May 27, 1941. C. W. MUSSER 2,243,354

SPEED MAINTAINING CONTROL

Filed Dec. 29, 1938

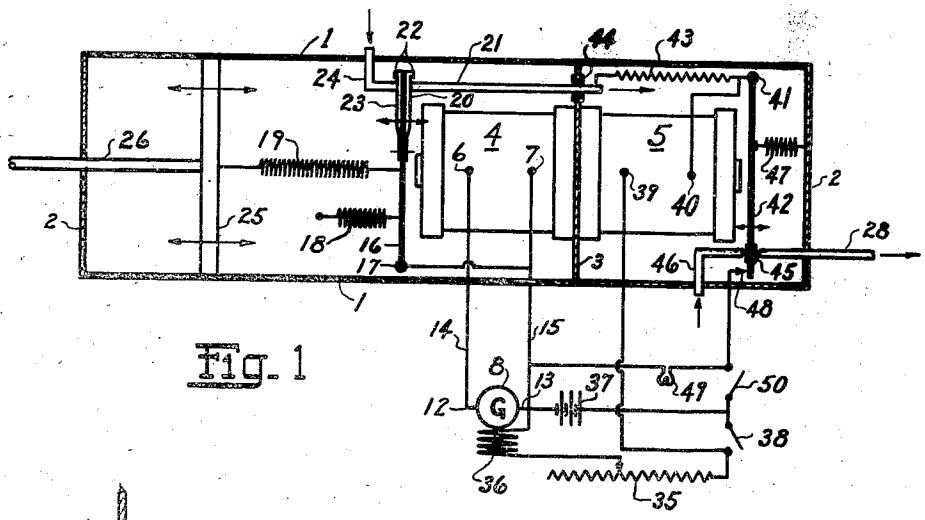

Fig. 1

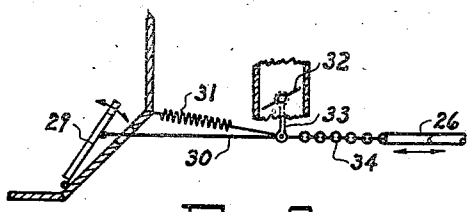

Fig. 2

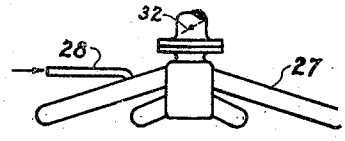

Fig. 3

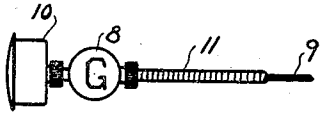

Fig. 4

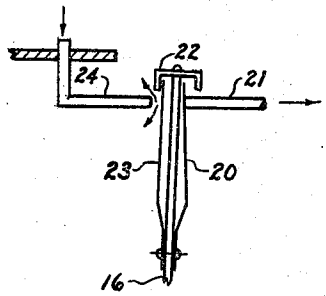

Fig. 6

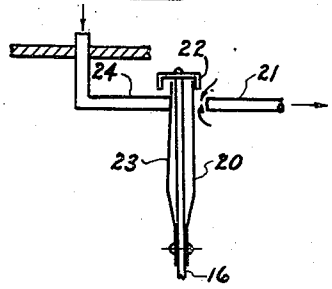

Fig. 5

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SPEED MAINTAINING CONTROL

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16 Claims. (Cl. 192—3)

This invention relates to a method of maintaining a selected speed of automotive vehicles, with automatic means of engaging and disengaging speed maintaining control according to requirements imposed by traffic and road conditions.

It has as its object, the supplementing of the conventional hand and/or foot fuel valve control (accelerator) of any automobile so equipped, without impairing or interfering with the use of either, by an automatic speed maintaining control unaffected by varying load conditions or terrain.

The invention has other objects in view, which will appear hereafter in the description thereof, in connection with the accompanying drawing. In the drawing:

Figure 1 is a longitudinal section of the control and the electrical connections thereto.

Figure 2 illustrates connection of the unit to the car's fuel control valve.

Figure 3 shows its connection to the car's intake manifold.

Figure 4 shows a means of driving a generator.

Figure 5 is a detail of control valves in intake position.

Figure 6 is a detail of control valves in exhaust position.

This invention is comprised basically of a relay governor adapted for attachment to, and optional automatic control of, a conventional automotive vehicle. In brief, after a car (automobile) equipped with this control has attained any preselected speed, a piston (actuated by an electrically controlled vacuum) automatically regulates the automobile's accelerator to maintain selected speed until disconnected by application of the foot brake.

In Figure 1, the case of the control, suitably fastened to car, is illustrated as a sectional view of a cylindrical tube 1, with closed ends 2, and stationary air-tight partition 3. Electromagnetic coils 4 and 5 are fastened to partition 3. Coil 4 is the speed-governing coil, and when coil terminals 6 and 7 receive an electric current generated by generator 8 (at brushes 12 and 13 through wires 14 and 15), magnetomotive force of coil 4 (on armature 16 pivoted at point 17) tends to overcome force of armature spring 18 and compensating spring 19.

Generator 8 is shown in Figure 4 as being driven by automobile's speedometer cable 9, interposed between speedometer 10 and speedometer cable housing 11. When this magnetomotive force of coil 4 (at all times proportional to generated current) on armature 16 overcomes force of springs 18 and 19, movement of armature 16 toward coil 4 causes intake valve 20 to close intake tube 21—and by further movement, valve stop fingers 22 cause exhaust valve 23 to open exhaust tube 24.

Intake valve 20 and exhaust valve 23 are thin spring metal pieces, fastened at one end to armature 16—of sufficient width to close ends of tubes 21 and 24 when in their respective closed positions.

Figure 5 shows the position of the valve when not sufficient or no current is being generated by generator 8 to supply necessary magnetomotive force to overcome the force of springs 18 and 19—the exhaust valve 23 closing exhaust tube 24 while valve finger 22 holds intake valve 20 from end of intake tube 21—leaving intake tube open and exhaust tube closed.

The valve position when the magnetomotive force balances springs 18 and 19 is shown in Figure 1—exhaust valve 23 closing exhaust tube 24, and intake valve 20 closing intake tube 21.

When the current generated by generator 8 supplies a magnetomotive force that overbalances springs 18 and 19 (Figure 6), intake valve 20 closes intake tube 21 while valve finger 22 holds exhaust valve 23 from end of exhaust tube 24.

Electrical control of valves can be obtained by the use of a generator or by any other current-fluctuating element responsive to car's speed.

Movement of piston 25 and piston rod 26 is determined by valves 20 and 23, varying the intake of vacuum obtained from automobile's intake manifold 27 (Figure 3) through tube 28. Accelerator pedal (foot fuel valve control) 29 (Figure 2), throttle connecting link 30, accelerator pedal spring 31, throttle butterfly valve 32 and throttle valve arm 33 are connected to piston rod 26 by a connecting link 34 which could advantageously take the form of a chain, as illustrated. Link 34 thus permits piston 25 to control movement of throttle valve 32 when speed governing control is in operation, and still remain yieldable to additional movement by manual operation of accelerator pedal 29.

The speed selector 35 is a variable resistance (mounted within convenient reach of the driver) which alters the magnetic flux of generator field 36 by regulating current received from car battery 37 through car ignition switch 38, thereby determining speed at which current required by coil 4 to overcome force of springs 18 and 19 will be furnished by generator 8. Speed selector 35 may, for convenience, be equipped with dial, arrow or any other type of indicating device.

Coil 5, by controlling vacuum inlet, determines when the speed governing section (part controlled by coil 4) shall be operative. Terminal 39 of coil 5 is connected to car battery 37 through car ignition switch 38. Terminal 40 is connected to pivot point 41 of armature 42 and to intake tube 21 through fixed resistance 43. Intake tube 21 is electrically insulated from partition 3 by insulation washer 44. Armature 42 has an electric insulating piece 45 which also acts as a valve piece for closing intake tube 28 or exhaust tube 46, according to position of armature 42.

Armature spring 47, during manual operation of accelerator, holds valve piece 45 against end of inlet tube 28—leaving exhaust tube 46 open and inlet tube 28 closed. This prevents vacuum from tube 28 from reaching speed governing section, leaving piston 25 inoperative due to lack of motive power. But when coil 5 receives energization from car battery 37 upon contact of valve 20 (when speed selected by setting of speed selector 35 is attained) with intake tube 21, (completing the electrical circuit of coil 5 through resistance 43) armature 42 is attracted toward coil 5, overcoming force of spring 47—opening intake tube 28 and closing exhaust tube 46 by valve piece 45.

This makes speed governing section operative by supplying motive power (vacuum) to intake tube 21 and thereby (under control of valves 20 and 23) to piston 25. This also brings armature 42 in electrical contact with contact point 48 connected to car's stoplight bulb 49 on side connected to car's stoplight switch 50, which is conventionally actuated by the application of the car's foot brake. This connection to stoplight bulb, through contact point 48, retains the energization of coil 5 (given by contact of valve 20 to intake tube 21) regardless of subsequent position of valve 20—by completing the electrical circuit through the stoplight bulb 49. Stoplight switch 50 is then connected on one side to terminal 39 of coil 5 through car switch 38, and on the other side to terminal 40 of coil 5 through contact point 48.

Therefore, upon closing of the stoplight switch 50, on application of the foot brake, coil terminals 39 and 40 of coil 5 both receive the same amount of voltage from car battery 37, thereby de-energizing coil 5 and permitting spring 47 to cause valve piece 45 to close intake 28 and open exhaust 46—disengaging the speed governing control. This returns the car's accelerator to manual operation by shutting off vacuum supply to speed governing section until car is again brought to selected speed.

Resistance 43 is interposed between tube 21 and pivot point 41 to absorb voltage when stoplight switch 50 is closed while valve 20 is connected to tube 21 and contact point 48 is connected to armature 42.

In operation on automobile, with speed selector set (for example) at 40 miles per hour, car would have to be brought to 40 miles per hour by manual operation of accelerator pedal 29 before generator 8 would produce sufficient current for coil 4 to attract armature 16. Movement of armature 16 toward coil 4 causes valve 20 to come into electrical contact with tube 21 thereby energizing coil 5. This causes armature 42 to open vacuum inlet 28 and close exhaust tube 46. Contact point 48 will then maintain energization in coil 5 and keep vacuum inlet 28 open. This introduces vacuum to tube 21.

Now, if foot is removed from accelerator pedal 29, as speed of car tends to decrease, a corresponding decrease in current will be supplied to coil 4 from generator 8. This permits valve 20 to open intake tube 21 (Figure 5) leaving vacuum therefrom pull piston 25 towards coil 4. Throttle valve 32 is thereby actuated through piston rod 26, connecting link 34 and throttle valve arm 33, tending to prevent further decrease in car's speed by opening throttle valve.

Compensating spring 19 limits the movement of piston 25 by changing spring force exerted on armature 16 in proportion to piston movement. This stabilizes action of control by preventing too great a movement of throttle valve 32. Therefore, as piston 25 opens throttle 32 it also lessens spring force on armature 16, causing valve 20 to close intake tube 21. Since exhaust valve 23 is now also closed (Figure 1), piston 25 retains opening of throttle valve 32 until change in speed (due to any varying load condition) change current output of generator 8.

If the speed decreases, foregoing described action takes place. If the speed increases, current from generator 8 will be increased proportionately, increasing magnetic pull on armature 16. Exhaust valve 23 will then open exhaust tube 24 (Figure 6), permitting accelerator spring 31 to cause movement of piston 25 away from coil 4. Opening of throttle valve 32 is thereby lessened, and increased tension of compensating spring 19 causes valve 23 to close exhaust tube 24, retaining this position of the throttle valve 32 and piston 25 until increase or decrease in speed repeats respective operation. Speed in excess of the automatically controlled speed is always available by manual operation of accelerator pedal 29.

If the speed of the car is to be lessened or the car brought to a standstill, the application of the foot brake causes stoplight switch 50 to de-energize coil 5—permitting spring 47 to cause valve piece 45 to close intake 28 and open exhaust tube 46. With piston 25 no longer having a retaining vacuum, accelerator spring 31 closes throttle valve 32 to car's normal idling position. The accelerator is therefore returned to manual operation until selected speed is again attained. This operation is the same for any selected speed—the 40 miles per hour having been taken merely as an example. The speed selector is at all times within reach and control of the car's driver.

This control is readily adapted to any car having a throttle valve, vacuum source, stoplight, and a driving means for current-fluctuating element. The details of connection to the various parts of the car are dependent on the make and model of car—therefore the drawing has been made diagrammatical to explain operation rather than specific details.

The attachment of this control to an automobile will not alter or affect the operations of handling the car until selected speed is attained. Thereafter the control will maintain this selected speed, without manual manipulation of the accelerator pedal, until foot brake is applied. Therefore, after selected speed is attained, the foot can be removed from the accelerator pedal and car will maintain selected speed automatically.

The flexibility of connecting link 34 permits manual operation of accelerator pedal for any desired speed in excess of selected speed. After application of foot brake disconnects automatic

operation, car must be again manually brought to selected speed to resume automatic operation. Speed selector 35 can be set by driver at any time, for any speed that the car is capable of maintaining.

The expressions "intake," "exhaust," "relay governor" and "selected speed" used in the description and claims are intended to mean:

"Intake"—(since vacuum is the motive power) is the opening to the vacuum or low pressure side.

"Exhaust" is the opening to the atmospheric pressure.

"Relay governor"—a speed regulating device utilizing auxiliary energy for motive power, which energy is released and controlled by a force varying in proportion to car speed.

"Selected speed" is the rate of motion the car's operator has chosen to maintain automatically, by appropriate setting of the speed selector.

What is claimed is:

1. In combination with a motor driven vehicle having a throttle valve for the fuel feed control, a pedal capable of being operated by the driver of the vehicle to control the throttle-valve, an automatic throttle-valve control responsive to the speed of the vehicle, and an electrical switch operative upon the attainment of a selected speed, whereby the automatic throttle-valve control retains the selected speed.

2. In combination with a motor driven vehicle having a throttle-valve for the fuel feed control, a means capable of being operated by the driver of the vehicle to control the throttle-valve, an automatic throttle-valve control responsive to the speed of the vehicle, an electrical switch operated by the automatic throttle-valve control upon the attainment of a selected speed, whereby the automatic control actuates the fuel feed throttle-valve to retain the selected speed.

3. In combination with a motor driven vehicle having a throttle-valve to control the fuel feed, a driver-operated control of the throttle-valve, an automatic control for the throttle-valve responsive to the speed of the vehicle, and means operative upon the attainment of a selected speed, whereby the throttle-valve control at the selected speed is dependent on the automatic control.

4. In a motor vehicle, with an engine, a throttle-valve to control the speed of the engine by regulating the fuel supply, means capable of being operated by the driver of the vehicle to control the throttle-valve, a relay governor responsive to the speed of the vehicle, to control the throttle-valve to retain the selected speed upon the attainment of the selected speed.

5. In combination with a manually-operated speed-controlling throttle-valve of engine-driven motor vehicles, an automatic control for the throttle-valve responsive to the speed of the vehicle, an electrical switch to connect the automatic control of the throttle-valve upon the attainment of a selected speed to maintain the selected speed.

6. In combination with a motor vehicle having an engine, a throttle-valve to regulate the fuel supply, means capable of being operated by the driver of the vehicle to actuate the throttle-valve to control the speed of the vehicle, an automatic speed regulator to control the throttle-valve and responsive to the speed of the vehicle, an electrical switch operative upon the attainment of a selected speed by the driver-operated means, to render the maintainment of the selected speed dependent on the automatic means.

7. In combination with a motor driven vehicle having a throttle-valve for the fuel feed control, a pedal capable of being operated by the driver of the vehicle to control the throttle-valve, a stoplight switch, an automatic throttle-valve control responsive to the speed of the vehicle, and an electrical switch operative upon the attainment of a selected speed, whereby the automatic throttle-valve control retains the selected speed when the stoplight switch is open.

8. In combination with a motor driven vehicle having a throttle-valve for the fuel feed control, means capable of being operated by the driver of the vehicle to control the throttle-valve, an automatic throttle-valve control responsive to the speed of the vehicle, a stoplight, a stoplight switch, an electrical switch operated by the automatic throttle-valve control upon the attainment of a selected speed and completing the electrical circuit through the stoplight to render the throttle-valve control at the selected speed dependent upon the automatic throttle-valve control until the stoplight switch is closed.

9. In combination with a motor vehicle having an engine, a throttle-valve to regulate the fuel supply, means capable of being operated by a driver of the vehicle to actuate the throttle-valve to control the speed of the vehicle, an automatic speed regulator responsive to the speed of the vehicle to control the throttle-valve, and means operative upon attainment of a selected speed whereby the manual control of the throttle-valve is replaced by the automatic speed regulator for the selected speed, manual control of the throttle-valve remaining normal for speeds in excess of the selected speed.

10. In combination with a manually-operated speed-controlling throttle-valve of engine-driven motor vehicles, an automatic throttle-valve regulator responsive to the speed of the vehicle, said automatic means replacing the manual control upon the vehicle's attainment of a selected speed and operating the throttle-valve to maintain this selected speed, speeds in excess of the selected speed remaining dependent on the manual control, and means to disengage the automatic control.

11. In a device for automatically controlling the speed of motor vehicles, a speed selector, a connecting link to the vehicle's throttle-valve, a vacuum-powered piston-actuating connecting link, an electrical control of the vacuum to the piston's cylinder, means whereby the electrical control of the vacuum becomes automatically operative upon the attainment of a speed selected with the speed selector to control the throttle-valve to retain the selected speed, and means for disconnecting the electrical control of the vacuum.

12. In combination with a motor-driven vehicle having a driver-operated throttle-valve for controlling the fuel supply to regulate the speed of the vehicle, a relay governor connected to the throttle-valve, a voltage-fluctuating unit responsive to the speed of the vehicle, and means automatically operative upon the attainment of the selected speed whereby the voltage-fluctuating unit controls the throttle-valve through the relay governor to maintain the selected speed.

13. In combination with a manually-operated speed-controlling throttle-valve of engine driven motor vehicles, a relay governor connected to the throttle-valve, a voltage-fluctuating unit respon-

sive to the speed of the vehicle, an electrical switch operated by the voltage-fluctuating unit upon the attainment of a selected speed, whereby the relay governor is caused to control the throttle-valve to retain the selected speed.

14. In combination with a manually-operated speed-controlling throttle-valve of engine driven motor vehicles, a relay governor connected to the throttle-valve, a voltage-fluctuating unit responsive to the speed of the vehicle and controlling an electromagnetically actuated switch operative only upon the attainment of a selected speed, whereby the relay governor retains the selected speed by controlling the throttle-valve.

15. In combination with a manually-operated speed-controlling throttle-valve of engine driven motor vehicles, a stoplight bulb, a relay governor connected to the throttle-valve, a voltage-fluctuating unit responsive to the speed of the vehicle and controlling an electromagnetically actuated switch operative only upon the attainment of a selected speed, whereby the relay governor retains the selected speed by controlling the throttle-valve, electrical circuit of the electromagnetic switch being completed through the stoplight bulb.

16. In combination with a motor vehicle's speed-controlling throttle-valve, a stoplight switch, a stoplight bulb, an electrically controlled relay governor responsive to the speed of the vehicle to control the throttle-valve to retain a selected speed upon the attainment of the selected speed, electrical circuit of the relay governor completed through the stoplight bulb until the stoplight switch is closed.

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