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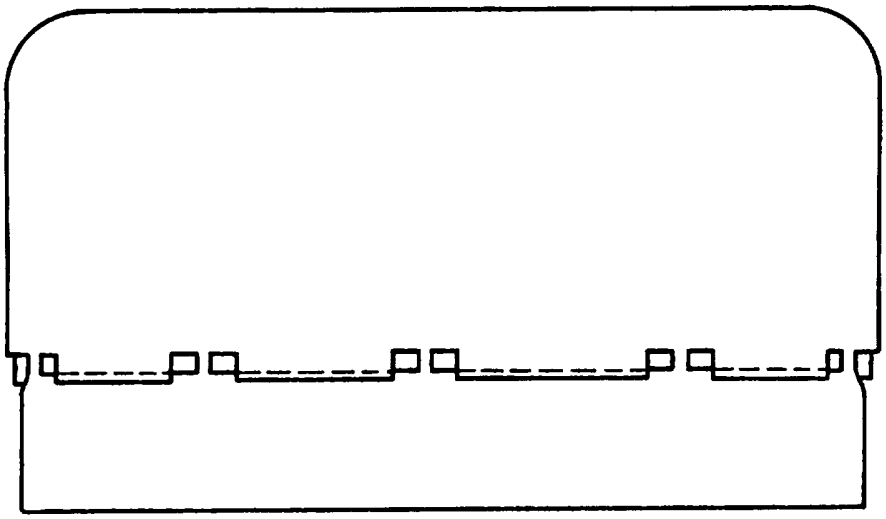
(54) Title: TAMPER EVIDENT BOTTLE CAP



(57) Abstract

A compression failure resistant tamper evident bottle cap includes a skirt (14) with a lower edge, and a tamper-evident band (24) formed integrally with the skirt and having structure for engaging beneath a retaining flange (30) on the bottle so as to prevent subsequent withdrawal of the band. Frangible bridges (26) connect the band to the lower edge of the skirt. To prevent destruction of the bridges as the cap is forced onto the bottle during installation, the skirt has one or more tabs (32) or the like, extending downward over a portion of the band, for preventing undue diametral expansion of the tamper evident band as it passes over the retaining flange.

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TAMPER EVIDENT BOTTLE CAP

BACKGROUND OF THE INVENTION

This invention relates to the art of bottle closures, and more particularly to a compression failure resistant tamper evident bottle cap.

Nowadays, many bottle caps have a band which tears away from the rest of the cap, remaining with the bottle neck, when the cap is removed for the first time. One can visually, or by feel, detect when such a cap has been removed and then reinstalled, because of the failure of the anti-tamper feature. Such caps, once made of metal, now are usually molded from a plastic polymer.

The tamper-evident band is normally smaller in diameter than a retaining flange on the bottle finish, and is pushed over the retaining flange at the factory when the cap is installed. The band is connected to the rest of the cap along a weakened peripheral line, for example define by a series of perforations which weaken the material and provide a locus for failure when the cap is removed.

A problem with some caps of this type is that during installation, as the band is being forced over the bottle's retaining flange, the resistance force not only puts large axial compression forces on the weakened peripheral line: it also expands the band radially. The combination of these two factors gives rise to the possibility that the band will tend to ride up over (around) the bottom of the cap, failing the tamper-evident features prematurely.

SUMMARY OF THE INVENTION

An object of the invention is to reinforce a bottle cap having a tamper-evident band against axial compression failure as described above.

This an other objective of the invention are achieved by the invention described below. According to this invention, a compression failure resistant tamper evident bottle cap including a skirt with a lower edge, and a tamper-evident band

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formed integrally with the skirt and having structure for engaging beneath a retaining flange on the bottle so as to prevent subsequent withdrawal of the band. Frangible bridges connect the band to the lower edge of the skirt. To prevent destruction of the bridges as the cap is forced onto the bottle during installation, the skirt has one or more tabs or the like, extending downward over a portion of the band, for preventing undue diametral expansion of the tamper evident band as it passes over the retaining flange.

BRIEF DESCRIPTION OF THE DRAWINGS

In the accompanying drawings,

Figure 1 is a top plan view of a compression failure resistant tamper evident bottle cap embodying the invention;

Figure 2 is a side elevation thereof;

Figure 3 is a detail of a portion of Fig. 2;

Figure 4 is a sectional view taken on the plane 4 - 4 in Fig. 1, with a portion of the bottle finish added;

Figure 5 is a detail of a portion of Fig. 4;

Figure 6 is a similar detail, apart from the bottle finish;

Figure 7 shows the bottle cap being installed onto a bottle;

Figure 8 is a view like Fig. 2, of a second embodiment of the invention;

Figure 9 is a view like Fig. 2, of a third embodiment of the invention;

Figure 10 is a view like Fig. 4, of a fourth embodiment of the invention; and

Figure 11 is a view like Fig. 10, showing the cap partially removed from the bottle.

DESCRIPTION OF THE PREFERRED EMBODIMENT

A compression failure resistant tamper evident bottle cap embodying the invention is shown in Figs. 1 - 7. The cap has a number of conventional features, including a planar, circular base 12 surrounded by a circular skirt 14 having a helical internal thread 16 for engaging a complementary thread 16 (see Fig. 7) on a bottle neck 18. The circular rib 20 on the bottom of the base provides a seal within the bottle mouth 22 when the cap is in place.

Figures 4 and 5 show the tamper-evident band 24 which is connected to the bottom of the skirt by a series of frangible bridges 26 designed to fail when the cap is removed from the bottle. However, the bridges must not fail when the cap is installed on the bottle at the factory, or they will give a false indication of tampering.

In Figure 5, one can see the cap being installed on a bottle, the internal circumferential frusto-conical sleeve 28 being pushed outward as its free edge passes over the external flange 30 on the bottle neck. The bottom of the flange has a steep pressure angle, greater than the angle of repose for the two materials in combination, so that the band remains captured as the cap is removed, by a retention force greater than that needed to break the bridges.

One can see, in Fig. 5, that the tamper evident band is expanded diametrally during installation, so that the bridges gain an oblique orientation. At the same time, the band experiences axial resistance to being forced over the bottle flange. These two factors combine to encourage continued flexure of the bridges, which in extreme cases can result in the band tending to ride up over (outside) the skirt, breaking the bridges.

Now, according to this invention, the amount of bridge flexure during installation is limited by providing, on the bottom edge of the skirt, structure which limits outward expansion of the band, and brings the skirt to bear directly down on the band, so that the bridges are not unduly stressed.

This protective structure may take a number of forms. The one presently most preferred is that shown in the first seven figures. In this embodiment, the skirt has a series of tabs 32 which extend downwardly, radially containing the uppermost part of the band. The windows 34 between the tabs are centered over the bridges, permitting one to see the bridges, and also facilitating manufacture. One can clearly see the function of the tabs in Figs. 5 and 7, where they are preventing undue outward movement of the band during installation. At all other times, the tabs are out of contact with the band, the only connection then being the bridges.

Figure 8 shows a modified form of the invention, which is the same in all respects as that previously described, except the there are no windows: the tabs are replaced by a continuous circular rim 36 which performs the same function as the tabs, perhaps with some added strength, but with the disadvantage that the bridges are hidden from view.

In the embodiment of Fig. 9, the tabs have been replaced by much narrower, more numerous lugs 38 which again keep the band from expanding too much during installation.

In Figures 10 and 11, the expansion-limiting structure 40 is, as in Figure 8, continuous, but axially abbreviated, so that one can still see the bridges. The internal lip 42 depicted provides a sealing function not important to the present invention.

In each embodiment of the invention, the expansion-limited structure at the bottom of the cap's skirt prevents the band from riding up over the cap during installation, and thus maintains the integrity of the bridges.

It may be noted that the bridges can be replaced by functional equivalents. For example, a circumferentially continuous thin connector strip, or a score line, might connect the band to the skirt. The bridges might be fairly narrow, circumferentially, as shown in Figure 3, or they might have substantially width. Conceivably, they could be defined between a series of perforations in the cap material. Other variations may occur to people in this field.

Since the invention is subject to modifications and variations, it is intended that the foregoing description and the accompanying drawings shall be interpreted as only illustrative of the invention defined by the following claims.

I claim:

1. In a compression failure resistant tamper evident bottle cap for installation on a bottle having a retaining flange, said cap comprising

a skirt with a lower edge,

a tamper-evident band formed integrally with the skirt and having structure for engaging beneath the retaining flange so as to prevent subsequent withdrawal of the band, and

frangible means for connecting the band to the lower edge of the skirt, the improvement wherein

said skirt has means for preventing undue diametral expansion of the tamper evident band as the cap is being installed on the bottle, to protect the structural integrity of the frangible means.

2. The invention of claim 1, wherein the frangible means are a series of bridges molded at circumferential intervals between the skirt and the band.

3. The invention of claim 2, wherein the expansion preventing means are a series of tabs extending downwardly from the bottom edge of the skirt, with windows between the tabs being centered over the bridges so that the bridges are visible between the tabs.

AMENDED CLAIMS

[received by the International Bureau on 9 September 1996 (09.09.96); original claims 1-3 replaced by amended claims 1-3 (1 page)]

1. In a compression failure resistant tamper evident bottle cap for installation on a bottle having a retaining flange, said cap comprising

a skirt with a lower edge,

a tamper-evident band formed integrally with the skirt and having structure for engaging beneath the retaining flange so as to prevent subsequent withdrawal of the band, and

frangible means for connecting the band to the lower edge of the skirt, the improvement wherein

said skirt has means for preventing undue diametral expansion of the tamper-evident band as the cap is being installed on the bottle, said expansion preventing means extending downwardly from the bottom edge of the skirt and adjoining to the outer surface of the tamper-evident band for providing restraining engagement of the tamper-evident band to protect the structural integrity of the frangible means.

2. The invention of claim 1, wherein the frangible means are a series of bridges molded at circumferential intervals between the skirt and the band.

3. The invention of claim 2, wherein the expansion preventing means are a series of tabs extending downwardly from the bottom edge of the skirt, with windows between the tabs being centered over the bridges so that the bridges so that the bridges are visible between the tabs.

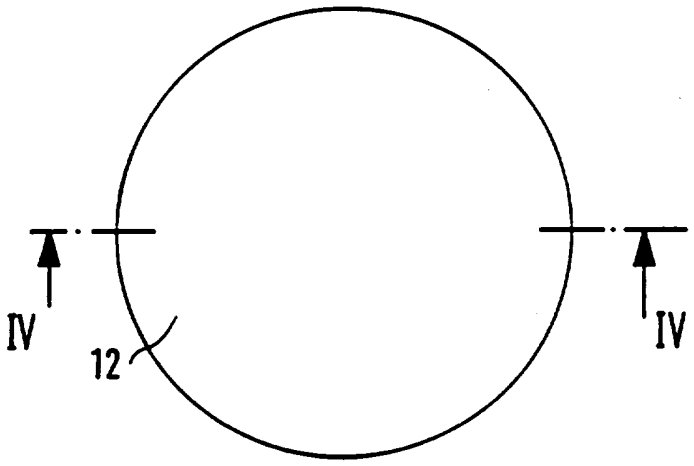


FIG.1

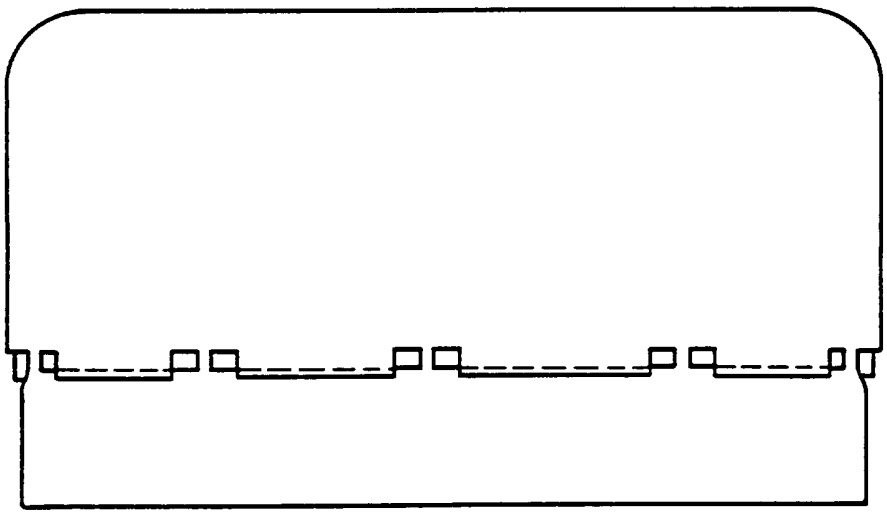


FIG.2

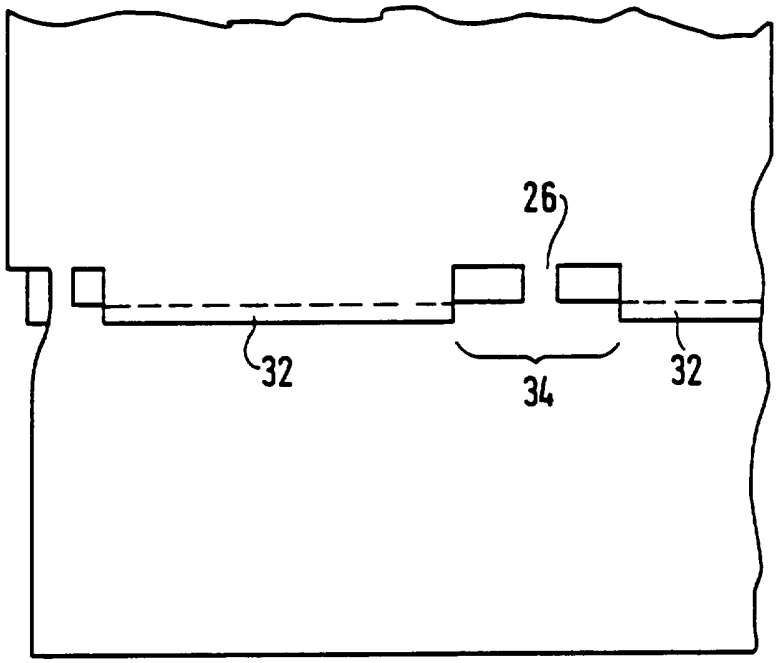


FIG. 3

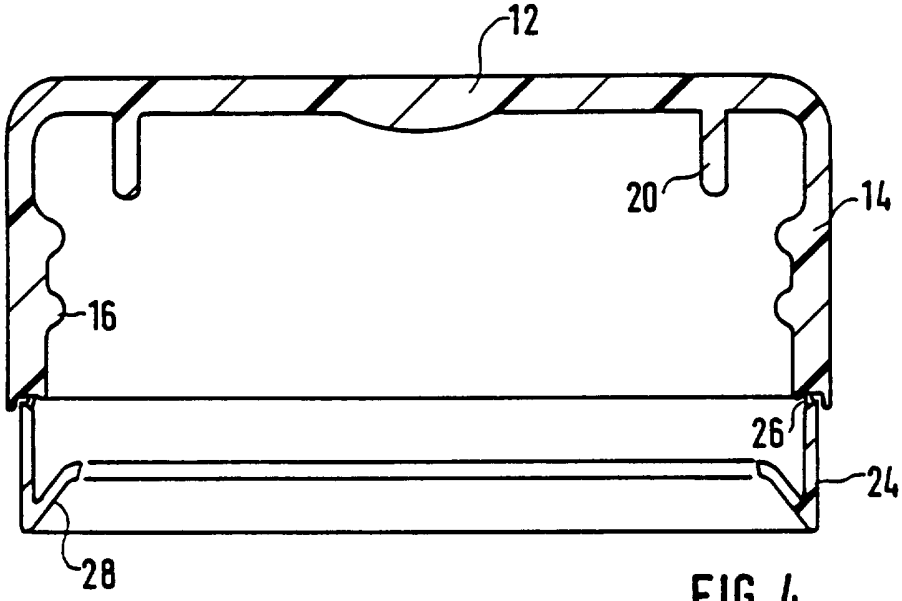


FIG. 4

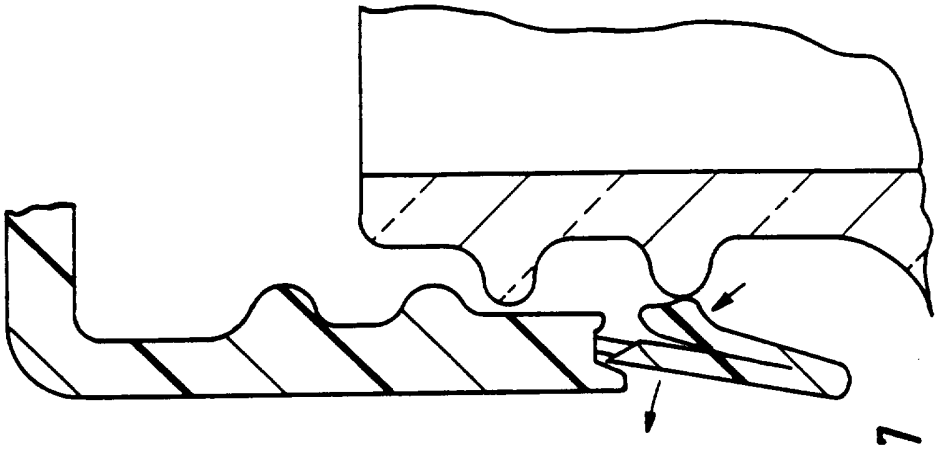


FIG.7

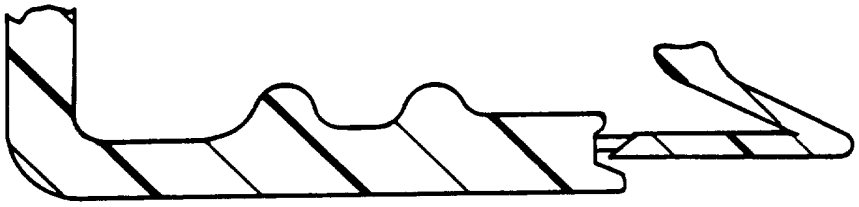


FIG.6

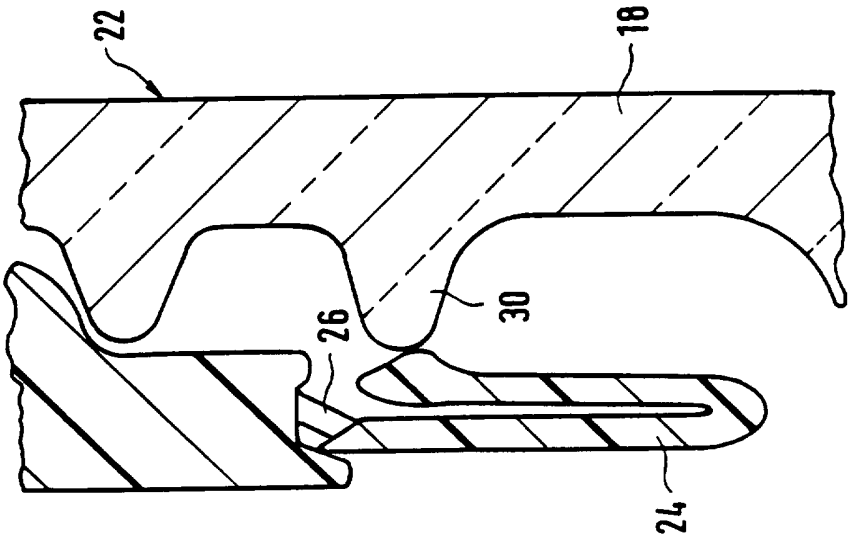


FIG.5

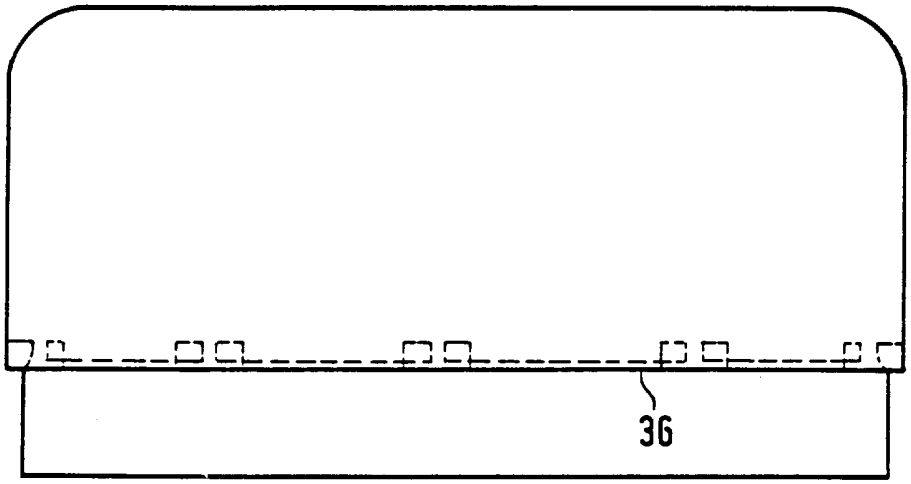


FIG.8

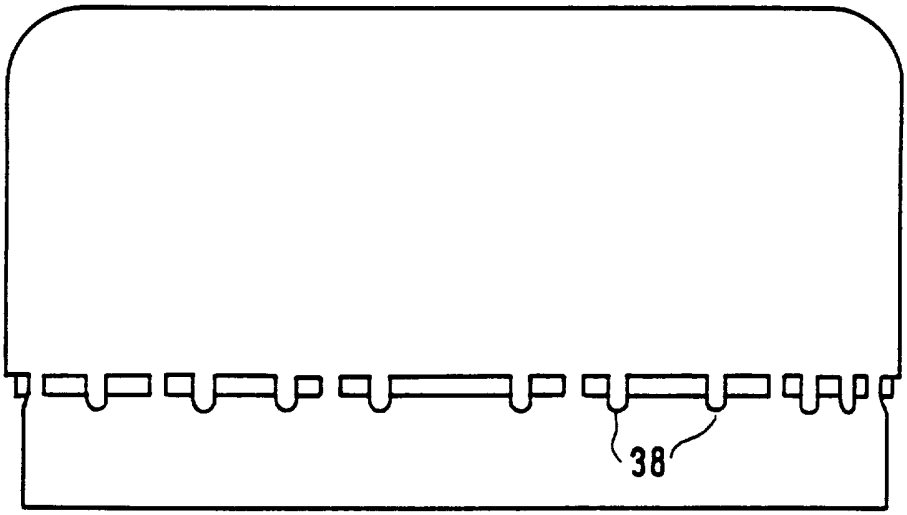


FIG.9

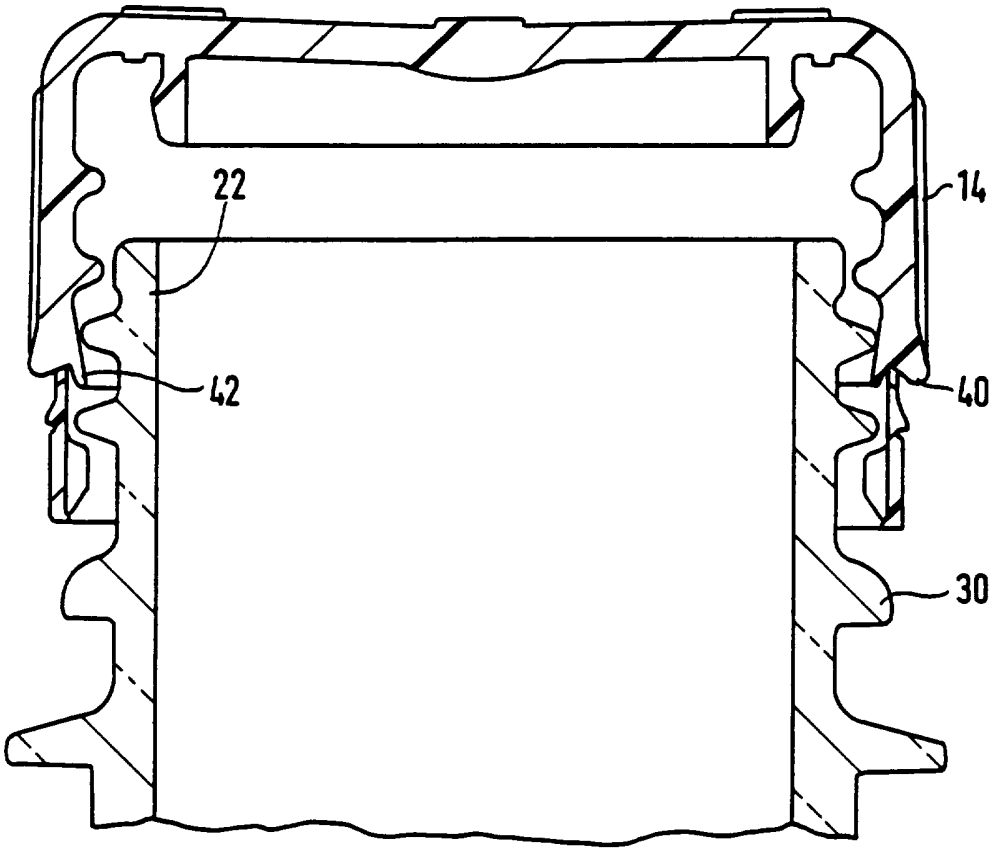
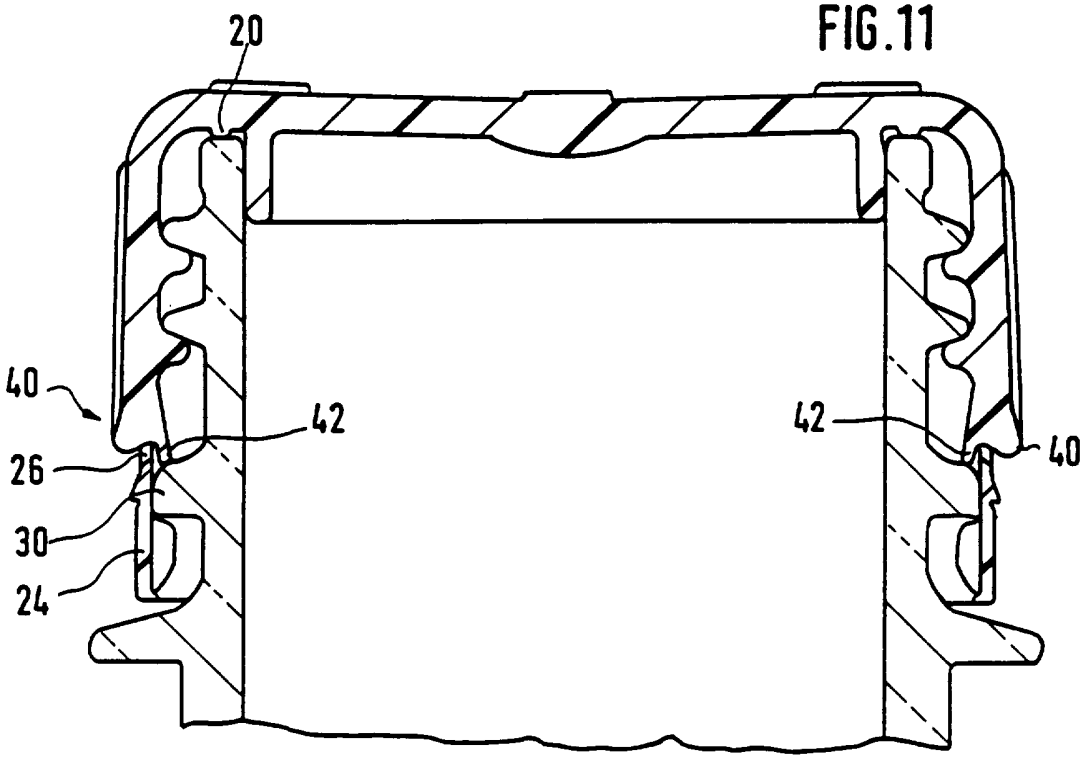


FIG.10

FIG.11



INTERNATIONAL SEARCH REPORT

Inte ɔnal Application No
PCT/EP 96/01447

A. CLASSIFICATION OF SUBJECT MATTER
IPC 6 B65D41/34

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
IPC 6 B65D

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	EP,A,0 228 618 (PHARMA-GUMMI WIMMER WEST GMBH) 15 July 1987 see page 18, line 21 - line 34; figures 14A-14B	1,2
X	US,A,4 147 268 (PATEL ET AL) 3 April 1979 see figures	1,2
X	US,A,3 737 064 (PATEL ET AL) 5 June 1973 see figures	1,2
A	DE,A,32 24 002 (ROBERT FINKE KG) 29 December 1983 see page 8, line 15 - line 16; figures	1,3

☐ Further documents are listed in the continuation of box C.

☒ Patent family members are listed in annex.

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Date of the actual completion of the international search	Date of mailing of the international search report
4 July 1996	15.07.96

Name and mailing address of the ISA	Authorized officer
European Patent Office, P.B. 5818 Patentlaan 2 NL - 2280 HV Rijswijk Tel. (+ 31-70) 340-2040, Tx. 31 651 epo nl, Fax: (+ 31-70) 340-3016	Smith, C

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INTERNATIONAL SEARCH REPORT

Information on patent family members

Inte ɔnal Application No
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Patent document cited in search report	Publication date	Patent family member(s)		Publication date
EP-A-228618	15-07-87	US-A-	4744480	17-05-88
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US-A-4147268	03-04-79	NONE		
US-A-3737064	05-06-73	NONE		
DE-A-3224002	29-12-83	NONE		