Sept. 20, 1971 G. J. ARDITO ET AL 3,606,107

PUSH-PULL CONTAINER AND CAP ASSEMBLY

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Fig. 2.

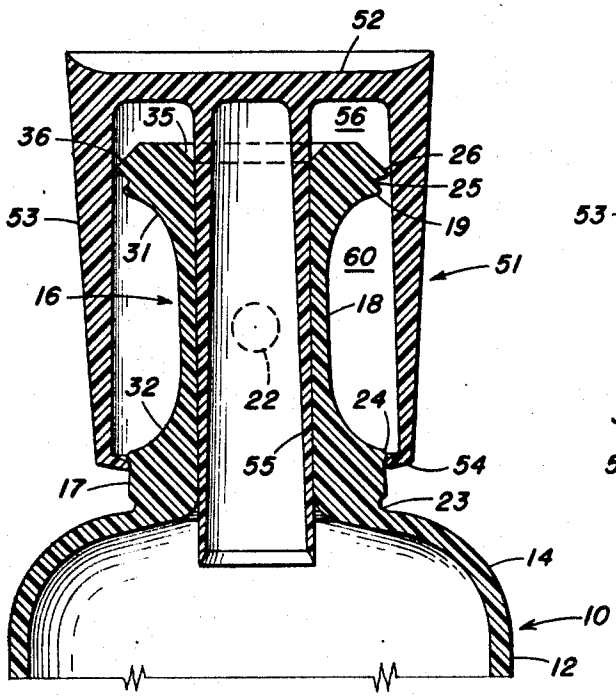


Fig. 1.

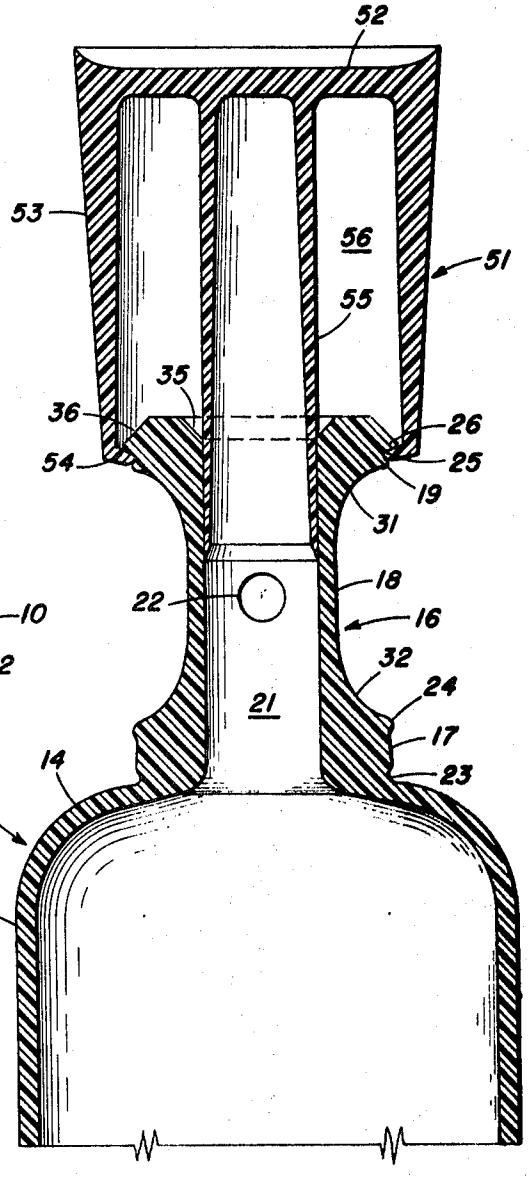
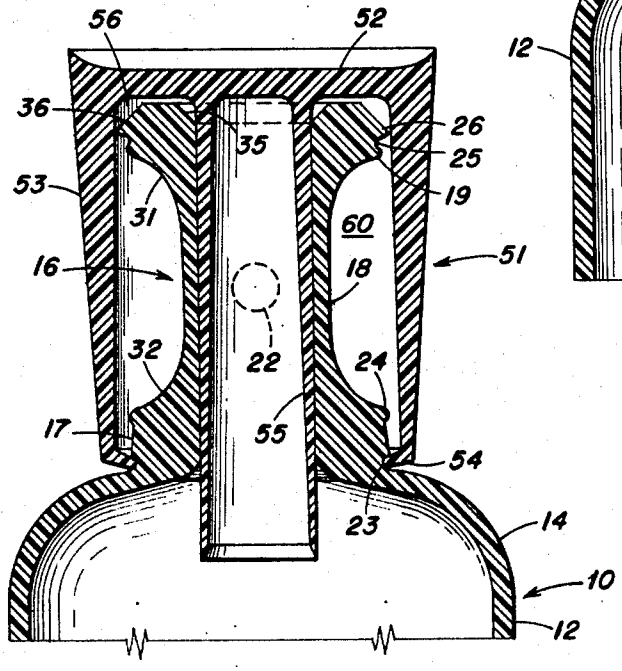


Fig. 3.



INVENTORS
Gerald J. Ardito
Jerome S. Newman
Samuel E. Sarris

BY Marn & Jangarathis

ATTORNEYS

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PUSH-PULL CONTAINER AND CAP ASSEMBLY

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Fig. 5

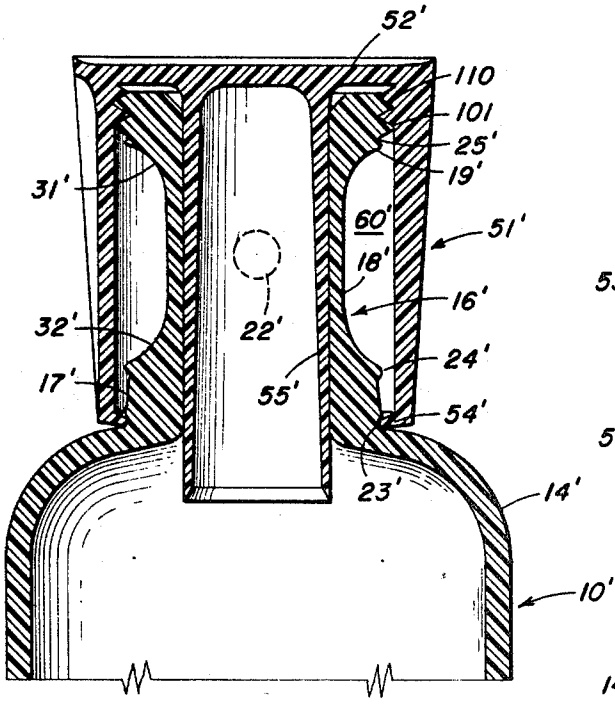


Fig. 4.

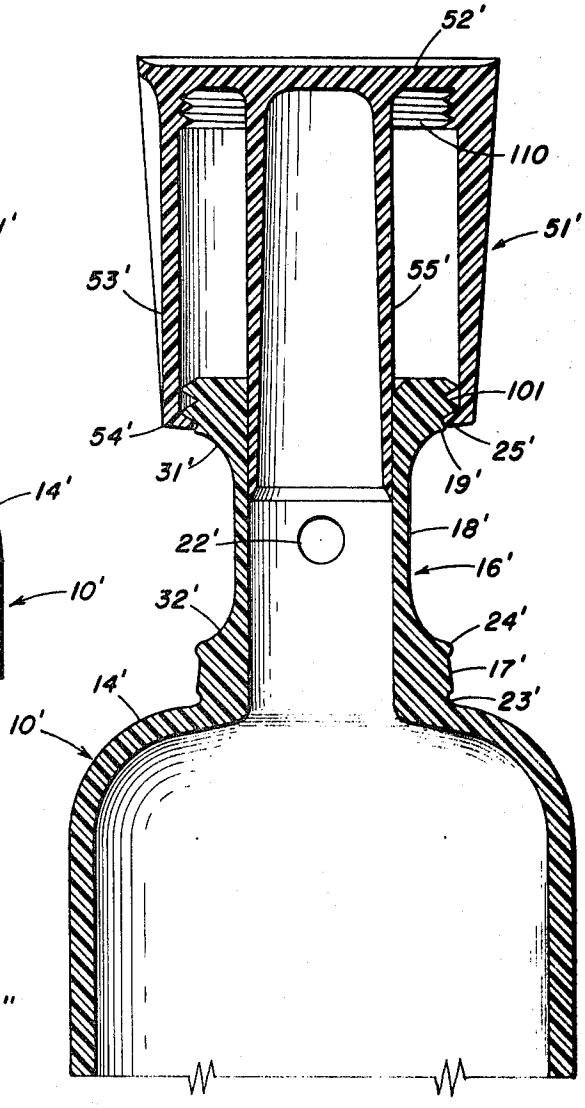
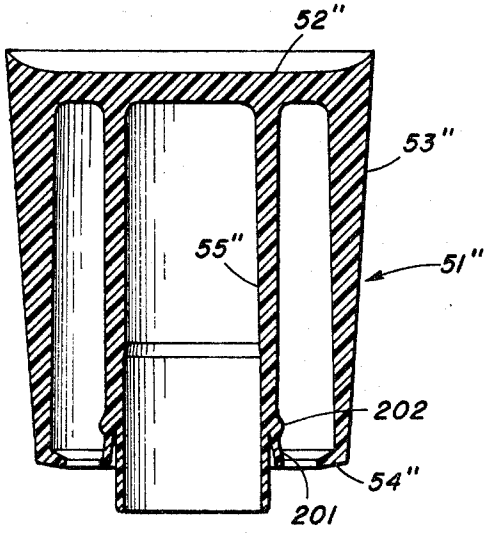


Fig. 6.



INVENTORS
Gerald J. Ardito
Jerome S. Newman
Samuel E. Sarris

BY Marn & Jangarathis

ATTORNEYS

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PUSH-PULL CONTAINER AND CAP ASSEMBLY

Filed Sept. 5, 1969 3 Sheets-Sheet 3

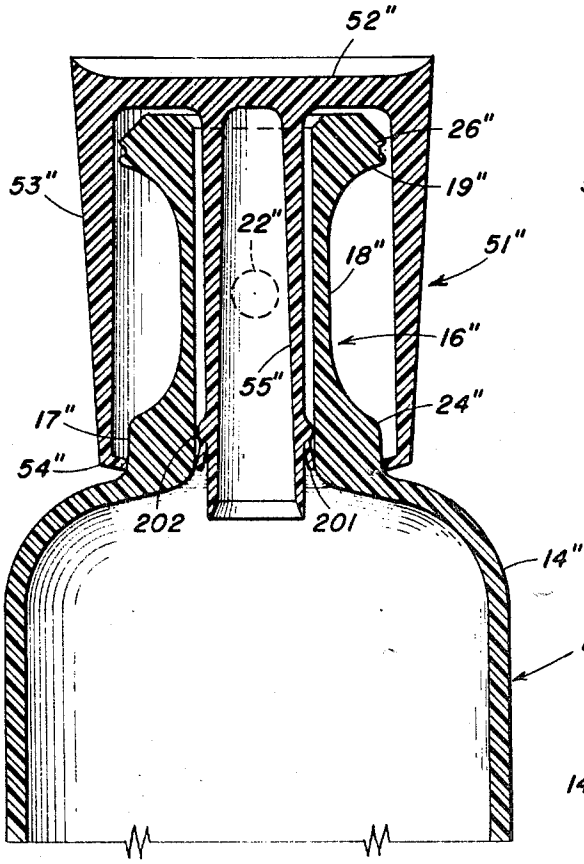


Fig. 8.

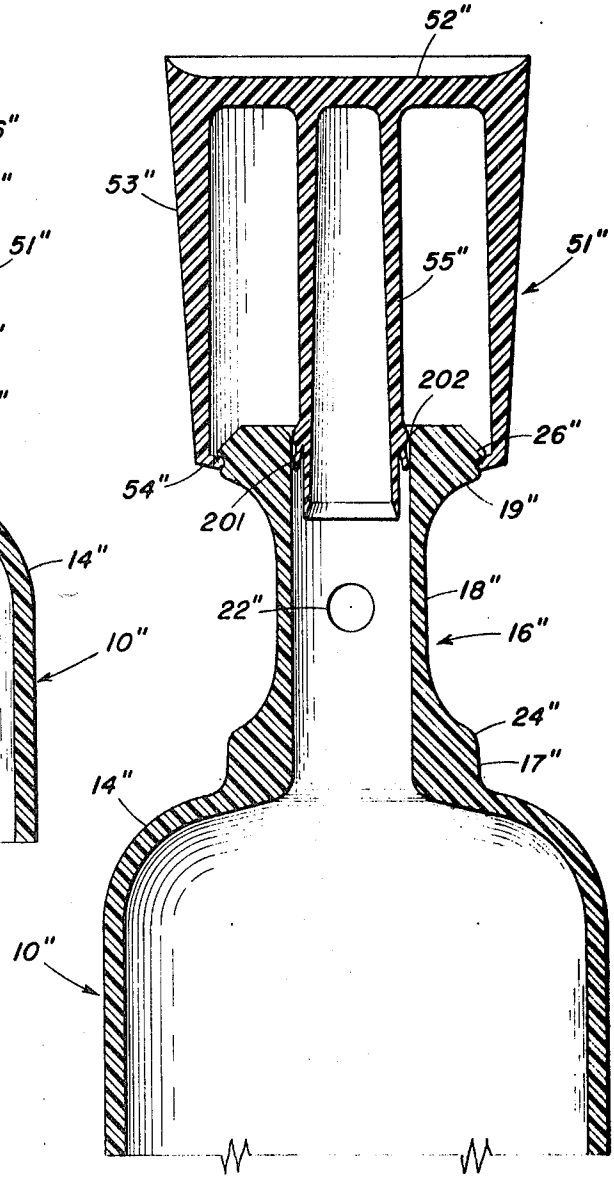


Fig. 7.

INVENTORS
Gerald J. Ardito
Jerome S. Newman
Samuel E. Sarris

BY Marn & Jangarathis
ATTORNEYS

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3,606,107

PUSH-PULL CONTAINER AND CAP ASSEMBLY

Gerald J. Ardito, Bayside, Jerome S. Newman, Floral Park, and Samuel E. Sarris, Jamaica, N.Y., assignors to Inventions Unlimited Incorporated, Glen Oak, N.Y.

Filed Sept. 5, 1969, Ser. No. 855,583
Int. Cl. B65d 47/12
U.S. Cl. 222—546 20 Claims

ABSTRACT OF THE DISCLOSURE

A material dispensing container provided with an elongated neck having a dispensing orifice in the side thereof. The neck of the container is also provided with engaging recesses. The cap of the container has a plunger which extends into the neck of the container and an outer portion which fits over the container neck. The lower extremity of the outer portion of the cap is provided with an inwardly extending peripheral engaging lip which cooperates with the engaging recesses of the neck of the container in open and closed positions. The plunger may also be provided with a resilient skirt which is compressed within the neck and outwardly biased to provide for sealing engagement, notwithstanding tolerance discrepancies.

BACKGROUND OF THE INVENTION

Many push-pull type of containers and cap therefor have been proposed to eliminate the need for complete removal of the cap in order to dispense material from the container. In U.S. Pat. No. 3,266,680, a push-pull material dispensing container and cap therefor was proposed which eliminated the unsightly appearance of accumulated material about the dispensing orifice and provided a means to reduce bacterial growth on such accumulated material by minimizing contact by air with such accumulation. Such design, however, did not prevent build-up of material above the dispensing orifice during continuous consumer operation and did not provide a more positive means of complete closure in a facile way. Additionally, tolerance discrepancies during manufacture of the cap and container sometimes resulted in a defective seal between the cap plunger and the inner surface of the neck of the container.

OBJECTS

It is a general object of the present invention to provide an improved push-pull container and cap assembly which overcomes the foregoing problems.

Another object of the present invention is to provide an improved container and cap design for a push-pull container and cap assembly whereby more positive closure is attained in a facile way therebetween.

Still another object of the present invention is to provide an improved container and cap design for a push-pull container and cap assembly whereby tolerance discrepancies during manufacturing do not adversely effect positive sealing therebetween.

Various other objects and advantages of the invention will become apparent from the following description of several embodiments thereof, and the novel features will be particularly pointed out in connection with the appended claims.

SUMMARY OF THE INVENTION

In essence the present invention is directed to a material dispensing neck and cap therefor to be employed for

dispensing material from a container. The neck which is attached to a container is comprised of a base portion, an intermediate portion having a dispensing orifice and a top portion, the bottom and top portion having a greater diameter than the intermediate portion, the transition from the intermediate portion to the top and bottom portions being defined by outwardly curved surfaces. The cap of the container has a center portion or plunger which when inserted into the neck of the container cooperates with the interior surface of the neck to provide an effective seal therebetween and as the cap is pushed into a closed position, the plunger covers the orifice thereby preventing material from being dispensed from the container. The cap is provided with an outer portion which extends over the container neck and such portion is provided with an inwardly extending lip which releasably engages the threaded top portion of the container neck in the open position. The cap is also provided with threadable means on the inside of the top of the outer portion thereof to permit the cap to be screwed on the threaded top portion of the container neck in the closed position. The base portion of the neck of the container adjacent to the beginning of the main body of the container is provided with means for engaging the cap lip to retain the cap in a closed position, generally in the form of a peripheral abutment means and a lower axially displaced peripheral recess to engage the lip of the cap in the closed position to provide a positive outer seal therebetween, with the outer portion of the cap being spaced from the intermediate portion of the neck to define a closed chamber therebetween. In a simplified embodiment, the threads on the top portion are eliminated and in its place there is provided an abutment and recess means, to engage the lip of the cap in the open position. In a particularly preferred embodiment, the exterior surface of the cap plunger is provided with resilient means which is compressed upon insertion of the plunger in the neck and in compression the resilient means is outwardly biased in sealing engagement with the interior of the neck. In this manner, an effective seal may be achieved, not withstanding tolerance discrepancies between the plunger and the interior of the neck.

THE DRAWING

Understanding of the invention will be facilitated by referring to the following detailed description in conjunction with the accompanying drawing, in which

FIG. 1 is a cross-sectional elevational view of a simplified embodiment of the invention with the container and cap assembly in open position;

FIG. 2 is a cross-sectional elevational view of a simplified embodiment of the invention with the container and cap assembly in a closed semi-locked position;

FIG. 3 is a cross-sectional elevational view of a simplified embodiment of the invention with the container and cap assembly in a closed fully-locked position;

FIG. 4 is a cross-sectional elevational view of another embodiment of the invention illustrating the container and cap assembly in open position wherein the container and cap are provided with threaded engageable means;

FIG. 5 is a cross-sectional elevation view of the container and cap assembly of FIG. 4 illustrating the assembly in a fully closed position;

FIG. 6 is a cross-sectional elevational view of another embodiment of a cap design including a resilient sealing means;

FIG. 7 is a cross-sectional elevational view of a cap and container assembly having the cap of FIG. 6 in open position; and

FIG. 8 is a cross-sectional elevational view of the cap and container assembly of FIG. 7 in closed position.

DESCRIPTION OF EMBODIMENTS

With reference to FIGS. 1, 2 and 3, there is provided a container, generally indicated as **10**, comprised of a body **12** in which a material is adapted to be held in the chamber thereof until such time as the same is required to be dispensed. It is unimportant whether the container body **12** be made of a collapsible or non-collapsible metal or plastic. The body **12** at a narrowed skirt portion **14**, is provided with a hollow neck, generally indicated by **16**. The neck **16** may be made integral with the body **12** when the container **10** is molded or otherwise formed or it may be attached thereto at a later time. The manner in which the neck **16** is connected to the body **12** is immaterial. The neck **16** is comprised of a base **17**, an intermediate elongated substantially cylindrical central portion **18** having a narrower cross-section than the base **17** and a top portion **19** having a cross-section substantially equal to the cross-section of the base **17**. The hollow interior **21** of the neck **16** is in fluid flow communication with the interior of the container **10**, whereby fluid may flow from the interior of the container **10** into the interior **21** of the neck **16**. The intermediate portion **18** of the neck **16** is provided with a dispensing orifice **22** whereby fluid may be dispensed from the interior of the container **10**.

The exterior surface of the base **17** of the neck **16** is provided with a circular recess or groove **23** at the juncture of the skirt portion **14** with the neck **16** and with an outwardly extending circular bead portion **24**, the bead portion **24** being above the recess or groove **23** and defining an abutment on the upper portion of base **17** for retaining a cap in a closed position, as hereinafter described. Similarly, the exterior surface of the top **19** of the neck **16** is provided with a circular recess or groove **25** and with an outwardly extending circular bead portion **26**, the bead portion **26** being above the recess or groove **25** and defining an abutment on the upper portion of top **19** to prevent complete removal of a cap, as hereinafter described. The exterior surface of the intermediate portion **18** is outwardly flared at both the top and bottom thereof whereby the transition from the narrower intermediate portion **18** to the thickened top and bottom portions **19** and **17**, respectively, is defined by unobstructed curved surfaces **31** and **32**, respectively, the curvature of surfaces **31** and **32** being selected to provide substantially continuous surfaces with portions of a cap for the container **10** in open and closed positions, respectively, as hereinafter more fully described.

The interior surface of the neck **16** is substantially cylindrical throughout the length thereof with the cross-section of the interior **21** of the neck **16** gradually increasing from the top to the bottom thereof in order to facilitate sealing with the cap of the container. It is to be understood, however, that the interior **21** of the neck may have a constant cross-section or a cross-section which decreases from top to bottom. The top portion **19** of the neck **16** has chamfered interior and exterior surfaces **35** and **36**, respectively, to facilitate placement of a cap thereover, as hereinafter described.

The neck portion **16** is provided with a substantially cylindrical cap **51** having a closed top **52** and open bottom with the outer periphery of the cap **51** being defined by a substantially cylindrically shaped outer wall **53** which decreases in thickness from top to bottom and terminates in an inwardly extending circular lip **54** at the open bottom of the cap. The cross-section of the interior of the cap **51** increases from top to bottom, whereby the inner surface of the wall **53** has a frusto conical shape. A substantially cylindrically shaped hollow plunger **55** having an open bottom extends downwardly from the closed top **52** of the cap **51** concentric with the outer wall **53** and the wall of the plunger **55** decreases in thickness from top to bottom. The hollow interior of the plunger **55** increases in cross-section from top to bottom and the exterior surface of the plunger **55** and the interior surface of outer wall **53** define an annular chamber **56**. The length of outer wall **53** of cap **51** is substantially equal to the length of the neck **16** whereby in the closed position the cap substantially encompasses neck **16**. The length of plunger **55** is greater than the length of the outer wall **53** and in a closed position the plunger **55** extends into the container **10**. The cap **51** is preferably formed of a resilient material to facilitate sealing with the neck portion **16** of the container **10**, as hereinafter described. The plunger **55** is preferably hollow and the thickness of the walls thereof preferably decreases from top to bottom, as shown, to enhance the resiliency thereof, but it is to be understood that a solid plunger may also be employed.

Referring to FIG. 1, which illustrates the container and cap assembly in open position, the plunger **55** of cap **51** extends into the interior **21** of neck **16** of container **10** with the outer diameter of the plunger **55** being substantially equal to the diameter of the interior of the neck and preferably slightly greater than the diameter of the interior **21** of neck **16** to provide a sliding sealing engagement between the exterior surface of plunger **55** and the interior surface of neck **16**, thereby effectively closing the open top of the neck **16**. The inwardly extending lip **54** of the cap **51** is in engagement with the recess of groove **25** on the top portion **19** of the neck **16** to hold the cap **51** in an upper or open position in which the plunger **55** of the cap **51** is positioned in the interior **21** of neck **16** above orifice **22**, whereby material may be dispensed from the interior of the container **10** through the orifice **21**. The circular bead portion **26** of the top **19** prevents further upward movement of the cap **51**, although the cap can be removed completely from the neck **16** by the application of a strong upward force, as a result of the deformability of the resilient material from which the cap **51** is generally constructed. In the open position, the outer surface of the lip **54** of the cap **51** and the curved surface **31** of the intermediate portion **18** of neck **16** define an unobstructed substantially continuous curved surface, thereby minimizing the chances of material entering chamber **56** while moving the cap from the closed to the open position.

The container **10** may be closed by the exertion of a downward force upon cap **51** thereby moving the lip **54** from engagement in the recess or groove **25** and further inserting the plunger **55** into the interior **21** of neck **16**. The cap **51** may be moved to the position illustrated in FIG. 2 which is the semi-locked closed position wherein the lip **54** of the cap **51** is positioned below the bead portion **24** in a manner such that the curved surface **32** of the intermediate portion **18** of the neck **16** and the inner surface of the lip **54** of cap **51** define an unobstructed substantially continuous curved surface. The circular bead portion **24** of the base **17** prevents upward movement of the cap **51** without the application of an upward force. The cap **51** and the neck **16** define a closed annular chamber **60** therebetween thereby minimizing or preventing contact between material about the neck **16** and the surrounding air. The plunger **55** is fully inserted into the interior **21** of neck **16** with the outer surface of plunger **55** being in sealing engagement with the inner surface of neck **16** thereby covering orifice **22** and preventing material from being dispensed from container **10**. The lower portion of the plunger **55** extends beyond the neck **16** into the container **10**, thereby releasing the compressive force applied to the lower portion by the neck **16**, resulting in an outward expansion of the plunger **55**. The cap **51** may be more securely locked to the container **10** by the exertion of a downward force to further downwardly move the cap

51 to a position in which the lip 54 of the cap 51 is engaged in the groove 23 of the base portion 17 of the neck 16, as illustrated in FIG. 3.

It is to be understood that numerous modifications and variations of the construction of the container neck and cap are possible within the spirit and scope of the invention. Thus, for example, the shape of the cap may be otherwise than as shown; e.g., the outer wall of the cap may be of constant thickness or increase in thickness from top to bottom although the design as shown is preferred. Similarly, the length of the plunger may be about equal to or shorter than the length of the neck of the container whereby the cap plunger does not extend into the neck in a closed position, as particularly shown. Alternatively, the thickness of the walls of the plunger may be substantially equal throughout the length thereof or increase from top to bottom, although the construction shown is generally preferred.

In another modification, the transition from the intermediate portion of the neck to the bottom and top portions thereof may be defined other than by an unobstructed substantially continuous curved surface, provided the outer surface of the cap lip and the outer surface of the neck, in the open position, define a substantially continuous unobstructed surface to minimize the chances of material entering chamber 56. The outwardly curved surface as particularly shown, however, is the preferred construction.

In a further modification, the lower recess on the neck may be eliminated and the bead portion employed as the sole means for preventing further upward movement of the cap without the exertion of an upward force. The slightly increasing diameter of the base portion, from top to bottom thereof, maintains a sealing relationship between the cap lip and base portion upon movement of the cap below the bead. Similarly, the bead portion on the neck could be eliminated in which case the locking of the cap in the closed position would be effected by engagement of the cap lip in the recess on the base portion of the neck.

Another embodiment of the invention is illustrated in FIGS. 4 and 5 of the drawings which is substantially identical to the embodiment illustrated in FIGS. 1–3, except for the provision of threaded means for more securely locking the cap to the container and like parts are designated by like prime numerals. Referring now to FIG. 4 which illustrates the cap 51′ in open position, the outer surface of top portion 19′ of neck 16′ is provided with a continuous thread 101 immediately above the recess 25′, with the lower part of the thread 101 defining the abutment for preventing removal of the cap 51′ from neck 16′. The recess 25′ may be a portion of the thread 101. In this embodiment, the top portion 19′ of the neck 16′ does not have an exterior chamfered surface, although such a surface could be employed.

The inner surface of wall 53′ of cap 51′ is provided with threads 110 adjacent the closed top 52′ thereof, the threads 110 being threads which mate with the threads 101 of the top portion 19′ of neck 16′.

The opening and closing of the container 10′ is substantially similar to the opening and closing of the container 10 described with reference to FIGS. 1–3 with the cap 51′ in the open position illustrated in FIG. 4 with lip 54′ thereof engaged in recess 25′ of the top portion 19′. The cap 51′ is moved to a closed position by the exertion of a downward force and after the lip 54′ of the caps 51′ is pushed past the bead portion 24′ of the base 17′ of the neck 16′ a point is reached short of engagement of the lip 54′ with the recess 23′ where further downward movement of the cap 51′ is resisted as a result of initial contact of the threads 110 of cap 51′ with the threads 101 of the top portion 19′ of neck 16′. The cap 51′ is further closed by twisting thereof whereby the threads 101 and 110 cooperate to cause further downward movement of the cap 51′ until the lip 54′ thereof is engaged in recess 23′. The cap 51′ may be further twisted after engagement of the lip 54′ in recess 23′ as a result of the resiliency of the lip 54′ and the further unengaged portions of the threads 101 and 110. The cap 51′ may be opened by reversing the closing procedure, i.e., upward twisting of the cap to disengage the threads at which point the cap 51′ may be pulled upwardly until engagement of the lip 54′ in the recess 25′.

The embodiment of the invention illustrated in FIGS. 4 and 5 may be modified in numerous ways similarly to the embodiment of FIGS. 1–3.

A further embodiment of the invention is illustrated in FIGS. 6, 7 and 8 which is similar to the embodiment illustrated in FIGS. 1, 2 and 3, except for the provision of means for providing more effective sealing between the cap and the interior of the container neck and the use of only a bead for locking the cap in the closed position and like portions are identified by like double prime numerals. Referring now to FIG. 6, there is shown a cap 51″ and the lower portion of the outer surface of plunger 55″ is provided with a downwardly depending outwardly extending narrow resilient skirt 201 which extends continuously around the plunger 55″, with the upper end of the skirt 201 being integral with the plunger 55″ and the lower end thereof being outwardly spaced from the plunger 55″. The skirt 201 is capable of being elastically compressed and under compresion the skirt 201 is outwardly biased whereby insertion of the plunger 55″ into the container neck results in a positive seal between the skirt 201 and the interior of the neck.

The exterior surface of the plunger 55″ of the cap 51″ is further provided with a resilient circular bead portion 202 positioned thereon above the skirt 201. The circular bead portion 202 provides additional sealing as the result of the elastic compression thereof upon placing the plunger 55″ into the container neck and also counterbalances the skirt 201, thereby maintaining the cap 51″ in even balance. It is to be understood, however, that the bead portion 202 may be eliminated or replaced with a skirt identical to skirt 201. Similarly, the plunger 55″ of cap 51″ may contain two or more skirts to increase the sealing effectiveness. Alternatively, the skirt 201 may be eliminated, and the sealing provided by the resilient circular bead portion 202, with this structure being least preferred.

In employing the cap 51″ with a container 10″, the cap 51″ in the open position (FIG. 7) engages the top portion 19″ of the neck 16″ as described with respect to the embodiments illustrated in FIGS. 1–3, with the bead portion 202 and the skirt 201 being placed within the interior of the neck thereby providing effective sealing engagement between the plunger 55″ of the cap 51″ and the interior surface of the container neck. In the closed position, the cap engages the neck as described with reference to FIG. 3 with the bead portion 202 and the skirt portion 201 being compressed within the interior of the container neck and the cap lip 54″ being engaged with bead 24″ on the base 17″ of neck 16″. The use of skirt 201 and beaded portion 202 and/or additional skirts 201 permits effective sealing, notwithstanding tolerance discrepancies between the outer dimensions of the plunger 55″ and the interior dimensions of the container neck. It is to be understood that additional skirts 201 may be provided on the exterior surface of plunger 55″ and such skirts 201 may be provided on the portion of the plunger 55″ which is within or outside of the container neck in the open position, with the chamfered surface on the top of the interior of the neck facilitating reentry and insertion of the plunger and skirt into the neck.

It is also to be understood that the cap, containing a resilient means, may be constructed as described with reference to FIGS. 4 and 5, i.e., with threads on the interior of the cap and the exterior of the container neck.

It is further to be understood that the embodiment illustrated in FIGS. 6–8 is subject to numerous modifications similar to the previously described embodiments.

In addition, the resilient means provided on the plunger of the cap may be constructed other than as particularly shown although the illustrated embodiment is preferred. Thus, for example, the plunger can be provided with a spring loaded bumper instead of the skirt as shown. It is also to be understood that the interior of the neck portion may be provided with resilient means in order to provide for tolerance discrepancies.

The cap and neck of the present invention to be employed for effectively dispensing material from a container is particularly advantageous in that contact between material and the surrounding atmosphere is minimized while the cap is in the closed position while simultaneously minimizing the chances of material entering the interior of the cap during repeated opening and closing thereof. In adidtion, the cap and neck assembly are provided with specific structure which permits effective sealing without requiring unduly strict tolerance requirements.

Various changes in the details, materials and arrangements of parts, which have been described and illustrated in order to explain the nature of the invention, may be made by those skilled in the art within the principle and scope of the invention as defined in the appended claims.

What is claimed is:

1. In combination, a cap and neck for dispensing material from a container, said neck being elongated and hollow and including a dispensing orifice for dispensing material from the hollow interior of the neck, said neck having an upper portion, an intermediate portion and a base portion, said intermediate portion having a thickness which is less than the thickness of both the upper portion and the base portion, the outer surface of the upper portion of the neck including an upper engaging means and the outer surface of the base portion of the neck including a lower engaging means, said cap including an outer wall which surrounds the outer surface of the neck and a plunger which is positioned in the hollow interior of the neck in sliding sealing cooperation therewith, said cap being movable with respect to the neck to open and closed positions with the plunger thereof opening and closing said orifice, the lower portion of the outer wall of the cap including an inwardly extending lip, said lip being releasably engaged by the upper engaging means in the cap open position and releasably engaged by the lower engaging means in the cap closed position, the outer wall of the cap being spaced from the intermediate portion of the neck in the closed position to define a closed chamber therebetween.

2. The combination defined in claim **1** wherein an outwardly extending resilient bead is provided on the outer surface of the plunger.

3. The combination as defined in claim **1** and further including resilient means on the exterior surface of said plunger to provide a portion of the plunger with an enlarged diameter, said resilient means being positioned on the portion of the plunger within the neck to maintain sealing engagement with the interior of the neck.

4. The combination as defined in claim **1** wherein the plunger further includes at least one downwardly depending outwardly extending resilient skirt on the outer surface thereof, said skirt being positioned and compressed within the neck to maintain sealing engagement with the interior of the neck.

5. The combination as defined in claim **1** wherein thread means are provided on the top portion of said elongated neck and the top inner portion of said outer wall of said cap.

6. The combination as defined in claim **1** wherein the first thread of said thread means on said elongated neck is said upper engaging means on said elongated neck.

7. The combination as defined in claim **1** wherein with the cap lip engaged by the upper engaging means the outer surface of the cap lip and the outer surface of the neck define a substantially continuous unobstructed surface.

8. The combination as defined in claim **1** wherein a lower portion of the neck above the lower engaging means is outwardly curved and cooperates with the inner surface of the cap lip when engaged in the lower recess to provide a substantially continuous surface.

9. The combination as defined in claim **1** wherein the upper engaging means comprises a recess in the top portion of the neck.

10. The combination as defined in claim **9** wherein the lower engaging means comprises a bead portion on the base portion of the neck.

11. The combination as defined in claim **9** wherein the lower engaging means comprises a recess in the base portion of the neck.

12. In combination, a material dispensing container and a cap therefor, said container comprising a body having an elongated hollow neck, said neck including a base portion, a top portion and an intermediate portion, said base and top portion having a greater diameter than the intermediate portion, the intermediate portion having outwardly flared surfaces at the top and bottom thereof terminating in the top and base portions, respectively, said neck including a dispensing orifice whereby material can be dispensed from the interior of the container; said base portion including first engaging means and said top portion including a second engaging means; said cap comprising a closed top and an open bottom, an outer wall terminating in an inwardly extending lip at the open bottom of the cap and a plunger extending downwardly from the closed top of the cap, said cap being placed on the container with the plunger of the cap extending into the interior of the elongated neck in sliding sealing engagement therewith and the outer wall of the cap surrounding the exterior of said neck, said cap being movable along the neck of the container to move the plunger in sliding sealing engagement with the neck to open and close the dispensing orifice, whereby in the open position said inwardly extending lip of the outer wall of the cap is engaged by the second engaging means and in the closed position the inwardly extending lip of the outer wall of the cap is engaged by the first engaging means and the outer wall of the cap is spaced from the narrower intermediate portion of the neck defining a closed chamber therebetween.

13. The combination as defined in claim **12** wherein in the open position the outwarly flared surface at the top of the intermediate portion of the neck and the outer surface of the inwardly extending lip of the cap cooperate to define a substantially continuous curved surface.

14. The combination as defined in claim **12** and further including resilient means on the exterior surface of said plunger to provide a portion of the plunger with an enlarged diameter, said resilient means being positioned in the portion of the plunger within the neck to maintain sealing engagement with the interior of the neck.

15. The combination as defined in claim **12** wherein the exterior of the plunger further includes a resilient skirt, one end of said skirt being spaced from the plunger, said skirt being positioned and compressed within the neck of the container to maintain sealing engagement between the interior of the neck and said plunger.

16. The combination as defined in claim **15** wherein the exterior of the plunger further includes a resilient bead.

17. The combination as defined in claim **15** wherein the second engaging means is a recess.

18. The combination as defined in claim **15** wherein the first engaging means includes a bead portion and a recess positioned below the bead portion to provide two closed positions for the cap.

19. The combination as defined in claim **12** wherein the top portion of the neck and the top inner portion of

the cap include mating threads to provide threaded engagement between the cap and neck in the closed position.

20. The combination as defined in claim **12** wherein the first engaging means is defined by a downwardly increasing thickness of the base portion of the neck.

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SAMUEL F. COLEMAN, Primary Examiner

N. L. STACK, JR., Assistant Examiner