

[54] **FLUID-TIGHT, FLEXIBLE AND TAMPER-PROOF CAPS FOR CONTAINERS HAVING A MATCHING NECK PROFILE**

558,998	1/1944	Great Britain	215/43 R
78,075	4/1962	France.....	215/41
79,447	10/1962	France.....	215/41

[72] **Inventor:** Paul S. Van Baarn, Monte Carlo, Monaco

Primary Examiner—M. Henson Wood, Jr.
Assistant Examiner—Thomas C. Culp, Jr.
Attorney—Munson H. Lane and Munson H. Lane, Jr.

[73] **Assignee:** Captocap Limited, Vaduz, Liechtenstein

[22] **Filed:** Nov. 13, 1970

[21] **Appl. No.:** 89,377

[57] **ABSTRACT**

A fluid-tight and tamper-proof assembly comprising a container having a neck and a cap of elastomeric material, which cap comprises a top portion, and a skirt portion which engages around the neck, in which the outer surface of the neck is provided with at least two parallel collars and the inner surface of the skirt is provided with the same number of annular ribs as there are collars on the neck of the container, these ribs forming, with the inner surface of the skirt, grooves in which the collars engage resiliently when the cap is forced onto the neck characterized in that there are recesses formed under the collars on the neck to form a gap between each rib and the neck into which gaps the material of the ribs is forced when the cap is moved along the neck in a direction to remove the cap.

[30] **Foreign Application Priority Data**

Nov. 19, 1969 France.....6939752

[52] **U.S. Cl.**.....215/41

[51] **Int. Cl.**.....B65d 41/22

[58] **Field of Search**.....215/41, 43 R

[56] **References Cited**

UNITED STATES PATENTS

3,224,617	12/1965	Hohl et al.	215/41 X
2,886,198	5/1959	Herter	215/41 X

FOREIGN PATENTS OR APPLICATIONS

1,479,330	3/1967	France.....	215/41
-----------	--------	-------------	--------

4 Claims, 8 Drawing Figures

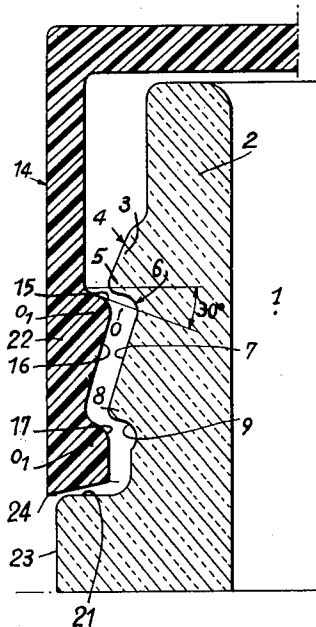
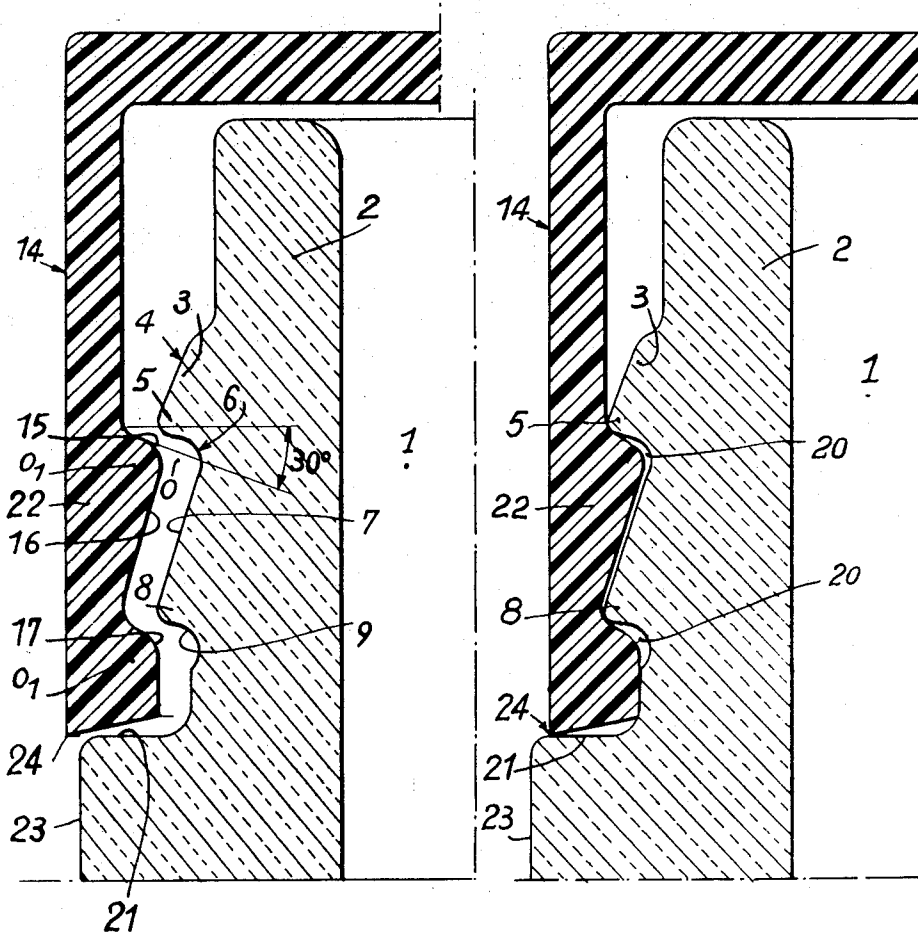


Fig.1

Fig.2



PAUL S. VAN BAARN
INVENTOR

Munson H. Kane
ATTORNEY

Fig. 3

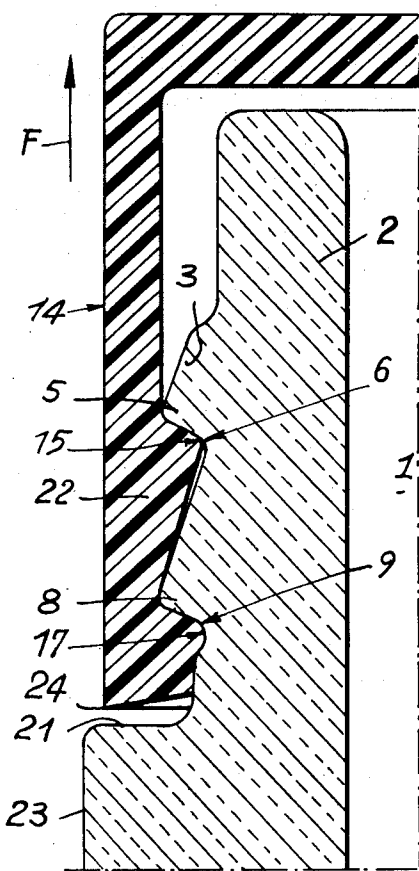
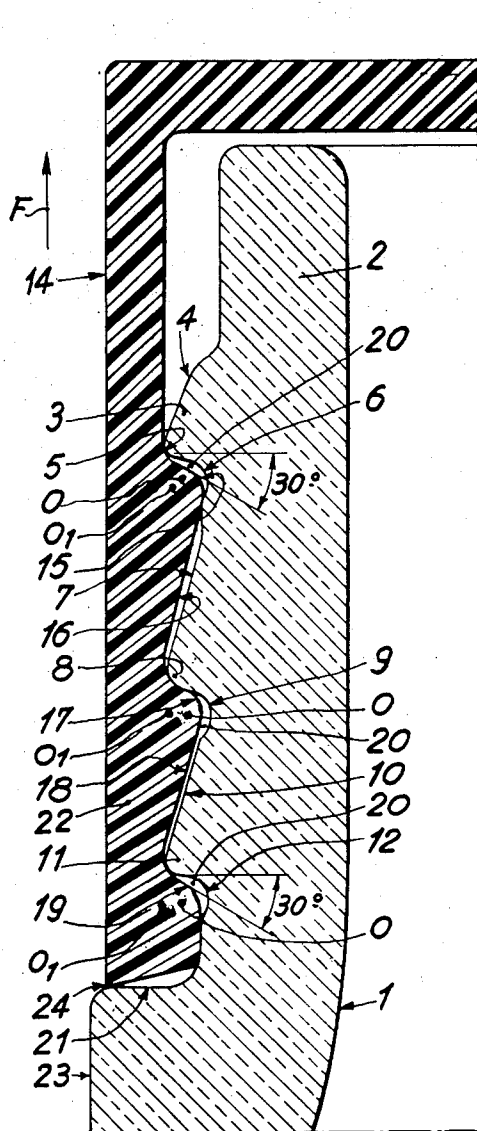


Fig. 4



PAUL S. VAN BAARN
INVENTOR

Munson H. Rane
ATTORNEY

Fig. 5

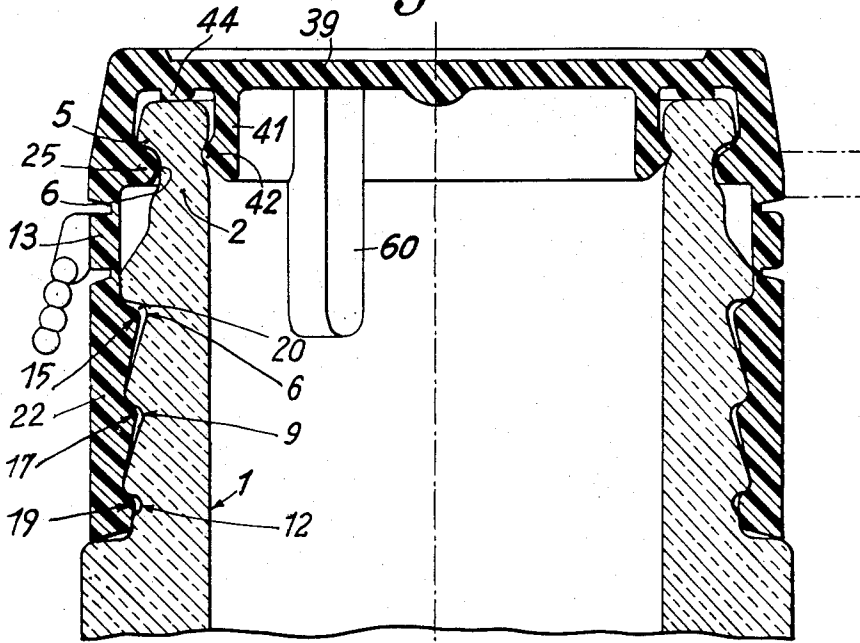
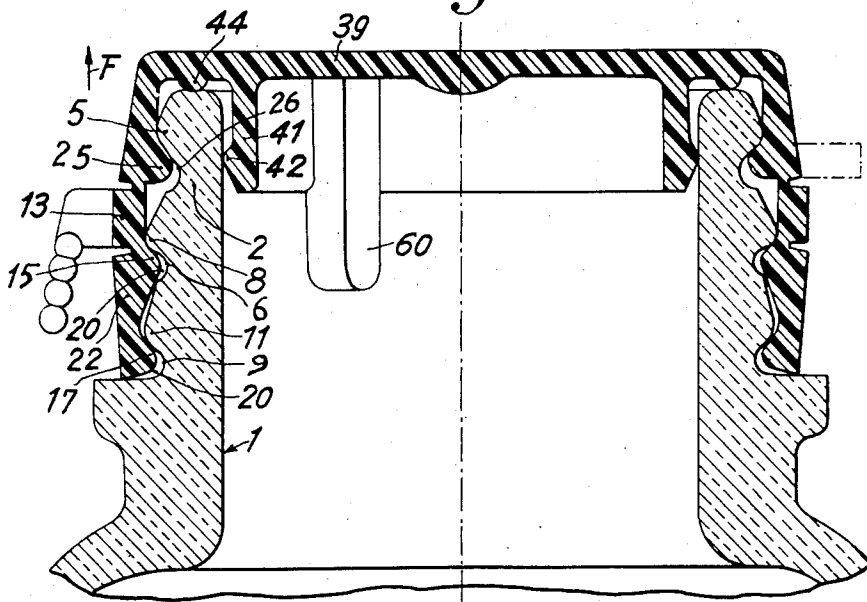
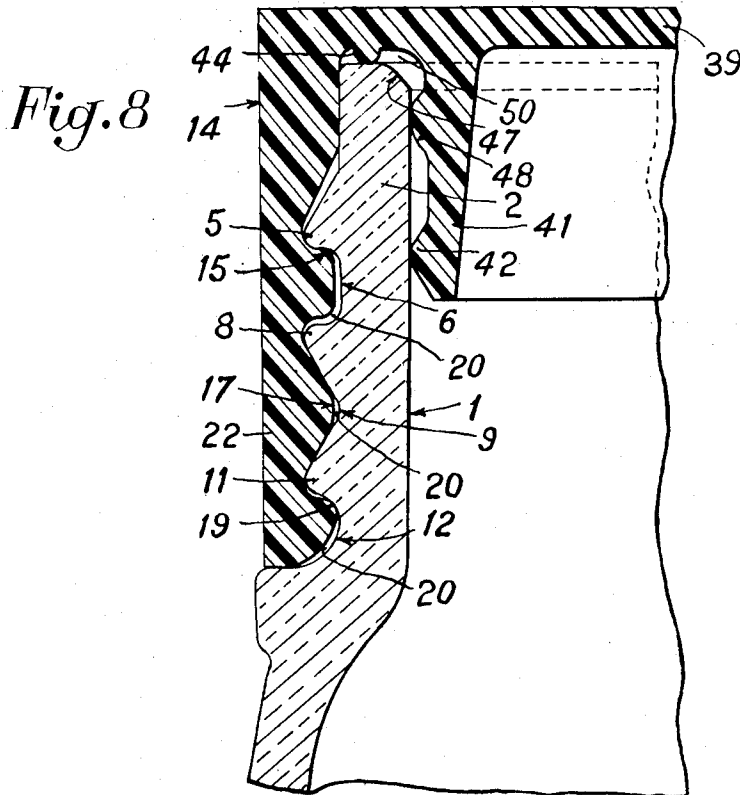
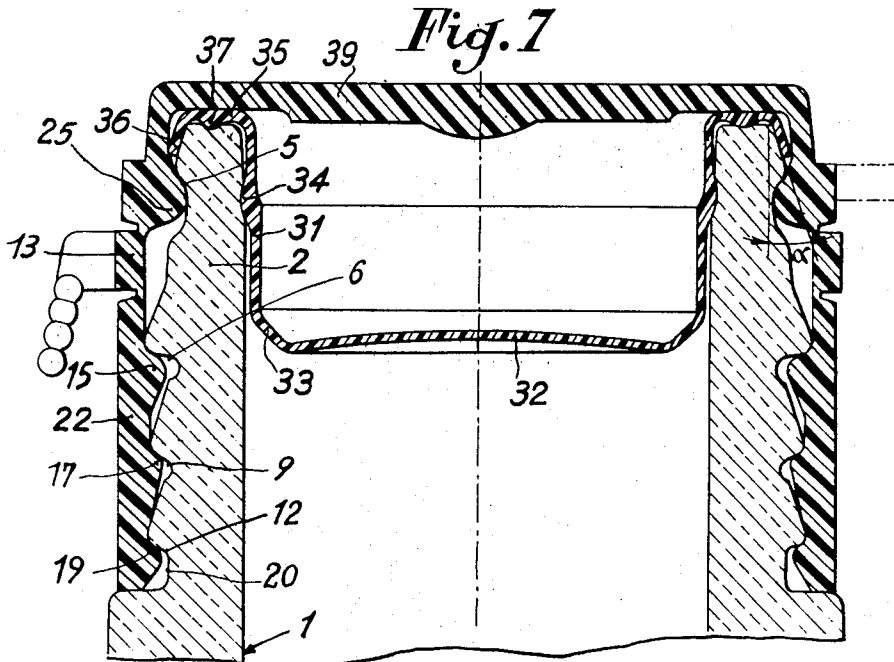


Fig. 6



PAUL S. VAN BAARN
INVENTOR

Munson H. Lane
ATTORNEY



PAUL S. VAN BAARN
INVENTOR

MURSON H. LANE
ATTORNEY

FLUID-TIGHT, FLEXIBLE AND TAMPER-PROOF CAPS FOR CONTAINERS HAVING A MATCHING NECK PROFILE

SUMMARY OF THE INVENTION

The present invention relates to an assembly of a plastic cap formed with an outer skirt engageable in a fluid-tight and tamper-proof fashion on the neck of a container.

The invention provides a fluid-tight and tamper-proof assembly comprising a container having a neck and a cap of elastomeric material, which cap comprises a top portion, and a skirt portion which engages around the neck, in which the outer surface of the neck is provided with at least two parallel collars and the inner surface of the skirt is provided with the same number of annular ribs as there are collars on the neck of the container, these ribs forming, with the inner surface of the skirt, grooves in which the collars engage resiliently when the cap is forced onto the neck, characterized in that there are recesses formed under the collars on the neck to form a gap between each rib and the neck into which gaps the material of the ribs is forced when the cap is moved along the neck in a direction to remove the cap.

BRIEF DESCRIPTION OF THE DRAWING

Now several forms of embodiments of the invention will be described by way of example with reference to the attached drawing in which:

FIG. 1 is a fragmentary sectional view showing an outer skirt of a sealing cap, before its engagement with the matching contour of the neck of a container;

FIG. 2 is a similar view showing the cap in operative position;

FIG. 3 is a similar view for explaining the tamper-proof feature of the device of this invention;

FIG. 4 is a sectional view showing a modified form of embodiment;

FIG. 5 is a sectional view showing a cap provided with outer and inner skirts and a three-fold locking feature, with the contour of the corresponding neck;

FIG. 6 is a similar view showing a cap having a double locking engagement with the container's neck;

FIG. 7 is a sectional view showing on the one hand a cap assembly comprising a cap proper with outer skirt and locking means, and a cup-shaped inner joint or sealing device and, on the other hand, the matching contour of the relevant neck;

FIG. 8 is a sectional view showing a modified structure of the assembly of FIG. 4.

DESCRIPTION OF THE PREFERRED EMBODIMENT

The inviolability or tamper-proof characteristics of the cap of this invention will first be explained with reference to FIGS. 1 through 4 of the drawing.

The neck of the container, in this case a bottle, has formed on its outer surface, from the top or inlet edge 2 downwards, a first or topmost nose-shaped peripheral collar 3 comprising first a moderately inclined straight portion 4 merging into the outermost nose-shaped rounded portion 5 followed by an underlying, substantially circular groove 6 having its center 0 disposed substantially on the generatrix tangent to the nose 5, or

slightly recessed inwards with respect to this generatrix. This groove 6 merges into another moderately inclined straight portion 7 of another nose-shaped collar and merges in turn into another nose-shaped rounded portion 8 overlying another circular groove 9 having the same characteristics as groove 6.

The plastic cap 14 comprises an outer skirt 22 formed on its inner face with a contour matching substantially the above-described contour of the neck 1; thus, this skirt 22 comprises on its inner face firstly a rib or bead of circular contour, for example a semi-circular contour 15 corresponding to the groove 6 of the neck and merging into a moderately inclined straight portion 16 to another rib or bead 17 corresponding in turn to and engaging the groove 9 of said neck when the cap is fitted in position on the neck.

Since the centers of curvature 0₁ of these ribs 15 and 17 are by construction very close to the centers of curvature 0 of grooves 6 and 9, it is obvious that when the cap is force-fitted to the neck of the container these ribs or beads 15, 17 fit with a very slight clearance into the corresponding grooves 6 and 9. It will be seen that there is a substantially linear contact between each groove and each rib, along a surface area forming an angle of 30° below the horizontal, and that narrow gaps 20 are formed between the bottom of said grooves and the ribs, and also the moderately inclined straight portions of the neck and cap.

Thus, the following twofold result is obtained:

1. These narrow gaps 20 counteract any tendency of the liquid in the container to spill out therefrom by capillarity;

2. If a tractive effort is exerted on the cap in the direction of the arrow F (FIG. 3), the ribs 15, 17 of the cap 14 tightly engage the grooves 6, 9 of neck 1, thus safely preventing any slipping movement of said cap.

A greater number of ribs may be provided on the inner surface of the outer skirt 22 of the cap 14, these ribs corresponding of course to an equal number of grooves formed on the outer surface 14 of the neck 1. FIG. 4 illustrates a typical example of a cap and neck assembly comprising three ribs 15, 17 and 19 on the skirt, which correspond to three grooves 6, 9 and 12 on the neck which are located at the level of the ribs of said outer skirt when the cap is fitted in position. The additional groove 12 is disposed beneath a third collar 11 connected through a moderately inclined straight portion 10 to said groove 9. On the other hand, the third rib 19 of this cap is connected through another moderately inclined straight portion 18 to the second rib 17.

Under the lowermost groove 12 a circular collar 23 connected through an annular flat shoulder 21 may be provided, the lower edge 24 of the skirt 22 engaging this flat shoulder 21 to increase the safety of the device and preventing the insertion of a blade or point therebetween.

FIG. 5 illustrates a modified form of embodiment of a cap comprising an inner skirt 41 and an outer skirt 22, parallel to each other, and a flat bottom, as well as of a container's neck having a contour matching that of the cap skirts.

The inner skirt 41 of the cap has formed at its projecting edge a peripheral outer rib 42 registering with the rib 25 formed on the inner face of the cap. A third

peripheral rib 44 is formed on the flat bottom 39 so as to provide circular cavities between the inner skirt 41 and the outer skirt of the cap.

Beneath the first rib 25 the outer skirt 22 is a guaranty strip 13 of a type known per se adapted to be torn off wholly or partly.

The inner skirt 41 may be provided with a guide lug 60 also of known type.

The outer skirt 22 comprises beneath the tear-off strip 13 a three-fold locking feature on the neck of the container, that is to say three ribs 15, 17, 19 adapted to constitute a collar for engaging in the grooves 6, 9, 12 of the outer surface of the neck 1 when the cap is positioned thereon by force-fitting, with narrow gaps 20.

These grooves and ribs have the characteristics as those set forth hereinabove with the reference to FIGS. 1 through 4.

FIG. 6 is a similar view of a cap of same type but provided beneath the tear-off strip 13 with a pair of peripheral inner ribs 15 and 17 formed on the outer skirt 22.

In the closed cap position these ribs 15 and 17 register with a pair of matching grooves 6 and 9, of substantially semi-circular configuration, formed on the neck of the container; these grooves 9 and 12 are disposed beneath the collars 8 and 11 respectively and have their centers of curvature adjacent to those of ribs 15 and 17. Thus, when the guaranty strip 13 is torn off wholly or partly, an annular strap doubly locked to the container's neck is obtained, due to the forced engagement of ribs 15 and 17 into grooves 6 and 9 of said neck; the fluid-tightness of the capsule 39 is obtained as in the preceding case, notably by causing the rib 25 of the cap to engage the groove 26 of the neck 1. Moreover, any attempt at tearing off the cap in the direction of the arrow F will tend to lock the ribs 15, 17 under the collars and counter-collars 8 and 11 of neck 1, as explained hereinabove in connection with FIGS. 1 to 4.

The fluid-tightness is ensured as in the preceding case by providing narrow gaps 20 between the circular ribs 15, 17 and the outer surface of the neck 1.

The tamper-proof fluid-tight plastic cap illustrated in FIGS. 7 and 8 comprises two elements, namely a joint or seal of preferably rigid and inert thermoplastic material, such as polypropylene, and a capsule of thermoplastic flexible plastic material such as polyethylene.

The joint or seal is a substantially cup-shaped member having a cylindrical lateral peripheral wall 31 and a flat or slightly convex bottom 32 connected to said wall 31 through a frustoconical wall portion 33. The cylindrical wall 31 has formed at the upper portion of its outer surface a projecting rib 34. This cup is formed with an integral flat flange 35 provided with a depending marginal portion 36 forming an angle α for example 15° , to the vertical.

In the bottom of the groove formed between the flange 35 of this cup-shaped seal and the depending marginal portion 36, another circular rib 37 is provided.

The corresponding cap consists, as in the preceding examples, of a substantially flat top-portion 39 and an outer skirt 22. This outer skirt 22 comprises adjacent the cap bottom 39, a first peripheral rib 25 projecting outwards, and engaged under the nose 5, followed by

the tear-off guaranty strip 13, a first circular rib 15 having a special contour intended to cause its locking engagement with the lower portion of a collar 6 formed on the neck 1, another inner rib 17 also engageable under another collar 9 and a third rib corresponding to the groove 12 of the neck.

The joint or seal described hereinabove is adapted to be force-fitted into this capsule until the marginal portion 36 of flange 35 resiliently fits between the top portion 39 and rib 15. The resulting assembly is then force-fitted in turn on the neck 1, as usual, due to the inherent elasticity of the cap material and the joint does not interfere with this driving action.

This two-piece cap operates exactly like a one-piece cap but is advantageous in that only the cup-shaped joint is in contact with the liquid kept in the container to be closed; therefore, this two-piece cap may prove particularly useful when it is desired to avoid any physical and/or chemical alteration of the content of the container while permitting the use of a relatively flexible material of any desired and adequate character for making the capsule proper. As this joint is force-fitted into the cap, the fluid tightness is obtained by providing ribs on the joint and/or the cap.

In the variant represented in the example in FIG. 8, the neck 2 of the bottle 1 has, as in the embodiment in FIG. 4, three rings 5, 8, 11 separated by grooves 6, 9, 12 to which the ribs 15, 17, 19 of the outer skirt 14 of the cap correspond. These ribs have curved profiles substantially homothetic with the profiles of the grooves in which they are force-fitted elastically when the plastic cap 14 is pushed on the bottle 1. Lamellar spaces 20 are provided between these ribs and the bottom of the grooves below the rings, for the purpose of breaking the capillarity and permitting the crushing of the ribs in the bottom of the grooves when a tractive force is exerted tending to tear away the cap, in such a way as to render this latter perfectly fluid-tight and inviolable.

The capsule may have an inner skirt 41 forming with the top of the outer skirt 22 a circular corridor 50 in which the neck 2 of the bottle is force-fitted; fluid-tightness may be increased by circular ribs 42 and 48 of this inner skirt, as also be the circular rib 44 of the bottom of the corridor 50. Preferably, the neck of the bottle has a flat 47 cut towards the throat, at 45° for instance.

Preferably also the intermediate groove 6 has a clearance in respect of the rib 15 such as to permit a vertical play of this rib in its groove and to balance the results of the forces exerted in the two directions on the cap when it is desired to push it on or tear it off.

What I claim is:

1. A fluid-tight and tamper-proof assembly comprising a container having a neck and a cap of elastomeric material, which comprises a top portion, and a skirt portion which engages around the neck, in which the outer surface of the neck is provided with at least two parallel collars and the inner surface of the skirt is provided with the same number of annular ribs as there are collars on the neck of the container, these collars being shaped in order to constitute under them grooves in which the ribs of the skirt engage resiliently when the cap is forced onto the neck, a gap being provided between each rib and each groove of the neck, the con-

5

tact area between the matching pairs of ribs and collars being inclined by about 60° to the axis of the neck.

2. An assembly as claimed in claim 1, comprising a fluid-tight liner or inert plastic material consisting of a cup-shaped cylindrical, preferably convex bottom and an annular flange formed with an inclined outer peripheral marginal portion adapted to be resiliently locked above the first inner rib of the outer skirt of said cap.

3. A fluid-tight and tamper-proof assembly comprising a flexible cap having a top portion, an inner skirt adapted to be force fitted into the neck of a container, an outer skirt adapted to fit resiliently on the neck of the container formed with peripheral rings, said outer skirt having formed on its inner face annular beads of

6

substantially circular cross-sectional contour, interconnected by tapered faces, and a container neck provided at the level of, and above said beads, beak-shaped rings interconnected by other tapered faces and forming beneath them grooves in which the beads of the cap skirt are engageable with gaps.

4. An assembly as set forth in claim 3, which comprises a container having a neck formed with a ring and a cap of which the outer skirt comprises at the level of and above the container ring an annular bead adapted to fit under said ring, and a tear-off strip adapted to be torn completely or partially and disposed above said annular beads of the base of the outer skirt of said cap.

* * * * *

20

25

30

35

40

45

50

55

60

65