Jan. 7, 1969 D. F. CORSETTE 3,420,413

LIQUID AND PASTE DISPENSER

Filed Aug. 14, 1967

FIG. 1

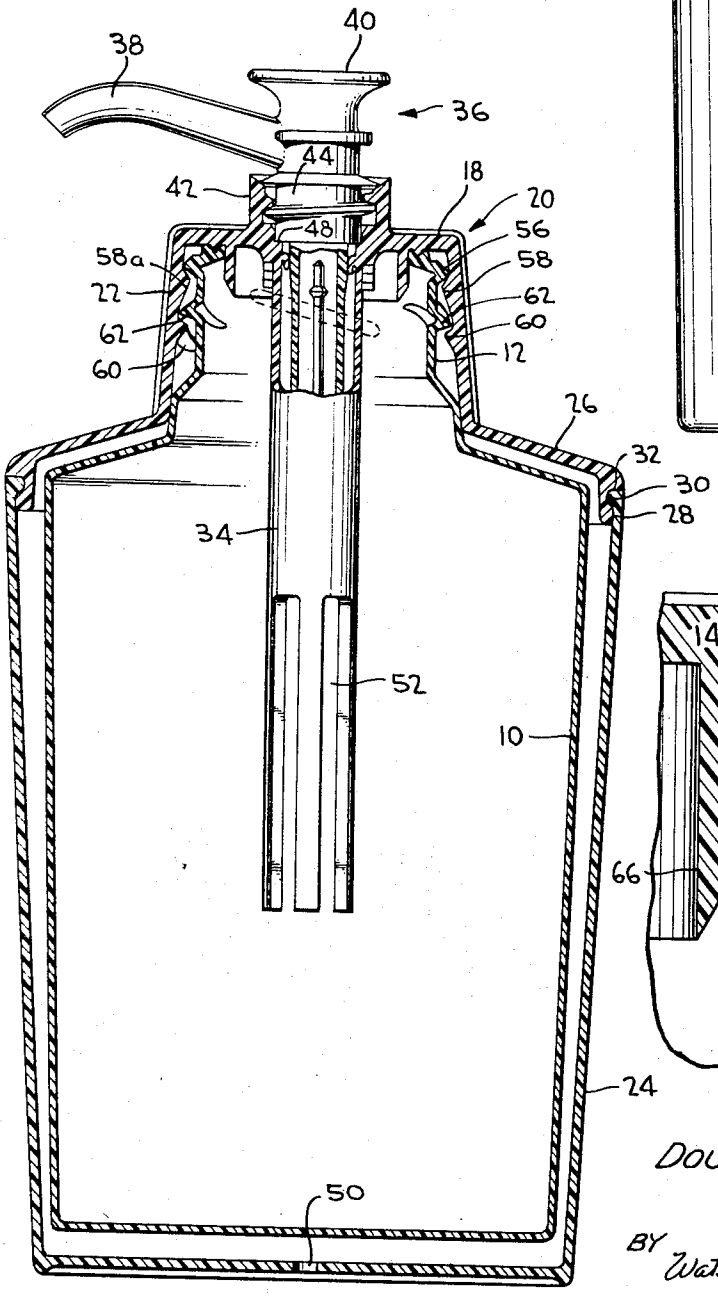


FIG. 2

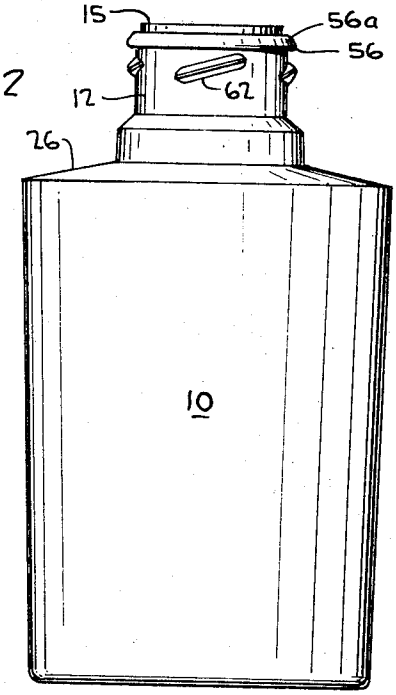
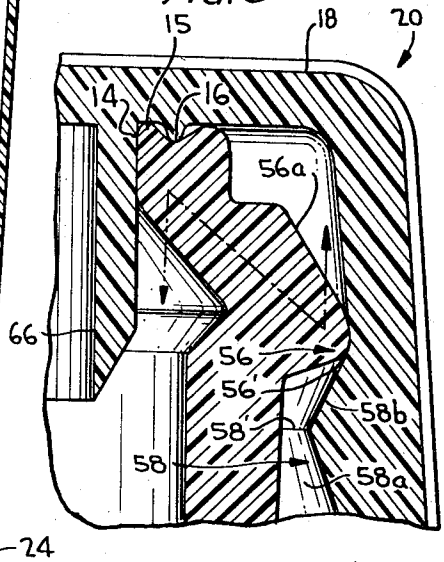


FIG. 3



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LIQUID AND PASTE DISPENSER

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ABSTRACT OF THE DISCLOSURE

A dispenser for liquid and paste products wherein a pump withdraws the product from an air-tight container housed within a rigid casing and collapsible under atmospheric pressure incident to withdrawal of its contents. The pump is supported within the container by a closure member which is secured onto both the container and its housing by snap beads. The snap beads of the container are interlocked by threaded means which are then disengaged and separated by action of the snap beads to prevent subsequent use of the threads in removing the closure member.

Background of the invention

It has heretofore been proposed, for instance in my prior Patent No. 3,288,334 of Nov. 29, 1966, to utilize a generally conventional reciprocating pump for dispensing liquid or paste-like contents from a collapsible container. Such a collapsible container may be suitably supported, either as taught in the patent or in a generally rigid casing, to withstand the vertical thrust of the pumping action. It is of particular importance in such a dispensing arrangement to provide a completely reliable air-tight connection between the container and its closure member inasmuch as leakage of air into the container in any substantial amount will either render the pump inoperative or seriously detract from the efficiency in dispensing of comparatively viscous liquids or pasty materials.

Also, in connection with the dispensing of various products, it is frequently desirable to provide a closure which, after once being applied, cannot be removed without visible damage, thereby preventing the refilling of an exhausted container or the substitution of its contents by a spurious product, without the knowledge of the consumer.

Summary of the invention

The present invention contemplates the provision of a closure member, as well as of certain adaptations of the container, to adapt it for use in combination with the closure member to achieve the ends above indicated. While the closure member and the consequential cooperating features of the container are particularly adapted for use in a liquid or pasty material dispenser of character above described, they are also adapted for more general application not necessarily involving any dispensing pump or function.

In accordance with an important aspect of the invention, the closure member is secured on the neck of the container member by snap beads on each member which are interlocked with each other by the action of threaded sections of the respective members in drawing the closure member axially onto the container neck. The snap beads and threaded sections are so arranged that the threads release each other after moving the snap beads to interlocking relation. The beads themselves, through the action of cooperating cam surfaces, achieve the desirable ends of urging and resiliently maintaining the closure member in axial sealing engagement with the container neck. Also, the coacting cam surfaces serve to axially separate the

disengaged threads to prevent their subsequent use for removal of the closure member. To achieve the above ends, it is sufficient that either of the members be resiliently radially deformable.

Where the container neck is resiliently radially deformable, however, the invention may attain certain other important functions. In particular, in such event, the closure is provided with a stopper depending into the container mouth; and the end portion of the container neck between its mouth and snap bead is of generally upwardly converging conical configuration whereby axial thrust of the closure member against the end of the neck will tend to deflect the container mouth into radial sealing engagement with the stopper. Moreover, the radial compressing effect of the closure member around the container neck in such event tends to elongate the upper portion of the neck and thus maintain it in resilient thrusting engagement with the closure member.

Brief description of the drawing

In the accompanying drawings:

FIGURE 1 is a view in axial section through a pump type dispensing container embodying the preferred form of the invention;

FIGURE 2 is a side elevation on a somewhat reduced scale compared with FIGURE 1 showing the container only with the closure cap and dispensing pump removed; and

FIGURE 3 is an enlarged detail section of interconnected portions of the container neck and closure cap.

Description of the preferred embodiment

Referring now in detail to the drawings, the invention as illustrated therein is embodied in a dispenser comprising an inner container member of a suitable elastomeric plastic material, such as polyethylene, having a main body **10** of any suitable cross-sectional shape and a tubular neck **12** of circular cross-sectional configuration, the upper end of which defines a container mouth or outlet **14** surrounded preferably by axially directed sealing rings **15** concentric to each other and radially spaced for sealing reception between them of the sealing ring **16** carried by the top wall **18** of a closure cap generally designated **20** and having an internally threaded skirt **22** for cooperation with the externally threaded container neck **12** in a manner more fully described hereinafter.

In the preferred embodiment of the invention, the container **10** is flexible and collapsible; and it is, therefore, desirable that it be supported within a rigid outer casing or housing of which the container closure cap **20** may form a part, together with a cup-like casing member of vinyl or other rigid plastic **24**.

It will be seen in FIGURE 1 that the collapsible container **10** is connected to the closure cap and supported thereby in suspended fashion within the container section **24**. In order to interconnect the closure and casing body **24**, the closure member **20** is formed with a preferably integral shoulder **26** projecting radially outwardly from the lower periphery of its skirt **22** and having depending therefrom a generally conventional snap ring or rib **28** for cooperation in usual manner with an inwardly projecting snap ring **30** at the upper edge of the container body **24**. A downwardly directed surface **32** of the shoulder **26** rests on and abuts against the upper edge of the casing body **24** to provide axial support for the closure cap and the container itself on the casing body **24**.

In the present instance, a supply of liquid housed within the container **10** is adapted to be withdrawn therefrom and dispensed by a pump of generally conventional structure including a stationary pump cylinder or barrel **34**

which preferably is formed integrally with the top wall **18** of the cap and depends axially therefrom into the container in the manner such as disclosed in U.S. Patent No. 3,248,021 of Apr. 26, 1966. It will be seen that the barrel **34** opens upwardly through the cap for reception of the reciprocating pump plunger **36**, through which suitable discharge passages (not shown) extend for connection to a discharge spout **38** carried by the external end of the plunger **36**. It will be understood that the plunger may be of the usual spring-projected type for actuation by intermittent finger pressure on the upper end portion or head **40**, as in the Corsette et al., U.S. Patent 3,248,021.

In order to seal the pump against the inadvertent escape of the container contents or influx of air to the container between the plunger and cylinder, it may be desirable to form the cap with an upwardly directed internally threaded sleeve **42** for cooperation in the usual manner with an externally threaded base portion **44** of the plunger head. By threading down this base portion **44** tightly into the internally threaded sleeve or socket **42**, a seal **46** is established. Also, the base of the externally threaded plug **44** sealingly engages the shoulder or ledge **48** within the pump barrel.

When it is desired to use the pump for dispensing the container contents, the threaded plug portion **44** of the plunger is rotated to release it from the internally threaded sleeve or socket **42**, whereupon it may be reciprocated to dispense the desired amount of contents from the container.

The container member **10** is subjected to atmospheric pressure which is free to enter the outer casing **24** through an opening **50** in the bottom thereof. Thus, as the container contents are withdrawn by the pump, the atmospheric pressure will collapse the container around the pump barrel **34**. In order to preserve a clear path of entry for substantially all of the container contents into the pump barrel as the container collapses around the barrel, it is desirable to form the barrel with a series of slots, such as **52**, extending upwardly from its lower end but terminating at a location somewhat below the range of reciprocation of the plunger piston (not shown) within the cylinder.

The arrangement as thus far generally described exemplifies the type of arrangement, such as disclosed in my prior Patent 3,288,334, in which it is essential that seepage of air into the container, as well as loss of the container contents through the closure member, be prevented by an efficient sealing relationship between the container and closure members. While such an arrangement is one in which the present invention finds particular utility, the invention is by no means restricted to this specific use.

The present invention not only provides an efficient sealing relationship, but also provides for easily and efficiently applying the cap to the container. Moreover, in accordance with a further aspect of the invention, the cap is applied in a manner such that it is locked onto the container and, after its initial application, cannot be removed without damage or destruction of the various parts. Thus, a manufacturer who employs such a container for the sale of his product has some assurance that the container cannot be refilled with a spurious product without knowledge of the consumer.

Now, considering in more detail the specific connection of the closure cap or member to the container member, it will be seen by reference to FIGURES 1 and 2 that the container neck **12** is formed externally with a radially projecting snap bead, generally designated **56**, adjacent but below its mouth **14**, while the closure cap **22** is formed internally with a radially inwardly projecting snap bead **58** for cooperation with the snap bead **56**. Both of the snap beads have radially presented annular crests **56'**, **58'** respectively disposed in radial planes with respect to their axes of relative rotation, and, the bead **58** of the cap is normally of smaller diameter at its crest **58'** than is the neck bead.

Moreover, both the cap skirt **22** and the neck **12** are provided below their respective snap beads with threaded sections **60** and **62** respectively. These threaded sections are axially located and dimensioned to interengage during threading of the cap downwardly onto the container neck only prior to and during such time as the crest **58'** of the cap or closure bead moves downwardly onto and through a dead center position in which its crest **58'** is in a common radial plane with the crest **56'** of the neck snap bead **56**. The threads **60** and **62** are of such axial location and extent as to disengage immediately upon downward movement of the closure bead **58** through or past this dead center position.

Preferably, each of the threaded sections comprises multiple threads of identical pitch, and axially coextensive, so that they will exert equal axial forces at locations concentric to the axis of relative rotation of the container and closure members, thus avoiding any tendency to axially tilt or cant the members relative to each other.

As has been above mentioned in the preferred embodiment, the container member **10** itself, including its neck **12**, is formed of a suitable flexible resiliently deformable material such as will permit radial compression of its neck at the location of the bead **56** to permit movement therepast of the closure bead **58**.

In order to provide for radial contraction or compression of the neck so that the snap beads **56** and **58** may move past each other during application of the closure member, one of the beads, in this instance the skirt bead **58**, is provided with a generally conical cam surface **58*a*** which diverges axially downwardly from its crest **58'**. Thus, as the closure cap is threaded downwardly onto the container neck, the camming engagement of the conical surface **58*a*** with the bead **56** will radially deform and, in the present instance, radially compress the container neck at the base of its conical surface **56*a*** until the beads snap past each other.

At this time, it will be understood that the closure threads **60** will have passed downwardly through the neck threads **62** and thus become disengaged, though the two sets of threads may still be in axial abutment, and the radially compressed portion of the neck will be free to re-expand.

In order to produce a slight axial separation between these threads or threaded sections such as will prevent their subsequent cooperation to facilitate removal of the cap, one of the snap beads, in the present instance the bead **58** of the cap, is provided with a conical cam surface **58*b*** which diverges axially upwardly from its crest **58'** for continued camming engagement with the other bead **56**, incident to expansion of the latter with the neck, to pull the cap still further onto the container neck after the threads are disengaged. Preferably, the slope of the cam surface **58*b*** is sufficiently sharp as to therafter firmly secure the closure member on the container member.

It will be noted that the closure member **20** above its snap bead **58** is of somewhat less internal diameter than the crest of the snap bead **56** on the neck so that, even after the beads **56**, **58** snap past each other, the closure member still exerts a radial confining and compressing action on the neck at the level of its bead **56**. By thus axially confining the neck, it produces an axial elongation of the neck into sealing engagement with the closure top wall, while also camming the top wall axially against the neck, to maintain an efficient seal.

It will further be seen that the neck is formed above the bead **56** with a tapering substantially conical portion **56*a*** which diverges downwardly from adjacent the mouth **14** of the container to the crest of bead **56**, and is preferably coincident with the upper surface of bead **56**.

The top wall of the closure member carries an annular rigid stopper **66** which is snugly received in the mouth

14. Because of the conical configuration of the upper end portion of the neck, the axial thrust between the closure top wall **18** on the upper end of the neck urges the upper end radially inwardly so as to contract the container mouth **14** into firm radial sealing engagement with the stopper. At the same time, the stopper backs up the container mouth against the radially inward deflection produced by the axial thrust of the closure top wall. The stopper thus defeats the tendency of the flexible plastic neck material to "cold flow" or weaken with time under the continuing stress imposed on it.

Operation of the invention

In the operation of the invention which is believed to be apparent from the foregoing description, the closure member with its pump support therein will normally be applied to the filled container prior to insertion of the latter into the casing **24**. The pump will be inserted downwardly into the container neck, while the closure member **20** will be applied axially onto the neck **12** until the threaded portions **60** and **62** respectively are interengaged. Relative rotation between the container member **10** and closure member **20** will then function to draw the snap bead **56** of the closure member downwardly just past the dead center position with respect to the container snap bead **56**, thus radially compressing the neck in the radial plane of its bead **56**, at which time the threads of the closure member will have passed downwardly completely through the threads of the container neck. At this time, the camming action of the snap bead surface **58***b* against the neck snap bead **56**, incident to radial expansion of the neck, will draw the closure member further down onto the container neck sufficiently to axially separate the threaded sections **60** and **62** as well as to bring the top wall **18** of the closure cap into axially thrusting sealing engagement with the upper end of the container neck.

In the interlocked condition of the snap beads **56** and **58**, the snap bead **56** of the neck will still be maintained under radial compression in the closure member. Because of the conical configuration of the upper end of the neck, such compression will generate an axial component of thrust of the neck against the top wall of the closure as well as a radially inwardly component causing the outlet or mouth **14** at the upper end of the neck to contract around and radially seal against the stopper **66**.

Moreover, it will be seen that the annular stopper **66** functions in this arrangement to back up the periphery of the container mouth **14** against radially inward pressures resulting from its thrusting engagement with the top wall **18** of the container member and thus will defeat any tendency of the flexible plastic material of the neck to cold-flow or weaken with time under the stresses which are applied to it.

After the closure member and pump are thus applied to the container member **10**, the container is then disposed within the comparatively rigid casing **24** and the lower periphery of the container shoulder **26** is snap fitted onto the container casing **24** in a manner that will be readily apparent.

The pump may then be employed in conventional manner to dispense the contents of the container **10** as desired. In order to use the pump, it is necessary first to rotate it to disengage its threaded portion **44** from the internally threaded socket **42** of the closure member whereupon it may be reciprocated by intermittent finger pressure on the plunger head **40** to expel the product from the container through the spout **38**.

As the product is withdrawn from the container, the latter is collapsed by atmospheric pressure entering the container casing **24** through the opening **50**. It is not necessary that the pump have its intake located near the lower end of the container inasmuch as the collapsing of the container around the pump cylinder will urge the product into the cylinder through the intake slots **52** and open lower end of the pump cylinder.

In this application, I have shown and described only the preferred embodiment of the invention, having in mind that various modifications will be readily apparent to persons of average skill in the art, without departing from the inventive concept as defined in the appended claims.

Having thus described my invention, I claim:

1. In combination, a container member having a tubular neck of resiliently deformable material defining a circular mouth at its upper end, and a closure member having a top wall for axial abutment with the upper end of the neck and a depending skirt encircling the neck, said neck having an upper end portion of substantially frusto-conical configuration diverging downwardly from its mouth, with the base of said portion projecting radially outwardly from the axially adjacent sections of the neck to provide a snap bead, a stopper depending from said top wall of the closure member and snugly received in said mouth, a radially inwardly projecting snap bead formed within the skirt of said closure member and of a diameter less than that of said base to radially compress the latter during movement downwardly over said frusto-conical portion and to engage beneath said base incident to radial expansion of the latter, said top wall being axially spaced from the skirt bead a distance to thrust axially against said upper end of the neck and to urge said mouth radially into sealing engagement with the stopper, said snap bead of the closure being formed with a downwardly presented annular cam surface of conical configuration for engagement with said snap bead of the neck to thrust said top wall of the cap against the upper end of the neck incident to radial expansion of the neck snap bead therebeneath, said neck and said skirt being provided beneath their respective snap beads with cooperating threaded sections arranged to interengage incident to rotary movement of the closure member as it is applied to the container member whereby to urge said snap bead of the skirt downwardly over said base, and to disengage as said neck snap bead is engaged by said annular cam surface of the neck, the ensuing radial expansion of the neck base following its passage through said skirt snap bead relatively axially moving said closure onto the neck and axially separating said threaded sections.

2. The combination defined in claim **1**, in which said threaded sections are provided with multiple coaxial threads, of similar pitch, each occupying but a fraction of the circumference of its respective section, the threads of the respective sections simultaneously engaging at a plurality of circumferential locations around said sections to avoid the creation of axial tilting forces between the container and closure members.

3. In combination, a container member having a tubular neck defining a dispensing outlet through its upper end, and a closure member adapted for axial reception on and sealing engagement with the upper end of said neck, one of said members being of resiliently deformable material, said neck being encircled by a radially outwardly projecting snap bead and said closure member having a skirt encircling the neck and formed with a radially inwardly presented snap bead, both of said snap beads having radially presented annular crests in radial planes of the members, said bead of the closure cap being normally of substantially smaller diameter at its crest than that of the neck, both said neck and said skirt having cooperating threaded sections below their snap beads, said threaded sections being located and dimensioned to interengage during relative axial movement of said crests into and through a dead center position in a common radial plane as the cap is threaded onto the container neck, and being arranged to disengage immediately upon movement through said dead center position, one of said beads having an axially downwardly diverging conical

cam surface for engagement with the other bead to radially deform said deformable member incident to threading of the cap onto the container neck, one of said beads having an axially upwardly diverging conical cam surface for camming engagement with the other said bead after movement of the beads past said dead center position and disengagement of the said threaded sections to axially separate the threaded sections, said cap having means positioned to axially seal against said container neck and arrest the downward movement of the closure member before said deformable member has fully regained its normal radial dimension.

4. The combination of claim 3, in which said means positioned to axially seal against the container neck comprises the top wall of the closure member.

5. The combination of claim 3, in which said container and closure members respectively include telescopically interfitted portions spaced axially below and of substantially larger diameter than said snap beads.

6. The combination of claim 3, in which said threaded sections are provided with multiple coaxial threads, of similar pitch, each occupying but a fraction of the circumference of its respective section, the threads of the respective sections simultaneously engaging at a plurality of circumferential locations around said sections to avoid the creation of axial tilting forces between the container and closure members.

7. The combination defined in claim 3, in which said container member is of resiliently deformable material, and its neck is maintained under radial compression by the closure member, and thus caused to exert a resilient axial sealing thrust against the closure member.

8. The combination defined in claim 3, in which said container member is of resiliently deformable material, said snap bead of the skirt having formed thereon said upwardly divergent cam surface for caming said closure

member further onto the neck incident to partially radial reexpansion of the neck bead after passing through the crest of said skirt bead, the internal diameter of the skirt immediately above its said snap bead being greater than the crest diameter of its said snap bead but smaller than the crest diameter of said neck snap bead, to maintain said snap bead of the neck under radial compression, and thereby to resiliently thrust the upper end of the neck into axial sealing engagement with said top wall of the closure member.

9. The combination defined in claim 3, in which the upper end of said neck has a substantially conical configuration converging upwardly from said neck bead substantially to the container mouth, and its upper end around the mouth is of substantially smaller diameter than its said external snap bead, for axial abutment with the closure member, a stopper carried by said closure member and depending into said mouth, said resilient axial thrust of the neck against said top wall, in combination with the conical configuration of said upper end of the neck, urging the inner periphery of said neck into radial sealing engagement with said stopper.

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