Oct. 3, 1967 D. H. ZIPPER 3,344,943

CONTAINER CLOSURE

Filed June 9, 1965 2 Sheets-Sheet 1

FIG. 1.

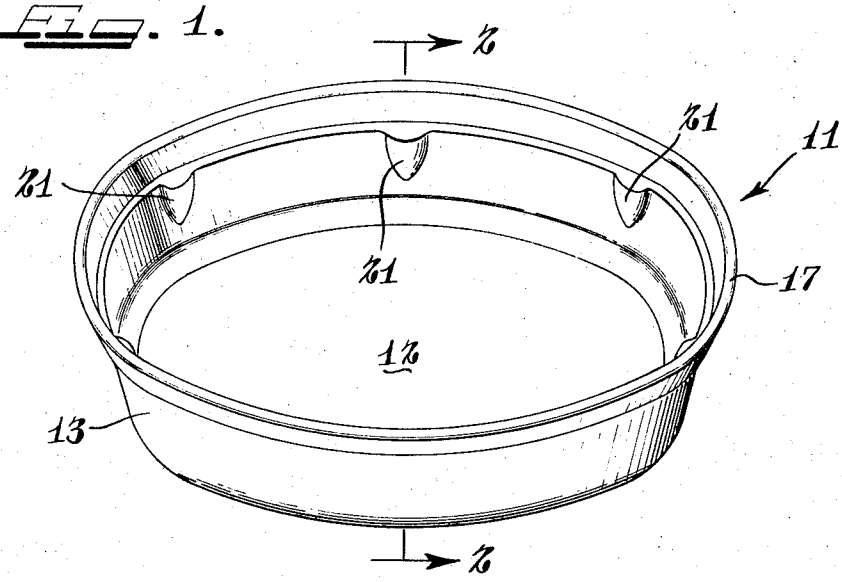


FIG. 2.

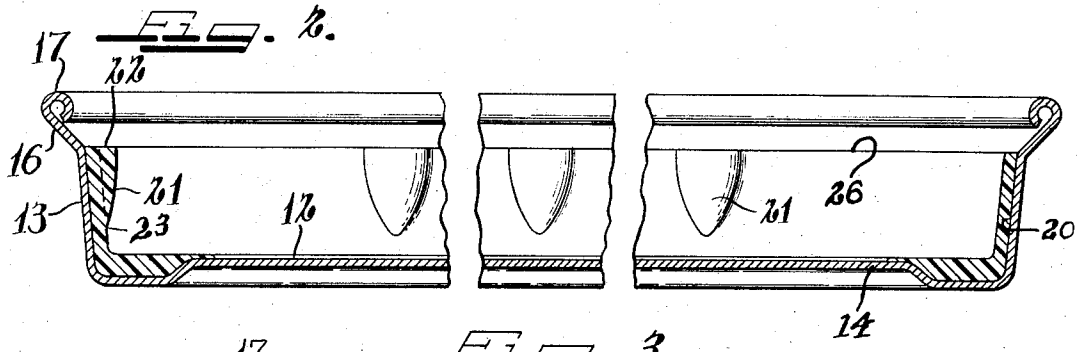
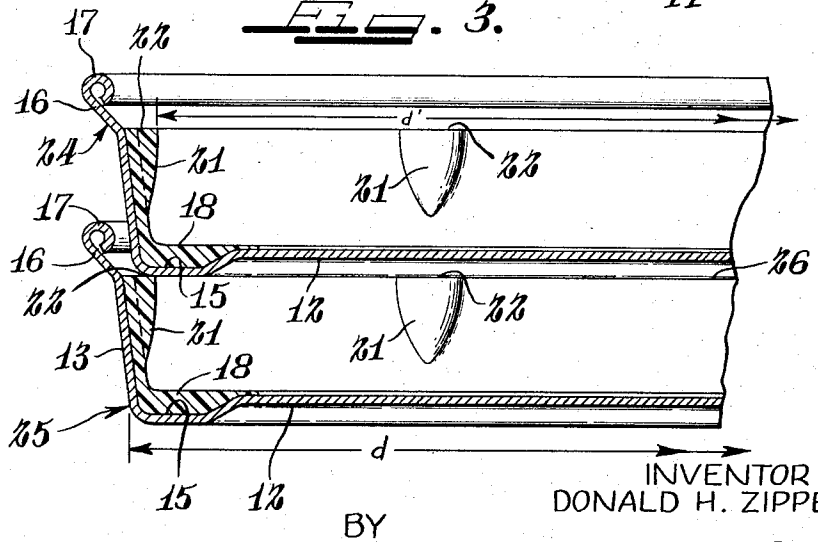


FIG. 3.



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FIG. 4.

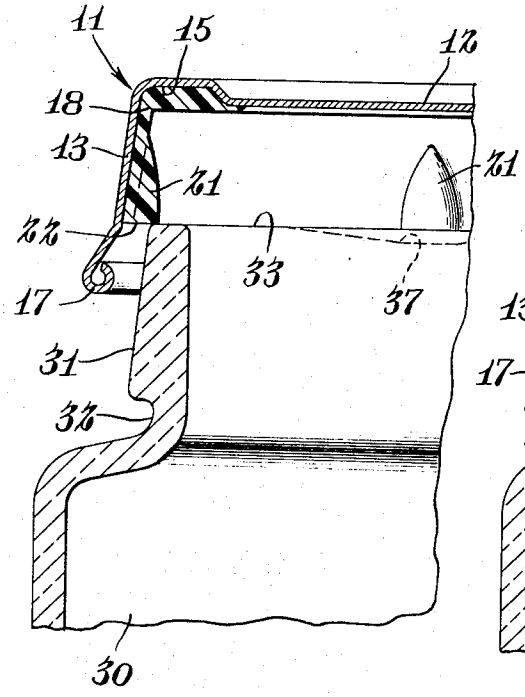


FIG. 5.

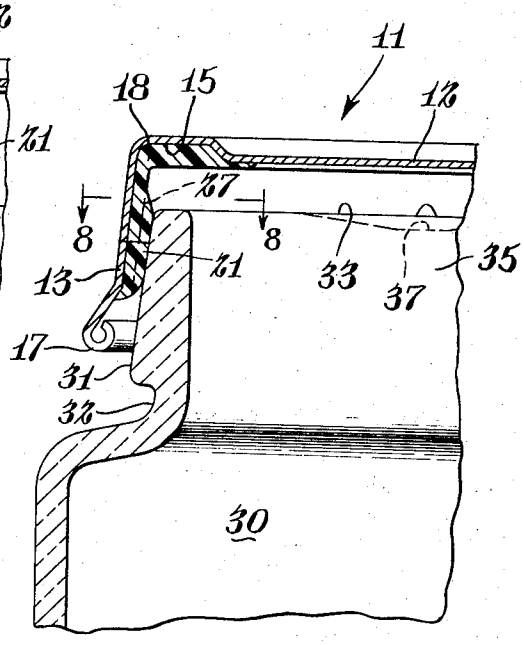


FIG. 6.

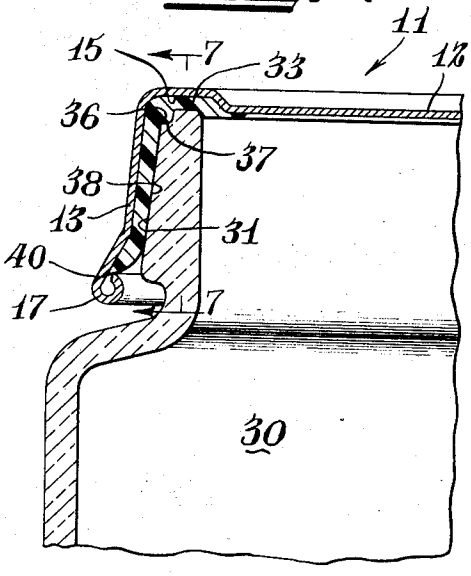


FIG. 7.

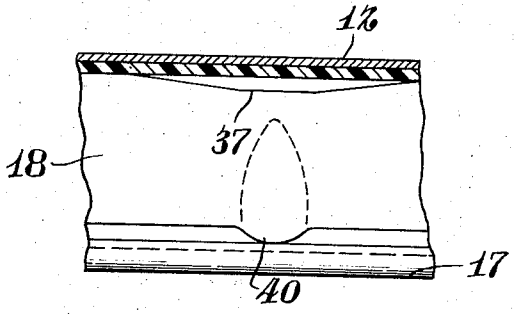
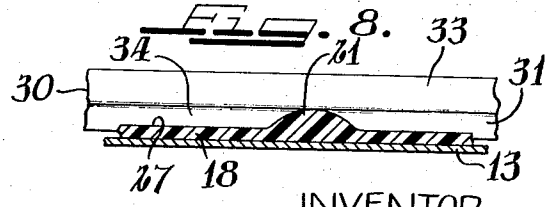


FIG. 8.



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CONTAINER CLOSURE

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5 Claims. (Cl. 215—40)

ABSTRACT OF THE DISCLOSURE

A closure cap having a lining of reformable gasket material on which inwardly projecting lobes are formed. The reformable lobes prevent cap nesting prior to application to a container finish and maintain the gasket spaced from the container finish during application up to the final increment of cap movement relative to the container finish, thus avoiding entrapment of air and pumping.

This invention relates to closure caps in general and more specifically is directed to a new and improved closure cap having means to prevent cap nesting prior to application and pumping during application of a cap to a container.

In its broadest aspect, the present invention comprises a closure cap having a shell including the usual top panel and skirt portions. An endless ring or layer of gasket material is disposed within the shell and extends from partially overlying the top panel to overlie a substantial portion of the skirt. Prior to application, the gasket supports a plurality of lobes or protrusions projecting radially inwardly towards the central axis of the cap, which lobes are integral with and reformable into the layer of gasket material on application of the closure cap to a co-operating container finish.

From the packaging standpoint, press-on types of caps are considered as being one of the most desirable type of closure caps because they may be applied to a container finish with the simplest type of capping equipment at extremely high capping rates. Such caps usually seal along the circumferential portion of the co-operating container finish with some caps also having an additional seal formed at the top of the container finish.

In the application of the conventional type of press-on cap to a container, a hermetic seal is established almost at the instant the gasket contacts a full three hundred and sixty degrees of the container finish or shortly thereafter. Subsequent axial movement of the closure cap along the finish is required to bring it to the final sealed position on the container. It is during the latter stage of cap movement that the surrounding medium which is trapped within the closure cap is forced into the mouth of the container, exhibiting a condition which is known in the art as "pumping." The undesirability of such is self-evident especially in vacuum packed food products and the like which are subject to oxygen deterioration. In addition, the gases and vapors (usually steam) trapped by this pumping action oftentime causes the cap to rise on the container requiring recapping.

In high speed capping operations, such as occur in a press-on type cap application, the caps are generally hoppered for feeding to a capping head. When the caps are properly oriented for fast feeding to the capping machine, if the diameter of the skirt adjacent the top panel is less than the inside diameter of the skirt at the lower margin, one cap will fit within the other establishing a condition commonly referred to as "nesting." When several caps are hoppered in a stack, the weight of the caps alone is sufficient to cause one cap to become tightly wedged or nested within the other. The slight jarring in feeding to the capping machine may even cause the nested caps to become more

tightly wedged. When this occurs, the feeding of caps to the capping machine is delayed and tumbling, manual type separation or the like is required in order to separate caps so nested. When capping at the usual high speeds, any delay to separate nested caps can be rather costly and therefore should be avoided if at all possible.

The present invention relates to a new and improved type of closure cap having a unique means formed internally of the cap which is reformable when the cap is seated on the cooperating container, however, prior to and during application serves as an anti-nesting means and an anti-pumping means, respectively.

A better understanding and greater appreciation of the salient features of the present invention may be had by a consideration of the objects and a detailed description of a preferred embodiment which follows:

It is an object of this invention to provide a new and improved closure cap.

It is a further object of this invention to provide a new and improved closure cap having reformable lobe means therein to prevent nesting of said caps during cap handling.

It is a further object of this invention to provide a new and improved closure cap adapted for press-on type application which includes a gasket having a plurality of inwardly projecting protrusions or lobe means which are reformable into the annular gasket on application to a container.

It is a further object of this invention to provide a new and improved closure cap having an endless layer of gasket material adapted to form a seal along a circumferential portion of a container, with the gasket layer having a plurality of lobe means projecting radially inward and serving to prevent nesting of the caps and pumping on application to the container.

It is a still further object of this invention to provide a new and improved cap having anti-pump means which serves to delay the establishment of a hermetic seal with the container to which the cap is applied until the final increment of cap travel, thereby permitting the surrounding media of vapor and gases from being pumped into the head space in the container.

Further and fuller objects of this invention will become readily apparent when reference is made to the accompanying drawings wherein:

FIG. 1 is a perspective view of an inverted closure cap embodying the principles of the present invention;

FIG. 2 is an enlarged cross sectional view of the cap of FIG. 1 taken along the lines 2—2 of FIG. 1;

FIG. 3 is an enlarged fragmentary cross sectional view of two caps like that illustrated in FIG. 1 stacked in a manner as would commonly occur during cap handling;

FIG. 4 is a fragmentary cross sectional view of the application of the cap of FIG. 1 to a container with the cap at the initial contact position;

FIG. 5 is a fragmentary sectional view of the cap illustrated in FIG. 4 at an intermediate stage of application;

FIG. 6 is a view similar to FIGS. 4 and 5 with the cap illustrated in the final position;

FIG. 7 is a view taken along the lines 7—7 of FIG. 6 with the container omitted; and

FIG. 8 is a schematic illustration of a developed view taken along the lines 8—8 of FIG. 5.

Referring to FIGS. 1 and 2, the closure cap illustrated includes a shell illustrated generally at **11** having a top panel portion **12** and annular skirt **13**. The top panel **12** may include a depressed central portion **14** sometimes referred to as a stacking panel as it is dimensioned to receive the bottom of a container for stacking in storage and merchandising. The outer margin of the top panel **12** is provided with an annular groove **15** having the inner wall portion formed during formation of the stacking

panel **14**. The outer wall portion is formed by the bottom of the groove merging with the skirt **13**. As illustrated, the skirt **13** may be of frustoconical contour having an outwardly flaring lower portion **16** which may terminate in a curled end **17**. Obviously, the skirt **13** may take various other shapes so long as it does not conflict with the practice of the invention as set forth.

Disposed within the shell **11** is an endless layer or ring of gasket material **18** which may be formed from plastomeric or elastomeric materials such as plasticized polyvinyl chloride plastisols, rubber, synethic rubber, foamed polyurethane, foamed polyethylene or the like so long as they exhibit the required flow and set properties. Plastisols or other materials containing small discreet bubbles of gas which provides a compressible volume to compensate for any variations in the differential volume defined on the outer periphery by the closure shell and the inner periphery by the container are well suited for the present application. These materials are oftentimes described in the art as puffed or foamed materials and the method of manufacturing the same is well known.

As noted, the layer of gasket material **18** is endless, extending around the inner circumferential surface **20** of the skirt **13**, and has an axial depth which substantially covers the entire skirt. Obviously, the axial depth may vary to a certain degree depending upon the length of the co-operating container finish and particular application or use of the closure cap. At its upper margin, the annular gasket extends radially inward towards the center of the stacking panel **14**, filling the gasket channel or groove **15** and may cover the same or terminate at its inner margin in any desired shape such as a feather edge construction which is described in detail in U.S. Patent No. 2,841,304. In caps having flat top panels, or other panel configurations, the gasket compound may cover all or any part of the underside. For example, caps for the conventional catsup bottle, the top panel in its entirety may be covered and the gasket compound may extend down the skirt any desired distance.

The gasket material may be formed in a layer of substantially uniform thickness provided with a plurality of circumferentially spaced inwardly projecting lobes or protrusions **21** as seen in FIGS. 1 and 2. The lobes **21** may take varied shapes, however, the ones illustrated have been found to exhibit the desired characteristics. In elevation, the lobes may have a contour similar to a bullet or projectile, with the surfaces being arcuate axially and circumferentially. Described in another manner, the lobes illustrated are of a configuration similar to that formed by a portion cut from a solid cone parallel to but spaced from its center axis.

As seen in the left-hand portion of FIG. 2, at its lower margin **22** the lobe **21** is coextensive with the lower margin **26** of the gasket **18** and projects radially inwardly towards the center of the shell **11**. Moving upwardly along the surface of the lobe **21**, it diminishes in radial thickness and transverse width relative to the lower margin **22** and merges smoothly into the gasket **18** as at **23**.

Referring to FIG. 3, two of the caps shown in FIG. 1 are illustrated in cross section in the relationship which they will occupy relative to each other during cap handling and hoppering for feeding to the capping machine. Depending on the feeding means, the caps may be inverted from the position shown but a similar nesting problem would be encountered and the present invention is equally applicable to its solution.

For convenience of description, each of the caps in FIG. 3, although identical to that shown in FIG. 1, will be given a separate reference numeral with the upper cap being designated **24** and the lower cap **25**. Each cap has an outside diameter "*d*" at the upper end of the skirt **13** at its merger into the gasket groove **15** which diameter exceeds the inside diameter "*d'*" as measured from the lobe **21** on the cap **24** shown in cross section to a diametrically opposed portion of the basket **18**. Since in the illustrated form the lobes **21** are not diametrically opposed the minimum internal dimension, represented by *d'*, is taken between one lobe **21** and an inner surface **27** of the gasket **18** represented by *d*. When one closure cap is received within a corresponding closure cap, such as illustrated in FIG. 3 by the caps **24** and **25**, the top panel **12** of one cap rests on the bottom **22** of the protrusions or lobes **21** of the immediately adjacent cap and lateral gasket surface **26**.

As seen in FIG. 3, the outwardly flaring lower portion **16** of the skirt **13** is of substantially greater diameter than the outside diameter of the skirt **13** at its juncture with the top panel. Accordingly, considerable lateral clearance is available in the stacked position which prevents nesting or wedging of one cap within the other. The lobes **21** serve to maintain the caps in the elevated relationship illustrated where sufficient lateral clearance is available and one cannot be wedged within the other even if they become angulated relative to each other. Obviously, the required number of lobes and the geometry of placement may be varied to meet the need fulfilled. In summary, during all phases of cap handling including hoppering, caps equipped with the inwardly protecting protrusions or lobes **21** described above do not become nested or wedged within each other and accordingly, the problems of cap handling during the capping operation are minimized.

Referring now to FIG. 4, the anti-pump feature provided by the lobes **21** will be described in conjunction with the application of the closure cap **11** to a container. A fragmentary portion of a container is illustrated at **30** and may be of any design such as a wide mouth or the like. The container **30** is provided with a container finish **31** which is of frustoconical contour terminating at its lower portion in a necked in annular groove **32**. The upper margin or rim **33** of the container finish is shaped to provide a generally flat annular radially extending surface defining the mouth of the container and of such radial thickness so as to permit reception of the gasket groove **15** in the closure cap **11**. Cam-type means shown in dotted lines at **36** are formed adjacent the rim **33** of the finish **31** and co-operate with means on the cap to permit the same to be removed by rotation. Specific types of cam means which may be used are set out in the application to Foster et al., Ser. No. 369,092, filed May 21, 1964, now U.S. Patent No. 3,270,904, or the copending application to Moloney and Foster, Ser. No. 490,311, filed Sept. 27, 1965, now U.S. Patent No. 3,285,452. Any other type of finish wherein the closure cap is applied by at least some form of press-on application either with or without rotation and where pumping is experienced is equally well suited for application of the present invention. For ease of description, the present invention is described in conjunction with the illustrated closure cap since it uses a side seal which extends substantially the full length of the container finish **31** when finally seated on the container **30** in addition to a top seal formed by the rim **33** being embedded in the gasket groove **15**.

In the form illustrated fragmentarily in FIG. 4, the closure cap **11** is illustrated at the initial contact position with the rim **33** of the container **30**. The bottom portion **22** of lobe **21** may rest on the upper surface of the rim **33** along the outer marginal edge. It is contemplated that the degree of overlap with the finish will be very slight and in some instances the outside diameter of the container finish adjacent the rim may be even slightly less than the inside diameter as measured from the lobe to a diametric opposed portion of the gasket **18** in which case the lobe will initially contact the finish **31**.

As seen in FIG. 5, as the application of the container cap **11** progresses, it is pressed onto the container finish **31** and the lobes **21** undergo reformation causing the lobe material to flow or be reformed into the gasket **13**. In the schematic cross sectional view of FIG. 8, the circumferential or transverse width of the lobe **21** is expanded as it is depressed and it is forced into the gasket

18. The radial depth of the lobe 21 has diminished also, generally illustrating the physical change occurring at an intermediate stage cap application. It can be appreciated that although cap application in terms of axial travel is almost one-half complete, a readily identifiable space 34 still exists between the container finish 31 and the inner circumferential portion or surface 27 of the gasket 18 which permits escape of the trapped media from the container mouth or head space.

At this point it can be appreciated that if a hermetic seal had been established when the cap was in the initial position shown in FIG. 4, a volume of the surrounding media (generally gas and vapor) would have been entrapped which is approximately equal to the volume encompassed by the top panel and skirt to a depth of the lower margin of the gasket 18. Accordingly, when the closure cap 11 moves to the position shown in FIG. 5, if present, this volume would normally be forced into the head space or mouth 35 of the container. The undesirability of this is self-evident especially in those capping operations wherein the product in the container is susceptible to deterioration by the presence of oxygen even in relatively small quantities.

As the cap approaches the final position shown in FIG. 6, the lobe 21 is completely reformed into the gasket 18 which forms a long length side seal substantially the full axial extent of the frustoconical finish 31. Immediately prior to establishment of a hermetic seal by a final increment of cap travel, or expressed another way, immediately prior to gasket contact with the rim 33, the space 34 between the gasket 18 and finish 31 still exists, however, is of much less radial extent than shown in FIG. 8, yet sufficient to allow the gas and vapors trapped to escape.

As seen in FIG. 6, when the cap is in the final or hermetically sealed position on the container 30, a cam surface 36 around the outer margin of the rim 33 is filled with gasket compound to form a cam follower which will cause lifting of closure cap when the shell 11 is rotated relative to the container 30. This coaction in the formation of this lift-off type cam arrangement does not per se form a part of this invention and therefore reference is made to the applications identified above for the details of the construction.

At the point of initial contact of the radially extending portion of the gasket 18 with the rim 33, the lobes 21 have been reformed or merged into the gasket material and the final increment of closure cap travel causes the rim 33 to be embedded and simultaneously, forms the cooperating cam follower 37 in the gasket material. The lobes are completely reformed so as to be coextensive with the circumferential surface 38 of the gasket 18 which is now shaped to the configuration of the container finish 31. Under normal circumstances, all evidence of the former presence of the lobe 21 would be undetected after application to the container 30 since it is reformed into the gasket. As seen in FIG. 7, however, where the gasket does not completely cover the entire skirt, the lobe which is outlined in dotted lines may be deformed axially to extend downwardly as at 40 in close proximity to the curl 17.

It is to be appreciated that the novel construction described above is advantageous to insure good vacuums during cap application and also provide means whereby the caps will be prevented from nesting prior to application. In the construction shown, the long length gasket on the finish 31 serves to provide good protection against oxygen permeation and against damage or loss of vacuum due to impact of the closure cap 11. Such long length seal may be used with excellent results since the novel lobes delay the establishment of a hermetic seal during application until the final increment of cap travel thus avoiding objectionable pumping.

Upon a consideration of the foregoing it will become obvious to those skilled in the art that various modifications may be made without departing from the invention embodied herein. Therefore, only such limitations should be imposed as are indicated by the spirit and scope of the appended claims.

I claim:

1. A closure cap particularly adapted for press-on type application to a container, said closure cap comprising a shell having a top panel and skirt, an endless layer of gasket material received in said shell at least around the inner periphery of said skirt, said gasket material being characterized by being reformable on initial application to said container and including a plurality of reformable lobe means formed on said layer of reformable gasket material prior to application to said container, said reformable lobe means projecting radially inwardly of said layer of gasket material in said shell to prevent nesting of said caps during hoppering, and said lobes maintaining said gasket material spaced from said container finish during application to said container to prevent pumping.

2. A closure cap particularly adapted for press-on type application comprising a shell having a top panel and a skirt, a layer of gasket material received in said shell for sealing and thread forming engagement with a container finish, said gasket material being reformable on application to said container finish into an annulus having a surface substantially conforming to the shape of a co-operating circumferential portion of said container finish, and a plurality of lobe means on said layer of gasket material, said lobe means being reformable into said surface conforming to the configuration of the circumferential portion of said container finish, said lobe means acting to prevent hermetic sealing engagement of said gasket ring until the final increment of downward travel of said shell during capping operations.

3. In a press-on turn-off type cap having a shell formed into a top panel portion and a skirt portion and a reformable gasket compound disposed within the shell around the outer margins of said top panel and extending over at least a part of said skirt portion, the improvement which comprises a plurality of reformable lobe means projecting radially inward from said gasket compound toward a central portion of said shell, the dimension between said lobes being lesser than that of said top panel portion to prevent nesting of said cap within like caps when hoppered, and said lobe means being reformable to prevent pumping by said cap on application thereof to a container through maintaining said gasket compound in spaced relation to said container until said cap is closely adjacent a hermetically sealed position with said container.

4. A closure cap adapted for press-on type application to a container finish, said cap having a top panel portion and skirt portion, an annular gasket groove formed in said top panel portion adjacent the intersection with said skirt portion, gasket means extending from inwardly of said groove radially outwardly and down said skirt portion to substantially cover the same, lobe means formed in said gasket means, said lobe means projecting radially inwardly at least at the lower extremity of said gasket means to define a space having a dimension with a diametrically opposed portion which is less than the outside diameter of said skirt adjacent said top panel, said lobe means being deformable to form a part of said gasket means when said closure cap is applied to said container finish, and further being adapted to prevent nesting of one cap within another during cap handling.

5. A closure cap for application to a container having a finish, said closure cap including a top panel portion and a frustoconical skirt portion, a gasket groove formed between said top panel portion and said skirt portion, a gasket formed from reformable material substantially filling said groove and extending along said skirt portion in a direction away from said groove to terminate adjacent a lower margin of said skirt, a plurality of inwardly projecting lobe means formed integrally with said gasket at

spaced points around a circumferential portion thereof, each of said lobe means extending axially from adjacent said lower margin upwardly towards said gasket groove, one of said lobe means and said gasket when measured at said lower margin defining a diametric dimension which is lesser than an outside diameter of said skirt portion taken adjacent said gasket groove whereby said lobe means will prevent nesting of said cap and pumping on application to a container finish.

References Cited

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2,808,854	10/1957	Smith	215—40 XR
2,960,134	11/1960	Fornas	220—97 XR
2,979,218	4/1961	Stover	215—40

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GEORGE E. LOWRANCE, *Examiner.*

UNITED STATES PATENT OFFICE

CERTIFICATE OF CORRECTION

Patent No. 3,344,943 October 3, 1967

Donald H. Zipper

It is hereby certified that error appears in the above numbered patent requiring correction and that the said Letters Patent should read as corrected below.

Column 3, line 75, for "basket" read -- gasket --; column 3, line 3, for "2,808,854" read -- 2,808,954 --.

Signed and sealed this 15th day of October 1968.

(SEAL)
Attest:

Edward M. Fletcher, Jr.
Attesting Officer

EDWARD J. BRENNER
Commissioner of Patents