Oct. 23, 1951 M. MALLORY 2,572,169

CARBURETOR

Filed Aug. 6, 1945

FIG. 2.

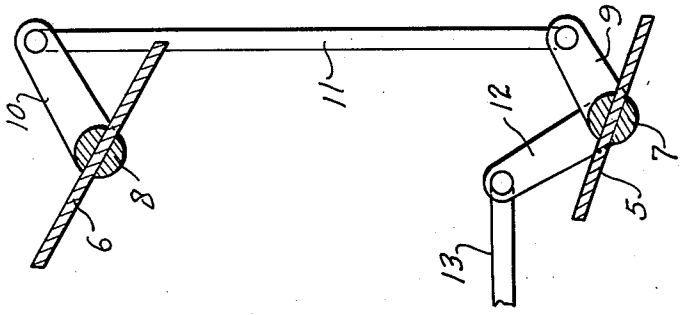
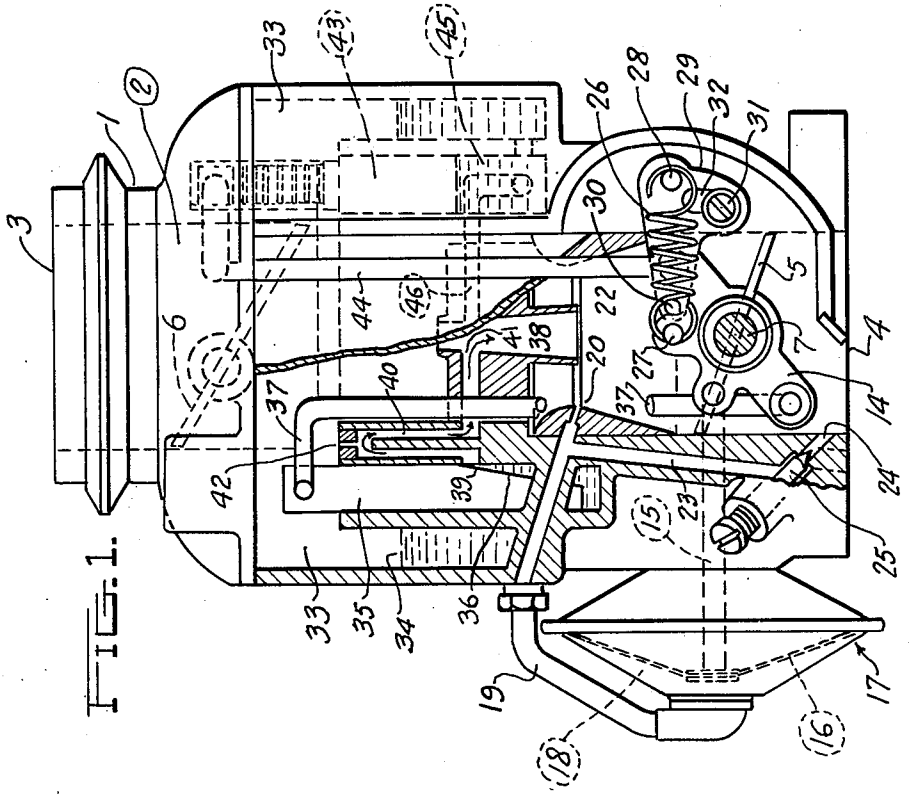



FIG. 1.

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## CARBURETOR

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3 Claims. (Cl. 261—52)

1

This invention relates to a carburetor for an internal combustion engine.

It is the object of this invention to produce a carburetor which will vary the quality of the fuel mixture in direct relation to variation in the load applied to the engine.

In the ordinary carburetor the quality or mixture ratio is not varied in direct relation to the load of the engine, because the present day carburetors have what is known as the vacuum power jet or economizer, which is controlled entirely by the vacuum existing in the intake manifold between the carburetor throttle and the engine. And when using this vacuum to operate a power jet, it is impossible to vary the fuel mixture ratio in direct relation to the load applied to the engine over the complete range from no load to full load or closed throttle to wide open throttle, because the vacuum in the intake manifold actually varies from 1 inch to 25 inches of mercury when the vehicle is connected to the engine and being driven on the road. The fact is the vacuum between the throttle and engine actually surges or varies due to the slightest movement of throttle or the slightest change in engine load, and in any attempt to meter fuel with a metering device throughout the entire throttle and load range using the manifold vacuum to control the metering device, difficulties would arise because the slightest movement of the engine throttle or the slightest change in engine load would cause the metering device to surge over the same wide range that the vacuum in the intake manifold surged, naturally the mixture would surge from a rich mixture to a lean mixture and from a lean mixture to a rich mixture and the engine would roll or surge in harmony. It is for the above reasons why the present day power jet or metering device will not meter the fuel satisfactorily over the entire throttle and load range. Therefore, the present day power jets are set by spring tension to open when the vacuum in the manifold drops below four or six inches and to close when the vacuum in the manifold rises above four or six inches, consequently, in the present day metering devices the fuel is only metered over a small part of the throttle and load range. In other words, the fuel is only metered perhaps between 6½ inches and 3½ inches of vacuum; any time the manifold vacuum is lower than 3½ inches a full load mixture is being delivered and any time the vacuum in the manifold is above 6½ inches of mercury a light load mixture is being delivered. The present day metering device merely produces two

2

mixture conditions, one rich for full load and one lean for light load. Naturally, there are many times when the mixture is richer than necessary for the load under which the engine is operating. Such metering of fuel not only results in spotty performance of the engine but it results in poor economy because an overly lean mixture results in poor economy as well as an overly rich mixture.

In my carburetor, I use the suction between the carburetor throttle and engine, also the suction between the carburetor throttle and atmosphere to operate the metering device. In this manner the high manifold vacuum between the carburetor throttle and manifold is lowered by venting it to the lower vacuum existing in the venturi or intake passageway between the throttle and atmosphere. The orifice above the throttle plays the role of an air bleed to the orifice below the throttle and increases the air bleed effectiveness as the throttle is moved towards a closed position preventing the vacuum from surging to a high point in the suction device that operates the metering device and vice versa when the throttle valve starts to move toward an open position the orifice above the throttle ceases to be an air bleed and becomes a suction orifice preventing a sudden drop in the vacuum existing in the suction device that operates the metering device. By this method of operating a power jet or metering device the surging from a lean mixture to a rich mixture and from a rich mixture to a lean mixture is eliminated making possible the use of a metering device that will operate smoothly through the complete range from closed throttle to open throttle or no load to full load.

In the drawings:

Fig. 1 is a vertical section through my carburetor.

Fig. 2 is a detail showing the connection between the air valve and throttle valve.

The parts of my carburetor are referenced as follows: carburetor housing 1, intake passageway 2 having air inlet 3 and fuel mixture outlet 4 to the engine intake manifold, throttle valve 5 and air valve 6, throttle valve shaft 7 and air valve shaft 8 both journalled in housing 1, cranks 9 and 10 fixed on shafts 7 and 8, respectively, link 11 connecting cranks 9 and 10 so that valves 5 and 6 open and close in unison, crank 12 fixed on shaft 7, rod 13 connected to crank 12 for manually controlling the throttle valve 5 and air valve 6, crank 14 journalled on shaft 7 and freely rotatable relative to shaft 7, rod 15 connecting

crank 14 with diaphragm 16 of suction device 17, suction chamber 18, conduit 19 connecting suction chamber 18 with orifice 20 in venturi 22, conduit 23 connecting conduit 19 with orifice 24 on the engine or outlet side of throttle valve 5, adjustable needle valve 25 for adjusting the effective size of orifice 24, tension spring 26 anchored to post 27 on crank 14 and to post 28 on plate 29, pivot 30 for plate 29, set screw 31 in arcuate slot 32 for holding plate 29 in adjusted position, float chamber 33, fuel level 34, metering pin 35 having the usual tapered face 36, link 37 connecting pin 35 with crank 14, booster venturi 38, metering orifice 39, fuel passageway 40 connecting metering orifice 39 with fuel jet 41 in venturi 38, air bleed 42 to prevent fuel from siphoning out of bowl 33 into the engine, pump plunger 43 connected by link 44 to crank 14, pump cylinder 45, passageway 46 connecting cylinder 45 with venturi 38.

The operation of my device is as follows: Assuming the engine is idling, as shown in Fig. 1, valves 5 and 6 will be nearly closed and the vacuum will not be as high in suction chamber 18 as it is in the manifold at orifice 24 because orifice 20 in the venturi is in a higher pressure and bleeds down the high manifold vacuum. Valve 25 will be adjusted so that at idle the vacuum established in chamber 18 will move diaphragm 16 to the left, in the position shown, which acts through rod 15, crank 14 and link 37 to bring the tapered or flat portion 36 of metering pin 35 in correct position with orifice 39 so as to admit the correct amount of fuel through orifice 39 into the mixing chamber for idle. If throttle valves 5 and 6 are now moved toward an open position, the vacuum will drop at orifice 24 but the velocity of the fuel mixture by orifice 20 will induce a vacuum at orifice 20 which will prevent such a sudden drop of vacuum in chamber 18. The metering pin will move toward an open position smoothly instead of flying wide open abruptly as it would if it were not for orifice 20. If metering pin 35 flew open abruptly, the mixture would go too rich and it would be impossible to obtain proper opening of the metering pin if only orifice 24 were used. As throttle valves 5 and 6 move further toward open position vacuum decreases at orifice 24 and in suction chamber 18 permitting spring 26 to move metering pin 35 upwardly to increase the mixture richness. It should be borne in mind that the metering pin is controlled by suction device 17 independently of throttles 5 and 6 which are controlled manually or through the usual accelerator pedal. If the throttle is held at one position between wide open and closed and the load on the engine is decreased or increased due to the vehicle going down grade or up grade, the vacuum in suction chamber 18 will increase or decrease and the metering pin will move to give the engine the proper mixtures for either the light load when going down grade or the heavier load when going up grade. With my arrangement the metering pin substantially follows the vacuum from a point when the vacuum is the highest at no load to a point when the vacuum is the lowest at full load.

Another feature of my carburetor is this: Metering pin 35, and in particular the flat tapered surface 36, is mounted with respect to orifice 39 so that when the vehicle is decelerating and the vehicle is driving the engine to thereby cause the vacuum at orifices 24 and 20 to be higher than the idle vacuum, the vacuum established in chamber 18 will be high enough to cause metering pin 35 to completely close orifice 39 and prevent any fuel from entering the engine as long as on deceleration and the vacuum is higher than idle vacuum. Thus, with my carburetor I shut off both the idle and main fuel jet 39 whenever the vacuum upon deceleration of the vehicle at orifice 41 becomes higher than the idle vacuum. This is an advantage because otherwise under such conditions there would be a slight feeding of fuel out of the main jet of the venturi which would be too lean a mixture for good combustion and would simply burn in the exhaust pipe or muffler and create obnoxious gases which would find their way into the vehicle and also cause a waste of fuel.



As throttle valve 5 moves toward closed position orifice 20 plays the role of an air bleed to orifice 24 and when valve 5 moves toward open position orifice 20 ceases to be an air bleed to orifice 24 and becomes a suction orifice. Due to this interplay of orifices 20 and 24, the vacuum in suction chamber 18 never equals the vacuum which obtains in the intake passageway on the engine side of valve 5. By way of example and not by way of limitation, the vacuum in chamber 18 never reaches over ten or twelve inches of mercury. The mixture richness is actually metered according to the vacuum under which the engine is running so that as the load decreases the mixture gets leaner and vice versa. The tension of spring 26 can be adjusted by loosening screw 31 and swinging lever 29 about pivot 30 either upwardly or downwardly and then resetting screw 31 in adjusted position. By adjusting this spring the mixture ratio can be varied.

Although I have shown my fuel metering system in connection with a mechanically operated air valve carburetor, I do not wish to be limited to the use of my metering system in this type of carburetor. The metering system can be used with a single valve carburetor having no air valve.

For purposes of description, fuel is drawn through jet 41 by the intake passageway suction but it is understood that fuel could be injected through jet 41 by positive pressure such as by means of an injection pump. Thus, my invention contemplates discharging the fuel out of fuel jet 41 either by suction or pressure.

I claim:

1. In a carburetor for an internal combustion engine, said carburetor having an intake passageway therethrough, a throttle valve in said intake passage, a fuel passageway discharging into said intake passageway on the atmosphere side of said throttle valve and having a metering orifice, metering means having a uniformly tapered surface which cooperates with said metering orifice for gradually varying the effective size of said metering orifice, a first orifice in the wall of said intake passageway on the atmosphere side of said throttle valve, a second orifice in the wall of said intake passageway on the fuel mixture outlet side of said throttle valve, pressure actuated means, a passageway connecting said first and second orifices with each other and with said pressure actuated means, a connection between said pressure actuated means and said metering means, resilient means operatively connected to said metering means and tending to move said metering means to increase the effective size of said metering orifice, said pressure actuated means responding to an intermediate pressure

resulting from a blending of the pressures obtaining in the intake passageway at said first and second orifices, the said pressure actuated means responding to a fall in said resultant pressure to decrease the effective size of said metering orifice and to an increase in said resultant pressure to increase the effective size of said metering orifice, said first orifice acting as an air bleed to said second orifice as the throttle valve approaches closed position and as said throttle valve moves from idle toward open position said first orifice ceases to be an air bleed orifice and becomes a suction orifice due to the increased fluid flow through said intake passageway by said first orifice, said metering means and metering orifice being constructed and arranged whereby when the vacuum in said pressure actuated means exceeds the idle vacuum obtaining in the intake passageway on the engine side of the throttle valve when in idle position the said pressure actuated means will respond to said vacuum and close said metering orifice to completely shut off the flow of fuel therethrough, and an air valve positioned in the intake passageway on the atmosphere side of both the throttle valve and the point at which the fuel is discharged into the intake passageway, and means connecting said air and throttle valves so that they open and close substantially in unison.

2. In a carburetor for an internal combustion engine, said carburetor having an intake passageway therethrough, a throttle valve in said intake passageway, a fuel passageway discharging into said intake passageway on the atmosphere side of said throttle valve and having a metering orifice, a metering valve for varying the effective size of said metering orifice, a first orifice in the wall of said intake passageway on the atmosphere side of said throttle valve, a second orifice in the wall of said intake passageway on the fuel mixture outlet side of said throttle valve, pressure actuated means, linkage mechanism connecting the metering valve to said pressure actuated means, said pressure actuated means including a suction chamber and a diaphragm movable in a first direction in response to a fall in pressure in said suction chamber to close the metering valve and movable in a second and opposite direction upon a rise in pressure in said suction chamber to open the metering valve and resilient means operatively connected to, and applying a force on, said diaphragm in said second direction, and a passageway connecting said first and second orifices with each other and with the suction chamber of said pressure actuated means, the above construction and arrangement being such that the intermediate pressures resulting from a blending of the pressures obtaining in the intake passageway at said first and second orifices apply force on said diaphragm in opposition to said resilient means and movement of the diaphragm as aforesaid acts through said linkage mechanism to effect closing and opening movement of the metering valve to decrease and to increase respectively the effective size of said metering orifice.



3. In a carburetor for an internal combustion engine, said carburetor having an intake passageway therethrough, a throttle valve in said intake passageway, a metering orifice in the intake passageway on the atmosphere side of said throttle valve through which fuel is discharged into said intake passageway, a fuel passageway between said source of fuel and metering orifice, a metering valve having a tapered face cooperating with said metering orifice for varying the effective size of said metering orifice, a first orifice in the wall of said intake passageway on the atmosphere side of said throttle valve, a second orifice in the wall of said intake passageway on the fuel mixture outlet side of said throttle valve, a single pressure actuated means actuated solely by the suction obtaining in said intake passageway at said first and second orifices as specified below, said pressure actuated means being the sole means for opening and closing said metering valve, linkage mechanism connecting the metering valve to said pressure actuated means, said pressure actuated means including a suction chamber and a diaphragm movable in a first direction in response to a fall in pressure in said suction chamber to close the metering valve and movable in a second and opposite direction upon a rise in pressure in said suction chamber to open the metering valve and resilient means operatively connected to, and applying a force on, said diaphragm in said second direction, and a passageway connecting said first and second orifices with each other and with the suction chamber of said pressure actuated means, the above construction and arrangement being such that the intermediate pressures resulting from a blending of the pressures obtaining in the intake passageway at said first and second orifices apply force on said diaphragm in opposition to said resilient means and movement of the diaphragm as aforesaid acts through said linkage mechanism to effect closing and opening movement of the metering valve to decrease and to increase respectively the effective size of said metering orifice.

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## REFERENCES CITED

The following references are of record in the file of this patent:

UNITED STATES PATENTS

| Number | Name | Date |
|---|---|---|
| 1,841,778 | Beatson | Jan. 19, 1932 |
| 1,850,307 | Moore | Mar. 22, 1932 |
| 1,945,200 | Mock | Jan. 30, 1934 |
| 2,182,090 | Mallory | Dec. 5, 1939 |
| 2,232,392 | Kittler | Feb. 18, 1941 |
| 2,316,327 | Garretson | Apr. 13, 1943 |
| 2,361,227 | Mock | Oct. 24, 1944 |
| 2,392,055 | Mennesson | Jan. 1, 1946 |