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(12) # EUROPEAN PATENT APPLICATION

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(54) **Child-resistant tamper-evident closures.**

(57) In a closure assembly of the snap-on kind in which child-resistance is achieved by requiring that the cap be turned to a predetermined orientation (e.g. as indicated by arrows) before it can be pushed off, tamper-evidence is provided by a tear-off strip (8) on the skirt of the cap (1) co-operating with the neck in a way which prevents rotation of the cap to that orientation.Consequently the neck does not need to have a bead under which the tamper-evident strip engages. There may be teeth (9.11) on the inside of the strip and on the outside of the neck.

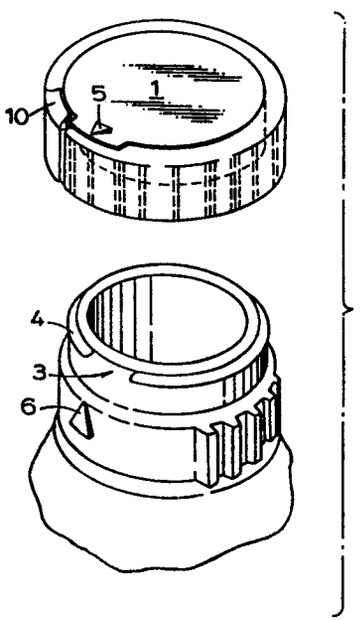

FIG.1.

EP 0 217 630 A2

Description

CHILD-RESISTANT TAMPER-EVIDENT CLOSURES

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 that 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, 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. Another U.S. Patent Specification No 1 342 058 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.

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 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).

There have also been proposals to add tamper-evident tear-off strips to child-resistant closures, for example in U.K. Patent Specification No 1 520 808 and its U.S. equivalent 4 043 475, and more recently in U.S. 4 449 639 and European 0113550. In each of these the strip is of the straightforward tear-off kind. Finally there is a proposal in U.S. Patent Specification No 4 457 437 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 invariably 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.

The aim of the present invention is to provide a neater and simpler way of adding tamper-evidence to a snap-on child-resistant cap of the general kind described above. According to the invention, in a combined child-resistant and tamper-evident closure assembly of the kind comprising a snap-on cap of a circular cross-section which has to be turned to a predetermined orientation in relation to a co-operating neck formation before it can be removed (thereby providing the child resistance) and which furthermore has a tear-off strip which is joined to the remainder of the cap by a line of weakness and interengages with a portion of the neck formation and has to be at least partially removed from the cap before the cap can be removed (thereby providing the tamper indication), there are co-operating tooth or abutment surfaces on the tear-off strip and the neck formation which prevent rotation of the cap to the said predetermined orientation until the strip is detached.

By preventing rotation of the cap, the strip prevents removal of the cap without relying on the strip itself having to engage under any bead, and so the bead on the neck usually associated with the tamper-evident strip can be omitted. This simplifies moulding. However the omission of this bead is not an essential feature of the invention and it could be retained for added security.

Because it does not have to engage under a bead the strip need not extend all the way round the skirt of the cap. Moreover, it is not essential for the strip to prevent rotation altogether, as long as it prevents rotation to that orientation in which the cap can be removed.

Preferably the strip has a continuous ring of internal teeth and there is a continuous ring of teeth around the neck of the container so that when the cap is first applied to the container its orientation does not matter. However it could, if thought to be simpler, be sufficient to have only a single tooth on either the cap or the container and it would still prevent rotation and still allow initial assembly in any orientation. Indeed , in theory a single tooth on one, fitting between a single pair of teeth on the other could be sufficient but then the cap would have to be assembled onto the container in the correct orientation, which could cause problems.

An example of the closure system according to the invention is illustrated in the accompanying drawings, in which:

Figure 1 is an isometric view of the cap and the neck;

Figure 2 shows the neck with the cap in place;

Figure 3 shows the tear-off band partially removed;

Figure 4 shows the neck and cap after the removal of the band;

Figure 5 is a half-plan view of the cap;

Figure 6 is a scrap section through the cap in a plane containing its axis;

Figure 7 is a scrap elevation of part of the neck of the container; and

Figure 8 is a plan view of part of the neck of the container.

The child-resistant arrangements can be substantially the same as those disclosed in British Patent Specification 1 295 207 and marketed under the

trade mark 'Snap-safe'; a cap 1 has an internal bead 2 (Fig. 6) and a lug (not shown) of a circumferential extent allowing it to pass upwards through a gap 3 (Fig. 1) in a bead 4 on the neck of the container provided the cap has first been turned to the correct orientation, as indicated by lining up arrows 5 and 6 (Fig. 1) on the cap and the neck.

Moulded integrally with the cap 1, and joined to it by a thin breakable web 7, is tear-off band 8 of L-shaped cross-section (Fig. 6), of which the inner face has a ring of teeth 9. There is a tab 10 for grasping. The teeth 9 engage a matching ring of teeth 11 moulded on the neck of the container below the bead 4.

It will be appreciated that the cap can be fitted onto the container initially in any orientation. The band 8 must be removed before the cap can be turned to a position in which it can be opened and even after the ring has been discarded the closure retains all the advantages of the existing child-resistant caps.

In Figure 8 the teeth on the neck of the container are shown as being canted over; they could equally well be of symmetrical profile.

An added advantage of the arrangement described over the earlier tamper-evident child-resistant closures is that the neck of the container only has a single annular bead instead of two, and so the moulding of it is easier, and in particular the extraction of the container from the neck mould. This is because, to prevent removal, it is sufficient simply to prevent the child-resistant cap being turned to the release position.

It will be understood that the child-resistant arrangements could be of a different kind, provided they involve orientation; for example there could be an outwardly projecting bead on the neck that has to be aligned with a gap in an internal bead in the skirt of the cap.

Claims

1. A combined child-resistant and tamper-evident closure assembly of the kind comprising a snap-on cap (1) of a circular cross-section which has to be turned to a predetermined orientation in relation to a co-operating neck formation before it can be removed (thereby providing the child resistance) and which furthermore has a tear-off strip (8) which is joined to the remainder of the cap (1) by a line of weakness and interengages with a portion of the neck formation and has to be at least partially removed from the cap before the cap can be removed (thereby providing the tamper indication), distinguished by the feature that there are co-operating tooth or abutment surfaces (9,11) on the tear-off strip (8) and the neck formation which prevent rotation of the cap (1) to the said predetermined orientation until the strip (8) is detached.

2. A closure assembly according to claim 1 in which the tear-off strip (8) extends circumferentially around the lower edge of the skirt of the cap (1).

3. A closure assembly according to claim 2 in which the co-operating surfaces include a continuous ring of teeth (11) around the neck formation, co-operating with at least one tooth or abutment surface (9) on the strip (8).

4. A closure assembly according to any one of claims 1 to 3 in which the neck formation includes a single annular bead (4) which prevents removal of the cap (1) except at the said predetermined orientation but no separate annular bead engaged by the tear-off strip (8).

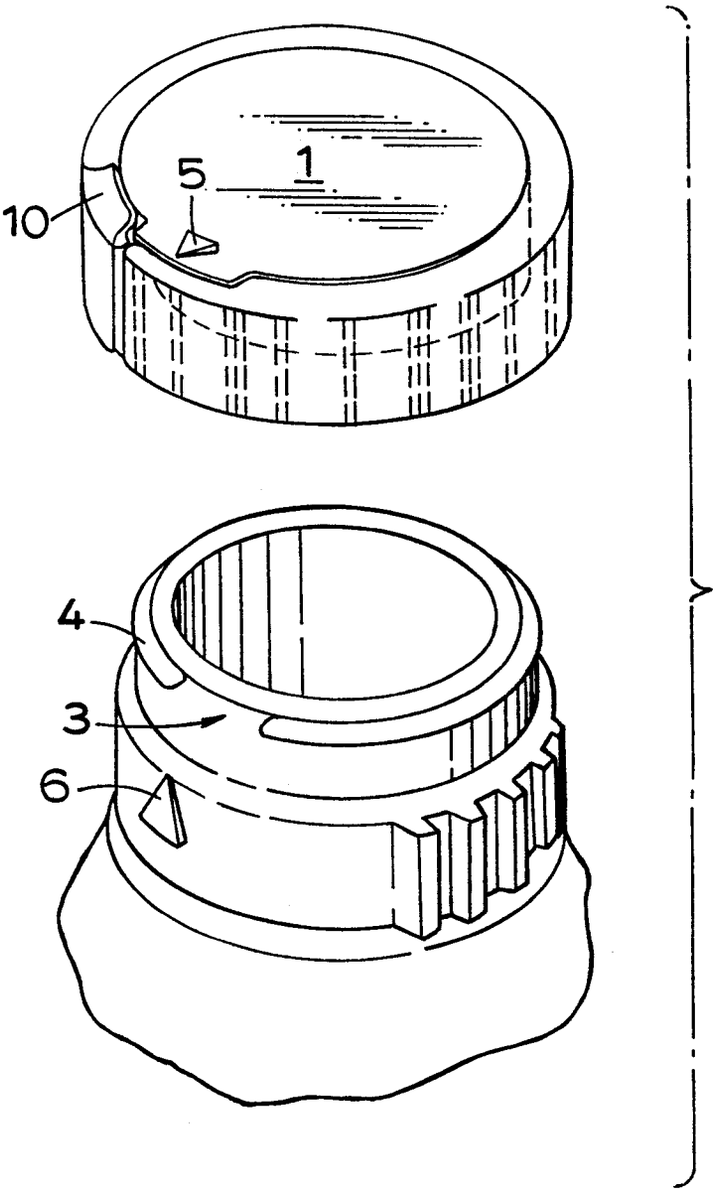

FIG.1.

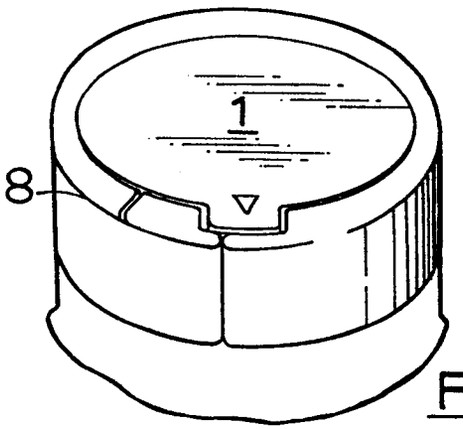

FIG.2.

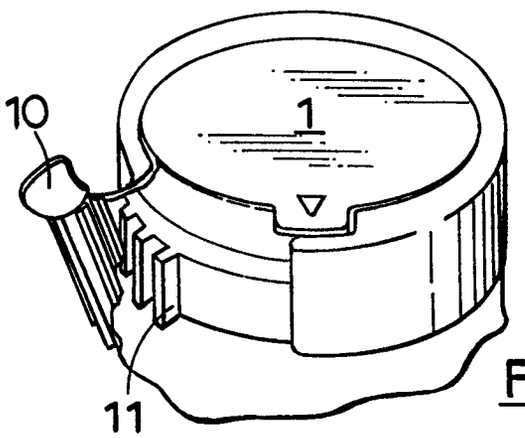

FIG.3.

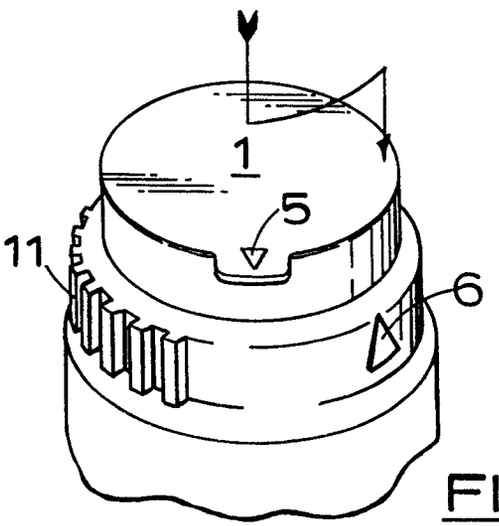

FIG.4.

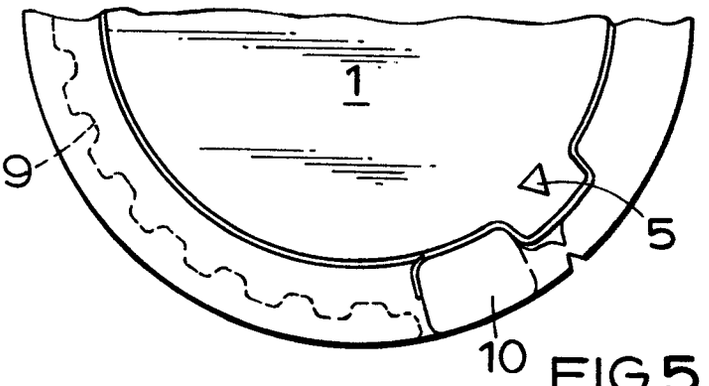

FIG.5.

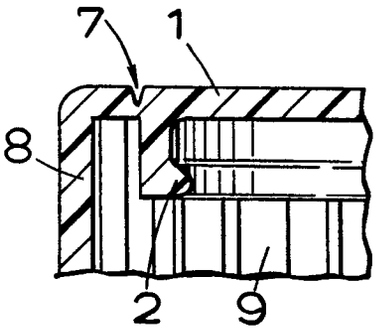

FIG.6.

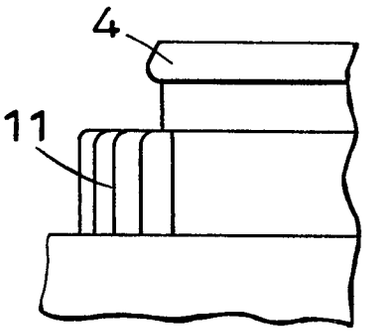

FIG.7.

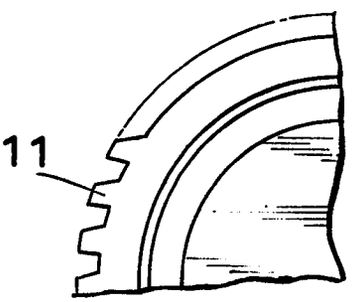

FIG.8.