

Description

This invention is concerned with metal screw closures for packaging containers, in particular (but not exclusively) with screw closures of the kind having peripheral skirts with an internal lining of a gasket compound which, after non-rotary application of the closure to the neck of a container, is capable of conforming itself permanently to screw thread formations on the container neck. The closure is first fitted on the container by the food manufacturer by a simple pressing action, but subsequently requires removal (and replacement) by the consumer using a conventional twisting action. Such closures are accordingly often referred to as "press-twist" or, more commonly, PT closures, a nomenclature which will be used hereinafter whenever appropriate.

PT and other vacuum closures are often provided with tamper-evident buttons at the centre of their closure panels, where they overlie the mouth of the container to which they are fitted. The button is an integral, raised and circular part of the closure panel, which is held in an inverted, depressed position by the normal vacuum which is created in the container headspace by the closing process, but which returns resiliently to its raised position if the vacuum is for any reason subsequently broken or substantially reduced. The button thus indicates, for example, if the contents of the container have "blown", or if the closure has not made a proper seal with the container.

One intended function of the button is to indicate if the container has been opened, possibly with a view to contaminating its contents by addition of a harmful substance. However, it is possible for a technically knowledgeable person to remove the closure and replace it in such a way that a substantial vacuum is again created in the container headspace so that the button is again held in its depressed position. The button cannot therefore be relied upon to indicate tampering, and there is a commercial need to provide a PT closure with a feature which, with suitable arrangement, can be more reliably indicative of tampering than would be a conventional tamper-evident button. As will become apparent from the described embodiment, however, whilst it provides tamper-evidence in its own right, in its application to a PT closure the invention may advantageously be used in conjunction with a conventional tamper-evident button.

DE-A-2233305 at Figure 5 shows a metal closure having an intumed curl formed around the free edge of its peripheral skirt. The curl serves to hold captive the top end of a plastics security ring which extends below the skirt and has a line of weakening along which it may be ruptured to provide access and tamperevidence. For that purpose the bottom

end of the security ring is mechanically interlocked with a formation on the container when the closure is fitted.

The closure shown in DE-A-2233305 is of the kind usually named "RO", "RO" being an abbreviation of "Roll-On" which alludes to the manner in which the skirt is formed with screw threads after the closure has been applied to the container to be closed.

RO closures are used extensively for liquid products such as fruit cordials and squashes, spirits and mineral waters. These products are filled cold, and do not require to be heat treated after filling and closing; moreover, the screw threads of the container to which they are applied may be given a substantial helix angle and axial extent, so enabling a line or lines of weakening of a plastics security ring to be reliably ruptured by axially directed tension which is generated in the security ring when the closure is unscrewed. In the closure of DE-A-2233305 it is therefore largely immaterial as to whether or not the security ring is capable of rotating in relation to the closure.

In contrast, PT closures as mentioned above are used for products, for example baby food products and preserves, which are either hot-filled or are thermally pasteurised or sterilised after filling and closing. Moreover, because of limitations imposed by their manner of formation, their screw threads necessarily have a relatively small helix angle and are of a correspondingly small axial extent. With such an arrangement the limited axial movement of the closure which occurs on opening makes it difficult or impossible to achieve reliable operation of a plastics security ring if employing axially directed forces to achieve rupturing. Forces generated by relative angular movement of the closure and the locked bottom end of the security ring may be used instead, but this requires secure, specifically non-rotary, attachment of the top end of the security ring to the closure if it is to be effective.

A known characteristic of moulded plastics articles is their tendency to soften and shrink when subjected to elevated temperatures. Thus, a plastics security ring secured to an inward curl formed around the free edge of a metal closure as proposed in DE-A-2233305 would, when fitted to a container and subjected to elevated temperatures, tend to contract both bodily and radially inwardly towards the container. Any substantial contraction which occurs, however, may cause the security ring to move into contact with the container and perhaps subsequently become stuck to the container by product residue existing in that area. It is thus an object of the invention to secure a security ring to a metal closure in such a way as to restrain the ring from shrinkage during thermal treatment.

According to the present invention in one aspect there is provided a screw closure for a container, which comprises a metal closure body having a closure panel to overlie the mouth of a container, and a skirt which is peripherally attached to the closure panel, has a generally cylindrical region on which a screw thread formation is formed or formable for engagement with the container, and extends axially beyond the generally cylindrical region to an inward curl which includes the terminal edge of the closure metal, the closure further including a plastics security ring which has a top portion held captive by the closure skirt and which extends axially beyond and interiorly of the curl to an integral bottom portion capable of making locked engagement with the container, the security ring having at least one line of weakening along which it is rupturable to enable the closure to be unscrewed from the container whilst leaving visible evidence of the same, characterised in that the terminal edge of the closure metal faces generally axially of the closure towards the closure panel, and for holding the top portion captive the closure skirt has a substantially radial annular shoulder which is disposed in spaced opposition to the inward curl intermediate the curl and the generally cylindrical region, the top portion of the security ring having a radial annular top surface beneath the annular shoulder and the terminal edge of the closure metal having been deformed against an exterior lower shoulder portion of the top portion of the security ring, whereby the top portion of the security ring is compressively engaged axially of the closure in a non-rotary manner between the shoulder and the curl thereof, a radially outward part of the exterior lower shoulder portion being received within the curl and surrounding a recess in which the said terminal edge of the closure metal is disposed so as to restrain the shoulder portion against inward movement.

According to the invention from another aspect there is provided a method of attaching a plastics security ring to a depending tubular skirt of a metal closure body in the manufacture of a screw closure, the method comprising:

- a) forming the tubular skirt with a generally radial annular shoulder and a generally cylindrical portion extending from the outer periphery of the shoulder to the free edge of the closure metal;
- b) locating a top portion of the security ring within the generally cylindrical portion and against the shoulder, a part of the generally cylindrical portion then projecting beyond a lower surface of said top portion of the security ring; and
- c) bending the free edge of the closure metal inwardly under said lower surface of the top

portion of the security ring, characterised in that: the top portion of the security ring has a radial annular upper surface which is located below the radial annular shoulder of the skirt, and in that

step c) is carried out by forming an inward curl so as to cause the free edge of the closure metal to become located in a recess in the lower surface of the top portion of the security ring whilst compressing the same against the shoulder axially of the closure, a radially outward part of the lower surface being received within the curl, the security ring thereby being secured to the metal skirt in a non-rotary manner with its said outward part restrained against inward movement.

A still further aspect of the invention provides a method of making a package for a food product which requires heat treatment after filling and closing, characterised by the steps of:

- a) forming a tubular skirt with a generally radial annular shoulder and a generally cylindrical portion extending from the outer periphery of the shoulder to the free edge of the metal closure;
- b) providing a security ring having a top portion with a radial annular upper surface and an integral bottom portion;
- c) locating the top portion of the security ring within the generally cylindrical portion with the upper surface against the shoulder, a part of the generally cylindrical portion then projecting beyond a lower surface of said top portion of the security ring;
- d) forming an inward curl from the projecting part of the generally cylindrical portion so as to cause a free edge of the closure metal to become located in a recess in the underside of the top portion of the security ring whilst compressing the same against the shoulder axially of the closure, a radially outward part of the lower surface being received within the curl, the security ring thereby being secured to the metal skirt in a non-rotary manner with its said outward part restrained against inward movement;
- e) filling a container with food product;
- f) securing the closure formed by steps a) to d) to the container; and
- g) heat treating the package thus formed.

In relation to the two preceding paragraphs reference is made to EP-A-0086970 which describes securement of a security ring by a metal closure by reforming the closure metal against the security ring when the latter is already in its desired position. In this particular respect the teaching of EP-A-0086970 is relevant to the present application. However, in EP-A-0086970 thermal contraction of the security ring is possible and, indeed, encouraged, and no axially directed compression of the top portion of the security ring occurs.

An advantage which accrues from the prevention of radially inward contraction of the top portion of the security ring as discussed above is manifest in circumstances when the non-rotary attachment of the security ring in the closure is required to survive the thermal treatment to which the closure is subjected.

Otherwise, there would be a danger that, when the consumer attempted to unscrew the closure, relative movement of the closure in relation to the whole of the security ring would occur and would prevent proper rupturing of the latter along its line or lines of weakening. Indeed, it is possible that the security ring would fail to rupture before the closure became disengaged from the screw thread formations of the container, so that the closure could not be removed without considerable difficulty.

In circumstances such as are described above the present invention seeks to ensure that the non-rotary attachment of the security ring in the closure curl can survive the elevated temperatures to which the closure is subjected, so that, if required, the security ring can reliably operate by relative angular movement created between its top end and its locked bottom end when the closure is unscrewed. It will thus be apparent that the invention has particular application to PT closures, for which the axial movement generated by the threaded engagement of the closure with the container and which is therefore available to achieve rupturing of the security ring may be only about 1.5 mm. However, the invention is applicable to screw closures other than PT closures; the screw thread formations of the closures may either be preformed, or, as in a PT closure, they may be formed in situ when the closure is located on the container.

In order that the invention may be more fully understood, a PT closure embodying the invention and a modification thereof will now be described, by way of example only, with reference to the accompanying drawings. In the drawings:-

Fig 1 is an exploded view of the PT closure as seen in relation to the neck of a glass container of a food product to which the closure is fitted, both the closure and the container neck being shown in side elevation;

Fig 2 is a sectional view taken on the line II-II of Fig.1 and to a larger scale, showing the engagement of the closure with the container neck;

Fig 2A is a substantially enlarged view of part of Fig 2, showing the attachment of the security ring to the closure body;

Fig 3 is a scrap view of the container/closure combination, as seen on the line III-III of Fig 2;

Figs 4(a), 4(b), 4(c) and 4(d) are scrap plan views of the top surface of the security ring, showing different raised formations which may

be used;

Fig 5 shows the underside of the top panel of the enlargement of the closure skirt;

Fig 6 is a perspective view of the moulding punch by which plastisol lining compound is distributed within the interior of the closure body;

Fig 7 is a view in radial section of part of a modified closure showing the security ring as it appears before attachment to the closure body;

Fig 8 is a scrap view of the modified closure taken in section along the line A-A of Fig 7; and Fig 9 is a similar view of a variant of the modified closure, taken in section along the line A-A of Fig 7.

Referring now to Figs 1 and 2, a PT closure 10 is shown in relation to the generally cylindrical neck 12 of a glass container for a baby food product, the common central axis of the container and closure being indicated by the line XX. The neck defines the container mouth 14, and is externally formed with a multi-start screw thread 16 with which the closure may engage for its removal or replacement by the user in known manner. The screw thread is formed on a cylindrical portion 17 of the container neck.

The PT closure 10 has a metal body 11 which is conventionally formed by pressure from a suitable sheet material, with a generally plane closure panel 18 overlying the container mouth 14, and a tubular skirt 20 which is peripherally attached to the closure panel and extends from there to a free edge 22 formed by an intumed curl 24 at the end of the skirt. As shown in Fig 2, the terminal edge 28 of the metal sheet material of which the body is formed is located within the curl so as to face generally axially of the closure towards the closure panel 18.

The interior of the body 11 has a lining 30 of a conventional plastisol gasket compound which is arranged to extend across the top free edge 32 of the container neck 12, and down the inside of the skirt 20. In known manner the lining 30 when first formed has a cylindrical bore which is an interference fit with the screw thread 16 of the container; the closure 10 is fitted onto the container by the food packer by simple axial movement, and during thermal processing of the container the lining takes a set by which it is made permanently to conform to the container screw thread for subsequent twist-off removal or replacement of the closure by the user.

Insofar as it has been described above the closure 10 is conventional. Also conventionally, it has a circular button 34 formed in its closure panel 18 and arranged to indicate whether or not a vacuum of the required level exists in the headspace of the container. In the drawing the button is repre-

sented by full lines as it appears when in its inverted, depressed position, indicating the existence of a vacuum; its relaxed, raised position is indicated at 34' by the broken lines. However, and as has previously been discussed, it is possible for a person wishing to tamper with the contents of the container to reestablish a vacuum in the headspace on reclosure. In order to provide evidence of such behaviour the closure further includes a security ring 36 which is moulded from a suitable polymeric material such, for example, as polypropylene. The security ring is of generally uniform cross-section, and has an annular top portion 38 which is held captive by the skirt. For that purpose the skirt has a terminal enlargement 26 in which the portion 38 of the security ring is received and which includes the curl 24. The formation and arrangement of the enlargement and its engagement with the security ring will be described later in detail.

From the top portion 38 the ring member extends, in a generally axial direction away from the closure panel 18, past and beyond the curl 24 and the free edge 22 of the skirt. Beyond the free edge 22 the security ring has a generally cylindrical bottom portion 40 which is attached along a line of weakening. The line of weakening is formed by a narrow gap 42 between the portions 38 and 40, and a plurality of thin, regularly spaced, integral and rupturable bridges 44 which span the gap and attach the portions 38, 40 together.

The bottom portion 40 of the security ring is arranged for locking engagement with the container neck and for that purpose has an even number (eg 30) of circumferentially spaced barbs or teeth 46 formed around its inner periphery.

Each barb has a downwardly and outwardly inclined camming surface 48 and a substantially radial (i.e plane) upper surface 50, these two surfaces together defining an apex which projects radially towards the container neck as shown in Fig.2.

As shown in Figs. 1 and 2, for cooperation with the barbs 46 the container neck is formed with a peripheral groove 52 which is separated from the threaded portion 17 by a continuous land or projection 54 having a cylindrical outer surface 56. The bottom surface 58 of the land forms the top face of the groove and is directed substantially radially as shown.

Opposite the land 54, the bottom face of the groove 52 is provided by a continuous and conventional transfer ring 60 by means of which the container may be lifted and/or transported as required during its manufacture. The transfer ring accordingly has a substantially radial lower surface 62 which may be engaged by a lifting/transporting mechanism (not shown). The upper surface 64 of the transfer ring, forming the bottom face of the

groove, is downwardly and outwardly slanted as shown. In the fitted position of the closure a substantial vertical clearance exists between this surface and the camming surfaces 48 of the security ring, for the reason later to become apparent.

The barbs 46 project into the groove 52 within the vertical confines of the land 54 and of the transfer ring 60. As can clearly be understood from Fig.1, the groove is continuous except at two discontinuities which are created by vertical ribs 65. These ribs bridge the groove at two diametrically opposed locations on the container neck, and occupy substantially the depth of the groove. To facilitate moulding, the ribs are angularly spaced by 90° from the mould parting line of the container.

As can be seen from Fig.3, the leading side faces 68 of the barbs 46 in the direction of an unscrewing movement of the closure are substantially radially directed, and therefore capable of making face-to-face abutment with the appropriate side faces 66 of the ribs 65; for that purpose, the faces 66 are, within moulding limitations, normal to the groove surface from which they rise.

When the closure is applied to the container by axial movement as previously mentioned, the camming surfaces 48 of the barbs 46 ride down the screw thread 16 and land 54 of the container neck until the fitted position of the closure 10 is reached. The barbs are then generally as illustrated in Figs 2 and 3, that is to say, they are freely located in the groove 52.

Therefore, if an attempt is subsequently made to unscrew the closure 10, two diametrically opposed barbs 46 will engage the ribs and prevent closure removal until the bridges 44 are broken and the bottom portion 36 becomes disconnected from the closure. The bottom portion is then free to drop down onto the transfer ring 60, so providing clear evidence that the closure has been partially or wholly unscrewed. It is hoped to so arrange the security ring and its relationship with the closure and the container that this tamperevident function is effective before the vacuum is broken in the container and the button 34 is released. A further security function of the security ring becomes effective if an attempt is made to pry off the closure using axial movement without rotation. The barbs 46 and the land 54 will then engage one another at their respective surfaces 50 and 58 (Fig 2), so that, as before, closure removal can only be accomplished by rupturing the bridges 44.

When the closure is being first applied to the container, it may happen that two of the barbs 46 coincide angularly with the ribs 65. Those barbs may then ride along the ribs and remain there until freed by rotary movement of the closure through a small angle, whereupon they will spring resiliently

into the groove 52 in readiness for engaging the side faces 66 of the ribs as described above.

From the foregoing it will be understood that the security ring is primarily required to operate by rotational movement of the closure on the container neck, the usual small helix angle and axial extent of the screw thread 16 of the PT closure 10 making it unsatisfactory or impractical to rely upon axial movement for achieving operation.

Operation of the security ring by rotational movement itself requires that the security ring be securely held by the closure body 11 against rotation, despite softening of the polymeric material of the security ring and a tendency for it to contract both bodily and radially inwardly when the closed container and its contents are subjected to thermal sterilisation. Figs 4 to 8 illustrate how secure non-rotary attachment of the security ring to the closure body may be achieved.

The various parts of Fig 4 are scrap views of the security ring as it appears before incorporation into the closure and as seen from above. In Fig 4(a) the top face 70 of the top portion 38 of the security ring is moulded with a pattern of raised and intersecting ribs 72A. Fig 4(b) illustrates a variant in which the face 70 is formed with raised ribs 72B which are separate and angularly inclined in relation to the axis XX, and Fig 4(c) illustrates a further variant having raised ribs 72C which are separate and radially directed. In the variant shown in fig 4(d) the face 70 is moulded with a pattern of raised pimples 73. In each of the four variants, and as shown, the top portion is formed with a chamfer 74 around the outside periphery of its face 70. As shown in Fig 2, in the assembled closure this chamfer ensures that a free space is available outside the face 70 to prevent compressive stresses in the polymer material of the security ring from generating substantial and radially inwardly directed forces in the locality of the face.

The enlargement 26 of the closure skirt 20 has an annular and substantially plane top panel or shoulder 76 with which the face 70 engage. The shoulder is attached to the curl 24 by a cylindrical panel 78 which bounds the outside periphery of the top portion 38 of the security ring. In order to ensure a high effective resistance to relative movement along its interface with the face 70, the shoulder is itself treated by forming its lower surface 80 with a thin lining 82 of the plastisol compound of the lining 30. As will shortly become apparent, the lining 82 is formed at the same time as the lining 30, and constitutes an extension of that lining. However, whereas the lining 30 extends continuously around the closure, by virtue of the manner in which it is formed the lining 82 is discontinuous around the shoulder.

Fig 5 shows the lower surface 80 of the shoulder 76 as it is presented to the top face 70 of the security ring, the cylindrical panel 78 being shown in section. From that figure it will be seen that the plastisol lining 82 has the form of a series of regularly spaced and generally triangular formations 84 having their apices located on the inner periphery of the shoulder. A narrow annular margin 86 lacking any lining compound is located around the outside periphery of the shoulder and serves a similar function to the chamfer 74 (as previously described). Also, surplus plastisol material from the moulding operation is distributed on a circular locus in the spaces between adjacent formations 84, so as randomly to form partial bridges 90.

The triangular formations 84 and partial bridges 90 are created from uncured plastisol compound which is deposited on the shoulder 76 at the same time as compound is being placed on the closure panel 18 and the cylindrical part 31 of the skirt 20. In known manner liquid plastisol compound is flowed into the base periphery of the inverted closure body while the latter is rotating, and a heated moulding punch is subsequently inserted into the body so as by hydraulic action to distribute the compound where required. In a conventional PT closure these operations are performed on the completed closure, that is, after the usual inward curl has been formed on the skirt. For the purposes of the present invention, however, the operations are performed before the curl 24 is formed or the security ring is in place, and at a time when the metal destined to create the curl still forms a cylindrical extension of the skirt.

Reference is now made to Fig.6 in which for ease of understanding the axial dimensions have been magnified. The moulding punch 89 has a central portion 90 arranged for entering the cylindrical part 31 of the skirt. The central portion has an end face 92 which is conventionally shaped so as to confine compound flow to the desired outer marginal region of the closure panel. Adjacent the end face the moulding punch is generally cylindrical and dimensioned for distributing compound over the cylindrical part 31 of the skirt, where the screw thread of the closure is to be formed. Above its cylindrical surface, that is to say, remote from the end face 92, the central portion has a frustoconical surface 94 dimensioned so as when the moulding punch is in its desired operating position in relation to the closure to engage the elbow 96 (Fig 2) which is formed between the cylindrical and enlarged portions (31, 26) of the skirt. The engagement then serves to provide centralisation for the moulding punch; in addition, it serves to control the flow of compound onto the shoulder 76 by providing a peripheral seal except at a plurality of regularly spaced locations cor-

responding to the apices of the triangular formations 84 (Fig 5). Compound flow at these locations is provided by small axially directed grooves 98 which are formed along the surface 94 so as to bypass the sealing engagement between the moulding punch and the closure at the elbow 96. Compound which is forced through these grooves by hydraulic pressure when the moulding punch is inserted moves in a generally radially outward direction along an interface which is formed with the shoulder 76 by a contoured annular face 100 of the tool surrounding the frustoconical face 94.

The face 100 has relieved triangular areas 102 which are destined to form the formations 84 of the lining 82 and which accordingly communicate with the grooves 98 for supply of plastisol lining compound. Channels 104 extending on a circular locus between the triangular areas provide a sump for accommodating surplus compound by forming the partial bridges 90 previously mentioned. The moulding punch is mounted on a shaft 106 by which it may be moved into and out of the closure. Except at the triangular areas 102, the face makes face-to-face contact with the lower surface 80 of the shoulder 76 when the moulding punch is in its fully inserted position.

As previously mentioned, the lining compound is placed in position before the curl 24 is formed or the security ring placed in position. The compound is then cured in an oven, and in known manner expands or puffs generally in proportion to the depth of compound. The security ring is then placed in position within the skirt enlargement 26, and the rollers of a rotating curling head (not shown) are engaged with the upstanding free edge 28 of the skirt and in known manner form the curl 24 by causing progressive inward deformation of a terminal part of the enlargement which projects beyond the top portion 38 of the security ring. The axial forces exerted on the skirt during this time are substantial, with the result that the free edge 28 of the skirt becomes deeply indented in the security ring, and a substantial residual compressive stress remains in the security ring after curling is completed.

Firm support for the closure while curling is taking place is provided by an annular support tool (not shown) within which the closure is received. The tool supports the closure by engagement with the exterior surface of the shoulder 76 of its skirt enlargement 26, the generally plane nature of the shoulder 76 ensuring that the axial forces exerted by the curling head are substantially localised to the skirt enlargement, and no deformation of the closure occurs except where required.

After curling, the closure is ready for dispatch and fitting to a container as previously described. By virtue of the residual compressive stress within

the top portion 38 of the security ring and its firm engagement by the curl 24, no substantial relative movement of the security ring in relation to the container body is possible despite any thermal sterilisation process to which the closed container may be subjected. Above the portion 38 of the security ring, lack of any substantial relative motion is ensured by the enhanced frictional resistance generated at the interface by generally random indenting engagement of the moulded formations 72 of Fig 4 with the triangular areas 84 of lining compound (including the partial bridges 90) of Figure 5. At the bottom of the ring portion 38 relative movement is resisted by the deep indentation of the polymer material by the free edge 28 of the skirt, which for that purpose may be serrated if desired; in addition, the ring portion 38 has a bulbous annular rib 110 moulded on its underside where the curl is to be formed. This rib substantially fills the curl and in particular provides substantial resistance to radial movement of the security ring in relation to the closure body despite contraction of the plastics material of the security ring which may occur.

When indenting the security ring as described above, the free edge 28 of the skirt creates for itself a conforming recess in the security ring. Figure 2A shows the engagement of the free edge in the security ring to a greater scale than is shown in Fig 2, the conforming recess being particularly denoted in Fig 2A by the reference numeral 200. Also clearly apparent from Fig 2A is the substantial degree of interference, axially of the closure, which exists between the free edge of the closure body and the part of the security ring lying within the curl and including the rib 110. This interference provides the substantial resistance to relative radial movement which is provided at the bottom of the top portion 38 of the security ring and discussed in the preceding paragraph.

Fig 7 shows a modification of the embodiment previously described, in which the security ring is moulded with a recess 200' into which the free edge 28' of the closure metal can be entered by the curling operation. The recess defines a bulbous and downwardly extending shoulder portion 202' of the security ring. After the curl has been formed this portion lies within, and generally conforms to the curl. It has a substantially cylindrical inner surface 206 in engagement with a generally cylindrical terminal portion 210 of the curl which carries the free edge 28'.

By virtue of this engagement the portion 202', and thereby the security ring as a whole, is restrained from inward movement caused by contraction of the security ring during thermal processing. Applicants have found that, because the degree of penetration of the free edge into the security ring is

substantially increased over the degree of penetration which can be reliably achieved by simple indentation as in the embodiment described above with reference to Figs 1 to 6, the retention of the security ring by the curl is made more secure than before, and any tendency for the security ring to move inwardly past the free edge 28' along generally chordal lines is prevented.

In the embodiment described above with reference to Figs 1 to 6 substantial axially directed compressive stress is created in the top portion 38 of the security ring by the curling operation. In this embodiment, however, the axial stress produced by curling is substantially smaller, the radial location of the top portion 38' being primarily achieved by the firm, essentially radial, engagement of the shoulder portion 202' between the opposed wall of the curl, assisted by the greater penetration of the curl in the top portion 38'. Whilst, as in the previous embodiment, the cooperating surfaces of the security ring and the shoulder may be arranged to provide an enhanced resistance to relative movement between them, Applicants believe that adequate location may be achieved even if, as shown, neither one of those surfaces is specially formed or treated; specifically, in Fig 7 the upper surface 70' of the security ring is essentially plane, and the gasket compound 30' is not extended to cover the shoulder 76' but instead is terminated short of the elbow 96' between the shoulder 76' and the thread-forming part of the skirt - (compare Fig 2).

As will now be understood from Figs 7 and 8, in the described modification a substantial resistance to rotary movement of the security ring in the closure body is generated within the recess 200' by crushing or indenting engagement of the free edge 28' of the closure body with a plurality of spaced ribs or lands 212 each of which rises from the base of the recess and spans the opposed walls of the recess. Usually the free edge 28' will have "ears" which are naturally formed undulations created when the closure body is being pressed from a flat metal blank; these ears will tend to enhance the resistive effect of the engagement of the free edge 28' with the ribs or lands 212.

In the variant of the security ring shown in Fig 9 the ribs or lands are replaced by a succession of shallow and regular formations 214 having plane, inclined flanks and these formations are randomly indented by the free edge 28' of the recess 200' to a greater or lesser degree, depending upon the extent of "earring". In a further variant, not illustrated in the drawings, the base of the recess is flat (peripherally of the closure), and the free edge 28' indents it over all or a substantial part of its length. Alternatively or additionally, the free edge 28' itself may be artificially formed with serrations or undulations of suitable form for engagement with the

plastics material at the base of the recess 200'.

Claims

- 5 1. A screw closure for a container, which comprises a metal closure body (11) having a closure panel (18) to overlie the mouth of a container, and a skirt (20) which is peripherally attached to the closure panel, has a generally cylindrical region on which a screw thread formation is formed or formable for engagement with the container, and extends axially beyond the generally cylindrical region to an inward curl (24) which includes the terminal edge (28) of the closure metal, the closure further including a plastics security ring (36) which has a top portion (38) held captive by the closure skirt and which extends axially beyond and interiorly of the curl to an integral bottom portion (40) capable of making locked engagement with the container, the security ring having at least one line of weakening (42,44) along which it is rupturable to enable the closure to be unscrewed from the container whilst leaving visible evidence of the same, characterised in that the terminal edge (28) of the closure metal faces generally axially of the closure towards the closure panel, and for holding the top portion captive the closure skirt has a substantially radial annular shoulder (76) which is disposed in spaced opposition to the inward curl (24) intermediate the curl and the generally cylindrical region, the top portion of the security ring having a radial annular top surface (70) beneath the annular shoulder (76) and the terminal edge of the closure metal having been deformed against an exterior lower shoulder portion of the top portion of the security ring, whereby the top portion (38) of the security ring (36) is compressively engaged axially of the closure in a non-rotary manner between the shoulder and the curl thereof, a radially outward part of the exterior lower shoulder portion being received within the curl and surrounding a recess (200,200') in which the said terminal edge (28,28') of the closure metal is disposed so as to restrain the shoulder portion against inward movement.
- 50 2. A screw closure according to claim 1, characterised in that the recess (200) is formed by indenting engagement of the free edge (28) of the closure metal with the plastics material of the security ring (36).
- 55 3. A screw closure according to claim 1, characterised in that the recess (200') is formed in the security ring (36) prior to attachment of the



substantially increased over the degree of penetration which can be reliably achieved by simple indentation as in the embodiment described above with reference to Figs 1 to 6, the retention of the security ring by the curl is made more secure than before, and any tendency for the security ring to move inwardly past the free edge 28' along generally chordal lines is prevented.

In the embodiment described above with reference to Figs 1 to 6 substantial axially directed compressive stress is created in the top portion 38' of the security ring by the curling operation. In this embodiment, however, the axial stress produced by curling is substantially smaller, the radial location of the top portion 38' being primarily achieved by the firm, essentially radial, engagement of the shoulder portion 202' between the opposed wall of the curl, assisted by the greater penetration of the curl in the top portion 38'. Whilst, as in the previous embodiment, the cooperating surfaces of the security ring and the shoulder may be arranged to provide an enhanced resistance to relative movement between them, Applicants believe that adequate location may be achieved even if, as shown, neither one of those surfaces is specially formed or treated; specifically, in Fig 7 the upper surface 70' of the security ring is essentially plane, and the gasket compound 30' is not extended to cover the shoulder 76' but instead is terminated short of the elbow 96' between the shoulder 76' and the thread-forming part of the skirt - (compare Fig 2).

As will now be understood from Figs 7 and 8, in the described modification a substantial resistance to rotary movement of the security ring in the closure body is generated within the recess 200' by crushing or indenting engagement of the free edge 28' of the closure body with a plurality of spaced ribs or lands 212 each of which rises from the base of the recess and spans the opposed walls of the recess. Usually the free edge 28' will have "ears" which are naturally formed undulations created when the closure body is being pressed from a flat metal blank; these ears will tend to enhance the resistive effect of the engagement of the free edge 28' with the ribs or lands 212.

In the variant of the security ring shown in Fig 9 the ribs or lands are replaced by a succession of shallow and regular formations 214 having plane, inclined flanks and these formations are randomly indented by the free edge 28' of the recess 200' to a greater or lesser degree, depending upon the extent of "earring". In a further variant, not illustrated in the drawings, the base of the recess is flat (peripherally of the closure), and the free edge 28' indents it over all or a substantial part of its length. Alternatively or additionally, the free edge 28' itself may be artificially formed with serrations or undulations of suitable form for engagement with the

plastics material at the base of the recess 200'.

Claims

- 5 1. A screw closure for a container, which comprises a metal closure body (11) having a closure panel (18) to overlie the mouth of a container, and a skirt (20) which is peripherally attached to the closure panel, has a generally cylindrical region on which a screw thread formation is formed or formable for engagement with the container, and extends axially beyond the generally cylindrical region to an inward curl (24) which includes the terminal edge (28) of the closure metal, the closure further including a plastics security ring (36) which has a top portion (38) held captive by the closure skirt and which extends axially beyond and interiorly of the curl to an integral bottom portion (40) capable of making locked engagement with the container, the security ring having at least one line of weakening (42,44) along which it is rupturable to enable the closure to be unscrewed from the container whilst leaving visible evidence of the same, characterised in that the terminal edge (28) of the closure metal faces generally axially of the closure towards the closure panel, and for holding the top portion captive the closure skirt has a substantially radial annular shoulder (76) which is disposed in spaced opposition to the inward curl (24) intermediate the curl and the generally cylindrical region, the top portion of the security ring having a radial annular top surface (70) beneath the annular shoulder (76) and the terminal edge of the closure metal having been deformed against an exterior lower shoulder portion of the top portion of the security ring, whereby the top portion (38) of the security ring (36) is compressively engaged axially of the closure in a non-rotary manner between the shoulder and the curl thereof, a radially outward part of the exterior lower shoulder portion being received within the curl and surrounding a recess (200,200') in which the said terminal edge (28,28') of the closure metal is disposed so as to restrain the shoulder portion against inward movement.
- 50 2. A screw closure according to claim 1, characterised in that the recess (200) is formed by indenting engagement of the free edge (28) of the closure metal with the plastics material of the security ring (36).
- 55 3. A screw closure according to claim 1, characterised in that the recess (200') is formed in the security ring (36) prior to attachment of the



security ring to the closure body (11).

4. A screw closure according to claim 3, characterised in that the security ring (36) has a plurality of spaced formations (212,214) which are located within the recess (200') and indented by the free edge (28') of the closure metal. 5
5. A screw closure according to any preceding claim, characterised in that the free edge (28,28') of the closure metal is formed with a plurality of undulations or serrations. 10
6. A screw closure according to any preceding claim, characterised in that in radial cross-section the shoulder (76) of the skirt (20) is of generally sinuous form, having a downwardly bowed annular portion within an upwardly bowed annular portion. 15 20
7. A screw closure according to any preceding claim characterised in that the shoulder (76) of the skirt (20) and the top portion (38) of the security ring (36) are each adapted at the interface between them so as to present an enhanced resistance to mutual relative movement at least in the circumferential direction. 25
8. A screw closure according to any preceding claim, characterised in that the shoulder (76) of the skirt (20) has a lining (82) of a gasket compound for engagement by the top portion (38) of the security ring (36). 30 35
9. A screw closure according to claim 8, characterised in that the lining (82) on the shoulder (76) is a continuation of a lining formed on the generally cylindrical region of the skirt (20) and in which a said screw thread is formed or formable by a said container. 40
10. A screw closure according to any preceding claim, characterised in that for engagement with the shoulder (76) of the skirt (20) the top portion of the security ring is moulded with a raised formation or formations (72A,72B,72C,73). 45
11. A screw closure according to any preceding claim, characterised in that the line of weakening of the security ring (36) comprises a gap (42) separating the top and bottom portions (38,40), and a plurality of rupturable integral bridges (44) spanning the gap. 50 55
12. A screw closure according to any preceding claim, characterised in that it is arranged for the bottom portion (40) of the security ring (36) to become detached and to separate from the top portion (38) on rupturing of the security ring along the line or lines of weakening.
13. A screw closure according to any preceding claim, characterised in that for making locked engagement with the container the bottom portion (40) of the security ring (36) has a plurality of circumferentially spaced and inwardly projecting, integral barbs or teeth (46).
14. A method of attaching a plastics security ring to a depending tubular skirt of a metal closure body in the manufacture of a screw closure, the method comprising:
 - a) forming the tubular skirt (20) with a generally radial annular shoulder (76) and a generally cylindrical portion (78) extending from the outer periphery of the shoulder to the free edge (28) of the closure metal;
 - b) locating a top portion (38) of the security ring (36) within the generally cylindrical portion and against the shoulder, a part of the generally cylindrical portion then projecting beyond a lower surface of said top portion of the security ring; and
 - c) bending the free edge of the closure metal inwardly under said lower surface of the top portion of the security ring, characterised in that:

the top portion of the security ring has a radial annular upper surface (70) which is located below the radial annular shoulder (76) of the skirt (20), and in that

step c) is carried out by forming an inward curl (24) so as to cause the free edge of the closure metal to become located in a recess (200,200') in the lower surface of the top portion of the security ring whilst compressing the same against the shoulder axially of the closure, a radially outward part of the lower surface being received within the curl (24), the security ring thereby being secured to the metal skirt in a non-rotary manner with its said outward part restrained against inward movement.
15. A method according to claim 14, characterised in that for enhancing the frictional resistance between the shoulder (76) and the top portion (38) of the security ring (36) at the interface between them it includes the additional step of forming a lining (82) of a gasket compound on the shoulder prior to location of the security ring thereagainst.



16. A method according to claim 15, for a PT closure, characterised in that the said shoulder lining (82) is formed as an extension of the lining in which the screw thread for the closure is formed or formable. 5
17. A method according to claim 16, characterised in that said shoulder lining (82) and the said screw thread forming lining are formed substantially simultaneously by insertion of a moulding punch (89) into the closure. 10
18. A method of making a package for a food product which requires heat treatment after filling and closing, characterised by the steps of: 15
- a) forming a tubular skirt 20 with a generally radial annular shoulder (76) and a generally cylindrical portion (78) extending from the outer periphery of the shoulder to the free edge (28) of the metal closure; 20
 - b) providing a security ring having a top portion (38) with a radial annular upper surface (70) and an integral bottom portion; 25
 - c) locating the top portion (38) of the security ring (36) within the generally cylindrical portion with the upper surface (70) against the shoulder, a part of the generally cylindrical portion then projecting beyond a lower surface of said top portion of the security ring; 30
 - d) forming an inward curl (24) from the projecting part of the generally cylindrical portion so as to cause a free edge of the closure metal to become located in a recess (200,200') in the underside of the top portion of the security ring whilst compressing the same against the shoulder axially of the closure, a radially outward part of the lower surface being received within the curl (24), the security ring thereby being secured to the metal skirt in a non-rotary manner with its said outward part restrained against inward movement; 35
 - filling a container with food product; 45
 - securing the closure formed by steps a) to d) to the container; and
 - heat treating the package thus formed. 50

Patentansprüche

1. Schraubdeckel für einen Behälter, der einen metallischen Deckelhauptteil (11) mit einer Deckelplatte (18), die zum Überdecken der Öffnung eines Behälters dient, und einem Mantel (20) aufweist, welcher am Umfang an der Deckelplatte befestigt ist, einen allgemein zylindrischen Bereich aufweist, an welchem ein

Schraubgewinde zum Eingriff mit dem Behälter ausgebildet oder ausbildbar ist, und welcher sich axial über den allgemein zylindrischen Bereich bis zu einer Einwärtsbördelung (24) erstreckt, die die Endkante (28) des Deckelmetalls bildet, wobei der Deckel ferner einen Kunststoffsischerungsring (36) aufweist, der einen vom Deckelmantel festgehaltenen Ober- teil (38) aufweist und sich axial über die Bördelung hinaus und weiter innen als diese zu einem fest damit verbundenen Unterteil (40) erstreckt, der in Verriegelungseingriff mit dem Behälter kommen kann, wobei der Sicherungs- ring wenigstens eine Schwächungslinie (42, 44) aufweist, längs der er zerreißbar ist, um ein Abschrauben des Deckels vom Behälter zu ermöglichen, wobei ein sichtbarer Beweis des Abschraubens zurückbleibt, dadurch gekenn- zeichnet, daß die Endkante (28) des Deckel- metalls allgemein in Axialrichtung des Deckels zur Deckelplatte hinweist, und daß zum Fest- halten des Oberteils der Deckelmantel eine im wesentlichen radiale Ringschulter (76) aufweist, die im Abstand gegenüber der Einwärtsbörde- lung (24) zwischen der Bördelung und dem allgemein zylindrischen Bereich angeordnet ist, wobei der Oberteil des Sicherungs- rings eine radiale ringförmige Oberfläche (70) unterhalb der Ringschulter (76) aufweist und die Endkan- te des Deckelmetalls gegen einen äußeren un- teren Schulterteil des Oberteils des Siche- rungsrings verformt ist, wodurch der Oberteil (38) des Sicherungs- rings (36) in Axialrichtung des Deckels undrehbar zwischen der Schulter und der Bördelung desselben in Druckeingriff steht, wobei ein radial äußerer Teil des äuße- ren unteren Schulterteils innerhalb der Börde- lung aufgenommen ist und eine Ausnehmung (200, 200') umfaßt, in der die Endkante (28, 28') des Deckelmetalls derart angeordnet ist, daß sie den Schulterteil entgegen Einwärtsbe- wegung festhält.

2. Schraubdeckel nach Anspruch 1, dadurch ge- kennzeichnet, daß die Ausnehmung (200) durch eindringenden Eingriff der freien Kante (28) des Deckelmetalls in das Kunststoffmateri- al des Sicherungs- rings (36) gebildet ist.

3. Schraubdeckel nach Anspruch 1, dadurch ge- kennzeichnet, daß die Ausnehmung (200') im Sicherungsring (36) vor der Befestigung des Sicherungs- rings am Deckelhauptteil (11) aus- gebildet ist.

4. Schraubdeckel nach Anspruch 3, dadurch ge- kennzeichnet, daß der Sicherungsring (36) eine Anzahl von in gegenseitigen Abständen ange-



- ordneten Gebilden (212, 214) aufweist, die innerhalb der Ausnehmung (200') angeordnet sind und in die die freie Kante (28') des Deckelmetalls eindringend eingreift.
5. Schraubdeckel nach einem der vorangehenden Ansprüche, dadurch gekennzeichnet, daß die freie Kante (28, 28') des Deckelmetalls mit einer Anzahl von Wellungen oder Zahnungen ausgebildet ist. 5
 6. Schraubdeckel nach einem der vorangehenden Ansprüche, dadurch gekennzeichnet, daß im radialen Querschnitt die Schulter (76) des Mantels (20) allgemein Sinusform besitzt und einen nach unten gekrümmten Ringteil innerhalb eines aufwärts gekrümmten Ringteils aufweist. 10
 7. Schraubdeckel nach einem der vorangehenden Ansprüche, dadurch gekennzeichnet, daß die Schulter (76) des Mantels (20) und der Oberteil (38) des Sicherungsringes (36) jeweils an der Trennfläche zwischen denselben geeignet sind, einen besseren Widerstand gegen Relativverschiebung wenigstens in Umfangsrichtung zu bieten. 15
 8. Schraubdeckel nach einem der vorangehenden Ansprüche, dadurch gekennzeichnet, daß die Schulter (76) des Mantels (20) eine Auskleidung (82) einer Dichtungsverbindung zum Eingriff mit dem Oberteil (38) des Sicherungsringes (36) aufweist. 20
 9. Schraubdeckel nach Anspruch 8, dadurch gekennzeichnet, daß die Auskleidung (82) der Schulter (76) eine Fortsetzung einer Auskleidung ist, die im allgemein zylindrischen Bereich des Mantels (20) ausgebildet ist, und in der ein Schraubengewinde der genannten Art ausgebildet ist oder durch einen Behälter der genannten Art formbar ist. 25
 10. Schraubdeckel nach einem der vorangehenden Ansprüche, dadurch gekennzeichnet, daß zum Eingriff mit der Schulter (76) des Mantels (20) der Oberteil des Sicherungsringes mit einem erhabenen Gebilde oder erhabenen Gebilden (72A, 72B, 72C, 73) geformt ist. 30
 11. Schraubdeckel nach einem der vorangehenden Ansprüche, dadurch gekennzeichnet, daß die Schwächungslinie des Sicherungsringes (36) aus einem Spalt (42) besteht, der Ober- und Unterteil (38, 40) voneinander trennt, sowie aus einer Anzahl von abreißbaren einstückigen Brücken (44), welche den Spalt überspannen. 35
 12. Schraubdeckel nach einem der vorangehenden Ansprüche, dadurch gekennzeichnet, daß er so ausgebildet und angeordnet ist, daß der Unterteil (40) des Sicherungsringes (36) vom Oberteil beim Zerreißen des Sicherungsringes längs der Schwächungslinie oder Schwächungslinien gelöst und getrennt wird. 40
 13. Schraubdeckel nach einem der vorangehenden Ansprüche, dadurch gekennzeichnet, daß zur Erzeugung eines Verriegelungseingriffs mit dem Behälter der Unterteil (40) des Sicherungsringes (36) eine Anzahl von in Umfangsrichtung in gegenseitigem Abstand angeordneten und nach innen stehenden einstückigen Haken oder Zähnen (46) aufweist. 45
 14. Verfahren zum Befestigen eines Kunststoff-Sicherungsringes an einem abstehenden rohrförmigen Mantel eines metallischen Deckelhauptteils bei der Herstellung eines Schraubdeckels, welches Verfahren umfaßt: 50
 - a) Ausbilden eines rohrförmigen Mantels (20) mit einer allgemein radialen Ringschulter (76) und einem allgemein zylindrischen Teil (78), der sich vom Außenumfang der Schulter zur freien Kante (28) des Deckelmetalls erstreckt;
 - b) Anordnen eines Oberteils (38) des Sicherungsringes (36) innerhalb des allgemein zylindrischen Teils und anliegend an der Schulter, wobei ein Teil des allgemein zylindrischen Teils sodann über eine untere Fläche des Oberteils des Sicherungsringes vorsteht; und
 - c) Biegen der freien Kante des Deckelmetalls nach innen unter die untere Fläche des Oberteils des Sicherungsringes, 55
 dadurch gekennzeichnet, daß:

der Oberteil des Sicherungsringes eine radiale ringförmige obere Fläche (70) aufweist, die unterhalb der radialen Ringschulter (76) des Mantels (20) angeordnet ist, und daß Schritt c) durchgeführt wird, indem eine Einwärtsbördelung (24) derart geformt wird, daß die freie Kante des Deckelmetalls in einer Ausnehmung (200, 200') in der Unterfläche des Oberteils des Sicherungsringes angeordnet wird, während derselbe in Axialrichtung des Deckels gegen die Schulter gedrückt wird, wobei ein radial äußerer Teil der Unterfläche innerhalb der Einbördelung (24) aufgenommen wird, und der Sicherungsring dadurch am Metallmantel undrehbar festgelegt wird, wobei sein äußerer Teil gegen Einwärtsbewegung festgehalten wird.



15. Verfahren nach Anspruch 14, dadurch gekennzeichnet, daß zur Verbesserung des Reibungswiderstandes zwischen der Schulter (76) und dem Oberteil (38) des Sicherungsringes (36) an der Trennfläche zwischen denselben der weitere Schritt durchgeführt wird, daß eine Auskleidung (82) einer Dichtungsverbindung an der Schulter vor dem Anordnen des Sicherungsringes in Anlage an derselben gebildet wird.

16. Verfahren nach Anspruch 15 für einen Druck-Drehverschluß (PT closure), dadurch gekennzeichnet, daß die Schulterauskleidung (82) als Fortsetzung der Auskleidung gebildet ist, in der das Schraubengewinde für den Deckel geformt oder formbar ist.

17. Verfahren nach Anspruch 16, dadurch gekennzeichnet, daß die Schulterauskleidung (82) und die das Schraubengewinde formende Auskleidung durch Einsetzen eines Gießdorns (89) in den Deckel im wesentlichen gleichzeitig ausgebildet werden.

18. Verfahren zum Herstellen einer Verpackung für Nahrungsmittelprodukte, bei welchem eine Wärmebehandlung nach dem Füllen und Verschließen erforderlich ist, gekennzeichnet durch folgende Schritte:

a) Formen eines rohrförmigen Mantels (20) mit einer allgemein radialen Ringschulter (76) und einem allgemein zylindrischen Teil (78), der sich vom Außenumfang der Schulter zur freien Kante (28) des Metalldeckels erstreckt;

b) Vorsehen eines Sicherungsringes mit einem Oberteil (38), der eine radiale ringförmige Oberfläche (70) aufweist, und einem einstückigen Unterteil;

c) Anordnen des Oberteils (38) des Sicherungsringes (36) innerhalb des allgemein zylindrischen Teils innerhalb der oberen Fläche (70) anliegend an der Schulter, wobei ein Teil des allgemein zylindrischen Teils sodann über eine Unterfläche des Oberteils des Sicherungsringes vorsteht;

d) Formen einer Einwärtsbördelung (24) vom vorstehenden Teil des allgemein zylindrischen Teils, um eine freie Kante des Deckelmetalls zu veranlassen, in einer Ausnehmung (200, 200') in der Unterseite des Oberteils des Sicherungsringes angeordnet zu werden, während derselbe in axialer Richtung des Deckels gegen die Schulter gedrückt wird, ein radial äußerer Teil der Unterfläche innerhalb der Bördelung (24) aufgenommen wird und der Sicherungsring

dadurch am Metallmantel undrehbar festgelegt wird, wobei sein äußerer Teil gegen eine Einwärtsbewegung festgehalten wird; Füllen eines Behälters mit einem Nahrungsmittelprodukt;

Festlegen des durch die Schritte a) bis d) gebildeten Deckels am Behälter; und Warmbehandeln der so gebildeten Verpackung.

Revendications

1. Fermeture à vis pour récipient, qui comprend un corps de fermeture en métal (11) comportant un panneau de fermeture (18) pour recouvrir l'ouverture d'un récipient, et une bordure (20) qui est fixée à la périphérie au panneau de fermeture, comporte une zone généralement cylindrique sur laquelle un pas de vis est formé ou peut être formé pour engagement avec le récipient, et s'étend axialement au-delà de la zone généralement cylindrique jusqu'à une portion roulée vers l'intérieur (24) qui comprend le bord terminal (28) de la fermeture en métal, la fermeture comprenant en outre une bague de sûreté en plastique (36) qui comporte une portion supérieure (38) retenue par la bordure de fermeture et qui s'étend axialement au-delà et vers l'intérieur de la portion roulée jusqu'à une portion inférieure d'un seul tenant (40) capable de réaliser un engagement par verrouillage avec le récipient, la bague de sûreté comportant au moins une ligne de fragilisation (42, 44) le long de laquelle elle peut être rompue pour permettre à la fermeture d'être dévissée du récipient tout en laissant une preuve visible de ce dévissage, caractérisée en ce que le bord terminal (28) de la fermeture en métal donne généralement axialement par rapport à la fermeture vers le panneau de fermeture, et pour retenir la portion supérieure la bordure de fermeture comporte un épaulement annulaire sensiblement radial (76) qui est disposé en face de la portion roulée vers l'intérieur (24) et espacé de celle-ci entre la portion roulée et la zone généralement cylindrique, la portion supérieure de la bague de sûreté comportant une surface supérieure annulaire radiale (70) sous l'épaulement annulaire (76) et le bord terminal de la fermeture en métal ayant été déformé contre une portion d'épaulement inférieure externe de la portion supérieure de la bague de sûreté, de sorte que la portion supérieure (38) de la bague de sûreté (36) soit engagée par compression axialement par rapport à la fermeture sans rotation entre l'épaulement et la portion roulée, une partie radialement vers l'extérieur de la portion d'épaulement



- ment inférieure externe étant reçue au sein de la portion roulée et entourant un évidement (200, 200') dans lequel ledit bord terminal (28, 28') de la fermeture en métal est disposé de manière à empêcher la portion d'épaulement de se déplacer vers l'intérieur.
2. Fermeture à vis selon la revendication 1, caractérisée en ce que l'évidement (200) est formé par engagement par enfoncement du bord libre (28) de la fermeture en métal avec la matière plastique de la bague de sûreté (36).
 3. Fermeture à vis selon la revendication 1, caractérisée en ce que l'évidement (200) est formé dans la bague de sûreté (36) avant la fixation de la bague de sûreté au corps de fermeture (11).
 4. Fermeture à vis selon la revendication 3, caractérisée en ce que la bague de sûreté (36) comporte une pluralité de portions espacées (212, 214) qui sont situées au sein de l'évidement (200') et enfoncées par le bord libre (28) de la fermeture en métal.
 5. Fermeture à vis selon l'une quelconque des revendications précédentes, caractérisée en ce que le bord libre (28, 28') de la fermeture en métal est doté d'une pluralité de portions ondulées ou crantées.
 6. Fermeture à vis selon l'une quelconque des revendications précédentes, caractérisée en ce qu'en section transversale radiale l'épaulement (76) de la bordure (20) a une forme généralement sinueuse, comportant une portion annulaire courbée vers le bas au sein d'une portion annulaire courbée vers le haut.
 7. Fermeture à vis selon l'une quelconque des revendications précédentes, caractérisée en ce que l'épaulement (76) de la bordure (20) et la portion supérieure (38) de la bague de sûreté (36) sont adaptés à l'interface qui se situe entre eux afin de présenter une résistance accrue à un mouvement relatif mutuel au moins dans le sens de la circonférence.
 8. Fermeture à vis selon l'une quelconque des revendications précédentes, caractérisée en ce que l'épaulement (76) de la bordure (20) comporte un revêtement (82) d'un composé de joint d'étanchéité pour engagement par la portion supérieure (38) de la bague de sûreté (36).
 9. Fermeture à vis selon la revendication 8, caractérisée en ce que le revêtement (82) sur l'épaulement (76) est un prolongement d'un revêtement formé sur la zone généralement cylindrique de la bordure (20) et dans laquelle ledit pas de vis est formé ou peut être formé pour engagement par ledit récipient.
 10. Fermeture à vis selon l'une quelconque des revendications précédentes, caractérisée en ce que pour engagement avec l'épaulement (76) de la bordure (20) la portion supérieure de la bague de sûreté est dotée par moulage d'une ou de plusieurs portions exhaussées (72A, 72B, 72C, 73).
 11. Fermeture à vis selon l'une quelconque des revendications précédentes, caractérisée en ce que la ligne de fragilisation de la bague de sûreté (36) comprend un espace (42) séparant les portions supérieure et inférieure (38, 40), et une pluralité de ponts d'un seul tenant cassables (44) traversant l'espace.
 12. Fermeture à vis selon l'une quelconque des revendications précédentes, caractérisée en ce qu'il est prévu que la portion inférieure (40) de la bague de sûreté (36) se détache et se sépare de la portion supérieure (38) lors de la rupture de la bague de sûreté le long de la ligne ou des lignes de fragilisation.
 13. Fermeture à vis selon l'une quelconque des revendications précédentes, caractérisée en ce que pour réaliser un engagement par verrouillage avec le récipient la portion inférieure (40) de la bague de sûreté (36) comporte une pluralité de picots ou dents (46) d'un seul tenant, espacés à la circonférence et se projetant vers l'intérieur.
 14. Procédé de fixation d'une bague de sûreté en plastique à une bordure tubulaire dépendante d'un corps de fermeture en métal dans la fabrication d'une fermeture à vis, le procédé comprenant les opérations consistant à :
 - (a) doter la bordure tubulaire (20) d'un épaulement annulaire généralement radial (76) et d'une portion généralement cylindrique (78) s'étendant de la périphérie externe de l'épaulement au bord libre (28) de la fermeture en métal;
 - (b) disposer une portion supérieure (38) de la bague de sûreté (36) au sein de la portion généralement cylindrique et contre l'épaulement, une partie de la portion généralement cylindrique se projetant alors au-delà d'une surface inférieure de ladite por-



tion supérieure de la bague de sûreté; et
(c) courber le bord libre de la fermeture en métal vers l'intérieur sous ladite surface inférieure de la portion supérieure de la bague de sûreté, caractérisé en ce que :

la portion supérieure de la bague de sûreté comporte une surface supérieure annulaire radiale (70) qui est située sous l'épaulement annulaire radial (76) de la bordure (20), et en ce que l'opération (c) est effectuée en formant une portion roulée vers l'intérieur (24) de manière que le bord libre de la fermeture en métal soit situé dans un évidement (200, 200') dans la surface inférieure de la portion supérieure de la bague de sûreté tout en comprimant celle-ci contre l'épaulement axialement par rapport à la fermeture, une partie radialement vers l'extérieur de la surface inférieure étant reçue au sein de la portion roulée (24), la bague de sûreté étant ainsi fixée à la bordure de métal sans rotation avec sa partie radialement vers l'extérieur ne pouvant se déplacer vers l'intérieur.

15. Procédé selon la revendication 14, caractérisé en ce que pour accroître la résistance par frottement entre l'épaulement (76) et la portion supérieure (38) de la bague de sûreté (36) à l'interface entre eux est prévue l'opération supplémentaire de formation d'un revêtement (82) d'un composé de joint d'étanchéité sur l'épaulement avant de placer la bague de sûreté contre celui-ci.

16. Procédé selon la revendication 15, pour fermeture à pression et rotation caractérisé en ce que ledit revêtement (82) d'épaulement constitue un prolongement du revêtement dans lequel le pas de vis pour la fermeture est formé ou peut être formé.

17. Procédé selon la revendication 16, caractérisé en ce que ledit revêtement (82) d'épaulement et ledit revêtement de formation de pas de vis sont formés sensiblement simultanément par insertion d'un poinçon de moulage (89) dans la fermeture.

18. Procédé de fabrication d'un récipient pour un produit alimentaire qui requiert un traitement thermique après remplissage et fermeture, caractérisé par les opérations consistant à :

(a) former une bordure tubulaire (20) avec un épaulement annulaire généralement radial (76) et une portion généralement cylindrique (78) s'étendant de la périphérie externe de l'épaulement au bord libre (28) de la fermeture en métal;

(b) doter une bague de sûreté comportant une portion supérieure (38) d'une surface supérieure annulaire radiale (70) et d'une portion inférieure d'un seul tenant;

(c) disposer la portion supérieure (38) de la bague de sûreté (36) au sein de la portion généralement cylindrique avec la surface supérieure (70) contre l'épaulement, une partie de la portion généralement cylindrique se projetant alors au-delà d'une surface inférieure de ladite portion supérieure de la bague de sûreté;

(d) former une portion roulée vers l'intérieur (24) à partir de la partie en projection de la portion généralement cylindrique afin qu'un bord libre de la fermeture en métal soit situé dans un évidement (200, 200') dans la surface inférieure de la portion supérieure de la bague de sûreté tout en comprimant celle-ci contre l'épaulement axialement par rapport à la fermeture, une partie radialement vers l'extérieur de la surface inférieure étant reçue au sein de la portion roulée (24), la bague de sûreté étant ainsi fixée à la bordure de métal sans rotation avec sa partie radialement vers l'extérieur ne pouvant se déplacer vers l'intérieur;

remplir un récipient du produit alimentaire;
fixer la fermeture formée par les opérations a) à d) au récipient; et
traiter thermiquement l'emballage ainsi formé.

