Sept. 20, 1966 L. LISTER ET AL 3,273,736

CROWN CLOSURES

Filed April 17, 1963

Fig. 1.

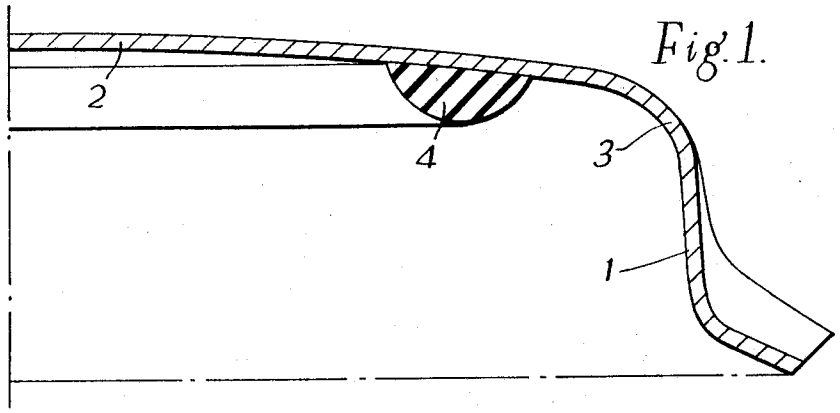


Fig. 2.

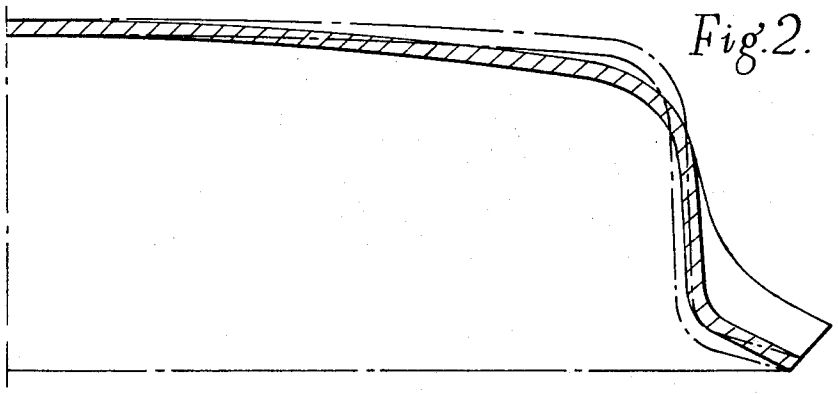
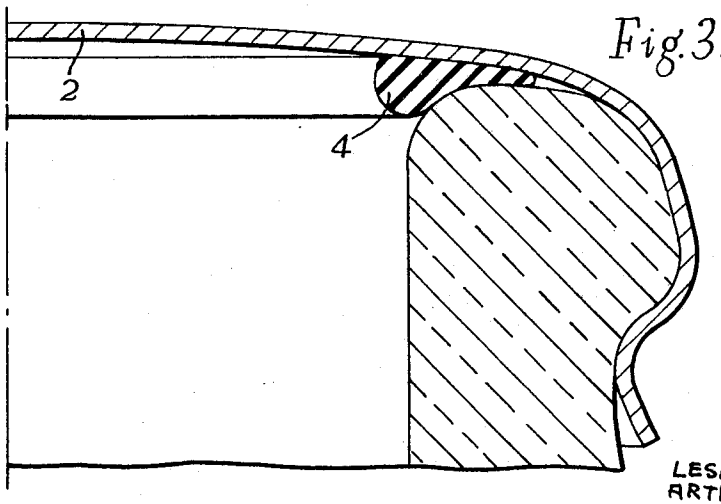


Fig. 3.



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CROWN CLOSURES

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3 Claims. (Cl. 215—40)

The present invention relates to crown closures and in particular to crown closures made from aluminium, which term includes aluminium alloys of the class used for conainers and bottle closures.

There is a universally accepted standard for the dimensions and contours of bottle necks intended to be sealed by means of crown closures and all the critical dimensions hereinafter set forth are determined by reference to such accepted standard.

The crown closures herein described were developed to fit bottles whose dimensions conform to those specified in British Standard Specification B.S. 1918, Part II, 1959: Glass container finishes; Crown finish. However, in practice it has been found that they are suitable for bottles whose dimensions lie outside the ranges specified in this specification.

A conventional crown closure is made of a tin plate shell and a relatively thick cork wad liner to form a seal between the shell and the bottle mouth. A tin plate shell is objectionable in certain respects, particularly in that the edge of the shell is raw and rough and somewhat prone to rust. Aluminium, on the other hand, is substantially incorrodible and the cut edges of an aluminium crown closure shell are much softer.

In order to compete successfully with a conventional tin plate crown closure, an aluminium crown closure should desirably be made from a smaller initial blank because of the greater cost of the metal, and likewise the cost of the sealing gasket used in an aluminium crown closure must be kept as low as possible.

It has already been proposed to make a crown closure having an aluminium shell, which is provided with a gasket in the form of a ring of a flowed-in polymeric substance, bonded to the interior of the closure shell. Previous attempts at making an aluminium crown closure in this way have not proved wholly successful.

We have now found that economically satisfactory aluminium crown closures can be produced by careful correlation of the gauge and configuration of the aluminium shell and of the gasket dimensions and position. Basically the crown closure of the present invention as characterised in that the ring-shaped plastic gasket, formed of soft, readily deformable, polymeric material, is positioned to seal against the radiused surface which joins the top end sealing surface of the bottle with the inside surface of the bottle neck.

Although it is in no way essential to the functioning of the crown closure, as a practical matter, an aluminium crown closure must have, before application to a bottle, the same overall dimensions, i.e., diameter and overall height, as a corresponding tin plate crown closure to obtain commercial acceptance, since users require closures which can be fed through standard crown cork application machinery, which they already possess. Thus, the overall height and maximum diameter must be the same as for a standard tin plate crown closure to enable the aluminium crown closure to be fed through the same machinery, although the contour of the aluminium crown closure will be different. Thus, it will be appreciated that the elimination of the thick wad-type gasket used in tin plate crown closures means that the height of the skirt of the shell is less in the case of an aluminium crown closure than it is in the case of a tin plate crown closure. In consequence, the top of the aluminium crown closure shell is given a greater degree of doming so as to maintain the overall height of the shell the same. The radius of the corner angle between the skirt and top of the shell is preferably greater than is used in the case of tin plate.

It will, however, be appreciated that where modification of the bottling machinery is acceptable to the user, the doming of the top of the closure shell need not be so pronounced.

According to the present invention a crown closure comprises an aluminium shell having a fluted skirt and a top portion, the aluminium shell being of a thickness of 0.010–0.013 inch (0.25–0.325 mm.), the corner radius between the skirt and the top portion being 0.08–0.10 inch (2.0–2.5 mms.), and a ring-shaped flowed-in gasket, bonded to the top portion, said gasket having a weight of not less than 160 mgms. (in the uncured state), an internal diameter of 0.56–0.64 inch (14.0–16.0 mms.), and a gasket width of 0.08–0.14 inch (2.0–3.5 mms.).

In order to reduce the size of the blank used as compared with the standard tin plate blank, the corner radius between the skirt and the crown is much more rounded than is used conventionally and this enables a blank of 1.44–1.47 inches (36.6–37.3 mms.) diameter to be employed as compared with a standard blank of 1.50 inches (38.1 mms.), thus giving a saving of metal of about 4–8%. The crown of the shell is formed, where the shell is to be applied by existing machinery, with a radius of about 3 to 5 inches (75.0–125.0 mms.) to give the extra doming necessary to give the desired overall height.

For most applications it is necessary for the undersurface of the crown closure to be lacquered and in practice the surface is usually lacquered. In any event, there must be a good bond between the gasket and the metal, so that in the case of a lacquered crown the lacquer must be chosen so as to bond firmly both with the metal and with the gasket compound. Without a good bond the gasket may be dislodged from the shell under the application of pressure so that the crown will fail.

A particularly good bond may be achieved by using aluminium strip that is first anodised to give an oxide film of a thickness of approximately 0.3 micron, the pores in this film being sealed by means of a lacquer which after stoving gives good adhesion to the gasket compound.

A suitable lacquer may be a modified vinyl/phenolic type, whilst the gasket is preferably formed of a soft polyvinyl chloride compound. Both the lacquer and the gasket material must be chemically inert, non-toxic and flavour free. The gasket material is preferably flowed under pressure into the closure shell as a viscous liquid, which is cured by a simple heating operation. The cured gasket material must be able to resist the heat and pressure which are generated during pasteurisation. One suitable gasket material is sold under the name "Darex" No. 3556, whilst a suitable lacquer is Holdens No. 17633.

In one example using a shell of 0.012 inch (0.3 mm.) thickness and a gasket of 180 mgms. weight, a closure made in accordance with the present invention was found to have a pressure retention of 170/180 lbs./sq. inch both under cold conditions and at the pasteurisation temperature used for beer.

One construction of crown closure made in accordance with the invention is illustrated in the accompanying drawings, wherein:

FIGURE 1 is a partial section of a crown closure made in accordance with the invention.

FIGURE 2 is a similar section showing the shell of the crown closure of FIGURE 1 superimposed on the shell of a conventional tin plate crown closure shell.

FIGURE 3 is a partial section of the crown closure of FIGURE 1 fitted to a bottle.

In the construction shown in FIGURE 1 a crown closure made in accordance with the present invention comprises a shell, pressed from lacquer-sealed anodised aluminum container sheet of a thickness of 0.012 inch (0.3 mms.). The shell comprises a fluted skirt **1**, a top portion **2** which is domed on a curvature of about 4 inches (100 mms.) and a radiused bend **3** between the top portion **2** and the skirt **1**, the radiused bend having a radius of about 0.08 inch (2 mms.). The overall height of the shell is about 0.22 inch (6.6 mms.) which is substantially identical with that of a standard tin plate crown closure.

A plastic ring-shaped gasket **4** is formed by depositing 180 mgms. weight of a soft polyvinyl chloride gasket compound, which is cured in situ. The internal diameter of the ring is about 0.59 inch (15 mms.) and the width of the ring is about 0.12 inch (3 mms.), so that its external diameter is about 0.83 inch (21 mms.). Since the material of the gasket ring is soft and accommodates itself to the space available between the hard shell and the hard bottle, the actual position and shape of the gasket ring is not too critical. It does, however, tend to take on a curved shape owing to the normal surface forces acting on the material when deposited in its original uncured state.

It will be seen that, when the crown closure is applied to a bottle, the material of the sealing gasket conforms to the rounded curvature between the interior of the neck of the bottle and the top surface which surrounds the bottle mouth. This is a very important feature of the invention.

It will readily be appreciated that the pressure of the contents of the bottle tend to lift the top portion of the aluminum shell, thus tending to separate it from the bottle mouth. Since the pressure forces act in all directions, they tend to push the soft gasket material outwardly into the generally wedge-shaped space between the top portion of the shell and the radiused surface

on the bottle and thus the sealing gasket accommodates itself to maintain a seal with the bottle.

We claim:

1. An apparatus comprising, in combination, a standard bottle having a neck terminated at a standard mouth configuration including radiused surface joining the conventional top end sealing surface and the substantially cylindrical inside surface of the bottle neck, and a crown closure secured to said bottle over said mouth comprising an aluminum shell having a thickness of between 0.010 and 0.013 inch (0.252–0.325 mm.) including a top portion and a fluted skirt, an annular gasket formed of flowed-in plastic material and having a weight of not less than 160 mgms. (in the uncured state) and a width of from 0.08 to 0.14 inch (2.0–3.5 mms.), bonded to the underside of said top portion, the inside diameter and width of the gasket being such that the gasket seals against an annular portion of said radiused surface of the standard bottle, the inner diameter of said gasket being substantially equal to, or less than, the inner diameter of said inner surface of said bottle neck.

2. Apparatus according to claim **1** formed from a blank of a diameter of from 1.44 to 1.47 inches (36.6–37.3 mms.).

3. Apparatus according to claim **1** wherein the top portion is domed to a curvature of from 3 to 5 inches (75.0 to 125.0 mms.).

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