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PUMP WITH LOST MOTION STRUCTURE ABOUT DIAPHRAGM PLUNGER

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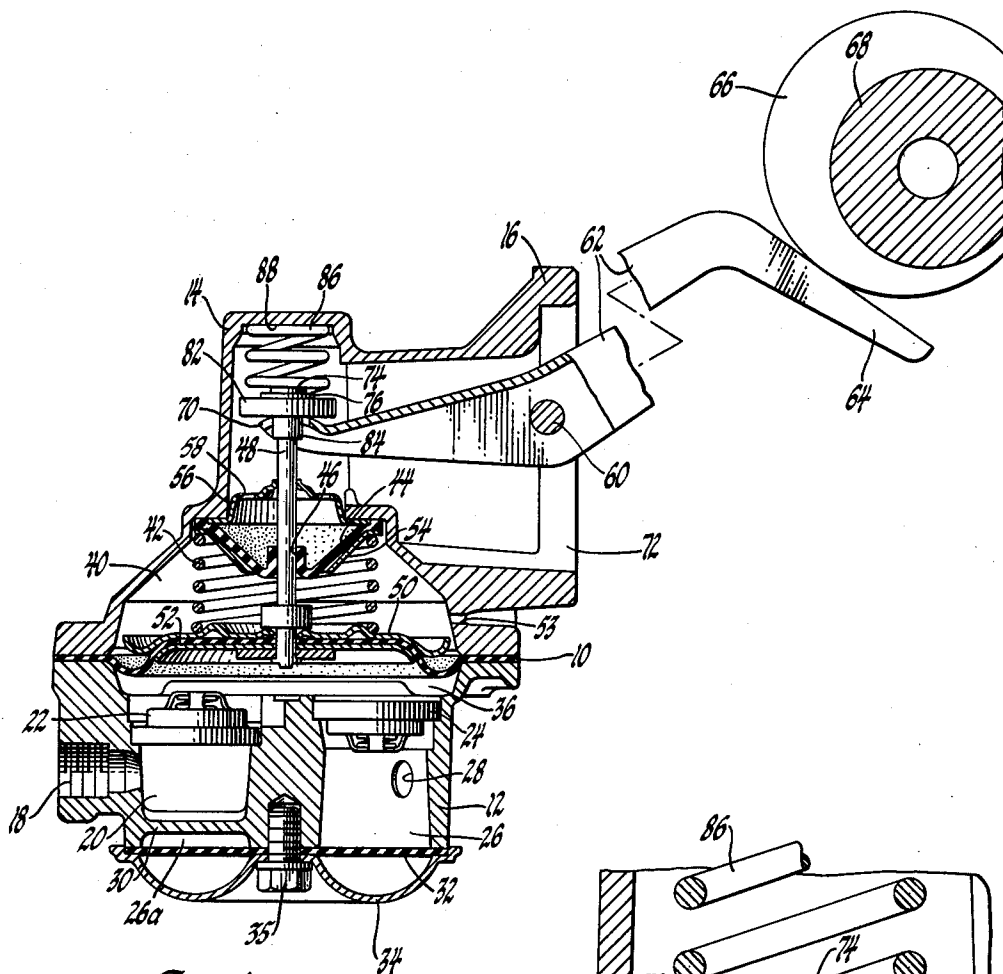


Fig. 1

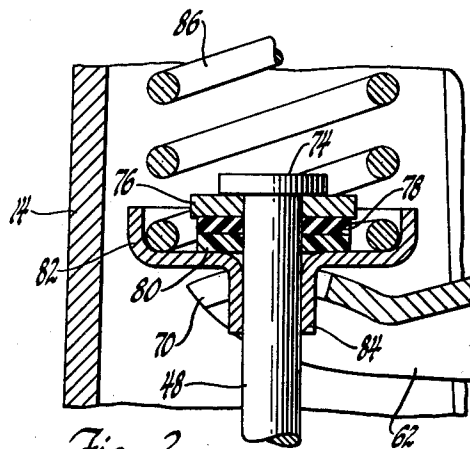


Fig. 2

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PUMP WITH LOST MOTION STRUCTURE ABOUT DIAPHRAGM PLUNGER

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This invention relates to pumps and more particularly to diaphragm fuel pumps suitable for use in automobiles.

Conventional fuel pumps add to the noises generated from the many working parts of an automobile and any lowering of the noise level by reducing noises is much to be desired. It has also been found that in the assembling of diaphragm pumps, rubber or flexible seals about the diaphragm plungers are subject to damage during insertion of the conventional actuating rocker arms, thereby necessitating great care with a consequent loss in quantity production. Also, insertion of a rocker arm into a pump body must be correct for proper subsequent pump operation.

An object of the present invention is to provide an improved fuel pump which is quiet in operation. Another object is to provide a fuel pump which may be quickly and conveniently assembled without subjecting any vital parts to damage and without special care being needed for the assembling operation.

A feature of the present invention is a diaphragm pump having spring retainer means slidable on a diaphragm plunger between a head of the plunger and a rocker arm with spring means surrounding the head and urging the retainer means toward the rocker arm. Another feature is a pump body with an opening for receiving a rocker arm, a guiding space along the length of a pumping diaphragm plunger being provided to receive the rocker arm during pump assembly.

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

In the drawings:

FIGURE 1 discloses a cross-sectional view of a diaphragm fuel pump embodying the features of the present invention together with a cross-sectional view of an engine camshaft for actuating the pump; and

FIGURE 2 is an enlarged sectional view of a detail of construction utilized in the pump of FIGURE 1.

Many of the structural details of the pump disclosed are shown in equivalent form in the United States Patent No. 2,868,135, granted January 13, 1959, to Donald R. Reinertson. The present invention is not concerned with the pulsator chambers and valve structure of such a pump but is primarily concerned with the rocker arm actuating structure of the pumping diaphragm. It suffices herein to state that the present pump comprises a pumping diaphragm 10 and a pumping body including a first pump body 12 and a second pump body 14 fixed together to clamp between them the periphery or margin of the pumping diaphragm. The second pump body 14 includes a flanged portion 16 which is adapted to be bolted to the side of a crankcase of an engine as is conventional. The first body 12 is provided with a threaded fuel inlet as at 18, an inlet chamber at 20, a one-way inlet valve 22, a one-way outlet valve 24 and an outlet chamber 26 having a pump discharge as at 28. It will be noted the outlet chamber extends annularly and as at 26A and between a thin wall 30 defining the inlet chamber 20 and a pulsator diaphragm 32. The latter is held in position on the first body 12 by a cover member 34 retained by means of a single bolt 35. A pumping chamber is defined at 36 between the diaphragm 10 and the first pump body 12.

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The second pump body 14 includes a vented spring chamber 40 in which is enclosed a pumping spring 42 and a sealing diaphragm 44. The latter is bonded as at 46 to an intermediate portion of a diaphragm plunger 48. The latter is fixed to a central portion of the pumping diaphragm 10 with the aid of cooperating plates 50 and 52 which are conventional. A vent is shown at 53. A steel conical member 54 is inserted between the upper end of the pumping spring 42 and the sealing diaphragm 48 firmly to hold the latter in position and in tight relation with a fixed guiding disk 56. The latter is vented as at 58 and is apertured at its center to slide with relation to the plunger 48.

A pin 60 is conventionally mounted on the second pump body 14 to serve as a pivot for a one-piece rocker arm 62. The latter is of U-shaped construction in cross section to lend it rigidity. One end of the rocker arm extends to the exterior of the pump body and is flattened as at 64 for engagement with a cam 66 of a camshaft 68. The other end of the rocker arm 62 is bifurcated as at 70 for the reception of a flange 84 upon insertion of the rocker arm through an opening 72 formed in the second pump body 14.

The diaphragm plunger 48 is provided with a head 74. Next to the head 74 and located on the plunger 48 are three washers 76, 78 and 80. The washer 76 is preferably made of steel. The washer 78 is preferably made of a rubber covered fabric and the washer 80 is preferably made of nylon. Surrounding the three washers and also the rod 48 is a spring retainer means 82 which bears the downwardly extending flange 84 and which is slidable on the rod 48. The forked end 70 of the rocker arm 62 is such as to receive the flange 84. Rocker spring means in the form of a coil 86 has one end abutting an inner surface 88 of the second body 14 and has its other end retained within the spring rocker means 82.

It will be noted that the coil spring 86 constantly urges the spring retainer means 82 toward the forked end of the rocker arm 62. This serves to maintain the flat surface 64 in engagement with the cam 66 at all times. In the event full pump displacement is not needed at any time, the spring 86 will cause the spring retainer means 82 to lower with respect to the plunger head 74, and when the rocker arm 62 again effects a lift on the plunger 48 there is practically no sound emanating because of engagement of the parts.

In assembling the pump, the flange 84 will engage the fixed guiding disk 56 due to the expansion of springs 86 and 42 and determine a minimum space into which the forked end 70 of the rocker arm may be inserted as a preliminary to installing the pivot pin 60. This assembly technique may be termed "a blind man installation" for the arm 62 may be quickly inserted so that the forked end will encircle the plunger 48 and the flange 84. The space for receiving the arm is not lost by action of the pumping spring 42 and the sealing diaphragm 44 is so protected, not only by its location but also by the fixed disk 56, that it cannot be damaged by the forked end 70 in the assembly operation.

I claim:

1. A pump including a pumping diaphragm, a first pump body defining a pump chamber and inlet and outlet chambers on one side of said diaphragm, one-way valves arranged to control flow through said inlet chamber, pump chamber and outlet chamber, a second pump body cooperating with said diaphragm in defining a vented spring chamber on the other side of said diaphragm, a pumping spring in said spring chamber and acting against said diaphragm, a plunger in said second pump body and fixed to said diaphragm, a head on said plunger, a fixed guiding disk slidably engaging an intermediate portion of said plunger, a rocker arm pivoted on said second pump

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body with one end exterior thereto and the other end interposed between said plunger head and fixed disk, spring retainer means slidable on said plunger and interposed between said head and said other end of said rocker arm, and rocker arm spring means acting between said second pump body and said spring means retainer urging the latter toward said other end of said rocker arm.

2. A pump such as set forth in claim 1, said rocker arm being a solid lever.

3. A pump including a pump body, a pumping diaphragm in said body partially defining a pumping chamber therein, one-way valves arranged to control flow through said pumping chamber, a pumping spring acting against said diaphragm on the side opposite said pumping chamber, a plunger fixed to said diaphragm and having a head, a fixed guiding disk slidably engaging an intermediate portion of said plunger and fixed to said pump body, a rocker arm pivoted on said pump body with one end exterior thereto and the other end interposed between said plunger head and fixed disk, said other end of said rocker arm being forked to receive said plunger, spring retainer means slidable on said plunger and interposed between said head and said forked end of said rocker arm, and rocker arm spring means acting between said pump body and said spring means retainer urging the latter toward said forked end of said rocker arm.

4. A pump such as set forth in claim 3, said spring retainer means having a flange extending along said plunger toward said fixed guiding disk and adapted to cooperate with the latter in determining a minimum clearance space for the insertion of said other end of said rocker arm.

5. A pump such as set forth in claim 3, said spring retaining means surrounding resilient washers retained between said spring retainer means and said plunger head.

6. A pump such as set forth in claim 3, flexible sealing means surrounding said plunger and located between said fixed guiding disk and said pumping diaphragm.

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7. A pump such as set forth in claim 2, means determining a minimum clearance space between said spring retainer means and said fixed guiding disk for the reception of said rocker arm during assembly.

8. A pump including a pumping diaphragm, a first pump body defining a pump chamber and inlet and outlet chamber on one side of said diaphragm, one-way valves arranged in said first pump body to control flow through said inlet chamber, pump chamber and outlet chamber, a second pump body cooperating with said diaphragm in defining a vented spring chamber on the other side of said diaphragm, a pumping spring in said chamber and acting against said diaphragm, a plunger in said second pump body and fixed to said diaphragm, a sealing diaphragm fixed to said plunger and to said second pump body, a head on said plunger, a fixed guiding disk slidably engaging an intermediate portion of said plunger between said head and said sealing diaphragm, a rocker arm pivoted on said second pump body with one end exterior thereto and the other end interposed between said plunger head and fixed disk, spring retainer means slidable on said plunger and interposed between said head and said other end of said rocker arm, rocker arm spring means acting between said second pump body and said spring means retainer urging the latter toward said other end of said rocker arm, and resilient means between said plunger head and said spring retainer means for promoting silence in pump action.

9. A pump as set forth in claim 8, said spring retainer means and fixed guiding disk having hubs adapted to abut and determine a minimum clearance space for the reception of said other end of said rocker arm.

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