Jan. 13, 1942. C. A. ERICKSON 2,269,625

PUMP

Filed Dec. 20, 1940

Fig. 2.

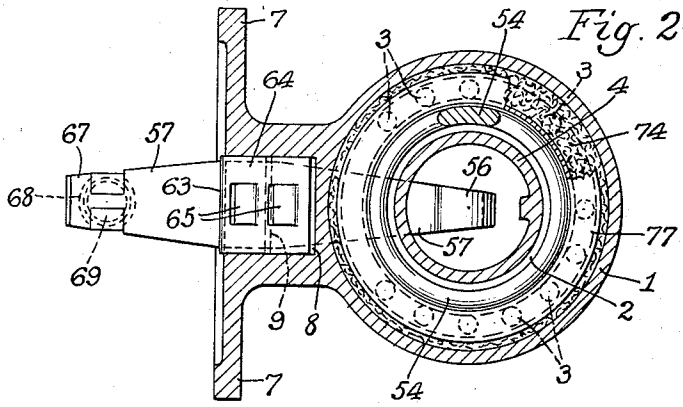


Fig. 3.

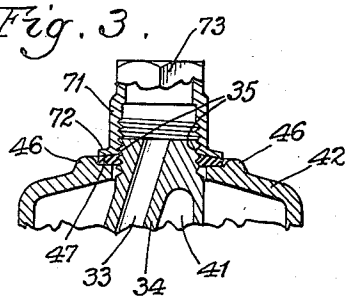


Fig. 4.

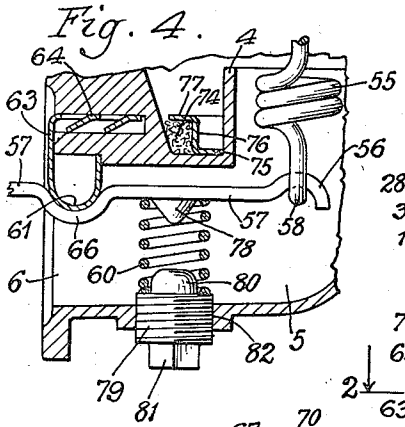


Fig. 1.

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UNITED STATES PATENT OFFICE

2,269,625

PUMP

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Application December 20, 1940, Serial No. 370,992

13 Claims. (Cl. 103—150)

This invention relates to a pump and to one primarily adapted for use in the supply of fuel for internal combustion engines, although it is not limited to that use. One of the objects of the invention is to provide a simple pump construction having a minimum of parts and so arranged that as far as possible all working parts of the assembly are positioned within the general outline of the pump chamber to effect an economy in size and space utilized. Another object is to provide a pump of the type indicated without the usual storage or accumulating vessel. Another object is to provide a pump having within itself excess vapor capacity which provides the effect of a vapor dome without additional parts.

Other objects will appear from time to time throughout the specification and the claims.

The invention is illustrated more or less diagrammatically in the accompanying drawing, wherein:

Figure 1 is a vertical cross sectional view of the pump;

Figure 2 is a transverse section taken at line 2—2 of Figure 1 with parts omitted and parts broken away;

Figure 3 is a vertical sectional detail showing a modified construction from which the additional vapor dome has been omitted;

Figure 4 is a sectional detail showing a modification of the spring supporting means.

Like parts are designated by like characters throughout the specification and the drawing.

The pump is formed in general with three main housing parts. 1 is a lower housing part having a spring chamber 2. One or more perforations or openings 3 provide communication between the spring chamber 2 and the outer air. Projecting partly within the chamber 2 is a spring passage and retainer 4. 5 is an outwardly extending branch communicating with the passage 4 and open at its outer end as at 6. About the outer end a flange 7 may be positioned for attachment of the pump to any suitable support. A pocket 8 is formed within the housing member 1 and it has an open outer end. Formed, preferably within the passage 5, is a shoulder 9.

10 is a second housing part. It forms, among other things, the upper part of the pump chamber or space 11. 12 is an inlet passage through which fluid to be pumped enters the housing. It may be interiorly threaded as shown to receive a supply pipe or passage member. Formed within the housing is a preferably generally annular space 13 to which the inlet passage 12 discharges. A threaded perforation 14 leads from the chamber 13 to a space or chamber 15 into which a raised spring seat member 16 projects. A passage 17 leads from the space 15 to the pump chamber 11. The member 16 is notched as at 18. There may be a plurality of such notches or only a single notch. A spring 19 has one end seated about the member 16 and bears at its other end against a valve 20. This valve may be seated against the member 21, which is threaded to be received in the threaded perforation 14. The member 21 carries a strainer 22. As here shown, the strainer is formed of screen cloth. Any other suitable screening or filtering member might be substituted for it. A bypass 23 leads from the space 15 and is controlled by a valve 24 which is provided with a handle 25 by means of which it may be rotated for adjustment. A spring 26 may be added if desired.

An outlet passage 27 leads from the pump chamber and may be interiorly threaded to receive a pipe or conduit if desired. This passage leads downwardly as at 28 and may be closed by a valve 29, which is preferably seated on a removable valve cage 30. A spring 31 tends, when free to do so, to hold the valve 29 seated. This spring bears at one end against the valve and is positioned about an inwardly projecting member 32. A passage 33 leads from the space above the valve 29 upwardly through a passage-defining member 34 which is preferably formed as a part of the housing member 10 and is positioned generally centrally of the pump. At its upper end the member 34 is threaded as at 35 to receive the lower portion 36 of a vapor dome. Secured to this lower portion is a second or upper portion 37 of the vapor dome. Between the members 36 and 37 the edge of a baffle 38 is received. This baffle is perforated adjacent its edges as at 39, 39. It is upwardly deflected as at 40 and it is imperforate except for the perforations 39 situated adjacent its edges. Formed also in the passage member 34 is a guiding cavity or space 41.

The third housing member comprises a cover 42 which is positioned about the upper edge of the housing member 10. This upper edge is preferably beveled as at 43. 44 is a packing member positioned between the beveled edge 43 of the housing member 10 and the adjacent edge of the housing member 42. The housing member 42 is perforated as at 45 and is positioned about but preferably out of contact with the threaded upper end of the member 34, 35. The housing member 42 is provided with a bead or raised portion 46. 47 is a packing member which is positioned within the bead 46 and between the housing member 42 and a suitably inclined flange 47a on the vapor dome portion 36.

The pumping mechanism proper includes a diaphragm 48, the edges of which are engaged between the housing members 1 and 10. These two housing members may be secured together by bolts, screws or otherwise as desired. A diaphragm guide 49 is provided with a flange 50 and

extends upwardly into the guiding space 41. Ordinarily, the guide 49 is out of contact with the inner surface of the space 41 but may contact that surface for guiding purposes. A diaphragm reenforcing disc 51 is positioned on the side of the diaphragm opposite the flange 50 and a spring loop member 52 is formed integrally with it or positioned against it. The flange 50, the disc 51 and the loop 52 may be secured together by rivets 53 or otherwise.

A spring 54 is positioned within the space 2 and bears at one end against the bottom of that space and at the other end against the disc 51. This spring tends, when free to do so, to force the diaphragm upward. A spring 55 engages the loop 52 at one end and at the other end engages the curved portion 56 of a lever arm 57. Ordinarily, the lower end 58 of the spring 55 has formed in it an eye which is large enough to engage the member 56 loosely so that relative movement of these two parts is possible under certain conditions. The lever arm 57 has formed on it a spring seating member 59 about which is seated a spring 60. One end of the spring bears against the lever arm 57 and the other bears against the inner surface of the passage 5. 61 is a fulcrum member provided with a portion 62 which bears against the shoulder 9. It is provided with a second portion 63 which preferably bears against the outer face of the housing portion 1 adjacent the flange 7. The fulcrum member is also provided with a retaining portion 64 from which locking ears or lugs 65 are punched. These locking ears engage the inner surface of the space 8 and prevent withdrawal of the fulcrum member as a whole.

The lever arm 57 is preferably provided with a curved fulcrum engaging portion 66 which preferably has substantially the same curvature as the fulcrum member 61. The outer end of the lever arm 57 may be curved as at 67 to receive a cuplike member 68 within which the upper end of a push rod 69 is loosely received. The upper end of the rod may be rounded as at 70 if desired.

In the modified form of Figure 3 the parts shown are as described above except that the vapor dome has been omitted and in its place a cap 71 has been substituted. The cap is provided with a flange 72 similar to the flange 47a which engages the packing member 47. At its upper end the cap may have a rectangular cross section as at 73 to receive a tool by means of which it can be rotated.

For some purposes the perforations 3 might be omitted. Where they are present, and they will generally be present, it may be desirable to provide means for filtering the air which passes through them. This is particularly important where the pump is to operate in a dusty atmosphere. When that is to be the case, an air filter is provided. As shown this filter comprises a quantity of filtering material 74 which is positioned in the bottom of the chamber 2 and about and over the perforations 3 so that air entering through any of the perforations must pass through this filter material 74. A retainer is provided for the filter material. As shown it comprises an inwardly directed flange 75 against which the lower end of the spring 54 may rest. It comprises an upwardly directed portion 76 and a top outwardly directed flange 77. This retainer may be held in place by the spring 54 alone or may be riveted, welded, screwed or otherwise fastened in place. Any other form of air filter might be provided and the one here shown is not to be taken as limiting the invention to any particular type of air filter.

In Figure 4 there is shown a modification of the means for positioning and centering the spring 60. As there shown, the lever arm 57, instead of carrying the member 59, is provided with a short and preferably conical projection 78 which may be made integrally with the member 57; it may be punched out from it or welded or otherwise secured to it. In this form of the device, instead of having the spring fit loosely upon the floor of the passage 5, a pilot or centering device is provided and this includes preferably a threaded plug 79 which has on its upper end a pilot or centering member 80. The plug may be squared as at 81 to receive a tool by means of which it may be rotated. The plug is removably and adjustably received in a threaded perforation 82 in the floor of the chamber 5. The member 80 might, instead of being carried by a plug, be made as an integral part of the floor of the passage 5 or might be separately made and permanently secured thereto. It furnishes a centering point for the spring 60.

Although there is shown an operative form of the device, it will be understood that many changes in the form, shape and arrangement of parts might be made without departing from the spirit of this invention, and it is wished that the showing be taken as, in a sense, diagrammatic.

The use and operation of this invention are as follows:

When the pump is to be used it is put in position and a supply pipe or conduit is connected to the inlet opening 12 and a discharge pipe or conduit is connected to the outlet or discharge opening 27. Some means are provided in the total assembly for moving the push rod 69 and for thus raising and lowering the lever arms 57. Any suitable means may be provided for causing the lever arm to rock. When the lever arm is raised it pulls downwardly on the spring 55 and thus moves the diaphragm downwardly. When the lever arm is permitted to fall, it no longer pulls down on the spring 55 and the spring 54 is free to raise the diaphragm. Thus the diaphragm is alternately raised and lowered. When it is lowered suction is created. Thus the valve 28 is unseated. Fluid enters through the passage 12, passes through the filter 22 and downwardly through the fitting 21. If the valve 28 has not been brought and moved down to be seated against the end of the member 16, liquid passes over the end of that member and also passes through the notches 18. If the valve has been brought down to its full downward limit of movement, liquid still passes through the notch or notches 18. When the diaphragm is raised compression is developed in the pump chamber 11, the valve 28 is seated and the valve 29 is opened against the resistance of the spring 31 and fuel is discharged through the outlet opening 27. The space 33 will ordinarily not be filled with liquid and this space acts as a vapor or pressure dome. This is true in the form of the device shown in Figure 3. In the form of the device shown in Figure 1 it is also true but there is added the additional space enclosed within the vapor dome 36, 37. The shape of the baffle prevents projection of liquid into the space above the baffle. Should the space in the member 36 fill with liquid, then the liquid could penetrate through the perforations 39 but as soon as pres-

sure conditions permit, the liquid would flow out through those perforations. In ordinary operation and under certain pressure conditions, the space above the baffle will never receive liquid and frequently the entire system, including even the passage 33, will be free from liquid. All liquid rising in this passage will ultimately be discharged back from it since there is no other discharge either from it or from the vapor dome.

The pump has been designed for ready assembly. For that purpose the construction of the fulcrum member is designed. To install it it is necessary only that the pump be provided with a space 8 into which the tongued end of the member 64 is inserted. The tongues 65 are of spring material and they spring outwardly and their outer points or ends engage the inner surface of the member 8. Thus the member is merely pushed into place and thereafter holds itself in place. The shoulder 9, if it is provided and it need not be, serves as a positioning member for the fulcrum member.

The upper housing member 42 is fastened in place by the vapor dome member 36 or by the cap 71 either of which engages the threading on the member 35. Either the cap or the vapor dome is screwed down far enough to secure the housing member 42 in place and sufficient pressure is applied to compress the packing 44. The inclined surface 43 produces a better seal than can be produced with two mating flat surfaces. The packing is forced outwardly and downwardly and is compressed against the inner edge of the member 42.

Similarly, the packing 47 is compressed between the upper face of the member 42 and the inclined flange 47*a* or 72 of the vapor dome or cap, as the case may be, and it may also be compressed against the inner face or edge of the bead 46.

I claim:

1. In combination in a pump, pump actuating means, a hollow housing formed of a plurality of separable members, one of said members forming a chamber to receive said pump-actuating means, a second of said members forming a part of a pump chamber and providing support for valve parts, and a third of said members comprising a cover for said second member, and a diaphragm positioned within said pump, an inlet passage to said pump chamber, a valve positioned to control said inlet, an outlet passage from said pump chamber, a valve positioned to control said outlet passage, said second housing member provided with a portion having an internal guiding chamber, there being a guide positioned on said diaphragm and adapted normally to be loosely guided in said chamber, and a passage formed in said second housing member and in the portion thereof in which said guiding chamber is formed and extending away from the direction normally taken by outgoing liquid, and a closure for said last-mentioned passage.

2. In combination in a pump, pump actuating means, a hollow housing formed of a plurality of separable members, one of said members forming a chamber to receive said pump-actuating means, a second of said members forming a part of the pump chamber and providing support for valve parts, and a third of said members comprising a cover for said second member, and a diaphragm positioned within said pump, an inlet passage to said pump chamber, a valve positioned to control said inlet, an outlet passage from said pump chamber, a valve positioned to control said outlet passage, said second housing member provided with a portion having an internal guiding chamber, there being a guide positioned on said diaphragm and adapted normally to be loosely guided in said chamber, and a passage formed in said second housing member and in the portion thereof in which said guiding chamber is formed and extending away from the direction normally taken by outgoing liquid, and a pressure dome positioned in communication with said last mentioned passage.

3. In combination in a pump, pump actuating means, a hollow housing formed of a plurality of separable members, one of said members forming a chamber to receive said pump-actuating means, a second of said members forming a part of a pump chamber and providing support for valve parts, and a third of said members comprising a cover for said second chamber, and a diaphragm positioned between said first and second members, an inlet passage to said pump chamber, a valve positioned to control said inlet, and a strainer in the inlet line, an outlet passage from said pump chamber, a valve positioned to control said outlet passage, said second housing member provided with a portion having an internal guiding chamber, there being a guide positioned on said diaphragm and adapted normally to be loosely guided in said chamber, and a passage formed in said second housing member and in the portion thereof in which said guiding chamber is formed and extending away from the direction normally taken by outgoing liquid, and a pressure dome positioned in communication with said last mentioned passage.

4. In combination in a liquid pump, separable members defining a pump housing, a diaphragm positioned between two of said members and forming one wall of a pump chamber, a guide fixed to said diaphragm, one of said members cooperating with said diaphragm to form the other wall of said chamber, there being an inlet and an outlet for said chamber, the maximum diameters of said housing members lying substantially within the diameter of said diaphragm, the housing member which provides one wall of said pump chamber having a central hollow stem, said stem having a guide chamber formed in it and a separate fluid passage formed in it, a closure for said separate passage, said guide being movable within said guide chamber.

5. In combination in a liquid pump, separable members defining a pump housing, a diaphragm positioned between two of said members and forming one wall of a pump chamber, a guide fixed to said diaphragm, one of said members cooperating with said diaphragm to form the other wall of said chamber, there being an inlet and an outlet for said chamber, the maximum diameters of said housing members lying substantially within the diameter of said diaphragm, the housing member which provides one wall of said pump chamber having a central hollow stem, said stem having a guide chamber formed in it and a separate fluid passage formed in it, a closure for said separate passage, said stem extending outwardly beyond the housing, said guide being positioned and adapted to move in said guide chamber, and a retaining member adapted to be removably seated upon said stem and, when so seated, to hold two of said housing members removably together.

6. In combination in a liquid pump, separable members defining a pump housing, a diaphragm

positioned between two of said members and forming one wall of a pump chamber, a guide fixed to said diaphragm, one of said members cooperating with said diaphragm to form the other wall of said chamber, there being an inlet and an outlet for said chamber, the maximum diameters of said housing members lying substantially within the diameter of said diaphragm, the housing member which provides one wall of said pump chamber having a central hollow stem, said stem having a guide chamber formed in it and a separate fluid passage formed in it, and a vapor dome in communication with said separate passage, said stem extending outwardly beyond the housing, and a retaining member adapted to be removably seated upon said stem and, when so seated, to hold two of said housing members removably together, said retaining member comprising a hollow pressure dome in communication with the passage formed in said stem, said guide being positioned and adapted to move in said guide chamber.

7. In combination in a liquid pump, separable members defining a pump housing, a diaphragm positioned between two of said members and forming one wall of a pump chamber, a guide fixed to said diaphragm, one of said members cooperating with said diaphragm to form the other wall of said chamber, there being an inlet and an outlet for said chamber, the maximum diameters of said housing members lying substantially within the diameter of said diaphragm, the housing member which provides one wall of said pump chamber having a central hollow stem, said stem having a guide chamber formed in it and a separate fluid passage formed in it, and a vapor dome in communication with said separate passage, said stem being threaded at its outer end, said stem extending outwardly beyond the housing, and a correspondingly threaded retaining member adapted to be removably seated upon said stem and, when so seated, to hold two of said housing members removably together, said guide being positioned and adapted to move in said guide chamber.

8. In combination in a liquid pump, separable members defining a pump housing, a diaphragm positioned between two of said members and forming one wall of a pump chamber, a guide fixed to said diaphragm, one of said members cooperating with said diaphragm to form the other wall of said chamber, there being an inlet and an outlet for said chamber, the maximum diameters of said housing members lying substantially within the diameter of said diaphragm, the housing member which provides one wall of said pump chamber having a central hollow upwardly projecting stem, said stem having a guide chamber formed in it and a separate fluid passage formed in it, and a closure for said separate passage, said stem being threaded at its outer end, said stem extending outwardly beyond the housing, and a correspondingly threaded retaining member adapted to be removably seated upon said stem and, when so seated, to hold two of said housing members removably together, said retaining member comprising a hollow pressure dome in communication with the passage formed in said stem, said guide being positioned and adapted to move in said guide chamber.

9. In combination in a pump, a plurality of hollow housing members therefor, one of said members provided with an inlet passage, a valve seat and valve-supporting means contained in said member and positioned within the inlet line of fluid flow through said member, said member provided also with an outlet passage, a valve seat and valve support positioned in said outlet passage, and a hollow stem formed integrally with said member and providing a separate fluid passage directed away from said outlet passage, and a closure for said separate passage.

10. In combination in a pump, a plurality of hollow housing members therefor, one of said members provided with an inlet passage, a notched valve seat and valve-supporting means contained in said member and positioned within the inlet line of fluid flow through said member, said member provided also with an outlet passage, a valve seat and valve support positioned in said outlet passage, and a hollow stem formed integrally with said member and providing a fluid passage directed away from said outlet passage, and a closure for said fluid passage.

11. In combination in a pump, a plurality of hollow housing members therefor, one of said members provided with an inlet passage, a valve seat and valve-supporting means contained in said member and positioned within the inlet line of fluid flow through said member, said member provided also with an outlet passage, a valve seat and valve support positioned in said outlet passage, and a hollow stem formed integrally with said member and providing a fluid passage directed away from said outlet passage, and a vapor dome in communication with said last-mentioned fluid passage, and means within said housing member and in line with said inlet passage for receiving and supporting a filter.

12. In combination in a pump, a plurality of hollow housing members therefor, and a diaphragm, having a guide fixed to it, mounted within said pump, one of said members provided with an inlet passage, a valve seat and valve-supporting means contained in said member and positioned within the inlet line of fluid flow through said member, said member provided also with an outlet passage, a valve seat and valve support positioned in said outlet passage, and a hollow stem formed integrally with said member and providing a fluid passage directed away from said outlet passage and providing also a guide chamber, for said diaphragm guide, and a vapor dome in communication with said last-mentioned fluid passage.

13. In combination in a pump, a plurality of hollow housing members therefor, and a diaphragm, having a guide fixed to it, mounted within said pump, one of said members provided with an inlet passage, a notched valve seat and valve-supporting means contained in said member and positioned within the inlet line of fluid flow through said member, said member provided also with an outlet passage, a valve seat and valve support positioned in said outlet passage, and a hollow stem formed integrally with said member and providing a fluid passage directed away from said outlet passage and providing also a guide chamber, for said diaphragm guide, and a closure for said last-mentioned fluid passage, and means within said housing member and in line with said inlet passage for receiving and supporting a filter.

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