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[54] **CARBURETOR THROTTLE VALVE POSITIONER**

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[58] **Field of Search**....123/DIG. 11, 97 B, 198 D, 198 DB, 123/110, 103

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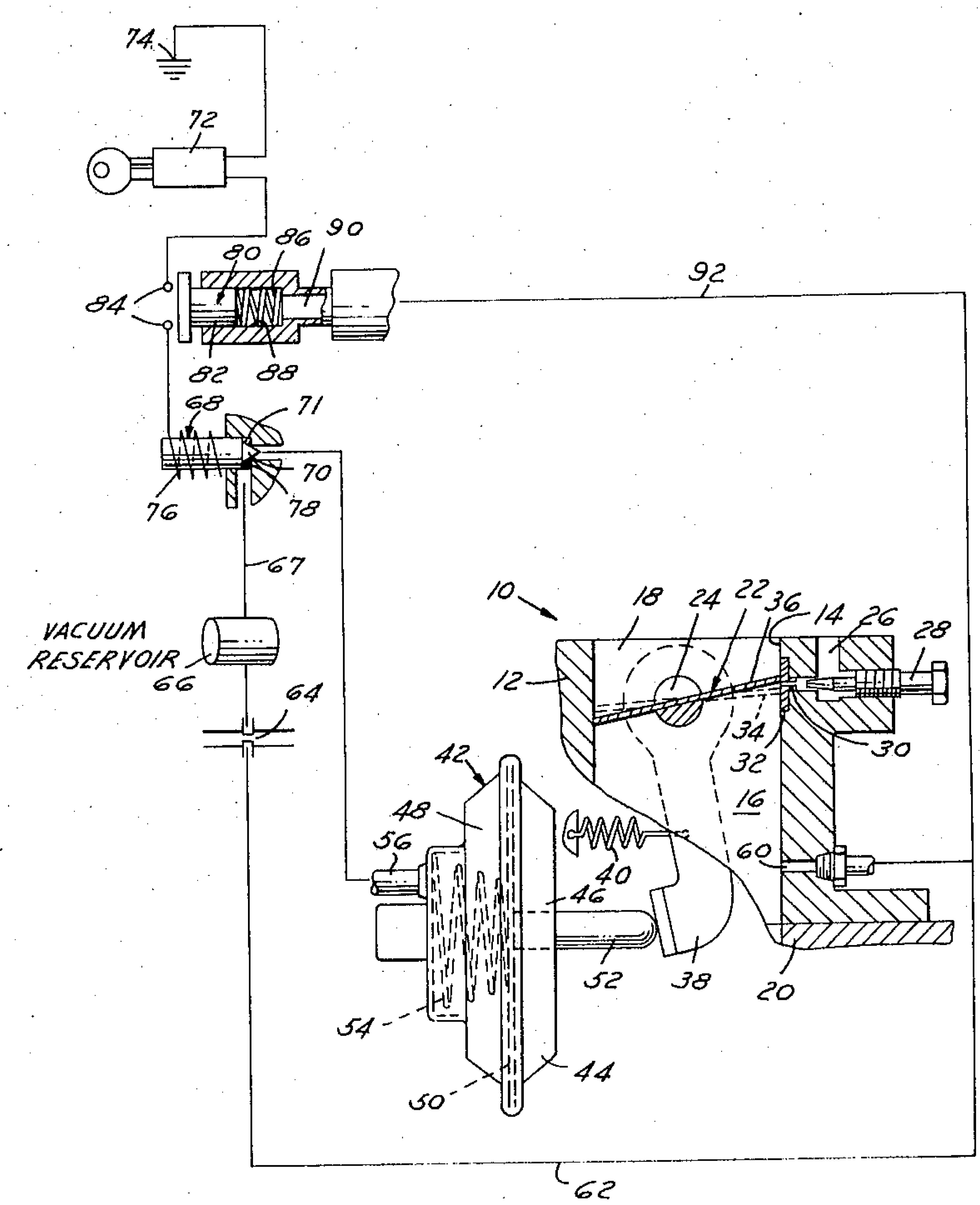
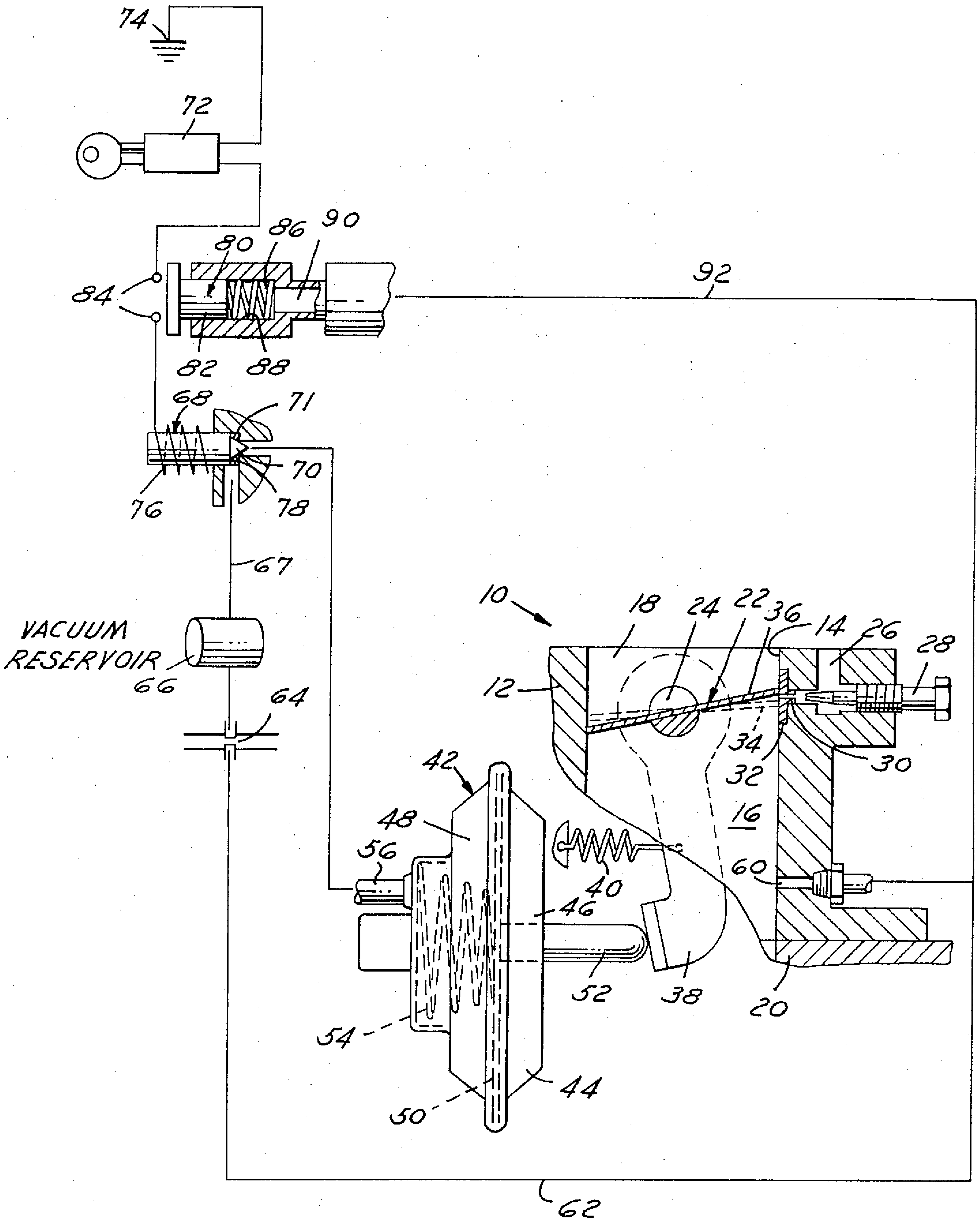
[57] **ABSTRACT**

A downdraft type carburetor has an idle system discharge port that is straddled by the 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; the two positions being controlled by a servo operatively engaging the throttle valve; the servo operation being controlled by intake manifold vacuum during engine deceleration operation to close the throttle valve, or upon engine shut off interrupting the ignition circuit to close the throttle valve with a subsequent return of the throttle valve to its curb idle position for engine restarting.

8 Claims, 1 Drawing Figure





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CARBURETOR THROTTLE VALVE POSITIONER

This invention relates, in general, to means for positioning the throttle valve of a carburetor to minimize the emission of undesirable elements into the atomosphere. More particularly, it relates to a vacuum and electrically controlled servo to shut off fuel and air flow through a carburetor after engine shutdown and during engine deceleration operating conditions 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. Also, during engine deceleration, the very high manifold vacuum developed interferes with the scavenging of the exhaust gases from the combustion chamber. This results in incomplete burning of the idle system fuel pulled into the engine at this time, and, therefore, a large amount of unburned hydrocarbons may pass out into the atmosphere.

This invention provides a carburetor throttle valve construction that permits a full closing of the throttle valve to shut off all fuel and air flow, or alternatively, a curb idle position for normally maintaining the engine at idling speed. An electrical circuit including the engine ignition key includes a valve to normally block the flow of manifold vacuum to a valve positioning servo so that the throttle valve normally remains in its curb idle position when not depressed. Upon shutting off of the ignition, the latter valve opens to permit vacuum from a vacuum reservoir to actuate the servo and permit the throttle valve to fully close to thereby shut off all flow of fuel and air to the engine cylinders. Also, at high engine manifold vacuums indicative of an engine decelerating operating condition, say, for example, above 19 inches Hg., the vacuum actuates a switch to break the ignition circuit and thereby again permit the servo to fully close the throttle valve.

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 and deceleration operating conditions sucking 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 during engine decelerating operating conditions.

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 during engine decelerating operating conditions.

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 to at times fully close the throttle valve to completely shut off all flow of fuel and air to the engine cylinders; the servo itself being controlled by the engine ignition system to fully close the throttle valve upon engine shutdown, or to fully close the throttle valve when the manifold vacuum reaches a level indicative of engine deceleration operation.

It is a still further object of the invention to provide a carburetor with a servo positioned throttle valve, the servo being vacuum controlled, the vacuum in turn being controlled by an electrical circuit including the engine ignition key and a valve controlled in response to high engine intake manifold vacuum indicative of engine deceleration operation.

Other objects, features and advantages of the invention will become more apparent upon reference to the succeeding detailed description thereof, and to the drawing illustrating a preferred embodiment thereof, wherein the figure illustrates a schematically a portion of a carburetor embodying the invention.

The FIGURE 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** providing the conventional and/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 a conventional 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 dotted line position **34** 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** in an insert **32** 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 dotted line 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 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 present idling speed. It will also be clear that to prevent engine dieseling and to prevent the passage of any unburned fuel into the exhaust system and atmosphere during engine decelerating operating conditions, it is desirable to move the throttle valve to its fully closed position to completely shut off the flow of fuel and air to the engine cylinders at these times.

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

The lever 38 is adapted to be moved to the right, as seen in the Figure, to rotate the throttle valve counterclockwise to its engine idle speed position 36 by a servo 42. The latter includes a shell type housing 44 divided into an atmospheric pressure chamber 46 and a vacuum chamber 48 by an annular flexible diaphragm 50. A vacuum line 56 opens into chamber 48. A stem type actuator 52 is secured to diaphragm 50 and is normally biased against the end of lever 38 by means of a spring 54.

The force of spring 54 is chosen to be greater than that of return spring 40 so that in its extended position, rod 52 will rotate the throttle valve to the curb idle speed position 36 shown. Manifold vacuum applied to servo chamber 48 on the other hand will retract the rod 52 sufficient to allow spring 40 to rotate the throttle valve 22 to its dotted line fully closed position 34.

The vacuum to line 56 emanates from an intake manifold vacuum port 60 shown opening into the carburetor body portion 12 below the throttle valve. It could equally be tapped directly into the intake manifold portion 20. The intake manifold vacuum is sensed in a line 62 through a restriction or orifice 64 to a vacuum reservoir or accumulator 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.

The passage of vacuum from reservoir 66 to servo line 56 is controlled by a spring opened, electrically closed, valve 68 of the of on-off type. More specifically, the valve body is shown provided with intersecting passages 67, 56 into which projects the cone-shaped end 70 of a shuttle valve. A spring 71 normally unseats the valve to open passage 67 to passage 56 to allow vacuum to be applied to the servo to fully close the throttle valve.

Valve 68 also forms part of the conventional engine ignition circuit. The latter includes a known type of igniton key operated switch 72 bridging or breaking the circuit from a battery 74 to the coil 76 of a solenoid or similar suitable type device of which valve 68 is a part. That is, the valve in this case can be the armature of a solenoid so that when the coil 76 is energized, valve 68 will be forced rightwardly against the force of spring 71 to seat the valve and fully close off the passage 56.

The electrical circuit to valve 68 also includes a manifold vacuum controlled switch 80 adapted to make or break the circuit from the ignition switch 72 to valve 68 as a function of the level of manifold vacuum below the throttle valve. More particularly, the switch 80 includes a plunger 82 biased to the left to bridge the contacts 84 of the switch by a spring 86. The latter operates in a chamber 88 connected by a bore 90 to a manifold vacuum line 92 branched off intake manifold vacuum port 60.

The spring 86 is chosen of a force sufficient to normally maintain the contacts 84 bridged so long as engine intake manifold vacuum is below a level of say, for example, 19 inches Hg. Above this level, the vacuum is indicative of the engine operating under deceleration operating conditions, at which point it is desirable to fully close the throttle valve to prevent the flow of further fuel and air to the engine cylinders. Accordingly, it will be seen that above 19 inches Hg., switch 82 will be moved rightwardly by vacuum to unbridge the contacts 84 and open the circuit from the ignition switch 72 to valve 68. This permits spring 71 to open the valve 68 and flow vacuum from reservoir 66 to the servo chamber 48 to fully close the throttle valve.

The operation of the system is believed to be clear from the above description and from a consideration of the drawing. However, in brief, prior to engine start up, servo chambers 46 and 48 are at atmospheric pressure, permitting servo spring 54 to move lever 38 to crack open the throttle valve to its idle speed position 36. As soon as the engine is cranked and started, the turning of the ignition key closes the switch 72 to shut valve 68 and thereby prevent flow of vacuum to line 56. Accordingly, the throttle valve remains in the position shown, with normal engine idling fuel and air supply being inducted into the passage 16 through the orificed discharge 30. Plunger 80 at this time bridges the contacts 84 since the manifold vacuum is below 19 inches Hg. The starting of the engine permits a build-up in vacuum level in the reservoir 66, for future use.

Assume now that the engine has been accelerated and the vehicle then moved, by the throttle valve being opened wider than the idle position, to accelerate the vehicle. It will be seen that this is permitted by the counterclockwise rotation of lever 38 away from engagement with the end of rod 52 of servo 42. If now the vehicle operator releases his foot from the accelerator pedal, spring 40 will attempt to rotate the throttle valve to its closed position 34. In take manifold vacuum level will immediately increase to or above 19 inches Hg., indicative of engine decelerating operating conditions. This will move plunger 80 to break the ignition circuit to valve 68 and permit the spring 78 to open the valve. This immediately applies the vacuum in reservoir 66 to servo chamber 48, retracting rod 52 and allowing spring 40 to fully close the throttle valve. This shuts off all flow of fuel and air to the engine cylinders, and prevents any passage of unburned fuel into the atmosphere.

Assume now that the engine is shut off by turning the ignition key. This opens the ignition switch **72** and again opens the valve **68** to permit the vacuum in reservoir **66** to flow to servo chamber **48** and retract rod **52** to permit closing of the throttle valve. There is a slight difference, however, in this operation as compared to the deceleration operation. As soon as the engine is shut down, the intake manifold vacuum inport **60** decays almost immediately to an atmospheric pressure level. However, because of the orifice or flow restrictor **64**, the vacuum in reservoir **66** is only slowly bled to atmospheric pressure. This delay of several seconds is sufficient to permit vacuum to be applied to the servo chamber **48** of a level sufficient to retract rod **52** and permit full closing of the throttle valve to shut off all fuel and air flow. The time delay of bleeding of the vacuum in reservoir **66** is sufficient, therefore, to prevent dieseling of the engine upon engine shutdown.

It will be noted, that once the vacuum in reservoir **66** does decay to atmospheric pressure, then servo chamber **48** will be at the same pressure level as chamber **46**, and spring **54** will move the throttle valve to its engine idle or engine start position **36** shown.

Therefore, it will be seen that the invention provides a throttle valve positioner that completely shuts off all flow of fuel and air to the engine during high engine decelerating operating conditions; prevents engine dieseling after the engine is shut off for a period of time sufficient to permit the engine to come to rest; and yet repositions the throttle valve to an attitude providing engine starting.

While the invention has been showed in its preferred embodiment 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 off-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 said positions, said control means including first means operatively biasing said throttle valve to an open throttle position, and power means responsive to engine shutdown operation for effecting initially a movement of said throttle valve to its closed throttle position to shut off the flow of a fuel/air mixture through said passages, and subsequently a movement of said throttle valve to an open position for an engine starting operation.

2. A throttle positioner as in claim **1**, including second means biasing said throttle valve to a closed position, said power means including a vacuum servo having a spring extended, vacuum retracted, piston rod in its extended position operatively engaging and moving said throttle valve to said engine starting position, and in its retracted position permitting said second means to close said throttle valve, said vacuum means operatively acting on said rod to retract said rod in response to engine shutdown.

3. A throttle positioner as in claim **2**, including means connecting said vacuum means to said intake manifold.

4. A throttle positioner as in claim **1**, said power means including a vacuum servo, conduit means connecting said servo to said intake manifold servo, conduit means connecting said servo to said intake manifold vacuum, on-off valve means in said conduit means spring biased to an on position in response to engine shutdown to connect vacuum to said servo to close said throttle valve, and a vacuum reservoir in said conduit means for maintaining a vacuum on said servo of a level sufficient to close said throttle valve for a predetermined period after decay of the intake manifold vacuum until the decay in vacuum in said reservoir permits said first means to bias said throttle valve to said open position.

5. A throttle positioner as in claim **4**, including engine ignition means including an ignition switch and an electrical circuit operably connecting said switch to said on-off valve for effecting movement of the same to an off position upon closing of said switch to effect engine start-up to block the flow of said vacuum to said servo.

6. A throttle positioner as in claim **5**, including manifold vacuum actuated circuit interrupting means operable in response to the attainment of a high vacuum level indicative of engine decelerating operation to break said circuit means and effect opening of said on-off valve to close said throttle valve.

7. A throttle positioner as in claim **5**, said on-off valve including spring means biasing said latter valve to an on position permitting application of vacuum to said servo, said latter valve including electrical means energized in response to closing of said ignition switch to move said latter valve to an off position blocking application of vacuum to said servo.

8. A throttle positioner as in claim **4**, including flow restricting means in said conduit means between said manifold vacuum and said reservoir for delaying decay of vacuum in said reservoir upon decay of manifold vacuum at engine shutdown.

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