

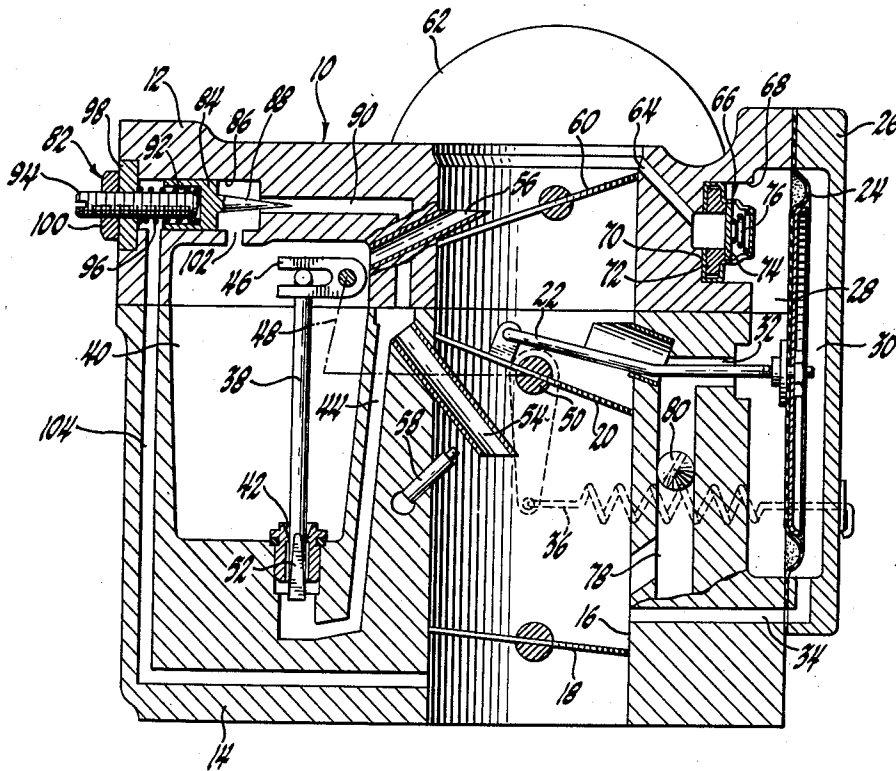
Feb. 19, 1963

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3,078,079

AIR VALVE CARBURETOR

Filed June 29, 1960



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AIR VALVE CARBURETOR

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Filed June 29, 1960, Ser. No. 39,500

4 Claims. (Cl. 261-44)

The present invention relates to an air valve type carburetor of the type shown in copending application Serial No. 2,189, Mick, filed January 13, 1960, now U.S. Patent 2,996,051. More particularly, the present invention relates to certain improvements whereby effective cold starting is achieved and further in which manifold vacuum responsive means is provided for insuring economical operation under normal operating conditions.

In the present air valve carburetor, an automatic choke device is utilized to facilitate vehicle engine operation when the engine is warming up. In this carburetor a diaphragm controlled air valve is provided in which the pressure drop across the valve is transmitted to the diaphragm whereby the valve may be positioned to maintain a constant pressure drop thereacross. In the present invention, an atmospheric bleed valve is provided which uniquely coacts with the choke valve to momentarily increase the pressure drop across the diaphragm during engine starting conditions which in turn increases the quantity of fuel flow through the fuel metering valve which is also controlled by the operation of the air valve.

Further, a manifold vacuum controlled valve is provided whereby air is bled into the fuel supply lines posteriorly of the fuel metering valve to reduce the quantity of fuel delivered under normal operating conditions and to thereby achieve certain fuel economy.

The details as well as other objects and advantages of the present invention will be apparent from a perusal of the detailed description which follows.

The drawing is a diagrammatic representation of an air valve type carburetor embodying the subject invention.

The carburetor is indicated generally at 10 and includes casing members 12 and 14 which have an air induction passage 16 formed therethrough. A throttle valve 18 is provided for controlling the quantity of fuel-air mixture flowing through the induction passage.

An air valve 20 is rotatably disposed in casing 12 anteriorly of throttle 18 and has one end of a control rod 22 articulated thereto. The other end of control rod 22 is centrally secured to a diaphragm member 24 peripherally clamped between casings 12-14 and a cover casing 26. Diaphragm 24 coacts with the various casing members to provide chambers 28 and 30. In general, chamber 28 is maintained at atmospheric pressure whereas chamber 30 is maintained at a subatmospheric pressure level. Normally, chamber 28 communicates with induction passage 16 anteriorly of air valve 20 through a passage 32. At the same time chamber 30 communicates with the induction passage posteriorly of the air valve through a passage 34. As is well known, in an air valve type carburetor, the position of the air valve is adjusted by diaphragm 24 to maintain a constant pressure drop across the valve. Thus as engine speed increases the pressure drop across air valve 20 would tend to increase. This momentarily increased pressure drop is impressed across diaphragm 24 whereby the latter opens valve 20 against the force of spring 36 to maintain the aforementioned constant pressure drop. A fuel metering rod 38 is disposed in fuel reservoir 40 and is adapted to be longitudinally adjusted relative to a metering orifice 42 to vary the quantity of fuel flowing from the reservoir to fuel supply passage 44 in accordance with the position of air

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valve 20. This adjustment of the metering rod in accordance with the air valve position is achieved through a lever 46 connected to metering rod 38 and which lever is in turn connected through any suitable control link, such as indicated by the dash line 48, articulated to air valve shaft 50. Thus as air valve 20 is moved to a progressively more open position by diaphragm 24 to maintain a constant pressure drop with increased air flow conditions, lever 46 is caused to rotate in a clockwise direction moving the tapered end 52 of metering rod 38 out of metering orifice 42 to thereby increase the quantity of fuel flow from reservoir 40 to fuel supply passage 44. In this way a substantially constant fuel-air ratio is maintained.

A fuel jet 54 is disposed in casing 14 and communicates fuel outlet passage 44 with induction passage 16 intermediate the air valve 20 and throttle 18. Air flow past jet 54, as well as the pressure drop across air valve 20, induces fuel to flow from fuel passage 44 to induction passage 16.

A vent 56 is provided in casing 12 and communicates fuel reservoir 40 with induction passage 16 whereby fuel vapors are internally vented to the induction passage and ultimately consumed during the combustion cycle of the engine.

An additional nozzle 58 is disposed in casing 14 and is adapted to communicate with an accelerator pump, not shown, to supply additional fuel during high power demand conditions. The accelerator pump is shown and described in detail in the aforementioned copending Mick application.

A conventional choke valve 60 is disposed in induction passage 16 anteriorly of air valve 20 and is adapted to be controlled in any desired manner either manually or automatically. In the present instance an automatic choke controlling mechanism is indicated generally at 62 and may be of the type shown in Jorgensen 2,705,484.

During normal engine warm-up operation choke 60 functions to enrich the fuel-air mixture sufficiently by applying a larger differential to fuel passage 44 than would otherwise be present across air valve 20. However, with the flow through fuel passage 44 being controlled by the pressure differential across air valve 20, it is almost impossible to choke the carburetor sufficiently to obtain an adequate starting air-fuel ratio.

To overcome this difficulty, which occurs only when the engine is being started, a passage 64 is provided in casing 12 and communicates at one end with induction passage 16 anteriorly of choke valve 60. The other end of passage 64 communicates with diaphragm chamber 28 through a valve 66. Valve 66 is disposed in a recessed portion 68 of casing 12 and includes a casing 70 open at both ends and having an enlarged portion in which valve body 72 is retained. A movable disc 74 is disposed within casing 70 and is adapted to be seated against valve body 72 by a spring 76 to normally block any air flow through passage 64 to diaphragm chamber 28.

Under normal engine operating conditions the pressure differential across valve disc 74 is insufficient to open the valve. However, under cold starting conditions with choke valve 60 closed, the pressure drop across valve 66, due to cranking vacuum, causes valve disc 74 to open against the force of spring 76 admitting atmospheric pressure to diaphragm chamber 28 increasing the pressure differential across diaphragm 24. This results in additional opening of air valve 20 and moves metering rod 38 out of metering orifice 42. The increased opening of the metering orifice, of course, increases the fuel flow from reservoir 40 to fuel output passage 44 thereby enriching the fuel-air ratio during starting conditions. As soon as

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the engine is started choke valve 60 is opened to a limited extent, either automatically or manually, which reduces the pressure drop across atmospheric vent valve 66 enabling spring 76 to close disc 74. Thus valve 66 functions only while the engine is being started and becomes inoperative the moment engine starting is accomplished.

As described in the aforementioned copending application, an external adjustment is required to obtain a good idle mixture. This is accomplished by bypassing a small quantity of air around air valve 20 through passage 78. An externally adjustable screw 80 is provided in passage 74 for controlling the quantity of air bypassed around air valve 20. As screw 80 is backed out, for example, more air bypasses the air valve whereby the valve tends to close decreasing the flow through fuel passage 44 and leaning the idle mixture.

A valve mechanism 82 is provided to insure economical operation of the carburetor under normal engine operating conditions. Valve 82 includes a piston member 84 slidably mounted in a recess 86 formed in casing 12. A tapered needle member 88 extends from one end of piston member 84 and coacts with an air bleed passage 90 which openly communicates at its other end with fuel supply passage 44. Piston member 84 includes a recess 92 within which an adjustable screw member 94 is adapted to extend and which also houses one end of a spring member 96 the other end of which biases against a plate 98. A nut member 100 is threadably disposed on screw 94 to adjust the axial position thereof and in turn to limit the extent to which tapered member 88 may open bleed passage 90. The right end of casing recess 86 communicates through a port 102 with the top of the fuel reservoir 40 which, as already noted, is communicated with the atmosphere through vent tube 56. The left end of recess 86 communicates through a passage 104 with induction passage 16 posteriorly of throttle 18.

Accordingly, manifold vacuum acts on piston member 84 tending to urge the same to the left against the force of spring 96 to thereby bleed atmospheric air into fuel supply passage 44. Under conditions of high power demand manifold vacuum acting on piston member 84 will be insufficient to overcome the force of spring 96 and tapered member 88 will block the bleed of atmospheric air into passage 44 whereby maximum fuel flow is realized through fuel output passage 44 for the particular position of the metering rod 38. On the other hand, during normal engine operating conditions manifold vacuum will be sufficient to move piston 84 to the left whereby tapered member 88 moves partially out of vent passage 90 admitting a limited amount of atmospheric pressure into passage 44 and thereby bleeding down the vacuum force created by air flow past jet tube 54. In this way a reduced quantity of fuel flow would be discharged through tube 54 resulting in more economical carburetor operation consistent with the reduced power demands.

Inasmuch as the present invention has been diagrammatically represented, it is apparent that various structural modifications may be made within the intended scope of the hereinafter appended claims.

I claim:

1. A charge forming device for an internal combustion engine comprising an induction passage, a throttle valve rotatably mounted in said induction passage, an air valve rotatably mounted in said induction passage anteriorly of said throttle valve, a pressure responsive device having conduit means connecting it to said induction passage on one side of said air valve and conduit means connecting it to said induction passage on the other side of said air valve and operatively connected to and adapted to control the position of said air valve in accordance with the pressure drop across the air valve, a source of fuel, conduit means communicating said fuel source with the induction passage intermediate said air and throttle valves, a metering orifice in said conduit means, a me-

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tering rod adapted to coact with said orifice to control the quantity of fuel flow therethrough, said metering rod being adjustably connected to said air valve whereby fuel flow through the orifice is proportional to the degree of opening of said air valve, a choke valve disposed in said induction passage anteriorly of said air valve, valve means responsive to closure of said choke valve to increase the differential of the pressures on opposite sides of said air valve causing said pressure responsive device to increase the fuel flow through said metering orifice, said valve means also being responsive to opening of said choke to eliminate said increase whereby after the engine has started fuel metering will be unaffected by said valve means and controlled in a normal manner in accordance with the position of the air valve.

2. A charge forming device for an internal combustion engine comprising an induction passage, a throttle valve rotatably mounted in said induction passage, an air valve rotatably mounted in said induction passage anteriorly of said throttle valve, a pressure responsive device having conduit means connecting it to said induction passage on one side of said air valve and conduit means connecting it to said induction passage on the other side of said air valve and operatively connected to and adapted to control the position of said air valve in accordance with the pressure drop across the air valve, said pressure responsive device including a diaphragm one side of which communicates with the induction passage posteriorly of the air valve and the other side of which communicates with the induction passage anteriorly of the air valve, a source of fuel, conduit means communicating said fuel source with the induction passage intermediate said air and throttle valves, a metering orifice in said conduit means, a metering rod adapted to coact with said orifice to control the quantity of fuel flow therethrough, said metering rod being adjustably connected to said air valve whereby fuel flow through the orifice is proportional to the degree of opening of said air valve, a choke valve disposed in said induction passage anteriorly of said air valve, normally closed valve means adapted to communicate the said other side of the diaphragm with the induction passage anteriorly of the choke valve and responsive to closure of said choke valve to open and increase the pressure drop across the diaphragm thereby increasing the fuel flow through said metering orifice.

3. A charge forming device as set forth in claim 2 in which said valve means includes a valve element, spring means biasing said valve to a closed position, the pressure drop across the valve element being sufficient to open the valve element against the force of the spring only when the choke valve is closed.

4. A charge forming device for an internal combustion engine comprising an induction passage, a throttle valve rotatably mounted in said induction passage, an air valve rotatably mounted in said induction passage anteriorly of said throttle valve, a pressure responsive device operatively connected to and adapted to control the position of said air valve in accordance with the pressure drop across the air valve, a source of fuel, conduit means communicating said fuel source with the induction passage intermediate said air and throttle valves, a metering orifice in said conduit means, a metering rod adapted to coact with said orifice to control the quantity of fuel flow therethrough, said metering rod being adjustably connected to said air valve whereby fuel flow through the orifice is proportional to the degree of opening of said air valve, said pressure responsive device including a diaphragm, a first conduit communicating one side of the diaphragm with the induction passage anteriorly of the air valve, a second conduit communicating the other side of said diaphragm with the induction passage posteriorly of the air valve whereby the pressure drop across the air valve will be transmitted to the diaphragm to modify the position of the air valve to maintain said

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pressure drop constant thereacross, a choke valve disposed in said induction passage anteriorly of the air valve, a third passage communicating the said one side of the diaphragm with the induction passage at a point immediately anteriorly of the choke valve when the latter is closed, a spring biased valve mounted in said third passage, said choke valve when closed causing the spring biased valve to open thereby increasing the pressure drop across said diaphragm and thereby increasing the quantity of fuel flow through said metering orifice.

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