Dec. 22, 1959 D. M. TEAGARDEN 2,918,046

PRESSURE CARBURETOR

Filed June 17, 1957 2 Sheets-Sheet 1

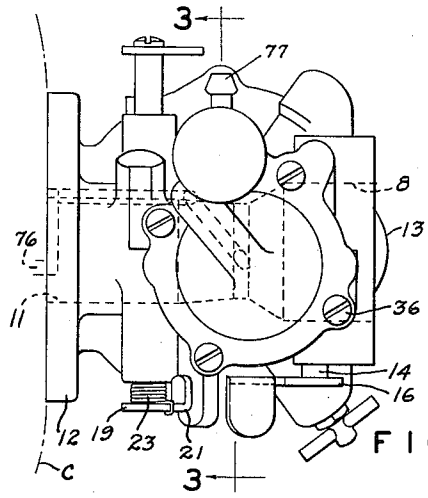


FIG. 1.

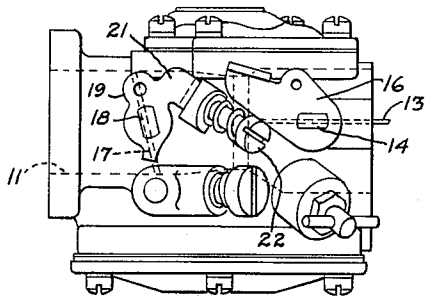


FIG. 2.

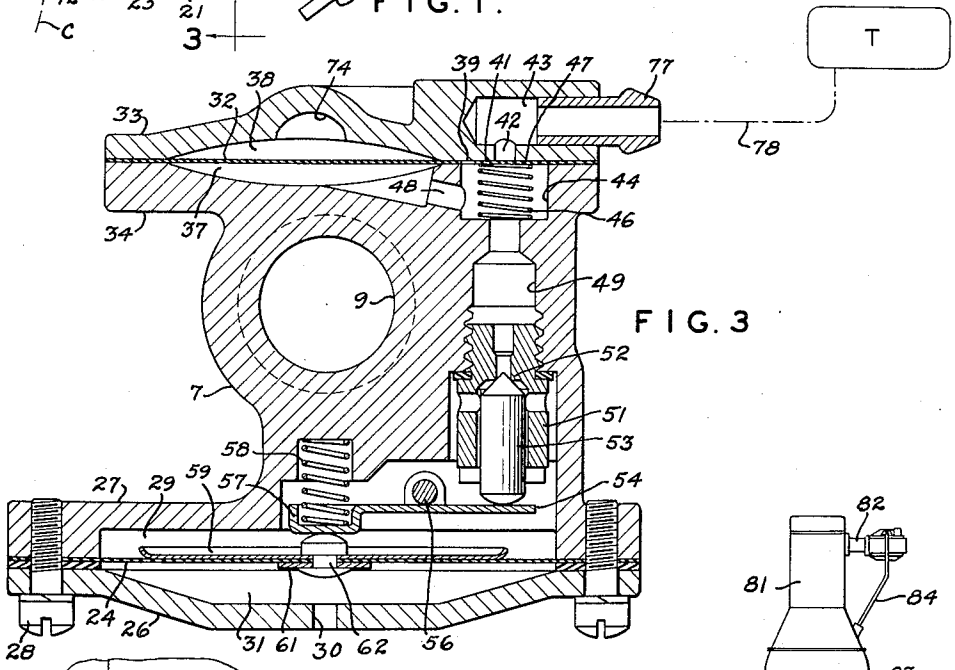


FIG. 3

FIG. 10.

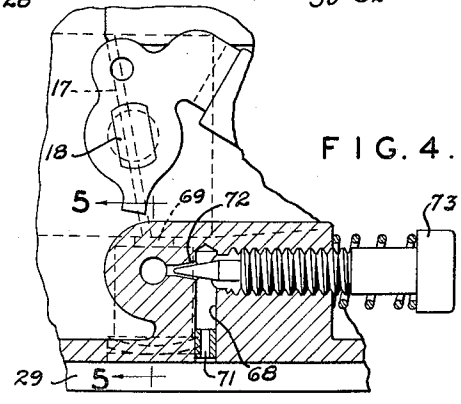


FIG. 4.

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Dec. 22, 1959 D. M. TEAGARDEN 2,918,046

PRESSURE CARBURETOR

Filed June 17, 1957 2 Sheets-Sheet 2

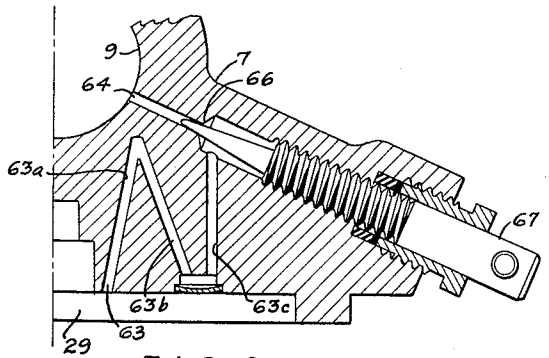


FIG. 6.

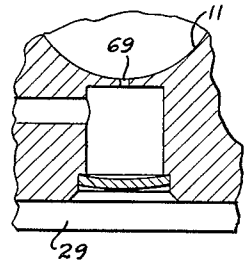


FIG. 5.

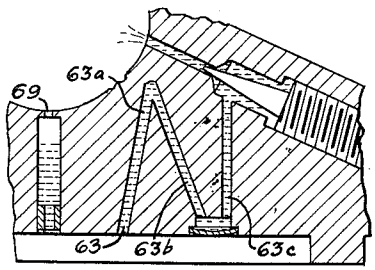


FIG. 7.

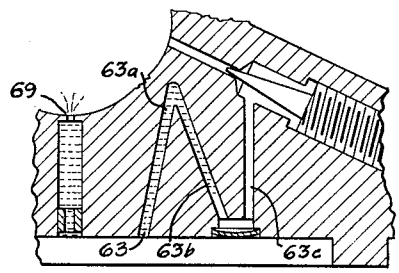


FIG. 8.

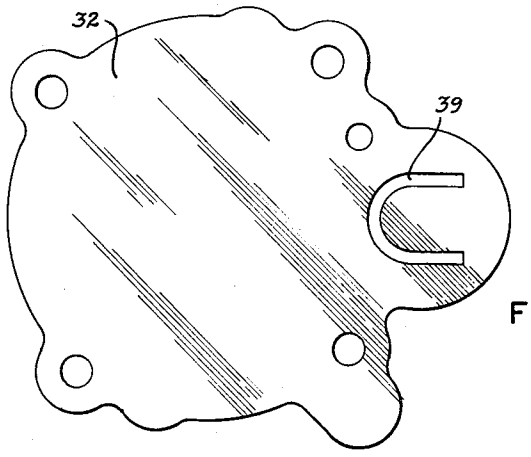


FIG. 9.

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2,918,046

PRESSURE CARBURETOR

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Application June 17, 1957, Serial No. 666,049

8 Claims. (Cl. 123—119)

This invention relates to fuel systems for internal combustion engines and more particularly to a combined carburetor and fuel pump unit.

An object of the invention is to provide a combined carburetor and pump unit operable in various positions to supply a fuel mixture to internal combustion engines employed to drive power saws, lawn mowers, and other devices.

Another object of the invention is to provide a combined carburetor and pump unit of the diaphragm type operable responsive to pressure pulsations from an engine to deliver fuel in sufficient quantities of satisfy engine requirements.

A further object of the invention is to provide a charge forming device having a fuel sump to prevent a back bleed of air through the main fuel nozzle during idling operation of the engine.

Another object of the invention is to provide a combined carburetor and pump unit adapted for use on either two or four cycle engines.

The invention embodies other novel features, details of construction, and arrangement of parts which are hereinafter set forth in the specification and claims, and illustrated in the accompanying drawings, wherein:

Fig. 1 is a top plan view illustrating a combined carburetor and pump unit embodying features of the invention, the unit being shown as mounted on the crankcase of a two-cycle engine to supply a fuel mixture thereto.

Fig. 2 is a side elevation of same.

Fig. 3 is an enlarged transverse sectional view taken along the line 3—3 of Fig. 1.

Fig. 4 is an enlarged fragmentary vertical sectional view illustrating the idle fuel passage and the idling adjustment screw.

Fig. 5 is a detail sectional view taken along the line 5—5 of Fig. 4.

Fig. 6 is an enlarged fragmentary vertical sectional view illustrating the main fuel nozzle as connected to the fuel chamber by a tortuous N-shaped passage to prevent back bleed of air through the nozzle to the fuel chamber during idling of the engine.

Fig. 7 is a diagrammatic sectional view, corresponding to Fig. 6, illustrating the fuel flow from the fuel chamber to the main fuel nozzle when the throttle valve is opened.

Fig. 8 is a view, corresponding to Fig. 7, illustrating the manner in which fuel in the tortuous main fuel passage serves to prevent back air bleed through the main fuel nozzle to the fuel chamber when fuel is being discharged through the idle port into the mixing conduit.

Fig. 9 is a detail plan view of the pump diaphragm.

Fig. 10 is a diagrammatic view showing the combined carburetor and pump unit as applied to a four-cycle internal combustion engine.

Referring now to the drawings for a better understanding of the invention, and more particularly to Figs. 1 to 6 therein, the combined carburetor and fuel pump unit is shown as comprising a body 7 formed with a

mixing passage having an inlet 8, a venturi 9, and an outlet 11. A flange 12 is provided on the body 7 for bolted engagement on a crankcase C of a conventional two-cycle internal combustion engine to supply a fuel mixture from the mixture conduit into the crankcase during operation of the engine.

A choke valve 13 is provided in the inlet 8 and secured to a shaft 14 journaled at its ends in the body 7. A choke control lever 16 is secured on one end of the shaft 14 for rotating the choke valve 13 between its open and closed positions.

A throttle valve 17 is provided in the outlet 11 and secured to a shaft 18 journaled at its ends in the body 7. A throttle control lever 19 is secured to one end of the shaft 18 and formed with an arm 21 for abutting engagement against an idle adjustment screw 22 on the body 7 when the throttle valve is disposed in its idle position. A helical torsion spring 23 is mounted on the shaft 18 to yieldably resist movement of the arm 21 away from the idle adjustment screw 22, one end of the spring being secured to the body 7 and the other end thereof engaging the stop arm.

A flexible, resilient, pressure sensing diaphragm 24 has its marginal portion clamped between a base plate 26 and a lower flange 27 on the body 7 by means of cap screws 28. As illustrated in Fig. 3, the diaphragm serves as a movable partition between a fuel chamber 29 in the body and an atmospheric chamber 31 in the base plate. The base plate is provided with an air vent 30. The diaphragm is preferably of the type shown and described in Patents 2,595,127 and 2,734,009, comprising a textile fabric coated on both sides with cured synthetic rubber.

A flexible, resilient pump diaphragm 32 has its marginal portion clamped between a cover 33 and an upper flange 34 on the body by means of cap screws 36, and is preferably formed of diaphragm material of the type disclosed in the above mentioned patents. The diaphragm 32 provides a movable partition between a pump chamber 37 in the body 7 and an impulse chamber 38 in the cover 33.

As illustrated in Figs. 3 and 6, the diaphragm 32 is slotted at 39 to form a flap inlet check valve 41 for a valve port 42 leading from a main fuel inlet 43 into a fuel transfer chamber 44 having a compression spring 46 therein to yieldably resist movement of the check valve from its seat 47. A common fuel inlet-outlet passage 48 is provided in the body 7 between the transfer chamber 44 and the pump chamber 37, and a main fuel inlet passage 49 leads from the fuel transfer chamber to the fuel chamber 29. It will be noted that the transfer chamber 44 forms part of the main fuel inlet passage 49 which communicates with the pump chamber 37 by means of the single inlet-outlet fuel passage 48, whereby movements of the pump diaphragm 32 cause fuel to flow back and forth in the passage 48.

A needle valve body 51 is threaded into the outlet end of the main fuel inlet passage 49 and formed with a restricted port 52 and an annular valve seat. A needle valve 53 is slidably mounted in the valve body and formed with a tapered end to engage the valve seat, the other end of the valve being rounded for engagement by one end of an inlet control lever 54. The needle valve is adapted to be inexpensively manufactured from nylon rod stock, and provided with a rather blunt tapered end having a taper of, for example, 45° to prevent sticking of the tapered end in the valve seat.

The control lever 54 is pivotally mounted intermediate its ends upon a pivot pin 56 secured to the body 7, and is provided with a spring seat 57 to receive one end of a compression spring 58 having its other end seated against the body 7. Disks 59 and 61 are secured to

opposite sides of the pressure sensing diaphragm 24 by means of a rivet 62 which is adapted to engage the spring seat end of the control lever 54 to open the needle valve 53.

A main fuel outlet passage 63 leads from the fuel chamber 29 to a fuel discharge orifice 64 opening into the throat of the venturi 9. A valve seat 66 is formed in the body 7 at the entrance to the orifice 64 to receive the tapered end of a high speed adjustment screw 67 threaded into the body 7.

As illustrated in Figs. 6, 7, and 8, the main fuel outlet passage 63 extends upwardly at 63*a* from the fuel chamber 29, then downwardly at 63*b*, and thence upwardly at 63*c* to prevent back bleeding of air during idling operation of the engine.

The body 7 is also provided with an idle fuel passage 68 leading from the fuel chamber 29 to an idle port 69. A restricted orifice 71 is provided at the inlet end of the passage 68, and an idle adjustment orifice 72 is provided in the idle passage between the orifice 71 and port 69 to receive the tapered end of an idle adjustment screw 73 threaded into the body 7. The idle port 69 leads into the outlet 11 of the mixing conduit, and is located adjacent the edge of the throttle valve 71 when the latter is disposed in its idle position, as illustrated in Fig. 4.

An air passage 74 leads through the cover 33 and body 7 from the impulse chamber 38 to an opening 76 in the crankcase C of the engine. A nipple 77 is mounted in the main fuel inlet 43 to receive one end of a fuel line 78 leading to a fuel tank T.

In the operation of the combined carburetor and fuel pump thus described, pressure pulsations within the crankcase C of a two-cycle internal combustion engine are transmitted through the passage 74 and impulse chamber 38 to the pump diaphragm 32 to cause a flow of fuel from the inlet 43 past the check valve 41 into and through the fuel passage 49 and thence past the needle valve 53 into the fuel chamber 29.

During high speed operation of the engine, fuel is delivered from the fuel chamber 29 through the main fuel passage 63 into the throat of the venturi 9 during each induction stroke of the engine, at which time the differential in pressure on opposite sides of the diaphragm 24 causes the latter to engage and pivot the control lever 54 in a direction to open the needle valve 53. After each induction stroke, the spring 58 acts through the lever 54 to close the needle valve 53.

During idling of the engine, fuel is delivered from the fuel chamber 29 through the idle passage 68 and port 69 to the outlet 11 of the mixing passage. As illustrated in Fig. 8, it will be noted that some fuel will be trapped in the passage 63 to prevent back bleeding of air during idling operation of the engine.

In the operation of the combined carburetor and pump unit, it will be noted that the flow of fuel from the inlet 43 to the fuel chamber 29 is controlled by the inlet check valve 41 and needle valve 53. As the pump diaphragm 32 and pressure sensing diaphragm 24 are both actuated during each induction stroke of the engine, it would appear to be necessary to provide an outlet check valve for the pump to be located in the passage 49. As the unit shown and described has proven to be operative in supplying sufficient fuel to an engine to satisfy its requirements, it appears that the pump must draw in fuel from the fuel inlet 43 prior to opening of the needle valve 53 by the diaphragm 24. Such an operation may be due to an excessive quantity of fuel in the fuel chamber 29, which delays engagement of the diaphragm 24 against the lever 54 until the pump diaphragm has acted to draw fuel into the passage 49. The unit shown and described is adapted to operate efficiently without a reverse flow check valve in the fuel outlet passage 63.

Fig. 10 illustrates schematically a modified form of the invention in which the combined carburetor and pump unit is shown as applied to a one cylinder, four-cycle internal combustion engine 81 having an intake manifold 82 and a crankcase 83. In this form of the invention, the flange 12 is bolted to the manifold 82, and a conduit 84 leads from the crankcase 83 to the impulse chamber 38 of the pump, whereby pressure pulsations in the crankcase are transmitted to the pump diaphragm 32. This form of the invention is otherwise similar to the form heretofore shown and described.

Certain structures have been described herein which will fulfill all the objects of the present invention, but it is contemplated that other modifications will be obvious to those skilled in the art which come within the scope of the invention as defined by the appended claims.

I claim:

1. In a fuel system for an internal combustion engine, a carburetor body having a mixing passage and a fuel chamber, a resilient pressure sensing diaphragm forming one wall of said chamber, a fuel inlet passage leading to said chamber, a fuel outlet passage leading from said chamber to said mixing passage, a diaphragm pump operable responsive to pressure pulsations from the engine for supplying fuel under pressure through said inlet passage into said chamber, a valve in said fuel inlet passage controlled by said pressure sensing diaphragm and serving as an outlet check valve for said pump, an idle fuel passage leading from said fuel chamber to said mixing passage, said fuel outlet having a fuel sump normally filled with liquid fuel to prevent back air bleed when fuel is being discharged from said idle fuel passage into said mixing passage.

2. In a combined carburetor and pump unit, a carburetor body having a fuel chamber and mixing passage interconnected by a main fuel passage and an idling fuel passage, said main fuel passage defining a fuel sump to prevent back bleed of air therethrough, a pump having a resilient diaphragm operable responsive to pressure pulsations for supplying fuel under pressure to said fuel chamber, and means including a resilient pressure sensing diaphragm forming one wall of said fuel chamber operative to supply fuel to an engine in sufficient quantities to satisfy engine requirements.

3. In a combined carburetor and pump structure for supplying fuel to an internal combustion engine, a body having a fuel mixing passage, a pressure sensing diaphragm having its marginal portion clamped against one side of said body by an apertured base plate to define a fuel chamber and an atmospheric chamber, a pump diaphragm having its marginal portion clamped against the opposite side of said body by a cover to define a pump chamber and an impulse chamber, an inlet fuel passage in said body leading to said fuel chamber, an inlet check valve at the inlet end of said inlet fuel passage, a needle valve at the outlet end of said inlet fuel passage actuated by said pressure sensing diaphragm to control the flow of fuel into said fuel chamber, a main fuel outlet passage and an idling fuel passage leading from said fuel chamber to said mixing passage, a common inlet-outlet passage connecting said pump chamber and said fuel inlet passage between said inlet check valve and said needle valve whereby said needle valve serves as an outlet check for the pump, and means providing a passage for pressure pulsations from an engine to said impulse chamber, said main fuel outlet passage being generally N-shaped to provide a fuel sump to prevent back air bleed therethrough.

4. In a combined carburetor and pump unit, a carburetor body having a fuel chamber and mixing passage interconnected by a main fuel passage and an idling fuel passage, a pump having a resilient diaphragm operable responsive to pressure pulsations for supplying fuel under pressure to said fuel chamber, and means including a resilient pressure sensing diaphragm forming one wall of said fuel chamber operative to supply fuel to an engine in sufficient quantities to satisfy engine require-

ments, said pressure sensing diaphragm coacting with a pump outlet check valve to control the flow of fuel to said fuel chamber, said main fuel passage extending zig-zag to provide a fuel sump to prevent back bleed of air from the mixing passage to the fuel chamber when fuel is being discharged through the idling fuel passage.

5. In a pressure-type carburetor, a body providing a fuel chamber and mixing passage interconnected by a main fuel passage and an idling fuel passage, said main fuel passage providing a fuel sump to prevent back bleeding of air from said mixing passage to said fuel chamber during discharge of fuel through said idling fuel passage.

6. In a pressure-type carburetor, a body providing a fuel chamber and mixing passage interconnected by a main fuel passage and an idling fuel passage, said main fuel passage being zig-zag to provide a fuel sump to prevent back bleeding of air from said mixing passage to said fuel chamber during discharge of fuel through said idling fuel passage.

7. In a pressure type carburetor, a body structure having a mixing passage defined thereby, a fuel chamber for containing fuel under pressure, a main fuel passage connecting the fuel chamber and the mixing passage, said main fuel passage including a fuel sump for normally containing fuel to provide a liquid seal to prevent back bleeding of air from said mixing passage to said fuel chamber, and an idling fuel passage connecting said fuel chamber and said mixing passage.

8. The structure of claim 7, characterized in that the main fuel passage and the idling fuel passage are provided with means for regulating the flow of fuel therethrough.

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