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(54) **Flexible shell**

(57) A one-piece closure (10,110) comprising a top plate (20,120) and a skirt (30,130) for sealing a container, wherein a stepped portion (70,170) is provided at the

junction of the top plate (20,120) and the skirt (30,130), and the radial wall thickness at this point is reduced, for increasing the flexibility of the skirt of the closure for an improved sealing effect.

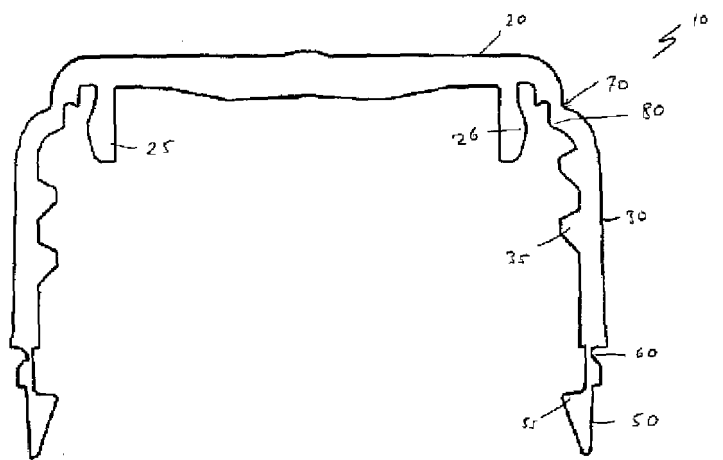


FIGURE 2

Fig. 2

Description

[0001] The present invention relates to a closure for a container of carbonated soft drinks or other such products, which are packaged under pressure or produce overpressure after packaging.

[0002] Closures for use with containers of carbonated soft drinks (CSD) have to be designed in a particular way to address the peculiarities of such contents. For example, the closure must maintain the pressure within the container so that the drink does not go flat. Further, the closure must not missile during the rapid release of pressure that occurs on opening. Further still, the closure must be easy to open and preferably be of lightweight construction.

[0003] One known way of maintaining pressure inside a container is by use of a so-called "pressure block" within the closure. This pressure block is an approximately rectangular shaped annulus lying around the circumference of the closure at the junction between the skirt and the top plate thereof. The pressure block presses against the rim of an associated container when the closure is screwed onto, or otherwise affixed, to the container.

[0004] One problem with this type of system is that it is relatively difficult to unscrew the closure from the container due to friction between the block and the container rim. To overcome this problem liners are often used. These lie between the pressure block in the closure shell and the rim of the container. The liner helps reduce the friction between the closure and the container and thus increases the ease with which the closure may be unscrewed from the container. Such liners often incorporate slip-additives such as erucimides, which can detrimentally affect the taste of the contents of the container.

[0005] Other problems incurred by the use of pressure blocks is that they are relatively inflexible and they increase the overall weight of the closure and accordingly the amount of material used to form such closures. Furthermore, two separate pieces are needed, the closure shell and the liner. This obviously increases cost and time required to produce the closure by introducing extra steps into the manufacturing process.

[0006] To address the problems outlined above, an alternative closure has been proposed, as shown in WO 2005039996. This closure has a projection on the inner radial surface of the skirt and a sealing strip depending from the top plate. When the closure is applied to the neck of a container, the sealing strip slides around the external radius on the container rim and thereafter is pinched between the projection and the container neck to form a gas tight seal and to decrease friction therebetween.

[0007] However, such closures also have associated problems. For instance, the sealing strip is typically very thin in cross-section (of the order of less than 0.5mm). Thus, the mould used to produce the projection and the sealing strip has to be quite intricate. Accordingly, the moulds are both difficult to produce and costly. Further-

more, such moulds are difficult to keep clean and because of the intricate nature of the moulding, there are many flaws in the finished closure, leading to rejects during the production process.

[0008] Accordingly it would be desirable to have a closure which effectively seals a container containing a CSD but which requires relatively less material, needs only one part (i.e. with no liner) and is simple to mould thus ensuring considerably fewer rejects than may occur with more intricate mouldings.

[0009] According to one embodiment, the present invention provides a closure for sealing a container, the closure comprising a top plate and a skirt, characterised in that a stepped portion is provided at the junction of the top plate and the skirt, and the radial wall thickness within the stepped portion is reduced, thereby increasing the flexibility of the skirt to provide improved sealing.

[0010] An advantage of this closure is that it requires no liner to reduce friction. The stepped portion of the closure shell may act as a hinge. The hinge isolates the skirt from movement of the top plate, such as may be caused by doming of the top plate on overpressure in the container. Thus, the skirt continues to maintain sealing contact with the neck of the container, even when the top plate domes.

[0011] Furthermore, the closure requires no intricately moulded parts within its shell, which reduces the cost of the moulds and also reduces the amount of wastage due to faulty mouldings. Further still, the closure uses less material due to the thinned stepped portion and lack of a conventional pressure block.

[0012] The present invention will now be described, by way of example only, by reference to the accompanying drawings, in which:

[0013] Figure 1 shows an external side view of a package comprising a container neck and a closure according to a first embodiment of the invention.

[0014] Figure 2 shows a cross section through an embodiment of a closure according to the invention;

[0015] Figure 3 shows a cross section through the package shown in Figure 1;

[0016] Figure 4 shows a cross section through a package comprising a second embodiment of the closure attached to a jar-like container, and

[0017] Figure 5 shows an enlarged view of a portion of Figure 4.

[0018] In Figure 1, a closure 10 comprises a top plate 20 and a skirt 30. The skirt is shown with ribbing 40 to provide improved grip. At the underside of the closure a tamper evident band 50 is shown. This is connected to the lower edge of the skirt 30 by frangible bridges 60. The neck of the container is indicated by reference numeral 15.

[0019] In Figure 2, the closure 10 is shown in cross section. The top plate 20, skirt 30, tamper evident band 50 and frangible bridges 60 may be seen. Further, internal threads 35 and an olive seal 25 are shown. The olive seal 25 depends from the underside of the top plate 20.

The olive seal has a bulge 26 on its outer radial surface.

[0020] With reference to the tamper evident band 50, it may be seen that on the inner radial surface of this tamper evident band a projection 55 is formed. Further detailed explanation of this projection will be given below.

[0021] The outer shell of the closure 10 has a step 70 at the shoulder portion (i.e. at the junction between the skirt 30 and the top plate 20). By the presence of this step in the shell, it is immediately obvious that less material has been used than in the previously described pressure block type closures. The wall thickness of conventional closures of this type lies in the range 1 to 1.2 mm. However, the present closure has a wall thickness of only about 0.6 mm.

[0022] Furthermore, the wall thickness is reduced at the step (70). Typically, the wall thicknesses of the step (70) is 30% - 70% that of the remainder of the closure shell and preferably, the wall thickness of the step (70) is about 50% that of the remainder of the closure shell. This reduced wall thickness ensures that the step (70) is flexible relative to the remainder of the closure shell. The significance of the step 70 is not only related to the reduction in weight (approximately 10% of the weight of the total closure) but also an improvement in performance as will be discussed with reference to Figure 3.

[0023] Figure 3 is similar to Figure 2 but in addition to the cross-section of the closure also show a cross section of a container neck 15. This combination demonstrates how the closure 10 and container neck 15 interact. The container neck 15 has a thread 17, which permits the closure 10 to be screwed on by means of corresponding thread 35. Although threads are shown, other means of attaching the closure to the container neck are also possible such as snap beads.

[0024] The container neck 15 also includes a projection 18. The projection 55 of the tamper evident band 50 of the closure 10 fits underneath the projection 18 in a well understood manner so that when the closure is removed for the first time the frangible bridges 60 will break leaving behind the tamper evident band 50.

[0025] It can be seen that the olive seal 25 and the bulge 26 are forced slightly inward by the container neck 15 to ensure a good seal between the rim 16 of the container neck 15 and the olive seal 25. A further sealing effect is produced by the sealing portion 80, which lies on the inner radial surface of the closure 10, pressing against the outer radial surface of the container rim 16.

[0026] In use it is typical for the top plate of closures to "dome" due to the pressure of the carbonated soft drinks within the container. This doming is characterised by the central portion of the top plate 20 rising away from the container (upwardly in the figures). By this doming action the skirt 30 is pulled inward towards the container neck 15. This is because the reduced thickness/step portion 70 acts as a hinge.

[0027] Moreover, the seal portion 80 of the skirt 30 is pulled radially inward towards the rim 16 of the container neck 15. Accordingly, the rim 16 of the container neck

15 is squeezed between the bulge 26 of the olive seal 25 and the sealing portion 80 of the closure 10. Consequently, the container is more effectively sealed by the closure 10. Further, the closure is thus more firmly affixed to the container neck, which helps to prevent missiling of the closure 10.

[0028] Figure 4 shows an alternative embodiment wherein instead of a closure for a bottle, a closure 110 for a container such as a jar is shown. The closure 110 may be seen to be formed from a ring 120 and a skirt 130. The top plate of the closure 124 is in fact formed of a metal disk 122. Such closures are well known in the art. The metal top plate 122 has a so-called and well known "safety button" 124 in the central portion. This button is a form of tamper evidence in that it is only released when the closure has been opened initially and cannot easily be reset.

[0029] The closure 110 has a threaded fitting 135 and may include a further tamper evident band 156. This closure 110 also has a stepped and portion of reduced wall thickness 170 at the junction between the ring 120 and the skirt 130. This stepped portion/reduction in thickness 170 acts in the same way as described above with regard to Figures 1 to 3.

[0030] Figure 5 shows an enlarged view of one part of the closure of Figure 4. This drawing clearly shows the stepped portion 170 and the metal top plate 122. It may also be seen that the ring portion 120 has a nose portion 121. This nose portion 121 extends around the entire circumference of the ringed portion 120. The nose portion 121 seals against the upper part of the metal top plate 122, thus preventing water ingress into space 190 between the metal top plate 122 and the underside of the plastic ring 120. This prevents rusting of the metal plate 122 and also helps to prevent other undesired effects of water entering this space 190.

[0031] It may be seen that the closure 110 has similar features to the closure 10 described above with reference to Figures 1 to 3. For instance, closure 110 also has a sealing portion 180 and a stepped portion 170 which may act as a hinge. Again, if the closure domes due to overpressure in the container, the stepped portion which acts as a hinge will transfer the upward doming effect of the metal top plate 122 such that the skirt 130 is pulled more tightly in towards the neck 115 of the associated container. Accordingly, the sealing portion 180 is pressed more firmly against the rim 116 of the container neck 115 to ensure a greater seal.

[0032] The doming described above with regard to both embodiments may of course occur for other reasons such as fermentation of the product in the container or reduction of pressure in the surrounding environment. It is seen how both closures 10, 110 reduce the effect of missiling due to overpressure. Further, both closures may be seen to have less material than in similar types of closures, which have a so-called "pressure block". Further still, no liner is required in either closure to reduce the coefficient of friction between the closure and the

neck so as to reduce the torque required to open the closure. In other words, less torque is required to remove the present closures from the container neck without the need for a liner. Finally, the mould shape is less intricate than other linerless types of closures.

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Claims

1. A closure (10,110) for sealing a container (15), the closure comprising a top plate (20,120) and a skirt (30,130),
characterised in that
a stepped portion (70,170) is provided at the junction of the top plate (20,120) and the skirt (30,130), and the radial wall thickness within the stepped portion (70,170) is reduced, thereby increasing the flexibility of the skirt (30,130) to provide improved sealing.
2. A closure (10,110) according to claim 1, wherein the stepped portion (70, 170) has a flexible sealing portion (80, 180), which is adapted to press against the outer radial surface of a container neck (16).
3. A closure (10,110) according to any of the preceding claims, wherein the stepped portion (80,180) is adapted to act as a hinge, isolating the skirt (30,130) from movement of the top plate (20,120).
4. A closure (10,110) according to any of the preceding claims, wherein the thickness of the stepped portion (70, 170) is reduced by 30% - 70%.
5. A closure (10,110) according to claim 4, wherein the thickness of the stepped portion (70, 170) is reduced by 50%.
6. A closure (110) according to any of the preceding claims, wherein the top plate (120) is provided by a disk and the skirt (130) is provided by a separate ring adapted to secure the top plate (130) in the closure (110).
7. A closure (110) according to claim 6, wherein the top plate (120) is made of metal.
8. A package comprising a closure according to any of the preceding claims and a container containing a carbonated soft drink.

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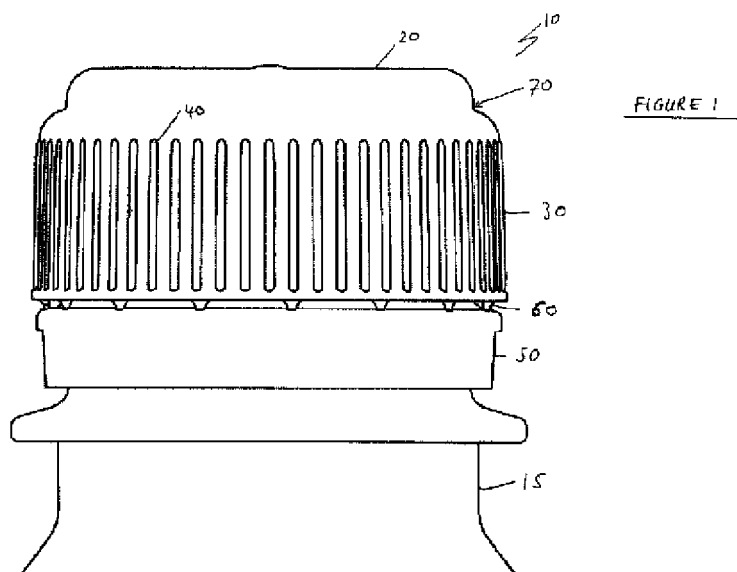


Fig. 1

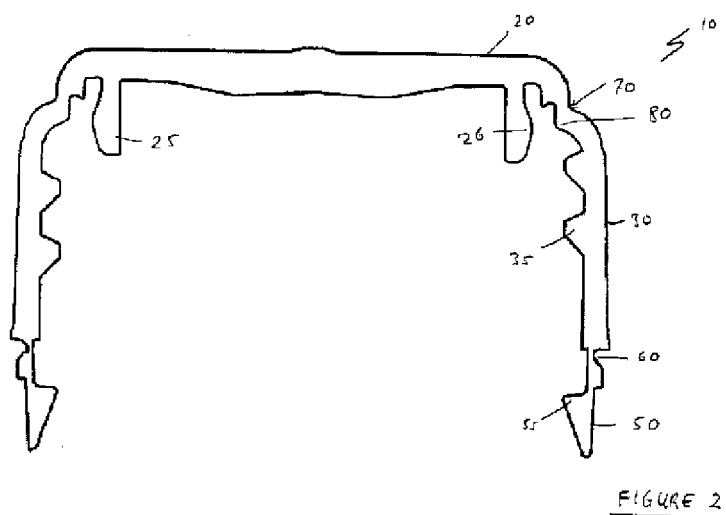


Fig. 2

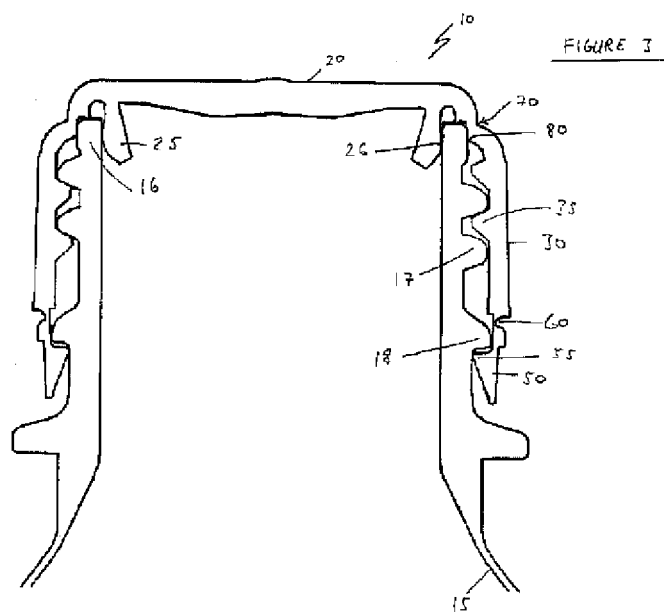


Fig. 3

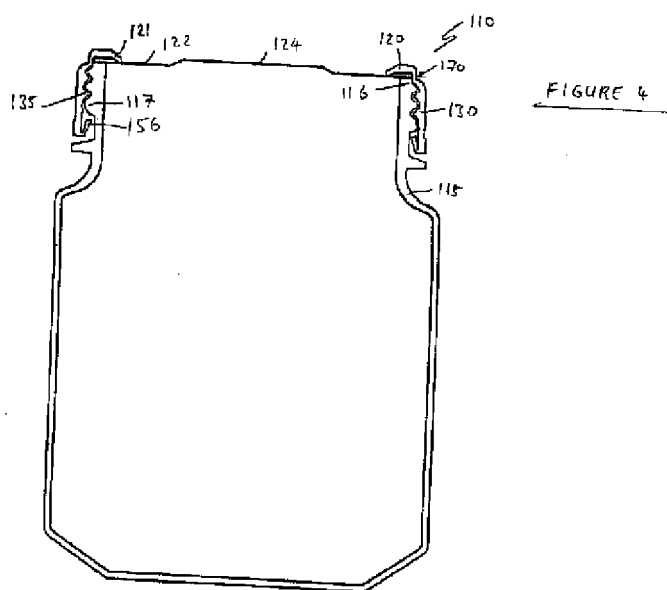


Fig. 4

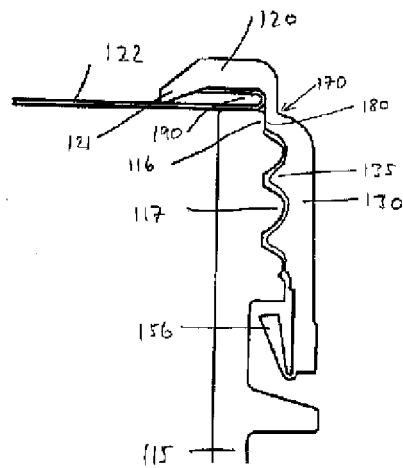


FIGURE 5

Fig. 5



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EUROPEAN SEARCH REPORT

Application Number
EP 05 10 6715

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Place of search Munich		Date of completion of the search 27 September 2005	Examiner Cazacu, C
CATEGORY OF CITED DOCUMENTS X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons & : member of the same patent family, corresponding document			

EPO FORM 1503 03.82 (P04C01)

**CLAIMS INCURRING FEES**

The present European patent application comprised at the time of filing more than ten claims.

- ☐ Only part of the claims have been paid within the prescribed time limit. The present European search report has been drawn up for the first ten claims and for those claims for which claims fees have been paid, namely claim(s):
- ☐ No claims fees have been paid within the prescribed time limit. The present European search report has been drawn up for the first ten claims.

LACK OF UNITY OF INVENTION

The Search Division considers that the present European patent application does not comply with the requirements of unity of invention and relates to several inventions or groups of inventions, namely:

see sheet B

- ☐ All further search fees have been paid within the fixed time limit. The present European search report has been drawn up for all claims.
- ☐ As all searchable claims could be searched without effort justifying an additional fee, the Search Division did not invite payment of any additional fee.
- ☐ Only part of the further search fees have been paid within the fixed time limit. The present European search report has been drawn up for those parts of the European patent application which relate to the inventions in respect of which search fees have been paid, namely claims:
- ☒ None of the further search fees have been paid within the fixed time limit. The present European search report has been drawn up for those parts of the European patent application which relate to the invention first mentioned in the claims, namely claims:
- 1-5,8



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**LACK OF UNITY OF INVENTION
SHEET B**

Application Number
EP 05 10 6715

The Search Division considers that the present European patent application does not comply with the requirements of unity of invention and relates to several inventions or groups of inventions, namely:

1. claims: 1-5, 8

- flexible sealing portion / stepped portion

2. claims: 6, 7

top plate and skirt being separate parts of the closure

**ANNEX TO THE EUROPEAN SEARCH REPORT
ON EUROPEAN PATENT APPLICATION NO.**

EP 05 10 6715

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For more details about this annex : see Official Journal of the European Patent Office, No. 12/82

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