



(12) **EUROPEAN PATENT APPLICATION**

(43) Date of publication:
28.08.2002 Bulletin 2002/35

(51) Int Cl.7: **B65D 51/22**

(21) Application number: **02251141.4**

(22) Date of filing: **20.02.2002**

(84) Designated Contracting States:
AT BE CH CY DE DK ES FI FR GB GR IE IT LI LU
MC NL PT SE TR
 Designated Extension States:
AL LT LV MK RO SI

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(30) Priority: **22.02.2001 EP 01301637**

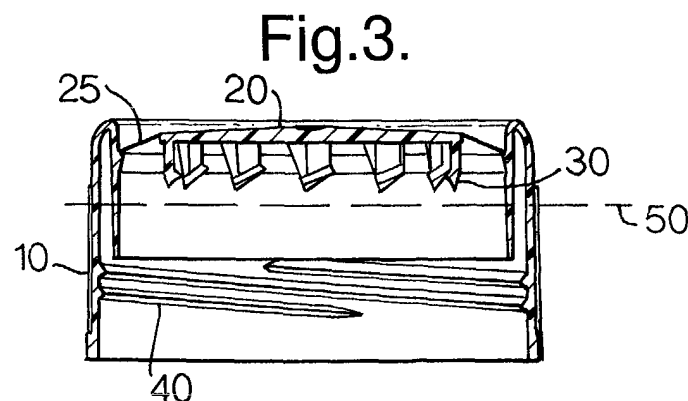
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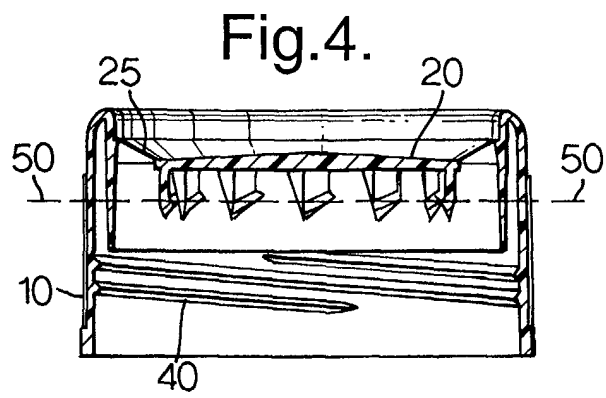
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(54) **Pierce and cut closure**

(57) A plastics closure (1) for a container of the type having an opening sealed by a thin severable membrane. Rotation of the closure with respect to the container is used to effect separation of a panel of the membrane from the remainder of the container. The closure end plate (20) is provided with opening means (30) which include piercing means (65) to pierce through the

membrane, and cutting means (70) to cut through the membrane as the closure is rotated. In addition the opening means have retaining means (75) which lift and retain the panel as it is separated. The end plate (20) is movable from a stable raised position to a stable lowered position with respect to the membrane to effect piercing.





Description

[0001] The present invention relates generally to a plastics closure for a container of the type having a laminar closure member such as a thin severable membrane defining and sealing an opening, and to such a plastics closure in which means for opening the container are provided on the closure itself. The present invention is concerned more particularly with a plastics closure in which rotation with respect to the container is used to effect at least partial separation of the laminar closure member from the remainder of the container.

[0002] An example of this type of closure system is a cylindrical container closed at one end to define a base and sealed at its other end by a laminar closure member, for example a panel of aluminium foil or the like. In the past, opening means for separating the panel from the remainder of the container have been conveniently provided on the plastics closure itself. For example, it is known from US Patent No. 6039198 to provide a cutting or piercing means on a plastics closure.

[0003] If any such system is to be successful it is preferable for the separation of the laminar closure member from the remainder of the container to be as simple as possible. It is also noted by the inventor that removal of the laminar closure member from the container is an important step. If the severed panel of the laminar closure member is simply pushed into the interior of the container or not completely separated this could hinder access to the contents of the container and the user may not wish to risk contamination of the contents of the container by introduction of the severed panel.

[0004] In many prior art plastics closures of this general type cutting means or piercing means have been provided on an upper surface of the plastics closures. For example, many tubes are sealed with a foil panel which is pierced using a barb or the like provided on an upper surface of the closures. When opening is desired the closure is removed from the container to expose the foil panel and inverted before piercing through the panel.

[0005] In the present invention the opening means may be provided on any suitable part of the closure, for example on an upper surface so that the closure is inverted before opening takes place. However, it is preferable for the opening means to be provided on the interior of the closure so that they are not exposed to the atmosphere before they enter the container during opening and so that a normal unscrewing motion can be used to cut the foil. Where this is the case it is clear that the opening means must be spaced from the laminar closure member during transport and storage and be selectively engageable to effect opening.

[0006] Accordingly there is provided a plastics closure for a container of the type having an opening sealed by a laminar closure member. The closure end plate carries one or a plurality of opening elements having piercing means for piercing through the laminar closure member and cutting means for cutting through the laminar clo-

sure member as the plastics closure is rotated with respect to the container; the opening elements further include retaining means for lifting and retaining the laminar closure member panel during or following cutting. The closure is characterised in that the end plate is movable from a stable raised position to a stable lowered position with respect to the laminar closure member to effect piercing.

[0007] The opening elements are thereby movable between a raised, retracted position and a lowered, extended position. In the raised position the opening elements are held above the laminar closure member and in the lowered position at least part of the opening means are held below the member as far as is required to effect piercing and allow subsequent cutting, lifting and retaining of the closure member as the plastics closure is rotated relative to the container.

[0008] It is therefore a feature of the present invention that both the separation and removal steps are performed by the plastics closure itself and, moreover, are performed using only the rotation of the closure with respect to the container.

[0009] The presence of the retaining means simplifies the opening of the container, and has the additional benefit of removal of the laminar closure member with no additional input required from the user.

[0010] The end plate may be surrounded by an annular band which is movable between upwardly and downwardly inclined stable positions to allow the end plate to be moved between the raised and lowered positions.

[0011] The end plate may be rigid; this allows force to be applied directly to the panel which then transfers the force to the opening elements.

[0012] A snap action arrangement for the end plate is preferred. This means that the force required to move the plate completely from its raised to its lowered position must be overcome before the plate moves. This is particularly useful for situations where the laminar closure member is formed from material which is likely to stretch when pressure is applied by a piercing tool. A sharp stabbing movement from a piercing tool is more likely to pierce into the material cleanly. A further advantage of this push-button type arrangement is that it requires movement only from the end plate and not from the whole of the closure.

[0013] During the movement of the opening elements from the raised to the lowered position of the end plate they are preferably substantially perpendicular to the laminar closure member at least at the point of contact, as this is ideal for piercing. In the case of a flat rigid end plate the teeth would therefore be positioned perpendicular to the panel and the movement of the plate would be perpendicular to the laminar closure member. Inclination away from the perpendicular might, however, be used to give other benefits such as better retention of the cut laminar panel. A flexible domed end plate would change the inclination of the teeth as it moved and so would require appropriate initial inclination to ensure

perpendicularity at contact.

[0014] In a preferred embodiment the opening elements comprise one or a plurality of teeth-like projections.

[0015] The piercing means, the cutting means and the retaining means may all be formed on the or the same opening element. In this case all of the elements can be identical to simplify production. Whilst the principle of the present invention is applicable to all containers of this general type a preferred embodiment uses screw thread engagement to secure the cap to the container. Of course other such systems, for example, snap-fit engagement could be equally well applied.

[0016] Where a plurality of opening elements are present they may be disposed around or adjacent the periphery of the closure end plate. This maximises the size of the aperture created from the size of the closure. Of course the elements could be disposed a distance in from the periphery, which would result in a smaller laminar closure member panel being removed. In practice the positioning of the elements will be dictated by the required aperture size and the size of the closure end plate.

[0017] The retaining means may comprise an inclined surface extending upwardly away from a leading edge which is below the plane of the laminar closure member when the opening means are in the lowered position, to lift and retain the laminar closure member in the plastics closure as it is rotated.

[0018] The opening means may be formed as an integral part of the closure although of course it will be understood that they might also be formed as a separate and removable element which can be attached prior to opening of the container.

[0019] Externally obvious visual evidence that the container has been opened is an advantage in such systems. Because the end plate is moved from a raised to a lower position the distinction between the raised and lowered positions provides a tamper-evident feature. There may be further provided a tamper-evident band frangibly detachable from the plastics closure when it is removed from the container, activated to indicate that the opening means have been used.

[0020] The present invention will now be more particularly described, by way of example, with reference to the accompanying drawings, in which:

Fig.1 is a perspective view of a plastics closure according to the present invention;

Fig.2 is an under plan view of the closure of Fig.1;

Fig.3 is a cross section of the closure of Fig.2 taken along line III-III;

Fig.4 is a magnified side view of an opening element provided on the plastics closure of Fig.3;

Fig.5 is a frontal view of the opening element shown in Fig.4;

Fig.6 is a perspective view of the closure of Fig.1 with the opening means shown in a lowered position;

and

Fig.7 is a cross section taken along line VII-VII of Fig.2 when the opening means are in the lowered position.

[0021] Referring first to Fig.1 there is shown a plastics closure generally indicated 1 comprising an annular skirt 10 closed at one end by a circular end plate 20 that is joined to the skirt 10 by an annular band 25.

[0022] Referring now also to Fig.2, mutually spaced around the periphery of the inner surface of the panel 20 are a plurality (in this case twelve) of downwardly depending opening elements generally indicated 30. When viewed in the cross section of Fig.3 the opening elements 30 are shown to be teeth-like projections. As can be seen a screw thread 40 is provided at the lower end of the annular skirt 10 on the interior surface to allow for engagement with a container (not shown). As can be seen from Figs. 1 and 3 the annular band 25 is upwardly inclined and as such holds the plate 20 in a first, raised position.

[0023] Also shown in Fig.3 is a notional plane indicated 50 which is defined by the level of the laminar closure (not shown) when the closure is secured to the container. It will be noted that in the first position of the panel 20 the opening elements are held spaced from the plane 50.

[0024] Referring now to Figs. 4 and 5 the panel 20 is shown in a second position in which the opening elements 30 now extend below the level of the plane 50. The panel 20 is shown in a second position and the annular band 25 is shown in a downwardly inclined state. Movement of the panel 20 from the first position shown in Fig. 3 to the second position shown in Fig.4 is achieved by a downward pressure on the panel 20 member which causes movement of the annular band 25 from its upwardly inclined to its downwardly inclined orientation. The first and second positions of the plate 20 are stable positions and the positions intermediate the two are unstable such that movement between the first and second positions is a snap action which provides the force for the opening element to extend below the level of the laminar closure member as described in more detail below. The raised and lowered positions of the plate 20 are visually distinguishable; this serves as a tamper-evident feature. In some embodiments (not shown) the plate 20 may be prevented from returning to the first position or there may be provided a frangibly detachable element to prevent re-setting of the closure with no evidence on the closure itself that the plate 20 has been activated to open the container.

[0025] Referring now to Figs. 6 and 7, an opening element 30 is shown in more detail. Each opening element 30 includes a generally rectangular body 60. A generally triangular piercing portion 65 extends from a lower edge of the body 60; a generally triangular cutting portion 70 extends from a side edge of the body 60. The position of the plane 50 with the opening elements in their low-

ered positions as shown in Fig.4 illustrates that in the lowered position the panel 20 has allowed piercing through the laminar closure member and positioned the cutting portion transverse the plane 50 such that rotary motion of the closure with respect to the container will now provide the force for the cutting member to cut through the laminar closure member.

[0026] In addition a retaining portion 75 extends from one side of the body to lie substantially in line with the part of the cutting portion at which it intersects. The retaining portion is a generally planar projection which extends transversely to the body. It can be seen that the leading edge 80 of the retaining portion 75 is slightly below the plane 50. As the container and the plastics closure are rotated relative to each other the cutting portion 70 cuts through the laminar closure member which is then lifted by the inclined retaining portion 75.

[0027] When the plastics closure is rotated with respect to the container the laminar closure member panel will therefore be separated from the remainder of the container. Moreover the laminar closure member panel will be held collectively by the retaining portions 75 on the underside of the closure 1. When the plastics closure is further unscrewed and removed from the container the laminar closure member panel is removed with it and can therefore be easily removed from the plastics closure if required prior to screwing the closure back on to the container.

Claims

1. A plastics closure (1) for a container of the type having an opening sealed by a laminar closure member,

the closure end plate (20) carries one or a plurality of opening elements (30) having piercing means (65) for piercing through the laminar closure member and cutting means (70) for cutting through the laminar closure member as the plastics closure is rotated with respect to the container, the opening elements further include retaining means (75) for lifting and retaining the laminar closure member panel during or following cutting,

characterised in that the end plate (20) is movable from a stable raised position to a stable lowered position with respect to the laminar closure member to effect piercing.

2. A closure according to Claim 1, wherein the end plate (20) is rigid and is attached to the closure side skirt (10) by a band (25) which is movable between upwardly and downwardly inclined positions to allow the end plate to be moved between the raised and lowered positions.
3. A closure according to Claim 1 or Claim 2, wherein the opening elements (30) are disposed around the

periphery of the end plate (20).

4. A closure according to any of Claims 1 to 3, wherein the end plate (20) is substantially flat.
5. A closure according to any preceding claim, wherein the movement of the end plate (20) is a snap action.
6. A closure according to any preceding claim, wherein the opening elements (30) are substantially perpendicular to the laminar closure member at the point of contact between the piercing means and the member.
7. A closure according to any preceding claim, wherein the opening elements (30) are substantially perpendicular to the end plate (20).
8. A closure according to any preceding claim, wherein the movement of the end plate (20) is substantially perpendicular to the laminar closure member.
9. A plastics closure according to any preceding claim, wherein the retaining means (75) comprise an inclined surface extending upwardly away from a leading edge (80) which is below the plane of the laminar closure member when the end plate (20) is in the lowered position whereby to lift and retain the laminar closure member panel in the closure as it is rotated.
10. A plastics closure according to any preceding claim, wherein the piercing means (65), the cutting means (70) and the retaining means (75) are formed on the same opening element (30).

Fig.1.

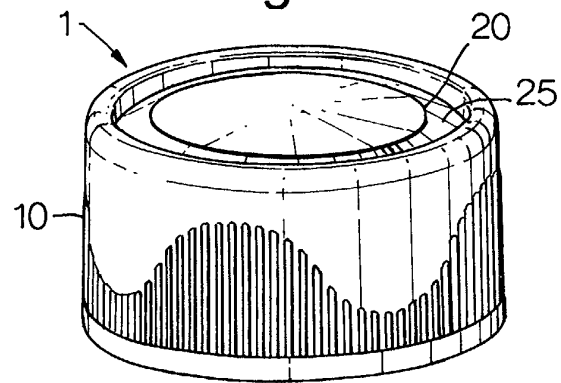


Fig.2.

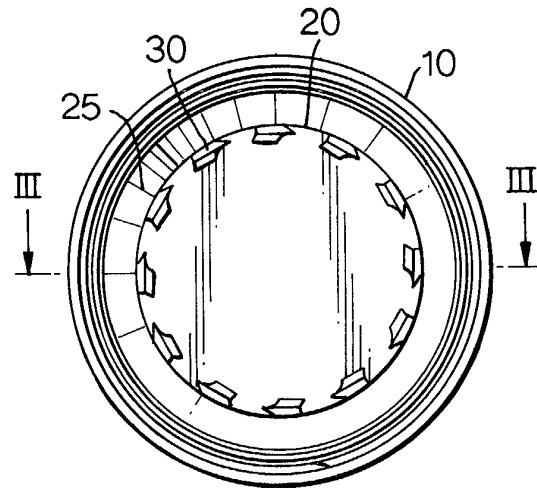


Fig.3.

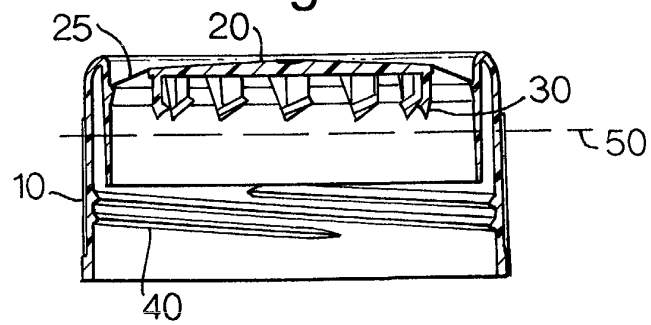


Fig.4.

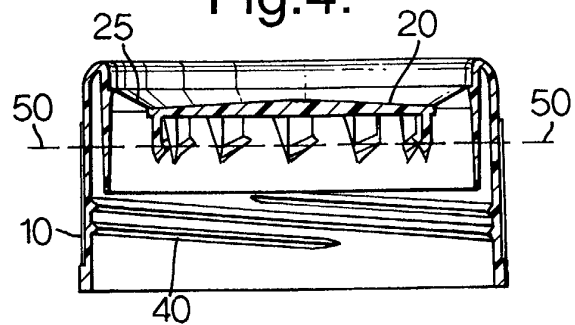


Fig.5.

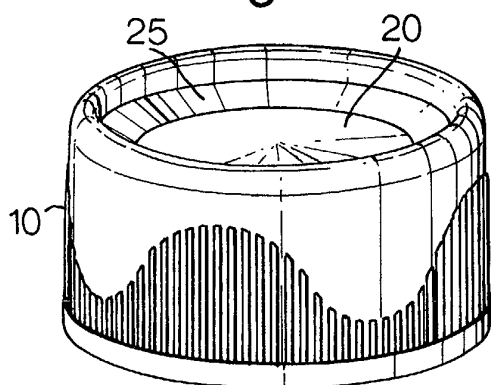


Fig.6.

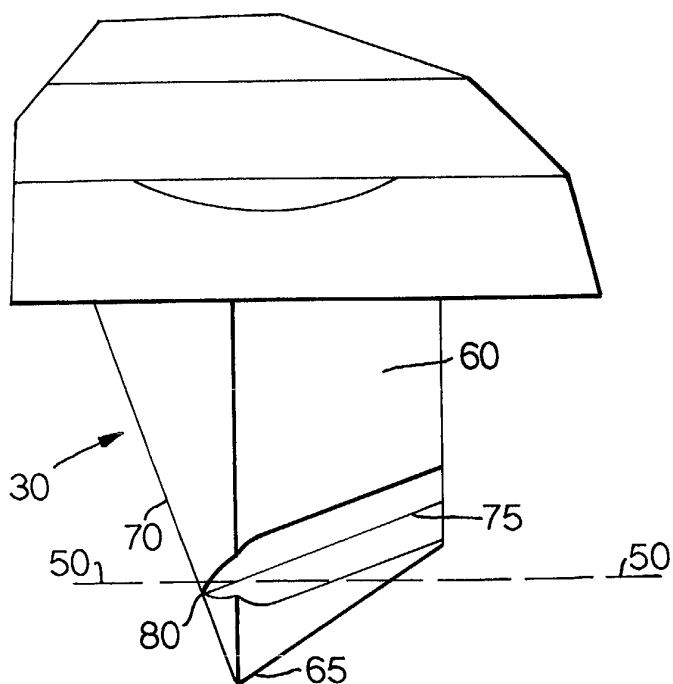
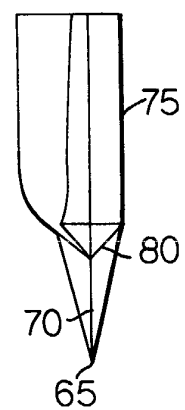


Fig.7.





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