

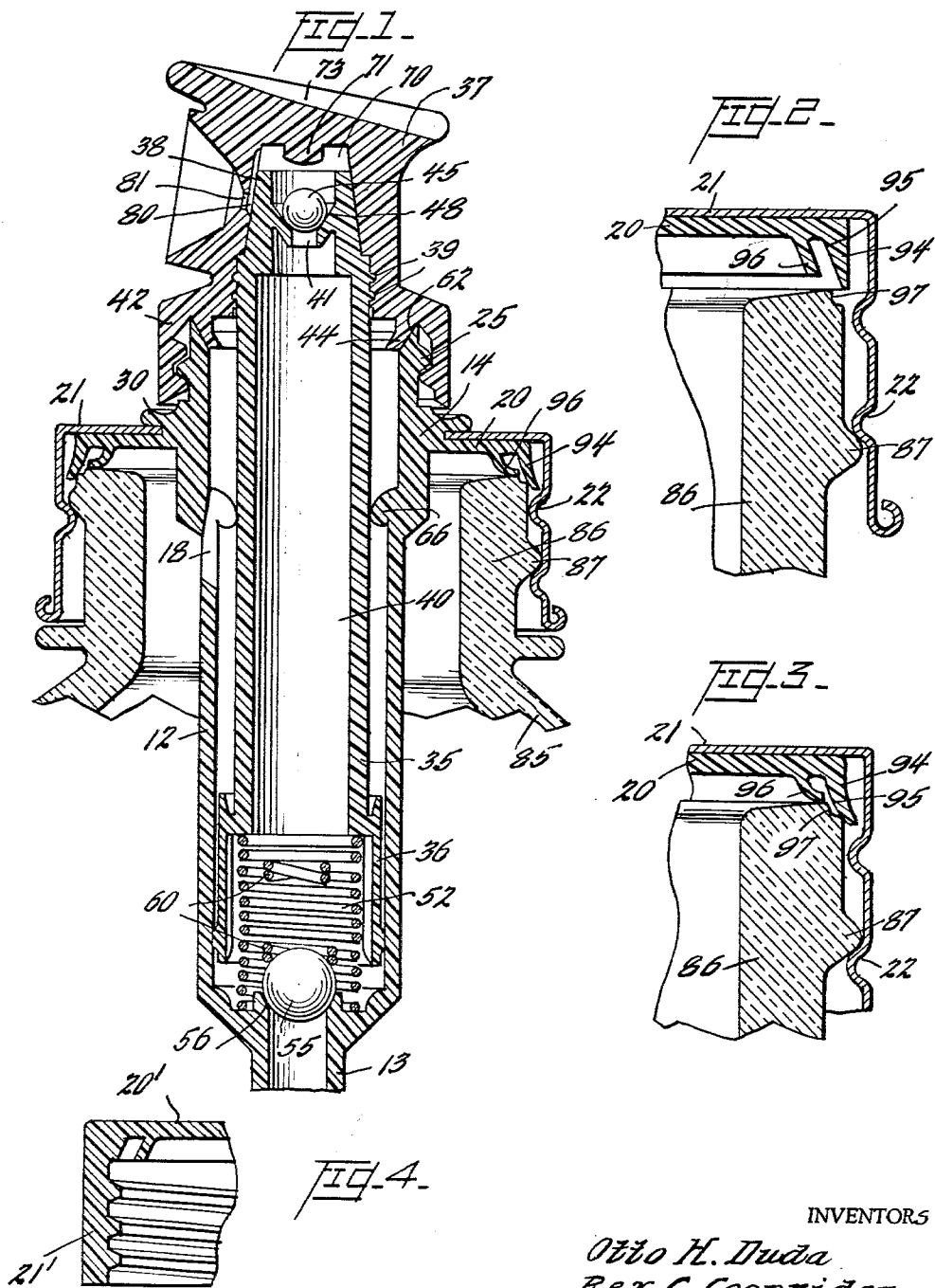
April 27, 1965

O. H. DUDA ETAL

3,180,534

LIQUID DISPENSER

Filed April 11, 1963



INVENTORS

Otto H. Duda
Rex C. Coopridge,

BY Watson, Cole, Grindle & Watson
ATTORNEYS

1

3,180,534

LIQUID DISPENSER

Otto H. Duda, Bell, and Rex C. Coopriders, Downey, Calif., assignors to Calmar, Inc., City of Industry, Calif., a corporation of California

Filed Apr. 11, 1963, Ser. No. 272,279

4 Claims. (Cl. 222-321)

This invention relates to new and improved plastic dispensers or pumps of the reciprocating piston type for discharging liquids from portable containers in the form of a fine spray or mist, or as a stream.

It has long been the practice to employ, for the dispensing of liquids from small containers, hand actuated pumps formed of moldable plastic material comprising, in assembled relation, a stationary unit including a barrel or cylinder for direct association with the container, and a reciprocable unit including a plunger or piston reciprocable in the stationary unit to effect discharge of the container contents, and having at its upper end a discharge head from which the fluid is expelled.

Within recent years certain pumps of this type have been supplied with means to minimize or prevent leakage of liquid from the pumps, after assembly thereof with containers for the liquids, to facilitate shipping and to avert the annoyance of leakage after the product has been put in use by the consumer. Usually the sealing of the pump, and its release for normal operation, are achieved by rotation of a threaded element about the pump axis to displace axially the reciprocable unit to and from an immobilized and inoperative position in which sealing means are rendered effective. A number of United States patents have been granted on improved pumps of this kind, including Coopriders, 3,062,416, granted November 6, 1962, Coopriders et al., 2,956,509, granted October 18, 1960, and Corsette, 3,053,459, granted September 11, 1962.

Such pumps are commonly provided with a container cap, mounted on the stationary unit of the pump, and threaded on the neck of a container or bottle to suspend the pump in the container, and a radial flange or like part on the stationary unit is clamped between the container cap and the container neck when the cap is threaded down. Since the pump is so constructed that it may be sealed, it is essential that leakage at the container cap be prevented also. While this may be achieved by inserting a gasket beneath the radial flange, so that the gasket will be compressed between the flange and the upper end of the container neck when the cap is threaded down, the gasket increases the cost of the device and presents an added assembling problem.

In accordance with the present invention, it is proposed to form an effective sealing means integrally with the radial flange, the construction being such that engagement of the sealing means with a part of the container neck of uniform contour is assured.

More specifically, it is an object of the invention to provide, in a pump of the type described, an annular sealing flange integral with and dependent from the radial flange on the stationary unit, the sealing flange having a diameter such that it engages the surface at the upper end of the container neck. It is a feature of the invention that correct engagement of the sealing flange with the aforesaid surface is insured by the provision at the outer edge of the radial flange of an annular depending centering flange, integral with the radial flange, and engaging the peripheral portion of the container neck.

Further objects and features of the invention will be apparent from the following description, taken in connection with the accompanying drawings, in which

FIGURE 1 is a vertical sectional view of one form of

2

pump to which the invention may be applied, showing the pump assembled with a container;

FIGURE 2 is an enlarged fragmentary sectional view of a portion of the structure shown in FIGURE 1, with the parts in the position which they occupy as the pump is applied to the container but before the container cap is threaded down;

FIGURE 3 is a view similar to FIGURE 2 and showing the parts in the position which they occupy when the container cap is fully applied; and

FIGURE 4 is a fragmentary sectional view showing integral formation of the barrel flange and container cap.

For convenience in describing the invention, its principles are illustrated as applied to the pump type sprayer shown and described in the patent to Corsette, 3,053,459, above mentioned. It will be appreciated, however, that the invention may be as readily applied to other pumps, such as the dispenser of Coopriders, 3,062,416, in which the stationary and reciprocable units are each of one-piece construction, or the sprayer of Coopriders et al., 2,956,509, in which the reciprocable unit is held in inoperable and sealed position by a threaded overcap, or to any other pump structure in which sealing at the container cap is desirable or necessary.

Referring first to FIGURE 1, the dispenser or pump there illustrated includes a stationary unit which may be molded in one piece to provide a barrel or cylinder 12 from which a suction tube 13 depends and, at the upper end of the barrel 12, a collar portion 14, noting that throughout the following description the dispenser will be assumed to occupy the upright position in which it is normally used.

The upper end of the barrel 12 is preferably slotted at circumferentially spaced points, as indicated at 18, for the purpose of preventing the formation of an airlock in the barrel 12 above the piston, to permit ingress to the container of air in order to replace discharged liquid, and to allow drainage into the container of liquid which may pass the piston and which would otherwise be trapped in the upper portion of barrel 12.

A radial barrel flange 20, formed on the collar portion 14, provides a seat for container cap 21. Cap 21 is apertured to receive collar portion 14 and is internally threaded as shown at 22 for cooperative engagement with external threads formed on the neck of the container.

The collar portion 14 is further provided at its upper end with an exteriorly threaded sleeve portion 25, and an annular lip 30 which is formed by deformation of sleeve portion 25 after assembly of the container cap 21 thereon, in order to lock the cap on the collar portion 14.

The stationary and reciprocable units of the dispenser may be formed of any moldable plastic materials, preferably materials commonly designated thermoplastics, for instance, polyethylene and polypropylene. Vinyl chloride acetate is also highly effective, and in general, any plastic material subject to hot or cold flow, capable of being molded.

The reciprocable unit of the dispenser comprises a plunger 35 and a dependent hollow piston 36, the piston being enlarged in diameter at its lower end to fit snugly the interior wall of barrel 12; the plunger and piston may be integrally formed by injection molding.

The interior of plunger 35 defines a fluid passage 40, communicating at its upper end with a passage 41 which is provided with a valve seat 48 receiving a ball valve 45. Movement of fluid upwardly in the passages 40, 41 is thus normally unimpeded, the valve 45 serving merely as a check valve to prevent downward movement of fluid. At its upper end, the plunger 35 is preferably tapered upwardly to provide a conical portion 38. A discharge head 37, which may be cast separately from thermoplastic resins of the type hereinbefore described, is recessed

internally for reception with a snug fit on the upper end of the cylindrical portion of the plunger 35 and on the tapered portion 38 thereof. Assembly of the head 37 on the plunger 35 is effected by applying endwise pressure to force the head downwardly on the plunger until it assumes the position shown, in which annular beads 39 on the plunger seat in coacting annular grooves in the interior of the head, the head yielding sufficiently to pass it over the beads. The head and plunger, thus assembled, are fitted together sufficiently tightly to prevent egress of fluid therebetween.

The tapered portion 38 of the plunger 35 terminates short of the upper end of the head 37, providing a cavity 70, into which passage 41 opens. A stud 71, projecting downwardly from the finger rest portion 73 of the head into cavity 70 serves as a retainer for the ball valve 45.

Formed in the inner tapered surface of head 37 is a spin chamber 80, which may be generally conical with its flared end inward. An orifice 81 communicates with the axis of spin chamber 80. Fluid may be directed into the spin chamber by tangential passages formed in the inner surface of the head 37 and communicating with the cavity 70, as is conventional. Alternatively, rotation of fluid in spin chamber 80 may be established as described more particularly in the patent to Corsette, 3,053,459. The structure of the head forms no part of the instant invention and the application of the invention to pumps having a discharge spout delivering a stream of liquid, as in the patent to Coopridge, 3,062,416, is of equal value.

Received with piston 36 and seated in the lower end of barrel 12 is a coil compression spring 52, acting to urge the reciprocable unit upwardly. Ball valve 55, seating by gravity in the lower end of barrel 12, acts as a check valve to prevent drainage of liquid downwardly from the barrel 12. Preferably the seat 56 for ball valve 55 forms an angle of at least 45° with the axis of the dispenser to minimize the possibility of wedging of the valve in its seat.

Spring 52 is formed with convolutions 60 of reduced diameter, preferably adjacent each end, as shown, to provide reversibility. In the position which the parts occupy in FIGURE 1, the reciprocable unit being fully depressed, the ball valve 55 is engaged by the adjacent small convolution 60 of spring 52 to hold the valve tightly against its seat, thus preventing flow of liquid into the barrel and outwardly through passages 40 and 41 when the dispenser is inverted.

At its lower end the head is formed to provide a depending skirt portion 42, formed with interior threads which coact with the external threads on the sleeve portion 25 of the barrel 12. When the head is thus screwed down on the upper end of the barrel, as shown in FIGURE 1, coacting inclined surfaces 62 on the head and barrel are pressed together to form a seal preventing discharge of liquid from the container through the slots 18 and externally of the plunger 35. Since movement of liquid upwardly into the lower end of the barrel 12 and the plunger 35 is prevented in the fully depressed position of the plunger by direct engagement of the convolutions 60 of the spring 52 with the ball valve 55, leakage of liquid is prevented during handling and shipping, this being of particular importance when toxic liquids, such as insecticides, are used. It should be noted that the lip 44 depending within the skirt portion 42 of the head 37 seats inside the upper end of the barrel and thus tends to resist springing of the skirt 42 and stripping or overriding of the threads as the head is screwed down on the barrel.

It will be appreciated that in order to render the dispenser operative, it is only necessary to unscrew the head from the barrel, whereupon the plunger 35 is raised by spring 52. Liquid may then be forced upwardly within the plunger 35 by finger pressure on the upper surface of the head to reciprocate the plunger in barrel 12 in the usual manner. Preferably the discharge head 37 is

formed of linear polyethylene, having a relatively low coefficient of friction and a smooth, waxy surface, to facilitate threading of the skirt portion of the head within the sleeve portion 25 of barrel 12.

The reciprocable unit is retained in position in the stationary unit by an inwardly directed annular part 66 which extends into close proximity with the plunger 35 and serves as a bearing surface for guiding the plunger during reciprocation thereof, while limiting outward movement of the plunger in response to the action of spring 52. The annular part 66 is formed after assembly of the two units, by assembling around plunger 35 a cylindrical tool, the tool being pressed downwardly against a shoulder formed at the junction of the barrel proper with the collar portion 14 of the barrel so as to cause the material to flow inwardly.

All of the structure thus far described is disclosed and claimed in prior patents, and is merely illustrative of one type of pump in which the instant invention may be employed. The details of the selected pump are, therefore, not to be construed as limiting the scope of the invention.

The novel structure requires modification of the usual radical barrel flange 20 to effect the seal with the container neck, hereinbefore described. The container, here shown as a glass bottle 85, is formed to provide a neck 86, externally threaded at 87 to receive the threads 22 on the skirt of container cap 21, which may be formed either of metal or of molded plastic. The radial barrel flange 20 is extended outwardly beyond the rim of the bottle neck 86, and terminates in an integrally formed depending annular skirt or centering flange 94. The inner surface 95 of centering flange 94 is inclined downwardly and outwardly as shown in FIGURE 2, and is so dimensioned that its lower end will clear the rim of bottle neck 86, continued downward movement of the pump as the container cap 21 is threaded onto the bottle neck serving to supply pressure between the generally conical surface 95 and the rim of the bottle neck, so as to insure that the pump is properly centered on the neck.

A sealing flange 96, also molded integrally with the barrel flange 20 and depending therefrom, is inclined downwardly and outwardly as shown, and is so dimensioned that its lower end will engage the upper continuous surface of the bottle neck as the container cap 21 is threaded down, thereby providing an effective seal between the barrel flange and the bottle neck in the fully assembled position, as represented in FIGURE 3. Owing to the function of the centering flange 94, the position of sealing flange 96 with respect to the upper surface of the neck of the bottle is accurately determined, and the sealing flange will invariably engage a surface which is consistently uniform.

In this connection, it may be pointed out that in the molding of glass bottles there is frequently formed at the periphery of the bottle neck rim a discontinuous or non-uniform surface, due to failure of the glass to fill the mold completely. Frequently this produces a slight indentation, such as shown at 97 in FIGURE 2, and any attempt to form a seal at this point is likely to result in a substantial proportion of defective units. Also, it is essential that the centering flange 94 be constructed so as to clear the rim of the bottle neck to avoid jamming at the recess 97 as the container cap is threaded down. By arranging for engagement of the sealing flange 96 inwardly of the bottle neck rim, correct sealing contact is assured.

While the container cap is illustrated herein as having the usual threaded connection with the container neck, and this arrangement is preferred because of the leverage thereby afforded, permitting the application of substantial axial pressure on the seal between the barrel flange and the container neck, an alternative arrangement in which the container cap snaps onto the container neck, for instance as shown in the patent to Corsette, 3,069,040, granted December 18, 1962, may be substituted for the

5

illustrated threaded connection. It will be appreciated, therefore, that for the purposes of the instant invention a snap cap may be deemed the full equivalent of the usual threaded container cap illustrated and described herein.

Wherever it is possible to do so, components of the pump will preferably be formed integrally. For instance, as shown in FIGURE 4, the container cap 21¹ may be molded integrally with the radial barrel flange 20¹, this being especially useful when the container cap has a snap coupling (for example as in the patent to Corsette, 3,069,040) rather than a threaded connection with the bottle neck.

Such further modifications and alterations in the illustrated structure are contemplated as would normally occur to those skilled in the art to which the invention relates.

Having thus described the invention, what is claimed as new and desired to be secured by Letters Patent is:

1. A manually operable pump for liquids, comprising a stationary unit including a generally vertical pump barrel, a reciprocable unit including a plunger having a sliding fit in said barrel, said pump barrel being formed adjacent its upper end to provide a generally radial barrel flange, and a container cap carried by said flange and having internal threads for coaction with the external threads on the neck of a container for liquid, said barrel flange being formed to provide a depending annular centering flange having an inner surface inclined outwardly in a downward direction as initially formed and so dimensioned that its larger diameter is slightly greater than the external diameter of the upper portion of the container neck, whereby said centering flange will surround and embrace the upper portion of said container neck when the container cap is threaded down, said barrel flange being formed to provide an annular sealing flange of less diameter than said centering flange for engagement with the top surface of said container neck, said sealing flange being inclined outwardly in a downward direction, whereby the force acting between said sealing flange and the top surface of said neck as said container cap is threaded down exerts a radially outward thrust on said sealing flange to deflect the lower end of the latter in an outward direction.

2. A manually operable pump for liquids, comprising a stationary unit including a generally vertical pump barrel, a reciprocable unit including a plunger having a sliding fit in said barrel, said pump barrel being formed adjacent its upper end to provide a generally radial barrel flange, and a container cap carried by said flange and having internal threads for coaction with the external threads on the neck of a container for liquid, said barrel flange being formed to provide a depending annular centering flange having an inner surface inclined outwardly in a downward direction as initially formed and so dimensioned that its larger diameter is slightly greater than the external diameter of the upper portion of the container neck, whereby said centering flange will surround and

6

embrace the upper portion of said container neck when the container cap is threaded down, said barrel flange being formed to provide an annular sealing flange of less diameter than said centering flange for engagement with the top surface of said container neck.

3. A manually operable pump for liquids, comprising a stationary unit including a generally vertical pump barrel, a reciprocable unit including a plunger having a sliding fit in said barrel, said pump barrel being formed adjacent its upper end to provide a generally radial barrel flange having a peripherally disposed and depending annular flange provided with internal threads for coaction with the external threads on the neck of a container for liquid, said annular flange having above said threads an inner surface inclined outwardly in a downward direction as initially formed and so dimensioned that its larger diameter is slightly greater than the external diameter of the upper portion of the container neck, whereby said centering flange will surround and embrace the upper portion of said container neck when the said threads are fully engaged, said barrel flange being formed to provide inwardly of said surface an annular sealing flange for engagement with the top surface of said container neck, said sealing flange being inclined outwardly in a downward direction, whereby the force acting between said sealing flange and the top surface of said neck when said threads are in coacting relation exerts a radially outward thrust on said sealing flange to deflect the lower end of the latter in an outward direction.

4. A manually operable pump for liquids, comprising a stationary unit including a generally vertical pump barrel, a reciprocable unit including a plunger having a sliding fit in said barrel, said pump barrel being formed adjacent its upper end to provide a generally radial barrel flange having a peripherally disposed and depending annular flange provided with internal threads for coaction with the external threads on the neck of a container for liquid, said annular flange having above said threads an inner surface inclined outwardly in a downward direction as initially formed and so dimensioned that its larger diameter is slightly greater than the external diameter of the upper portion of the container neck, whereby said centering flange will surround and embrace the upper portion of said container neck when the said threads are fully engaged, said barrel flange being formed to provide inwardly of said surface an annular sealing flange for engagement with the top surface of said container neck.

References Cited by the Examiner

UNITED STATES PATENTS

2,601,040	6/52	Livingstone	222—542 X
2,763,402	9/56	Livingstone	222—542 X
3,064,865	11/62	Scoggin et al.	222—321

LOUIS J. DEMBO, *Primary Examiner.*

HADD S. LANE, *Examiner.*