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(54) Safety closures.

(57) With reference to Figures 3 to 8, a closure for a container is moulded from a suitable plastics material and comprises a cap with a top wall 1 and skirt 2. The lower edge of the skirt 2 is joined by a breakable web 3 to a tear-off band 4, and the band 4 is joined in turn by a similar web 5 to a captive band 6. The interior of the skirt 2 is formed with an interrupted bead defined by two internal circumferentially spaced shoulders 7 (Figure 3) with a gap 8 between them, a vestigial bead 9 and a substantial inwardly projecting lug 10. On the outside of the cap in alignment with the lug 10 is a finger tab 11 (Figure 4) to facilitate removal of the cap when it has first been turned to the right angular position on the neck of the associated container, with the lug 10 in a gap 12 in the bead 13 (Figures 7 and 8) on the reck of the container.

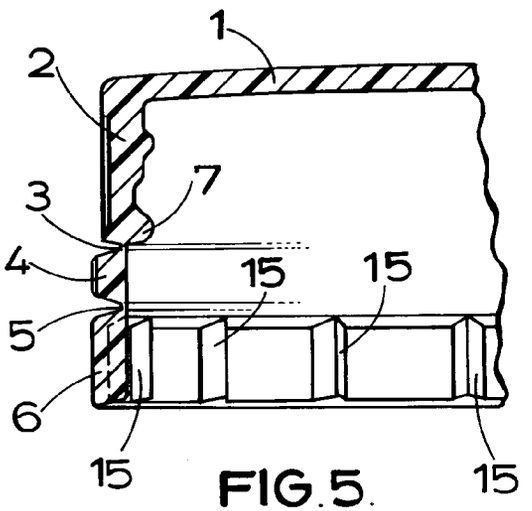

FIG.5.

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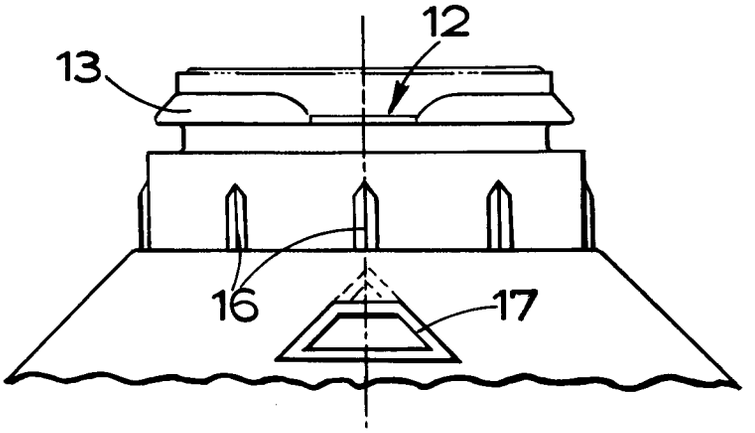

FIG.8

This invention relates to closures for containers which are not only child-resistant but also tamper-evident. The provision of some kind of discouragement to children opening containers, especially those that contain drugs, pills and potentially harmful household products, goes back many years and there have been countless different proposals, both on screw caps and on snap-on caps. One of the most successful in the snap-on field has been one in which the cap has to be rotated to a predetermined orientation (indicated by arrows or other indicia on the cap and on the neck of the container) to align a lug on the inside of the cap with a gap in an annular bead around the neck of the container before the cap can be pushed off. This is the subject of British Patent Specification No. 1 295 207 of Diamond International and the equivalent U.S. 3 627 160. A somewhat similar, though less successful, cap is disclosed in U.S. Patent Specification No. 3 393 816 of Grimm. Another U.S. Patent Specification No.3 342 058 of Burgess discloses a third version, and also the logical inverse in which an outwardly projecting lug on the neck of the container has to be aligned with a gap in a bead inside the skirt of the cap. This inverse type is also disclosed in British Patent Specification No. 1 520 808 of Glyndon Plastics Limited.

The provision of an indication that a closure has been tampered with has an even longer history. Both in screw caps and in snap-on caps it has been usual to provide a circumferentially extending tear-off or break-off strip joined to the skirt of the cap by a line of weakness and engaging under a circumferential bead on the neck of the container; there may be a tab which the user grasps to remove the strip, or the strip may be left in place and the line of weakness simply broken as the cap is removed (see our U.K. Patent Specification No. 205928A). In some of the known tamper-evident arrangements the tear-off band itself engages under an annular bead around the neck of the container. In others, as exemplified by British Patent Specification No. 1 404 084 of Johnsen & Jorgensen, there is a captive band engaging under a bead on the neck of the container and this is joined to the closure by a tear-off band.

There have also been proposals to add tamper-evident tear-off strips to child-resistant closures, for example in the above-mentioned British Patent Specification No. 1 520 808 of Glyndon Plastics Limited and its U.S. equivalent 4 043 475, and more recently in U.S. 4 449 639 and European 0113550 of Johnsen & Jorgensen (Plastics) Limited. In each of these the strip is of the straightforward tear-off kind, although in Figures 7 and 8 of British 1 520 808 there is shown a version in which, as in some of the known tamper-evident caps mentioned above, the cap is joined by a tear-off intermediate band to a captive band which remains on the neck of the container and forms an anchorage for a hinge by which the closure is retained on the container. As pointed out in the specification, a drawback of this arrangement is that after removal of the tear-off band and when the closure is thereafter being used in its normal child-resistant mode, it is necessary to turn the interconnected closure and captive band to a child-resistant position after opening.

There is a proposal in U.S. Patent Specification No. 4 457 437 of Heath to provide, on a child-resistant cap of this kind, i.e. one that has to be turned to a predetermined orientation to open it, an indicating element on the cap which is broken by a fixed lug on the neck of the container when an attempt is made to turn the cap beyond a certain amount to the required position.

Known circumferentially extending tear-off tamper-evident strips almost always engage under an annular bead provided on the neck of the container, in fact it is by engagement under a bead that the strip holds the cap in place and prevents its removal until the strip has first been torn away.

In European Patent Specification No.0 192 881 (and the equivalent U.S. Patent Specification No. 4 573 599) of Owens-Illinois Inc., there is disclosed a snap-on child-resistant closure similar to that of the British Patent Specification No. 1 295 207 (i.e. requiring to be turned to a predetermined orientation, indicated by marks, before it can be removed) with a tear-off tamper-evident band which instead of preventing upward movement has a ring of internal circumferentially spaced vertical ribs which co-operate with ribs on the container to prevent the closure being turned to the lift-off position. After the ribbed band has been torn away the closure can be turned to line up the arrows, and thereafter it behaves as a normal child-resistant closure.

The present invention is concerned with a further development in child-resistant tamper-evident closures of the general kind described above, ensuring even more effectively than the known ones that the closure cannot be levered off by unauthorised persons without breaking the band and furthermore avoiding the known problems of unwanted breakage during 'capping', that is to say, as the closure is fitted to the container. A further aim is to make tampering more obvious than in some of the known closures.

According to the invention there is now proposed a child-resistant and tamper-evident snap-on closure assembly comprising a closure having a top wall and a skirt and there being co-operating circumferential beads and lugs on the inside of the skirt of the cap and on the neck of the container making it necessary to turn the closure to a certain angular position in relation to the neck to bring a lug on the skirt or neck into alignment with a gap in the bead on the neck or skirt (for example as disclosed in the above-mentioned British Patent Specification No. 1 295 207) and the skirt of the cap being joined by a breakable web or webs to a circumferentially extending tear-off band which in its turn is joined by a breakable web or webs to a continuous

circumferentially extending captive band on the neck of the container, and that captive band has at least one lug co-operating with a lug or lugs on the neck of the container to prevent rotation of the cap to the said certain angular position until the tear-off band has been removed to disconnect the cap from the captive band.

Thus unlike, for example, Figures 7 and 8 of British Patent Specification No. 1 520 808, the captive band is prevented from rotation rather than upward movement and furthermore once the tear-off band has been removed the cap can turn even though the captive band cannot, and so there is no problem in achieving automatic child-resistance when the cap is removed and replaced; indeed it then behaves just like any existing child-resistant snap-on cap.

At the same time, unlike those closures where the tear-off band itself engages under a bead on the neck of the container, it clearly reveals when tampering has taken place as there is an obvious gap created between the cap and the captive band; in the known closures with a single band it is not apparent after removal of the tear-off band, that there had ever been one there in the first place.

It thus has an advantage over, for example the closure of European Patent Specification No. 0 192 881. Moreover, as the captive band only has to resist turning, not upward movement, there need be no annular bead on the neck of the container associated with this band, and so capping presents no problem, and the difficulties associated with, for example, the type of child-resistant tamper-evident closure disclosed in European Patent Specification No. 0 113 550 are thus avoided.

It will be appreciated that although each of the individual principles embodied in the closure assembly now proposed is old in itself, the particular combination proposed has never been used before and brings with it a particular and unforeseen set of advantages. This will become apparent from consideration of the following description of a particular example with reference to the accompanying drawings, in which:-

Figure 1 is an elevation of a container fitted with the closure according to the invention;

Figure 2 is a partial front view to a larger scale of the closure alone;

Figure 3 is a plan view of the closure from below;

Figure 4 and 5 are partial vertical sections through the closure on the lines 4-4 and 5-5 respectively in Figure 3;

Figure 6 is a detail plan view from above of a portion of the closure; and

Figure 7 is a plan view of the neck of the container; and

Figure 8 is an elevation of the neck.

The closure illustrated is moulded from a suitable plastics material and comprises a cap with a top wall 1 and skirt 2, the lower edge of the skirt being joined by a thin breakable web 3 to the upper edge of a tear-off band 4, and the lower edge of the band being joined by a similar thin breakable web 5 to a further band 6. The cap is of a child-resistant construction similar or identical to that described in British Patent Specification No. 1 295 207 or U.S. 3 627 160, with an interrupted bead defined by two internal circumferentially spaced shoulders 7 with a gap 8 between them, a vestigial bead 9 and a substantial inwardly projecting lug 10. On the outside of the cap in alignment with the lug is a finger tab 11 to facilitate removal of the cap when it has first been turned to the right angular position on the neck of the associated container, with the lug 10 in a gap 12 in the bead 13 (Figs 7 and 8) on the neck of the container.

The tear-off band 4 has a finger tab 14 to grasp for tearing it off and the webs 3 and 5 are omitted in this region to make the initial movement easy. The webs are otherwise continuous, although instead of such continuous webs one could use individual circumferentially spaced webs.

The inside of the tear-off, band 4 is smooth and cylindrical, with nothing engaging the neck of the container. The lower band 6, however, has a ring of Vee-section vertical ribs or lugs 15 (sixteen of them in the example shown) on its inside face, co-operating with ribs 16 on the neck of the container. These have the effect of preventing rotation of the band 6, and hence of the cap, until the band 4 has been removed. Thus as long as the closure has been placed initially on the container with lug 10 anywhere but in alignment with the gap 12 in the bead 13, the cap cannot thereafter be removed without first removing the tear-off band 4. Theribs 15 on the neck have pointed upper ends to ensure that there are no problems on capping. The circumferential positions of the ribs are chosen so that the closure cannot be put in place in the 'aligned' position, i.e. with the lug 10 aligned with the gap 12.

Removal of the band 4 is immediately apparent as there is a gap between the cap and the lower band 6, which remains in place. This is in contrast to these known arrangements (such as shown in European 0 192 881) in which the tear-off band, after removal, leaves nothing to show there was a tamper-evident device there in the first place.

Yet at the same time the closure according to the invention is easy to apply to the container (the so-called 'capping' step) because unlike the known closures having a band that resists upward movement, there is no circumferential internal bead on either of the bands that needs to be forced over a circumferential bead on the neck of the container. In practice, without going outside the scope of the inventing one could provide a vestigial circumferential bead on the inside of the band or the outside of the neck, or both, but there is no reliance on mutual engagement of such

beads to resist upward movement of the band, and so the capping is is easy to perform, and there is no risk of breaking the bands or webs.

There is the usual arrow or other mark 17 (Fig 8) on the neck of the container to show the position to which the tab 11 must be turned for opening the cap. In an alternative arrangement this mark could be placed so as to be concealed by the band 4 until the band is removed. Although the band 6 is described as captive there is in fact nothing positive holding it onto the neck in the example shown; there could however be a vestigial bead sufficient to prevent it falling off.

Although several ribs 15 and 16 are shown (sixteen on the band 6 and eight on the neck), it would in theory be possible to have only a single rib on either the band or the neck provided there are sufficient on the other to prevent turning to the 'aligned' position. However we prefer the number shown.

Claims

1. A child-resistant and tamper-evident snap-on closure assembly comprising a cap having a top wall (1) and a skirt (2), a co-operating circumferential bead (13) and lug (10) on the inside of the skirt and on the neck of the container making it necessary to turn the cap to a certain angular position in relation to the neck, so as to bring a lug (10) on the skirt (2) or neck into alignment with a gap (12) in the bead on the neck or skirt, the skirt being joined by one or more breakable webs (3) to a circumferentially extending tear-off band (4) which in its turn is joined by one or more breakable webs (5) to a continuous circumferentially extending captive band (6) on the neck of the container, the said captive band (6) having at least one lug (15) co-operating with a lug or lugs (16) on the neck of the container to prevent rotation of the cap to the said certain angular position until the tear-off band has been removed to disconnect the cap from the captive band.

2. A closure as claimed in claim 1, wherein the bead (13) is provided on the neck of the container.

3. A closure as claimed in claim 1 or 2, wherein a single web (3) joins the skirt to the tear-off band, said single web being of continuous form.

4. A closure as claimed in any one of claims 1, 2, or 3, wherein a single web (5) joins the tear-off band to the captive band, said single web being of continuous form.

5. The combination of a closure assembly as claimed in any one of claims 1 to 4, and a co-operating container.

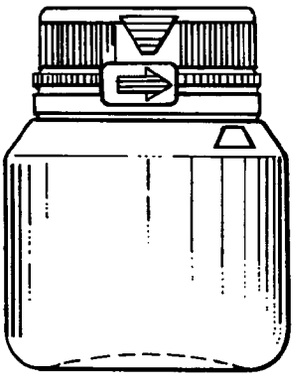

FIG.1.

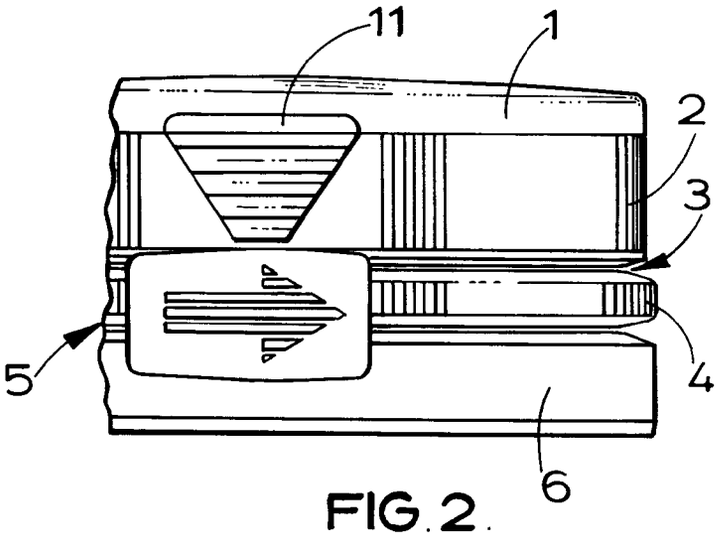

FIG.2.

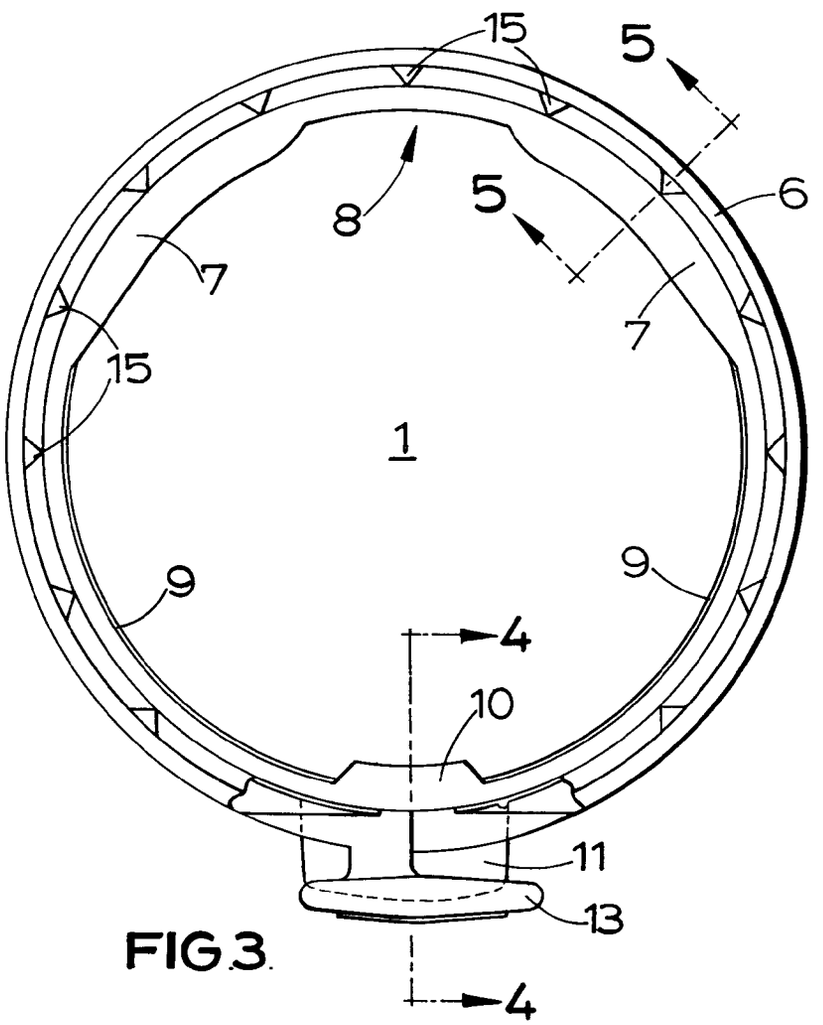

FIG.3.

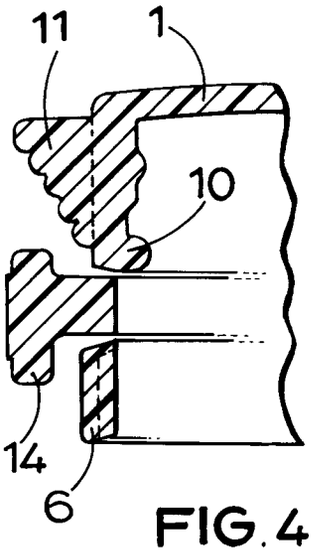

FIG.4.

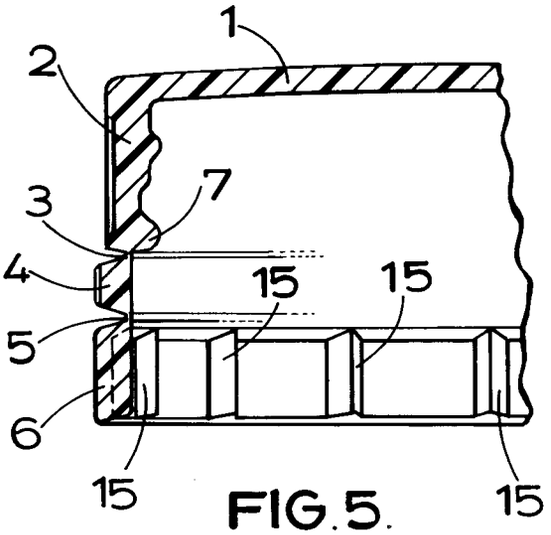

FIG.5.

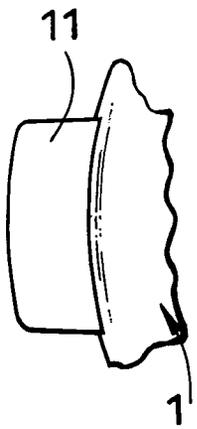

FIG.6.

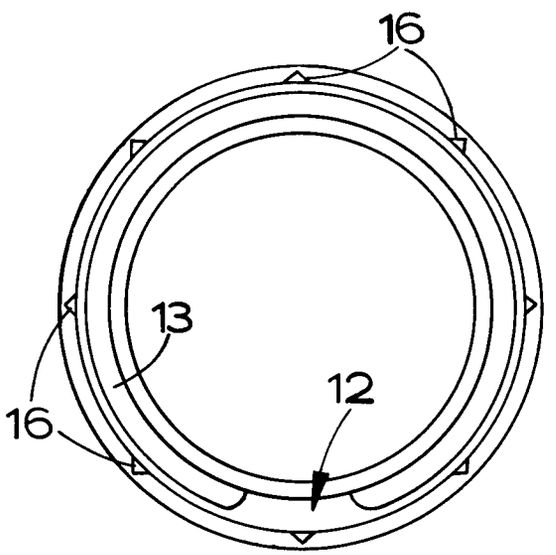

FIG.7.

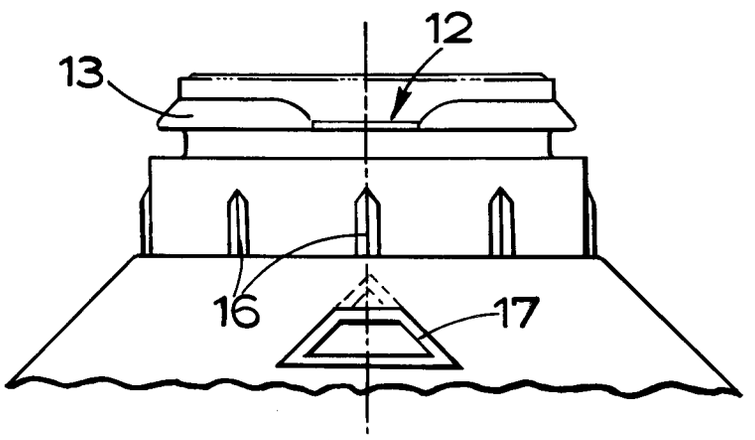

FIG.8.

European Patent Office

EUROPEAN SEARCH REPORT

Application Number

EP 92 30 1197

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int. Cl.5)
E	WO-A-9 204 249 (P.STUBBS) * abstract; figures * ---	1-5	B65D55/02
X	US-A-4 449 638 (E.E.DAVIS) * column 2, line 53 - line 57 * ---	1-5	
A,D	EP-A-0 192 881 (OWENS-ILLINOIS ONC.) * abstract; figures * ---	1	
A	EP-A-0 217 630 (COPE ALLMAN PLASTIC LTD) -----	1	

TECHNICAL FIELDS SEARCHED (Int. Cl.5)

B65D

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
THE HAGUE	12 JUNE 1992	ZANGHI A.

CATEGORY OF CITED DOCUMENTS

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