

[54] CLOSURE CAP

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[22] Filed: **May 5, 1971**

[21] Appl. No.: **140,353**

[52] U.S. Cl. **215/40, 215/42, 215/DIG. 1**

[51] Int. Cl. **B65d 55/08**

[58] Field of Search **215/40, 42, DIG. 1**

[56] **References Cited**

UNITED STATES PATENTS

3,224,617	12/1965	Hohl et al.	215/40 X
3,203,571	8/1965	Plunkett	215/DIG. 1
3,329,295	7/1967	Fields	215/42

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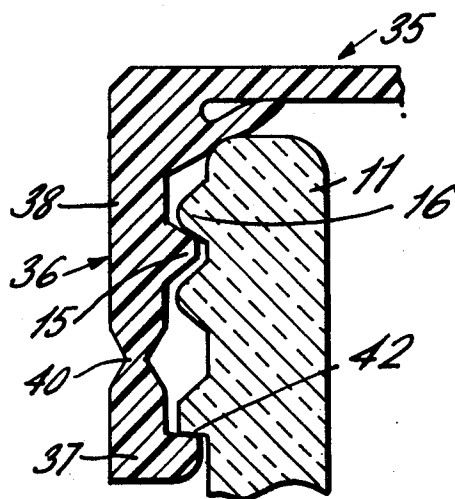
Attorney—Cushman, Darby & Cushman

[57] **ABSTRACT**

The invention concerns a closure cap adapted to seal the neck of a container, the closure cap being formed

of a molding of elastomeric material and having a top portion, an annular skirt which extends from the periphery of the top portion, an abutment portion of said skirt which is adapted firmly to engage said neck to releasably retain the closure cap thereon, and an annular resilient flange portion which extends from and radially inwardly of the skirt and which is spaced from the internal surface of the said top portion by an annular groove whose outside diameter is less than the major internal diameter of the skirt, the resilient flange portion having a surface which is remote from the top portion and which, even when the resilient flange portion is undeformed, is radially inwardly inclined towards the top portion, the radially innermost part of the last-mentioned surface being convexly curved, the resilient flange portion, when the cap is fitted to the container, effecting a primary sealing engagement with the radially outer edge of the end portion of the neck and a secondary sealing engagement with the top surface of the end portion of the neck, and the resilient flange portion engaging the internal surface of the top portion and trapping a pocket of air therebetween.

3 Claims, 7 Drawing Figures



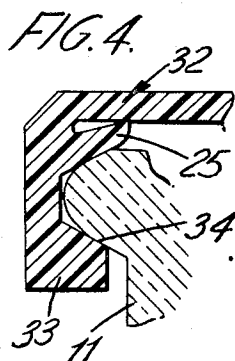
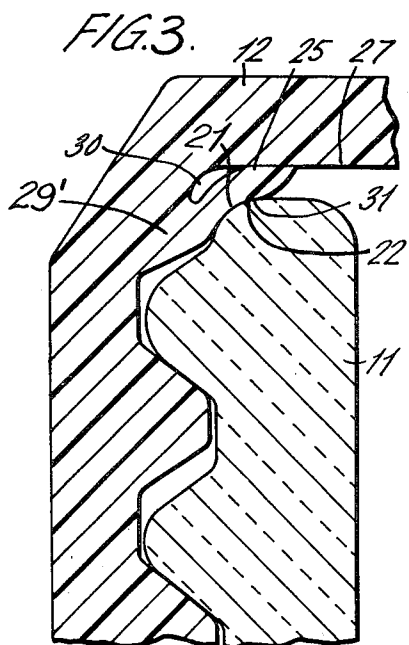
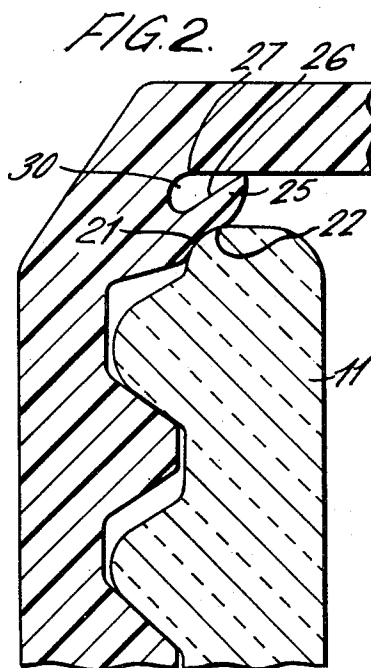
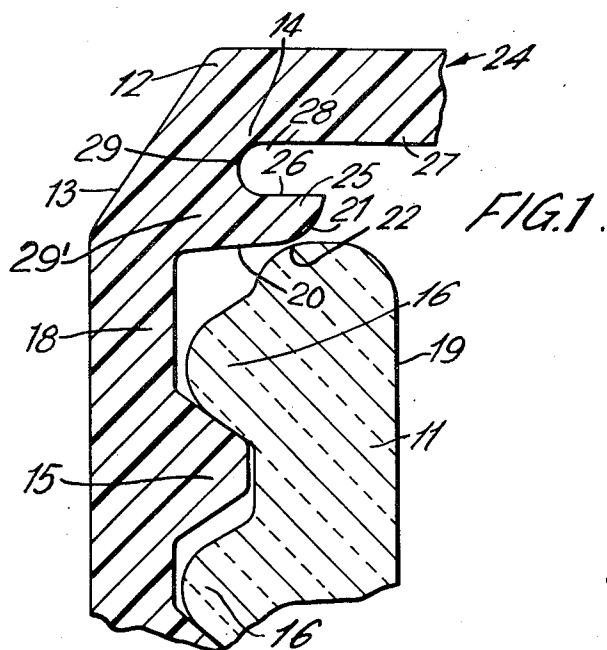


FIG. 5.

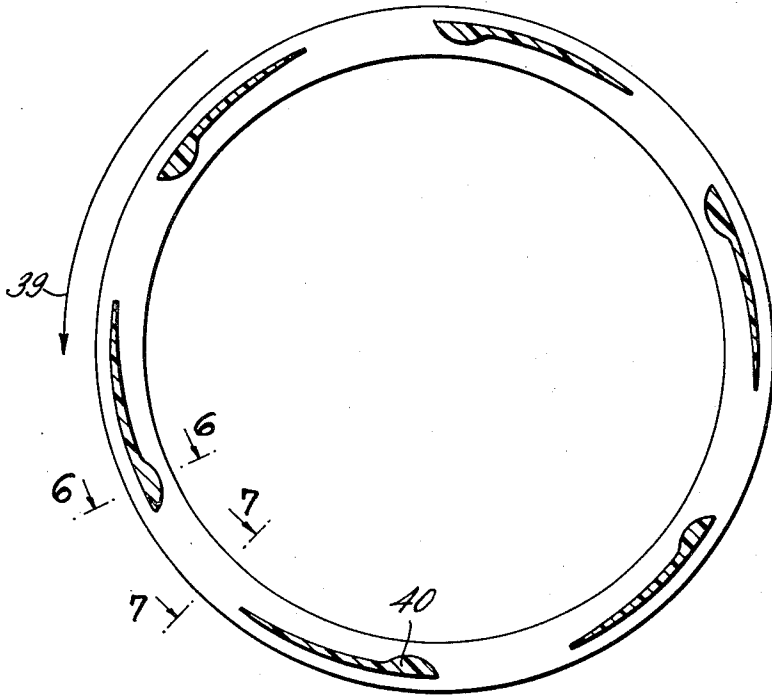


FIG. 6.

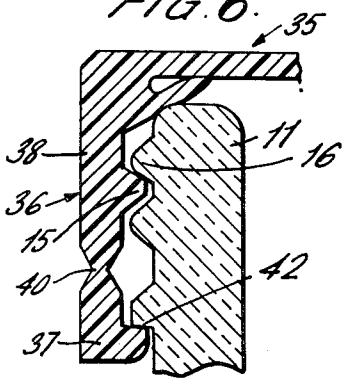
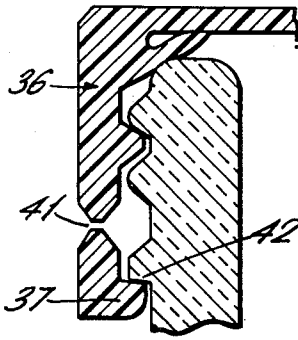


FIG. 7.



CLOSURE CAP

This invention concerns a closure cap for sealing the neck of a container.

According to the present invention there is provided a closure cap adapted to seal the neck of a container, the closure cap being formed of a molding of elastomeric material and having a top portion, an annular skirt which extends from the periphery of the top portion, an abutment portion of said skirt which is adapted firmly to engage said neck to releasably retain the closure cap thereon, and an annular resilient flange portion which extends from and radially inwardly of the skirt and which is spaced from the internal surface of the said top portion by an annular groove whose outside diameter is less than the major internal diameter of the skirt, the resilient flange portion having a surface which is remote from the top portion and which, even when the resilient flange portion is undeformed, is radially inwardly inclined towards the top portion, the radially innermost part of the last-mentioned surface being convexly curved, the resilient flange portion, when the cap is fitted to the container, effecting a primary sealing engagement with the radially outer edge of the end portion of the neck and a secondary sealing engagement with the top surface of the end portion of the neck, and a resilient flange portion engaging the internal surface of the top portion and trapping a pocket of air therebetween.

Since the resilient flange portion extends from the skirt and is adapted to seal against the rim of the container, any variation (which in practice can be quite considerable) in a diameter of the bore of the container does not affect the quality of the seal. Moreover, provided that the resilient flange portion extends radially inwardly to an adequate extent, variations in the diameter or shape of the rim will also not affect the quality of the seal.

Indeed, any specific closure cap in accordance with the present invention is capable of effecting an excellent seal on a wide variety of different containers, whether the latter are formed of glass, plastics material, or thin metal, even if the containers have substantially varying wall thicknesses. This excellent seal can, moreover, be achieved without it being necessary to provide the rim of the neck of the container with any particular shape, and without it being necessary to provide a closure cap having an unusual external appearance.

Provided, however, that the resilient flange portion is adequately spaced from the top portion it is possible, if desired, to introduce a liner to cover the internal surface of the top portion. Although the present invention is primarily concerned with linerless or "wadless" closure caps, i.e., those which do not employ a liner, and although it is preferably made of a material such as polypropylene which is inert to most contents of such containers, nevertheless if the contents are of such character that they would otherwise attack the material of the closure cap, it is convenient to form the closure cap such as to be capable of accepting a liner which resists such attack. If this is done, the same closure cap may be employed both for the generality of uses in which the contents of the container will not attack it, and (when provided with a liner) for the minority of uses where such attack may occur. The resilient flange portion engages the said top portion to trap a pocket of air which resiliently resists deformation of the resilient

flange portion by the neck. This further improves the quality of the seal.

The abutment portion may be adapted to be both snapped over and to be removed from an abutment on the neck of the container.

Alternatively, the abutment portion may comprise an internally threaded part of the skirt which is firmly engageable with an externally threaded portion of the neck.

The lowermost portion of the skirt may be connected to the remainder thereof by a frangible connection, the arrangement being such that, when the closure cap is unsealed from the neck, the frangible connection is broken and the said lowermost portion remains trapped on the neck.

Thus the lowermost portion may be adapted to be snapped over but not to be removable from an abutment on the neck of the container.

The said lowermost portion may be connected to the said remainder of the skirt only by a plurality of angularly spaced apart bridge portions.

Moreover, the radial thickness of each said bridge portion may vary circumferentially of the closure cap, the said thickness increasing in the direction in which the closure cap is unscrewed from the container.

The invention is illustrated, merely by way of example, in the accompanying drawings, in which:

FIG. 1 shows a partial section of a first embodiment of a closure cap according to the present invention which is seated on, but not fully screwed down on, the neck of the container,

FIG. 2 is a view similar to that of FIG. 1 but with the closure cap of FIG. 1 screwed further down on the neck of the container,

FIG. 3 is a view similar to that of FIGS. 1 and 2 but with the closure cap thereon screwed fully down on the neck of the container,

FIG. 4 is a partial section of a second embodiment of a closure cap according to the present invention,

FIG. 5 is a cross-section through a third embodiment of a closure cap according to the present invention, and

FIGS. 6 and 7 are sections taken respectively on the lines 6—6 and 7—7 of FIG. 5.

In FIGS. 1 to 3 there is shown a closure cap 24 for sealing the neck 11 of a glass or other container, the closure cap 24 being an integral moulding of an elastomeric material. The closure cap 24 has a top portion 12 the whole of whose internal surface 27 is flat and an annular skirt 13 which extends from the periphery 14 of the surface 27. The skirt 13 is provided with an internally threaded part 15 which is firmly engageable with an externally threaded portion 16 of the neck 11 on being screwed onto the latter.

The closure cap 24 also has an annular resilient flange portion 25 which extends from and radially inwardly of the skirt 13.

The resilient flange portion 25 has an inner surface 20 remote from the top portion 12 and, even when the resilient flange portion 25 is undeformed as shown in FIG. 1, the surface 20 is radially inwardly inclined toward the top portion 12. The radially innermost part 21 of the surface 20 is convexly curved. As the closure cap 24 is screwed downwardly on the neck 11, and into the fully seated position shown in FIG. 3, the convexly curved part 21 of the resilient flange portion 25 first contacts convexly curved the radially outer edge or the rim 22 of the neck 11 and then is deformed by the latter

so that a primary sealing engagement is established between the resilient flange portion 25 and the said radially outer edge 22.

Since this sealing arrangement is effected over a wide area of the rim 22, variations in the diameter or shape of the latter will not affect the quality of the seal. In particular, it is of advantage that the resilient flange portion 20 does not affect a seal within the bore 19 of the neck 11 since variations in the size of the bore are often, in practice, considerable.

The resilient flange portion 25 has an outer surface 26 the whole of which, in the undeformed state, is spaced from the surface 27 by an annular groove 28 whose outside diameter 29 is less than the major internal diameter 18 of the skirt 13. This construction provides a mass of material in the region indicated at 29' to assist in sealing. Thus when the closure cap 24 is screwed down from the FIG. 1 to the FIG. 2 position, an air pocket 30 is created which is defined in parts by the surfaces 26, 27. When the closure cap 24 is screwed fully down into the FIG. 3 position, the consequent deformation of the resilient flange portion 25 is resisted by the resilience provided by the air pocket 30, thus improving the seal. It will be noted that in the FIG. 3 position, the resilient flange portion 25 is forced into sealing engagement with the surface 27 over a wide area, inasmuch as its convexly curved part 21 effects a primary sealing engagement with the rim 22 while the resilient flange portion also effects a secondary sealing engagement with the top surface 31 of the end portion of the neck 11. That is to say, the maximum sealing pressure is against the rim 22, and a smaller sealing pressure is excited against the top surface 31.

The space constituted by the annular groove 28 between the surfaces 26, 27 when the resilient flange portion 25 is undeformed permits a liner (not shown) to be inserted therebetween and in contact with the surface 27. Such a liner may be of a material to prevent the surface 27 from being attacked by the contents of the container.

The large sealing area provided by the embodiment of FIGS. 1 to 3 is also of value in resisting loosening of the closure cap during transit of the respective container, since it provides a large sealing area and therefore a high area of friction.

FIG. 4 illustrates another embodiment of the present invention which is generally similar to that of FIGS. 1 to 3 and which will not therefore be described in detail. In the case of the FIG. 4 construction, however, a closure cap 32 is provided which, instead of being internally threaded, has an abutment portion 33 which is adapted to be snapped over and to be removed from an abutment 34 on the neck 11 of the container. The design of the abutment portion 33, in relation to the abutment 34 is of course such that when the closure cap 32 is fully seated on the neck 11 of the container, the force retaining the closure cap 32 in the fully seated position is greater than the recovery force of the deformed resilient flange portion 25.

FIGS. 5 to 7 illustrate a "pilfer-proof" closure cap, i.e., a closure cap a part of which is left on the container when the remainder of the closure cap is removed therefrom to indicate that such removal has been effected.

In the embodiment of FIGS. 5 to 7, a closure cap 35 is provided whose upper portion is closely similar to that of FIGS. 1 to 3 and which for this reason will not

be described in detail. The closure cap 35, however, has a skirt 36 whose lowermost portion 37 is connected to the upper portion 38 thereof by a frangible connection constituted by bridge portions 40 which are arranged only at a plurality of angularly spaced apart regions. Thus, as will be seen from FIG. 7, the skirt 36 is provided with a plurality of angularly spaced apart slots 41 which constitute a line of perforations. Moreover, the bridge portions 40 have a radial thickness which varies circumferentially of the closure cap 35, the said thickness increasing in the direction of the arrow 39 in which the closure cap 35 is unscrewed from the neck 11 of the container.

The lowermost portion 37 is adapted to be snapped over but not to be removable from an abutment 42 on the neck 11 of the container. The upper portion 38 is provided, moreover, with an internally threaded portion 15 which is firmly engageable with an externally threaded portion 16 on the neck 11 of the container on being screwed onto the latter.

The container 11 is sealed by screwing the closure cap 35 downwardly as far as it will go, thus causing the lowermost portion 37 to snap over and behind the abutment 42. When it is desired to unseal the closure cap, the closure cap 35 is unscrewed in the direction of the arrow 39, but since the lowermost portion 37 is trapped on the neck 11, the upper portion 38 is pulled axially away from the lowermost portion 37, and this causes the bridge portions 40 to shear and the frangible connection between the parts of the closure cap 35 thus to be broken.

The tapering shape of the bridge portions 40 ensures that, whilst they have at their thicker ends sufficient strength to prevent premature parting of the portions 37, 38 from each other, their thinner ends (which may be made very thin) start to tear as soon as unscrewing occurs. As the unscrewing proceeds, the tears progressively lead into the thicker ends, thus giving progressive clean tears which are difficult to achieve in a resilient plastics or other elastomeric material.

Closure caps normally either rely on being provided with a liner or "wad," or alternatively are such as to be incapable of being provided with such a liner or "wad." In the case of the constructions shown in the drawings however, the construction is such that the closure cap may be employed either as a "wadless" or as a "wadded" cap.

If desired, the closure cap of the present invention could itself form the inner member, or liner, or an outer closure cap, the latter being, for example, a metal crown cap. In this case, the top portion of the closure cap according to the invention might be made very thin, e.g., of the order of 0.01.

I claim:

1. A closure cap adapted to seal the neck of a container the closure cap being formed of a molding of elastomeric material and having a top portion, an annular skirt which extends from the periphery of the top portion and which has an internally threaded part which is adapted firmly to engage an externally threaded portion of the neck on being screwed onto the latter, and an annular resilient flange portion which extends from and radially inwardly of the skirt and which is spaced from the internal surface of the said top portion by an annular groove, the lowermost portion of the skirt being connected to the remainder thereof only by a plurality of angularly spaced apart bridge portions the

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radial thickness of each of which varies circumferentially of the closure cap, the said thickness increasing in the direction in which the closure cap is unscrewed from the container, the said lowermost portion being adapted to be snapped over but to be irremovable from an abutment on the neck of the container, the bridge portions being broken and the said lowermost portion remaining trapped on the neck whenever the closure cap is unsealed from the neck.

2. A container having a neck provided with a closure cap which is formed of a molding of elastomeric material and which is fully seated on the neck, the closure cap having a top portion, an annular skirt which extends from the periphery of the top portion, an internally threaded portion of said skirt which is screwed onto an externally threaded portion of the said neck and which may be unscrewed therefrom, and an annular resilient flange portion which extends from and radially inwardly of the skirt and which is spaced from the internal surface of the said top portion by an annular groove whose outside diameter is less than the major internal diameter of the skirt, the resilient flange portion having a surface which is remote from the top por-

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tion and which, even when the resilient flange portion is undeformed, is radially inwardly inclined towards the top portion, the radially innermost part of the last-mentioned surface being convexly curved, the resilient flange portion being deformed by the neck and effecting a primary sealing engagement with a convexly curved radially outer edge of the end portion of the neck and a secondary sealing engagement with the top surface of the end portion of the neck, the resilient flange portion engaging the internal surface of the top portion and trapping a pocket of air therebetween, the lower most portion of the skirt being snapped over and being irremovable from an abutment on the neck of a container, the said lower most portion being connected to the remainder of the skirt only by a plurality of angularly spaced apart bridge portions, the radial thickness of each bridge portion varying circumferentially of the closure cap, the said thickness increasing in the direction in which the closure cap is unscrewed from the container.

3. A container as claimed in claim 2 in which the whole of the internal surface of the top portion is flat.

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