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CLOSURE FOR CONTAINERS

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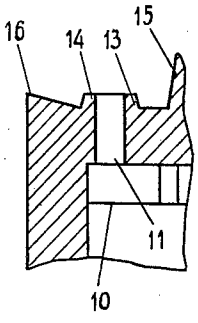


Fig.1a

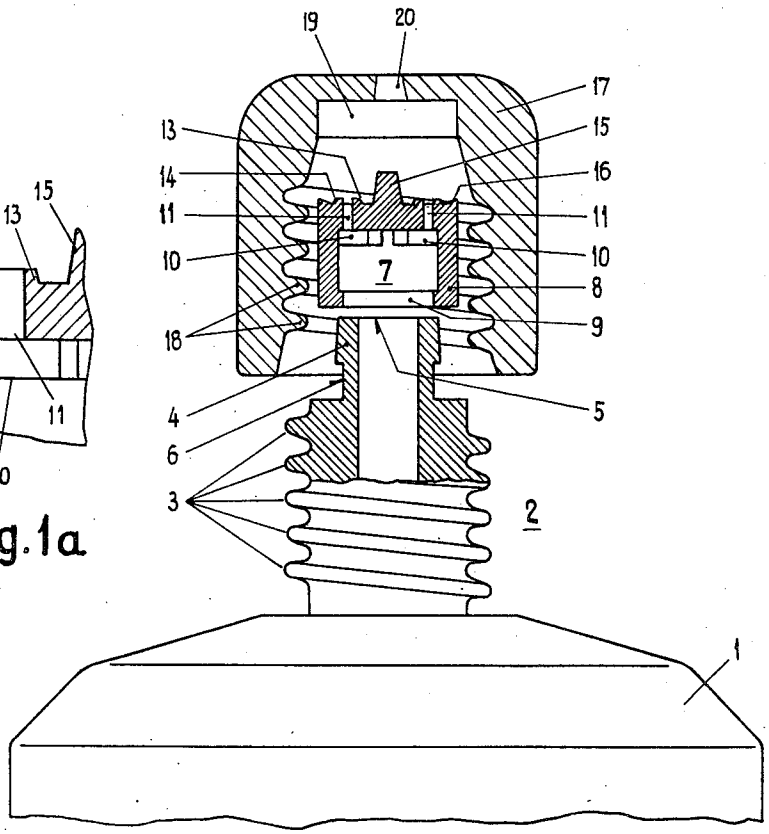


Fig.1

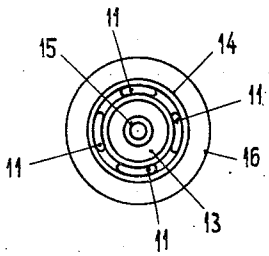


Fig.2

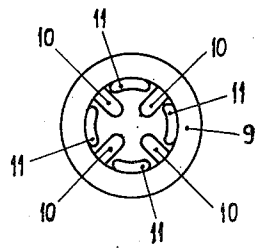


Fig.3

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CLOSURE FOR CONTAINERS

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6 Claims. (Cl. 215—74)

The invention relates to screw threaded closure caps for containers of all kinds, particularly for bottles, collapsible tubes, pressure containers and the like containing fluids, pastes, cremes, gases and the like.

The invention particularly concerns the improvement of a screw threaded closure, consisting of a screw threaded cap having a discharge orifice at the center of the top of the cap and an inner member having passages and a projection fitting into the discharge orifice of the screw threaded cap.

It is an object of the invention to provide an improved closure of this type.

The screw-on closure according to the present invention consists of a screw-on cap having a central opening in its top which is designed for the passage of the contents of the container, and a sleeve-type inner member for attachment to the neck of the container, which member is equipped with a central projection in its top face to fit the top opening in the cap, and passages for the contents of the container arranged around the said projection. The invention is characterized by the fact that the sleeve-type inner member is formed of compressible material having a top portion of which the lower surface facing the edge of the bottleneck is provided with a plurality of evenly spaced radial ribs. The said ribs form between them radial channels of which each opens peripherally into a passage arranged axially in the top. The openings of the passages in the upper surface are disposed between two annular ribs concentrically arranged around the projection. The sleeve-type inner member encloses the bottleneck with its cylindrical portion, engages the said edge with the periphery of each radial rib and, when the cap is screwed down, bears upon the flat lower face of the cap top with its annular ribs, sealing the passages towards the periphery and the center.

Considerable pressure may be exerted upon the annular ribs on the top face and around its periphery when the cap is screwed down since the periphery of the radial ribs below the annular ribs bears upon the edge of the bottleneck. Accordingly a perfectly air-tight closure of the passages towards the periphery and the center can be obtained. The pressure exerted upon the annular ribs moreover results in a deformation of the sleeve-type inner portion ensuring a perfect seal between its cylindrical portion and the bottleneck on the one hand, and the cylindrical inner wall of the screw cap. In the screw cap according to the present invention, the projection of the inner member and the central opening in the cap are not required to cooperate to seal the closure, the closure of the cap opening preferably serving to prevent undesirable foreign matter from entering.

The closure according to this invention is particularly suitable for mass production and for general application. The inner member being formed of rubber-type, elastic and flexible material, such as rubber, synthetic rubber, buna, oppanol, preferably of polyethylene, a perfectly air-tight seal is ensured even with the tolerances normal in mass production. Tests with interior pressures up to 5

gauge atmospheres have proved the perfect tightness of the closure when a screw cap made of a synthetic material was employed. If the cap consists of metal, it may also also be used for high-pressure containers. The inner member then cooperates with the screw cap to form an adjustable valve and renders unnecessary the costly grinding of rigid, conical surfaces such as are required for glass stoppers and the like.

The inner member formed of compressible elastic synthetic material may be attached to the bottleneck above the thread designed to engage the cap in any manner desired, preferably in a manner ensuring that the said member cannot be removed from the bottleneck either when the cap is unscrewed or by the action of the contents of the container.

The closure according to this invention incorporates the advantage that the inner member may be employed irrespective of the diameter of the neck of the container and of the screw cap, with the same dimensions for bottle and tube closures having a narrow mouth. Air-tight closure renders the invention particularly suitable for perfume bottles and similar containers holding costly fluids which must be protected against evaporation, for containers under elevated gas pressure and for tubes containing liquid or other adhesives, which are protected against drying and prevented from binding the screw cap to the thread of the neck of the container by virtue of the air-tight seal.

The invention may also be employed on containers and pressure containers of all kinds which are provided, above the thread, with an adapter designed to hold the elastic inner member permanently.

Further objects and advantages will be described in connection with the accompanying drawing, illustrating a closure according to the invention.

In the drawing:

Figure 1 is a diagrammatic view, partly in longitudinal section, of a screw cap, a sleeve-type inner member and a bottle-neck;

Figure 1*a* is an enlarged section through a part of the sleeve-type inner member shown in Fig. 1.

Figure 2 is a plan view of the inner member according to Figure 1, and

Figure 3 is a plan view of the lower face of the inner member according to Figure 1.

The embodiment disclosed in Fig. 1 illustrates the application to a bottle **1** made of glass, metal, synthetic material or the like, of which the neck **2** is provided with threads **3**. Above this male thread the neck **2** of the bottle is equipped with a tubular extension **4** whose outside is cylindrical or slightly tapering towards the mouth **5** of the neck **2** as shown in Fig. 1, and provided with an annular groove **6**. The neck edge surrounding the mouth **5** forms a flat annular surface and is designed to act as a bearing surface.

The extension **4** of the bottleneck **2** serves for attachment of the sleeve-type inner member **7** formed of a compressible, tough material such as rubber, synthetic rubber, buna, oppanol or preferably polyethylene. The lower end of this cylindrical member **8** is equipped with an annular bead **9** extending radially inwards, of which the inner diameter is identical with, or somewhat smaller than, the outer diameter of the annular groove **6** formed in the bottleneck. The lower face of the top of inner member **7** is provided with several radial ribs **10**, four being shown in the drawing, of which the lower surface facing the edge of the bottleneck is flat. The axial distance between the lower surface of the radial ribs **10** and the inner edge of the annular bead **9** exactly corresponds to the axial length of the flange formed by the annular groove **6** in the extension **4** of the bottleneck. When the inner member **7** is slipped on the extension **4** of the bottle-

neck, the bead 9 of the inner member 7 expands and slips over the extension 4 until the lower surface of the radial ribs 10 rests upon the edge of the bottleneck surrounding the mouth 5 while the annular bead 9 engages annular groove 6. In this position the inner member 7 on bottleneck 2 is positively held against removal in the upward direction and remains in this position even when the screw cap is removed or replaced.

Between the radial ribs 10 are formed the radial channels shown in Fig. 3, which are defined laterally by the radial ribs 10, the inner surface of the top above, and the edge of the bottleneck below when the inner member 7 is in operative position. Each radial channel widens towards its periphery which is formed by the inner wall of the cylindrical member 8 and there opens into a passage 11 formed in the top in axial direction. These passages 11 are shown as sector-shaped slots in Fig. 3, but it is obvious that they may consist of one or several bores. If the material employed for the inner member 7 is particularly soft, it may also be advantageous to form the radial ribs 10 as wedges widening towards the periphery, thereby providing radial channels which are of the same width near the center and at the periphery, while the passages 11 are each restricted to one bore. In all events it must be ensured that, with the inner member 7, in operative position substantial pressure can be exerted on its top, the radial ribs 10 engaging the edge of the bottleneck, thereby positively preventing any deformation of the top at least within the range of the passages 11.

These radial channels formed by the radial ribs 10 form the flow paths for the contents of the bottle from the mouth 5 of the bottleneck to the passages 11.

On the outside of the top of inner member 7 the passages 11 open between two annular ribs 13 and 14, respectively, arranged radially inside and radially outside as shown in Fig. 2. These annular ribs are arranged concentrically relatively to one another and to the circular top face and they somewhat project from the said face. Concentrically within the annular rib 13 is arranged a conical projection 15 on the upper face of the top. The periphery of the top is formed by a further annular rib 16 of which the height above the top is approximately the same as that of ribs 13 and 14. The radial ribs 10 on the inside of the top are so dimensioned in respect to their radial length that they extend underneath the annular rib 13.

The screw cap 17 formed of a synthetic material or of other material sufficiently strong, is provided with a female thread 18 fitting the thread 3 formed on the bottleneck 2 and a cylindrical recess 19 of which the diameter is identical with the outer diameter of the cylindrical sleeve-type inner member 7 to ensure a tight fit when the parts are in operative position. The axial length of the cylindrical recess 19 should advantageously correspond to about one-half of the axial length of the inner member 7. The front of the recess 19 is flat and has an opening 20 which tapers towards the upper face and of which the cone angle is identical with, or somewhat larger than, that of the projection 15. The wall thickness of the top of the cap, i. e., the axial dimension of the opening 20, should substantially correspond to the axial length of the projection 15.

If the compressible inner member 7 is in operative position on the flange-type extension 4 of the bottleneck, and the cap 17 is screwed down, its recess 19 seals the upper portion of the inner member 7 and when the cap is tightened, the inside of the recess 19 bears upon the three concentric annular ribs 13, 14 and 16. Since all radial ribs 10 rest upon the edge of the bottleneck enclosing the mouth 5, only a slight deformation of the top of inner member 7 is possible and at all events the entire length of the annular ribs 13 and 14 is tight against the front end of the recess 19 so that a reliably tight closure of all flow paths from the mouth 5 through the radial channels between the radial ribs 10 and the passages 11 to the top

opening 20 is ensured. In addition, the outer annular rib 16 is under the pressure of the top of recess 19 so that the cylindrical part 8 is forced against the flange-type extension 4 of the bottleneck, thereby preventing the contents of the bottle from flowing downward along the projection 4. This action of the annular rib 16 is rendered possible by the sliding fit of the recess 19 of the cap 17 and the upper portion of inner member 7 which protects the cylindrical wall 8 of the inner member 7 from being deformed in the peripheral direction.

When the screw cap 17 is screwed down on the bottleneck 2, the conical projection 15 enters the corresponding opening 20 in the cap 17 and prevents dirt from entering. The conical projection 15 is, however, not employed as a closure for the contents of the bottle, and the entire screw cap functions without this valve-type arrangement 15, 20.

The design of the top of the inner member 7 illustrated in Figs. 1 and 2 constitutes only a typical embodiment. Other designs are possible, it being necessary, however, positively to close the flow paths from the mouths of the passages 11 to the opening 20. By way of example this may be achieved if only the annular ribs 13 and 16 are provided, annular rib 14 being dispensed with. Naturally the cross-section of the annular ribs may be different from that shown in Fig. 1, the annular rib 13 may, by way of example, be widened radially inwards towards the projection 15 while the annular rib 16 may extend inwards in the shape of a wedge, thus producing an edge rising obliquely towards the periphery.

It should be pointed out that the above screw-on closure is not restricted in its application to bottle-shaped containers as shown in Fig. 1. Tubes for paste-type products can advantageously be equipped with such a closure. When a tough material is used, such as polyvinyl chloride, to form the inner member 7, and metal for the screw cap 17, the closure may also be used to close containers for gaseous products with high interior pressure.

What I claim is:

1. A screw-on closure for containers, pressure containers, bottles, tubes and the like, comprising a screw cap having a central opening formed in its top permitting the contents to be dispensed, and a sleeve-type inner member for attachment to the neck of the container, said member having a central projection on its top designed to fit into the central opening in the top of the screw cap, said member further having formed therein passages for the contents of the container arranged around said projection, the sleeve-type inner member being formed of compressible material, the lower surface of the top of said member facing an edge of the bottleneck comprising several radial ribs evenly distributed thereon to form between them radial channels of which each opens peripherally into a passage axially formed through the top, and ribs projecting from the upper face of said top, the opening in the upper face of the last-mentioned passage being located between the last-mentioned ribs, said sleeve-type inner member enclosing the bottleneck with its cylindrical portion, resting on an edge of the bottleneck with the periphery of each radial first-mentioned rib and bearing against the flat lower surface of the cap top with the last-mentioned ribs on its top when the screw cap is screwed down.

2. A screw-on closure comprising a screw cap having a central opening formed in its top permitting the contents to be dispensed, and a sleeve-type inner member for attachment to the neck of the container, said member having a central projection on its top designed to fit into the central opening in the top of the screw cap, said member further having formed therein passages for the contents of the container arranged around said projection, the sleeve-type inner member being formed of compressible material, the lower surface of the top of said member facing an edge of the bottleneck comprising several radial ribs evenly distributed thereon to form between them radial channels of which each opens peripherally

into a passage axially formed through the top, and ribs projecting from the upper face of said top, the opening in the upper face of the last-mentioned passage being located between the last-mentioned ribs, said sleeve-type inner member enclosing the bottleneck with its cylindrical portion, resting on an edge of the bottleneck with the periphery of each radial first-mentioned rib and bearing against the flat lower surface of the cap top with the last-mentioned ribs on its top when the screw cap is screwed down, wherein the last-mentioned ribs comprise a radially inner annular rib and a radially outer annular rib, the openings of the first-mentioned passages in the top face being located therebetween.

3. A screw-on closure according to claim 2, comprising a peripheral bead forming a sealing rib and surrounding the openings of the passages in the top face.

4. A screw-on closure according to claim 2, characterized by the fact that the radial ribs on the lower top face of the compressible inner member extend radially inwards to form a hollow space in the center to facilitate admission of the contents of the container to the radial channels.

5. A screw-on closure according to claim 2, comprising a projecting annular rib, the extreme periphery of the top face of the compressible inner member being formed as said projecting annular rib, on which pressure is exerted when the screw cap is screwed down, whereby said pressure improves the seal between the cylindrical exterior and interior sides of the inner member and the screw cap and the bottleneck, respectively.

6. A screw-on closure according to claim 5 characterized by the fact that the outermost projecting annular rib is formed with a wedge-shaped cross section and forms an edge rising obliquely from the passages towards the periphery.

References Cited in the file of this patent

UNITED STATES PATENTS

2,060,622	Jones	Nov. 10, 1936
2,075,249	Wilson	Mar. 30, 1937
2,104,413	Cahoon	Jan. 4, 1938
2,585,429	Boe	Feb. 12, 1952
2,669,740	Main	Feb. 23, 1954

FOREIGN PATENTS

717,393	Germany	Feb. 13, 1942