(57) Abstract: A plastic closing element for beverage containers comprising a body defined by an upper surface (2) and an annular liner (3) made in a single piece to enclose an end portion of the container (4). The annular liner (3) presents, along its inside surface, an undercut (7) that stably engages a corresponding annular bead (8) on the container neck (6). The undercut extends circumferentially through a defined angle (α) and is interrupted in the part of the annular liner (3) where there are means (9) for detaching the closing element (1) from the container (4). The detachment means comprise: a first weakened line (10) extending from the free edge (7a) of the annular liner (3) for a certain length (C) in the direction of the upper surface (2); a second weakened line (11) extending from the end of the first weakened line (10) and continuing in a direction parallel to the undercut (7) for a defined length (M); and a hand gripping means (12) acting on the two weakened lines (10, 11) and designed to permit opening of the container by moving a part of the undercut (7) away from the annular bead (8) to separate the closing element (1) from the container neck (6) by tearing it along the weakened lines (10, 11).
Description

CLOSING ELEMENT FOR CONTAINERS FOR LIQUIDS

Technical Field
The present invention relates to a closing element for containers for liquids, in particular a closing element made of plastic.

Background Art
In the field of container closures, that is, caps for plastic or glass bottles, there is an increasing demand for alternative solutions capable of effectively substituting metal crown caps and plastic screw-on caps.

The need for effective alternatives to traditional caps is felt particularly strongly in the field of containers for beverages such as beers and soft drinks of the latest generation which are normally required to have certain basic features, such as:

- the possibility of relieving the containers of excess gas pressure caused by handling (an operation known as "venting" to experts in the trade);
- having parts of the closure which, if breached or missing, provide evidence to consumers that tampering has occurred (a feature known as "tamper evidence" or "tamper proofing");
- not damaging the neck of the container so that, where necessary, the container can be re-used.

The closures currently used on containers/bottles, especially those made of plastic, do not fully meet these requirements.

Prior art container closures include the following:
- traditional screw-on caps (either of metal, usually aluminium, or of plastic, usually polyolefin based such as, for example, polyethylene or polypropylene);
- metal caps (usually aluminium) associated with an opening grip ring wrapped around or set alongside the container neck;
- traditional crown caps, constituting the most widespread type of cap on the market.

In the first of the cap types listed above, the disadvantages are the high production cost, in some solutions, and, in all events, the fact that the container neck must necessarily be threaded.

The disadvantages of the second type of cap listed above are its high production cost, the impossibility of re-closing the container after opening for the first time and its low safety level since the consumer can, if he or she does not exercise due care in opening, be injured by the resulting sharp edges.

In the case of crown caps, the disadvantages are due to: the high axial loads required to apply the cap to the container, making it difficult (or impossible) to apply it to plastic containers owing to the risk of destroying the container itself during the capping process; the impossibility, or difficulty, of opening the container manually; the impossibility of properly re-closing the container because the cap is irreversibly deformed on opening; and, lastly, the impossibility of re-using the container - if it is made of plastic - since the corrugations and the tightening force applied during capping irretrievably scratch the mouth of the container.

To overcome these drawbacks, the Applicant designed and constructed a closing element (see Italian patent applications IT B02000A000139 and IT B02001A000459) having a lateral portion with a pair of weakened and/or tear lines extending from the free edge of the annular liner for a length equal to a first dimension R. The two lines are separated, at their end sections away from the free edge, by a second dimension A and, at the free edge, by a third dimension B (see Figure 1, which illustrates prior art).

These three dimensions A, B and R are calculated as a function of the inside and outside diameters of the container neck and of the pressure, actual or potential, inside the container, so as to separate the closure from the main body of the container neck at first-time opening by pulling a tab in such a way as to partly or totally break the weakened and/or tear lines.
More specifically, the first dimension of the two weakened lines is substantially equal to the second dimension calculated at the free edge from which the tab, forming an extension of the lateral portion, extends.

This solution has formed the subject matter of numerous tests which have shown it to be functional in its basic constructional aspects and container sealing properties. However, separating the cap from the neck of the container still presents a few problems, which leaves room for improvement to make opening the container quicker and easier.

The aim of the present invention is therefore to provide a closing element that combines the excellent technical and sealing properties of the prior art described above with a novel system that makes opening the container quick, easy and practical.

Disclosure of the invention

This aim is accomplished through a plastic closing element for beverage containers comprising a body defined by an upper surface and an annular liner made in a single piece to enclose an end portion of the container; the annular liner presenting, along its inside surface, an undercut that stably engages a corresponding annular bead on the container neck; the undercut extending circumferentially and being interrupted in the part of the annular liner where there are means for detaching the closing element from the container; the detaching means comprising: a first weakened line extending from the free edge of the annular liner for a certain length in the direction of the upper surface; a second weakened line extending from the end of the first weakened line and continuing in a direction parallel to the undercut for a defined length; and hand gripping means acting on the two weakened lines and designed to permit opening of the container by moving a part of the undercut away from the annular bead in such a way as to separate the closing element from the container neck.
Description of the drawings

The technical characteristics of the invention, with reference to the above aims, are clearly described in the claims below and its advantages are apparent from the detailed description which follows, with reference to the accompanying drawings which illustrate a preferred embodiment of the invention provided merely by way of example without restricting the scope of the inventive concept, and in which:

Figure 1 is front view, with some parts cut away in order to better illustrate others, of a closing element according to prior art;

Figure 2 is a perspective view of a closing element for containers for liquids according to the present invention;

Figure 3 is a side view, with some parts cut away and others in cross section, of the closing element of Figure 2 applied to a container;

Figure 4 is a front view of the closing element according to the invention;

Figure 5 is a rear face view, with some parts in cross section and others cut away of another embodiment of the closing element according to the invention;

Figure 6 is a plan view from below of the closing element according to the invention;

Figure 7 is a side detail view, with some parts in cross section, showing a part of yet another embodiment of the closing element according to the invention;

Figure 8 schematically illustrates a part of the closing element according to the invention, with some parts cut away to highlight the parts that make up the means for opening the container.

Detailed description of the preferred embodiments of the invention

With reference to the accompanying drawings, and in particular, Figures 2 and 3, the closing element according to the invention is used to close containers of the latest generation for beverages such as beer or soft drinks.
The closing element, labelled 1, is made of plastic and comprises a main body with a circular-cylindrical shape, or rather, a circular-truncated cone shape. This body is defined by an upper surface 2 and a lower annular liner 3 made in a single piece to enclose an end portion of the container 4.

The container 4 (see Figure 3) comprises a mouth 5 for dispensing the beverage and defined by the neck 6 of the container 4.

Looking in more detail at the closing element 1, the annular liner 3, comprises, along its inside surface, at least one tooth 7, forming an undercut that stably engages a corresponding annular bead 8 on the neck 6 of the container 4.

The tooth 7 extends circumferentially (see Figure 6) through a defined angle α broken at a zone of the aforementioned annular liner 3 where there are means 9 for detaching the closing element 1 from the container 4.

In particular, the detaching means 9 comprise:
- a first weakened and/or tear line 10 extending from the free edge 3a of the annular liner 3 for a certain length C in the direction of the upper surface 2;
- a second weakened and/or tear line 11 extending from the end of the first line 10 close to the upper surface 2 and continuing in a direction parallel to the undercut 7 for a defined length M; and
- hand gripping means 12 acting on the first and second lines 10 and 11 in such manner as to permit opening of the container by moving a part of the undercut 7 away from the annular bead 8 so as to separate the closing element 1 from the container neck 6 by tearing it along the first and second weakened tear lines 10 and 11.

To allow the undercut 7 to be moved away cleanly from the annular bead 8, the second weakened and/or tear line 11 extends along the aforementioned direction for a defined length M so that at least one portion of it runs above the undercut 7 (see Figure 8).
As shown by the broken line in Figure 4, the first weakened and/or tear line 10 may extend perpendicularly to the free edge 3a of the annular liner 3.

Alternatively, the first weakened and/or tear line 10 may extend at an angle β to the free edge 3a of the annular liner 3.

As mentioned above, the second weakened line 11 extends for a defined length M such that it runs above the undercut 7 for a length T (see Figure 8) calculated as a function of the diameters D and D1 and height H of the portion of container 4 neck 6 forming the annular bead 8 (see Figure 3) and, preferably, also as a function of the pressure, actual or potential, inside the container 4.

The length M of the second line 11 must be calculated in such a way that, after first-time opening, the container 4 can be re-closed, relieving excess pressure, whether actual or potential, inside the container 4.

At a structural level, the second line 11 follows an arc-shaped path, parallel to the undercut 7, that subtends an angle δ, measured at the centre of the upper surface 2, ranging at least from 20° to 60°, the angle δ being preferably 35°.

Besides the dimensions mentioned up to now, the width L of the first weakened line 10 and the width N of the second weakened line 11 can be taken into account to facilitate opening by removing the closing element, to relieve excess gas pressure to enable the container 4 to be properly re-closed.

As shown in Figure 6, the annular liner 3 features a second tooth 13 that is separate from the first tooth 7 and that makes a second undercut in the part of the annular liner 3 delimited by the first line 10.

Figures 2, 4 and 5 clearly illustrate the hand gripping means 12, which comprise a tab 14 formed by the annular liner 3 and delimited at the top by the first and second weakened lines 10 and 11.

The tab 14 extends in the same plane as the annular liner 3, protrudes downwardly from the annular liner 3 and has an end portion 14a that faces a section of the annular liner 3 to form a handgrip.
Between the end portion 14a of the tab 14 and the annular liner 3 there is at least one tamper-evident bridge 15 joining the end portion 14a to the edge 3a of the annular liner 3: thus, when the bridge 15 is broken, it is evident that the container 4 has been opened.

As shown in Figures 5 and 7, the closing element 1, consisting at least of the annular liner 3, the upper surface 2, the hand gripping means 12 and sealing means 16, is made in a single piece.

Figure 7, illustrates an embodiment where the upper surface 2 has, on the inside face of it, a plurality of annular lamellar elements 17 forming the sealing means 16, uniformly distributed on the upper surface 2 itself and designed to allow excess gas to escape gradually from the container 4 and to lower the pressure inside the container 4, in particular when the container 4 is being opened.

Close to the innermost annular lamellar element 17 there is a single sealing ring 18 whose depth P is greater than the depth of the remaining annular lamellar elements 17 and which creates a seal that couples with the inside of the container 4 neck 6.

The annular lamellar elements 17 extend on the inside face of the upper surface 2 either in circular fashion or, alternatively, in spiral fashion.

Figure 5 illustrates another embodiment of the closing element 1 according to the invention, where the sealing means 16 comprise a single sealing ring 18 made in a single piece on the inside face of the upper surface 2.

The sealing ring 18 has a series of notches 19 designed to allow excess gas to escape gradually from the container 4 and to lower the pressure inside the container 4 when the container 4 is being opened.

The closing element 1 is made in a single piece and preferably of polyethylene.

Alternatively, see Figure 6, the upper surface 2 may have, on its inside face, yet another independent element 20 forming a sealing ring that acts on the container 4.
Even the sealing ring 20 may have a series of notches 21 (indicated by the broken line) designed to allow excess gas to escape gradually from the container 4 and to lower the pressure inside the container 4 when the container 4 is being opened.

The closing element 1 with independent element 20 may be made using any of several manufacturing processes: in a first solution, the two elements may be made by a bi-injection process; in a second solution, the seal 20 may be press fitted onto the inside face of the upper surface 2 of the closing element 1; in a third solution, the seal 20 may be glued to the inside face of the upper surface 2 of the closing element 1. In the latter case, the closing element 1 is preferably made of polypropylene.

The closing element made according to the invention as described above facilitates opening of the container thanks to the structure of the two weakened lines, which, during the twisting motion imparted to it by the user on the portion of tab and annular liner, enables the undercut to be moved away from the annular bead, thus separating the closing element from the bottle neck.

Thanks to this structure, the closing element according to the invention meets a wide range of technical specifications, namely: easy opening with only one hand, requiring just a minimum effort to twist the tab to open the container; tamper evidence thanks to the fact that it is easy to see when the weakened and/or tear lines and the bridge have been broken, clearly indicating that the container has been opened; possibility of re-closing the container, once opened, thanks to the dimensions C, L, β, M, N and to the presence of the internal seal, which permit compensation of excess pressure inside the container, not only for artificially carbonated beverages but also for naturally fermented drinks; possibility of re-using the container thanks to the special structure of the opening means which do not scratch or otherwise damage the part of the container neck covered by the closing element.

It will be understood that the invention can be modified and adapted in several ways without thereby departing from the scope.
of the inventive concept. Moreover, all the details of the invention may be substituted by technically equivalent elements.
Claims

1. A closing element for beverage containers, the closing element (1) comprising a main body, with a circular-cylindrical shape, or rather, a circular-truncated cone shape, defined by an upper surface (2) and an annular liner (3) made in a single piece to enclose an end portion of the container (4); the latter comprising a mouth (5) for dispensing the beverage and defined by the neck (6) of the container (4); the annular liner (3) presenting, along its inside surface, at least one tooth (7) forming an undercut that stably engages a corresponding annular bead (8) on the container (4) neck (6); the tooth (7) extending circumferentially through a defined angle (α) and is interrupted in the part of the annular liner (3) where there are means (9) for detaching the closing element (1) from the container (4); the closing element being characterised in that the detaching means (9) comprise:
   - a first weakened and/or tear line (10) extending from the free edge (3a) of the annular liner (3) for a certain length (C) in the direction of the upper surface (2);
   - a second weakened and/or tear line (11) extending from the end of the first line (10) close to the upper surface (2) and continuing in a direction parallel to the undercut (7) for a defined length (M);
   - hand gripping means (12) acting on the first line (10) and on the second line (11) in such manner as to permit opening of the container by moving a part of the undercut (7) away from the annular bead (8) so as to separate the closing element (1) from the container neck (6) by tearing it along the first and second weakened lines (10, 11).

2. The closing element according to claim 1, characterised in that the second weakened and/or tear line (11) extends along the aforementioned direction for a defined length (M) so that at least one portion of it runs above the undercut (7).

3. The closing element according to claim 1, characterised in that the first weakened and/or tear line (10) extends perpendicularly to the free edge (3a) of the annular liner (3).
4. The closing element according to claim 1, characterised in that the first weakened and/or tear line (10) extends at an angle (β) to the free edge (3a) of the annular liner (3).

5. The closing element according to claim 1, characterised in that the second weakened and/or tear line (11) extends for a defined length (M) such that it runs above the undercut (7) for a length (T) calculated as a function of the diameters (D, D1) and height (H) of the portion of the container (4) neck (6) forming the annular bead (8) and as a function of the pressure, actual or potential, inside the container (4).

6. The closing element according to claim 1, characterised in that the second line (11) extends for a defined length (M) such that it runs above the undercut (7) for a length (T) calculated at least as a function of the diameters (D, D1) and height (H) of the portion of the container (4) neck (6) forming the annular bead (8) and as a function of the pressure, actual or potential, inside the container (4), in such a way that, after first-time opening, the container (4) can be re-closed, relieving excess pressure, whether actual or potential, inside the container (4).

7. The closing element according to claim 1, characterised in that the second line (11) extends in a direction parallel to the undercut (7) through an angle (δ), measured at the centre of the upper surface (2), ranging at least from 20° to 60°.

8. The closing element according to claim 7, characterised in that the second line (11) extends through an angle (δ) of 35°.

9. The closing element according to claim 1, characterised in that the annular liner (3) features a second tooth (13) that is separate from the first tooth (7) and that makes a second undercut in the part of the annular liner (3) delimited by the first line (10).

10. The closing element according to claim 1, characterised in that the hand gripping means (12) comprise a tab (14) formed by the annular liner (3) and delimited at the top by the first weakened line (10) and second weakened line (11); the tab (14) extending in the same plane as the annular liner (3), protruding downwardly from the annular liner (3) and having an end portion
(14a) that faces a section of the annular liner (3) to form a handgrip.

11. The closing element according to claim 10, characterised in that between the end portion (14a) of the tab (14) and the annular liner (3) there is at least one tamper-evident bridge (15) joining the end portion (14a) to the edge (3a) of the annular liner (3) and clearly indicating, when broken, that the container (4) has been opened.

12. The closing element according to claim 1, characterised in that the closing element (1) of the container (4), consisting at least of the annular liner (3), the upper surface (2), the hand gripping means (12) and sealing means (16) is made in a single piece.

13. The closing element according to claim 12, characterised in that the upper surface (2) has, on the inside face of it, a plurality of annular lamellar elements (17) forming the sealing means (16), uniformly distributed on the upper surface (2) itself and designed to allow excess gas to escape gradually from the container (4) and to lower the pressure inside the container (4).

14. The closing element according to claim 13, characterised in that close to the innermost annular lamellar element (17) there is a single sealing ring (18) whose depth (P) is greater than the depth of the remaining annular lamellar elements (17) and which creates a seal that couples with the inside of the container (4) neck (6).

15. The closing element according to claim 13, characterised in that the annular lamellar elements (17) extend on the upper surface (2) in circular fashion.

16. The closing element according to claim 13, characterised in that the annular lamellar elements (17) extend on the upper surface (2) in spiral fashion.

17. The closing element according to claim 12, characterised in that the sealing means (16) comprise a single sealing ring (18) made in a single piece on the inside face of the upper surface (2); the sealing ring (18) having a series of notches (19) designed to allow excess gas to escape gradually from the container (4) and to lower the pressure inside the container (4).
when the closing element (1) is separated from the neck (6) of the container (4).

18. The closing element according to claim 1, characterised in that the upper surface (2) has, on its inside face, another independent element (20) forming a sealing ring that acts on the container (4).

19. The closing element according to claim 18, characterised in that the sealing ring (20) has a series of notches (21) designed to allow excess gas to escape gradually from the container (4) and to lower the pressure inside the container (4) when the closing element (1) is separated from the neck (6) of the container (4).

20. The closing element according to claim 18, characterised in that the sealing ring (20) and the closing element (1) are made by a bi-injection process.

21. The closing element according to claim 18, characterised in that the sealing ring (20) is press fitted onto the inside face of the upper surface (2) of the closing element (1).

22. The closing element according to claim 18, characterised in that the sealing ring (20) is glued to the inside face of the upper surface (2) of the closing element (1).

23. The closing element according to claim 1, characterised in that the first weakened line (10) extends from the free edge (3a) of the annular liner (3) towards the upper surface (2) for a first stretch of length (C) and width (L) and extending at an angle (β) to the free edge (3a) of the annular liner (3); the second weakened line (11) extending from the end of the first weakened line (10) for a stretch of length (M) and width (N); the dimensions (C, L, β, M, N) of the first weakened line (10) and of the second weakened line (11) being calculated at least as a function of the inside and outside diameters (D, D1) and of the height (H) of the container (4) neck (6) and as a function of the pressure, whether actual or potential, inside the container (4).

24. The closing element according to claim 1, characterised in that the closing element (1) is made of plastic.

25. The closing element according to claim 1 or 24, characterised in that the closing element (1) is made of polypropylene.
26. The closing element according to claim 1 or 24, characterised in that the closing element (1) is made of polyethylene.
INTERNATIONAL SEARCH REPORT

A. CLASSIFICATION OF SUBJECT MATTER

IPC 7    B65D41/48

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 7    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

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Patent family members are listed in annex.

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Date of the actual completion of the international search

16 September 2003

Date of mailing of the international search report

23/09/2003

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