

[54] **CARBURETOR THROTTLE VALVE POSITIONER**

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[58] Field of Search ..... **123/97 B, 103 R, 123/DIG. 11, 119 D, 124 R, 198 R, 142**

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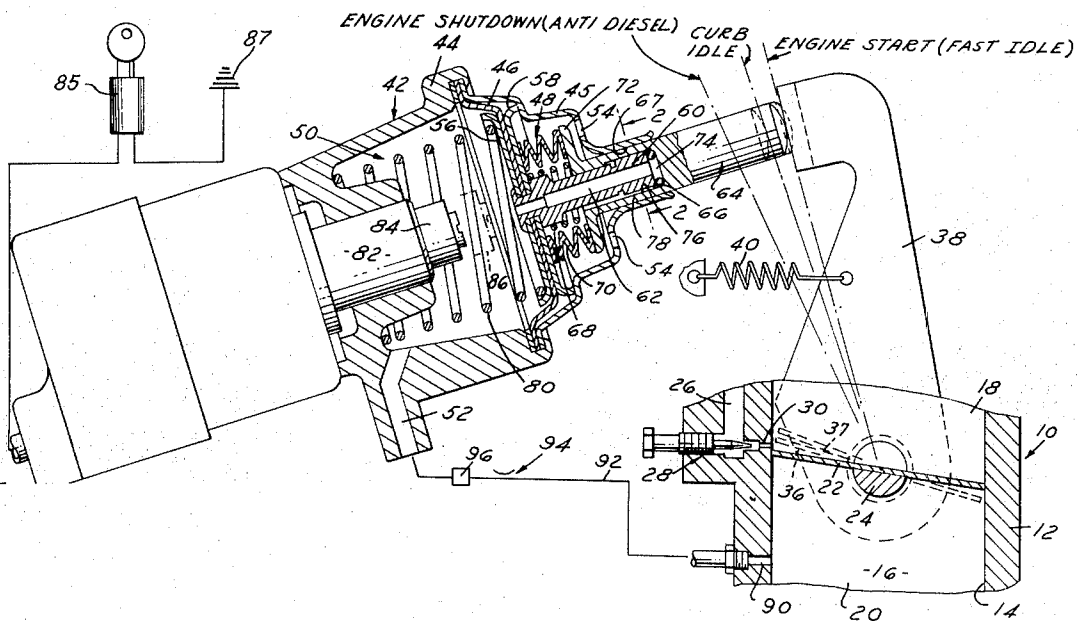
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[57] **ABSTRACT**

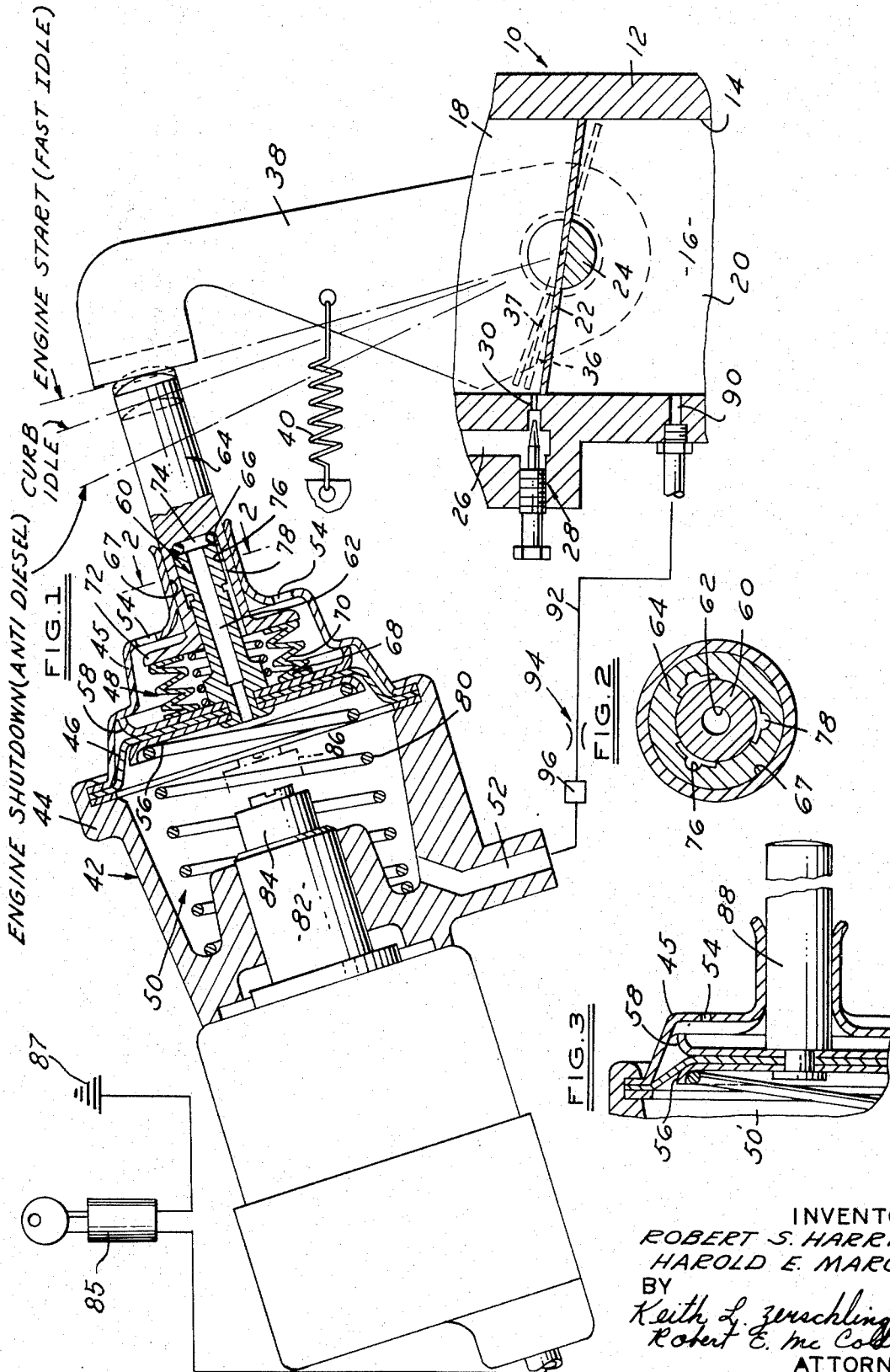
A downdraft type carburetor has an idle system discharge port that is straddled by the normal idle speed and closed throttle positions of the throttle valve so as to permit idle speed fuel and air flow in one position and no flow in the other position; a third beyond normal idle, or fast idle speed position is provided for engine startup; the three positions are controlled by a servo operatively engaging the throttle valve; the servo operation is controlled by intake manifold vacuum to initially close the throttle valve upon engine shut off, with a subsequent return of the throttle valve to its fast idle position for engine restarting, or to return the throttle valve to a normal idle position upon release of the vehicle accelerator pedal during engine operation.

**6 Claims, 3 Drawing Figures**



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**CARBURETOR THROTTLE VALVE POSITIONER**

This invention relates, in general, to means for controlling the movement of the throttle valve of a carburetor. More particularly, it relates to a vacuum and electrically controlled power means to control fuel and air flow through a carburetor to prevent engine dieseling and minimize the passage of unburned hydrocarbons into the atmosphere.

The problem of engine dieseling after the engine has been shut off is recognized. The vacuum signal still present in the carburetor throttle bore below the throttle valve pulls idle system fuel and air into the hot combustion chamber such that combustion is maintained for a few seconds or longer after the engine is shut off. This naturally is undesirable.

This invention provides a carburetor throttle valve construction that (1) permits a full closing of the throttle valve upon engine shutdown to shut off all fuel and air flow; or (2) a curb idle position for normally maintaining the engine at a normal idling speed; or (3) a faster idle position for the leaner start of a hot engine. Throttle return delay means is also provided to only slowly close the throttle valve during engine deceleration, to dry out the throttle bore.

In the prior art devices, the carburetor idle system generally discharged the fuel/air mixture into the induction passage at a point located below the closed or at-rest position of the throttle valve so that no matter how closed the throttle valve was, it was possible to obtain fuel flow into the engine cylinders via the idle system. Accordingly, the problems described above as to dieseling inducting additional fuel and air into the engine compartment existed even though the throttle valve may have fully closed at times.

The invention provides a construction in which the idle system discharge port is straddled by the throttle valve in its fully closed and engine idle speed positions so that when the throttle valve is positioned for normal idle speed operation, idle fuel and air flow can be obtained in the conventional manner; however, when the throttle valve is moved to its fully closed position, all fuel and air flow is terminated.

The invention provides suitable apparatus for moving the throttle valve to its various positions to prevent engine dieseling and the emission of unburned hydrocarbons into the exhaust system, while at the same time providing good starting.

It is one of the objects of the invention, therefore, to provide a carburetor with a throttle valve positioner that will prevent engine dieseling and minimize the passage of unburned hydrocarbons into the exhaust system or atmosphere, and will reposition the throttle valve for a fast idle restart upon engine shutdown.

It is also an object of the invention to provide the throttle valve of a carburetor with a servo that is controlled by manifold vacuum and a solenoid controlled stop to at times fully close the throttle valve to completely shut off all flow of fuel and air to the engine cylinders, while at other times positioning the throttle valve to a beyond idle position for a better engine start.

It is a still further object of the invention to provide a carburetor with a multi-position throttle valve servo actuator, the servo being vacuum and solenoid controlled, the solenoid being controlled by an electrical circuit including the engine ignition key.

Other objects, features and advantages of the invention will become more apparent upon reference to the succeeding detailed description thereof, and to the drawings illustrating a preferred embodiment thereof; wherein, FIG. 1 shows a cross-sectional view of a portion of a carburetor embodying the invention;

FIG. 2 is a cross-sectional view taken on a plane indicated by and viewed in the direction of the arrows 2-2 of FIG. 1; and,

FIG. 3 is a cross-sectional view of a modification.

FIG. 1 illustrates a portion 10 of a downdraft type carburetor, although it will be clear as the description proceeds that the invention is equally applicable to other types of carburetors, such as updraft or sidedraft, for example. More particularly, the carburetor is provided with a main body portion 12 having a cylindrical bore 14 containing the conventional venturi 15 in an air/fuel induction passage 16. The latter is open at its upper end 18 to air at essentially atmospheric pressure passing through the conventional air cleaner, not shown. At its lower end 20, passage 16 is adapted to be connected to an engine intake manifold, from which the air and fuel mixture passes to the engine cylinders, not shown, in a known manner.

The flow of air and fuel through induction passage 16 is controlled in this instance by a conventional throttle valve 22. The latter is rotatably mounted on a shaft 24 fixed for rotation in the side walls of body 12, in a known manner. A main fuel system is not shown, since it can be any of many known types. The fuel would be inducted into passage 16 above the throttle valve in a known manner as a function of the rotation of the valve from its fully closed full line position shown to its wide open nearly vertical position, by the change in vacuum signal.

The carburetor also contains an idle system for supplying the necessary fuel and air to the engine cylinders during engine idling speed operation. This air and fuel is provided through the bypass passage 26 past an adjustable needle valve 28 and through an orificed discharge port 30 into induction passage 16.

It will be noted in this instance that the discharge end of the idle system is located so as to be straddled by the throttle valve between its fully closed position 34 and its curb idle or engine idle speed setting 36 shown in full lines. It will be clear that in the fully closed position 34, the vacuum existing below the throttle valve is cut off from the idle passage 26, and, therefore, no fuel or air will flow at this time as passage 26 is at ambient or atmospheric pressure at both ends. It will also be seen that when the throttle valve is positioned in its normal idle speed position 36, the discharge orifice 30 is subjected to the vacuum signal below the throttle valve so as to cause the desired amount of fuel and air to pass through the idle system to maintain the engine at the preset idling speed. A further fast idle or beyond normal idle position 37 is provided for hot engine starting purposes, as will be explained more clearly later.

To accomplish the above, a lever or link 38 is fixed on or formed integral with throttle valve shaft 24 for rotation with it, a tension spring 40 biasing lever 38 in a counterclockwise direction at all times to bias the throttle valve to its closed position 34.

Lever 38 is adapted to be moved clockwise to the right, as seen in the Figure, to rotate the throttle valve

clockwise to its normal idle speed position 36, or to the fast engine idle speed position 37, by a servo 42. The latter includes an open shell type housing 44 closed by a stepped diameter cover 45. A flexible annular diaphragm 46 is secured between the housing and cover and extends across the hollow interior defined between the two to divide it into an atmospheric pressure chamber 48 and a vacuum chamber 50. A vacuum line 52 opens into chamber 50, while chamber 48 communicates with the atmosphere through holes 54 in cover 45.

Fixedly secured to diaphragm 46 by a pair of retainers 56 and 58 is a first plunger 60 having a central bore or passage 62. A second nylon plunger 64 has a central recess 66 that permits it to be mounted over plunger 60 in a telescopically slidable manner. An internal shoulder 65 on plunger 64 prevents total separation of the plungers, but permits sliding to provide the clearance shown. The end of plunger 64 extends slidably through an opening 67 formed in cover 45.

A light spring 68 biases the two plungers 60 and 64 apart to the extreme position shown. Plunger 64 is hat-shaped in cross section for the attachment thereto, by any suitable means, of an annular screen-type collapsible dirt filter 70. An O-ring type seal 74 is installed in the end of recess 66 for the seating at times of it against the adjacent end of plunger 60, by the throttle return spring 40.

Plunger 64, as best seen in FIG. 2, has a number of slotted or fluted portions 76 providing air passages 78 connecting the air holes 54 and plunger passage 62 when plunger 60 is not against O-ring seal 74.

Servo chamber 50, on the other hand, is formed to contain one end of a main spring 80 seated at its opposite end against diaphragm retainer 56. The spring normally biases the diaphragm and both plungers 60 and 64 to the right to contact link 38, if the vehicle accelerator pedal is not depressed and the engine inoperative, to force throttle valve 22 to the fast idle, engine start position 37. More fuel vapor exists with a hot engine. Therefore, a greater throttle valve opening provides more air flow to produce the desired starting air/fuel ratio.

A solenoid 82 is adjustably mounted in housing 44, and has an armature 84 movable between the full line position shown and the dotted line position, as a function of the operativeness or inoperativeness of the engine. That is, the operation of the solenoid is adapted to be tied in with the engine ignition system so that when the ignition key is turned on, for example, an electrical connection is made to solenoid 82 to energize the same and move armature 84 to the dotted line position 86. When the ignition system is shut off, for engine shutdown, deenergization of solenoid 82 causes armature 84 to be retracted by a conventional spring, not shown, to the full line position shown.

The above described circuit could be similar to that shown and fully described in Ser. No. 120,953, Carburetor Throttle Valve Positioner, Robert S. Harrison and Max W. Lunsford having a common assignee. As seen schematically herein in FIG. 2, it could include, for example, a known type of ignition key operated switch 85 bridging or breaking the circuit from a battery 87 to the coil (not shown) of solenoid 82. When the coil is energized, armature 84 would be forced rightwardly against

the force of a spring to move the armature to the position 86.

In this case, the dotted line position of solenoid armature 84 stops the movement of plunger 60 in a leftward direction at a point corresponding to the normal idle speed position 36 of throttle valve 22. The full line position of armature 84 permits the plungers 60 and 64 to move leftwardly to the fully closed position 34 of the throttle valve.

The force of spring 80 would be chosen to be greater than that of return spring 40 so that in its rightwardly extended position, plunger 64 will rotate the throttle valve to the fast idle speed position 37 shown. Manifold vacuum, as will be explained, applied to servo chamber 50 on the other hand will retract the plungers 60 and 64 sufficient to allow spring 40 to rotate the throttle valve 22 to its dotted line fully closed position 34.

The vacuum to line 52 emanates from an intake manifold vacuum port 90 shown opening into the carburetor body portion 12 below the throttle valve. It could equally be tapped directly into the intake manifold portion below. The intake manifold vacuum is sensed in a line 92 through a restriction or orifice 94 to a vacuum reservoir or accumulator (optional, as desired) indicated schematically at 66. The orifice 64 prevents momentary fluctuations in the manifold vacuum from affecting the level of vacuum in the reservoir 66. More importantly, it prevents a sudden decay in the manifold vacuum from equally suddenly decaying the vacuum in the reservoir 66.

FIG. 3 shows a modified construction in which only a single plunger 88 is used instead of the dual plunger arrangement of FIGS. 1 and 2. The plunger is connected directly to diaphragm retainers 56 and 58. This eliminates the time delay function shown in FIGS. 1 and 2, which will be described now in connection with the operation of the invention.

To summarize briefly before proceeding to the operation, the purpose of the throttle positioner is to provide three positions for emission control; namely, a starting position, in which the throttle valve is opened beyond idle position to provide a leaner start of a hot engine and yet a good start of a colder engine; secondly, a curb idle position against a solenoid armature to which the throttle valve is returned after start and during deceleration operation; and, thirdly, an anti-dieseling position in which the solenoid armature is retracted upon engine shut-off to permit full closure of the throttle valve, with a subsequent return to the engine start, fast idle position after a slight delay.

The two constructions of FIGS. 1 and 3 differ only in that the FIG. 1 construction also contains a dash pot to delay the closing movement of the throttle.

In operation of the FIGS. 1 and 2 embodiment, the parts are shown in the engine-off condition positioned for a start operation. The throttle valve spring 40 has returned the throttle valve link 38 against the end of plunger 64. This pushes plunger 64 against the end of plunger 60, collapsing filter 48 and seating O-ring seal 74. The main servo spring 80 has positioned the diaphragm retainer 58 against the housing cover 45, the light positioning spring 68 being overcome by the throttle return spring 40. This position corresponds to a hot start where the throttle valve is open beyond the normal idle position, to position 37.

As soon as the engine is cranked, the solenoid armature 84 is moved to the right to the curb idle position indicated at 86. The initial vacuum buildup in the intake manifold acting through orifice 94 in the passage 92 into servo chamber 50 acts against diaphragm 46 to pull the same against the armature 84.

The throttle valve return spring 40 now pushes the throttle valve link 38 against plunger 64 and through the seal 74 plunger 60 to cause plunger 60 to follow the movement of diaphragm 46 to position the throttle valve at the curb idle position. The holes 54 permit atmospheric air pressure to maintain the diaphragm 46 against the solenoid armature 84. The plunger 60 being sealed against the seal 74 at this time prevents a bleed down of the vacuum.

As soon as the throttle valve is moved by the operator to an open, off-idle position, beyond the start position, the light spring 68 can now move the plunger 64 back to a position to unseat seal 74 from plunger 60. This permits a bleed down of vacuum from chamber 50 by air entering through holes 54, the filter 70, and the fluted passage 76 into the passages 78 and 62 past seal 74. This decays the vacuum in chamber 50 until spring 80 is able to move the diaphragm 46 against the housing 45 and spring 68 moves the plunger 64 outwardly to the free position indicated.

Assume now a deceleration condition in which the throttle valve is released towards the curb idle position 36, and the vehicle is driving the engine. Immediately, the throttle valve return spring 40 seats the plunger 64 and seal 74 against plunger 60 to block passages 78 to 62. The throttle valve, however, temporarily stays in the start position 37 until the vacuum in chamber 50, acting through the restriction 94 in the supply line 92 builds up again to a point where it will move the diaphragm 46 to the curb idle position 86. This leans the vacuum signal in the carburetor passage 26, and, therefore, provides less fuel and air flow at this time and better emission control.

Assuming now the engine is shut off, the solenoid armature 84 immediately will retract to the anti-dieseling position shown in full lines. Since the intake manifold vacuum is applied through 92 through a restriction or orifice 96, the vacuum remains in chamber 50 for approximately two seconds after engine shut-off, which is sufficient time to permit atmospheric pressure in chamber 48 to move the diaphragm 46 to the anti-dieseling position completely closing the throttle valve. After the two seconds, the atmospheric buildup in chamber 50 permits the spring 80 to reposition plunger 60 to the right, and spring 68 will move plunger 64 to the right to locate throttle valve 22 for the hot start position 37.

The operation of the FIG. 3 embodiment is essentially the same as the FIGS. 1 and 2 embodiment except that no time delay or dash pot action is provided upon a return movement of the throttle valve to a normal engine idle speed position.

In brief, manifold vacuum in chamber 50 will always hold diaphragm 46 against the armature 84 in a curb idle position, so long as the engine is running. Throttle valve spring 40 will, accordingly, always return the link 38 and throttle valve 22 to the curb idle position, without a dashpot or time delay action.

The anti-dieseling operation is the same as described in connection with FIG. 1.

Therefore, it will be seen that the invention provides a throttle valve positioner that during normal engine operation permits a normal engine idle speed position; and yet also completely shuts off all flow of fuel and air to the engine and prevents engine dieseling after the engine is shut off, for a period of time sufficient to permit the engine to come to rest; and subsequently repositions the throttle valve to an attitude providing engine starting.

While the invention has been showed in its preferred embodiments in the drawing, it will be clear to those skilled in the arts to which it pertains that many changes and modifications may be made thereto without departing from the scope of the invention.

We claim:

1. A carburetor throttle valve positioner comprising, in combination, an engine carburetor having an induction passage open to atmospheric pressure at one end and adapted to be connected to an engine intake manifold at the opposite end so as to be subject to engine vacuum varying in level from ambient atmospheric pressure at engine shutdown to a maximum subatmospheric pressure level during engine deceleration operating conditions, a throttle valve rotatably mounted across said passage and movable from a closed position to an engine idle speed position and beyond to a wide open throttle position, and return, for controlling flow through said passage, an idle fuel/air mixture passage connected to said induction passage around said throttle valve and having a discharge end connected to said induction passage at a location above the closed throttle valve position but adapted to be traversed by the throttle valve as it moves towards an open position so that the idle passage is subjected to manifold vacuum when the throttle valve is positioned beyond the closed position to provide normal idle and beyond normal idle speed mixture flow and subjected to ambient pressure level during closed throttle valve position to terminate idle mixture flow, and control means to move said throttle valve to and between said positions, said control means including first means operatively acting on and biasing said throttle valve to an open beyond normal engine idle throttle position, second engine manifold vacuum responsive means operatively acting on said first means permitting return movement at times of said throttle valve to a normal engine idle speed position during operation of said engine, third movable stop means to prevent return movement of said throttle valve to a position less open than said normal idle position during operation of said engine, and means to withdraw said stop means upon engine shut down to permit movement of said throttle valve to a closed anti-dieseling position.

2. A positioner as in claim 1, including fourth means responsive to engine operation and inoperation for moving said third movable means.

3. A positioner as in claim 2, said fourth means comprising a solenoid movable upon engine startup to a position operatively preventing closing of said throttle valve beyond normal idle speed position, and movable in response to engine shutdown to a position permitting closure of said throttle valve.

4. A throttle valve positioner as in claim 1, said control means including a vacuum controlled servo having a movable actuator operatively engagable with said throttle valve and said second means to move said

throttle valve or be moved thereby, said first means comprising a spring operatively biasing said actuator to position said throttle valve open to an engine start/beyond engine idle position, conduit means for applying engine manifold vacuum to said second means to move said second means and actuator to said normal engine idle speed position, said third means comprising solenoid means having said stop means positioned to be engagable by said second means during engine operation to prevent movement thereof below the normal idle speed position, and retracted upon engine shutdown to a position permitting movement of said second means by manifold vacuum to a position permitting a throttle valve closed position.

5. A positioner as in claim 4, including time delay

means associated with said servo to delay the return movement of said second means towards said stop means.

6. A positioner as in claim 4, including flow restriction means in said conduit means whereby decay of vacuum level acting on said second means at engine shutdown is delayed beyond the time period required for actuation of said solenoid so that said second means and throttle valve initially move to close said throttle valve upon shutdown of said engine, to prevent anti-dieseling fuel flow, and subsequently are moved by said spring means to an engine start open beyond normal idle throttle valve position upon decay of said vacuum level.

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