

[54] **VACUUM CONTROLLED CARBURETOR THROTTLE VALVE POSITIONER**

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[22] Filed: **July 26, 1971**

[21] Appl. No.: **165,991**

[52] U.S. Cl. **261/39 R, 261/65, 123/DIG. 11**

[51] Int. Cl. **F02m 3/02**

[58] Field of Search **261/65, 39 R; 123/DIG. 11, 117 A**

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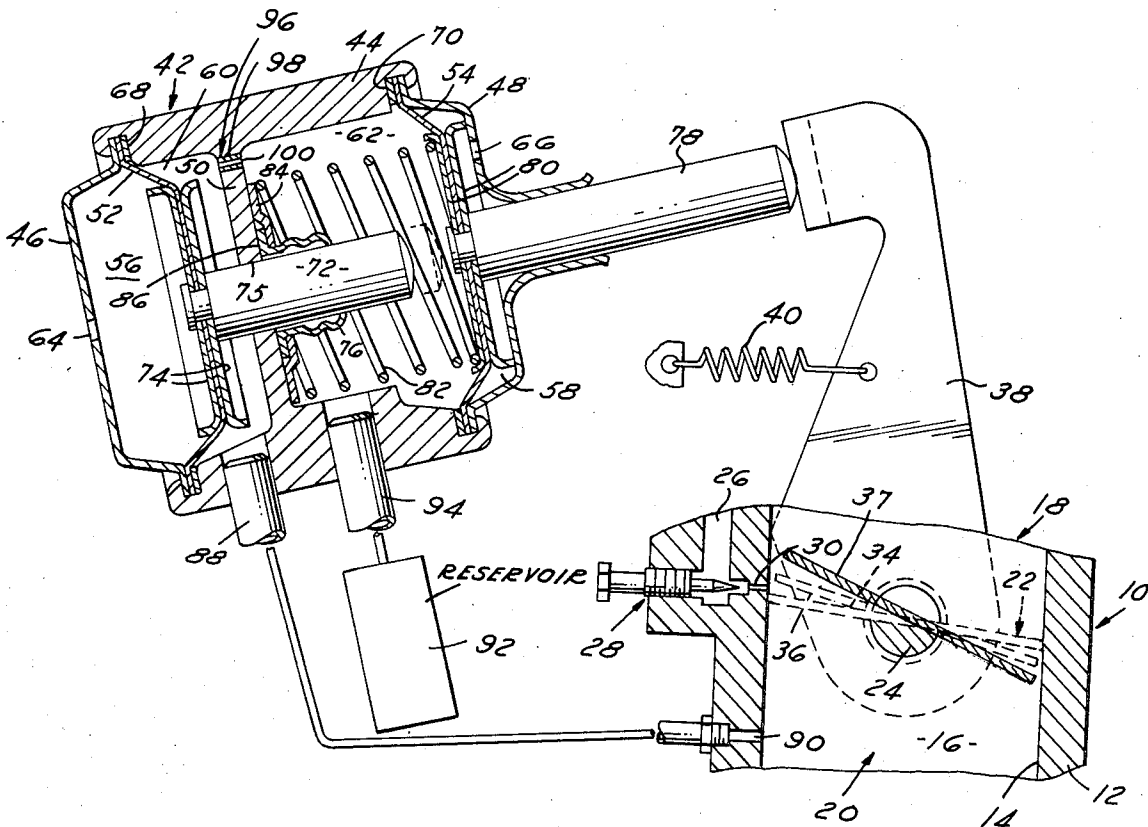
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[57] **ABSTRACT**

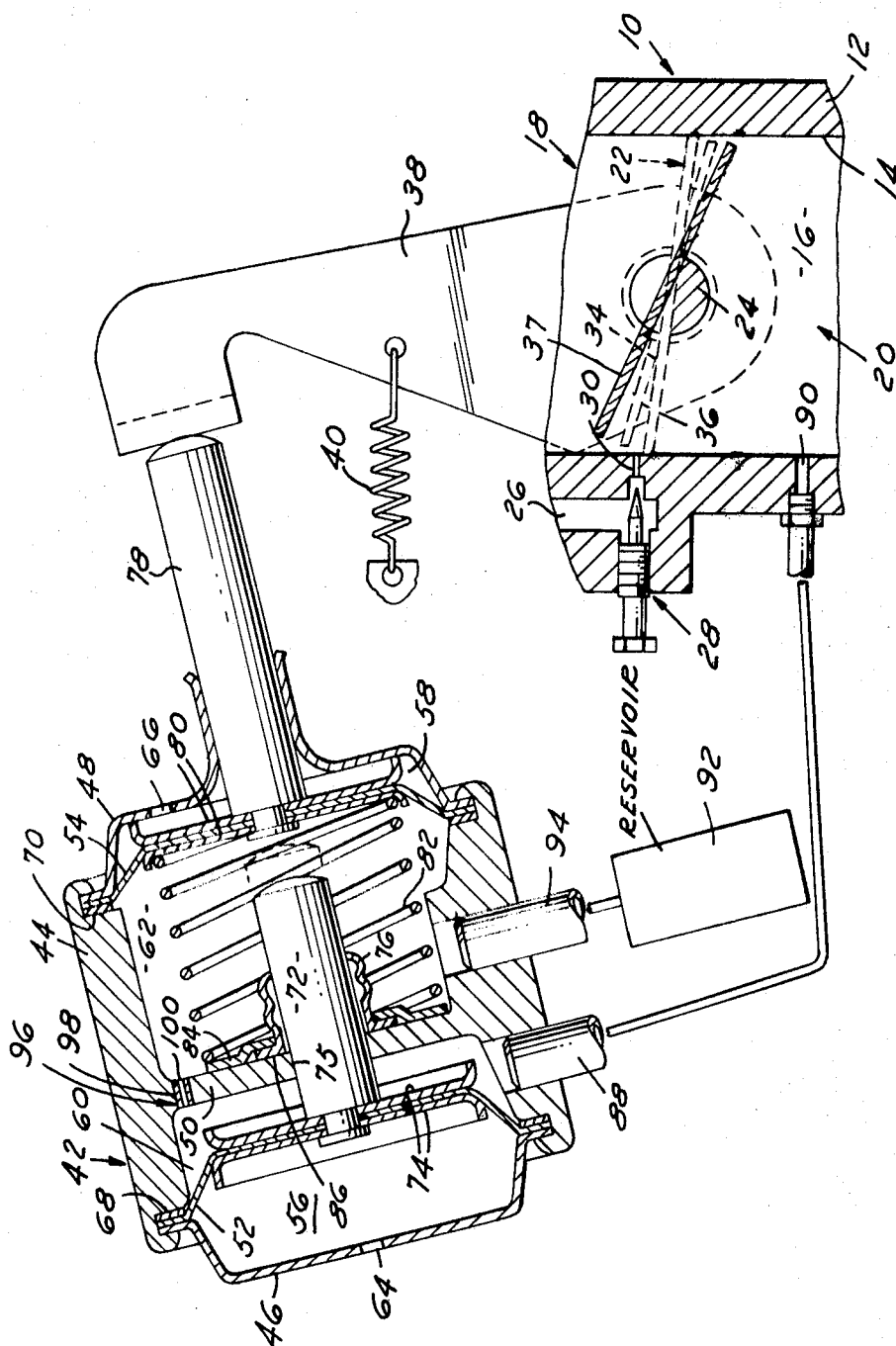
A downdraft type carburetor has an idle system discharge port that is straddled by the normal idle speed and closed throttle positions of the throttle valve so as to permit idle speed fuel and air flow in one position and no flow in the other position; a third beyond normal idle, or fast idle speed position 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, 1 Drawing Figure



PATENTED AUG 14 1973

3,752,450



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VACUUM CONTROLLED 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 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. Temperature responsive delay means is also provided to control the movement of the throttle valve at times.

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 inducing 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 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 dual diaphragm throttle valve servo actuator, the servo being vacuum controlled.

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, the FIGURE shows a cross sectional view of 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 that would contain the conventional venturi 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 position shown in dotted lines 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 dotted 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 consists of a sleeve type annular housing 44, closed at opposite ends by caps 46 and 48. The housing further has a central partition 50 dividing it into two chambers. A pair of annular flexible diaphragms 52 and 54 further subdivide the respective chambers into a pair of remote air chambers 56 and 58 and a pair of

back-to-back vacuum chambers 60 and 62. Chambers 56 and 58 communicate with the atmosphere through holes 64 and 66 in caps 46 and 48 respectively.

The outer edges of diaphragms 52 and 54 are sealingly mounted to the housing 44 as shown between washers 68, 70 and the caps 46 and 48. A first plunger 72 is fixed to diaphragm 52 for movement thereof or therewith by means of a pair of back-to-back retainers 74 riveted or otherwise fixed to diaphragm 52. The plunger 72 projects slidingly through a hole 75 in partition 50 and a rubber boot type seal 76 frictionally mounted on it.

A second plunger 78 is secured to diaphragm 54 in essentially the same manner as plunger 72; that is, fixed to a pair of retainers 80 riveted to diaphragm 54. A compression spring 82 is seated between one retainer 80 and a combination seat and seal positioner 84. The inner edge of 84 holds the upturned flange 86 of boot seal 76 against partition 50.

Spring 82 normally biases the diaphragm 54 and plunger 78 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.

Vacuum chamber 60 is connected to engine intake manifold vacuum through a conduit 88 connected to a carburetor induction passage port 90 located beneath the throttle valve. The line 88 could of course be tapped directly into the intake manifold further down from port 90, if desired. Vacuum chamber 62, on the other hand, is connected to a vacuum reservoir 92 through a pipe 94, and its only connection to vacuum chamber 60 is by way of an orifice or flow restriction 96 in partition 49. The aperture defining the restriction, in this case, contains a temperature sensitive member 98 having an orifice 100. The member 98 consists of a block of thermally sensitive material that is expandable and contractible in response to changes in ambient temperature to decrease or increase, respectively, the area of orifice 100. This in turn controls the time for equalization of vacuum levels between chambers 60 and 62 as a function of temperature changes.

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 stop (plunger 72) to which the throttle valve is returned after start and during deceleration operation; and, thirdly, an anti-dieseling position in which the plunger 72 is retracted upon engine shut-off to permit full closure of the throttle valve, followed by return to the engine start, fast idle position after a slight delay.

In operation, 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 78. The force of spring 82 would be chosen to be greater than that of return spring 40 so that in its rightwardly extended position, plunger 78 will rotate throttle valve to the fast idle position 37. The servo spring 82, therefore, has positioned the diaphragm retainer 80 against the housing cap 48.

As soon as the engine is cranked, the initial vacuum buildup in the intake manifold acting through passage 88 into servo chamber 60 acts against diaphragm 52 to pull the retainer 74 against the partition 50.

Atmospheric pressure then bleeding from chamber 62 through orifice 100 permits atmospheric pressure in chamber 58 and spring 40 to push diaphragm 54 and plunger 78 against spring 82 until it is stopped by the end of plunger 72. This corresponds to the curb idle speed position 36 of the throttle valve. As soon as the throttle valve is moved by the operator to an open, off-idle position, beyond the start position, the spring 82 can now move the plunger 78 back to a start position away from plunger 72.

Assuming now the engine is shut off, the manifold vacuum in chamber 60 will quickly decay to zero. This permits plunger 72 to be positioned to any location pushed since the pressure in chamber 60 is being quickly bled to atmosphere. Since communication between vacuum chambers 60 and 67, however, is still only by way of orifice 100, the only slowly decaying vacuum in reservoir 92, together with spring 40, is sufficient to pull plunger 78 leftwardly against plunger 72 until plunger 78 is moved to permit a full closure of the throttle valve to the anti-dieseling position 34. After a few seconds, the decay in vacuum in reservoir 92, by bleed of vacuum through orifice 100, will then permit spring 82 to reposition the plunger 78 to the right to the start position originally described, locating the throttle valve at the fast idle position 37.

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 shown 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 the 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 the passage, an idle fuel/air mixture passage connected to the induction passage around the throttle valve and having a discharge end connected to the 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 the throttle valve to and between its positions, the control means comprising power means having a first plunger operatively adapted to engage or be engaged by the throttle valve for moving the same or restricting the movement thereof, respectively, spring means acting on and biasing the first plunger to a first position urging the throttle valve to an open beyond engine idle speed position conditioning the engine for a hot start leaner fuel/air ratio, first engine intake manifold vacuum responsive servo means operatively acting on the first plunger in opposition to the spring means whereby the first plunger is retracted to an engine anti-dieseling second position permitting rotation of the throttle valve to a throttle valve closed position terminating flow of fuel/air to the engine, and second plunger means movable in the path of movement in a throttle valve closing direction of the first plunger to alternately prevent movement of the first plunger beyond a third position permitting rotation of the throttle valve to a curb idle normal engine idle speed position providing a richer fuel/air ratio, or permit movement of the first plunger to the anti-dieseling second position, and second intake manifold vacuum responsive means for controlling movement of the second plunger to its various positions.

2. A throttle valve positioner as in claim 1, the second plunger being floatably mounted for free movement in either direction so as at times to be withdrawn from engagement with the first plunger.

3. 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 the 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 the passage, an idle fuel/air mixture passage connected to the induction passage around the throttle valve and having a discharge end connected to the 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 the throttle valve to and between its positions, the throttle valve having linkage means secured thereto, the control means including first and second vacuum servos in back-to-back relationship with axially aligned actuators adapted to contact and move or restrict movement of each other at times, the first actuator being freely movable and the second actuator being spring biased towards the throttle valve linkage means, conduit means connecting engine intake manifold vacuum to the first vacuum servo for moving the first plunger toward the

second plunger, flow restriction means connecting said servos for communicating vacuum to the second servo while delaying changes in pressure level between the servos, the vacuum in the second servo urging the second plunger toward the first, said second servo having a vacuum reservoir for temporarily maintaining a vacuum in the second servo regardless of a decay in vacuum in the first servo to permit the second plunger to move the first plunger to a throttle valve closed throttle position.

4. A positioner as in claim 3, the first and second servos each having a flexible diaphragm secured respectively to the first and second plungers and dividing each servo into a vacuum and air chamber.

5. A positioner as in claim 3, the flow restriction means being temperature responsive to vary in area and thereby vary the time delay for equalization of pressures between the servos.

6. 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 the 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 the passage, an idle fuel/air mixture passage connected to the induction passage around the throttle valve and having a discharge end connected to the 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 the throttle valve to and between its positions, the control means including a servo, the servo having a hollow shell with a partition dividing the shell into two chambers each of which is subdivided into an air and vacuum chamber by an annular flexible diaphragm, means connecting a first plunger to the one chamber diaphragm and a second plunger to the diaphragm of the second of the two chambers, the plungers being axially aligned with the second plunger projecting slidably and sealingly through the partition for engagement at times with the first plunger, the vacuum chambers being adjacent one another while the air chambers are remote with respect to each other, means connecting the conduit means to the diaphragm of the second vacuum chamber and a vacuum storage reservoir to the diaphragm of the one vacuum chamber, and flow restriction means in the partition between the vacuum chambers for permitting a restricted communication therebetween and an equalization of pressures therein at times while at other times effecting a temporary unequalization of pressures therebetween.

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