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VARIABLE STROKE DIAPHRAGM PUMP WITH ECCENTRIC DRIVE

Filed Dec. 11, 1957

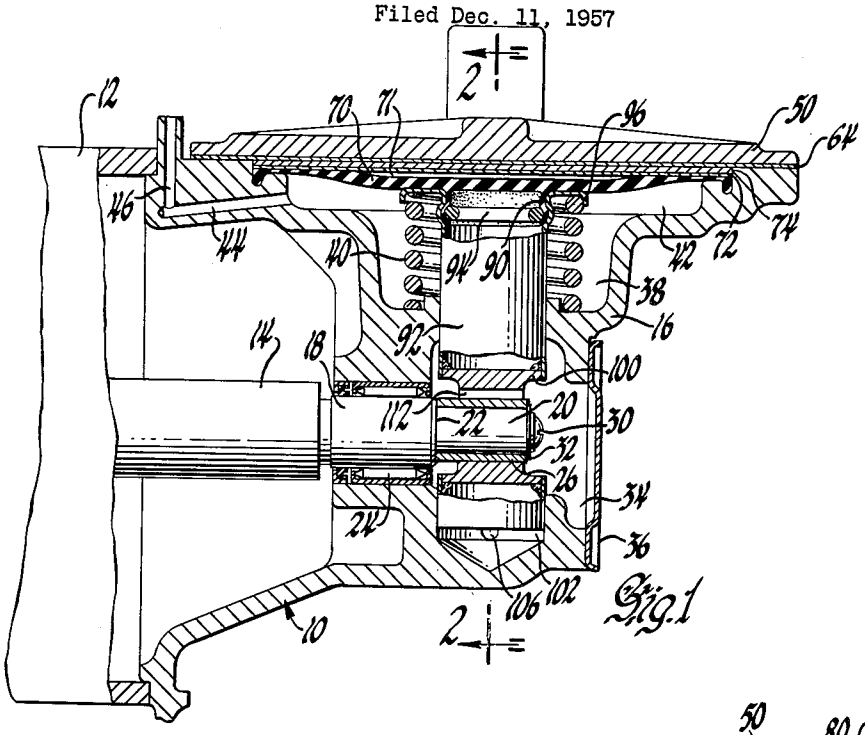


Fig. 1

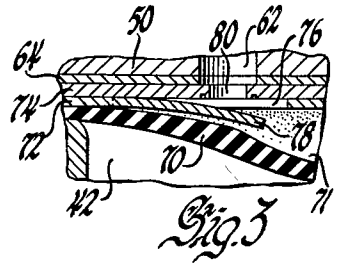


Fig. 3

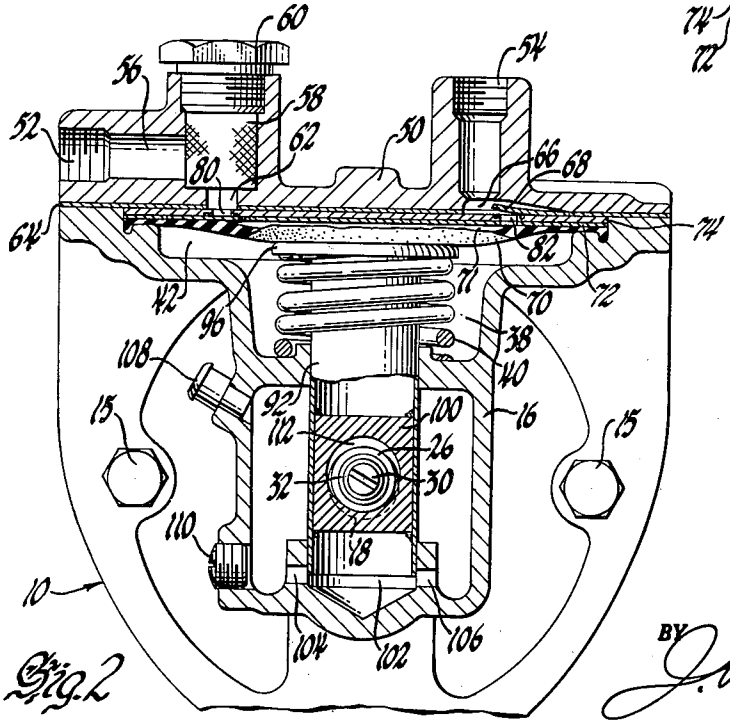


Fig. 2

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VARIABLE STROKE DIAPHRAGM PUMP WITH ECCENTRIC DRIVE

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1 Claim. (Cl. 103—38)

This invention relates to pumps and more particularly to pumps of the diaphragm type which are specially suitable for supplying a flow of fuel to internal combustion engines.

In supplying fuel to the carburetor of an internal combustion engine it has been customary to provide a diaphragm pump in which the stroke of the diaphragm is varied because of the variation in fuel demand and the incompressibility of the fuel. Variation in stroke is possible by effecting the pumping stroke through the expanding action of a coiled spring. Because of back pressure modifying the effective action of the spring, the stroke is automatically regulated in accordance with the fuel feed required. The suction stroke, on the other hand, is usually brought about by a positive acting linkage often driven by the cam shaft of the engine. Complexities of this combination of spring and positive drive have been many and ordinarily involve articulated levers and other elements. An example of such a combination is disclosed in the United States Patent 2,036,452 granted April 7, 1936, in the names of A. M. Babitch and G. W. Harry.

An object of the present invention is to provide an improved diaphragm pump in which the effective pumping stroke is variable and in which the suction stroke is positive, the actuating mechanism being simple and compact.

A feature of the present invention comprises an eccentric drive and a pumping diaphragm, the drive comprising an eccentric pin loosely retained in a crosshead connected to the pumping diaphragm.

These and other important features of the invention will now be described in detail in the specification and then pointed out more particularly in the appended claims.

In the drawings:

Fig. 1 is a view, partly in elevation and partly in section, of a fuel pump with a suitable driving mechanism and embodying the present invention;

Fig. 2 is a sectional view looking in the direction of the arrows 2—2 in Fig. 1; and

Fig. 3 is an enlarged view of a detail of construction pertaining to an intake valve shown in Fig. 2.

In the drawings, a fuel pump generally indicated at 10 is shown mounted on a support which, in this case, is a generator casing 12 with a generator shaft 14 extending therefrom into the main body 16 of the pump. Bolts 15 retain the latter in position. The shaft 14 is provided with two reduced portions 18 and 20 which are separated by a shoulder 22. The portion 18 is larger in diameter than the portion 20 and is retained within a bearing arrangement 24 recessed into a wall portion of the body 16. The portion 20 is eccentric with respect to the shaft 14 and the portion 18. A bearing sleeve 26 is arranged coaxial with the portion 20 and fixed to the shaft 14 by means of a screw 30 and a washer 32. The screw is accessible from one side of the main body 16 through an opening 34 which is closed by a removable cover 36.

The upper portion of the body 16 is provided with a recess 38 retaining a coil spring 40. A shallow portion

42 of the recess 38 is vented by two small connected passages 44 and 46. A cover 50 is fixed to the body 16 by means not shown, and this cover is formed with a horizontal threaded fuel inlet 52 and a vertical threaded fuel outlet 54. The inlet 52 is connected with a right angle passage 56 in the angle of which is mounted a filter element 58 which may be reached for cleaning by use of a removable plug 60. A portion 62 of the passage 56 extends downwardly and into communication with an opening passing through a thin metal sheet 64. The outlet 54 extends downwardly and communicates with a recess 66 formed in the under surface of the cover 50 and this recess is to accommodate the necessary vertical movement of a flexible reed 68 which is integral with the sheet 64. The reed and the sheet cooperate to form a reed valve controlling the outlet from the pump as will further appear.

The peripheral margin of the shallow recess portion 42 is formed to accommodate the beaded margin of a pumping diaphragm 70 as well as a sheet metal disc 72 and a gasket 74. The diaphragm, disc and gasket lie in planes parallel with the axis of the shaft 14. The sheet metal disc 72 is apertured as at 76 and formed with a reed 78 which is adapted to function as an inlet valve. The gasket 74 is apertured as at 80 to cooperate with the reed 78 in controlling flow from the inlet 52. The gasket 74 is also apertured at 82 the flow therethrough to be controlled by the reed 68 insofar as pump discharge is concerned. The peripheries of the diaphragm 70 and the sheet 72, as well as the gasket 74, are tightly held together and in contact with the gasket 64 by the means which holds the cover 50 to the body 16. The close engagement of the sheet 64 with the underside of the cover 50 precludes flow therebetween.

The central area of the pumping diaphragm 70 is provided with an integral and circular flange 90 which is held outwardly against the inner surface of a tube 92 by means of a split ring 94. The top of the tube 92 bears an outwardly extending flange 96 which abuts the bottom surface of the diaphragm 70 and is adapted to receive the upper end of the coil spring 40.

The tube 92 forms a crosshead with the help of a block 100. The body 16 bears a vertical bore passing through a horizontal inner wall of the body 16 slidably to receive the lower end of the tube 92. A portion of the body 16 surrounding the bottom end of the tube 92 is apertured as at 104 and 106 to relieve any build-up of pressure beneath the block 100. Lubricant is retained within the body 16 and may be supplied through a fitting 108 or removed by a threaded drain plug 110. An opening 112 is formed in the crosshead and it is of sufficient diameter or cross-sectional area to accommodate lateral movement of the sleeve 26 as the latter is rotated with an accompanying linear and vertical movement of the crosshead.

Assuming that fuel is to be delivered by the pump 10 from its discharge 54 and that the shaft 14 is rotated, the portion 20 will serve as an eccentric drive and the crosshead, which constitutes the tube 92 and the block 100, will be reciprocated in a vertical direction bringing about a pumping action through the space 71 defined by the diaphragm 70 and the disc 72 and by way of the reed type valves 78 and 68.

If the arcuate wall at the underside of the opening 112 in the block 100 are caused to remain firmly in contact with the underside of the sleeve 26, it is clear that the pump would be a positive displacement pump, and if back pressure permitted, the discharge of the pump could exceed the feed required for the carburetor. This will not happen in the use of the instant pump, however, for the incompressibility of the fuel in the discharge line will change the displacement, i.e., the back

pressure will necessarily reduce the stroke of the pumping diaphragm **70** by causing the sleeve **26** to come out of firm contact with the block **100** with an accompanying compression of the spring **40**. Contact of a firm nature will again come into being when normal conditions prevail; i.e., when the engine requirements equal the fuel discharge capacity of the pump at the particular speed of rotation of the shaft **14**.

From the above disclosure, it may be seen that a very simple and compact pump drive is provided which automatically regulates the feed in accordance with the demand, all parts in the pump which are subject to wear being easily and fully lubricated. Reed valves are disclosed for controlling the flow but conventional spring loaded valves, as mentioned in the United States Patent 2,036,452, may be used without departing from the spirit of the present invention.

I claim:

A pump with a variable pumping stroke, said pump having a main body with an inlet and an outlet, a diaphragm reciprocable in said main body to effect pumping action, a sheet metal disc in said main body and cooperating with said diaphragm to define a pumping chamber, reed type valves integral with said disc to control said inlet and outlet, an eccentric drive including a crosshead

linearly slidable in said body and fixed to said diaphragm for movement with the latter, a rotatable power shaft having crankpin means, an opening in said crosshead receiving said crankpin means and having cross sectional dimensions giving open clearance to permit relative linear and rotative motion of said crankpin means and crosshead, an arcuate surface on said crosshead partially defining said opening and arranged to contact said crankpin means with pressure during a suction stroke, and a spring surrounding said crosshead and arranged to urge said diaphragm in a direction for resiliently varying said pressure because of said relative linear and rotative motion within the range of said clearance.

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