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(54) IMPROVEMENTS IN OR RELATING TO CLOSURE CAPS

(71) We, METAL CLOSURES LIMITED, a British Company, of Bromford Lane, West Bromwich, Staffordshire, do hereby declare the invention, for which we pray that a patent may be granted to us, and the method by which it is to be performed, to be particularly described in and by the following statement:—

The present invention relates to combinations of metal closure caps with containers having externally threaded necks and in particular to combinations of closures with containers of which the contents are held under vacuum or under pressure or are hermetically sealed to prevent all contact with atmosphere until the contents are required for use.

To give one example of a problem which the present invention aims to provide a solution, it is known that in self-service stores there is a tendency for some shoppers to attempt to inspect the goods contained in screw-topped jars by unscrewing the closure and the results of such tampering can be extremely serious with vacuum-packed products, such as sieved baby-foods, which must be maintained unexposed to air until they are used. To a lesser extent tampering with the closure of carbonated beverages leads to undesirable results, because of loss of gas through loosening of the closure.

Although the use of any closure, which cannot be removed until a security band has been broken away from the main part of the closure cap might be thought to provide a complete answer to the problem arising out of tampering with a screw-threaded pressure- or vacuum-sealed container if the closure cap were applied to the container under pressure or vacuum sealing conditions, this is found in practice not to give entirely dependable results under all conditions. This class of closure is eminently satisfactory for their original purpose of assuring the purchaser that the contents of the container have not been adulterated or diluted after leaving the premises of the original packer. However, unless specially modified, it cannot afford the ultimate consumer a guarantee that the contents reach him in a satisfactory condition.

[Price 5s. 0d. (25p)]

One well known form of closure cap of the type requiring the separation of a security band is the well-known Pilferproof closure cap described in British Patent No. 369,494. The closure cap described in that Patent is applied to an externally screw-threaded bottle by a rolling process and is formed of a shell of thin ductile metal, such as thin gauge aluminium, in which is carried a gasket which seals against the top end of the bottle around its mouth. The shell has a top and a skirt formed of an upper portion, which, although it may be prethreaded, is usually thread-rolled into engagement with thread on the bottle neck during application to a bottle, and a lower portion which, in application to a bottle, is rolled into engagement under a rib on the bottle neck to act as a security band. An interrupted slit line forms a boundary between the upper portion and lower portion of the skirt so that they are connected to each other only by a series of angularly spaced bridges, arranged between the individual slits in the interrupted slit line. When a sufficient torque is applied to the upper portion of the closure cap in the unscrewing direction, the bridges rupture, leaving the security band anchored under the rib on the bottle neck.

As noted above, the lower portion of the skirt of the closure cap is rolled under a rib or collar on the bottle neck during application to provide a locking ring or security band. It is impossible to be certain that the seal between a "pilferproof" closure cap and a glass container will not be broken before the bridges rupture and it is, in fact, possible to break the seal in many instances without rupturing the bridges at all. This could be particularly dangerous with vacuum-sealed foodstuffs because the intact closure cap disguises the fact that the contents of the container have been exposed to atmosphere.

According to the present invention the above noted difficulty may be overcome by a combination of a metal closure cap with a container having an externally screw-threaded neck, said neck having an upwardly open mouth, a cylindrical portion of substantially

constant diameter extending from the screw-thread to the top end of the neck, and a circular rib on the neck below said screwthread, said metal closure cap being a metal shell, comprising a top cover, a skirt depending from said top, a security band connected by a series of small spaced bridges to the lower margin of said skirt, said security band having a lower edge portion turned under said rib to restrain said security band against upward motion, said skirt comprising a lower portion in threaded engagement with said container thread and an upper portion of lesser diameter surrounding said cylindrical portion of the container neck, the space between the lesser diameter portion of the closure shell and the cylindrical portion of the container neck being filled to such extent with a compressed mass of a soft flowed-in gasket material bonded to the metal shell that said material is in contact with the cylindrical portion of the container neck through a zone extending for at least 1 mm. below the top end of said cylindrical surface.

There is a tendency for the necks of all commercial glass bottles and jars to have a degree of ovality. The gasket material used must in consequence essentially have some resilience, so as to maintain sealing contact with the container within the angular movement of the closure cap permitted by the security band. A gasket bonded to the closure and formed *in situ* from flowed-in polyvinyl chloride compound, having a microporous structure, is found satisfactory for that purpose.

It is found desirable that friction forces between the gasket material and the material of the container, usually glass shall be as low as is consistent with obtaining a good seal, so as to keep the opening torque, required for removal of the closure, to a low value.

It is most convenient to form the lesser diameter portion of the closure cap during its application to a bottle by reducing its diameter at the junction between the top and skirt, so as to press firmly against the external cylindrical surface the portion of the gasket supported by the skirt to increase the vertical length of the seal and to compensate for any ovality of said cylindrical surface. The skirt of the closure is initially of a single diameter such as to enable it to be fitted over the thread on the neck of the bottle and the forming may take place simultaneously with the rolling of thread in the closure skirt in the conventional manner. Alternatively, these operations may be phased to take place consecutively during the application of the closure to the container.

A combination of closure cap and container in accordance with the invention is illustrated in the accompanying drawings, wherein:

Figure 1 is a semi-diagrammatic section illustrating the principle of the invention,

Figure 2 shows a combination of closure cap, partly in section, and screw-threaded container in accordance with the invention and

Figure 3 shows a similar cap before application.

In Figure 1 the glassware shown has a cylindrical sealing surface *a*, thread *b* and rib *c* on the outer surface of its neck, in addition to a top end sealing surface *d*. The closure cap is in the form of a metal shell A which is engaged with thread *b* and rib *c*. A line of weakness B is provided in the skirt of the shell A and the engagement of the edge of the skirt of the shell A under rib *c* limits the free upward movement of the shell to a certain distance until the lower part of the skirt has been severed from the upper part of the skirt along the line B.

A line of sealing contact between the shell A and the cylindrical surface *a* is provided at C by means of readily compressible gasket material. So long as the distance between line C and the top or outer end of the cylindrical surface *a* is in excess of the distance of free upward movement of the shell, the seal between closure and bottle will remain intact so long as there is no severance along the line of weakness B. (This assumes that the gasket material is a readily compressible, but resilient material so that loss of sealing contact will not occur on limited angular movement of the shell A, as might happen if the surface *a* was somewhat oval and the gasket material somewhat hard).

Although in Figure 1, a line of sealing contact is shown at C for illustrative purposes, sealing contact between the closure shell A and the glassware in a combination in accordance with the invention is provided by soft compressible gasket material from the line C up to the top or outer end of the cylindrical surface *a* and extends round and over the sealing surface *d*. A deep zone of contact between the gasket and the glassware gives greater protection against possible disruption of the seal due to damage to the shell during transit.

The closure cap illustrated in Figure 3 before application to a container comprises a metal shell 1, made as a pressing from light gauge aluminium container sheet and comprises a top 2 and a skirt 7. The skirt has a locking ring or security band portion 4 at its lower edge, which is marked off by an interrupted slit line 5, in which are provided bridges 6. The skirt 7 is adapted to fit fairly closely over the threads on the neck of the glassware, when such threads are at the maximum size permitted by the glassware specification. The skirt 7 is deformed by thread rolling to engage with the threads on the glassware when applied to a glassware container. A gasket 12 is formed *in situ* in the angle between the top 2 and the skirt.

During its application to a container the diameter of skirt 7 of the closure shell shown in Figure 3 is reduced at 27 (Figure 2) to press the gasket material firmly into sealing engagement with the cylindrical outer surface

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of the container neck and in particular to ensure that, despite any unevenness of the container neck or the gasket material, the sealing contact between the gasket material and the container neck extends to a sufficient depth of at least 1 mm.

In the construction of Figures 2 and 3 it will be seen that the gasket material extends down the vertical wall for a substantial distance before the application of the closure cap to the container and a substantial portion of it is supported by the top end of the skirt.

Where the containers, to which the closures are to be applied, are returnable, the locking ring may be constructed so as to break away automatically from the container as part of the unscrewing operation. Particularly the pilfer-proof closure shell may be provided with the arrangement of bridges and with the weakened or severed locking ring described in our Patent No. 974,564. In that construction the security band is split at a cut line, which extends obliquely across the security band and meets the interrupted slit line, which defines the upper edge of the security band, at the gap between two bridges, which are positioned very close to each other. One of these bridges is stronger than all the other bridges, and does not rupture when the closure shell is unscrewed, so that the security band remains attached to the skirt by the one unbroken bridge.

Referring to Figures 2 and 3 it will be seen that in the thread rolling operation the material of the skirt 7 is deformed to engage with the thread on the container neck. Simultaneously with the formation of the thread, the lower marginal portion of the locking ring or security band 4 is tucked under a rib on the container by known means. The known means apply metal closure caps of the present general type to a container in such a manner that the cap can only be turned through a very small angle before it is arrested by the contact of the security band 4 with the undersurface of the rib on the glass container and further turning movement is possible thereafter only by

applying sufficient torque to rupture the bridges 6.

In the present construction the longitudinal movement occasioned by turning the closure cap between the limits of movement, which are possible without breaking the bridges 6, is insufficient to break the seal between the gasket and the cylindrical surface on the outside of the container neck.

WHAT WE CLAIM IS:—

1. A combination of a metal closure cap with a container having an externally screw-threaded neck, said neck having an upwardly open mouth, a cylindrical portion of substantially constant diameter extending from the screwthread to the top end of the neck, and a circular rib on the neck below said screwthread, said metal closure cap being a metal shell, comprising a top cover, a skirt depending from said top, a security band connected to a series of small spaced bridges to the lower margin of said skirt, said security band having a lower edge portion turned under said rib to restrain said security band against upward motion, said skirt comprising a lower portion in threaded engagement with said container thread and an upper portion of lesser diameter surrounding said cylindrical portion of the container neck, the space between the lesser diameter portion of the closure shell and the cylindrical portion of the container neck being filled to such extent with a compressed mass of a soft flowed-in gasket material bonded to the metal shell that said material is in contact with the cylindrical portion of the container neck through a zone extending for at least 1 mm. below the top end of said cylindrical surface.

2. A combination of a container and a metal closure cap substantially as illustrated in Figure 3.

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