carburetor a decrease in flow area implies the amount of fuel entering also decreases which eventually reduces the speed of the vehicle. [2]

To achieve this we are providing a needle through a hole in to the main jet pipe for which we have to make a hole in the main jet pipe and we have to provide sealing arrangements.

2.2 In C.I engine

All of us know that how helical groove will help us in fuel induction pump I am just using the same helical groove with another circular ring with a hole. This ring is provided on the upper side of the spill port [2]. This ring is connected to the controlling rod. Controlling rod movement will help us to rotate this circular ring.

In this circular ring we will provide a hole which will act as same as spill port by rotating this ring the position at which the helical groove will open will be varied and at the same time the amount of fuel injected also varied

III. WORKING

The system will start working only when we applying the brake a number of times. The brake will act like a switch. When the brake is pressed the circuit will be completed by the battery which will start conducting the charge, which will be stored in the toroidal coil. Due to high valued resistor in the parallel circuit and low resistance of coil, 95% of charge will be stored within the coil. This charge will create a magnetic field around the coil that will pull the controlling rod.[4] This controlling rod movement will be used for controlling the fuel supply system for varying the fuel rate entering into the combustion chambers.

In case of S.I. engine the controlling rod will force or move another needle, which will obstruct the flow area in main fuel nozzle so with this effect the quantity of fuel entering will be decreased. It cannot affect the airflow rate or any other thing; it only reduces the quantity of fuel entered.[5] In case of C.I. engine the controlling rod movement will be used for rotating the circular ring on fuel induction pump, which will control the opening of hole through the port, when the hole is opened the fuel will be spilled out.

Due to opening of spill port in circular ring before the actual spill port (due to helical groove arrangement) the quantity of fuel injected will be varied. It will rotate in opposite direction to that of plunger rotation. If the controlling rod is moved to a full extent then the quantity of fuel injected will be very small irrespective of the actual spill port position.Due to opening of brake the circuit will be disconnected with the battery. During this energy that is stored in the toroidal coil will be discharged through the variable resistor and the lamp [3]. So there is no power or energy input to the toroidal coil. To discharge all the energy stored within the coil will take some time due to higher resistance in the path. During this period the system will continuously control the fuel flow. This time period we can vary by varying the resistance value of the resistor.

The lamp will be used as power consuming device and also for providing indicating signal for driver that he is in the highly populated road so he has to move slowly. So after some time the vehicle will be coming back to its normal state due to discharging of the stored power in toroidal coil. It will run as it runs normally [6].

IV. MATHEMATICAL INTERPRETATION FOR FORCE ACTING ON CONTROL ROD

R_V= Variable resistorR_C = Coil resistance

R_l=Lamp resistance V = Battery voltage

4.1 While Charging

Current output values from the battery when switch is in on condition.

I_1 iscurrent flowing in main circuit; $I_2$is current entering in to the toroidal coil;

I_3 is current entering in to the variable resister

We know that $I_1=I_2+I_3$---------- (1)

Equivalent resistance:

$1/Req=1/Rc+1/(R_V+R_l)$ $=>1/Req=(Rc+R_V+R_l)/(R_C(R_V+R_l))$---------- (2)

$I_1=V/Req=V(R_V+Rc+R_l)/(R_C(R_V+R_l))$---------- (3)

$I_2=(R_l+R_V)I_1/(Rv+Rc+R_l)$---------- (4)

$I_3=R_C*I_1/(R_V+Rc+R_l)$---------- (5)

Charge which is stored in the coil=----------.

Force generated= N* I_2, where,N is Number of turns.

4.2 While Discharging

During discharging the switch will be in off state so the battery will be disconnected from the coil, now coil will start discharging.

I_4 isdischarging current

$Req = Rc+Rv+R_l$; $V=I_2*Rc$---------- (7)
$I_4=V/Req= (I_2*Rc)/ (R_l+Rc+Rv)$----------(8)
This gives the discharge time.

V. SALIENT FEATURES OF THE SYSTEM

→We used the low voltage battery which is safe to operate and easy to charge
→ Controlling of force acting on the controlling rod is very easy. It is simply by varying the variable resistor.
→ Energy consuming device which we are using i.e. a lamp is a less expensive device and it is also used for giving indication to the driver.
→ The modifications given for the conventional carburetor or fuel injection pump are very small and simple.
→ The costs of the system are of very less expense varying from Rs. 1000/- to Rs. 3000/- only.
→ This system can be more effectively used for heavy duty locomotives and automobiles, which are the main cause for accidents.

VI. LIMITATIONS

There is a chance of the battery getting disconnected from the system when driver wants. So to reduce this there is a requirement of frequent checking of the complete system by some external government employees.In case of C.I. engine the system will be little complicated which is difficult to manufacture.The system will start working only when there is application of brake otherwise it will not start working.

VII. CONCLUSION

Finally we can use this system for S.I. engines, C.I. engines and also for gas engines. We can vary the value of variable résistance as per our requirements. For buses and Govt. vehicles we will set the resistance to a low value. So for these vehicles the time for which the system is in an active condition, is very less. So the time for which the vehicle will move slowly will also be very less.But for Lorries and autos we can use higher values of variable resistance. So it will take more time to consume the charged energy. These vehicles need more time to get back the system to its normal state.
So by using this system we can reduce rash driving and accidents up to 35% and we can save many lives and many valuable properties. We can reduce the rash driving within cities, within the regions of school zones, villages that are located at the highways and beside the highways.

VIII. ACKNOWLEDGEMENT

This is to acknowledge that the following people without whom this producing paper wouldn't have been successful. We would like to express our sincere gratitude to Mr.RAJESH B.Tech, M.Tech, (Ph.D.) our guiding staff, Head of Mechanical Department Mr.C.K.LAKSHMY NARAYANAN B.Tech, M.E and our dean Mr.N.VASUDEVAN, B.E, M.Techfor providing us with all necessary facilities, encouragement and their support. We also place record, our sense of gratitude to one and all who directly or indirectly have lent a helping hand in this venture.

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