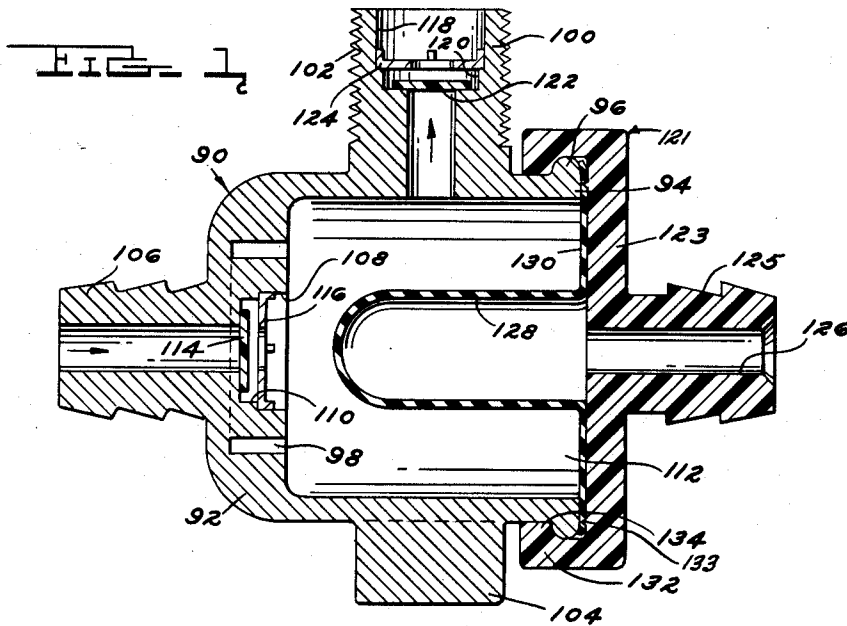
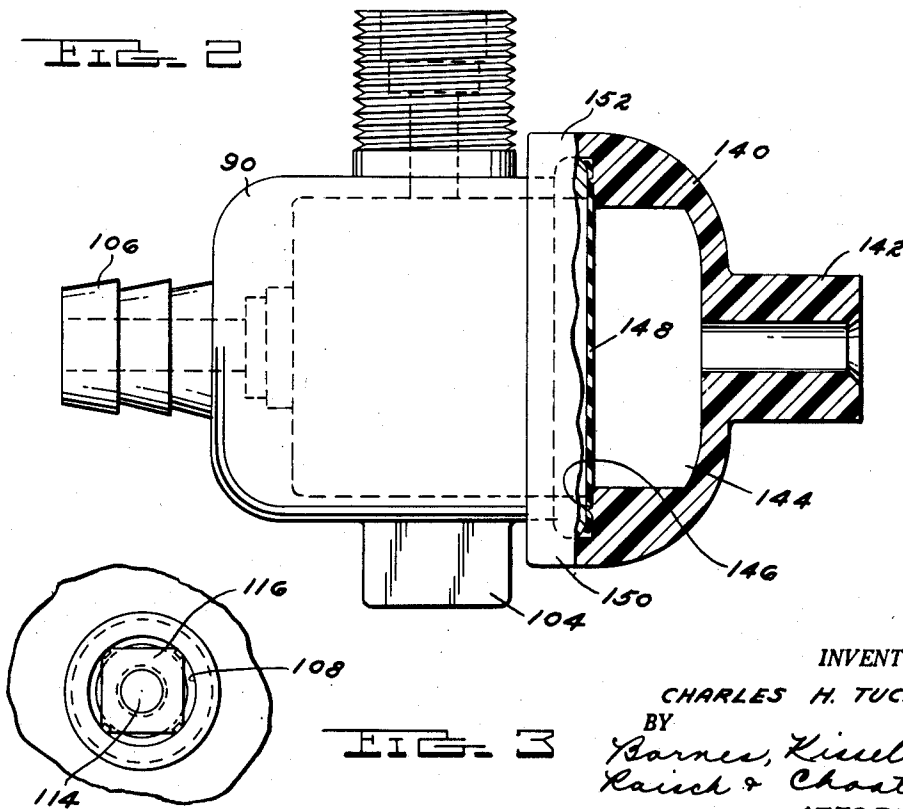


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BLADDER FUEL PUMP

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BLADDER FUEL PUMP

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This invention relates to a bladder fuel pump and is directed to the creation of a small, simple fuel pump for small engines.

This application is related to a co-pending application Serial No. 766,614, filed October 10, 1958, now matured into Patent No. 2,984,188, issued May 16, 1961.

In the use of small engines for chain saws and other small appliances, frequently it is necessary to tip the engines to various angles even to the extent of complete inversion. Thus with a gas tank below the carburetor, an engine will soon stop unless means is provided to supply fuel to the carburetor. Also in the design of non-invertible engines it still may be desirable to place the fuel supply below the carburetor for design reasons relating to cost and appearance.

With cost a vital factor in the design of these engines in what is now a highly competitive industry, it has become a problem to provide a simple and effective pump to move fuel up into a carburetor from a fuel supply.

The present invention is a result of this problem and has for its object a simple design, inexpensive, and efficient.

A further object of the invention is a provision of a pump housing having a fastening mechanism directly associated therewith and one which is adaptable for use with a bladder type diaphragm and also with a modified head for use with a flat type of diaphragm.

It is a further object to provide a pump in which the retaining cap is provided with means to circumferentially engage a diaphragm edge to hold it in extended position.

Another object is the provision of simplified valve mechanism for the pump which provides an effective valve with an extremely low cost.

Briefly, the invention comprises a pump to be operated from the crankcase having a bladder type pulsator and so constructed that it may be made very small and inserted directly in a fuel line or screwed into the carburetor. The entire pump can be about one inch long and three-fourths of an inch in diameter.

Other objects and features of the invention relating to details of construction and operation will be apparent in the following description and claims.

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

FIGURE 1, a longitudinal section showing the various parts of the pump.

FIGURE 2, a view of the pump body in elevation showing a modified cap construction.

FIGURE 3, an inside view of a valve recess showing the retainer means.

In FIGURE 1, a construction is shown wherein a cast or molded valve housing 90 is formed in a cup shape having a bottom 92 and an open lip 94 with an annular enlargement 96. In the interior of the cup is an annular recess 98 which can be used for a cylindrical filter screen when desired.

The cup has at one side a mounting projection 100 which is threaded at 102 so that the pump can be threaded directly into the side of an engine housing which is provided with a tapped hole. On the opposite side of the cup is a square projection 104 which can be used for the application of a wrench to tighten the pump into position. The bottom of the cup has a small hollow projection 106 shaped on the outside to hold the end of a

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tube. In the bottom of the cup also is a recess 108 ensmallled at 110 to serve as an inlet valve chamber for the cup chamber 112.

A small plastic valve disc 114 lies in the recess portion 110, loosely confined by a small press fit element 116 suitably apertured to permit flow past the valve disc when it is sucked back. The element 116 is preferably square shaped, for example, as shown in FIGURE 3. In the fastening projection 100 is also a valve chamber 118 having an ensmallled portion 120 for holding a valve disc 122 and a retainer 124. The closing cap 121 for the pump comprises a disc 123 and a hose connection nipple 125 with a central opening 126. The diaphragm is composed of a sac-like element 128 which in the actual size used for production is about $\frac{5}{16}$ " in diameter and about $\frac{1}{16}$ " in length.

The sac-like element 128 has a brim 130 which extends in between the disc 123 and the lip 94. The disc 123 has an axially extending annular flange 132 with an inwardly extending annular portion 134 which snaps over the enlargement 94 to lock the cap in place, squeezing the annular edge of the brim 130 to hold it in place. Disc 123 has a plurality of circumferentially distributed pips 133 which penetrate into the peripheral portion of brim 130 so that the diaphragm 128 is securely held against the lip 94 of the cup-shaped shell 90 by the usual snap-over arrangement created by flange 132 and annular portion 134.

In FIGURE 2, a similar pump housing is shown with a modified head or cap portion 140 provided with a connecting nipple 142. This cap has an enlarged chamber portion 144 which enlarges into an annular portion 150 which receives the edges of a flat diaphragm 148. On the shoulder between the portions 144 and 150 are provided small pips 146 which penetrate into the rim of the diaphragm distributed circumferentially around the shoulder so that the diaphragm is securely held against the lip of the cup by the usual snap-over arrangement created by the projecting flange 152.

The operation of the embodiment shown in FIGURES 1 and 2 is similar. The pulsations of the engine crankcase in a two-cycle engine or possibly from the manifold of a four-cycle engine will cause first an enlargement of the chamber within the diaphragm 128 in FIGURE 1 and the chamber 144 in FIGURE 2, and then an ensmalling of the respective chambers. This draws fuel in through the valve disc 114 on the left-hand side of the diaphragms while the valve disc 122 was closed against its seat. The reverse pulsation forces the liquid out of the chamber within the housing 90 past the valve disc 122 while valve disc 114 is closed against its seat. The pump is easily installed in the fuel line of an engine and has the advantage that it can be used as optional equipment, depending on the requirements of the installation.

The device shown in FIGURE 2 is designed for a slightly larger capacity utilizing higher pressures as, for example, those which occur in the manifold of a four-cycle engine. The flat diaphragm 148 is held in place by the small projections 146 which press into the periphery of the diaphragm. The larger chamber portion 144 in the cap allows this diaphragm to fluctuate in two directions. As previously stated, the projection 104 permits a wrench to be applied to the housing to screw it into place on an internal combustion assembly either into a portion of the engine body or that of the carburetor. As shown, the portion 102 of the pump can be screwed directly into the carburetor so that fuel can be discharged directly into the fuel chamber of the carburetor.

Thus, we have disclosed a pump construction which is in overall length about 1" long with a diameter of

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about $\frac{3}{4}$ " to 1" which can serve very effectively when interposed in a fuel line to move fuel into an internal combustion engine. It is also possible as will be seen that the diaphragms can readily be replaced if necessary by removal of the snap-on caps 121 or 140.

I claim:

1. In a small fuel pump adapted to be mounted in and supported by a fuel line of an internal combustion engine for remote operation and which comprises, a small elongate hollow shell open at one end, a unidirectional inlet means and outlet means in said shell spaced from the open end thereof, a cap for the open end of said shell, said cap including resilient means, having a snap-over relation thereto, and a pumping element in said shell comprising a thin walled, digital-shaped pouch of flaccid material projecting into said shell spaced from the walls thereof, the margins of said pouch being supported and confined around the edges of the open end of said shell between the shell and the cap, said pouch being otherwise unsupported in said shell, said cap having an opening to receive remote pulsations from the crank case of an engine, that improvement which comprises a radially extending surface on said cap to lie directly adjacent a similar radial surface at the end of said shell, wherein the peripheral portions of said pumping element are confined between said radial surfaces, and circumferentially spaced minute projections around one of said surfaces for projecting into engagement with the peripheral portions of said pumping element to lock it between said surfaces.

2. A device as defined in claim 1 in which one side of said shell has a threaded projection containing one of said unidirectional means, and a diametrically opposed out-of-round polygonal projection on the other side to serve as a location for the application of torsional pressure to said shell to fasten said threaded projection to a threaded conduit.

3. A device as defined in claim 1 in which said shell is provided at said inlet means with a stepped recess and at said outlet means with a similar stepped recess; inlet and outlet passages smaller than the bores of said recess leading to the smaller bore of each stepped recess, a disc located in the smaller of each of said recesses, and a confining means in a larger recess adjacent said disc

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comprising an out-of-round perforated disc having spaced frictional engagement with the walls of said stepped recess to permit unidirectional flow past said discs from said passages.

4. In a small fuel pump adapted to be mounted in and supported by a fuel line of an internal combustion engine for remote operation and which comprises, a small elongate hollow shell open at one end, a unidirectional inlet and outlet in said shell spaced from the open end thereof, a cap for the open end of said shell, said cap including resilient means, having a snap-over relation thereto, and a pumping element in said shell comprising a thin member of flaccid material, the margins of said member being supported and confined around the edges of the open end of said shell between the shell and the cap, said member being otherwise unsupported in said shell, said cap having an opening to receive remote pulsations from the crank case of an engine, that improvement which comprises a radially extending surface on said cap to lie directly adjacent a similar radial surface at the end of said shell, wherein the peripheral portions of said pumping element are confined between said radial surfaces, and circumferentially spaced minute projections around one of said surfaces for projecting into engagement with the peripheral portions of said pumping element to lock it between said surfaces.

5. A device as defined in claim 1 wherein said shell has a threaded projection, said threaded projection having a passageway therethrough, said passageway extending through said shell, one of said unidirectional means being located in said passageway, said shell further having an out-of-round polygonal projection, said out-of-round projection being adapted to facilitate fastening said threaded projection in tight relation with a portion of said fuel line.

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