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VALVE CLOSURE ASSEMBLY

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2 Sheets-Sheet 1

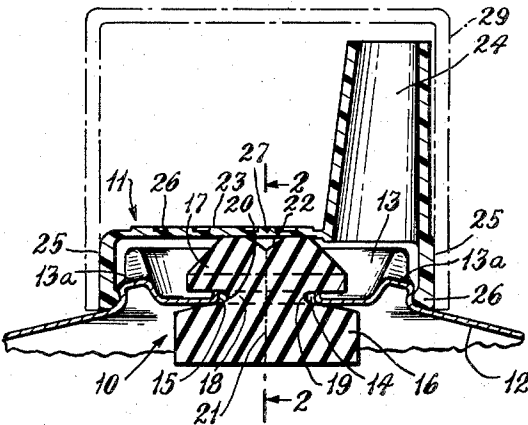


FIG. 1

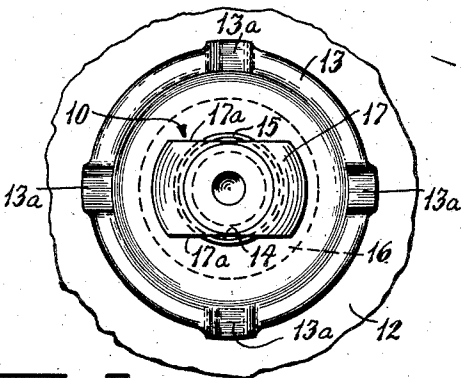


FIG. 3

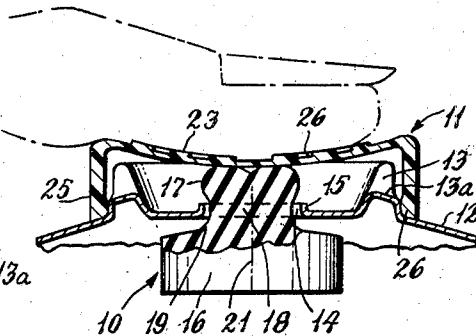


FIG. 2

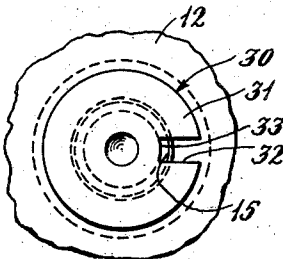


FIG. 4

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2 Sheets-Sheet 2

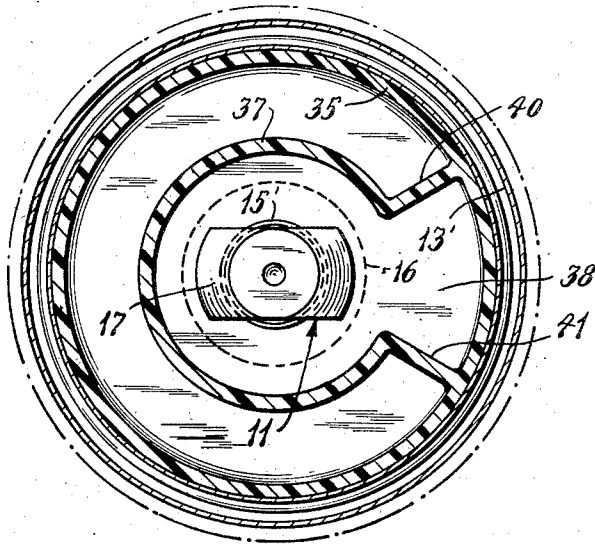
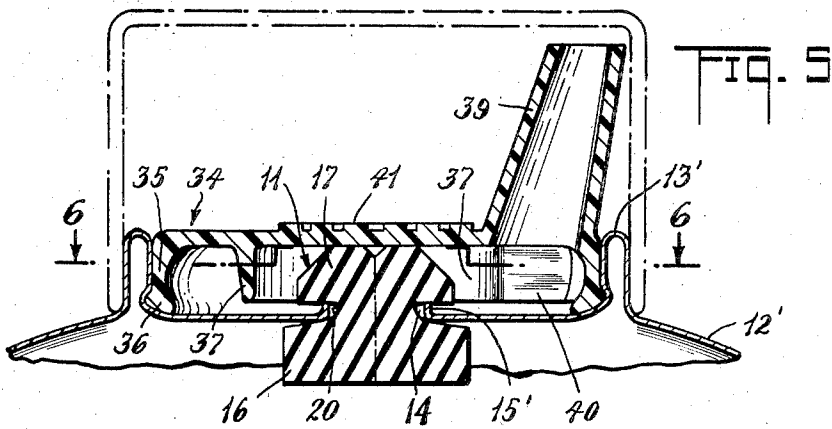


FIG. 6

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VALVE CLOSURE ASSEMBLY

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Application August 31, 1955, Serial No. 531,713

3 Claims. (Cl. 222—394)

The present invention relates to valve closures and more particularly to valve closures across which a fluid pressure differential can be maintained and through which both charging and discharging operations can be readily effected.

The rapidly expanding markets for self-expelling products maintained under pressure in containers has resulted in numerous attempts to provide efficient, safe and for the most part expendable valve closures for both charging the container with propellants, such as gas, and for discharging the pressurized products. A typical self-sealing closure for a container which can be readily tapped either to introduce or withdraw material is described in U. S. patent, No. 2,670,871. An adaptation of this closure to achieve in addition a controlled valving action is described in the applicants' pending application Serial No. 211,022, filed February 15, 1951, now U. S. Patent No. 2,761,593.

The present invention represents an improvement over these prior devices in that it provides a valve closure for containers in which both improved sealing and valving actions are achieved, the closure being capable of withstanding relatively high pressures and the valve operating in response to actuating forces applied in but a single direction. Several embodiments of the invention from which the above and other features will be readily understood are described in detail below having reference to the accompanying drawings thereof and in which:

Figure 1 is a view in vertical section of a valve closure assembly mounted in a container shown in part;

Figure 2 is a view in vertical section taken on the line 2—2 of Figure 1 showing how the valve closure assembly is operated;

Figure 3 is a plan view of a normally unexposed portion of a container and of the low pressure end of a normally unexposed portion of the valve closure assembly of Figure 1;

Figure 4 is a view corresponding in part to Figure 3 showing a modification of the normally unexposed valve closure portion;

Figure 5 is a view corresponding to Figure 1 showing a modification of another portion of the valve closure assembly; and

Figure 6 is a view in horizontal section taken on the line 6—6 of Figure 5 looking in the direction of the arrows.

Referring first to Figures 1, 2 and 3, the invention is illustrated in the form of a two piece valve assembly including an inner, valving and sealing member indicated generally by the numeral 10, and an outer valve actuating and product dispensing member indicated generally by the numeral 11, both mounted in a container, only one wall 12 of which is shown in the drawing. Preferably the wall 12 comprises a top cover or end for the container.

The wall 12 is formed with an upstanding circular rib or boss 13 having a series of lugs 13a struck therein and to which the member 11 attaches. Formed in the container wall 12 within the circular rib 13 is an open-

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ing 14 which can be defined by an outwardly flared, generally cylindrical flange 15. Preferably although not necessarily, the rib 13 and flange 15 are formed integrally with the wall 12 of the container.

The member 10, which is fitted in the opening 14, includes an inner or high pressure sealing portion or flange 16 and an outer or low pressure holding portion 18. The neck portion 18 is generally concave, being defined by wall surfaces 19 which can taper or converge toward a notch 20 (Figure 1) of slightly smaller size than the cylindrical flange 15 within which it is disposed. The surface 19 and contiguous parts of the sealing portion 16 normally seat against the underside of the wall 12 closely adjacent the flange 15 in sealing relationship due to tension in the neck as described below to close the valve.

The valve member 10, which is preferably formed from a single piece of resilient material, such for example as rubber, is adapted to receive a gas charging needle along a central puncturing axis 21, with the holding portion 17 being formed, if desired, with a tapered recess 22 at the upper end of the puncturing axis to pilot the charging needle along the axis. In accordance with said U. S. patent, No. 2,670,871, the neck 18 of the member 10 is so mounted in the container that it is maintained under tension to effect a sealing of the puncturing axis 21 when the charging needle is withdrawn.

The member 10 can be mounted in the container opening 14 by forcing the holding portion 17 through the opening before the wall 12 of the container is rolled or otherwise attached to the container body (not shown). In this fashion the sealing portion 16 can be formed to a size which is incapable of passing through the opening, thereby eliminating the possibility of blow-outs. In position in the container the neck 18 of the member 10 is maintained in tension by the relationship between the height and diameter of the cylindrical flange 15 and the corresponding dimensions and shapes of the neck 18. The cylindrical flange 15 of the container, being positioned in the converging walls which define the neck 18 of the member 10, develops relatively high tensile forces axially in the neck. It will be understood the neck 18 can be made generally cylindrical in shape, and no larger than the opening of the cylindrical flange, and still result in effective sealing, assuming the specified dimensional relationships are maintained.

The valve member 10 is formed with suitable product passing means which can take the form, referring to Figure 3, of laterally flattened portions 17a on the holding portion 17 to expose, as viewed from the low pressure end of the valve, a small section of the opening 14.

The valve actuating and product dispensing member 11, which can be formed from a single piece of flexible material such, for example, as plastic or rubber, is generally cup-shaped, including a depressible or deformable valve actuating upper surface 23, product discharge means in the form of a spout or nozzle 24, and a circular flange or skirt portion 25 having a bead 26 complementary to the circular rib 13 of the container wall 12 for attachment thereto. The surface 23 can be formed with circular grooves 26 or other design or instructions such as "press here" to define a thumb-engaging space in alignment with the axis 21 of the member 10. If the container is to be charged through the member 11, a puncturing axis through which a gas charging needle can be inserted, can be identified by a suitable recess or other indicator 27 in the exposed surface 23 in alignment with the puncturing axis 21 of the member 10.

The valve actuating and product dispensing member 11 is preferably so arranged that the underside of its depressible surface 23 is in engagement with or close to the

upper surface of the holding portion 17 of the member 10, and so that the flange portion 25 defines a product space around the member 10 in communication with the nozzle 24. In the event the surface 23 of the member 11 is spaced from the opposed surface of the holding portion 17, a nub or offset portion can be formed on the underside of the surface 23 to bridge the distance therebetween, although in general it is preferred that the total height of the member 11 from the surface of the container be kept to a minimum.

Operation of the valve is effected by pressing downwardly on the surface 23 with the thumb or finger, for example, as best seen in Figure 2, to flatten the holding portion 17 against the cylindrical flange 15, causing the latter to embed therein and to unseat the tapering wall 19 of the neck 18 from the seat formed by the wall 12 adjacent the cylindrical flange 15. This permits the product under pressure within the container to flow around the sealing portion 16 and into the product space or chamber formed by the member 11 through the product passing means as defined by the opening between the neck 18 and flange 15, from which it flows to the nozzle 24 to be discharged. The inherent resilience of the member 10 causes the valve to close when the thumb pressure is released. It will be understood, therefore, that the member 11, through which the valve member 10 is operated, is free to partake of lateral displacement relative to the member 10 without opening the valve and that the only component of motion which operates the valve assembly to discharge the product is that which is directed downwardly along the axis of the closure. Inadvertent bumping of the valve assembly and the member 11 in particular is unlikely therefore to result in opening of the valve.

If desired, the entire valve assembly formed by the members 10 and 11 can be covered by a detachable cap 29 held in place by friction, locking lugs, or the like.

The valve assembly as disclosed by Figures 1, 2 and 3 can be varied in design details within the scope of the invention. Thus, for example, referring to Figure 4, the valve closure portion can take the form of a valve closure member 30 having a generally circular holding portion 31 on its low pressure side having product passing means in the form of a metering orifice such as a notch 32 cut back to the throat 33, corresponding to the throat 18 of Figure 1. Depressing the member 30 along its axis, that is normal to the plane of the paper as viewed in Figure 4, establishes a flow of the product out of the product passing means 32 from which it enters the nozzle 24 all in accordance with the above described arrangement.

Referring to Figures 5 and 6, a modified valve actuating and product dispensing member 34 can be provided having a circular skirt portion 35, the bead 36 of which is forced, as by the inherent resilience of the member 34, outwardly against the rib 13' of the container wall 12' in sealing relationship. Disposed within the circular portion 35 but surrounding the holding portion 17 of the valve member 11 (which can if desired correspond to the member 11 of Figures 1-3 and which is therefore identified by like reference numerals) is a dam member 37. The dam member is formed with an opening 38, adjacent discharge means such as a spout or nozzle 39, the opening being defined by flared ends 40 and 41 which join the circular portion 35.

When the valve member 11 is actuated by pressing downwardly on a depressible surface 41 on the member 34, the depending or free edges of the dam member 37 engage the surface of the container in sealing relationship so that the product which flows from the container through the then opened valve will be confined, before discharge from the nozzle 38, to a relatively small space, thereby tending to preclude possible leakage at the junction of the bead 36 and the complementary mounting rib 13 and reducing the quantity of the resi-

due retained by the member 34. Upon release of the surface 41 to allow the valve member 11 to close, the dam member 37 raises from the wall 12' to enlarge the product space and thereby provide an expansion space for the residual product confined within the member 34. This feature is particularly useful in the case of containers for whipping and discharging edible cream products, shave creams, or the like, which are highly expanded in volume as they are discharged, for it tends to preclude the subsequent appearance of exudate at the discharge means 39 occasioned by the expansion of the residue within the member 34 as it heats up to room temperature after the cooling action of the discharge from the high pressure space of the container. In time the highly expanded product within the member 34 loses its gas to the atmosphere and attenuates to a liquid or filmy network and any portion thereof remaining within the area defined by the dam member 37 is readily purged upon subsequent operation of the valving means.

As will be appreciated from the foregoing disclosure, there is provided in accordance with the present invention a valve assembly which is small in size, particularly in height above the container wall, and which can be operated to release the contents of the container under the influence of minimum actuating motion. It will be understood, moreover, that the invention can take various forms and shapes within the scope of the invention disclosed herein which should not, therefore, be limited except as defined by the following claims.

We claim:

1. In combination, a container for fluids under pressure, an external wall in the container having an opening communicating with the inside of the container, a valving and sealing closure member comprising a resilient body having a stressed, resilient neck received in the opening, said neck dividing the body into a stressed resilient holding portion outside the container and a stressed resilient sealing portion inside the container, said body having a bearing surface releasably engaging the inside of the container wall to seal the opening and an opposing bearing surface engaging the outside of the container wall, the bearing surfaces of the body in its unstressed condition having a spacing measured axially of the neck and opening which is less than the spacing of the corresponding bearing surfaces of the container, the body thereby being stressed in situ to place the neck in tension, said neck being smaller than the opening to avoid the setting up of radial compressive forces therein, and means defining a permanently open fluid discharge passage from the neck outwardly, said fluid discharge passage being defined by a relieved space on said holding portion exposing part of the opening externally of the container wall, whereby the valving and sealing closure can be opened by flexing the body by pressure applied axially inwardly on the holding portion of the body to release the tension in the neck to unseat the inner bearing surface to establish a fluid flow past the neck and through the relieved space on said holding portion.

2. In the combination as set forth in claim 1 said neck portion being defined by concave, convergent wall surfaces, said container opening being defined by a tubular wall at angles with said convergent wall surfaces.

3. In the combination as set forth in claim 2 said convergent wall surfaces defining a V-shaped notch.

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