

CONTAINER-CLOSURE ARRANGEMENTField of the Invention

5 This invention relates to a tamper-evident container-closure arrangement, the closure being optionally resealable.

Background of the Invention

10 A container-closure arrangement of the type with which the present invention is concerned typically must meet a number of seemingly incompatible requirements. It should provide a container-closure seal that will be maintained when static loads and dynamic forces, such as arise from dropping the containers and/or from shifting
15 loads, tend to break the seal. However, the container-closure seal should at the same time be sufficiently pliant as to permit convenient removal and replacement of the closure as and when required. Also, the container-closure arrangement should provide for evidence of any
20 tampering that may occur following product containment and prior to delivery of the contained product to an end-user. However, the tamper evident structure should not be so unyielding as to impede legitimate removal of the closure from the container.

25 Various container-closure arrangements have been developed in an attempt to meet these requirements.

US 5730309 discloses a container which has a beaded rim and a closure that has a peripheral skirt. The skirt is formed with an inwardly directed ledge that is arranged
30 to mate in removable interlocking engagement with the rim bead, and the skirt incorporates a removable tear strip which functions to prevent removal of the closure from the container until the tear strip is removed. The arrangement of US 5730309 provides for multiple engagement
35 between portions of the closure skirt and inter-engaging portions of the container wall.

FR 2599004 discloses a container having a lateral

peripheral flange projecting outwardly therefrom, and a closure having a peripheral skirt, with a corresponding lateral peripheral flange extending from the skirt to align with the container flange when the closure is fitted to the container. The peripheral flanges can be connected together by ultrasonic welding. In addition, a line of detachment is provided in the closure, where the peripheral skirt attaches to the central body portion of the closure. This enables the closure to be removed from the container, but the arrangement is such that the closure cannot be resealed to the container once removed.

US 4434907, in a somewhat similar manner to FR 2599004, discloses a container having a laterally projecting peripheral flange, and a closure having a corresponding laterally projecting peripheral flange, the flanges aligning and being joined together. In this arrangement, a line of weakening is provided in the container lateral flange to enable detachment of the closure from the container. However, once detached, the closure can be remounted to the container in that a bead on the skirt inner wall can be pressed past a remnant of the container flange (ie remaining after the detachment of the container at the weakening zone).

Australian Patent 682096, to the present applicant, discloses a container which has a beaded rim, and a peripheral flange projecting out from the container at a location lower than the rim. A closure is mountable to that container that has a first peripheral skirt, with an inwardly directed ledge on the skirt arranged to interlock with the rim bead. A second skirt is connected to the first skirt at a frangible connection and projects downwardly therefrom, with a lower end sitting in a recess formed in the container flange when the closure is mounted to the container.

Summary of the Invention

The present invention provides a container-closure

arrangement including:

(i) a container having a base, a peripheral wall, a rim forming an upper margin of the wall and surrounding an opening of the container, and a flange formed integrally
5 with and surrounding the wall below the rim; and

(ii) a closure having a central portion that is arranged to overfit the opening of the container, a first skirt portion formed integrally with the central portion and arranged to surround the rim when the closure is
10 fitted to the container, a second skirt portion and optionally a third skirt portion extending in sequence from the first skirt portion, the second skirt portion being detachable either from the first skirt portion or, when present, from the third skirt portion, or being
15 detachable from both the first and third skirt portions; the arrangement being such that, when the closure is fitted to the container:

(a) one of the second or third skirt portions, being that portion adjacent to the flange, can be push-
20 fitted in an upwardly directed opening in the flange; or

(b) the third skirt portion when present can be bonded to the flange.

In (a), by upwardly orienting the opening, said part of the skirt can be push-fitted into the opening
25 simultaneously when the closure itself is fitted to the container. The term "push-fitted" is intended to include an interference fit, a snap fit and a friction fit. The resulting arrangement prevents the insertion of a thin-bladed implement between the container and closure skirt
30 portions, thus preventing the container contents from being tampered with.

In (b), by bonding the third skirt portion to the container flange, following fitting of the closure and eg.

after filling of the container, the insertion of a thin-bladed implement between the container and the closure skirt portions will also be blocked thereby preventing the container contents from being tampered with.

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Preferred Features of the Invention

Preferably in (a) a remote end of the second or third skirt portion is push-fitted in the flange opening, the remote end being defined by a projecting rim which, in
10 transverse cross-section, has an enlarged distal head and a proximal narrower neck connecting the head to the remote end, with the opening being an upwardly facing annular channel formed in the flange and extending around therewith, the channel including an annular projection at
15 the opening thereinto and past which the rim head must be pushed to be fitted into the channel; or in (b) the third skirt portion is disposed and shaped to be secured to the flange by a welding or adhesive bond, the flange optionally being formed with a peripheral rebate with the
20 disposition and shape of the third skirt portion being such as to locate in the rebate.

In (b) the bonding may be effected by a tack welding process or by a continuous seam welding process, using eg. an ultrasonic welding process.

25 Preferably the second skirt portion is detachable from the first and/or third skirt portions at a relatively narrower frangible connection between the skirt portions, the severance along which enables the closure to be detached from the container.

30 Preferably the annular channel is located in the peripheral rebate of the flange. Preferably the projecting rim extends downwardly from the third skirt

portion. Preferably the projecting rim is snap-fitted into the annular channel.

Preferably a bead is formed integrally with and surrounds the rim and preferably the first skirt portion engages the bead at a ledge located within and formed integrally with the first skirt portion and positioned to locate in interlocking engagement with the bead.

The third skirt portion preferably has an inner peripheral wall that is diametrically larger than an inner peripheral wall of the second skirt portion. In such case, preferably the second skirt portion has a lower marginal edge that is shaped and disposed to locate adjacent a wall portion of the container flange that is located radially inwardly of the rebate.

A ledge preferably is located within and formed integrally with the peripheral wall of the container and, in such case, the closure will be formed with an inner skirt that is disposed to locate within the container rim and to engage with the ledge when the closure is fitted to the container and a force is applied to the closure, for example as a result of stacking charged containers. The inner skirt may be disposed to locate adjacent the inner surface of the peripheral wall of the container or the inner skirt may be disposed obliquely with respect to the peripheral wall of the container.

The central portion of the closure preferably is formed with a well having a base and a peripheral wall and, in this case, the closure may be formed with radially extending webs that interconnect the peripheral wall of the well and the inner skirt.

The projecting rim of the second or third skirt portion can also be bonded to the container flange in a similar manner to the bonding of the second or third skirt

portion to the container flange in (b).

Brief Description of the Drawings

Notwithstanding any other forms which may fall within
5 the scope of the present invention, preferred forms of the
invention will now be described, by way of example only,
with reference to the accompanying drawings in which:

Figure 1 shows a perspective view of a first
assembled container-closure arrangement according to the
10 invention;

Figure 2 shows a sectional elevation view of a
portion of the arrangement as seen in the direction of
section plane 2-2 in Figure 1;

Figure 3 shows a view of a portion of the arrangement
15 as shown in Figure 2 but incorporating a modification of
that arrangement;

Figure 4 shows a view of another portion of the
arrangement as shown in Figure 2 but incorporating another
modification of that arrangement;

20 Figure 5 shows a sectional view similar to Figure 2,
but of a second assembled container-closure arrangement;
and

Figure 6 shows a view of a portion of the arrangement
of Figure 5, or a modification thereof.

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Modes for Carrying Out the Invention

As illustrated in Figures 1 and 2 of the drawings, a
first embodiment of a container-closure arrangement in
30 accordance with the invention comprises a container 10, a
closure 11 and a pivotable handle 12 connected to the
container. The container and closure may be moulded from
polypropylene or high density polyethylene. The handle may

be formed from steel or a plastics material. The container may be moulded in any desired size and typically will have a volumetric capacity in the order of 4 to 25 litres.

5 The container 10 has a base 13 which is sized to locate within a well 14 of the closure, so that a number of the container-closure arrangements may be stacked one upon another. The container also has a peripheral wall 15, and a rim 16 forms an upper margin of the wall 15 and
10 surrounds an opening of the container.

A bead 17 is formed integrally with and surrounds the rim 16. The bead has an undersurface 18 that connects with the outer surface of the peripheral wall 15.

15 An annular flange 19 is formed integrally with and surrounds the peripheral wall 15 of the container. The flange is located vertically below the level of the bead 17 and has two wall portions 20 and 21. The wall portion 20 is inclined with respect to the peripheral wall 15 of the container, and the wall portion 21 depends from the
20 outer margin of the inclined wall portion. A series of radially extending webs 22 connect the flange 19 to the peripheral wall 15 of the container. In accordance with the present invention, a rebate 23 is formed in the flange at the junction of the two wall portions 20 and 21.

25 A ledge 24 is located within and is formed integrally with the peripheral wall 15 of the container. The ledge 24 is located at a level below that of the closure well 14.

30 The closure 11 has a central portion 25 that incorporates the well 14 and which is arranged and sized to overfit the opening of the container 10. A first skirt portion 26 is formed integrally with the central portion 25 and is sized to surround and engage the container bead

17. An annular ledge 27 is located within and is formed integrally with the first skirt portion 26, and the ledge 27 is positioned to locate in interlocking engagement with the undersurface 18 of the container bead 17 when the
5 closure is fitted to the container.

The first skirt portion 26 flares outwardly from the ledge 27 and has an internal surface 28 that is profiled with gentle curves. The internal surface 28 is shaped to accommodate the fingers of a person who seeks to lift the
10 closure from the container. The internal surface 28 is shaped also to facilitate sliding inter-engagement of the closure and the container when the closure is pushed onto the container.

The container bead 17 is also shaped in a manner to
15 facilitate sliding engagement between the closure and the container when the closure is pushed onto the container.

A second skirt portion 29 depends from and is frangibly connected to the skirt portion 26 by way of an integrally moulded thin connecting web 30. Also, in this
20 first embodiment, a third skirt portion 31 forms an extension of the second skirt portion 29 and is frangibly connected to the second skirt portion by an integrally moulded web 32.

The third skirt portion 31 is shaped and dimensioned
25 to locate within the rebate 22 of the flange 19, so that the third skirt portion 31 may be bonded to the container flange 19 when the container has been charged with material and the closure 11 is fitted to the container 10 for the first time.

30 The bond between the third skirt portion 31 and the flange 19 may be established by injecting a sealant (not shown) or be created by welding the third skirt portion 31 into the rebate 22. This latter approach may be achieved by a tack welding process or by creating a continuous seam
35 weld. Welding may be effected in various ways, including, for example, by rotating the container-closure arrangement about the vertical axis of the container and directing

electrically heated air into the weld zone from a nozzle 33.

The third skirt portion 31 has an inner peripheral wall 34 that is larger in diameter than the inner
5 peripheral wall 35 of the second skirt portion 29. The resultant lower marginal edge 36 of the second skirt portion 29 then locates above the inclined wall portion 20 of the flange 19.

With the first embodiment as described so far, when
10 the third skirt portion 31 is bonded to the flange 19 it will be impossible to insert a prising blade or other implement between any of the skirt portions 26, 29 and 31 and the container wall 15. Thus, the closure may be removed only by first removing the second skirt portion
15 29, and this will provide evidence that an attempt has been made to remove the closure from the container.

As indicated in Figure 1 of the drawings, the second skirt portion 29 may be formed as a tear strip and be provided with a tear tab 37.

20 Figure 3 of the drawings shows a minor variation of the arrangement shown in Figure 2. As illustrated, the third skirt portion 31 is formed with a ledge 38 which is shaped and dimensioned to locate within a complementary recess 39 in the rebate 22. This arrangement may be
25 provided in circumstances where it is not required to bond the closure to the container and/or when an enhanced mechanical connection is required to be made between the closure and the container.

As shown in Figure 2, the closure 11 is formed
30 integrally with an inner skirt 40 that is disposed and dimensioned to locate within the container rim 16 and to bear on the container ledge 24 when the closure 11 is fitted to the container 10 and loaded in the direction of the ledge. The inner skirt 40 and the first (outer) skirt
35 portion 26 form a channel 41 in which the rim 16 locates and the channel 41 may be occupied in part by an elastomeric gasket-type sealant (not shown).

The inner skirt 40 is connected to a peripheral wall 42 of the closure well 14 by radially extending webs 43.

Figure 4 of the drawings illustrates a variation of the arrangement shown in Figure 2, in that the inner skirt
5 40 is formed to extend in an oblique direction between the central region 25 of the closure and the container ledge 24. In this case a second inner skirt 44 is provided to define the inner margin of the channel 41 and to seal against the inner surface of the peripheral wall 15 of the
10 container. Again, webs 43 (not shown in Figure 4) can connect wall 42 to the inner skirt 40 and/or to the second inner skirt 44.

Referring now to Figures 5 and 6, where like reference numerals are used to denote similar or like
15 parts, a second embodiment of a container-closure arrangement in accordance with the invention will now be described.

In this embodiment, a skirt arrangement 48 comprises a first skirt portion 26, a second skirt portion 29 and
20 optionally a third skirt portion 31. Either the second or more preferably the third skirt portion 31 is modified to include a downwardly projecting rim 50. In addition, the rebate 22 is modified to define an upwardly facing annular groove 52, into which the rim 50 can be received,
25 typically in a push-fit arrangement such as a snap, interference or friction fit.

Referring in particular to Figure 6, it will be seen that the projecting rim 50, in transverse cross section, includes an enlarged distal head portion 54, and a
30 relatively narrower neck portion 56 that connects the head portion to the skirt portion 31. It will also be seen that the annular groove 52 has, in transverse cross section, a relatively wider lower region 58, and a relatively narrower opening caused by an inwardly
35 projecting annular ledge 60. The arrangement is such that the head and neck portion 54, 56 sit snugly in the groove 52 as shown, but to insert or remove the rim 50 into or

from the groove, the head portion 54 and/or the ledge 60 must deform sufficiently enough to allow insertion of the rim 50 into groove 52. To assist with this insertion, a bevelled face 62 is defined on a lower region of the rim, along which the ledge 60 rides during rim insertion. The deformation of either or both of rim 50 and ledge 60 provides a characteristic snap-fit. However, other suitable fitting arrangements can be employed, including interference and friction type fits.

In the second embodiment, the second and third skirt portions can be replaced solely by a second skirt portion. For example, the skirt arrangement 48 can simply comprise a first skirt portion 26 and a skirt portion 31 frangibly connected thereto (e.g. as indicated in Figure 6).

However, it is more preferable that the arrangement 48 is comprised of three skirt portions, because the second skirt portion 26 can then define an easily removable tear strip.

Prior to or after locating the rim 50 in groove 52, a bond between the third skirt portion 31 and the flange 19 can be established, including the formation of a bond between the rim external walls and groove internal walls. Sealants, tack welding, heat welding, ultrasonic welding etc can be employed, as described above.

Whilst the invention has been described with reference to a number of preferred embodiments, it should be appreciated that the invention can be embodied in many other forms.

CLAIMS:

1. A container-closure arrangement including:
 - (i) a container having a base, a peripheral wall, a rim forming an upper margin of the wall and surrounding an opening of the container, and a flange formed integrally with and surrounding the wall below the rim; and
 - (ii) a closure having a central portion that is arranged to overfit the opening of the container, a first skirt portion formed integrally with the central portion and arranged to surround the rim when the closure is fitted to the container, a second skirt portion and optionally a third skirt portion extending in sequence from the first skirt portion, the second skirt portion being detachable either from the first skirt portion or, when present, from the third skirt portion, or being detachable from both the first and third skirt portions; the arrangement being such that, when the closure is fitted to the container:
 - (a) one of the second or third skirt portions, being that portion adjacent to the flange, can be push-fitted in an upwardly directed opening in the flange; or
 - (b) the third skirt portion when present can be bonded to the flange.
2. A container-closure arrangement as claimed in claim 1 wherein in (a) a remote end of the second or third skirt portion is push-fitted in the flange opening.
3. A container-closure arrangement as claimed in claim 2 wherein the remote end is defined by a projecting rim which, in transverse cross-section, has an enlarged distal head and a proximal narrower neck connecting the head to the remote end, with the opening being an upwardly facing annular channel formed in the flange and extending around therewith, the channel including an annular projection at

the opening thereinto and past which the rim head must be pushed to be fitted into the channel.

4. A container-closure arrangement as claimed in claim 1
5 wherein in (b) the third skirt portion is disposed and shaped to be secured to the flange by a welding or adhesive bond.

5. A container-closure arrangement as claimed in claim 4
10 wherein the flange is formed with a peripheral rebate, and the disposition and shape of the third skirt portion is such as to locate in the rebate.

6. A container-closure arrangement as claimed in any one
15 of the preceding claims wherein the second skirt portion is detachable from the first and/or third skirt portions at a relatively narrower frangible connection between the skirt portions, the severance along which enables the closure to be detached from the container.

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7. A container-closure arrangement as claimed in claim 3 wherein the flange is formed with a peripheral rebate in which the annular channel is located.

25 8. A container-closure arrangement as claimed in claim 3 or claim 7 wherein the projecting rim extends downwardly from the third skirt portion and is snap-fitted into the annular channel.

30 9. A container-closure arrangement as claimed in any one of the preceding claims wherein a bead is formed integrally with and surrounds the rim, and the first skirt portion engages the bead at a ledge located within and

formed integrally with the first skirt portion and positioned to locate in interlocking engagement with the bead.

5 10. A container-closure arrangement as claimed in claim 5 or claim 7 wherein the third skirt portion (when present) has an inner peripheral wall that is diametrically larger than an inner peripheral wall of the second skirt portion, and the second skirt portion has a lower marginal edge
10 that is shaped and disposed to locate adjacent to a wall portion of the container flange that is located radially inwardly of the rebate.

11. A container-closure arrangement as claimed in any one
15 of the preceding claims wherein a ledge is located within and formed integrally with the peripheral wall of the container, and the closure is formed with an inner skirt that is disposed to locate within the container rim and to engage with the ledge when the closure is fitted to the
20 container and a force is applied to the closure.

12. A container-closure arrangement as claimed in claim 11 wherein the inner skirt is either disposed to locate adjacent the inner surface of the peripheral wall of the
25 container, or is disposed obliquely with respect to the peripheral wall of the container.

13. A container-closure arrangement as claimed in claim 11 or claim 12 wherein the central portion of the closure
30 is formed with a well having a base and a peripheral wall, and the closure is formed with radially extending webs that interconnect the peripheral wall of the well and the inner skirt.

14. A container-closure arrangement as claimed in claim 3
wherein the projecting rim is bonded to the container
flange in a similar manner to the bonding of the second or
5 third skirt portion to the container flange in (b).