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Ishii

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[54] **CARBURETOR OF THE DIAPHRAGM TYPE HAVING A PRIMING DEVICE**

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[51] **Int. Cl.**..... **F02m 17/04**

[58] **Field of Search**..... 261/34 A, 36 A, 69, 261/69 A, 35, DIG. 68, DIG. 8, 179 G; 123/179 R, 180 R, 187.5, 136

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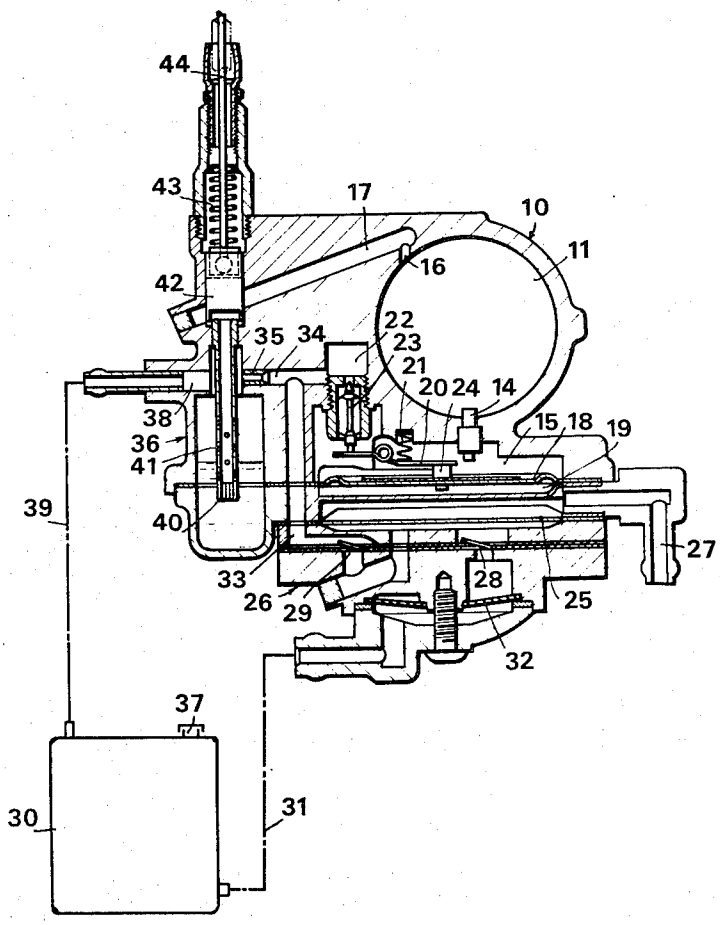
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[57] **ABSTRACT**

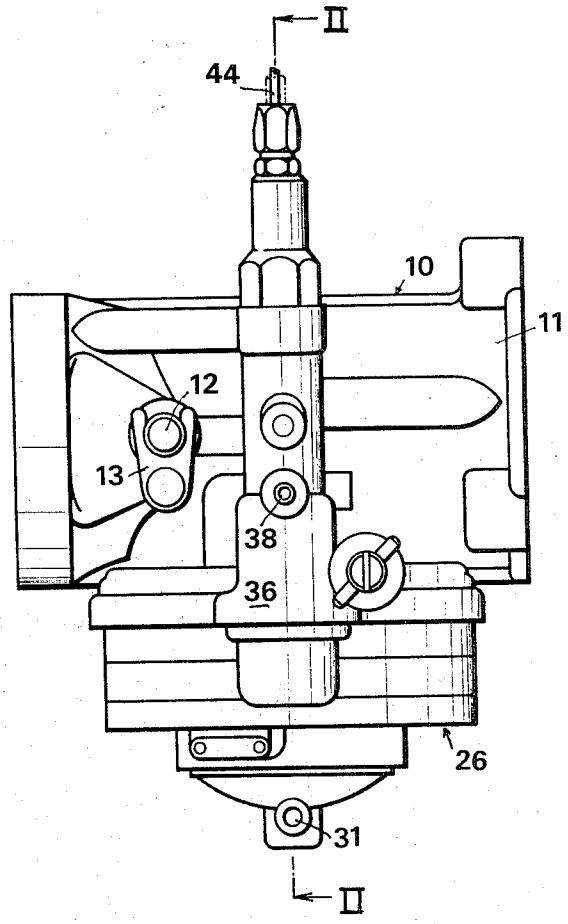
A carburetor of the diaphragm type comprising a passage branching off a fuel discharge passage communicating with a diaphragm chamber, a fuel well communicating with said passage, and a starting fuel passage connecting said fuel well with a mixing passage of the carburetor and having a starter valve mounted therein. The fuel well is adapted to receive a supply of fuel through said branched passage to store a predetermined quantity of fuel therein and the fuel stored in said fuel well is ejected into the mixing fuel passage through said starting fuel passage.

4 Claims, 2 Drawing Figures



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FIG.1



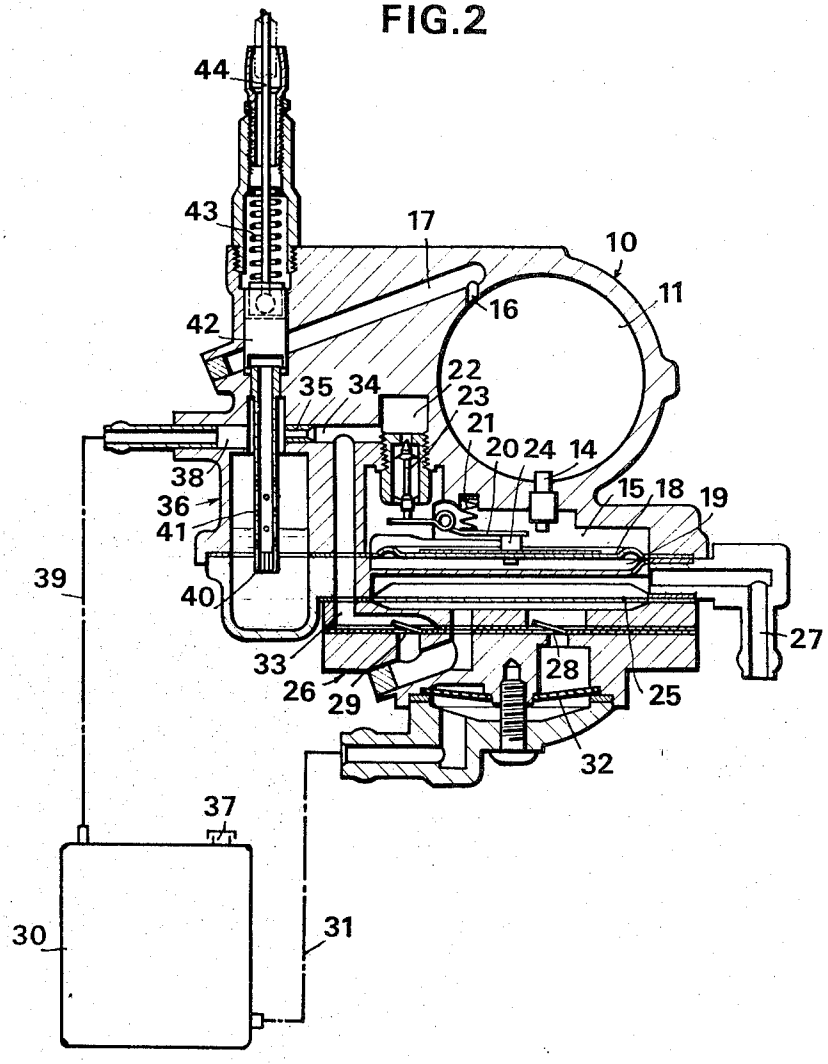
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FIG.2



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CARBURETOR OF THE DIAPHRAGM TYPE HAVING A PRIMING DEVICE

This invention relates to carburetors having a priming device. More particularly, the invention is concerned with improvements in or relating to carburetors of the diaphragm type for supplying a fuel by means of a fuel pump.

In carburetors of the diaphragm type which have no float chamber, fuel is delivered from a fuel tank to a diaphragm chamber, which is a main fuel chamber of the carburetor, by means of a fuel pump such as a plunger pump operably associated with the operation of an automobile engine or a negative pressure pump operably associated with the suction operation of an engine manifold. Carburetors of the diaphragm type described above have disadvantages. If the engine is shut off over a prolonged period of time, the fuel in the fuel pump leaks through a small gap in the valve seat of a suction valve or discharge valve and returns to the tank. With substantially no fuel in the fuel supply system for the carburetor, the engine does not start and priming is usually necessary in such case in order to successfully initiate the operation of the engine. However, the use of a priming pump makes the carburetor structure complex and complicates the operation for starting the engine.

Accordingly, an object of this invention is to provide a carburetor which permits to initiate the operation of an engine even when substantially all the fuel in a oil suction pipe of a fuel pump for the carburetor has been returned to a tank.

Another object of the invention is to provide a carburetor which comprises a fuel well provided in the main fuel supply system of the carburetor for storing therein a predetermined quantity of fuel at all times, so that when all the fuel in a fuel pump has returned to a fuel tank and there is no fuel left in the fuel pump following the shutting-off of an engine over a prolonged period of time the fuel in the fuel well can be ejected for facilitating the initiation of engine operation.

Still another object of the invention is to provide a carburetor of the diaphragm type which comprises a fuel well communicating with a passage branching off a fuel discharge passage communicating with a diaphragm chamber which is a main fuel chamber, for storing in said fuel well a predetermined quantity of fuel at all times while a fuel pump is in operation, whereby initiation of engine operation can be facilitated.

A further object of this invention is to provide a carburetor which comprises a starting fuel passage leading from the upper portion of a fuel well and a starter valve mounted midway in said starting fuel passage, so that when said starter valve is actuated the fuel in said fuel well can be ejected into a mixing passage of the carburetor through said starting fuel passage to thereby ensure that starting fuel is supplied to an engine.

Still further object of the invention is to provide a carburetor of the diaphragm type which comprises a fuel well formed with a fuel inlet communicating through a jet with a branch passage of a main fuel supply passage and a fuel outlet disposed opposite to the fuel inlet for returning excess fuel to a fuel tank, whereby a predetermined quantity of starting fuel can be stored in said fuel well at all times to thereby ensure that the starting fuel is ejected without fail.

Additional objects as well as features and advantages of this invention will become evident from the description set forth hereinafter when considered in conjunction with the accompanying drawings, in which:

FIG. 1 is a front view of the carburetor of the diaphragm type according to this invention; and

FIG. 2 is a view in section taken along the line II — II of FIG. 1 and seen in the direction of arrows.

In FIG. 1, the carburetor body generally designated 10 is formed with a mixing passage 11 therein. Mounted on a shaft 12 in the mixing passage 11 is a throttle valve (not shown) which is adapted to be opened and closed by an arm 13. Opening in the mixing passage 11 are a main nozzle 14 which communicates through a main jet with a diaphragm chamber 15 which is a main fuel chamber, and a duct 16 communicating with a starting fuel passage 17 (FIG. 2). Like ordinary diaphragm chambers, the diaphragm chamber 15 is partitioned by a diaphragm 18 from a lower chamber 19. A spring 21 is mounted on an actuation bar 20 pivoted in the diaphragm chamber 15 so that a needle valve 23 inserted in a fuel supply port 22 can be resiliently supported by one free end of the actuation bar 20. The other free end of the actuation bar 20 is maintained in contact with the top of a pin 24 provided in the central portion of the diaphragm 18 for pressing the diaphragm downwardly.

Provided in the lower portion of the carburetor body 10 is a fuel pump generally designated 26 which is in contact with a membrane chamber 25. The fuel pump 26 operates such that negative pressure pulsations are introduced from an engine manifold through a line 27 for causing the membrane to vibrate so as to thereby actuate a suction valve 28 and a discharge valve 29 alternately.

As the pump 26 operates, the fuel in a fuel tank 30 is passed through a fuel passage 31 and a filter 32, suctioned by the suction valve 28, discharged into a discharge passage 33 through the discharge valve 29 and introduced into the diaphragm chamber 15 through a fuel supply port 22.

As shown in FIG. 2, a branch passage 34 formed in the discharge passage 33 maintains communication with a fuel well 36 through a jet 35. It will be understood that as the fuel pump 26 operates fuel is supplied to the fuel well 36 through the branch passage 34 and jet 35 simultaneously as it is supplied to the diaphragm chamber 15 or main fuel supply chamber through the discharge passage 33 and fuel supply port 22. The fuel well 36 is formed with an inlet maintaining communication with the branch passage 34 through the jet 35 and an outlet 38 disposed opposite the inlet for connection with a line 39 communicating with the fuel tank 30. It will be understood that excess fuel in the fuel well 36 can be returned to the tank 30 through the outlet 38 and line 39 so that a predetermined quantity of fuel can be stored in the fuel well at all times. The fuel tank 30 is formed with a portion 37 for communicating with atmosphere so as to enable excess fuel in the fuel well 36 to be returned to the fuel tank 30.

Inserted in the fuel well 36 is a bleed pipe 40 which is formed with a number of small openings 41 in its wall as shown in FIG. 2. The bleed pipe 40 maintains communication, through a starter valve 42 mounted at the upper end of the pipe 40, with the starting fuel passage 17. The starter valve 42 is normally closed by the biasing force of a spring 43. As a starter valve actuation

cable 44 is operated, the starter valve 42 moves upwardly to thereby bring the pipe 40 into communication with the passage 17.

The operation of the carburetor constructed as aforementioned according to this invention will now be explained. Negative pressure pulsations produced by engine operation act on the membrane chamber 25 through the line 27 to thereby actuate the fuel pump 26. Actuation of the pump 26 results in the fuel in the fuel tank 30 being supplied through the passage 31, filter 32, suction valve 28 and discharge valve 29 to the discharge passage 33. The fuel is then supplied to the diaphragm chamber 15 through the needle valve 23 which opens in response to the operation of the diaphragm 18. Excess fuel enters the fuel well 36 through the jet 35 to fill the well. The portion of fuel which is in excess of the fuel required to fill the well 36 is returned to the fuel tank 30 through the outlet 38 and line 39. Thus, the fuel well 36 is filled with a predetermined amount of fuel during engine operation.

If the engine operation is stopped and the engine remains in the state over a prolonged period of time, the fuel in the fuel pump 26 will drop into the fuel tank 30 through the passage 31 so that the fuel pump 26 will be emptied of fuel. However, the diaphragm chamber 15 and fuel well 36 remain filled with fuel.

Accordingly, if the starter actuation cable 44 is pulled to open the starter valve 42 and initiate engine operation, the fuel in the fuel well 36 will be discharged into the mixing passage 11 through the bleed pipe 40 and fuel passage 17 by the negative pressure produced by the movement of engine piston. At this time, the fuel in the diaphragm chamber 15 is also discharged into the mixing passage 11 through the main nozzle 14. The supply of fuel from the diaphragm chamber 15 to the mixing passage 11 through the main nozzle 14 will soon be reduced in quantity because no fuel is delivered to the diaphragm chamber 15 by the fuel pump 26, but the majority of fuel required for initiating engine operation is delivered from the fuel well 36. Since the fuel from the fuel well 36 is subjected to air bleeding by the air in the upper portion of the tank moving in reverse flow through the line 39, so that atomization of fuel is promoted thereby and the air-fuel mixture produced in this way facilitates initiation of engine operation.

In the meantime, the fuel pump 26 is restored to its normal operating condition and delivers fuel to the diaphragm chamber 15 through the discharge passage 33. Therefore, if the starter valve 42 is closed by a resetting action of the cable, which action causes a pull-back of the cable to its initial position, the engine can be brought to a normal operating condition by the fuel delivered from the diaphragm chamber 15 through the main nozzle 14 to the mixing passage 11. Excess fuel in the discharge passage 33 finds its way through the branch passage 34 and jet 35 into the fuel well 36 which is filled with a predetermined quantity of fuel again. It is to be noted that the jet 35 functions such as to minimize influence exerted by fuel on the diaphragm chamber 15.

In the embodiment shown and described above, the fuel pump 26 is formed integral with the carburetor body 10. It is to be understood, however, that the fuel pump 26 may be formed independently of the carburetor body 10. The fuel pump of the aforementioned embodiment has been described as a negative pressure pump operated by the negative pressure produced in the engine manifold. It is to be understood, however, that the invention is not limited to this type of fuel pump and that the fuel pump used in this invention may be a mechanically operated fuel pump operative in response to engine operation.

The pipe 40 may be one which has no small openings formed in the wall if it is not required to perform the function of air bleeding. The actuation means for the starter valve 42 is not limited to the cable shown and described in the specification. Any other suitable means such as pushbutton may be used.

The carburetor which is constructed as aforementioned according to this invention has distinct advantages. A predetermined quantity of fuel required for initiating engine operation can be automatically stored in the fuel well during normal engine operation. This arrangement permits to successfully initiate engine operation even in cases where substantially all the fuel in the fuel pump has dropped into the fuel tank during engine shut-off. The ability of the carburetor to successfully initiate engine operation can thus be markedly improved.

I claim:

1. In an engine carburetor of the diaphragm type including a mixing passage for supplying a fuel mixture to said engine, a diaphragm chamber through which fuel is supplied to said mixing passage during normal engine operation, and means including a fuel pump and a fuel passage for supplying fuel from a fuel tank to said diaphragm chamber, the combination comprising a fuel well for containing at least a quantity of fuel sufficient when combined with fuel from said fuel passage to effect engine start-up, means including a fuel well supply passage branched from said fuel passage for maintaining communication between said fuel well and said fuel passage by operation of said fuel pump during normal engine operation, means including a starting fuel discharge passage and a starter valve for delivering fuel from said fuel well to said mixing passage during engine start-up said starter valve being operative to be shut when said engine achieves a predetermined normal operating level, and fuel well discharge means for continuously delivering fuel in excess of a predetermined level from said fuel well back to said fuel tank to prevent the supply of fuel in said fuel well from exceeding said predetermined level.

2. A carburetor according to claim 1 comprising jet means located in said branched fuel well supply passage between said fuel well and said diaphragm chamber to control the effect upon said diaphragm chamber of fuel flowing in said branch passage to said fuel well.

3. A carburetor according to claim 1 comprising means including a spring for biasing said starter valve in a closed condition to prevent fuel flow from said fuel well to said mixing passage, and starter valve actuating means for opening said starter valve against the biasing force of said spring during engine start-up to selectably enable fuel flow from said fuel to said mixing passage during start-up.

4. A carburetor according to claim 1 comprising a bleed pipe through which fuel discharges from said fuel well, said bleed pipe including a plurality of small openings in the well thereof.

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