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Electro-Magnetic Cruise control System

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Abstract

Present-day automotive are created with a coordinated auto cruise control system including a control circle that controls the degree of throttle opening which is typically controlled physically to keep up the speed of the vehicle. The proposed work portrays the utilization of an electromagnetically helped cruise control system that controls the throttle automatedly as activated. Likewise, the shift between the robotized and manual cruise control system is additionally orchestrated utilizing a hand-off circuit to break the circuit to stop the power supply to cruise control at whatever point required. The mileage of the regular vehicle is expanded by the establishment of this cruise control framework. It is demonstrated by playing out the mileage test with both ON and OFF methods of cruise control all the while and got improved efficiency in cruise mode. It likewise expands the solace of the driver in a long excursion. What's more, by redesigning this venture we can expand the vehicle security too as mishaps can likewise be diminished by introducing hostile to impact procedure by utilizing the sensors. In this proposed work we just utilized the fundamental segments like relays, brake switches, and a solenoid to control the throttle valve naturally.

Keywords: *cruise control system, throttle, speed, vehicle, brake switches, solenoid*

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I.INTRODUCTION

Several basic elements together form an Electro-mechanical cruise control system. The prototype includes a speed sensor, brake and clutch pedals sensors, controller and actuators. These elements function together with a control unit that processes input signals and controls the output variables. For a car Skoda Felicia with manually operated throttle coupled by cable with the accelerator pedal of the vehicle, a mechanical cruise control was designed and realized. The design of cruise control was influenced by the control of throttle position by control position of the actuators. It was necessary to solve several partial tasks associated with each parts of cruise control in implementing of that control. During design of a cruise control, it was compared with a conventional solution, emphasis on low-cost solutions.

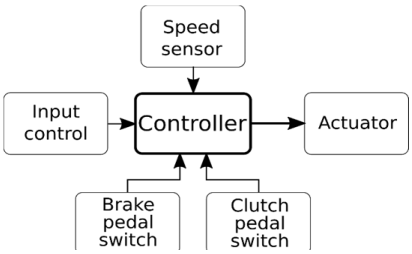

Figure 1. Mechanical cruise control system block diagram

1. THEORY: COMPONENTS OF CRUISE CONTROL SYSTEM

1.1 Parts and their working

- THROTTLE
- SOLENOID VALVE
- BRAKE SWITCH
- RELAYS
- POWER SWITCH

1.1.1 THROTTLE

The air and fuel flow in an engine is managed by obstruction or constriction with the assistance of throttle mechanism. The restriction of inlet gases can increase and decrease engine's power, but usually decreases. In a car's accelerator pedal, the term throttle unofficially represents any mechanism by which the speed or power of an engine is regulated. It is frequently termed as a thrust lever, particularly for jet engine powered aircraft. For a steam locomotive, the valve which controls the steam, is known as the regulator.

1.1.2 SOLENOIDVALVE

It is an electromechanically operated valve. These are classified by the characteristics of the electric current they use, the mechanism they use to regulate the fluid, the strength of the magnetic field they generate and the characteristics of fluid they control. This solenoid valve mechanism differs from linear action, plunger type actuators to rocker actuators and pivoted armature actuators. The required solenoid force Fs can be determined by an approximate relation between the fluid pressure P, and the orifice area A for a direct acting solenoid valve:

$$Fs = PA = \mathbf{P\pi d}^2/4$$

1.1.3 BRAKE SWITCH

A small device attached to the brake pedal mechanism is called brake light switch. Though it's small in size, the brake light switch plays a vital role in features of a modern vehicle.

Numerous vehicle systems including Antilock Braking system, Self-start and Vehicle Stability Control cannot operate if a brake light switch does not working properly. The brake light switch serves two major functions. First, the brake lights were ON when the driver presses the brake pedal. Second, a signal is sent to the vehicle computer that the brakes are applied. A car is UNSAFE to drive if it has a faulty brake light switch. Generally the brake light switch installed right above the brake pedal in most of the cars. It is a one- or two-way electric switch embedded inside. The faulty brake light switch has a most common consequence is that, when brake lights don't come on or stay on all the time.

Figure 2. Brake switch setup

1.1.4 RELAYS

Relay is a switch operated electrically, consisting of several operating terminal sets and consists of input terminals for multiple control signals. The switch may make contacts or break contacts or combinations therefore many numbers of contacts in multiple contact forms.

Only a control power of single pulse is required by Latching relays to operate the switch incessantly. In general reset of switch is done by a pulse with opposite polarity, or another pulse applied to a second set of control terminals, while repeated pulses of the same kind are unaffected. When interrupted power should not affect the circuits that the relay is controlling, magnetic latching relays are useful in this application.

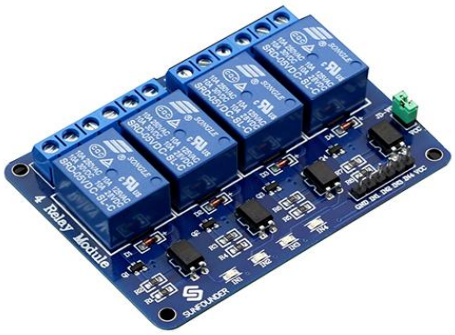

Figure 3. Relays

1.1.5 POWER SWITCH

A Power Switch establishes an electrical connection between a load and a voltage source or ground. Power across multiple voltage rails is saved by this and subsystems are protected from damage. It also ensures inrush current protection, provides component protection in an enhanced manner, and minimizes printed-circuit board (PCB) size. Several power switch topologies are in existence with different functions in order to address different applications. The power switch foundation is established by load switches by providing safe and reliable distribution of power. Typical applications where the use of load switches observed include power sequencing, power distribution, inrush current control, and reduced current leakage. Integrated Power MUX devices and load switches are similar but allow for multiple input sources. For selection and transition between two or more input power paths to a single output is done by using this set of electronic switches also providing input power protection. accessories such as E-Fuses and Hot Swap controllers offers additional input power path protection functions such as current limiting, current sense monitoring, overvoltage and under voltage protection and thermal shutdown. These devices are made ideal for transient and hot-plug events that would damage system components otherwise. These advantages help in maximizing equipment uptime and reduce system maintenance costs.

II. CONSTRUCTION AND WORKING

2.1 Construction procedure

The solenoid is taken from the fuel pump of the car. It is covered with the foam to eradicate the from the solenoid. In the center of solenoid, a bolt is fixed to transfer the electro-magnetic force to hold the throttle at a position. A small diameter rod is fixed on the throttle of the bike and a plate is fixed on the rod to take large amount of the electro-magnetic force to the rod. Other side a fixed rubber support is given for holding the rod tightly and not to transfer electro-magnetic force to the support plate provided on the other side. All the solenoid system is placed on the plate which is fixed on the handle of bike. A power switch is also provided on the handle of the bike. A bulb is placed to find the system is working or not and the power is supplying or not. A brake switch is connected by using the spring to the rear and front brake. The power is supplied by bike battery to all the equipment. All the circuit is controlled by relays provided at the front of the bike.

2.2 Circuit construction

All the connections are given from the battery by using the cables. All the connections are given from the positive of the battery and negative is given to the ground. The positive from the battery is given to the one port of the brake switch of back battery and another port is given to the one of the port of relay switch of port no.30. The front brake switch is connected in series to the back-brake switch. One port is series connected and other is connected to relay port no.85. One port of the relay is given to the ground. The output ports of the relay are 87 & 87a. When the circuit is in ON position the signals are sent to 87a. when the circuit is in OFF position then the signals are sent to the 87 port as this port is not connected to any output so signal transfer is not occurs. 87a is connected to the switch situated at the handle which allows power transfer to the solenoid and a bulb is connected with the solenoid to know whether the system is working are not.

ENGINE SPECIFICATIONS

ENGINE	PASSION, AIR COOLED
Cubic capacity	100cc
Stroke	4 stroke
Brake power	7.37 HP(5.4KW) @ 8000 RPM
Speed	1500 RPM
Number of cylinders	Single
Radius of Brake drum	0.083

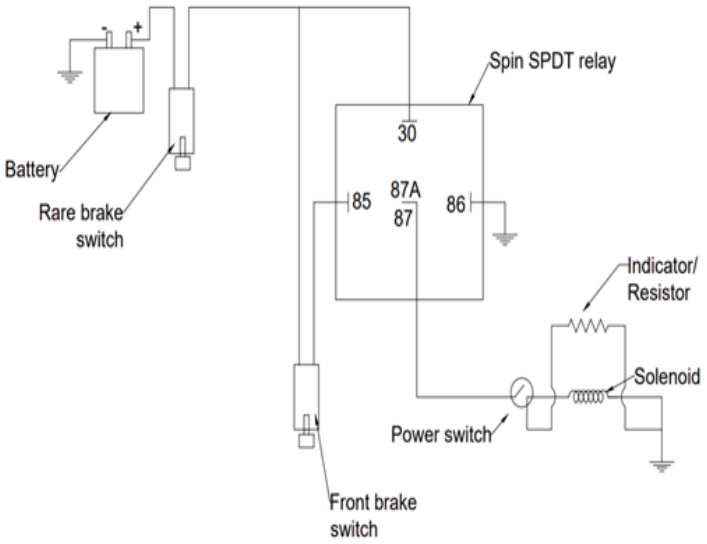

Figure 4. Construction of circuit diagram

III. RESULT & DISCUSSION

3.1 Normal condition

The solenoid is covered with the rubber to eradicate the heat from the solenoid. A bolt is fixed in center of the solenoid in order to transfer the electro-magnetic force to hold the throttle at the required position. A small diameter rod is fixed on the throttle of the bike and a plate is fixed on the rod to direct a large amount of the electro-magnetic force to the rod. On the other side a fixed rubber support is given for holding the rod tightly and not to transfer electro-magnetic force in other direction to the support plate provided on the other side. All the solenoid apparatus is placed on the plate which is fixed on the handle of the bike. A power switch is also provided on the handle of the bike. A bulb indicator is placed to check the system's working condition and the power supply. Brake switches are connected by using the spring to the rear and front brakes. The power is supplied by bike battery to all the equipment. All the circuit is controlled by relay mechanism provided at the front of the bike.

Figure 5. Normal Condition

3.2 Actuated Condition

In the working when the ignition is ON the battery will supply the power to all the circuit. On running the bike, we set a certain speed then the power switch is kept ON to supply the power to the solenoid to produce the electro-magnetic force for holding the throttle at that position. As the back-brake switch is in the off position and front brake switch is in the ON position when we pass current to the solenoid. When the rear brake is

applied the brake, switch breaks the circuit no power is supplied to the other part of the circuit. As the front brake is in ON position if we apply the brake then the output of relay is shifted to the port 87 as it is not connected to the any circuit no power is passed through the circuit. As the no power is supplied to the solenoid then the throttle can be controlled manually.

3.3 When brakes Applied

When brakes are applied, the relay circuit designed will breaks. As soon as the circuit breaks, the power supply to the solenoid stops. Thus, the solenoid doesn't act as a bar-magnet and stops the flow of electromagnetism to the plates, which releases the rod attached to the throttle and thus releases the throttle from automatic cruise control mechanism to manual operation. If we apply rear brake then the circuit will break at the starting of circuit and no power is passed to any of other components. Whereas if we apply front brake then the output port of relay is changed, as that port is not connected to any of device which gives the output. In this way we can break the circuit. And the we set the speed again and we can again switch ON the cruise controlsystem.

The cruise controlsystem made can be operated at any speed there is no speed limit. It can be used at any condition where a constant speed is required. As the electro-magnetic force is small in magnitude, it cannot damage the throttle if we disturb the throttle when cruise mode is in ON position. The throttle can come to its original position by using the spring force of the accelerator spring.

Figure 6. Actuated Condition

Figure 7. When brakes are applied

IV. CONCLUSIONS

This cruise control system consists of a control loop that executes the automatic control of the throttle instead of manual throttle operation when ever required. Upon actuating the proposed cruise control system, the operation of the throttle valve shifts from manual to automatic mode and by pressing brake pedal we can change operation mode from automatic to manual again. The following are the conclusions of this report:

- The spring force of the accelerator cable is made equal or less to the electro-magnetic force of solenoid to hold the throttle. The circuit is braked when brakes are applied to bring throttle to the manual operation by using relay.
- By using cruise control system, the fuel consumption is increased as there is no fluctuations of speeds.
- By using this system, the fatigue of the driver is decreased as he doesn't want to hold the accelerator continuously.
- It's also makes the driver feel comfortable that the no need increase or decrease the speed while travelling and he don't need to hold the clutch for decreasing the fatigue of hand which holds the accelerator.
- Mainly this project can operate at any speed there is no maximum or minimum speeds. And it can be used at any condition or any type of roads.
- Main advantage in this project is that as the electro-magnetic force is small, we can control the throttle manually when required it will not damage the throttle support.

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