April 5, 1966 L. G. BROWN 3,244,309

CLOSING DEVICE FOR CONTAINERS

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Fig. 1

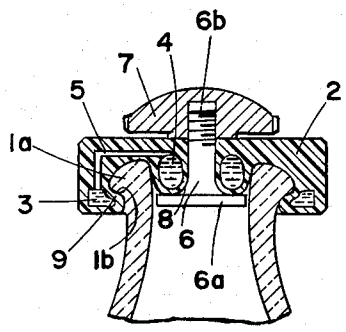


Fig. 2

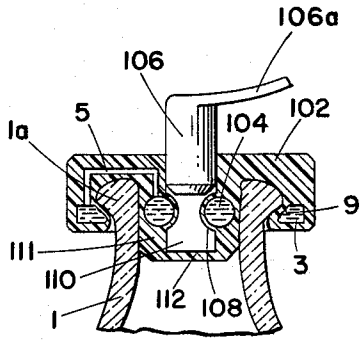


Fig. 3

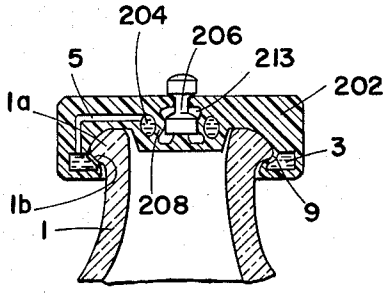
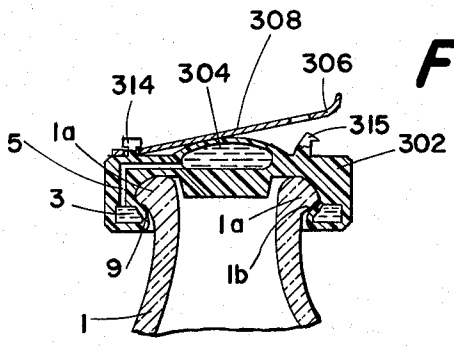


Fig. 4



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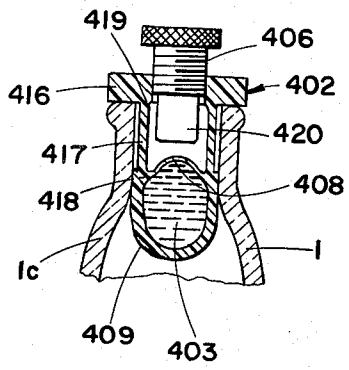
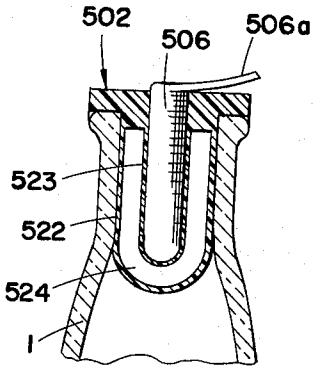


Fig. 5

Fig. 7



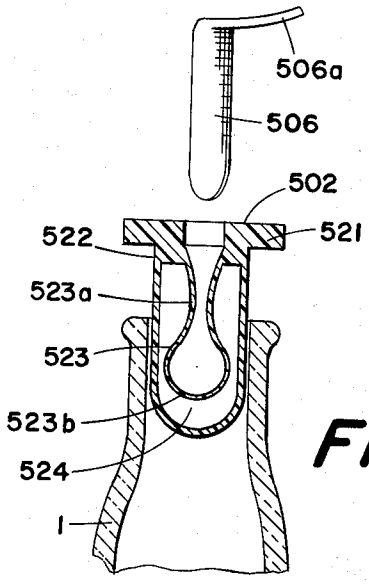


Fig. 6

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CLOSING DEVICE FOR CONTAINERS

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5 Claims. (Cl. 215—52)

The present invention relates to a closing device for a container, especially for a bottle.

It is the purpose of this invention to design a closing device which can be installed and removed very easily and without the use of a tool.

The closing device according to the invention is characterized by a closing member equipped with a chamber which is filled with a gas or a liquid and closed on all sides, and a displacement member adjustable along the closing member. The latter allows, by elastic deformation of a first part of the chamber wall within its sphere, an elastic deformation of a second part of the chamber wall by means of the liquid or the gas, respectively, in such a way that it clasps a part of the container along an annular area and rests tightly against this annular area.

The attached drawings illustrate some practical examples of the subject of the present invention.

FIGURES 1, 2, 3, 4, and 5 are longitudinal sections of a first, second, third, fourth and fifth design, respectively; FIGURES 6 and 7 are similar longitudinal sections of a sixth design, the parts being shown in two different positions.

In the different designs, **1** means the container which consists of a glass bottle. In the designs according to FIGURES 1 to 4, the neck of the bottle has a bulge **1***a* projecting outside.

The example according to FIGURE 1 has a closing member **2** which consists of a lid of thermoplastic synthetic resin or similar material. This lid has a uniform cavity which is completely filled with liquid or gas; it consists of an annular cavity **3** in the free border of the mantle of the lid, an annular cavity **4** in a projection on the interior side of the bottom of the lid, and a channel **5** which connects the annular cavities **3** and **4** freely to each other. The closing device includes, besides, a displacement member **6**; it has the shape of a screw with a flat, wide head **6***a* which is located in the bottleneck, and a stem **6***b* which penetrates a central opening of the closing lid and carries a nut **7**. By actuating the latter nut, the displacement member can be adjusted along the closing member. Upon adjustment upward and outward, respectively, the displacement member acts upon a "first" part of the chamber wall **8**, located within its sphere and confining the inner cavity **4** in its lower half; thereby the chamber wall part **8** undergoes an elastic deformation, decreasing the volume of the cavity **4** and thus displacing liquid or gas from this cavity **4** outward through the channel **5** into the outer cavity **3**. A "second" part of the chamber wall **9** which can also undergo elastic deformation confines this cavity **3** on its side which is facing the shoulder **1***b* of the bulge **1***a* of the bottleneck. By the liquid or gas pressed into the cavity **3**, the "second" chamber wall (part **9**), undergoes such an elastic deformation that its clasps the shoulder **1***b* just mentioned and rests tightly against it. The part of the wall which surrounds the cavity **4** on its circumference rests, at the same time, against the uppermost part of the wall of the bottleneck **1***a* at the inside, thus counteracting from inside the force applied from the outside on the end portion of the bottleneck by the chamber wall part **9**. As soon as the user screws off the nut **7** of the lid a little from the displacement body **6**, the latter can shift axially inward and allow the "first" chamber wall part **8** to return, due to its elasticity, into its initial position, thus enlarging the cavity **4**. Then the latter takes up liquid or gas from the cavity **3** and the "second" part of the wall **9** can be pushed beyond the bulge **1***a* of the bottleneck. This means, that now the closing lid **2** can be removed from the container.

The second design, shown in FIGURE 2, includes also a cap-like closing member **102**; but the "first" wall part **108**, which can undergo elastic deformation, is situated between the toroidal cavity **104** and a central cavity **110** of an interior projection **111** of the bottom of the lid. The cavity **110** is separated from the interior of the container by the bottom **112** of the projection **111**. The displacement member consists of a stopper **106** with the actuating lug **106***a*; the stopper can be shifted in the central cavity **110** and thus have such an effect on the wall part **108** that the cavity **104** decreases in size and the liquid or gas is displaced from this cavity **104** through the channel **5** into the cavity **3**, which is confined inside—as in the first design—by the "second" wall part **9** which can undergo elastic deformation.

The design according to FIGURE 3 also is quite similar to the designs described above. The closing member **202** includes, in a similar way as the one in FIGURE 2, a cavity **204**, which has the shape of a horseshoe in this design, the channel **5** and the cavity **3**. The bottom of the lid has a transverse slot **213** which is T-shaped in profile and has a certain inclination to the outer front face of the bottom of the lid; it includes an adjustable displacement member **206** in the form of a push-bar. In one position, this push-bar **206** acts upon the "first" wall part **208**, which can undergo elastic deformation, displacing liquid or gas from the cavity **204** into the cavity **3** and thus pressing the "second" wall part **9** against the shoulder **1***b* of the bulge **1***a* of the bottleneck. Upon shifting of the push-bar **206** into the other position, the liquid or gas can flow back from the cavity **3** into the cavity **204**, thus allowing removal of the closing lid from the container.

In the design according to FIGURE 4, the "first" wall part **308** which can undergo elastic deformation is located in the center, on the outer face of the closing cap **302**. The cavity **304** confined by it on the outside is again connected to the cavity **3** by the channel **5**; cavity **3** is confined inside by the "second" elastically deformable wall part **9**. The bottom of the lid has the projections **314** and **315** on the outside. The displacement member is designed as a rigid lever **306** which is pivoted to the projection **314**. When this lever is turned towards the bottom of the cap, its center portion acts upon the "first" wall part **308**, displacing liquid or gas from the cavity **304** into the cavity **3**, pressing the "second" wall part **9** against the shoulder **1***b* of the bulge **1***a* of the bottleneck. The lever can be secured in this position by catching in the hook-shaped projection **315**.

The design according to FIGURE 5 has a closing member **402**, where a plate **416** is connected through a hollow cylinder **417** with a part **418** which confines, from all sides, a cavity **403** which is at least approximately spherical in the operating position of the closing member. The plate **416** has a central threaded hole **419** into which the threaded portion of a pin-shaped displacement member **406** can be screwed. This way the displacement member can be adjusted with its part **420** in such a way that the latter acts upon the "first" wall part **408** facing it, thus expanding the "second" part of the wall **409**; this then clasps the part **1***c* of the bottle which widens towards the interior of the container, and rests tightly against the inner face of this bottle part **1***c*. Upon screwing back the displacement member **406**, the wall parts **408** and **409** return, due to their elasticity, into the shown position; then the closing member **402** can be easily pulled out of the neck of the bottle.

In the designs according to FIGURES 6 and 7, the closing member **502** consists of an annular plate **521** which comprises two bag-shaped, elastically flexible membranes, an outer membrane **522** and an inner membrane **523**, made from one piece. The mantle wall of the outer membrane **522** is cylindrical, its outer diameter being equal to, or only slightly smaller than, the inner diameter of the bottleneck. The inner membrane **523** has the convergent-divergent portion **523***a* and the approximately spherical end portion **523***b*. The closed interspace **524** between the two membranes is filled with a liquid or with a gas, such as air, which is preferably under a slight pressure. The closing member consists again of a cylindrical stopper **506** with an actuating lug **506***a*.

On mounting the closing device, first the closing member **502** alone is inserted into the bottleneck (FIGURE 6). The displacement member **506** is installed into the closing member **502** (FIGURE 7). In this way it expands the part **523***a* and displaces the gas or the liquid downward. In this manner the outer membrane **522** is expanded in such a way that it clasps the neck of the bottle and forms a secure, tight closure. For removal of the device, one proceeds in the reverse order.

The invention claimed is:

1. Closing device for a container, said device comprising: (A) a container closing member consisting of a centrally-hollow resilient plug adapted to be removably inserted into the outlet of an associated container and having at its inner end a closed chamber substantially spherical in shape and filled with a fluid, said chamber being formed by a pressure-deformable resilent wall having a first portion adjacent to the interior wall of said container in operating position and adapted by elastic deformation to contact said interior wall in sealing engagement, and said pressure-deformable resilient wall having a second portion disposed in operating position toward the outlet of said container and adjacent to the centrally-hollow portion of the outer end of said closing member; and (B) displacement means axially disposed through the centrally-hollow portion of the outer end of said closing member and adapted to releasable adjustment against said second portion in order to produce an elastic deformation in said first portion by transmitted fluid pressure.

2. Closing device for a container, said device comprising: (A) a container closing member in the form of a resilient cap having an axially-disposed centrally-located opening in its top portion and a downwardly extending skirt portion with inwardly extending bead around its periphery and said cap being adapted to removably and exteriorly envelop the outlet of an associated container, said closing member having a closed chamber filled with fluid and consisting of a first annular cavity in said bead of said skirt portion having a pressure-deformable resilient first wall portion adjacent to the exterior wall of said container in operating position and adapted by elastic deformation to contact said exterior wall of the container in sealing engagement, a second annular cavity in the top of said cap disposed around said centrally-located opening and within the internal projection of the outlet of said container in operating position and having a pressure-deformable resilient second wall portion adjacent said centrally-located opening, and a channel connecting both of said cavities; and (B) displacement means disposed in said opening and adapted to releasable adjustment against said second wall portion in order to produce an elastic deformation in said first wall portion by transmitted fluid pressure.

3. Closing device according to claim 2 wherein said displacement means comprises a rigid threaded rod and cooperating nut extending through said centrally-located opening.

4. Closing device according to claim 2 wherein said displacement means comprises a rigid plunger adapted to be releasably inserted into said centrally-located opening.

5. Closing device according to claim 2 wherein said displacement means comprises a rigid member of irregular transverse cross-section adapted to be turned in said centrally-located opening.

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