May 19, 1953 E. GRONEMEYER ET AL 2,639,057

CONTAINER CLOSURE

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Fig 1

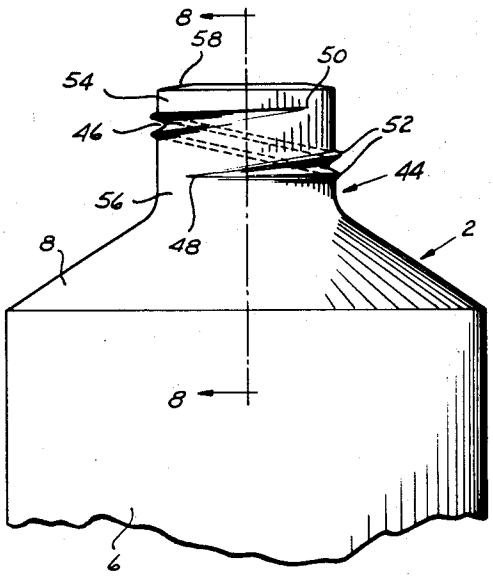


Fig 3

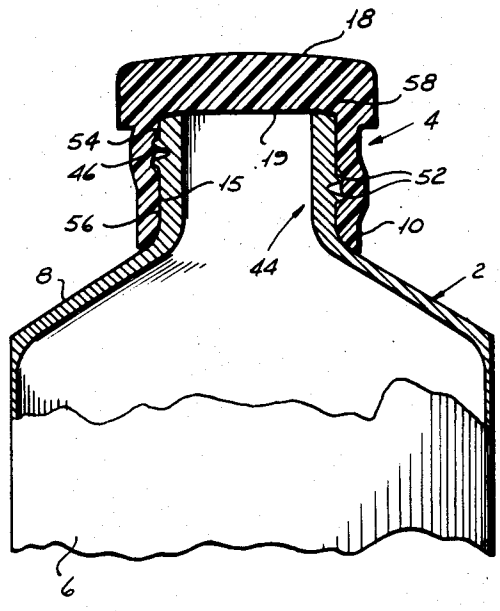
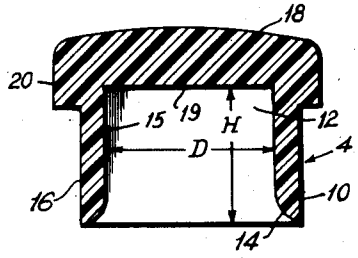


Fig 2



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CONTAINER CLOSURE

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4 Claims. (Cl. 220—42)

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This invention relates to an improved closure for containers, and more particularly it relates to the improved combination of a cap and a container having a neck thereon.

The invention has among its objects the provision of a novel combination of a cheaply made, easily applied, cap with a novel neck of a container, the cap being of such construction and cooperating with the neck of the container in such manner that although the cap is easily assembled on such neck and disassembled therefrom it provides a tight, shake-proof, seal therewith.

The invention has as a further object the provision of the combination of a cap of the indicated character with a container having a neck thereon, the cap and neck cooperating in such manner that the cap may be applied to and removed from the container neck by an essentially straight-line movement along the axis of the container neck.

Yet another object of the invention resides in the provision of the combination of the container neck and cap of such design that a fluid tight seal is provided between the neck and the cap even though the latter is not fully applied to the neck, or has been partially removed therefrom, whereby a seal is provided between cap and neck over an appreciable range of travel of the cap on the neck.

These and further objects of the invention will be more readily apparent upon consideration of the following description and illustration of preferred embodiments of the invention.

The container shown in the accompanying drawings, to which the cap of the invention is applied by way of illustration, is of the collapsible tube type in which are sold toothpastes, shaving creams, unguents, and the like. Whereas the cap, and the combination of such cap with the container neck, of the invention find perhaps their greatest advantages when employed on a collapsible tube such as shown, it is to be understood that the cap of the invention and its combination with the container neck may be employed on various other types of containers.

Containers such as collapsible tubes have long been provided with necks having screw threads on the outer surfaces thereof, the closure member being a cap made, for example, of hard rubber, metal, or other hard material, such cap screwing down upon the neck of the container. Such cap requires an additional sealing disc or member which is interposed between the upper inner surface of the cap and the upper lip of the

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neck of the container, where the seal is formed. It will be appreciated that such prior closure forms a seal only when the cap is threaded into fully engaged position upon the container neck so that the gasket or sealing member is tightly pressed against the lip of the neck of the container. Thus, should the cap be loosened somewhat, accidentally or otherwise, there is no longer provided a seal at the container neck. Furthermore, the gasket or sealing disc is very frequently lost and is usually removed and thrown away by the user upon his first opening of the tube. Thereafter, of course, no seal is possible with the cap, the cap merely acting as a cover when reapplied to the container neck. The screw type of closure is further disadvantageous because of the time required to remove it and also to replace it.

The use of the gasket or sealing disc is further disadvantageous, particularly when the material in the collapsible tube is adapted to be used with a tubular applicator applied to the neck of the container, since quite frequently the gasket remains on the lip of the container upon removal of the cap, thereby effectively sealing the contents after the applicator has been applied to the tube and the contents subjected to pressure by squeezing the tube. Very frequently, when the disc becomes so positioned in the applicator the tube finally bursts.

The container closure of the present invention is designed to overcome the above pointed out disadvantages of prior art closures. Briefly, the invention comprises providing a container having a neck thereon, the outer surface of the neck being generally cylindrical, such neck having at least one annular zone thereon which is smooth and uninterrupted. The container closure, which has a sleeve portion designed to telescope over the above described neck and form a seal therewith, is made from an elastomer which is relatively stiff. The internal dimension of the skirt of the cap in that zone adapted to cooperate with the smooth annular uninterrupted zone on the neck is such that normally, that is, when it is not applied to the container neck, it is slightly less in diameter than the diameter of such smooth uninterrupted annular zone of the neck. The sleeve portion of the closure yields sufficiently when it is applied to the container neck, by motion which may be essentially straight-line along the axis of the neck, so as tightly to engage and form a seal with the smooth uninterrupted annular zone on the neck.

Means are provided on the container neck, or on the container neck and the removable closure

member, to provide marked frictional interengagement between the removable closure member and the container neck at a zone other than the sealing zone, whereby the closure member is firmly held in sealing position on the neck when fully applied thereto. The frictional engaging means is of such character, however, that it does not prevent the ready and easy removal of the closure member from the container neck, when desired, nor impede the application of the member to the neck.

In the illustrated embodiment such frictional engaging means takes the form of a zone in the form of a helical land on the container neck frictionally engaging the normally smooth inner wall of the sleeve or skirt of the closure member, the cap and neck having such relation to each other that the cap may be applied to or removed from the container, if desired, by straight-line axial movement of the cap on the neck.

The invention will be more readily understood by reference to the accompanying drawings in which:

Fig. 1 is a view in side elevation of the neck of the container employed in the preferred embodiment of the invention;

Fig. 2 is a view in vertical axial section through a cap made in accordance with the invention, the cap being shown removed from the container neck; and

Fig. 3 is a view in vertical section through the container neck of Fig. 1, such neck having a cap such as shown in Fig. 2 engaged thereon.

The container illustrated is a collapsible tube the main body of which is designated 6, and the conical portion at its upper end connecting such body to the neck thereof is designated 8. In the embodiment of Figs. 1 and 3 the raised portion on the external surface of the neck of the container frictionally engaging the cap is in the form of a screw thread of relatively steep pitch, such thread continuing throughout substantially greater than 360° around the container neck.

The two parallel lands 52 of the screw thread upon the container neck 44 are formed, in this instance, by means of a rolling tool between which and the container neck there is relative rotation and relative travel axially of the container neck. The rolling tool may, for example, be brought into contact initially with the container tube at the bottom terminal point 48. From such point the tool will continue in contact with the container tube, being pressed progressively deeper into it until it reaches its maximum depth after a rotation, for example, of approximately 45°. The roll then continues at such depth with respect to the neck until it is gradually withdrawn, withdrawal starting from a point beginning, for example, 45° in advance of its terminal point 50. It will be apparent that lands 52 will have a minimum radial height at points 50 and 48, the height thereof increasing from such points until the location of maximum depth of the rolling tool forming the groove between lands is reached. The top terminal point 50 lies an appreciable distance below the lip 58 of the neck, thereby providing an upper smooth annular sealing zone 54 of substantial width. In the embodiment shown there is a similar lower smooth annular sealing zone 56, which lies below the bottom terminal point 48 of the ridges 52.

The cap shown in Fig. 2, generally designated 4, is provided with a depending sleeve or skirt portion 10, which telescopes over the container neck, and with a transverse imperforate top portion 18, from which the skirt depends. Such cap may be made by the injection molding of elastomeric plastic material. The cavity 12 within skirt 10 is approximately cylindrical in section, the vertical elements of its interior wall 15 being parallel in its main portion until it reaches the lower, internally flared, end 14 thereof. The outer wall 16 of skirt 10 lies generally parallel to the inner wall of the cavity, as shown. The cap is provided with an outwardly projecting annular flange 20 which, as shown, is roughened so that it may be grasped easily by the user. The upper inner wall of transverse portion 18 of the cap is designated 19. Cavity 12 of the cap has a normal diameter, that is, when the cap is removed from the container neck, which is designated D in Fig. 2, the height of the cavity from the lower edge of the skirt to surface 19 being designated H.

The dimensions D and H of the cap shown in Fig. 2 are made such that, when the cap is placed upon the neck of the container in the manner shown in Fig. 3, the internal flared zone 14 of the cap will rest substantially in contact with the juncture of the neck 44 and the conical portion 8 when the lip 58 of the neck is contacted by the upper inner surface 19 of the cap. The internal diameter D of portion 10 of the cap is made slightly smaller than the diameter of the outer annular zone 54 of the neck. In a typical example, a toothpaste tube of conventional size, the ridges 52 lie approximately .005'' beyond the smooth surfaces of zones 56 and 54. The internal diameter D of the cap is made, in this instance, .002'' smaller than the diameter of zone 54.

When the cap is made of the relatively stiff elastomeric plastic material known as polyethylene, such construction allows the cap to be placed upon the tube by a straight-line movement, the inner wall of the skirt 10 being forced progressively outwardly by the ridges 52. When the cap is fully applied it has the appearance shown in Fig. 3, in which the zones of skirt 10 opposite ridges 52 are bulged slightly outwardly, the bulge being visible, or at least measurable, on the outer wall of the skirt 10. The elasticity of the skirt portion of the cap is such that a fluid tight seal is effected between the confronting surface 15 and the annular zone 54 of the cap at the upper end of the neck, and also between the bottom surface 15 of the skirt and the lower annular zone 56.

The cap 4 may be applied to the neck 44 by purely longitudinal movement along the axis of the neck, but it is simpler with the construction shown and claimed to thrust the cap onto the neck while turning the cap with respect thereto. Although ridges 52 do not appreciably permanently indent the inner surface of the skirt 10 of the cap, frictional contact between the ridges and such inner surface 15 is sufficient to give the cap a feed onto the neck as the cap is turned in the direction of the hand of the ridges 52. Sealing contact in this embodiment of the closure is effected between the inner wall 15 of the skirt of the cap and the upper and lower smooth annular sealing zones 54 and 56 of the container neck.

It will be apparent that the zone containing raised portions on the outer surface of the neck of the container is capable of considerable variation both as to structure and to the manner in which it is formed. It need not be formed, for

example, by means of an indenting rolling tool, but may be pressed up out of the surface of the neck as a whole without any corresponding depressions bordering it.

It is preferred to make the removable closure member of the above described embodiments of polyethylene, a commercially available product, one brand of which, sold under the trade-mark "Polythene," is made by the Du Pont Company. Such plastic is durable and sufficiently stiff and rigid for the purpose at hand, but still is markedly resilient and is soft enough to form a very efficient seal with the container neck. In addition, such material is immune or substantially immune from attack by almost any known reagent. Another elastomeric plastic material which may be employed for the cap or container closure member is polyvinyl acetyl, one brand of which, also made by the Du Pont Company, is designated "Butacite." Other suitable elastomeric plastic materials from which the container closure member of the invention may be made include cellulose acetate, cellulose nitrate, ethylcellulose, polyvinyl formal, polyvinyl acetate, polyvinyl butyral, and vinylidene chloride. It is to be understood that the above list of materials from which the container closure may be made is illustrative only and is not exhaustive.

The container closure of the invention is simple and cheaply made. Operations required on the neck of the container are no more complicated nor expensive than the customary screw threading now employed in connection with the conventional screw cap. The cap is durable and may be applied repeatedly without substantial, if any, loss of its sealing effect with the container neck.

Although we have described and illustrated a preferred embodiment of the container closure of the invention and have indicated an illustrative application thereof, it is to be understood that the invention is not limited to such construction since it may be varied considerably as to details. It is further to be understood that the closure of the invention is capable of use to advantage in many other applications than that indicated. The scope of the invention is therefore defined by the appended claims.

We claim as new the following:

1. The combination with a container having a neck, said neck having an axial opening therethrough, of a removable cap closing the axial opening through the neck of the container and effecting a temporary seal with the neck, the neck being approximately cylindrical over the major portion of its length, the neck having within an annular zone intermediate the ends thereof at least one relatively low ridge in the form of a helical land thereon encircling the neck, the annular zone of the outer surface of the neck outwardly of the ridge being smooth and uninterrupted, the outer end of the helical land starting at the level of the outer smooth annular zone and increasing gradually in radial height, said cap being cup shaped and including a sleeve telescoped over the neck of the container, the sleeve being made of a relatively stiff elastomeric material, the sleeve having an annular zone on its inner surface which elastically engages the uninterrupted annular zone on the container neck completely therearound and throughout substantially the length of such zone on the neck, the inner surface of the sleeve, in another zone, overlying and frictionally engaging the ridge on the container neck, the sleeve when removed from the container neck having an inner surface throughout the major portion of its length which is substantially cylindrical, the diameter of such cylindrical inner surface being slightly smaller than the diameter of the smooth annular uninterrupted zone on the container neck at the outer end thereof.

2. The combination with a container having a neck, said neck having an axial opening therethrough, said neck having an outer lip in the form of an annular zone lying substantially in a plane at right angles to the axis of the neck, of a removable cap closing the axial opening through the neck of the container and effecting a temporary seal with the neck, the neck being approximately cylindrical over the major portion of its length, the neck having within an annular zone intermediate the ends thereof at least one relatively low ridge in the form of a helical land thereon encircling the neck, the annular zones of the outer surface of the neck outwardly and inwardly of the ridge being smooth and uninterrupted, the outer and inner ends of the helical land starting and ending, respectively, at the level of the outer and inner smooth annular zones, respectively, the helical land increasing gradually in radial height in opposite directions from the outer and inner ends thereof, said cap being cup shaped and including a sleeve telescoped over the neck of the container, the sleeve being made of a relatively stiff elastomeric material, the sleeve having an annular zone on its inner surface which elastically engages the uninterrupted annular zone on the container neck completely therearound and throughout substantially the length of such zone on the neck, the inner surface of the sleeve, in another zone, overlying and frictionally engaging the ridge on the container neck, the inner top surface of the cap having at least the annular zone thereof confronting the lip of the neck lying in a plane substantially at right angles to the axis of the sleeve of the cap, said annular zone on the inner top surface of the cap effecting a seal with the lip of the neck of the container, the sleeve when removed from the container neck having an inner surface throughout the major portion of its length which is substantially cylindrical, the diameter of such cylindrical inner surface being slightly smaller than the diameter of the smooth annular uninterrupted zone on the container neck at the outer end thereof.

3. The combination with a container having a neck, said neck having an axial opening therethrough, of a removable cap closing the axial opening through the neck of the container and effecting a temporary seal with the neck, the neck being approximately cylindrical over the major portion of its length, the neck having a first annular zone of substantial axial length adjacent its outer end, said first zone being smooth and uninterrupted, the neck having a second annular zone inwardly of the first zone, there being a relatively low ridge in the form of a helical land of large pitch on such second zone, the surface of the second zone, except at the land, lying on substantially the same cylinder as the first zone, said cap being cup shaped and including a sleeve for telescoping over the neck of the container, the sleeve being made of a relatively stiff elastomeric material, the sleeve having an annular zone on its inner surface for elastically engaging the first annular zone on the container neck

completely therearound and throughout substantially the length of such zone on the neck, the inner surface of the sleeve, in another zone, overlying and frictionally engaging the ridge on the second zone of the container neck when the cap is applied to the neck, the sleeve when removed from the container neck having an inner surface throughout the major portion of its length which is substantially cylindrical and an inner diameter which is slightly smaller than the diameter of the first annular zone on the container neck at the outer end thereof.

4. The combination with a container having a neck, said neck having an axial opening therethrough, said neck having an outer lip lying substantially in a plane at right angles to the axis of the neck, of a removable cap closing the axial opening through the neck of the container and effecting a temporary seal with the neck, the neck being approximately cylindrical over the major portion of its length, the neck having a first annular zone of substantial axial length adjacent its outer end, said first zone being smooth and uninterrupted, the neck having a second annular zone intermediate the ends thereof and inwardly of the first zone, there being a relatively low ridge in the form of a helical land of large pitch on such second zone, the surface of the second zone, except at the land, lying on the same cylinder as the first zone, said cap being cup shaped and including a sleeve for telescoping over the neck of the container, the sleeve being made of a relatively stiff elastomeric material having an annular zone on its inner surface for elastically engaging the uninterrupted first annular zone on the container neck completely therearound and throughout substantially the length of such first zone on the neck, the inner surface of the sleeve, in another zone, overlying and frictionally engaging the ridge on

the second zone of the container neck when the cap is applied to the neck, the inner top surface of the cap having at least the annular zone thereof confronting the lip of the neck lying in a plane substantially at right angles to the axis of the sleeve of the cap, said annular zone on the inner top surface of the cap effecting a seal with the lip of the neck of the container when the cap is fully engaged on the container neck, the sleeve when removed from the container neck having an inner surface throughout the major portion of its length which is substantially cylindrical and an inner diameter which is slightly smaller than the diameter of the smooth annular uninterrupted zone on the container neck at the outer end thereof.

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