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2,808,966

DISPENSING PUMP AND VALVE ARRANGEMENT

Filed April 13, 1954

3 Sheets-Sheet 1

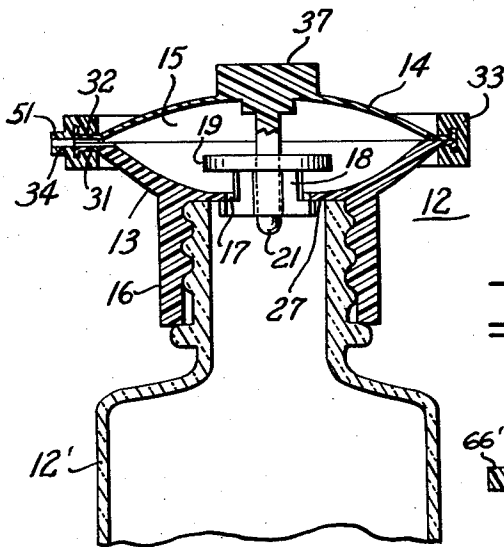


Fig. 1.

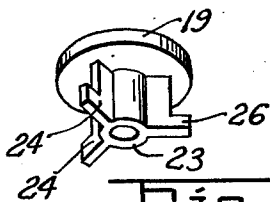


Fig. 2.

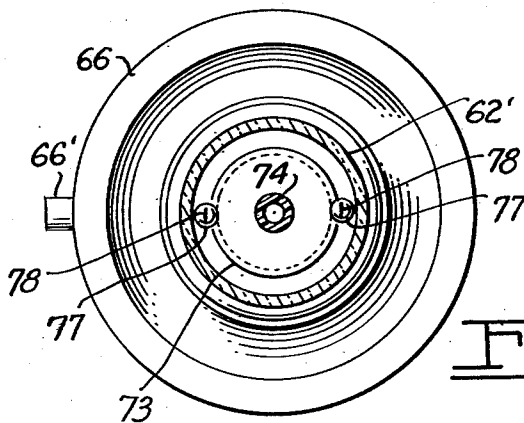


Fig. 3.

Fig. 4.

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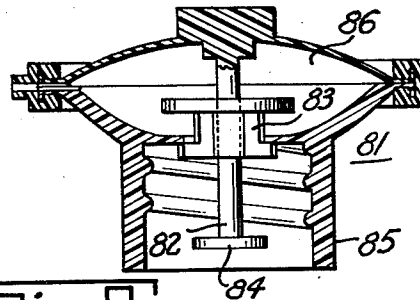


Fig. 9.

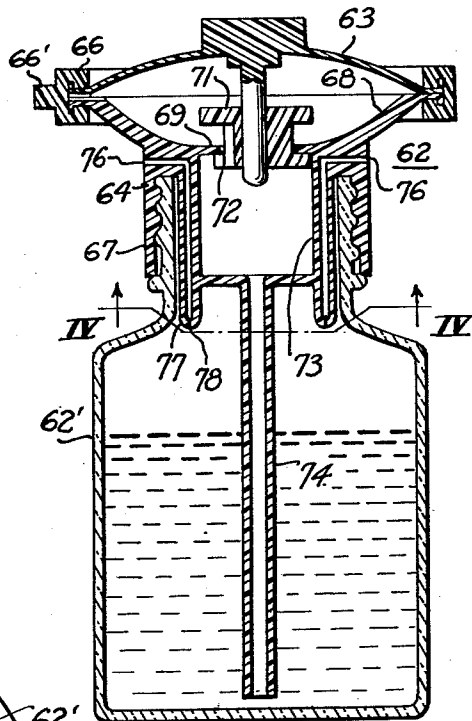


Fig. 4.

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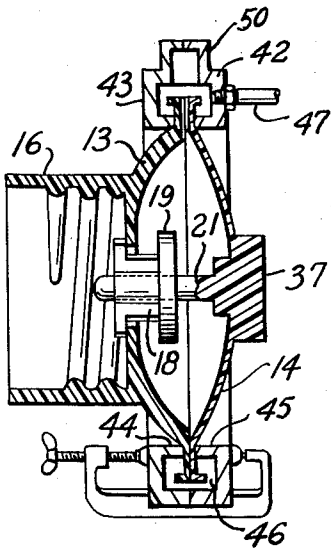


Fig. 8.

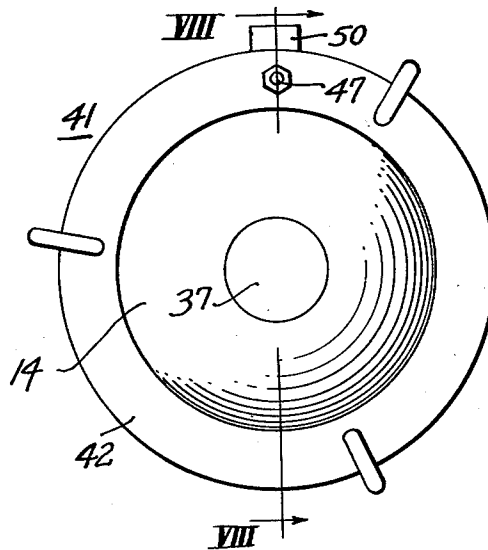


Fig. 7.

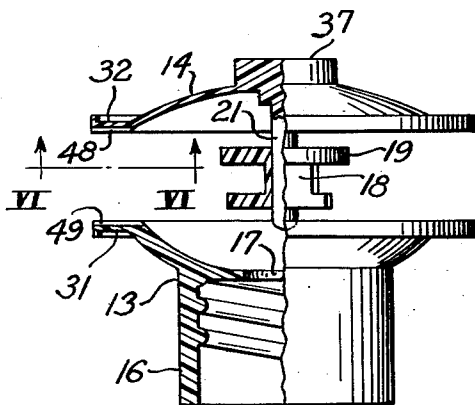


Fig. 5.

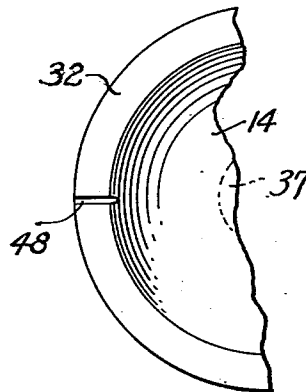


Fig. 6.

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DISPENSING PUMP AND VALVE ARRANGEMENT

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3 Sheets-Sheet 3

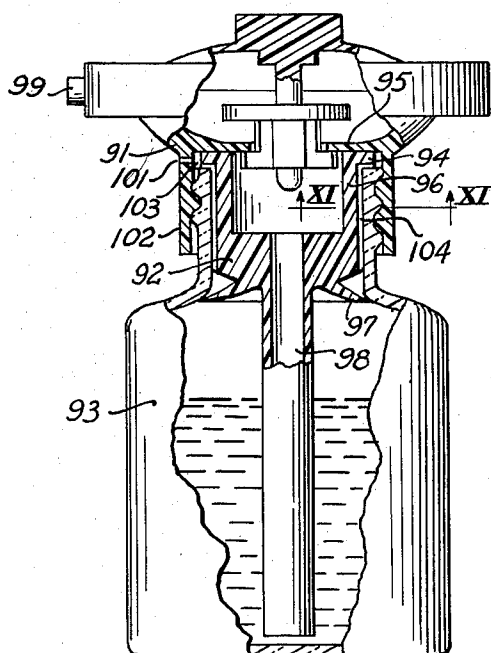


Fig. 10.

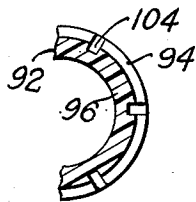


Fig. 11.

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DISPENSING PUMP AND VALVE ARRANGEMENT

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Application April 13, 1954, Serial No. 422,744

10 Claims. (Cl. 222—207)

This invention relates to a pump and valve arrangement for dispensing liquid from containers such as bottles and the like, and to a method of making the same.

An object of this invention is to provide a dispenser and pump which is so constructed that it can be used as a bottle cap and as a dispenser of liquid from the bottle by actuating the pump and valve which are an integral part of the structure.

A further object of this invention is to provide a pump and valve construction as in the preceding object, which, when used as a bottle cap, enables one to dispense controlled amounts of liquid from the bottle.

A further object of this invention is to provide an unbreakable plastic diaphragm pump and valve for mounting on the mouth of a bottle to close or cap the bottle.

A further object of this invention is to provide a dispensing pump having a diaphragm chamber therein and a valve for closing the entrance to the chamber when liquid is dispensed therefrom so that, when the diaphragm thereof is flexed from its normal position, the valve closes to permit liquid to be forced from the chamber.

A further object of this invention is to provide a dispensing pump of this type having a tube extending to the bottom of the bottle so that liquid can be pumped up the tube into the diaphragm chamber of the pump to be dispensed or discharged therefrom in controlled amounts.

A further object of this invention is to provide a method of forming a diaphragm pump and valve chamber in which the diaphragm and the co-operating part of the valve body are joined together and sealed at their marginal edges by a molded ring of suitable plastic.

The above and other objects and features of this invention will in part be apparent and will in part be obvious to those having ordinary skill in the art to which this invention pertains, from the following detailed description, and the drawings, in which:

Figure 1 is a view in vertical section of a pump and valve assembly embodying a form of the invention shown applied to a bottle for dispensing liquid therefrom;

Fig. 2 is a perspective view showing a valve member embodied in the pump and valve assembly of Fig. 1;

Fig. 3 is a view in vertical section of a modified form of a pump and valve assembly as applied to the dispensing of liquids from a bottle;

Fig. 4 is a view in section taken on a line IV—IV in Fig. 3;

Fig. 5 is an exploded view partly in side elevation and partly in section showing the component parts of the pump and valve illustrated in Fig. 1;

Fig. 6 is a bottom plan view of one of the component parts illustrated in Fig. 5 as seen looking in the direction of the arrows VI—VI of Fig. 5;

Fig. 7 is a plan view of a mechanism for molding a ring about the peripheral edges of the component parts of the pump chamber for sealing the joint between the marginal edges thereof;

Fig. 8 is a view in section taken on the line VIII—VIII in Fig. 7;

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Fig. 9 is a view in vertical section showing a pump and valve assembly embodying another form of the invention;

Fig. 10 is a view in vertical section showing a pump and valve arrangement constructed in accordance with another embodiment of this invention as applied to a bottle; and

Fig. 11 is a view in section of a plug which is a part of the arrangement taken on the line XI—XI of Fig. 10.

In the following detailed description, and the drawings, like reference characters indicate like parts.

In Fig. 1 a diaphragm pump and valve assembly 12 is shown. The particular embodiment of the assembly 12, as illustrated, is designed and adapted to be mounted on the neck of a bottle 12' in the same fashion that an ordinary bottle cap is, and, when so mounted, may be used to dispense controlled amounts of liquid from the bottle. The pump and valve assembly 12 includes a lower or body portion 13 and a diaphragm 14, which are secured together at their marginal valving edges and sealed to provide a chamber 15 therein. The lower portion or body 13 includes a tubular depending portion 16 for receiving the neck of the bottle. An opening 17 in the body communicates with the interior of the bottle. The interior of portion 16 may be threaded as shown so that the assembly 12 may be screwed onto the neck of the bottle. A valve member 18 is mounted in the opening 17 and can move up and down therein between an open position shown in Fig. 1 and a lowered position, not shown, in which a valve disc 19, which forms a part of the valve member 18, covers and closes the opening 17.

A stem or pin 21 is attached to the diaphragm 14 and projects through the valve member 18 in frictional engagement therewith. The valve member is hollow and is adapted to frictionally receive the pin. The pin extends downwardly from the diaphragm 14. When the diaphragm is pushed downwardly by one's thumb, as shown in Fig. 1, the stem 21 urges the valve member downwardly onto the seat of the valve opening to close the opening. When the diaphragm 14 is released, the resiliency of the diaphragm causes the diaphragm to spring upwardly and return to its normal position shown in Fig. 1, and the stem 21 draws the valve member 18 upwardly.

Details of construction of the valve member are shown in Fig. 2. The valve member includes an annular central portion 23, the valve disc 19, and stripper or stop members 24. Each of the stop members 24 includes an outwardly projecting lug 26 engageable with a flange 27 on the interior of the body member and through which the opening 17 extends. The lugs 26 limit the upward movement of the valve member 18, as shown in Fig. 1.

As shown in Fig. 1, the body member is provided with an outwardly projecting flange 31 which meets an outwardly projecting flange 32 on the diaphragm 14. The flanges 31 and 32 are held together and sealed to each other by an annular interlocking seal member or ring 33 molded on the edges of the flanges 31 and 32. An opening 34 extends through the ring 33 and communicates with the space 15 between the diaphragm 14 and the body member 13.

When liquid is trapped in the space 15, as when the bottle 10 is inverted, and a raised central or push button portion 37 of the diaphragm is pushed toward the bottle, the valve disc 19 is seated to close opening 17, and the liquid in the space 15 is discharged through opening 34. By controlling the manner in which the diaphragm 14 is depressed, the amount of liquid discharged through the opening 34 can be regulated to controlled amounts.

The sealing ring 33 is formed in a mold 41, illustrated in Figs. 7 and 8. The mold 41 includes an outer ring-shaped member 42 and an inner ring-shaped member 43.

The members 42 and 43 have inner flanges 44 and 45, respectively, which grip the edges of the diaphragm member 14 and the body member 13 as shown in Fig. 8. An annular space 46 is formed between the ring molds 42 and 43, and a plastic ring-forming material is injected into this space through a suitable inlet pipe 47 to form a ring sealing the members together and forming a pressure tight housing.

The body 13 and the diaphragm 14 are shown in Figs. 5 and 6 prior to being joined together. As shown in Fig. 6, a radial groove 48 is formed in one edge of the diaphragm. A similar and complementary radial groove 49 is formed in the body 13. The grooves 48 and 49 are aligned with an outwardly extending portion 50 of the mold members (Figs. 7 and 8) so that, when the ring 33 is molded on the edges of the diaphragm and body, an outwardly projecting nozzle 51 (see Fig. 1) is formed in alignment with the grooves 48 and 49. This nozzle can be punctured when the pump is to be used.

In Figs. 3 and 4 is shown a dispensing pump 62 constructed in accordance with another embodiment of this invention. The pump 62 is shown mounted on a bottle 62'. The pump 62 includes a diaphragm 63, which is generally of the same construction as the diaphragm already described and which is attached to a body member 64 by a sealing ring 66. A discharge nozzle 66' communicates with the interior of the pump 62. The nozzle is shown sealed closed. The nozzle can be punctured when the pump is to be used.

The body member 64 includes a bottle engaging portion 67, a flange 68 extending outwardly to the sealing ring 66, and an inwardly projecting flange 69, all of generally the same construction as the similar parts of the device shown in the other figures. A valve member 71 reciprocates in an opening 72 in the flange 69.

A cup-shaped member 73 is attached to the body member and extends downwardly inside the bottle to form an enclosed space in which the lower end of the valve member 71 reciprocates. A tube 74 is attached to the lower end of the cup 73 and extends to near the bottom of the bottle 62' so that, when the diaphragm 63 is deformed toward the bottle and then released, liquid can be pumped from the bottle through tube 74 and the chamber 73 into the space between the diaphragm 63 and the body 64. Air inlet tubes 76 are formed integrally with the body member and permit entry of air into the upper part of the bottle as liquid is discharged therefrom. As shown in Figs. 3 and 4, the lower ends of the air inlet tubes 76 terminate in end portions 77. Each end portion is provided with a slit 78 through which air can enter the bottle when the pressure inside the bottle is reduced. However, the slits 78 close when the pressure is equalized to prevent discharge of liquid from the bottle through the tubes 76.

In Fig. 9 is shown another pump and valve arrangement 81. The pump and valve arrangement 81 is similar to that shown in Fig. 1 except that the arrangement 81 includes a stem 82 which extends substantially beyond valve member 83 and is provided with an agitator 84 at the lower end thereof, which is adapted to stir material in the neck of tubular portion 85 before the material enters the chamber 86 thereof.

In Figs. 10 and 11 is shown a pump and valve arrangement 91 of a construction generally similar to that of the arrangement shown in Fig. 1. A hollow plug member 92 is mounted inside the neck of a bottle 93, and the pump and valve arrangement 91 is mounted on the outside of the neck of the bottle. As shown, the plug 92 has a lip 94 which rests on the mouth of the bottle and forms a seal with flange 95 of arrangement 91. A downwardly extending portion 96 of the plug 92 extends inside the neck of the bottle. A flexible skirt 97 is integral with the lower edge of the portion 96. A tube 98 is attached to the plug and extends downwardly into the bottle to permit liquid to be drawn upwardly from the bottom of

the bottle to be discharged through nozzle 99. As the liquid is discharged, air is drawn into the bottle. As shown, an opening 101 is provided in a bottle engaging portion 102 of the pump and valve arrangement 91. The opening 101 communicates with a space or chamber 103 at the mouth of the bottle. Flutes 104 in the sides of plug 92 and communicating with chamber 103 permit air to enter the bottle as liquid is withdrawn. The skirt 97 closes the flute openings when the pressure inside the bottle is equal to that outside the bottle to prevent discharge of liquid through the flutes.

The body portions of the dispensing pumps illustrated in the drawing and described above may be formed of any suitable material such as a polyethylene plastic or a Bakelite plastic material or the like. The diaphragm members are preferably formed of a resilient, deformable material such as a polyethylene plastic.

The dispensing pump assemblies illustrated in the drawings and described above are subject to structural modifications without departing from the spirit and scope of the appended claims.

Having described the invention, what we claim as new and desire to secure by Letters Patent is:

1. A pump and a valve for dispensing liquids from a bottle or the like, comprising a hollow body having a flexible outer wall member and a bottle neck receiving portion, said body having a valve opening communicating with said neck receiving portion, a valve disc in said hollow body for opening and closing said valve opening, said flexible wall member normally being spaced from the valve opening, a stem attached to the flexible wall member and slidably connected to the valve disc, the stem frictionally engaging the valve disc, said valve disc being adapted to close the valve opening when the flexible wall member is deformed toward the valve opening, said hollow body having an orifice for discharging fluid from the same when the flexible wall member is deformed further toward the valve opening after the valve disc closes, the valve disc being drawn to open position by the stem when the flexible wall member returns toward open position, and means for limiting the extent to which the valve disc is actuated in opening direction to arrest the valve disc before the flexible wall member reaches its normal position.

2. A pump and valve assembly for dispensing liquids from a bottle or the like comprising a hollow body having a flexible outer wall, there being a valve opening in a wall opposite said flexible wall, a second hollow body extending from said opposite wall and being in communication with said first hollow body through said valve opening, said second hollow body communicating with a tube adapted to extend towards the bottom of the bottle, a valve disc for said valve inside said first mentioned hollow body, a stem attached to said flexible outer wall and frictionally engaging said disc, said valve disc closing the valve opening when the flexible wall is deformed inwardly from its normal position, means for limiting movement of the disc in the opening direction when the flexible wall returns to its normal position, and a passage associated with said second hollow body and having communication with the atmosphere for admitting air into a bottle when the flexible wall of the first hollow body is actuated in a direction to open the valve disc.

3. A dispensing pump for a bottle which comprises a body having a portion for receiving the neck of a bottle, a flange projecting outwardly of said neck receiving portion, and a flange projecting inwardly therefrom, there being an opening in the inwardly projecting flange for communicating with the interior of the bottle, a spool-shaped valve member reciprocably mounted in said opening, said valve member comprising an annular central portion, a stop member attached to the central portion at one end thereof and engageable with the bottle side of the inwardly projecting flange, and a valve disc attached to the other end of the central portion and engageable

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with the other side of the inwardly projecting flange to close the opening thereof, a flexible outer wall member attached to the edge of the outwardly extending flange, a stem attached to the flexible wall and projecting through the central portion of the valve member in frictional engagement therewith, and a discharge nozzle communicating with the space between the flexible wall and the body, whereby, when the flexible wall is deformed toward the bottle, the valve member is closed and fluid in the space is discharged through the opening, and when the flexible wall is released, the valve is opened.

4. A dispensing pump in accordance with claim 3, characterized by the fact that a cup-shaped member is attached to the bottle side of the inwardly projecting flange surrounding the opening thereof, that the stop end of the valve member is reciprocable in said cup-shaped member, that a tube is attached to and communicates with the interior of the cup-shaped member and extends toward the bottom of the bottle, that an air inlet tube extends through the body member to provide communication between the interior of the bottle and the outside of the bottle, and that a valve in said air inlet tube permits entry of air into the bottle and prevents discharge of fluid from the bottle.

5. A dispensing pump in accordance with claim 3, characterized by the fact that the outwardly projecting flange and the flexible wall terminate in registry and that a ring of molded plastic material engages the edges of the outwardly projecting flange and the flexible wall to form a seal therebetween.

6. A dispensing pump in accordance with claim 3, characterized by the fact that the outwardly projecting flange and the flexible wall terminate in registry, that a ring of molded plastic material engages the edges of the outwardly projecting flange and of the flexible wall to form a seal therebetween and that the discharge opening extends through said ring.

7. A dispensing pump in accordance with claim 3, characterized by the fact that the outwardly projecting flange and the flexible wall terminate in registry, that a ring of molded plastic material engages the edges of the outwardly projecting flange and the flexible wall to form a seal therebetween, that an outwardly projecting discharge nozzle is formed on the ring, and that the discharge opening extends through said ring into the nozzle.

8. A dispensing pump in accordance with claim 3,

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characterized by the fact that a tube is connected to the inwardly projecting flange of the body in communication with the opening and projecting into the bottle toward the bottom of the bottle.

9. A dispensing pump in accordance with claim 3, characterized by the fact that a tube is connected to the bottle side of the inwardly projecting flange of the body in communication with the open end projecting therefrom toward the bottom of the bottle and that an air inlet tube projects through the body member to permit air to enter the bottle as fluid is drawn from the bottle by the valve.

10. A pump and valve assembly for dispensing a liquid from a bottle or the like comprising a hollow body having a flexible outer wall member and a bottle neck receiving portion, said body having a valve opening spaced from the flexible wall and communicating with said neck receiving portion, a valve disc in said hollow body for opening and closing said valve opening, an elongated shank attached to said valve disc, there being an elongated opening in said shank and disc, said opening having a substantially cylindrical wall, a stem attached to the flexible wall member and extending into and along the elongated opening, the stem being slidable along the elongated opening in substantially fluid-tight relation and in frictional engagement with the wall of the opening, the valve disc being adapted to close the valve opening when the flexible wall member is deformed toward the valve opening, there being an orifice in the hollow body for discharging liquid from the same when the flexible wall member is actuated toward the valve opening after closing of the valve, there being a shoulder adjacent the valve opening and on the side thereof remote from the valve disc, and means on the valve stem engageable with said shoulder for limiting the extent to which the valve disc is actuated toward open position when the flexible wall member returns toward its normal position to arrest the valve disc before the flexible wall member reaches its normal position.

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