Nov. 8, 1955 S. C. HART-STILL 2,723,041

CLOSURE FOR BOTTLES AND OTHER CONTAINERS

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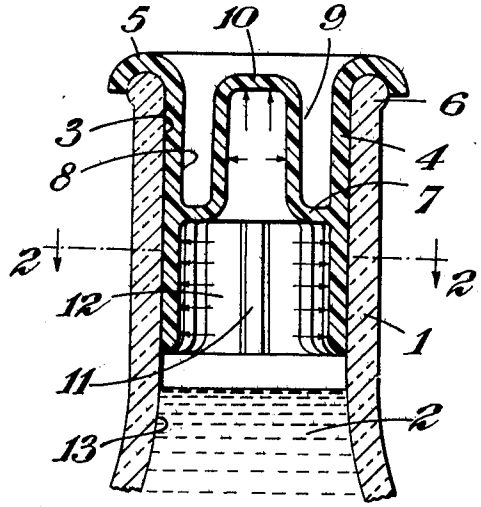


FIG. 1.

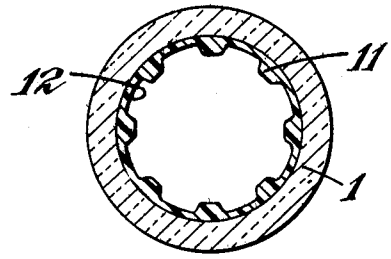


FIG. 2.

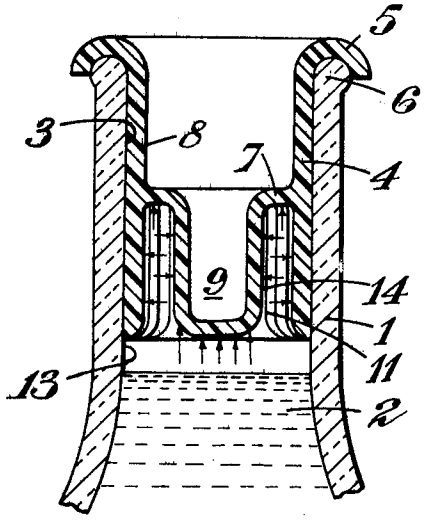


FIG. 3.

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CLOSURE FOR BOTTLES AND OTHER CONTAINERS

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1 Claim. (Cl. 215—52)

This invention comprises a closure for bottles and other containers.

The object of the invention is to provide an effective closure which can be readily unsealed without the use of a special tool or implement.

The most common method, at present, of sealing bottles, more especially those containing an aerated liquid, is by the "crown" method, where a metal disc, with a soft liner such as cork, is swaged or crimped over an external rim of the bottle mouth, the removal being effected by a special opener. Where, however, the proper opener is not available to the user, an unsuitable implement is frequently used and injury to the hands of the user may result.

The closure according to the invention comprises a hollow plug of resilient material adapted to be inserted with a sliding fit in the mouth of the container to be sealed, the hollow part of the plug being blocked by a deformable diaphragm shaped to provide a bulge or pocket which, in the sealing position, extends outwardly (i. e. in the direction opposite to the direction of insertion of the closure) but which is adapted to be depressed so as to extend inwardly in the unsealing position.

The invention is illustrated in the accompanying drawings, in which:

Figure 1 is a sectional view of a closure, according to the invention, in the sealing position,

Figure 2 is a section taken on the line 2—2 of Figure 1,

Figure 3 is a sectional view of the closure with the diaphragm depressed to permit removal of the closure.

Referring to the drawings, a bottle or like container **1**, which is shown partly broken away, contains a liquid the upper part of which is indicated at **2**. In the mouth **3** of the bottle is disposed a hollow plug indicated as a whole by the numeral **4** adapted to be inserted with a sliding fit in the mouth.

The plug **4** comprises a circumferential lip or flange **5** which nests on the rim **6** of the mouth **3**. The hollow part of the plug **4** is blocked by a deformable diaphragm **7** which is integral with the cylindrical wall **8** of the plug, being joined to the wall about half way between the top and bottom of the plug. The diaphragm **7** has a cylindrical bulge or pocket **9** the top **10** of which, in its outwardly directed position, is slightly below the top of the lip or flange **5**. It will be appreciated that the bulge or pocket **9** may be of any suitable shape, which when depressed is, so to speak, turned inside out.

The whole closure is preferably moulded in one piece from a plastic material which is chemically inert, non-porous and sufficiently flexible to ensure a gas-tight seal. A further desirable feature is the retention of flexibility at low temperatures so that refrigeration of the bottle and its contents may be possible. Most suitably, the closure is made of a plastic selected from the ethenoid group of plastics e. g. "Polythene."

The cylindrical wall **8** of the plug comprises a plurality of spaced-apart longitudinal ribs **11** (Figure 2). This construction is especially suited to take up variations in the internal contour of the bottle mouth. In operation, the thinner parts **12** of the plug, between the ribs **11**, expand to cause the plug to make a tight fit in the mouth of the container, whilst the ribs **11** withstand the longitudinally exerted pressure applied when inserting the closure.

In operation, the closure is applied as though it were a solid cork, the bulge **9** of the diaphragm **7** extending upwardly. As the plug enters the mouth of the bottle, air is trapped between the diaphragm and the liquid, and further downward movement of the plug increases the internal pressure to an extent inversely proportional to the air space. When the plug has been pushed fully home so that the flange **5** is seated on the rim **6** of the mouth, the pressure within the closure will be such that the closure will remain firmly in position. Under such conditions, internal pressures in the container will act radially outwardly against the cylindrical wall beneath the diaphragm, thus tending firmly to seat the cylindrical wall in the neck of the container. At the same time internal pressures in the cylindrical portion **9** of the diaphragm will act radially outwardly. Some of the internal pressure will act upwardly against the end or top **10**, but the area of the surface of this portion of the diaphragm is a small fraction of the cylindrical surface acted on by radially outward forces. The latter forces at the upper end of the bulge **9** will be absorbed by the top **10**, while the remaining forces will act outwardly through the transverse portion of the diaphragm to assist in firmly seating the cylindrical portion **8** of the plug against the neck of the container.

The removal of the closure is effected by depressing the bulge **10** of the diaphragm by means of any blunt article such, for example, as the end of a pen or pencil. When depressed, the bulge will assume the position shown in Figure 3. The same radial forces acting on the cylindrical portion **8** will be present under such conditions. However, whereas forces previously acted radially outwardly against the interior of the cylindrical bulge **9**, the same or somewhat greater forces will act radially inwardly on what will now be the outwardly facing cylindrical surface of the bulge **9**. Some of these radially inward forces will be absorbed by the end **10**, while the remaining radially inward forces will transmit corresponding forces through the transverse portion of the diaphragm to the cylindrical plug portion **8** to tend partially to overcome the radially outwardly acting forces against the lower portion thereof. Therefore, in Figure 1, the forces acting radially outwardly against the lower portion of the cylindrical wall **8** will be supplemented by the radially outwardly acting forces within the bulge **9**. However, when the parts are in the positions shown in Figure 3, radially inwardly acting forces on the cylindrical portion of the bulge will overcome some of the forces acting radially outwardly on the lower end portion of the cylindrical wall **8**. Accordingly, the plug holds in position far more firmly with the parts in the positions shown in Figure 1 than when the parts are positioned as in Figure 3. There is accordingly present a very much reduced total force tending to increase the frictional grip of the plug, and therefore the latter readily may be removed by hand.

I claim:

A closure comprising a resilient tubular plug adapted to be inserted with a slide fit into the mouth of a container to be sealed and provided with an open lower end communicating with the container, said tubular plug being provided at its upper end with an annular outstanding flange adapted to fit over the upper end of the container, and a deformable diaphragm integral with and sealing across the interior of said plug, said diaphragm having a peripheral portion intermediate the length of said plug substantially perpendicularly to the axis of said plug, and an axially elongated cylindrical portion integral with said

peripheral portion and of a cross-sectional shape and size substantially smaller than and parallel to the inner surface of said plug, said cylindrical portion normally projecting axially in said plug away from the interior of said container and having an integral end transverse to the axis of said container of materially smaller area than the cylindrical portion of said diaphragm and being deformable upon the application of axial pressure against said end portion to extend inwardly of the container from said peripheral portion whereby, when said cylindrical portion is in its normal position, pressures within the container will act radially outwardly against said cylindrical portion and transmit forces to said plug to tend to seat the latter more firmly in the mouth of the container, while such pressures will act radially inwardly on said cylindrical portion when the latter projects inwardly of the container to transmit radially inward forces through said peripheral portion to said plug to reduce the frictional engagement of said plug with the mouth of the container.

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