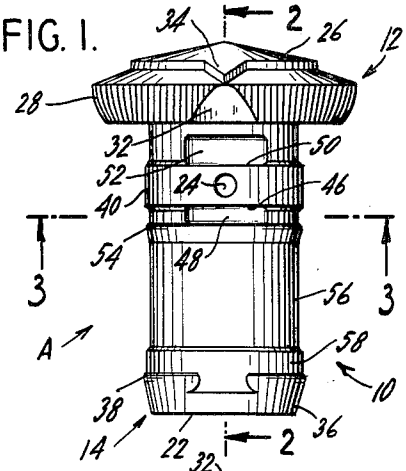
Nov. 30, 1965 R. NYDEN 3,220,657

CLOSURE-DISPENSER CAP FOR FLEXIBLE LIQUID CONTAINERS

Filed Feb. 24, 1964

FIG. 1.



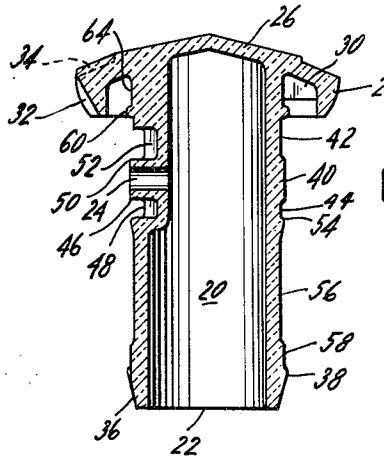


FIG. 2.

FIG. 3.

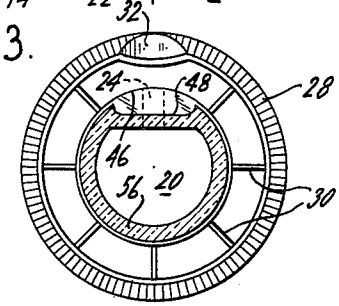


FIG. 5.

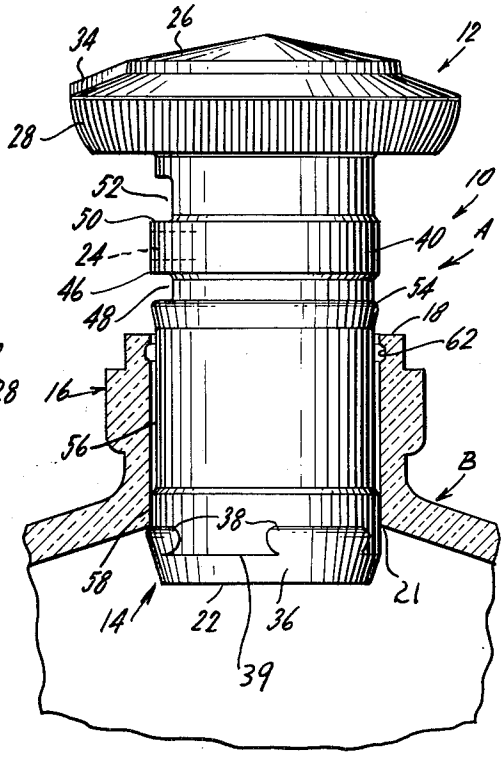
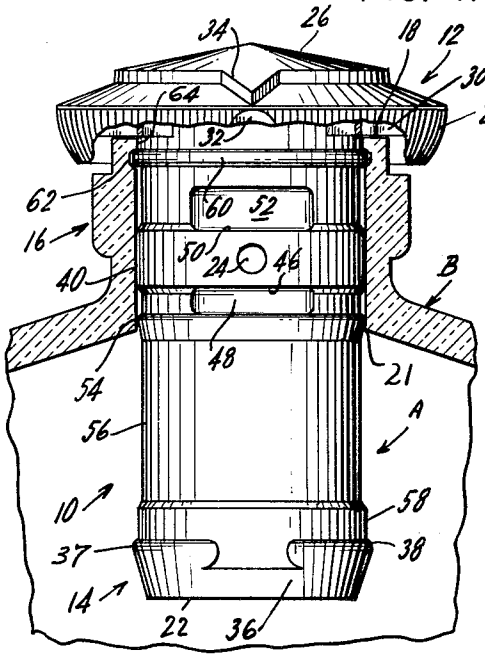


FIG. 4.



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CLOSURE-DISPENSER CAP FOR FLEXIBLE LIQUID CONTAINERS

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The present invention relates in general to improvements in container closures and dispensers, and relates in particular to a novel and improved closure-dispenser for flexible squeeze bottles containing viscous fluids.

The container closure of the present invention is of the type shown in my prior United States Patent No. 2,961,169, and constitutes an improvement thereover. Such type of closure, as disclosed in my aforesaid patent, constitutes a tubular closure member slidably mounted within the neck of a flexible and squeezable container, the closure member having an outlet aperture and being slidable between a raised position in which the tubular member projects from the container neck and exposes the outlet opening for the dispensing of fluid when the container is squeezed, and a lowered position in which the closure member is located within the container neck, the outlet aperture is covered, and the container is sealed by said closure.

Longitudinally slidable valved closures of this type are used as dispensers for flexible bottles containing both liquids and creams of viscous fluids. Where a liquid is to be dispensed, the closure and dispenser cap carries a tube which extends to the bottom of the container, and the liquid is emitted as a spray when the container is squeezed. Where a cream, such as a cosmetic hand lotion, is to be dispensed, the tube is omitted and the cream is dispensed in a stream. The improved closure of the present invention is adapted to be used for dispensing creamy or semi-viscous fluids in streams, and is particularly intended to eliminate some of the difficulties heretofore encountered in dispensing fluids of this kind.

Conventional dispenser closures of the type described above are subject to the disadvantage of being incapable of preventing some of the liquid from collecting on the interior of the dispenser cap and then dripping onto the exterior of the bottle. Because of the slippery nature of the creamy liquid, it becomes extremely difficult to wipe the liquid completely away from the exterior of the bottle, and even if this were possible, the wiping itself would represent a considerable inconvenience. In addition, the cream accumulated on the exterior surface of the dispenser cap is scraped to the top of the cap when the latter is depressed to its sealing position, and collects under the rim thereof and around the upper surface of the bottle neck, often causing unpleasant odors, and caking to interfere with the sliding action of the cap.

Another disadvantage found in the use of such closures is the tendency for the fluid to leak out between the inner wall of the container neck and the dispenser cap, both in the open and closed positions of said cap.

It is accordingly a primary object of the present invention to provide, for a squeeze-bottle of the above general type, a closure cap construction which will reliably prevent accumulation of the contents of the bottle onto the exterior thereof.

Another object of the present invention is to provide a closure cap of the character described which provides an improved leak-proof seal around the container mouth in both the open and closed position of the cap, and which, at the same time is easily displaceable between its open and closing position.

Another object of the present invention is to provide a closure cap construction which can be produced in an

economic molding operation and which can easily be assembled with the container itself.

In accordance with the invention, there is provided a closure and dispenser cap which is adapted to extend through the neck of a squeeze bottle, and is considerably longer than the neck so as to be slidable longitudinally between an elevated, operative position and a lowered, closed position. The closure cap has a hollow interior which communicates with the interior of the squeeze bottle through an open bottom end, and a discharge aperture located intermediate its ends for exposure when the closure cap is in raised position and for discharge of the liquid content of the bottle therethrough when the bottle is squeezed. The closure cap is formed with a series of annular sealing sections which engage the inner surface of the bottle neck and provide a sliding surface for the closure cap and liquid-tight and air-tight seals with the inner surface of the bottle neck, these sections being separated by alternate sections of lesser diameter than the bottle neck. An additional feature of the invention resides in the provision of one or more sharp edges below or above the discharge aperture, which edges act as a surface for the dripping of excess fluid away from the body of the closure cap to prevent leakage thereof onto the surface of the closure cap and bottle. A reservoir slot is provided adjacent each of the sharp edges to collect and retain excess fluid remaining on the closure cap.

Additional objects and advantages of the invention will become apparent during the course of the following specification when taken in connection with the accompanying drawings, in which:

FIG. 1 is a front elevational view of closure cap made according to the present invention;

FIG. 2 is a longitudinal section taken along the line 2—2 of FIG. 1 in the direction of the arrows;

FIG. 3 is a transverse section taken along line 3—3 of FIG. 1;

FIG. 4 is an enlarged front elevational view of the closure cap shown in FIGS. 1–3, showing the closure cap mounted within the neck of a container, the container being shown fragmentarily and in section, and portions of the closure cap being broken away; and

FIG. 5 is an enlarged elevational view similar to FIG. 4, but with the closure cap in its raised position relative to the container and rotated 90° about its central longitudinal axis.

Referring now to the drawings, it will be seen that the closure cap A of the present invention is adapted to be assembled with a squeeze-bottle B, which is fragmentarily illustrated in FIGS. 4 and 5, and both the closure cap A as well as the squeeze-bottle B are made of a suitable resilient and flexible plastic, such as polyethylene, for example. Moreover, the closure cap A has a one-piece construction and is molded in its entirety in a single operation, and the same is true for the squeeze-bottle B, so that the entire dispenser assembly includes but two elements.

The closure cap A has an elongated tubular body **10** which is provided with enlarged upper and lower ends, the enlarged upper end **12** forming a cap which projects radially from elongated member **10** at its upper end while the enlarged lower end **14** is adapted to act as a stop for limiting the upward movement of the closure cap, as will be presently described. Between its upper and lower enlarged ends **12** and **14** the tubular body member **10** has a generally cylindrical configuration, and is sized for insertion within the neck **16** of the bottle B, as shown in FIGS. 4 and 5. In this mounted condition, the upper enlarged end **12** of the body **10** engages the upper surface **18** of the neck **16** to prevent downward movement of the closure cap past the lower closed position shown in FIG. 4 where the container B is provided with an

air-tight and fluid-tight seal by the closure cap, as will be apparent from the description below. The enlarged lower end **14** of the body **10** engages the bottom end **21** of the neck **16**, as indicated in FIG. 5, to limit the upward movement of the closure cap to the upper open position thereof which is illustrated in FIG. 5.

As may be seen in FIG. 2, the elongated tubular body **10** has a hollow interior **20** and an open bottom end **22** through which the hollow interior **20** communicates with the interior of the container B. In addition, the member **10** is formed, between its upper and lower ends, with a substantially radial discharge aperture **24**. Thus, when the closure cap is in the upper open position of FIG. 5, the operator need only compress the bottle B to reduce the interior volume thereof and thus displace the contents upwardly through the open bottom end **22** into the hollow interior **20** and out through the discharge aperture **24** of the body **10**, and the liquid will issue from the member **10** in a steady solid stream which can be readily directed to any desired location.

The upper enlarged end **12** of the body **10** includes a top wall **26** which closes off the top end of the hollow interior **20** of body **10**, and which projects beyond the member **10**, terminating at its outer periphery in a downwardly-directed lip **28**. This lip **28** may be knurled at its exterior surface so that the operator can conveniently grasp the closure cap for lifting and lowering the same between its closed and open positions. A plurality of reinforcing ribs **30**, shown most clearly in FIG. 3, extend between and are formed integrally with the tubular body **10** and the lip **28** as well as with the bottom surface of upper wall **26** so that in this way the lip **28** is maintained rigid and will not yield when grasped by the operator. A portion of the lip **28** which is angularly aligned with the discharge aperture **24** is formed with a notch **32** to provide clearance for the stream of liquid issuing from the aperture **24**. As the volume of the creamy liquid within the bottle B becomes lower during use, the user must incline the bottle angularly downward to an increasing extent in order to facilitate the discharge of the liquid content, such position being a downward inclination of approximately 45° from the vertical. In such position, notch **32** will provide clearance for the stream of liquid and will prevent the liquid from engaging the lip **28** to be undesirably deflected thereby. The top surface of upper wall **26** is also molded to define an index, in the form of an arrow **34** which is aligned with the discharge aperture **24** and enables the user to direct the stream of liquid in the proper direction.

It will be seen from FIG. 4 that in the lower closed position of the closure cap, the lower edges of the ribs **30** engage the upper surface **18** of the bottle neck **16**, acting as a stop to restrain further downward movement of said closure cap.

While the greater portion of the elongated tubular body **10** is made of a diameter appreciably less than the internal diameter of the bottle neck **16**, the body **10** is formed with spaced annular bands or sections of greater diameter, these bands being sized to fit snugly within the bottle neck **16**, having a sliding and sealing fit therewith. Thus, the elongated body **10** has molded on its outer surface a primary annular sealing section **40** of external diameter substantially equal to the inner diameter of bottle neck **16**. The primary sealing section **40** engages the interior surface of neck **16** with a snug fit so as to provide a fluid-tight and air-tight seal therewith when the closure cap is in the closed position shown in FIG. 4. In addition, the section **40** provides a primary area of sliding contact when the closure cap is moved between its open and closed positions.

The body **10** is also formed with a secondary annular sealing section **54**, spaced a short distance below the primary section **40**, a lower annular sealing section **58** located adjacent the bottom end of body **10**, and an upper annular sealing section **64** located at the top of body **10** immediately beneath and adjacent the ribs **30**. All of these sealing sections **54**, **58** and **64** are of substantially the same diameter as the primary sealing section **40**, that is, they are sized to make a snug slide fit with the interior of neck **16** and form a liquid-tight and air-tight seal therewith.

Between the enlarged diameter sealing sections **64**, **40**, **54** and **58**, and spacing the same, are respective body sections **42**, **44** and **56**, all of a reduced diameter to provide clearance between their outer surfaces and the inner surface of neck **16**, as shown in FIG. 4.

The lower annular sealing section **58** terminates at its lower end in a bottom section **38** which forms the lower enlarged end **14** of the tubular body **10**. The bottom section **38** tapers downwardly from an upper edge, which is of greater diameter than the sealing section **58**, to a lower edge which is of lesser diameter than the reduced diameter body sections **42**, **44** and **56**. The tapered form of the bottom section **38**, and the reduced diameter of its bottom end facilitates the introduction of the lower end of the closure cap into the bottle neck **16**. The upper end of bottom section **38**, being of enlarged diameter, forms a shoulder **37** with the lower sealing section **58**.

The daimeter of the bottom section **38**, in the region of the shoulder **37**, is in excess of the inner diameter of neck **16**. When the tapered bottom section **38** is inserted into the neck **16**, and downward pressure is exerted thereon, the upper end of the bottom section **38** is compressed so that the shoulder **37** enters and slides down the inner surface of neck **16**, and snaps outwardly to its full diameter when the shoulder **37** clears the neck. To permit such compression, the upper enlarged portion of bottom section **38** is provided with a series of cut-away portions **39** which separate the enlarged upper portion and the shoulder **37** into spaced segments. This provides a flexibility to the upper portion of bottom section **38** which permits sufficient compression thereof to permit its insertion through the bottle neck **16**.

Once inserted, the shoulder **17** acts as a stop by engaging the bottom surface **21** of neck **16**, as shown in FIG. 5, to limit upward movement of the closure cap relative to the bottle and to define the fully extended position of the closure cap.

The discharge aperture **24** is located centrally within the primary annular sealing section **46**. It will be observed in FIG. 2 that the tubular body **10** has an area of substantial wall thickness in the vicinity of the discharge aperture **24**. The body **10** is formed with a relatively deep, elongated circumferential slot **48** in reduced diameter body section **44**, in alignment with and immediately beneath the discharge aperture **24**. Similarly, the body **10** is also formed with a deep, elongated circumferential slot **52** in the reduced diameter body section **44**, in alignment with and immediately above the discharge aperture **24**. The slots **48** and **52** are, at their respective upper and lower ends, co-extensive with the edges of the primary annular sealing section **46**, so as to provide relatively sharp and well-defined no-drip edges or corners **46** and **50** below and above the discharge aperture **24**.

In use of the assembly, the closure cap A is withdrawn to its extended position of FIG. 5, and the bottle B is tilted and squeezed so as to force the creamy liquid content thereof through the discharge aperture **24** and upon the hand of the user, for example. In such use, excess liquid tends to run down the surface of the closure cap and onto the bottle. Because of the novel form of the closure cap A, however, when the bottle is held in an upright tilted position, the cream collects and drips off the sharp edge **46**. Similarly, if the bottle is inverted, the creamy liquid will collect and drip off the sharp edge **50**. Any excess liquid remaining on the exterior of the primary section **40** will flow into the slot **48** or slot **52** and collect therein. A considerable amount of liquid is capable of accumulating in either of the slots **48** and **52**, so as to avoid undesired flowing along the surface of the closure cap.

In order to frictionally retain the closure cap in its lowered, closed position of FIG. 4, the closure cap is provided with a projecting annular locking bead **60** of semicircular configuration, between the reduced diameter section **42** and the upper sealing section **64**. The bottle neck **16** is provided with a complementary annular groove **62** located adjacent the upper end thereof, which is sized to receive the locking bead **60**. In the closed position of FIG. 4, the bead **60** snaps into the groove **62** to provide a releasable lock for the closure cap but does not provide a seal, so that it may be easily inserted and removed.

In the closed position of FIG. 4, a liquid-tight and air-tight seal is provided for the closure cap at its top end by engagement of the upper annular sealing section **64** with the top inner surface of neck **16** immediately above the head **60**. Another seal is provided by engagement of the primary annular sealing section **40** with the interior of neck **16**, and a further seal is provided by the secondary annular sealing section **54** with the bottom end of the neck **16**. The seal provided by primary section **40** is sufficient in itself, because of the relatively large width of section **40**, to prevent flow of the liquid content between the closure cap body **10** and the inner surface of neck **16**, in case of accidental squeezing of the bottle when the closure cap is in its closed position, and also to prevent air from entering the interior of the body. The seal provided by the upper annular sealing section prevents air from entering the neck and contacting the liquid accumulated in the reservoir slot **52** so as to cause drying and caking thereof. The seal provided by the secondary sealing section **54** prevents liquid in the bottle B from reaching and filling the slot **48**.

When the closure cap is raised from its closed position of FIG. 4 to its extended, operative position of FIG. 5, the primary and secondary annular sections **40** and **54** slide upwardly along the inner surface of neck **16**. Because these sections are not continuous with each other and are separated by sections of lesser diameter, the areas of sliding contact are relatively small and a relatively small frictional resistance is encountered in moving the closure cap. The secondary sealing section **54** is also tapered as shown to provide a small area of frictional contact and compensate for the long region of drag at the lower portion of the closure cap. This permits the closure cap to be manually operated with less effort than is required in conventional sliding closure caps.

As the closure cap moves upwardly, the primary sealing section **40** leaves the bottle neck **16**, exposing the discharge aperture **24**. The secondary sealing section **54** continues to serve as the sliding surface for the closure cap for a short distance, and just as it approaches the top of the bottle neck **16**, the lower annular sealing section **58** enters the bottle neck **16** and provides a sliding surface. In the fully-extended position of the closure cap, shown in FIG. 5, the primary and secondary sealing sections **40** and **54** are located externally of the neck **16** and the lower sealing section **58** is within the lower end of the bottle neck, providing a sliding surface and also providing a seal to prevent the liquid, under pressure, of the squeezed bottle, from flowing between the closure cap and the bottle neck **16**.

When the closure cap is lowered to its closed position of FIG. 4, the secondary sealing section **54** engages the inner surface of the bottle neck **16**, wiping off any liquid which may have accumulated on the surface of said section **54**. This liquid collects in the reduced diameter section **44**, particularly in the slot **48** therein. Similarly a self-wiping action is performed by the primary sealing section **40**, causing any liquid accumulated thereon to flow into the reduced diameter section **42** and the slot **52** therein. Such wiping action prevents accumulated liquid from gathering and caking at the top of the bottle neck, which has hitherto been an undesirable feature of slide-type closure caps.

It is apparent from the above description that the stopper A of the present invention can be readily molded in an inexpensive manner from plastic materials such as polyethylene, and is also capable of being easily assembled with the container B, while at the same time remaining reliably connected thereto since it cannot be easily pulled upwardly from the position shown in FIG. 5. Moreover, the stopper will effectively prevent any dripping of liquid onto the exterior of the bottle, even at the neck **16** thereof, while also maintaining any film at the interior surface of the neck **16** at a minimum thickness so that the tendency of the liquid to drip will be minimized.

Furthermore, because the outer atmosphere is maintained out of contact with the entire interior of the container, including the inner surface of the neck **16**, there will be no caking of the liquid content at any part of the bottle or closure cap.

While a preferred embodiment of the invention has been shown and described herein, it is obvious that numerous additions, changes and omissions may be made in such embodiment without departing from the spirit and scope thereof.

What is claimed is:

1. A squeeze-bottle closure cap comprising an elongated hollow member of substantially cylindrically configuration adapted to extend through the neck of a squeeze-bottle into the interior thereof and having on its outer surface intermediate its ends an integral projecting band of enlarged diameter adapted to slidably engage the inner surface of the neck of said squeeze-bottle, said member having an open bottom end communicating with the interior of said member so that the contents of a squeeze-bottle are adapted to pass through said open bottom end of said member into the interior thereof, said band being formed with a substantially radial discharge aperture communicating with the interior of said member and through which contents of the squeeze-bottle are adapted to be discharged, and a recess formed in the outer surface of said member beneath and contiguous with said band, the upper edge of said recess forming, with the lower edge of said band a relatively sharp, no-drip edge located beneath said aperture, such that excess liquid on said closure cap will gather at said edge and will accumulate in said recess without flowing along the closure cap.

2. A squeeze-bottle closure cap comprising an elongated member of substantially cylindrical configuration having upper and lower at least partially enlarged ends adapted respectively to engage the upper and lower ends of a squeeze-bottle neck through which said elongated member is adapted to extend and which is shorter than said elongated member such that said upper and lower enlarged ends of said elongated member are adapted to limit movement of said member relative to the neck of the squeeze-bottle between a closed position where said upper end of said member engages the upper end of said neck and an open position where said lower end of said member engages the lower end of said neck, said member having between said ends thereof a pair of spaced exterior annular sealing bands of enlarged diameter extending around the circumference of said member and adapted to slidably engage the inner surface of the neck of the squeeze-bottle when said member is in said lower closed position thereof and to be situated above the neck of the squeeze-bottle when said member is in its upper open position, said elongated member having an open bottom end and a hollow interior communicating with said open bottom end and adapted to communicate through said open bottom end with the interior of a squeeze-bottle, the uppermost of said bands being formed with a substantially radially extending discharge aperture extending from the interior to the exterior of said member, the uppermost of said pair of bands having beneath the said aperture a relatively sharp, no-drip edge, such that excess liquid on said closure cap will gather at said edge and will accumulate in the annular recess between said pair of bands.

3. A closure cap according to claim 2 in which said member is formed, in the recess between said pair of bands and in alignment with said discharge aperture, with a relatively deep elongated circumferential slot the upper edge of which adjoins said no-drip edge so that liquid contents can accumulate in said slot.

4. A closure cap for squeeze bottles having a neck, said closure cap comprising an elongated hollow member of cylindrical configuration of substantially greater length than said squeeze bottle neck and adapted to extend therethrough into the interior of said squeeze bottle, said member having an external diameter of lesser extent than the internal diameter of said squeeze bottle neck and being formed on its outer surface with a plurality of relatively narrow spaced annular bands extending continuously around the periphery of said member, the body portion of said member between said bands forming annular recesses extending around the circumference of said member, said bands having a diameter sufficiently large to engage the interior of said squeeze bottle neck in a sliding and sealing fit, said member having an open bottom end and a hollow interior communicating with said bottom end and with the interior of said squeeze bottle, a discharge aperture extending radially through one of said bands and communicating with the hollow interior of said member for ejection of liquid therethrough when said bottle is squeezed, and a sharp no-drip edge formed beneath said band containing said discharge aperture, such that excess liquid on said closure cap will gather at said edge and accumulate in the annular recess immediately beneath the last mentioned band.

5. A closure cap for squeeze bottles having a neck, said closure cap comprising an elongated hollow member of cylindrical configuration of substantially greater length than said squeeze bottle neck and adapted to extend therethrough into the interior of said squeeze bottle, said member having an external diameter of lesser extent than the internal diameter of said squeeze bottle neck and being formed on its outer surface with a plurality of relatively narrow spaced annular bands extending continuously around the periphery of said member, said bands having a diameter sufficiently large to engage the interior of said squeeze bottle neck in a sliding and sealing fit, a first of said bands being located at the upper end portion of said member, a second of said bands being located at the lower end portion of said member, a third of said bands being spaced below said first band, and a fourth of said bands being spaced below said third band, said member having an open bottom end and a hollow interior communicating with said bottom end and with the interior of said squeeze bottle, a discharge aperture extending radially through said third band and communicating with the hollow interior of said member for ejection of liquid therethrough when said bottle is squeezed, and a sharp no-drip edge formed beneath said third band containing said discharge aperture, such that excess liquid from said discharge aperture will gather at said edge and accumulate in the annular recess between said third and fourth bands.

6. A closure cap for squeeze bottles having a neck, said closure cap comprising an elongated hollow member of cylindrical configuration of substantially greater length than said squeeze bottle neck and adapted to extend therethrough into the interior of said squeeze bottle, said member having an external diameter of lesser extent than the internal diameter of said squeeze bottle neck and being formed on its outer surface with a plurality of relatively narrow spaced annular bands extending continuously around the periphery of said member, said bands having a diameter sufficiently large to engage the interior of said squeeze bottle neck in a sliding and sealing fit, a first of said bands being located at the upper end portion of said member, a second of said bands being located at the lower end portion of said member, a third of said bands being spaced below said first band, and a fourth of said bands being spaced below said third band, said member having an open bottom end and a hollow interior communicating with said bottom end and with the interior of said squeeze bottle, a dicharge aperture extending radially through said third band and communicating with the hollow interior of said member for ejection of liquid therethrough when said bottle is squeezed, and a sharp no-drip edge formed beneath said third band containing said discharge aperture, such that excess liquid from said discharge aperture will gather at said edge and accumulate in the annular recess between said third and fourth bands, said member being slidable within said squeeze bottle neck between a raised discharge position and a lowered storage position and having upper and lower enlarged ends adapted to engage the respective upper and lower ends of said neck in said lowered and raised positions, said third and fourth bands being located above said neck when said member is in said raised position.

7. A closure cap according to claim 6 in which said first, third and fourth bands are in sealing engagement with the interior of said squeeze bottle neck in the lowered storage position of said member to provide seals above and below said discharge aperture.

8. A closure cap according to claim 7 in which said second band is spaced a relatively long distance below said fourth band, said second band moving upwardly into sliding and sealing engagement with the interior of said neck as the member is brought to its raised position, only after said third band has moved above and clear of said neck, whereby said member is displaced to its raised position with a minimum of frictional drag.

9. A closure cap according to claim 8 in which said member is formed with an upper, relatively deep, elongated circumferential slot located within the annular recess between said first and third bands in alignment with said discharge aperture, the upper edge of said slot being contiguous with the upper edge of said third band to form an upper sharp no-drip edge above said discharge aperture, the excess liquid from said discharge aperture gathering on said upper no-drip edge, when the closure cap is in inverted position, and accumulating in the annular recess between said first and third bands and in said upper slot.

10. A closure cap according to claim 9 in which the outer surface of said third band moves in wiping contact along the interior surface of said squeeze bottle neck when said member is brought to its lowered position whereby the excess liquid in the vicinity of said discharge opening is wiped into said upper slot.

11. A closure cap according to claim 10 in which said member has between said first band and said enlarged upper end, an annular locking bead adapted to snap into a groove formed in the neck of said squeeze bottle, when the member has been displaced downwardly to its lowered position.

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