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SCREW-TYPE CAP HAVING FULCRUM SEAL

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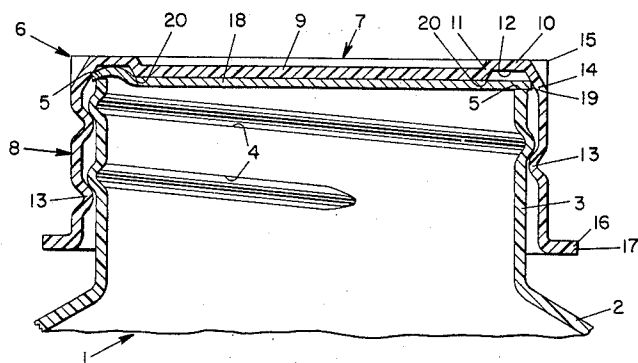


FIG. 1

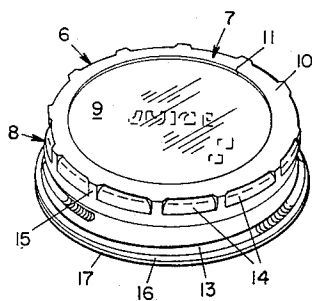


FIG. 2

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SCREW-TYPE CAP HAVING FULCRUM SEAL
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4 Claims

ABSTRACT OF THE DISCLOSURE

This invention relates to screw-type caps for containers and comprises a cap having an internal liner the edge portion of which is adapted to engage the sealing edge at the neck of a container and to be deflected upwardly by said edge, the cap having a groove internally thereof about its periphery to receive the upwardly-deflected edge portion of the liner and to maintain it in sealing engagement with the sealing edge as the liner is deflected. This cap is particularly useful with plastic bottles in which the sealing edge is not square and wherein the liner can accommodate the slope of the sealing edge.

The present invention relates to a screw-type cap or closure for bottles or other containers and particularly to such a cap that is especially adapted to be thermoformed from a sheet of plastic material and is adapted for use with plastic containers in which the mouth or free end of the neck may not be square, that is, is not in a plane exactly normal to the axis of the neck.

The primary object of this invention is to provide a screw cap for closing the mouth of a container, which cap will provide a fluid-tight seal at the sealing surface of a container wherein the sealing surface may not be square with the axis of the mouth of the container, such as in a plastic bottle wherein the free edge at the mouth of the container was trimmed at a slight angle. Further objects of this invention are to provide a screw cap that is adapted to be thermoformed from a sheet of plastic material, and is adapted to receive the usual indicia such as trademark or advertising matter or instructions normally applied to caps for bottles such as milk bottles. Further objects of this invention are to provide a screw cap for containers, which cap is inexpensive, easy to use from both the manufacture and consumer standpoint, and will maintain an effective fluid-tight seal on containers during the normal handling of those containers.

Briefly, the present invention comprises a screw-type cap having a paper or similar liner applied internally of the cap. When thermoformed from a sheet of clear plastic material, the indicia printed on the liner will be readable through the top wall of the cap. The liner serves as a gasket means for forming a seal against the free or sealing edge about the mouth of the container and the cap is provided with a relief in the form of an annular groove extending upwardly at the inner surface of the top wall of the cap about the edge thereof whereby the opposed edge portion of the liner can be deflected upwardly into the groove by the sealing edge of the container as the cap is turned down on the container. As the cap is turned down, the liner remains in sealing engagement with the sealing edge of the container and is deformed or bowed at the edge portion and thus accommodates unevenness in the sealing edge. The edge of the liner is in engagement with a sloping wall on the cap

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so that the edge of the liner is bent downwardly over the sealing edge of the container by the sloping wall as the edge portion of the liner inwardly is deflected or bowed upwardly into the groove.

With the above and other objects in view, a preferred embodiment of the present invention is hereinafter described with reference to the accompanying drawings, in which:

FIG. 1 is a fragmentary sectional view vertically through the neck of a bottle having a cap in accordance with this invention.

FIG. 2 is a perspective view of the cap per se that is illustrated in FIG. 1.

With reference to the drawings, there is illustrated in FIG. 1 a fragmentary portion of a container or, more particularly, of a blow molded plastic bottle 1. The illustrated portion of the bottle 1 includes a portion of the body 2 of the bottle and the neck 3, which is cylindrical and is provided with an external screw thread 4. The neck 3 terminates in an edge 5 that surrounds the mouth of the bottle and also constitutes the sealing edge that cooperates with the closure or cap means to close the mouth of the bottle in a fluid-tight manner.

The closure means comprises a screw-type cap 6 having a top wall 7 and a skirt 8. The top wall 7 has a disc-like central portion 9 that is substantially planar and an annular raised portion at the periphery of the top wall 7 and surrounding the central portion 9, which raised portion includes an annular surface 10 that is generally flat and parallel to the central portion 9, and is connected at its inner edge to the outer edge of the central portion 9 by an interconnecting wall 11 that extends generally upwardly from the outer edge of the central portion 9. The raised portion defines an upwardly extending groove 12 internally of the cap at the outer edge of the top wall 7.

The skirt 8 is generally cylindrical and depends from the periphery of the top wall 7, or more particularly, from the outer edge of the annular surface 10. The skirt 8 has an internal diameter that is larger than the external diameter of the neck 3 so that the cap can be telescoped over the neck 3 and is provided with an internal screw thread 13 that cooperates with the thread 4 of the neck to secure the cap 1 onto the same. At its upper portion, the skirt 8 is formed with a sloping wall 14 that is angled inwardly to the edge of the annular surface 10. At a plurality of points spaced about the periphery of the cap, the sloping wall 14 is interrupted by lugs 15 which in effect constitute projection of the annular surface 10 and the wall of the skirt 8 to the point of intersection. The lugs provide means for obtaining a purchase or grip on the cap in order to thread it onto or to unthread it from the bottle.

A disc-like liner 18 is inserted into the cap 6 against the inside surface of the top wall 7. The liner 18 is circular like the cap 6 and is held or captured inside the cap such as by an interference fit relative to the minimum internal diameter of the skirt 8, which is the diameter at the base of the thread 13. The interference is minimal so that the liner can be inserted within the cap without excessive distortion or deformation. Means other than the interference fit relative to the thread 13 can be used to capture the liner 18, for example, an interference fit relative to a plurality of inwardly projecting lugs formed in the skirt 8 above the thread 13.

The liner 18 may be made of treated paperboard or other suitable material which is relatively stiff but capable of providing an effective seal and is impervious, at least at its bottom surface, to the fluid in the container. The seal relative to bottle 1 may be improved and a tamperproof feature may be provided by selecting a treating material that may be heat softened and will adhere to the edge 5 of the bottle upon cooling whereby the liner is sealed to and will remain on the bottle when the cap is removed and must be broken loose when the bottle is first opened.

The liner 18 may also have printed on the upper surface thereof labeling or other indicia such as the usual trademark matter, or advertising, or other information normally used for example on milk bottles. With the cap formed of a clear plastic material such polypropylene, this indicia is readable through the top wall 7 of the cap 6. The liner 18 thus serves both as a gasket and to carry the indicia, the latter of which avoids the expense of printing on the cap, which is complicated not only by the shape of the cap but also by the difficulty of printing on plastic, or of applying the indicia by a separate label. With the indicia printed on the liner 18, it is protected by the cap 6 against being defaced or accidentally dislodged during normal handling which may include washing or otherwise wetting the cap.

As will be apparent, the exact dimensions of the liner 18 relative to the cap 6 are not critical within the broader aspects of the invention. There are however significant advantages in the specific dimensional relationship in the preferred embodiment that is illustrated.

As shown, the diameter of the annular surface 10 is preferably about equal to the outer diameter of the neck 3 of the bottle so that the meeting edge between the annular surface 10 and the sloping wall 14 is disposed substantially over the outer surface of the neck 3. The liner 18 is large enough relative to the cap 6 so that it lies flat against the inner face of the central portion 9 of the top wall 7 with the outer edge 19 thereof in engagement with or at least substantially in engagement with the inner surface of the sloping wall 14. The edge portion of the liner 18 thus overhangs the sealing edge 5 of the bottle. Accordingly, when the cap 6 is turned down on the neck 3, the sealing edge 5 engages the liner 18 along a line spaced inwardly from and generally concentric with the edge 19. At the same time, the liner 18 is supported by a fulcrum or edge 20 which is also concentric with the edge 19 and is spaced inwardly of the line of contact between the liner and the sealing edge 5, and which in the illustrated embodiment is at the outer edge of the central portion 9 of the top wall 7.

With a cap constructed in this manner, when the liner 18 is further turned down after it has engaged the sealing edge 5 of the bottle, the sealing edge 5 is forced into the edge portion of the liner between the edge 19 and the line engaged by the edge 20, and imposes a bow or upwardly concave bend thereto. The edge 5 is in sealing engagement with the edge 19 of the liner at all times after it is initially moved against the same and as it deflects the edge portion of the liner. The sealing force between the same is determined primarily by the stiffness of the liner but is enhanced by the sloping wall 14 which, because of the slope thereof, remains in contact with the edge 19 of the liner and holds that edge down against the thrust of the edge 5 of the bottle as the edge portion of liner is bowed and the lateral reach thereof is thus reduced. The groove 12 provides clearance for accommodating the upward bend of the edge portion of the liner 18.

Because of the ability of the liner 18 to effect a fluid-tight seal at varying levels in the groove 12, it can accommodate variations in the slope of the edge 5. More particularly, for example with a bottle in which the sealing edge 5 is not square with the axis of the mouth of the bottle, the cap may be turned down tight, that is,

with the high spot of the edge 5 seated in the groove 12 such as illustrated at the left in FIG. 1 while the low spot of the edge 5 is not seated but is nevertheless still effectively sealed as illustrated at the right in FIG. 1, which illustrates a minimum sealing engagement. In order to provide an effective seal on all bottles that are normally encountered, the yieldability of the liner 18 is made large enough to accommodate the expected range of variations in the difference between the high spots and the low spots of the edges 5.

The cap is preferably thermoformed, but not limited to this fabrication process, from a sheet of plastic heated to its forming temperature. After forming, the cap 6 is severed as by punching it from the sheet. In the illustrated cap there is a short flange 16 at the bottom edge of the skirt 8, that is, at the edge opposite the edge at the top wall 7, which flange 16 extends outwardly from the skirt 8 in a direction that is generally normal to the axis of the skirt 8. The flange 16 is a section of the original sheet from which the cap was formed and the edge 17 thereof is the cut edge at which it was severed from the sheet. Being thermoformed from a sheet of plastic, the flange 16, skirt 8 and top wall 7 are integral and have a thickness that is substantially equal to the original thickness of the sheet less the thinning that occurs during forming. In the normal course, the flange 16 and the central portion 9 of the top wall 7 are the thickest portions of the cap and the thickness of the cap decreases from the flange 16 and portion 9 toward the juncture of the sloping wall 14 and the annular surface 10, which is the thinnest section of the cap. The fact that the thinnest section of the cap is adjacent the groove 12 also helps to effect the yieldable seal particularly where extreme deformation is present because it permits local deformation of the cap.

What I claim and desire to protect by Letters Patent is:

1. A screw-type cap adapted to be threaded onto the externally threaded neck of a container for closing the same in a fluid-tight manner, said cap comprising a circular top wall and a generally cylindrical skirt depending from said top wall at the periphery thereof and having an internal screw thread adapted to cooperate with the external screw thread on the neck of a container for securing the cap on the container, a circular disc-like liner inserted into said cap and having a diameter substantially equal to the minimum diameter of the skirt whereby said liner is adapted to engage the sealing edge at the neck of a container upon which the cap is mounted along a line concentric of said liner, fulcrum means internally of said top wall for engaging said liner along a line concentric of said liner and spaced inwardly of the line of engagement with the sealing edge of the container, and clearance in said top wall for accommodating the edge portion of the liner outwardly of the fulcrum means upon deflection of the same about said fulcrum means by the sealing edge of a container as said cap is turned down on a container, said liner being relatively stiff and adapted to bend about said fulcrum means upon the deflection of said edge portion and to seal against the sealing edge of the container while disposed in spaced relation relative to said top wall, thereby accommodating variations in the plane of the sealing edge of the container from normal to the axis of the container neck.

2. A screw-type cap in accordance with claim 1 in which said skirt includes a sloping wall at the upper portion thereof adjacent to said top wall, which sloping wall is inclined inwardly from said skirt to said top wall and presents a decreasing diameter upwardly from the plane defined by the top wall of said cap, said liner having the edge thereof in engagement with said sloping wall whereby the edge portion of the liner is bent downwardly over the sealing edge of the container when the cap is turned down onto the container.

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3. A screw-type cap in accordance with claim 1 in which said clearance comprises an annular groove formed in the top wall of said cap at the periphery thereof, said groove extending upwardly into said top wall and opening at the inner surface thereof.

4. A screw-type cap in accordance with claim 1 in which said cap is made of a clear plastic material and said liner is provided with indicia on the surface thereof that is visible through said top wall of said cap.

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