Dec. 18, 1956 J. E. TEEGARDIN ET AL 2,774,517

FLUID DISPENSER DEVICE

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fig. 1.

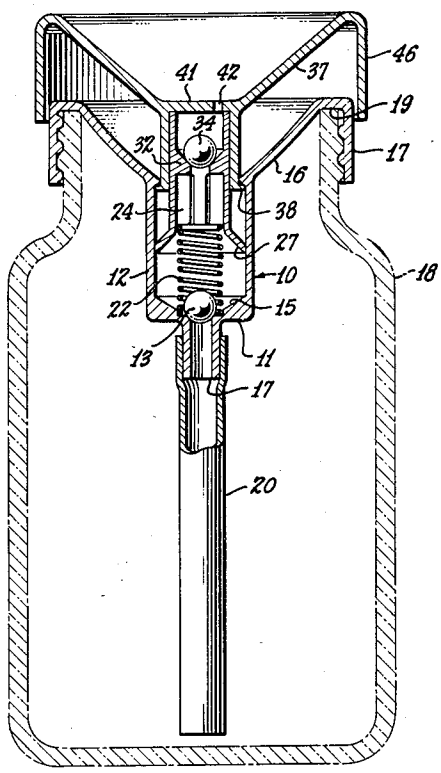


fig. 2.

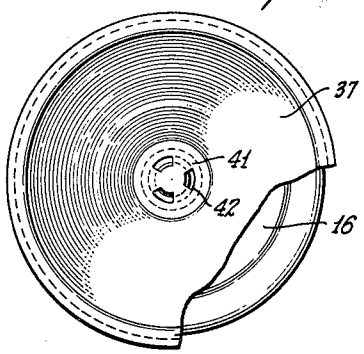


fig. 4.

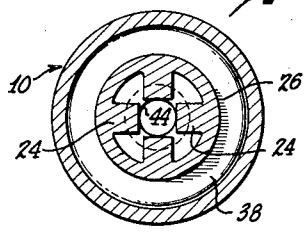


fig. 3.

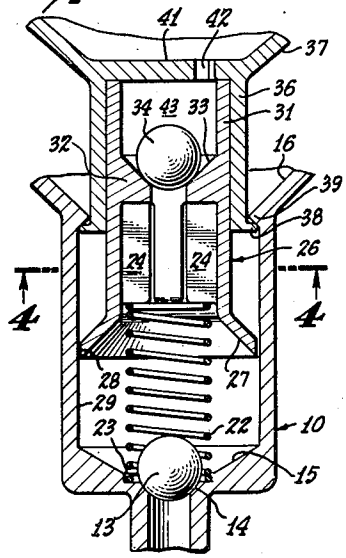


fig. 5.

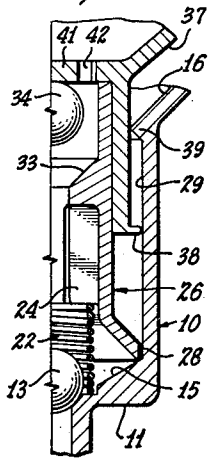
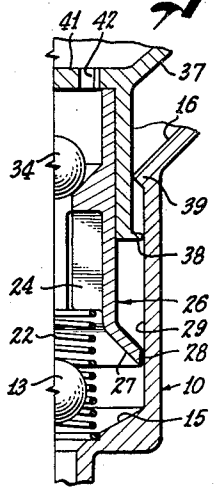


fig. 6.



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FLUID DISPENSER DEVICE

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7 Claims. (Cl. 222—205)

The present invention relates to a lift pump, and particularly to a lift pump for a fluid dispenser device.

A lift pump of the type used in fluid dispensers, for example, should be of efficient and compact construction and contain a minimum number of moving parts. The parts of the lift pump preferably should be interchangeable and designed for convenient and rapid assembly and disassembly for cleaning and other purposes. Furthermore, the assembled lift pump should be economical in cost, efficient and positive in its operation, and give long, trouble-free service.

Accordingly, it is an important object of the invention to provide a lift pump of efficient and compact design and construction and containing a minimum number of moving parts.

Another object is to provide a lift pump made of interchangeable parts for flexibility in use and designed for convenient and rapid assembly and disassembly for cleaning and other purposes.

A further object is to provide a lift pump for a liquid dispenser characterized by low cost, high efficiency, positive operation, and capacity for giving long, trouble-free service.

Additional objects will become apparent from the following description:

Stated in general terms, the lift pump of the invention comprises a cylinder having an internal projection means, preferably an internal annular flange means, in the top of the cylinder, and a resilient or flexible piston operatively mounted in the cylinder. The flexibility or resiliency of the piston is designed to permit snapping the piston into the cylinder past the internal projection or flange means during assembly of the piston and cylinder. The internal projection or flange means is, in turn, designed to facilitate this assembly operation and to resist any disassembly of the piston and cylinder unless the piston is forcefully snapped out of the cylinder past the internal projection or flange means.

A more detailed description of a specific embodiment of the invention is given with reference to the drawing, wherein:

Figure 1 is a cross-sectional elevational view showing a lift pump incorporated in a fluid dispenser assembly mounted on a bottle;

Figure 2 is a plan view of the assembly of Figure 1 with a portion broken away;

Figure 3 is an enlarged, elevational cross-sectional view showing lift pump construction details;

Figure 4 is a cross-sectional view taken on the line 4—4 of Figure 3;

Figure 5 is a partial view similar to that of Figure 3 showing the piston undergoing a downstroke; and

Figure 6 is a view similar to that of Figure 5 showing the piston undergoing an upstroke.

In the embodiment shown in the drawing, the cylinder 10 is made to have a generally cylindrical shape inside and outside. The bottom wall 11 is made considerably

thicker than the side wall 12. A ball valve unit consisting of a ball valve 13 and a seat 14 is positioned in the bottom of the cylinder. The seat 14 is made concentric in the bottom wall 11 at the bottom of a funnel-shaped portion 15 and communicates with a lift pipe 16 through a nipple 17 tightly fitted into the lift pipe 20, as shown in Figure 1.

The upper end of the cylinder 10 is joined annularly to the bottom of a funnel-shaped cap portion 16. The cap 16, in turn, is joined annularly to the top of a cylindrical, internally threaded cap portion 17 adapted for threadedly engaging a bottle 18 or other liquid receptacle or container. The juncture between cap portions 16 and 17 is made by an annular portion 19 having a lower flat surface for tightly seating on the lip of bottle 18.

Also seated in the bottom 11 of cylinder 10 is the lower end of a vertically disposed helical compression spring 22. The spring 22 is seated in an annular seat 23 concentric with seat 14 and made of sufficient diameter to accommodate spring 22. The inside diameter of spring 22 is made somewhat larger than the diameter of ball valve 13 so that the ball can move within the spring during its valving operation. The upper end of spring 22 is designed to engage the lower ends of longitudinal ribs 24 of a piston member 26 under a spring load.

Piston member 26 contains a conical or flared piston portion 27 having its lower annular edge 28 parallel to the inside cylinder wall 29 and in frictional engagement with the cylinder wall. The frictional engagement is produced by resilience or flexibility in the flared piston portion 27 urging the parallel edge 28 against the cylinder wall 29 to restrict the flow of gas or liquids between the edge 28 and the wall 29.

Connected to the upper annular edge of piston portion 27 is a cylindrical portion 31. Ribs 23 preferably are made integral with the cylindrical portion 31 and extend radially from the inside wall thereof. Also extending radially from the inside wall of cylindrical portion 31 is an annular seat portion 32 provided with a conical seat 33 on its upper portion for seating a ball valve 34.

The cylindrical portion 31 of piston member 26 is tightly fitted into a cylindrical extension 36 extending concentrically from the bottom of a funnel-shaped or dished member 37. The lower annular edge of cylindrical extension 36 is provided with an external annular flange 38 that fits slidably inside cylinder wall 29 but is of greater peripheral diameter than an annular internal flange 39 formed at the juncture of the upper end of cylinder 10 with the bottom of cap portion 16. The inner annular edge of flange 39 is made to converge to a sharp circular edge. The upper side of the flange 39 preferably is an extension of the inner surface of cap portion 16, and the lower side of the flange preferably corresponds to the annular edge of the lower end of cap portion 16 joining the top of cylindrical wall 29.

The outside diameter of annular edge 28 is approximately equal to, or slightly greater than, the outside diameter of annular flange 38 and is, therefore, also greater than the inside diameter of internal flange 39. The difference between the substantially equal outside diameters of annular edge 28 and annular flange 38, on the one hand, and internal flange 39, on the other, is made of such magnitude that in assembling the pump mechanism, piston portion 27 and flange 38 can consecutively be forced toward and into the sharp inner edge of flange 39 by radially inwardly compressing them sufficiently to snap them past the flange 39 and into frictional contact with cylinder wall 29.

In the thus assembled pump mechanism, the cylindrical extension 36 and the piston portion 27 are retained in concentric, slidable relationship inside cylinder 10 un-

less forcefully pulled therefrom with sufficient force to radially inwardly compress flange 38 or piston portion 27 sufficiently to snap them outwardly past flange 39. Also, in the assembled pump mechanism, helical spring 22 is designed to normally urge flange 38 upward into engagement with the lower side of flange 39, as shown in Figures 1 and 3, but with insufficient force to snap flange 38 past flange 39.

The funnel-shaped, or dished member 37, at its annular line of juncture with the upper end of cylindrical extension 36 is provided with a bottom 41 provided with apertures 42. Apertures 42 establish communication between the inside of bottle 18 and the atmosphere in member 37 through a chamber 43, valve seat 33, a space 44 (Figure 4) between ribs 24, the interior of cylinder 10, nipple 17, and pipe 20, when ball valves 13 and 34 are unseated. The upper annular edge of member 37 is joined to the annular upper edge of a cylindrical portion 46 of somewhat greater inside diameter than the outside diameter of portion 17.

The various parts of the assembled pump mechanism can be made of a suitably insoluble and inert resilient material such as resilient plastics materials. Polyethylene, or any of numerous non-metallic plastics materials available on the market, and in the process of development, can be used. In one embodiment of the invention, the ball valves 13 and 34, and helical spring 22, are made of steel and the other parts are die case of polyethylene. All of the parts can be made of stainless steel or other metals or alloys of suitable resilience and preferably insolubility and inertness in the liquids or fluids to be dispensed by the device of the invention.

The operation of the embodiment of the invention shown in the drawing is described with particular reference to Figures 5 and 6. Funnel-shaped member 37 is forced manually downward against the tension in spring 22, thereby compressing it, as shown in Figure 5. In this downstroke operation, piston portion 27 is moved downward and forces air, or other fluid, upward, as indicated by the arrows, because ball valve 13 is seated. Ball valve 34, on the other hand, is unseated, and the air, or other fluid, is forced into the atmosphere through apertures 42. The downstroke is completed when piston 27 contacts the bottom 11 of cylinder 10.

Release of manual pressure on member 37 causes piston 27 to move upward, as shown in Figure 6, in an upstroke movement, because of the compressive force in spring 22. During this upstroke movement, ball valve 34 is seated and air, or other fluid, is drawn upward from nipple 17 and pipe 20, as indicated by the arrows, into the interior cavity of cylinder 10. This upward movement of air, or other fluid, is induced by the pressure inside bottle 18, or other container, and is accompanied by a movement of liquid from the main body upward in pipe 20.

A repetition of the downstroke and upstroke movements of piston 27 results in the further movement of liquid upward through pipe 20 and nipple 17 into cylinder 10, and finally into dished member 37 through apertures 42, as a result of the pumping action described above. Once the liquid, or other fluid, of the main body in bottle 18 has reached the bottom of dished member 37, a single downstroke and upstroke movement of piston 27 pumps a measured increment of liquid, or other fluid, into dished member 37. This can be removed by any desired method.

The specific embodiment of the invention shown in the drawings is designed for use in dispensing liquid or fluid medicinals, pharmaceuticals, cosmetics, oils, alcohols, and the like, including solvents or solutions containing ether, acetone, caustic, other basic materials or acids, as well as reactive materials such as hydrogen peroxide and iodine, for example. The dished member 37 is conveniently shaped for dipping a wad of cotton or other absorbent material therein to soak up a portion of the material pumped into member 37 for convenient application to parts of the body.

It will be observed that the fluid dispenser device described above is of efficient and compact construction and contains a minimum number of moving parts. The die cast parts of the unit are interchangeable with those of other dispenser units and are capable of being conveniently and rapidly assembled and disassembled. In addition, the cost of the dispenser device is low, and it is capable of giving efficient and positive operation, and long, trouble-free service.

The foregoing description is given in connection with a particular embodiment of the invention primarily to illustrate that specific embodiment. It is understood that many changes, modifications or variations in structure, design or details of the illustrated fluid dispenser device will occur to one skilled in the art and that the invention can be applied to a variety of fluid dispensers. For example, the structure or design of annular internal flange 39 can be any suitable internal projection means. The structure of piston portion 27 need not necessarily be conical and the structure or relative position of flange 38 need not necessarily be as shown in the drawing. Also, valves other than ball valves 13 and 34 may be employed. Accordingly, it is understood that such applications of the invention and such changes, modifications or variations in the specific embodiment of the invention illustrated and described above may be made within the scope of the appended claims without departing from the spirit of the invention.

What is claimed is:

1. A fluid dispensing device comprising a cylinder, an internal projection means in the wall of the cylinder, a resilient piston operatively mounted in the cylinder, a resilient external projection means associated with the piston for limiting its stroke in the cylinder, the resiliency of the piston and the external projection means being adapted for snapping them past the internal projection means into the cylinder, a valve mounted in the wall of the cylinder for valving fluid thereinto, a second valve for valving fluid out of the cylinder, and a spring means for urging the piston through a return stroke.

2. A fluid dispensing device according to claim 1, wherein the valves are ball valves and the spring means is a helical compression spring.

3. A fluid dispensing device according to claim 1, wherein the internal projection means is an annular flange having a sharp inner edge, the piston is of generally conical shape for added resilience, and the external projection is an annular flange having an outside diameter substantially equal to that of the piston.

4. A fluid dispensing device according to claim 1, wherein the valves are ball valves, the spring means is a helical compression spring, the internal projection means is an annular flange having a sharp inner edge, the piston is of generally conical shape for added resilience, and the external projection is an annular flange having an outside diameter substantially equal to that of the piston.

5. In a fluid dispensing device in combination, cylinder means, means projecting inwardly of said cylinder means, piston means reciprocable within said cylinder means, means spaced from said piston means and projecting outwardly of said piston means, interengagement of said projecting means serving to limit reciprocation of said piston means within said cylinder means, at least one of said projecting means being resilient for enabling said piston means to be assembled into said cylinder means by resilient retraction of said resilient means, and means for valving fluid into and out of said cylinder means.

6. In a fluid dispensing device in combination, cylinder means, resilient means projecting inwardly of said cylinder means, piston means reciprocable within said cylinder means, interengagement of said projecting means

and a portion of said piston means serving to limit reciprocation of said piston means within said cylinder means, the resilience of said projecting means enabling said piston means to be assembled into said cylinder means by resilient retraction of said resilient means, and means for valving fluid into and out of said cylinder means.

7. The combination of claim 6 wherein said portion of said piston means is also resilient, thereby to enhance the resilience employed in the assembly of said piston and cylinder means.

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