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STOPPER FOR CLOSING CONTAINERS, SUCH
AS BOTTLES, FLASKS AND THE LIKE
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FIG. 1

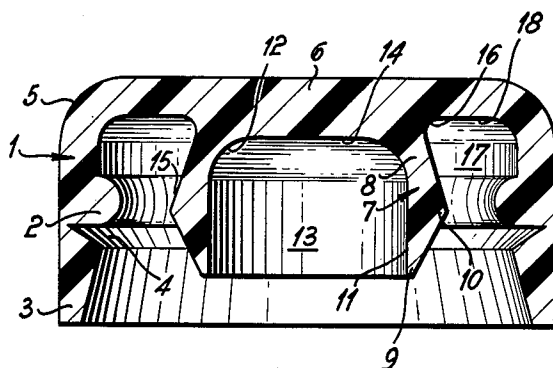
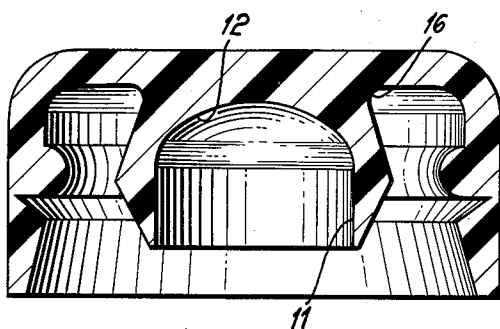


FIG. 2



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STOPPER FOR CLOSING CONTAINERS, SUCH AS BOTTLES, FLASKS AND THE LIKE

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L 44,850

1 Claim. (Cl. 215—41)

This invention relates to a stopper of elastic material for closing containers, such as bottles, flasks and the like, comprising an external cap portion and an inner hollow plug portion with an open bottom and a thin-walled neck externally coned to form a thicker wall portion tapering into a sharp-edged bottom lip.

A known type of stopper of plastic material for bottles and so forth comprises a plug provided with sealing ribs which are to be kept so thin that the plug can be inserted into the neck of a bottle by hand without considerable effort. However, in this form of construction the internal pressure to which the plug is subjected causes fatigue so that the grip of the plug inside the neck of the bottle quickly relaxes. Such plugs are not therefore able to provide completely reliable and permanent gas-tight seals for bottles in which the internal width of the neck is likely to vary within wider tolerational limits. Moreover, in order to achieve as tight a seal as is possible the top of the stopper must be formed with a slight depression above the top of the plug, said depression being pushed flat from the inside by the permanent outward thrust of the plug.

Another type of stopper which has been proposed for sealing bottles, flasks and the like has an inner plug with an annular bulge which tapers towards a bottom terminal lip, and is therefore capable of taking up even major tolerational variations in the internal width of the neck. The thinness of the walls of the plug prevents the sealing pressure of its bulge from being transmitted to the thick floor of the top of the stopper, so that the provision of a shallow depression therein can be dispensed with.

Nevertheless, this type of stopper also fails in some cases to provide an absolutely satisfactory seal, particularly on mineral water bottles containing a further addition of artificially introduced carbon dioxide.

Although for the purpose of tests a spontaneous evolution of a major part of the carbon dioxide contained in the water can be induced by the addition of small amounts of a fine-grained material, such as sugar and particularly common salt, exact measurements could not be made other than by providing the bottles with holes for the attachment of the necessary gauges. In this way it was found that a natural mineral water may contain more than 8000 mg. of free carbon dioxide and that after addition of further carbon dioxide at a gauge pressure of 2 ats, the pressure inside the sealed bottle may rise to 8.5 ats. In transportation tests the vibration even caused the gauge pressure inside the bottles at summer temperatures to rise to the considerable level of 12 ats. The known types of stopper were not always able to withstand pressures of this magnitude.

It is therefore the object of the present invention to provide a stopper of elastic material which comprises a skirted cap for embracing the mouth of the bottle and a plug which is insertable into the mouth of the bottle, intended particularly for bottles containing a liquid under very high pressure or capable of developing very high pressures under certain unfavourable conditions. The proposed stopper is further intended to provide an absolutely reliable gas-tight seal for lengthy periods. The proposed stopper is completely unobjectionable from the point of view of hygiene, consisting of a small quantity

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of inert material, and it is also suitable for rapid mass production at low price.

The invention provides a stopper of elastic material for containers such as bottles, flasks and the like, which comprises an external cap and an internal hollow open-bottomed plug with a thin-walled neck which is externally coned to form a thickened portion tapering towards a sharp edged bottom lip and an internal surface merging with a large radius into the underside of the top of the cap, whereas the external surface merges with a small radius into the underside of the cap at the top of the space intervening between the plug and the skirt of the cap.

In an alternative form of construction the inside of the hollow plug merges at the top into a concave spherical surface which forms the underside of the centre portion of the cap.

Another feature of the stopper as proposed by the invention is that the surface which forms the top of the cavity in the hollow plug is preferably located at a lower level than the annular surface forming the top of the space between the outside of the plug and the skirt of the cap, so that the centre portion of the cap above the plug is thicker than the annular portion adjacent the skirt.

In the above proposed forms of construction the top of the cavity of the hollow plug forms a circular or like arc in cross section. It will be understood that this curve might be a parabolic or some other arc which has axially symmetrical branches and that any such modification is intended to be included within the scope of the present invention, provided always that the radius of the curve merging into the inside walls of the plug and representing the generator of the body of revolution defining the surface at the top of said cavity is greater than the radius of the arc between the outside of the plug and the underside of the top of the cap.

Two preferred embodiments of the invention will now be described by way of example and with reference to the accompanying drawings, in which:

FIG. 1 is an axial section of a stopper in which the top of the cavity inside the plug is a surface of revolution generated by a catenary curve, and

FIG. 2 is an alternative embodiment in which the generating curve is a circular arc.

FIG. 1 shows a stopper which comprises an external cap with a skirt 1 formed with an internal bulbous ring 2 which engages the underside of the projecting rim of the mouth of the bottle, flask or the like. Below this ring 2 the skirt 1 has an extension 3 which can be torn off, and which to this end is separated from the upper part of the skirt by a deep indentation 4. The horizontal cap portion 6 of the cap merges into the skirt 1 with a short radius 5.

Below the horizontal cap portion 6 the stopper is formed with a hollow plug 7 with an open bottom. This plug 7 has a thin-walled neck 8 which is externally coned to form a thickened portion 10 tapering into a sharp edged lip 9. The internal surface 11 of the hollow plug 7 merges into the underside 14 of the cap portion 6 with a large radius 12. The outer surface 15 of the plug 7 above the neck merges into the annular part 18 of the underside of the cap portion 6 adjacent the skirt with a small radius curve 16.

In the second embodiment shown in FIG. 2 the internal surface 11 of the plug 7 forms a spherical surface underneath the cap portion 6.

The surface 14 at the top of the cavity 13 in plug 7 is formed at a lower level than the top of space 17 between the plug 7 and the skirt 1 of the cap.

In the embodiment in which the upper end of the cavity 13 in the hollow plug 7 is a concave spherical surface the apex of the spherical surface is still located below the level of the surface which forms the top of the space

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between the plug 7 and the skirt 1. Consequently the weakest part of the cap portion 6 directly above the plug 7 is thicker than the annular portion of the cap adjacent its skirt 1.

The described conformation of the stopper proposed by the invention therefore permits the stopper to be readily thrust into the mouth of a bottle and the pressure inside the bottle will press the outside of the plug against the inside of the mouth of the bottle. Extensive experiments have revealed that the described stopper will in fact securely and tightly seal bottles containing extremely high internal pressures.

I claim:

A stopper of elastic material for containers comprising an external cap having an end wall terminating in a depending peripheral skirt, said skirt including an inwardly directed peripheral locking bead, and an internal peripheral indentation below said bead whereby a lowermost skirt portion of said skirt can be removed incidental to the removal of the stopper from a container with which the stopper is associated, said end wall having a central portion joined to said skirt by a top wall portion having a thickness appreciably less than the thickness of said central portion, an integral open-bottomed plug depending axially downwardly from said thickened central portion of said end wall and terminating short of a lower-

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most edge of said skirt, said plug having internal and external surfaces, said internal surface being substantially cylindrical and merging with a large radius into the central portion of said end wall, said external surface having a first surface portion flaring radially downwardly and outwardly and a second surface portion flaring radially inwardly and downwardly to define with said internal surface a relatively sharp edged conical bottom lip, said internal and external surfaces setting off wall thicknesses of said plug which are relatively thin adjacent said central portion of the end wall, thicker to a maximum at the juncture of the first and second flaring portions, and thin appreciably at said bottom lip.

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