

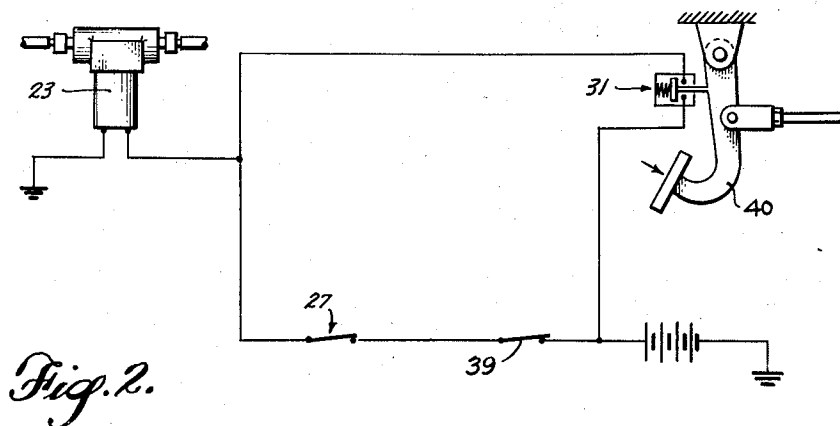
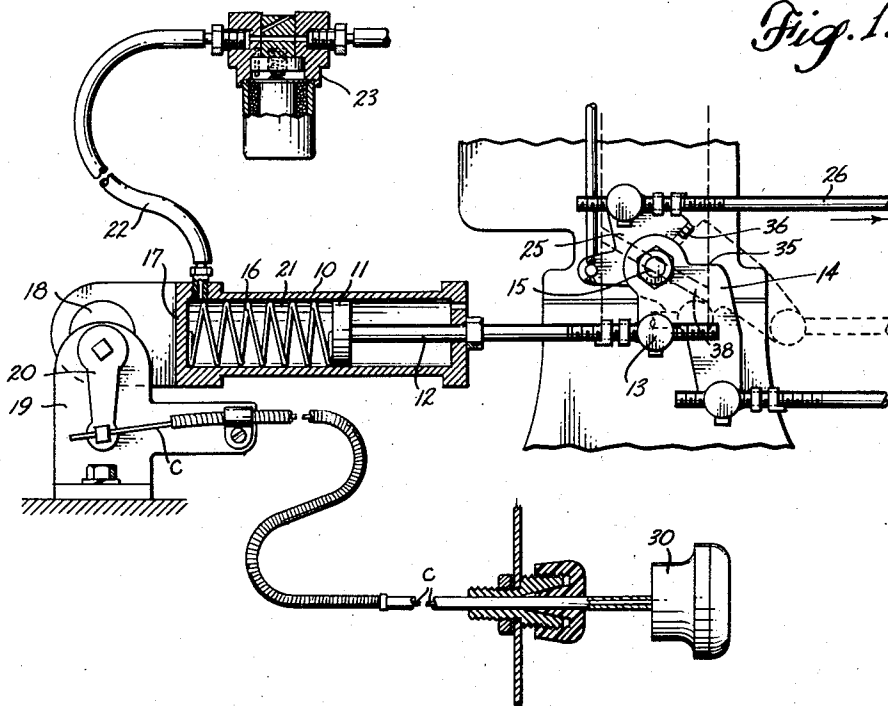
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ENGINE THROTTLE CONTROL SYSTEM

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ENGINE THROTTLE CONTROL SYSTEM

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5 Claims. (Cl. 192—3)

This invention relates to automatic control mechanism for carburetors of gas engines.

It is known that an internal combustion engine operates with least fuel consumption when its intake vacuum is equivalent to or greater than fifteen inches of mercury. Engine operation at less than thirteen inches of mercury vacuum causes excessive fuel consumption.

An object of the invention is to provide a control mechanism for gas engine carburetors effective to automatically adjust the engine-controlling carburetor throttle to maintain the engine functioning at a predetermined minimum vacuum insuring economical and satisfactory engine operation.

Another object of the invention is to provide a control mechanism for gas engine carburetors which automatically supplies fuel to the engine at a rate providing maximum fuel economy and, if desired, without requiring throttle manipulation by the operator during car travel.

Another object of the invention is to provide an automatic control mechanism for gas engine carburetors as described utilizing engine vacuum for controlling the carburetor throttle and being capable of being rendered optionally effective or ineffective at the will of the driver.

A further object of the invention is to provide an automatic control mechanism for gas engine carburetors, as described, having manual means, other than the throttle, for selectively controlling engine operation by regulating the engine vacuum effect on the carburetor throttle.

A further object of the invention is to provide an automatic control mechanism as described which may be quickly disabled by manipulation of the conventional brake pedal during normal or emergency brake operation, the mechanism again becoming automatically operative upon release of the brake pedal.

Other and further objects of the invention will be apparent when the specification is considered in connection with the drawing in which:

Fig. 1 is a side elevation, partly in section, of a control mechanism embodying the present invention and its connection with the throttle valve of the carburetor; and

Fig. 2 is a diagrammatic view showing the vacuum control valve of the mechanism of Fig. 1 and its associated electrical apparatus and circuits, and a brake pedal controlling one of the circuits.

Referring first to Fig. 1, the automatic throttle control mechanism comprises a cylinder 10 containing a movable member in the form of a plunger 11 connected to one end of a rod 12 extending through and supported for reciprocating movement in a centrally located opening in an end wall of the cylinder 10 and pivotally connected at 13 to an arm 14 secured to the carburetor throttle valve control shaft 15. The cylinder 10 contains a coiled compression spring 16 seated at one end against an end wall 17 of the cylinder and having its other end bearing against the plunger 11 to constantly urge the rod 12 in a direction outwardly of the cylinder. The end wall 17 of the cylinder is formed integral with a rearwardly extending

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ear disposed within a bifurcated portion of a fixed standard 19, the ear having an opening receiving and rotatably mounting an eccentric cam 18. The cam 18 is fixed to a pin extending through and rotatable in the spaced arms of a bifurcated portion of the standard 19, the pin extending through and being fixed to a portion of the cam 18 offset from the axis of the cam 18. An arm 20 is connected to an end of the pin, extending outwardly of the standard 19, to rotate the cam 18 upon actuation of the arm by a flexible cable or Bowden wire C. Rotation of the cam moves the cylinder 10 either to the right or left longitudinally which is effective to adjust the compressive effort of the spring 16 within the cylinder 10 for, when the cylinder moves, the plunger 11 does not move.

The cylinder 10 is provided with an opening at one end thereof and adjacent the wall 17 for receiving a hollow nipple or fitting connected to one of the terminal portions of a flexible conduit 22 of rubber or plastic, the other terminal portion of the conduit being connected to another hollow nipple fitting into one of two aligned bores in the wall of the housing of a solenoid valve 23, the other bore in the housing wall being provided with a fitting having a conduit connected thereto and to the intake vacuum chamber of the engine. It will be noted the cylinder wall, through which the rod extends, is provided with air bleed port to permit air to enter and escape the cylinder upon relative movement of the cylinder and piston. The valve 23 also comprises a movable valve body having a passage therethrough adapted to be aligned with the bores in the valve housing, as shown, for establishing communication between the engine vacuum chamber and the chamber 21 of the control cylinder 10.

The valve body is connected to and movable by the core of an electrically-operated solenoid. In the deenergized condition of the solenoid in Fig. 1, a spring acts on the core to cause the valve body to be positioned as shown to permit communication between the engine vacuum chamber and cylinder 10. Upon energization of the solenoid, the core and thereby the valve body moves in a downward direction to prevent communication between the engine vacuum chamber and the cylinder 10, and to position one end of the inclined passage in the valve body in communication with conduit 22, thereby avoiding communication between chamber 21 and atmosphere.

Fig. 2 illustrates diagrammatically the electric circuit and controls for energizing and deenergizing the solenoid valve 23. More particularly, the electrical system comprises the solenoid winding of valve 23 having one terminal thereof connected to ground and with the other terminal being connected by parallel circuits to the battery. One circuit includes an ignition switch 39 and a manually operable switch 27 mounted on the dashboard of the automobile. The other circuit includes a normally open brake light switch 31 which is closed by slight depression of the brake pedal. Thus, the solenoid valve may be energized by closing switch 27 or, in the open position of switch 27, by closing switch 31 by movement of the brake pedal.

The automatic control mechanism is connected to the carburetor controls by pivotally connecting the free end of the plunger rod 12 to the arm 14, which is fixed on the carburetor throttle valve shaft 15, the arm 14 being movable from the full line position to the dotted line position shown in Fig. 1 by the spring 16 in the cylinder 10 to engage the shoulder 35 in direct contact with a shoulder 36 on the conventional carburetor throttle valve shaft control arm 25 rotatably mounted on the shaft 15 and connected to the accelerator pedal rod 26. The carburetor butterfly or throttle valve is shown in broken lines and is identified by the numeral 38. With the various elements in the relative positions described, the control arm 25 is capable of moving the throttle valve

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shaft 15 from the closed throttle position in conventional manner when the accelerator pedal is depressed to move the rod 26 and rotate the arm 25 clockwise. It will be noted that rotation of arm 25 to open the throttle valve is effective to compress spring 16, when the shoulder 36 of arm 25 is engaged with shoulder 35 of arm 14.

In the operation of the embodiment of the invention, and assuming the engine is inoperative, switch 27 is in closed position, and knob 30 is in the position shown, closing the engine ignition switch 39 to start the engine will establish a circuit energizing the solenoid to thereby close valve 23 to prevent communication between the engine vacuum chamber and the cylinder chamber 21 while placing the cylinder in communication with the atmosphere, the spring 16 being effective to maintain the arm 14 in its dotted line position to permit conventional carburetor throttle control by the accelerator pedal rod 26, movement of the rod to open the throttle compressing spring 16.

When the automobile is traveling on the highway at a desired speed as reflected by the position of the accelerator pedal, the operator can place the automatic control mechanism in operation by simply moving the dashboard switch 27 to its open circuit position to deenergize the solenoid causing the valve to move to the position shown in Fig. 1 to establish communication between the engine vacuum chamber and the chamber 21 of the cylinder 10. Vacuum created in chamber 21 by engine suction is effective to move the plunger 11 to the left against the pressure of the spring 16. Movement of the plunger actuates rod 12 to attempt to move arm 14 to the solid line position shown in Fig. 1. The spring tension is set to balance the plunger position against a predetermined minimum vacuum created by the engine providing maximum fuel economy in operation. For this purpose, the spring pressure may be set to balance against an intake vacuum of approximately fifteen inches of mercury. As the control mechanism is automatically effective to provide this balance, the driver may release the accelerator pedal as he is not required to maintain foot pressure against the accelerator pedal due to the fact that the engine throttle shaft 15 is under the control of plunger 11, spring 16, and the vacuum created by the engine in the chamber 21 of the cylinder 10, which effects an automatic control of the carburetor valve.

Should the driver desire to operate the engine at sixteen or seventeen inches of mercury vacuum, the driver pushes in the dashboard control button 30 to move arm 20 clockwise and eccentric cam 18 then moves the cylinder 19 to the right thereby increasing the spring pressure 16 within the cylinder. It will be apparent that it now requires greater vacuum to move plunger 11 to the left and, as a result, the car cruising speed decreases. As the engine operates in an intake vacuum range above fifteen inches of mercury, fuel economy is maintained.

It will be noted that the above described mechanism does not depend in any way on a fixed carburetor throttle control setting. Neither does the invention resemble any type of engine r.p.m. or car speed governor.

When the above described mechanism is operative to control the engine throttle, and the working load on the engine is increased, as by the car beginning to climb a hill, the engine vacuum decreases, this being a natural phenomenon of engine operation. Assuming control knob 30 is set to maintain a minimum engine vacuum of 15 inches of mercury, when the increased engine load lowers engine vacuum below the predetermined minimum spring 16 acts to move rod 12 outward moving arm 14 to reduce the fuel supply to the engine. The car thus climbs the hill at reduced speed, but the minimum engine vacuum is maintained, and fuel economy is also maintained. If it becomes necessary to shift the car transmission to a lower gear, then the relative working load on the engine is reduced, engine intake vacuum

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increases, this moves rod 12 to the left in Fig. 1, and arm 14 is thereby actuated to automatically increase the quantity of fuel fed through the carburetor. This action is entirely independent of any manual adjustment of the carburetor throttle or of the knob 30.

While cruising with the car engine under control of the described mechanism, should it become necessary for the driver to suddenly slow or stop the car, he simply applies the brake in the usual manner. Movement of the brake pedal closes switch 31 which energizes the solenoid in valve 23, which promptly cuts communication between the engine vacuum line and the interior of chamber 21, and connects that chamber to atmosphere. In the absence of the spring balancing vacuum in chamber 21 spring 16 moves rod 12 outward. Arm 14 consequently oscillates shaft 15 to move the carburetor throttle control to "idle" position. This action is almost instantaneous and is equivalent to the action produced by the removal of foot pressure from the accelerator when the car is being operated in the conventional manner.

It will be apparent that although only one embodiment of the invention has been shown and described in detail, other embodiments are possible, and various changes may be made in the construction and arrangements of parts without departing from the spirit of the invention as defined in the claims.

Having described the invention with sufficient clarity to enable those familiar with this art to construct and use it, I claim:

1. In combination with an internal combustion engine having an intake manifold and a passage through which a fuel-air mixture is drawn; a valve to control the flow of the mixture through said passage; a movable member connected to said valve; a cylinder receiving said movable member; a spring in said cylinder and operative to constantly urge the movable member in a direction to decrease the passage of the mixture; a conduit connecting said cylinder and the intake manifold; a valve controlling engine suction from the intake manifold to said cylinder for actuation of said movable member in opposition to said spring and in a direction to increase the passage of the mixture, the differential action of the forces exerted on said movable member and thereby said first-named valve by engine suction and said spring permitting a predetermined flow of the mixture through said passage; and cam means for moving said cylinder relative to said spring to vary the force of said spring on said movable member.

2. In combination with an internal combustion engine having an intake manifold and a passage through which a fuel-air mixture is drawn; a valve to control the flow of the mixture through said passage; a movable member connected to said valve; a cylinder receiving said movable member; a spring in said cylinder and operative to constantly urge the movable member in a direction to decrease the passage of the mixture; a conduit connecting said cylinder and the intake manifold; a valve controlling engine suction from the intake manifold to said cylinder for actuation of said movable member in opposition to said spring and in a direction to increase the passage of the mixture, the differential action of the forces exerted on said movable member and thereby said first-named valve by engine suction and said spring permitting a predetermined flow of the mixture through said passage; and an electrically-controlled device energizable to close said engine-suction-controlling valve; and a brake pedal controlling energization of said device to close said engine-suction-controlling valve upon movement of the pedal to a brake-applying position.

3. In combination with an internal combustion engine having an intake manifold; a carburetor connected with the manifold and having a throttle valve for controlling the volume of fuel mixture passing to the engine; a lever secured to said valve and rotatable to move the valve

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between and to open and closed positions; a device connected to said lever and operative to automatically adjust the valve to maintain engine operation at a predetermined minimum intake manifold vacuum and including a movable member connected to said lever, a cylinder containing said movable member, a spring in said cylinder and operative to constantly urge said movable member to move the valve to closed position, a conduit connecting the intake manifold and the cylinder to effect movement of said movable member by the vacuum force transmitted through said conduit to said movable member and in opposition to the force exerted by said spring on said movable member and thereby to actuate the movable member to move the valve toward open position, the differential action of the forces exerted on said movable member and thereby said valve by vacuum and said spring automatically positioning said valve to maintain engine operation at a predetermined vacuum, and cam means operatively connected to said cylinder to effect relative movement of said cylinder and said movable member to vary the force of said spring on said movable member.

4. In combination with an internal combustion engine having an intake manifold; a carburetor connected with the manifold and having a throttle valve for controlling the volume of fuel mixture passing to the engine; a lever secured to said valve and rotatable to move the valve between and to open and closed positions; a device connected to said lever and operative to automatically adjust the valve to maintain engine operation at a predetermined minimum intake manifold vacuum and including a movable member connected to said lever, a cylinder containing said movable member, a spring in said cylinder and operative to constantly urge said movable member to move the valve to closed position, a conduit connecting the intake manifold and the cylinder to effect movement of said movable member by the vacuum force transmitted through said conduit to said movable member and in opposition to the force exerted by said spring on said movable member and thereby to actuate the movable member to move the valve toward open position, the differential action of the forces exerted on said movable member and thereby said valve by vacuum and spring automatically positioning said valve to maintain engine operation at a predetermined vacuum, a brake pedal; and means controlled by said brake pedal upon

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brake-applying movement thereof to prevent the application of suctional force to said movable member.

5. In combination with an internal combustion engine having an intake manifold; a carburetor connected with the manifold and having a throttle valve for controlling the volume of fuel mixture passing to the engine and including a rotatable throttle shaft; a manually movable arm rotatably mounted on said shaft; a lever fixed to said shaft and engageable by said arm to rotate said shaft to move the valve between and to open and closed positions; a valve controlling device including a movable member connected to said lever and operative to automatically adjust the valve to maintain engine operation at a predetermined minimum intake manifold vacuum, a cylinder containing said movable member, a spring in said cylinder and operative to constantly urge said movable member to move the valve toward closed position, a conduit connecting the intake manifold and the cylinder to effect movement of said movable member by the vacuum force transmitted through said conduit to said movable member and in opposition to the force exerted by said spring on said movable member and thereby to actuate the movable member to move the valve toward open position, a control valve in said conduit, electromagnetic means controlling said control valve and energizable to close said control valve, parallel electrical control circuits for said electromagnetic means, a switch in one of said circuits and manually operable to close the circuit to energize the electromagnetic means; a switch in the other of said circuits; a brake pedal operable to close said last-mentioned switch to energize the electromagnetic means upon movement of the brake pedal toward brake-applying position; cam means for moving said cylinder relative to said movable member to vary the force exerted by said spring on said movable member and thereby said throttle valve; and manually operable means for actuating said cam means.

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