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E. FUGLSANG-MADSEN ETAL

3,247,994

PLASTIC CAPS FOR USE AS CLOSURE FOR CONTAINERS

Filed March 4, 1964

2 Sheets-Sheet 1

Fig. 1

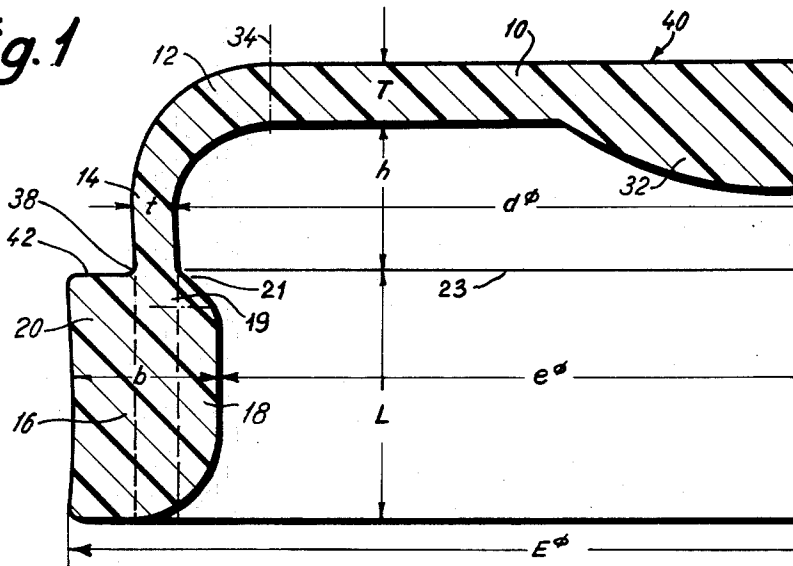
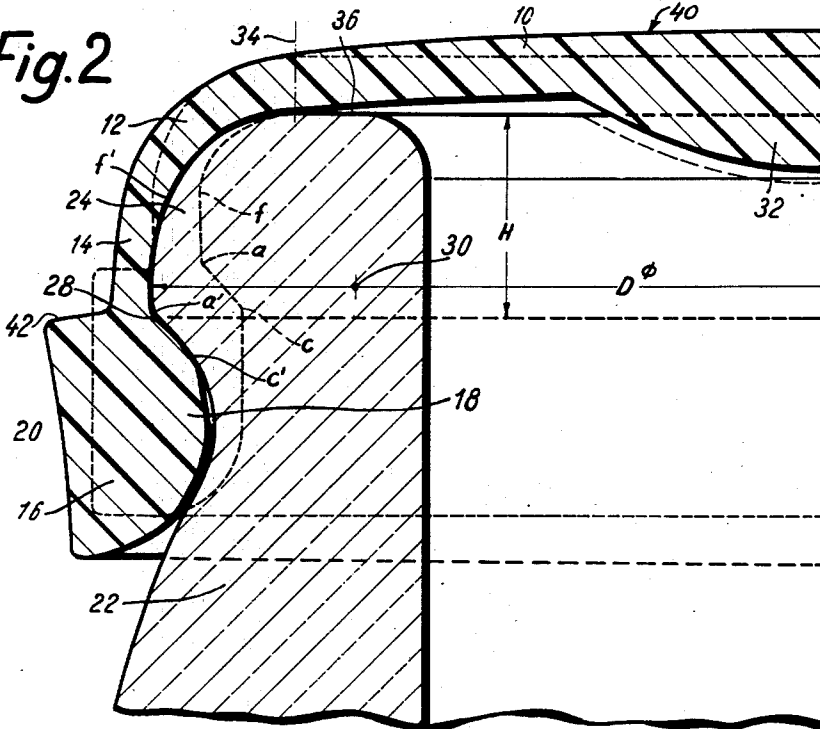


Fig. 2



INVENTORS:
Erik Fuglsang-Madsen and
BY Sven-Egon Stocklund,
Emmett D. Marmon,
THEIR ATTORNEY.

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2 Sheets-Sheet 2

Fig. 3

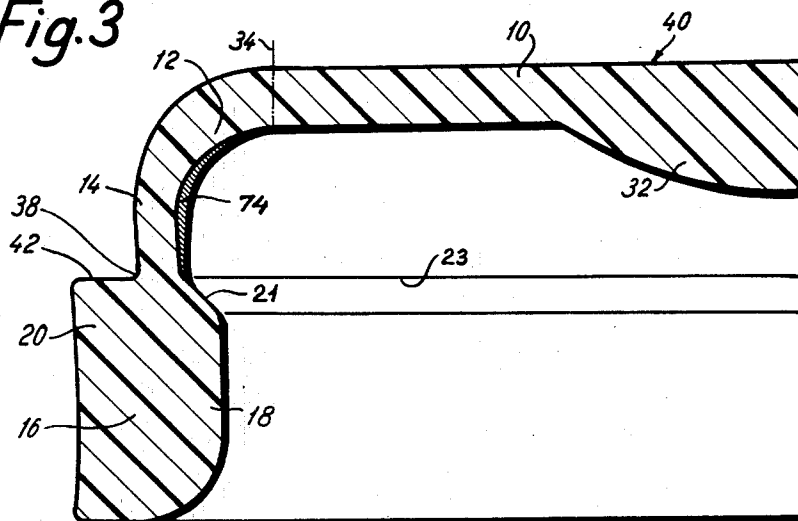
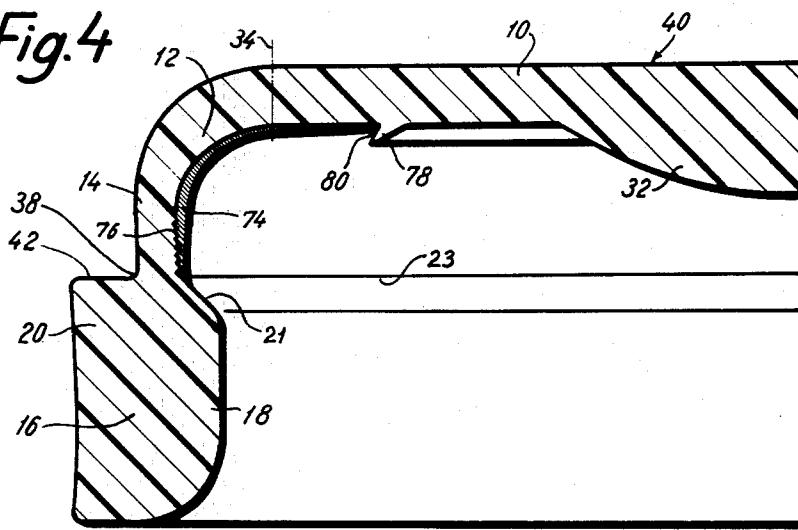


Fig. 4



INVENTORS:
Erik Fuglsang-Madsen and
Sven-Egon Stocklund,
BY
Edward D. Marmonch,
THEIR ATTORNEY.

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PLASTIC CAPS FOR USE AS CLOSURE FOR CONTAINERS

Erik Fugisang-Madsen, Tenerife, Canary Islands, Spain,
and Sven-Egon Stocklund, Rungsted Kyst, Denmark,
assignors to F.G.M. & Co., Copenhagen V, Denmark,
a company of Denmark

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19 Claims. (Cl. 215-41)

This application is a continuation-in-part of our abandoned application Serial Number 839,616, filed September 14, 1959.

This invention relates broadly to plastic caps for use as closures for standard containers, especially bottles, having at the top an outwardly projecting annular convex container bead, and more particularly to a plastic cap comprising a top-plate, an unsplit skirt portion extending downwardly from said top portion, and below said skirt portion an internally disposed clamping bead intended for engaging the lower side of the container bead and thereby to lock the cap to the container.

Bottle caps made from plastic have several advantages compared with the corresponding metallic caps, for example an essentially more gentle treatment of the bottle necks.

Up to now plastic bottle caps have, however, only been used for bottles or other containers containing liquids setting up only a relatively small excess pressure within the container but they have not found application for bottles in which there are or may arise comparatively high excess pressures, such as is the case with for examples bottles containing beer or mineral water since by such bottles it is difficult at the same time to obtain a reliable seal and a secure locking of the cap to the bottle neck.

Indeed plastic bottle caps have been proposed adapted to resist even rather big excess pressures in a bottle, for example to be used as closures for champagne bottles. The hitherto proposed bottle caps of this type are, however, provided with a stopper intended to engage into the bottle neck, which stopper is by special means adapted to provide a seal between the stopper and the inner wall of the bottle neck and to secure the retaining of the cap in spite of interior excess pressures. Such caps are, however, expensive to manufacture and cannot compete with the up-to-now conventional metallic caps or crown closures.

As closures for bottles and other containers it has further been proposed to use caps or cap-like closures made from rubber and the like highly elastic materials having a soft surface. Owing to the elasticity and compressibility of such materials such closures are able, when applied to a bottle neck in such a manner that the material is under pull or tension when the closure is in place, to ensure a tight close-fitting action between the closure and the bottle neck, but only provided the contents of the bottle is such, for example milk, juice or medicine, which sets up no excess pressure within the bottle. In case excess pressures arise within a bottle or other container closed by such a closure, just owing to the high elasticity of such material the fitting action between the closure and the bottle neck will be broken and gas or fluid will leak out between the bottle neck and the closure, and at higher excess pressures such a cap will unavoidably be blown off. Apart herefrom rubber and the like materials are much more elastic and much softer than plastic materials, such as for example polyethylene, polypropylene and polyacetate, which are usable for caps instead of metallic caps or crown closures.

An object of the present invention is to provide a new and improved plastic cap of the kind referred to above

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and of particularly simple construction and low cost and which is at the same time able to satisfy the demands on secure attachment and reliable sealing properties which can reasonably be expected of caps to be used as closures for bottles and other containers containing beer, mineral water, or other liquids setting up an interior excess pressure in the container, which excess pressure may for example in connection with beer during pasteurizing or when stored for some time at temperatures up to 50° C. amount to 10 atm.

A further object of the present invention is to provide a plastic cap of the kind referred to which in a simple manner can be produced in one piece, which moreover has a simple shape, only requires a comparatively small consumption of material, and can be used for closing even such bottles in which high excess pressures arise after the closing without risk of the cap being blown off and under procuring of a reliable seal providing sealing properties better than what hitherto has been possible to obtain by means of metallic caps or crown closures so that it is possible to obtain an essential smaller percentage of leaky bottles and tightness for an essentially longer time.

Another object of the invention is to provide a plastic cap of the type referred to which in spite of being made from plastic material and therefore being much harder and less compressible than rubber and other commonly used sealing materials is able to provide a reliable seal even against high excess pressures within the container only by the gripping action between its skirt portion and the container bead, at least provided the latter has an even and smooth surface such as may be the case when the container bead is after-polished, for example by flame polishing, and when the unavoidable casting burrs at the sides of the container bead are very low, and which cap is simultaneously able to remain in sealing position on the container in spite of high excess pressure within the same.

When a business such as a brewery uses a very great number of bottles to be closed by caps and these bottles are re-used a number of times before they are thrown away it cannot be avoided that many of the bottles will show comparatively coarse burrs which can render the sealing difficult when caps made in one piece are used since in such cases it will be necessary to require a softness of the cap material which it may be difficult to obtain when at the same time the material shall have the strength required for securing the cap on the bottle, and that the bottle neck bead will get minor cuts which also require a soft material to be filled out.

A still further object of the invention is to provide a plastic cap of the kind referred to which is of simple construction and low cost and which is provided with an inner lining of a material softer than the cap material itself and thereby is able to ensure a reliable seal even in case of the container bead being not quite smooth, and which in spite of being provided with an inner lining and in spite of the elasticity of the plastic material is able to remain in sealing position on the container neck, also when high excess pressures arise within the container.

It is also an object of the invention to provide a plastic cap of the type referred to which can stand even very high excess pressures within the container without being blown off and simultaneously to secure tightness, which cap is of simple construction and although provided with an inner lining is cheap in production.

Other objects and advantages of the present invention will become apparent from this specification, the claims and the accompanying drawings showing, by way of example only, some embodiments of the plastic cap according to the invention.

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In the drawings, wherein like reference numerals indicate like parts:

FIG. 1 is a part sectional view, on a very large scale, of an embodiment of the plastic cap,

FIG. 2 is a fragmentary sectional view, on the same scale, of the upper part of a bottle neck with the cap shown in FIG. 1 fitted thereto and further showing, in dotted lines, the contour of a cross section of the cap exactly as shown in FIG. 1 and with the lower side of its top-plate contacting the top surface of the bottle neck, and

FIGS. 3 and 4 are part sectional views corresponding to FIG. 1 of two further embodiments of the invention.

The cap shown in FIGS. 1 and 2, as a whole indicated by 40, comprises a top-plate or portion 10 which merges into an intermediate portion comprising a curved transition portion 12 and an approximately cylindrical unslit skirt portion 14, possibly slightly tapered inwardly in the downward direction. The skirt portion 14 continues at its lower end into an elongated continuous annular bottom or bead portion 16 comprising an inner clamping bead subportion 18 extending inside the skirt portion 14 and an outer supporting bead subportion 20 extending outside the skirt portion 14.

The clamping bead 18 comprises an upper portion 19 provided with an upward facing outer embracing surface 21 having an upper edge 23 provided by the transition between said surface 21 and the inner face 15 of the skirt portion 14.

The bead portion 16 has an oblong cross section since its inner height L , measured between the lower edge 25 of the bead portion 16 and the upper edge 23 of the surface 21, is about 30% bigger than half the difference between the minor inner diameter e of the clamping bead 18 and the major outer diameter E of the portion of the outer bead 20 positioned lower than the portion 19 of the clamping bead, which difference corresponds in the embodiment shown to the thickness b of the bead portion 16.

The cap is intended to be fitted on a bottle neck 22 of the conventional standardized type shown in FIG. 2. Said bottle neck 22 is at its upper end provided with an outwardly projecting annular convex container bead 24 the outer surface of which merges in the upward direction with the top face 36 of the bottle neck 22. Immediately below the container bead 24 the bottle neck is provided with a circumferential groove 26. Between the exterior lower edge of the bead 24 and the upper part of the groove 26 there is a comparatively sharp transition 28. Immediately above the latter the outer surface of the bead 24 has a portion which is circular in cross section with the centre of curvature in the point 30 positioned slightly higher than the transition 28 so that the bead 24 has its major diameter D on level with the point 30 and below as well as above this level has a decreasing diameter.

It has to be noted that D indicates the standardized diameter of the container bead 24 of the bottle in question and that this diameter may in practice vary within a certain tolerance which, however, seldom exceeds $\pm 2\%$.

The skirt portion 14 of the cap has a major inner diameter d which is in the embodiment illustrated 6% less than D . In practice d ought to be at least 5% smaller than D although the effect aimed at is obtainable even if d is only 3% smaller than D , provided the cap is intended for bottles which are produced with lesser tolerance than mentioned above and which have faultless smooth outer sides of the container bead 24.

Apart from its central portion which for cast-technical reasons is formed with a downwardly extending domed portion 32 the top-plate 10 has a thickness T which is 15 to 20% bigger than the thickness t of the wall of the skirt portion 14. The curved transition portion 12 provides an even transition of thickness between the skirt portion 14 and the top-plate 10 and it merges into the top-plate 10 at a place 34 which, when the cap is placed on the bottle neck 22, lies opposite the top surface 36 of the same.

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The transition 38 between the outer side of the skirt portion 14 and the upper side 40 of the outer bead 20 is comparatively sharp and has a radius of curvature of at most $\frac{3}{4}$, preferably below $\frac{1}{2}$ the wall thickness t of the skirt portion 14.

In the embodiment shown the distance h between the underside of the top-plate 10 and the lower edge 23 of the inner side 15 of the skirt portion 14, which edge 23 is the same as the upper edge of the clamping bead surface portion 21, is smaller than the corresponding distance H between the top face 36 of the bottle neck 22 and the transition 28, whereby it is obtained, what is very essential, that the length of the inner side of the skirt portion 14 together with the curved transition 12 measured along said inner side from the edge 23 to the place 34 is less than the corresponding length of the outer side of the container bead 24 measured along said outer side from the transition 28 to a place corresponding to the place 34.

From the contour of the cap 40 shown in dotted lines in FIG. 2 in its original state shown in FIG. 1 it further appears that the design and dimensions of the cap 40 are so that the skirt portion 14 together with the curved transition portion 12 and at least the upper part of the upper portion 19 of the clamping bead 18 have such an inner contour that when a sectional view of the cap 40 through the axis thereof is drawn in on a sectional view of the bottle neck 22 through the axis thereof and so that the underside of the top-plate 10 contacts the top face 36 of the container neck 22, said inner contour is arranged entirely inside the outer contour of the container bead 24.

Therefore, when the cap 40 is fitted to the bottle neck 22, as shown in FIG. 2 with solid lines, the skirt portion 14 as well as the curved transition 12 will fit tightly round the container bead 24 and thus be sealingly held against said bead by clamping bead subportion 18 which has embracing surface 21 which surroundingly embraces the underside of the container closure bead and will at least at the major diameter of the container bead be stretched circumferentially. Simultaneously, the clamping bead 18 will grip into the bottle neck groove 26 and ensure that the lower part of the skirt portion 14 tightly fits the lower portion of the container bead.

Moreover the skirt portion 14 will, when the cap is forced down over the bottle neck, also be stretched in its longitudinal direction. This longitudinal stretching of the skirt portion 14 appears from FIG. 2. The cap 40 is in dotted lines shown in its original shape. On the cap shown with dotted lines three points a , c and f are indicated, corresponding to respectively the transition 23 between the skirt portion 14 and the upper surface 21 of the clamping bead, the innermost point of the last said surface, and the transition between the skirt portion 14 and the curved transition portion 12. The corresponding points a' , c' and f' are indicated on the cap drawn with solid lines.

This longitudinal stretching of the skirt portion 14 involves that the skirt portion 14 and at least the lower part of the curved transition portion 12 fitted on the bottle neck 22 will be stretched circumferentially as well as longitudinally and thereby in all directions, and that the skirt portion 14 and the curved transition portion 12 over their whole longitudinal length from the transition 23 to the place 34 directly make contact with the external surface of the container bead 24. These two effects together ensure that a sealing is provided which even at high excess pressures in the bottle no gas is able to penetrate, provided the outer face of the container bead 24 is smooth without appreciable projections or dents.

Assistant hereto is also that the thickness T of the top-plate 10 is bigger than the thickness t of the skirt portion 14 which causes that the pulling forces influencing the skirt portion 14 mainly cause a stretching of the skirt portion 14 and in a minor degree of the lower part of the curved transition portion 12, whereas it is less likely that any part of the top-plate 10 may be drawn down-

wards along the container bead 24 and thereby counteract the stretching of the skirt portion 14.

When the cap is fitted on the bottle the excess pressure within the same will cause the top-plate 10 to bulge out as shown in FIG. 2. Owing hereto, the top-plate 10 will approximately tangential to the upper part of the container bead 24 pull on the curved transition portion 12 and through this on the skirt portion 14. Owing to the gradually increasing thickness of the curved transition 12 between the skirt portion 14 and the top-plate 10 the bulging of the latter will produce a bigger pulling effect on the interior parts of the skirt portion 14 than on the exterior parts. This causes that the skirt portion 14 is brought into still closer contact with the container bead, and just owing to the excess pressure in the bottle.

It is, however, not sufficient that a bottle cap secures tightness, it must also secure that the interior excess pressure in the bottle is unable to push the cap off the bottle. In the cap referred to it cannot, however, be avoided that owing to the longitudinal stretching of the skirt portion 14 rather strong vertically directed forces will appear in the skirt portion 14, which forces combine with the pressure from the interior of the bottle in the attempt to push off the cap. For this reason it is, as shown, preferable that the transition 38 is comparatively sharp with a radius of curvature of at most $\frac{3}{4}$ of the wall thickness t of the skirt portion 14. Hereby it is obtained that the moment arm with which the skirt portion 14 can act on the bead portion 16 to produce an outward bend of the same from the bottle neck becomes as small as possible which will also make the opening effect small. This latter causes at the same time that the bead portion 16 will get no inclination to pull the skirt portion 14 in the outward direction and thus weaken the sealing pressure.

This effect may further be increased when the skirt portion 14 is slightly conically tapered in the downward direction. In this manner it is obtained that the bead portion 16 which is substantially stiffer than the skirt portion 14 secures that the transition 38 between the outer side of the skirt portion 14 and the outer bead 20 even by a comparatively great wall thickness of the skirt portion 14 will be positioned inside or on level with the greatest circumference of the bottle neck bead, which does not only strengthen the tightening but also to a still higher degree reduces the moment of everting on the bead portion 16.

Most essential it is, however, that the inner height L of the bead portion 16 is greater than its thickness b . True enough this involves a cross sectional area and thereby a consumption of material for the bead portion 16 which is essentially greater than what has hitherto been considered necessary for retaining a cap even when regard is taken to the high interior pressure in the bottle, but at the same time it is obtained that the pull forces transferred to the bead portion 16 through the skirt portion 14 will influence mainly on the upper part of the bead portion 16 and tend to draw this part outwards whereas said forces will only to a very small degree be transferred to the lower part of the bead portion 16, and, therefore, the outwardly acting forces generated in the upper part of the bead portion 16 are counteracted by the radial inwards acting shrinking tension forces of the lower part of the bead portion 16. This, as more as these last stated forces are acting with a relatively long moment arm with relation to the transition 28 along which the bead portion 16 will tend to everte. Thus the bead portion 16 gets a very high resistance against everting through the influence from the pull in the skirt portion 14 without its ability to expand during the capping being reduced.

The new cap causes certain demands to the material from which it is produced in order to obtain a reliable result. Thus for instance at the same time as it is sufficiently strong to resist the influences especially in consequence of the expansion of the bead portion 16 arising during the capping, it must be so resilient or elastic that

it can fit tightly round or penetrate into small projections or cuts in the bottle neck bead 24 without such projections or cuts producing leakage. Both the necessary resiliency (the coefficient of elasticity measured by Young's modulus) and the necessary tensile strength are, however, to an essential degree dependent on the dimensioning of the cap since a small resiliency of the material at a suitable dimensioning can be remedied when the material has at the same time a big tensile strength so that it can stand a powerful tightening round the bottle neck, in the same way as a minor tensile strength can be tolerated when the resiliency is sufficiently high, and sufficiently great wall thickness and other dimensions can consequently be used.

It is advantageous to use a plastic material having a resiliency corresponding to a Young's modulus of not over 1.8×10^4 kg./cm.² (2.5×10^5 lbs./square inch), preferably of below 0.7×10^4 kg./cm.² (1×10^5 lbs./square inch) in connection with a tensile strength of not less than 245 kg./cm.² (3500 lbs./square inch), preferably not less than 280 kg./cm.².

In practice a co-polymer plastic material based on polyethylene and having a tensile strength of about 290 kg./cm.² and a Young's modulus of about 0.56×10^4 kg./cm.² has been found to be suitable.

In the embodiment shown in FIG. 1 in which the inner side of the skirt portion 14 is constituted by the inner wall 15 itself of the skirt portion, the tightness obtained is dependent on a sufficient resiliency of the cap material itself so that this is able to yield to very small incisions, dents or projections in or on the outer side of the bottle neck bead.

Very frequently, however, bottles are used having container beads the surface of which is not quite smooth but comprises relatively coarse casting burrs or minor cuts. In such cases, owing thereto that the plastic materials usable for caps are not sufficiently compressible, it will not be possible to obtain the necessary sealing effect only by the stretching of the skirt portion 14 as explained above.

In such cases it might seem obvious to provide the cap with a sealing lining of conventional type, that is a relatively thick lining made from a material, such as rubber, which is so soft that it is able to absorb all the projections and to penetrate into the dents or cuts even the deepest ones. Such a sealing lining has shown, however, to be quite unfit for being used in a cap according to the invention since it will prevent the cap from remaining on the bottle neck when excess pressure arises in the bottle. This is owing thereto that within such a sealing lining owing to the upwards directed forces influencing the lining from the cap the outer layer of the lining will be displaced relative to the inner layer and in that case even a strongly dimensioned bead portion will not be able to prevent the cap from being pushed off.

It has been found, however, that even when applied to bottle necks having container beads with coarse burrs or other projections or pronounced cuts or dents it is possible to obtain a complete sealing effect and simultaneously to prevent pushing off of the cap provided the latter is provided with a thin, film-like inner lining of a material softer than the plastic material used for the cap itself. It has been proved that even if such an inner lining has a thickness less than 0.25 mm., and in practice a lining is used having a thickness less than 0.1 mm., it will be able to secure tightness and simultaneously it is so thin that a possible displacement between its outer and inner face will be so small that it is of no importance at all.

Naturally, however, such a thin lining is not able itself to provide tightness but has proved to be able thereto in cooperation with the plastic material of the cap. The cap material itself is able partially to envelope a projection and partially to bridge a dent or cut but owing to the relatively great hardness of its surface it is not able tightly to surround sharp edges or to penetrate into

sharp angles. However, in these cases the inner lining gets active since during the capping, when the cap material is forced to envelop a sharp edge or to penetrate into a cut or dent, the lining will be forced to fill up the spaces between the cap material itself and the edges or angles whereby the sealing effect aimed at it obtained. Thus by means of such a thin inner lining the cap is able to provide tightness, even if the container bead comprises projections essentially higher than, or cuts or dents essentially deeper than the thickness of the inner lining.

Two embodiments of caps provided with such an inner lining are shown in FIGS. 3 and 4. The caps 40 themselves are in these two embodiments as to all essential designed as the one shown in FIG. 1, but a film 74 of a fairly soft material, for example latex, is applied on the inner wall of the skirt portion 14.

In the embodiment shown in FIG. 3 the film or inner lining 74 covers most of the upper surface 21 of the clamping bead 18, the inner side of the skirt portion 14 and the inner side of the curved transition portion 12 up to the place 34.

In the embodiment shown in FIG. 4 the inner lining 74 further covers the outer portions of the top-plate 10 as described below.

The film or inner lining 74 is in both embodiments cast in the otherwise finished cap 40 which has thus served as a mold during the casting.

To ensure a good adhesion of the film 74 on the inner wall of the cap the inner wall of the skirt portion 14 may as shown in FIG. 4 be provided with a rough part 76 which for example may be obtained by sand blasting of the core in the mould in which the cap has been moulded.

Moreover, in the embodiment shown in FIG. 4 the lower side of the top-plate 10 is provided with a downwardly extending annular flange 78 forming the inner limitation of the film 74. The outer wall 80 of the annular flange 78 is conically tapered in direction towards the top-plate 10 so that it can cooperate in retaining the film 74 inside the cap also during its removal from a bottle neck. It is, however, also possible that the film, which for example may be made from rubber or soft polyvinylchloride can cover the entire portion of the inner wall of the cap 40 located above the clamping bead 18.

The annular flange 78 is located inside the upper side 36 of the bottle neck 22 conf. FIG. 2, viz inside the greatest inner diameter of the bottle neck at the mouth of the latter.

The film may be applied to the bottle cap in many different ways. It is, however, most advantageous to apply to the inner side of the skirt portion 14 a coating of lining material brought into a fluid state e.g. by melting or solution in an evaporable solvent, which material is thereafter hardened.

Lining material in fluid state can be obtained in several different ways. Many thermoplastic materials may thus be brought into a liquid state by melting, but if special conditions needing special materials do not so require the application of melted plastic material should normally not take place since the danger of spoiling the cap itself when using melted plastic material can become rather great owing thereto that the melted plastic material must necessarily have a comparatively high temperature.

Therefore it is more advantageous to use lining materials which have been brought into a fluid state by solution in a solvent evaporable at temperatures below the softening point or point of destruction of the material used for the cap itself. Certain cellulose varnishes may for instance be applicable. It has, however, proved most advantageous to apply a layer of a preferably ammoniacally latex solution which does not only provide a film of an extremely suitable material but at the same time is easy to treat and apply also in mass production.

Especially it has proved most advantageous when a lining material brought into a liquid state, for example an ammoniacal latex solution, is applied thereby that the cap is brought to rotate and then the amount of fluid material necessary for the formation of the film is admitted into the rotating cap inside the clamping bead 18 of the latter, and by means of the centrifugal force is distributed across the inner wall of the skirt portion 14. In the embodiment shown in FIG. 4 a couple of drops of fluid plastic material may thus be admitted inside the clamping bead 18, but outside the annular flange 78.

By this method the plastic material will be brought into an extremely intimate contact with the cap material especially if the latter is rough, so that the intimate connection between the inner lining and the cap is secured. Furthermore the rotation will ensure that the fluid material is distributed evenly along the circumference so that the film formed will get a uniform thickness. Moreover, by such a method the material serving for the formation of the lining will concentrate exactly at the place where it is most advantageously positioned, viz at the place which, when the cap has been placed on a bottle neck, is positioned where the bottle neck has its greatest diameter.

Further hereby it is possible to ensure the film 74 to adapt the ideal variation of thickness shown in FIGS. 3 and 4, from which it appears that the thickness of the film increases from the lower edge and upwards at least past the portion adapted to cooperate with the part of the container bead having the greatest outer diameter. This thickness-variation ensures that although a thin layer of inner lining is deposited on the upper face 21 of the clamping bead and thereby is able to increase the friction against the glass of the bottle neck, this layer is so thin that within this layer no shear can take place which otherwise would counteract the increasing of the friction, and simultaneously a somewhat thicker layer of inner lining is deposited where the effective seal has to be provided.

In many instances it may be advantageous that the inner lining does not only cover the inner side of the skirt portion, where the tightening is desired, but that it also covers other parts of the inner side of the bottle cap, for example for the inner side of the top-plate. This may be of importance in such cases where the cap is made of a plastic material allowing diffusion of gases through the material. In such cases a complete coating of the inner side of the cap with a film of another material will to an essential degree reduce this possibility of diffusion.

A film as the one referred to which can be extremely thin can by the aforesaid distribution of the film forming material by rotation be obtained in a simple way thereby that the fluid material is admitted into the cap so that it deposits at the middle of the inner side of the top-plate. From here the fluid material will on account of the centrifugal force be flung out to the skirt portion but in such a manner that a thin film of the material is also deposited all over the inner side of the top-plate.

It is to be understood that the embodiments of our invention herewith shown and described are to be taken as preferred examples of the same and that various changes in the shape, size and arrangement of parts may be resorted to without departing from the spirit of the invention or the scope of the subjoined claims.

We claim:

1. A container closure adapted to be fitted upon a container closure bead at the open top by stretching comprising a plastic continuum, said continuum being shaped into portions to provide means as follows viewing the closure placed in operative position atop a container:

- (a) a top portion providing a first means to close the top of said container;
- (b) an intermediate portion providing a second means as a skirt depending at one of its ends from said first means, said second means normally prior to mounting having a major inner diameter, and other dimensions

sions, smaller than the major diameter and respective other dimensions of the container bead and upon mounting onto the container being stretched longitudinally and circumferentially and therefore in all directions to thereby be molded sealingly in fitted position to the container bead;

- (c) an elongated continuous annular bottom portion subtended at the other end of said second means providing a third means as a bead shaped and adapted to provide

- (1) a clamping bead subportion, and
- (2) a supporting bead subportion

said clamping bead subportion extending inwardly relative to the inner surface of said skirt providing a clamp fitting against and having an embracing surface surroundingly embracing the underside of the container closure bead thereby maintaining stretched said second means,

said supporting bead subportion extending outwardly relative to the outer surface of said skirt and being stretched circumferentially generating a shrinking force,

said third means bead at its lower end exerting said shrinking force biasing inwardly and upwardly the upper section of said clamping bead subportion having said embracing surface.

2. The combination with a container of the type having a neck ending in an outwardly projecting annular convex bead of a container closure adapted to be fitted upon said bead at the open top by stretching to effect sealed closure of said container having contents setting up an excess pressure; said container closure comprising a plastic continuum, said continuum being shaped into portions to provide means as follows viewing the closure placed in operative position atop a container:

- (a) a top portion providing a first means to close the top of said container;

- (b) an intermediate portion providing a second means as a skirt depending at one of its ends from said first means, said second means normally prior to mounting having a major inner diameter and other dimensions smaller than the major diameter and respective other dimensions of the container bead and upon mounting onto the container being stretched longitudinally and circumferentially and therefore in all directions to thereby be molded sealingly in fitted position to the container bead;

- (c) an elongated continuous annular bottom portion subtended at the other end of said second means providing a third means as a bead shaped and adapted to provide

- (1) a clamping bead subportion, and
- (2) a supporting bead subportion

said clamping bead subportion extending inwardly relative to the inner surface of said skirt providing a clamp fitting against and having an embracing surface surroundingly embracing the underside of the container closure bead thereby maintaining stretched said second means,

said supporting bead subportion extending outwardly relative to the outer surface of said skirt and being stretched circumferentially generating a shrinking force,

said third means bead at its lower end exerting said shrinking force biasing inwardly and upwardly the upper section of said clamping bead subportion having said embracing surface.

3. A container closure according to claim 1 wherein said third means has an inner height, measured between said embracing surface and the bottom end of the bead, larger than $\frac{1}{2}$ the difference between the major outer diameter of said third means and the minor inner diameter of said third means.

4. A container closure according to claim 1 wherein said intermediate portion possesses an inner contour such that when a sectional view of the closure through the axis thereof is drawn in on a sectional view of said container through the axis thereof with the inner side of said first means contacting the top surface of the container neck, said inner contour is found wholly within the container neck.

5. A container closure according to claim 1 wherein said intermediate portion comprising an upper curved transition portion and a lower skirt portion which skirt portion has a thickness smaller than the thickness of said top portion where said top portion merges into said curved transition portion; said curved transition portion showing a gradual and even increase in the thickness between said skirt portion and said top portion.

6. A plastic closure as defined in claim 1 made from a plastic material having a tensile strength of at least 245 kg./cm.² (3500 lbs./square inch) and a coefficient of elasticity (Young's modulus) of not over 1.8×10^4 kg./cm.² (2.5×10^5 lbs./square inch).

7. A plastic closure as defined in claim 1 made from a plastic material having a tensile strength of at least 280 kg./cm.² (4000 lbs./square inch), and a coefficient of elasticity (Young's modulus) under 0.7×10^4 kg./cm.² (1×10^5 lbs./square inch).

8. A plastic closure as defined in claim 1; a thin, film inner lining softer than the closure itself being provided within said closure; said inner lining comprising at least an annular portion extending upon and covering said inner side of said skirt portion, and so arranged that, when said closure is fitted to a container, it is adapted to press against an annular zone of the container bead where the latter has its major diameter.

9. A closure according to claim 1 wherein the inner surface of said skirt has thereon a film liner softer than the closure plastic and wherein the major inner diameter of said liner is at least 5 percent smaller than the major diameter of the container bead.

10. A closure according to claim 9 wherein the plastic material has a tensile strength of at least 245 kg./cm.² (3500 lbs./square inch) and a coefficient of elasticity (Young's modulus) of not over 1.8×10^4 kg./cm.² (2.5×10^5 lbs./square inch).

11. A closure for containers according to claim 1 wherein a film of material softer than said plastic annularly covers at least a portion of said embracing surface.

12. A closure according to claim 8 wherein said film is a hardened latex.

13. A closure according to claim 8 wherein said film has a thickness less than about 0.25 mm.

14. A closure according to claim 8 wherein said film has a thickness less than about 0.1 mm.

15. A closure according to claim 8 wherein said intermediate portion is annularly substantially entirely covered by said film.

16. A combination according to claim 2 wherein a thin film inner lining softer than the closure itself being provided within said closure; said inner lining comprising at least an annular portion extending upon and covering said inner side of said skirt portion, and so arranged that, when said closure is fitted to a container, it is adapted to press against an annular zone of the container bead where the latter has its major diameter.

17. A closure according to claim 1 wherein said plastic is polyethylene.

18. A closure according to claim 1 wherein said plastic is polypropylene.

19. A closure according to claim 1 wherein said plastic is polyacetate.

No references cited.

LOUIS G. MANCENE, *Primary Examiner.*