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3,556,687

FUEL PUMP FOR SMALL ENGINES

Filed May 21, 1969

2 Sheets-Sheet 1

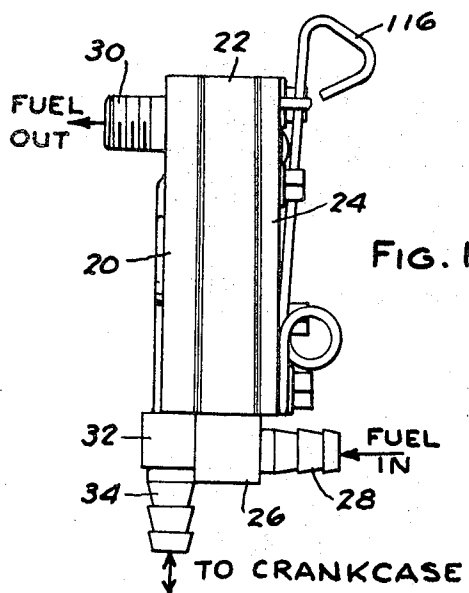


FIG. 1

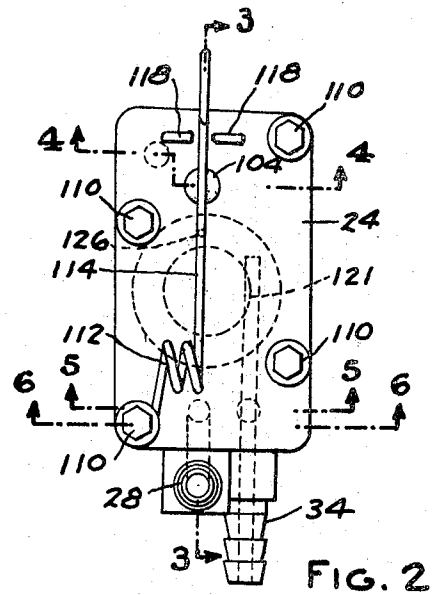


FIG. 2

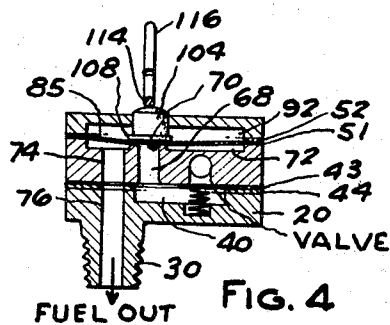


FIG. 4

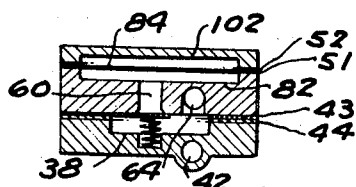


FIG. 5

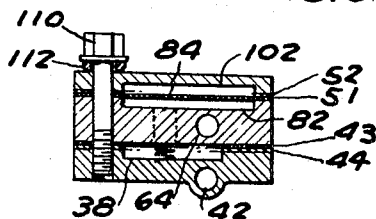


FIG. 6

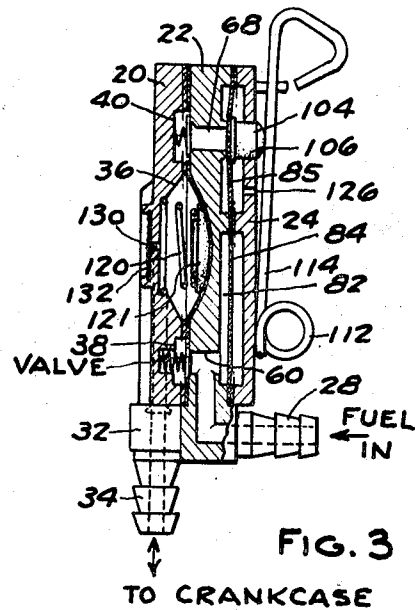


FIG. 3

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2 Sheets-Sheet 2

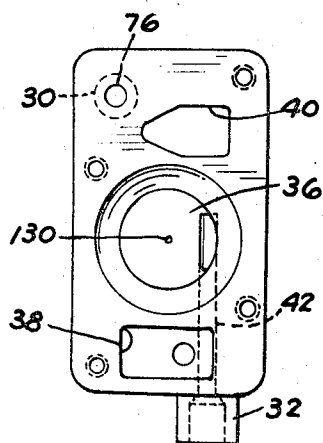


FIG. 8

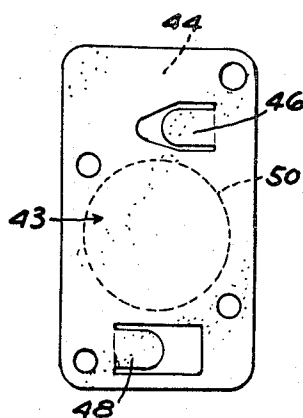


FIG. 10

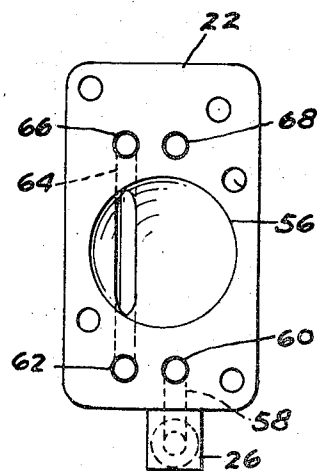


FIG. 12

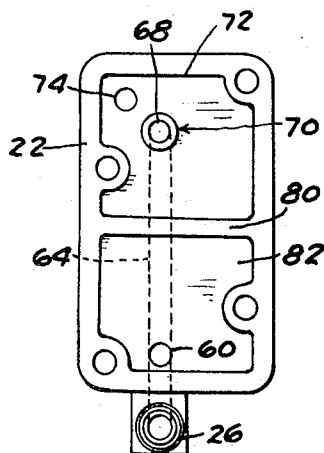


FIG. 9

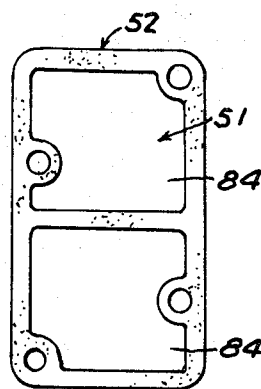


FIG. 11

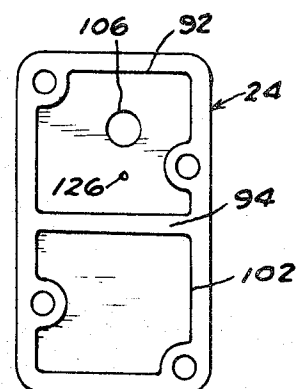


FIG. 13

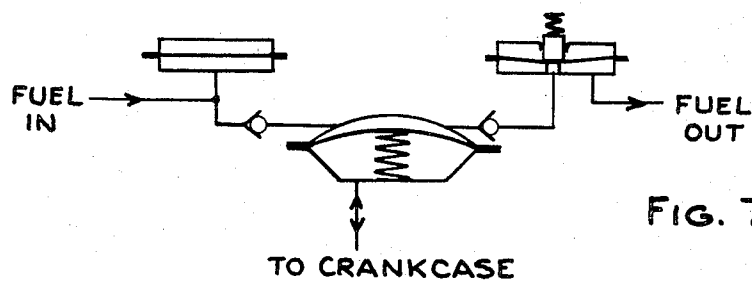


FIG. 7

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FUEL PUMP FOR SMALL ENGINES

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8 Claims

ABSTRACT OF THE DISCLOSURE

A pump and booster combination unit for supplying fuel to small engines utilizing engine pulsations as motive force and embodied in a housing independent of the carburetor or engine housing. The unit uses a three-part sandwich construction with diaphragms trapped between the parts which form the pumping and booster recesses, there being an exterior control for moving a diaphragm to a close-off position at the fuel outlet, and an external locking device for maintaining the control in the close-off position.

This invention relates to a fuel pump which is used primarily for small engines such as are used on power mowers, go-carts, snowmobiles, outboard engines and the like. The pump is a self-contained unit which is operated by crankcase impulses from the engine which it is to serve.

Pumps of this general nature have been used in the past, but the present design is intended to be an improvement in a pump and booster unit formed in a housing independent of a carburetor and engine with a compact relationship of the passages and chambers together with the sandwich-type construction which permits easy assembly and easy repair. The device also includes a system for external shut-off which is used in cooperation with a diaphragm in the unit to make it possible to cut off fuel for shipment or storage purposes.

Other objects and features of the invention relating to the principles of operation and the details of construction relative to the best mode contemplated for the performance of the invention will be found in the following description and claims.

Drawings accompany the disclosure and the various views thereof may be briefly described as:

FIG. 1, a side elevation of the pump.

FIG. 2, an elevational view of the pump from a top view.

FIG. 3, a sectional view on line 3—3 of FIG. 2.

FIGS. 4, 5, and 6, sectional views on lines 4—4, 5—5 and 6—6 of FIG. 2.

FIG. 7, a diagrammatic view of the pump circuit.

FIG. 8, a top view of a bottom member of a pump as disassembled.

FIG. 9, a top view of the central member of the pump disassembled.

FIG. 10, a view of a diaphragm and valve sheet and gasket.

FIG. 11, a view of a diaphragm sheet and sealing gasket.

FIG. 12, a bottom view of the central member of the pump.

FIG. 13, a bottom view of the upper member of the pump.

Referring to the drawings:

The pump is shown in FIG. 1 from a side edge and in FIG. 2 from a top view. While it will be appreciated that the pump can be oriented in any of numerous positions, the words "top" and "bottom" and "side" will be used to facilitate the following description.

In FIG. 1, a bottom plate 20 lies against a central plate 22 on the other side of which is a top plate 24. The central plate has a projection 26 from which extends a con-

necting nipple 28 for a fuel supply. This is designated as a "Fuel In" port. At the upper left-hand corner of FIG. 1 there is shown extending from the bottom plate 20 an outlet 30 which is designated as a "Fuel Out" port.

At the lower portion of FIG. 1 a projection 32 has extending therefrom a connecting nipple 34, this being a connection for the crankcase impulse. The bottom plate is shown in section in FIG. 3 and in plan view in FIG. 8. It has a dish recess 36 centrally thereof and at one end a rectangular valve chamber 38 and at the other end a valve chamber 40 which at one end has a tapered nose shape. The connector 32 has a passage 42 leading to the recess 36. Between the lower element 20 and the central element is a combination diaphragm and valve sheet 43 and gasket 44 illustrated in FIG. 10. This sheet 43 has a valve tongue 46 which will overlie the chamber 40 and a valve tongue 48 which will overlie the chamber 38. The portion of sheet 43 shown within the circular opening 50 in the gasket 44 will serve as a diaphragm overlying the recess 36. A second diaphragm sheet 51 and spacer gasket 52 shown in FIG. 11 are utilized between the elements 22 and 24 as will be later described.

The central element 22 is illustrated in FIG. 12, this being the view of the bottom surface of this element which as viewed in FIG. 12 would be rotated 180° to overlie the member shown in FIG. 8. This element 22 has on its bottom surface a recess 56 which registers with the recess 36 and overlies the diaphragm 50. The fuel inlet connection is shown at 26 with a passage 58 extending to a port 60 which will overlie the chamber 38. The port 60 is connected to a second port 62 through the valve 48 which would normally close the port 60 during the pressure cycle and open it during the intake cycle.

The port 62 leads through a passage 64 to a port 66 on the other side of the recess 56 which would normally be closed by the valve flap 46. Fuel being pumped will pass the valve 46 through the chamber 40 to a port 68 which passes through the central member to terminate in a seat 70 formed in a shallow chamber 72 in the top surface of the central member as shown in FIG. 9. This chamber 72 has an outlet port 74 which leads downwardly (FIG. 4) to the "Fuel Out" passage 76 in the bottom plate 20.

A septum wall 80 extending transversely of the top of the central element 22 forms another shallow chamber 82 as shown in FIG. 9, this chamber being open to the port 60 previously described in connection with the fuel inlet (FIG. 3). A diaphragm 84 as a part of diaphragm sheet 51 overlies the entire top surface of the central member 22 and a secondary gasket 52 as shown in FIG. 11 may also overlie this diaphragm sheet to reinforce the edges and create additional clearance. The bottom of the upper member 24 is shown in FIG. 13 having a recess 92 which will overlie the recess 72 when the plate 24 is moved 180° from its position in FIG. 13 to overlie the central plate 22 as shown in FIG. 9.

A septum 94 divides the bottom of the top plate 24 into a second chamber 102 which overlies the recess 82 of the middle plate as shown in FIG. 9. A diaphragm 85 as a portion of sheet 51, at the position above chamber 72, has a button 104 affixed thereto, this button being preferably formed of a plastic material such as nylon and passing through an opening 106 in the plate 24. A bottom retainer flange 108 on the bottom is dimensioned to be slightly larger than the valve seat 70 so that pressure on the bottom will seat the diaphragm 85 on the valve seat 70, thus closing the passage 68 (see FIGS. 3 and 4).

The parts as above described are held together by four assembly bolts 110 which transfix the parts and are threadably anchored in the bottom plate 20. Captive under the head of bolt 110 is a loop of a spring 112 as shown in FIG. 2, this spring having a coil por-

tion which terminates in an arm 114 extending along the top of the plate 24 to terminate in a finger-loop 116. The top of this plate has two lugs 118 with a space between them so that when the arm 114 is positioned in this space, it will be directly over the button 104 and exert downward pressure on it, thus forcing the diaphragm 85 against the seat 70. When the spring arm 114 is lifted and moved to either side of the lugs 118, it will not have any influence on the bottom and the diaphragm 85 can fluctuate in a normal way.

As shown in FIG. 3, there is also a coil spring 120 which is seated in the bottom of the recess 36 at its lower end and which at its top end carries a plastic button 121 which bears against the diaphragm 50.

Also as shown in FIGS. 4 and 6, small coil springs are respectively positioned to create a little more positive action on the flap valves 46 and 48. As shown in FIG. 3, a small vent hole 126 can be utilized in the top of chamber 92 when the button 104 is not used as a valve actuator. Also, a small air vent 130 is provided for pulsation chamber 36 covered by an air filter disc 132 staked in position. In some areas where a heavy oil is used in engines, it may have a tendency to collect in the impulse line at low temperatures. The vent 130 permits a clear return pulse to prevent hard starting and starvation of an engine.

The chamber 102 provides an inlet booster chamber over the inlet valve while the chamber 92 provides an outlet booster chamber over the outlet valve. The shut off provided by the button 104 and the locking arm effects a cut-off of flow through the pump, a shut off of the tank should it be in a position to maintain a fluid head on the pump, and also prevents drain back of fuel which might destroy the prime of the pump.

What is claimed as new is as follows:

1. A pump and booster combination for supplying fuel to small engines by reason of engine pulsations which comprises:

- (a) a base plate having formed therein a pulsation chamber open to one surface and an external connection having a passage leading to said chamber to convey engine pulsations to said chamber, and a valve pocket on each side of said chamber open to said surface,
- (b) a central plate having one side to overlie said surface of said base plate, said side having a pulsation chamber to register with the pulsation chamber of said base plate and having ports overlying said valve pockets of said base plate and extending through said central plate to an opposite side, said opposite side having spaced recesses with the border thereof, each to serve as a portion of a booster chamber, each recess respectively being open to one of said ports, one of said recesses being connected to a fuel outlet port, and an external connection having a passage leading to one of said ports to serve as a fuel inlet,
- (c) a top plate having a surface to overlie said opposite side of said central plate, said top plate surface having formed therein spaced recesses to register with said spaced recesses of said central plate,
- (d) a diaphragm sheet between said base plate and said central plate having a portion to serve as a flexible wall in said pulsation chamber and having portions to serve as unidirectional valves at said ports overlying said valve pockets, and
- (e) a diaphragm sheet between said central plate and said top plate having portions to serve as flexible walls in respective booster chambers formed

by the registry of said spaced recesses in said central and top plates.

2. A pump and booster combination as defined in claim 1 in which a valve seat is formed around a port in said central plate in the recess which is connected to the said fuel outlet port, and means is provided to move said diaphragm portion overlying said last-named recess to a position to close said valve seat to block off said fuel outlet port.

3. A pump and booster combination as defined in claim 2 in which resilient means is provided to selectively bias said means to a closed position on said valve seat.

4. A pump and booster combination as defined in claim 2 in which said means comprises a button having a portion projecting from said top plate and a portion overlying said valve seat wherein pressure on said button causes said diaphragm portion to close said valve seat.

5. A pump and booster combination as defined in claim 2 in which a resilient means anchored on said top plate has a portion selectively movable to bear against said button to close said valve.

6. A pump and booster combination for supplying fuel to small engines by reason of engine pulsations which comprises:

- (a) a housing having a pumping chamber, an inlet booster chamber and an outlet booster chamber formed therein, each chamber having a flexible diaphragm positioned to divide the chamber into two portions,
 - (b) a crankcase pulse passage connected to one portion of said pumping chamber,
 - (c) a fuel inlet passageway having a unidirectional valve therein and connected to one of said booster chambers and to the other portion of said pumping chamber,
 - (d) a fuel outlet passageway having a unidirectional valve therein and connected to the other of said booster chambers and to said other portion of said pumping chamber,
 - (e) means in said other booster chamber interposed between pumping chamber and the end of said outlet passageway serving as a close-off valve in cooperation with a diaphragm in said other of said booster chambers, and
 - (f) means accessible externally of said housing to permit manual actuation of said last-named diaphragm to close said outlet fuel passageway.
7. A pump and booster combination as defined in claim 1 in which an atmospheric vent is provided in the pulsation chamber below the diaphragm and calibrated to admit atmospheric pressure to said chamber without interfering with the pulsative forces thereon.
8. A pump and booster combination as defined in claim 6 in which an atmospheric vent is provided in the pulsation chamber below the diaphragm and calibrated to admit atmospheric pressure to said chamber without interfering with the pulsative forces thereon.

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R. E. GLUCK, Assistant Examiner

U.S. Cl. X.R.