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Design of Mechanical Cruise Control System in automobiles

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Abstract: *The cruise control system is designed to make highway driving less tiring. It allows you to select a speed and take your foot off the accelerator pedal. This type of cruise control is ideal for open road driving when there is little traffic, or the traffic is rolling along at a fairly constant speed The cruise control system maintains the speed you select when you press the CRUISE button until you step on the brake pedal, select a different speed setting, by using hydraulic control and relay. A Hydraulic fluid power system is defined as a mean of power transmission in which relatively incompressible fluid is used as the power transmitting media. The primary purpose of hydraulic system is the transfer of energy from one location to another location and this energy into useful work. Effort had taken to show the path of hydraulic fluid as it is applied and released. According to Bernoulli's Equation, Liquids can be heated by applying high pressure without any external heat energy supplied to them.*

Keywords: *Cruise, hydraulic, Pascal law, spring, wiper motor.*

I. Introduction

Cruise control (sometimes known as speed control or auto cruise in some countries) is a system that automatically controls the speed of a motor vehicle. The system is a hydraulic and relay circuit that takes over the throttle of the car to maintain a steady speed as set by the driver.

Cruise control is an invaluable feature on American cars. Without cruise control, long road trips would be more tiring, for the driver at least, and those of us suffering from lead-foot syndrome would probably get a lot more speeding tickets.

Cruise control is far more common on American cars than European cars, because the roads in American roads are generally bigger and straighter, and destinations are farther apart. With traffic continually increasing, basic cruise control is becoming less useful, but instead of becoming obsolete, cruise control systems are adapting to this new reality soon, cars will be equipped with adaptive cruise control, which will allow your car to follow the car in front of it while continually adjusting speed to maintain a safe distance.

The driver must bring the vehicle up to speed manually and use a button to set the cruise control to the current speed .All cruise control systems must be capable of being turned off both explicitly and automatically when the driver depresses the brake, and often also the clutch. Cruise control often includes a memory feature to resume the set speed after braking. When the cruise control is engaged, the throttle can still be used to accelerate the car, but once the pedal is released the car will then slow down until it reaches the previously set speed.

The cruise control systems of some vehicles incorporate a "speed limiter" function, which will not allow the vehicle to accelerate beyond a pre-set maximum, this can usually be overridden by fully depressing the accelerator pedal. (Most systems will prevent the vehicle accelerating beyond the chosen speed, but will not apply the brakes in the event of over speeding downhill.)

On vehicles with a manual transmission, cruise control is less flexible because the act of depressing the clutch pedal and shifting gears usually disengages the cruise control. The "resume" feature has to be used each time after selecting the new gear and releasing the clutch. Therefore cruise control is of most benefit at motorway highway speeds when top gear is used virtually all the time.

II. Mechanism

2.1 Hydraulic system

Hydraulic system is used to multiply exerted force, and to generate maximum energy to be used to perform the desired function. The hydraulic system uses fluid power actuators to perform various functions. All hydraulic systems uses high pressure, also called hydraulic liquid, distributed throughout the machine to various machine components to produce the desired energy.

Hydraulic machines are machinery and tools that use liquid fluid power to do simple work. Heavy equipment is a common example. The popularity of hydraulic machinery is due to the very large amount of power that can be transferred through small tubes and flexible hoses, and the high power density and wide array of actuators that can make use of this power.

Closed center circuits supply full pressure to the control valves, whether any valves are actuated or not. The pump very little hydraulic fluid until the operator actuates a valve. The valves spool therefore does not need an open center return path to tank. Multiple valves can be connected in a parallel arrangement and system pressure is equal for all valves.

III. Indentations And Equations

3.1 Force developing on hydraulic cylinder

Diameter of cylinder 1 D1=20mm
Area of cylinder A1=314 mm^2
Diameter of tube D2=14.9 mm
Area of tube A2= 175.77 mm^2
Diameter of cylinder2 D3=25mm
Area of cylinder2 A3=490.87 mm^2

To find the force of wiper motor
Power(HP)=force(LBS)*speed/375
Power = 12v*5=60 W
Power = 0.0804 HP
Speed= 3.14*D*N/60
Speed = 3.14*60.5*65/60
=205.9mm/s
= 0.46 mph
0.0804= force * 0.46/375
Force = 65.46 lbs 1 lbs = 4.45 N
Force F1 = 291.314 N
According to Pascal's law
F2/A2 = F3/A3 F1=F2
291.314/175.77 = F3/490.87
F3 = 813.55N (force producing in cylinder 3)

3.2 Spring force when pressing accelerator pedal

Mean diameter of the spring=9.5mm
Wire diameter of the spring=1.5mm
Modulus of rigidity=78000N/mm^2
Number of coils=93
To calculated total load
$P=P_i + yq$
$y=8P_iD^3n/Gd^4$

when the accelerator pressed at the extreme position (max speed).spring deflected 38 mm.
$38=8\ P_i\ (9.5)^3 93/78000(1.5)^4$
P_i=23.52N
Wall stress factor (K_S) =1.24
Spring index (C) =6.3
$T_S=K_S8PD/3.14d^3$
$T_S=1.24*8*23.52*9.5/3.14(1.5)^3$
T_S=209N/mm^2
$q=Gd^4/8D^3n$
$=78000(1.5)^4/8(6.3)^3 93$
q=0.62N/mm^2
P=Pi + yq
P=23.52 + (38*.62)
P=47.08N
Force produced by the hydraulic cylinder is greater than the force produced by spring.

IV. Figure

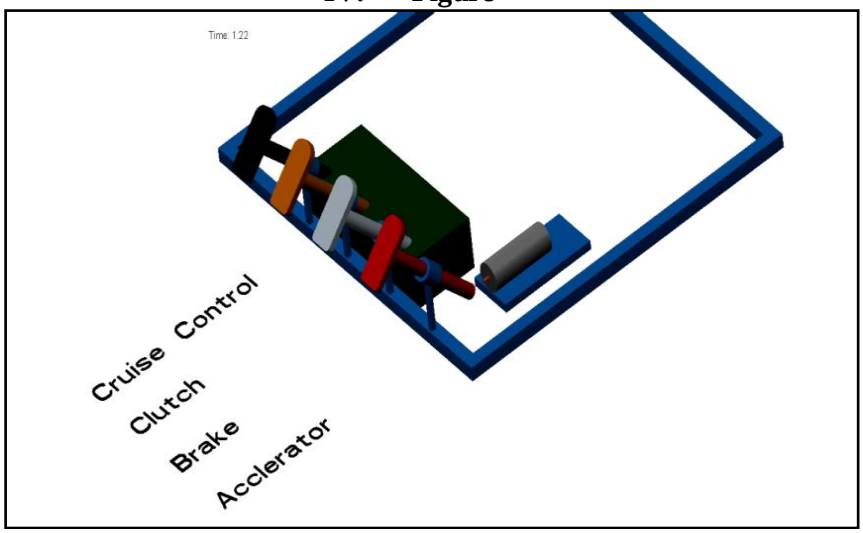

Fig 1. layout of design

Fig 2. Fabrication of system.

V. Conclusion

The project work deals with design and fabrication of mechanical cruise control system with suitable animation and drawing. In previous type, the cruise control was electronic circuit and sensors and it leads to battery failure. Our fabrication is a easy way to avoid more cost and also simple in construction so that it will be useful for the all types of vehicles. The hydraulic cylinder used in this fabrication is handfed which adds one more advantage of the project. Its usefulness for long drives (reducing driver fatigue, improving comfort by allowing positioning changes more safely) across highways and sparsely populated roads. This usually results in better fuel efficiency. The driver can keep the foot on the brake pedal, thus reducing the reaction distance and the total stopping distance.

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