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(12) # EUROPEAN PATENT APPLICATION

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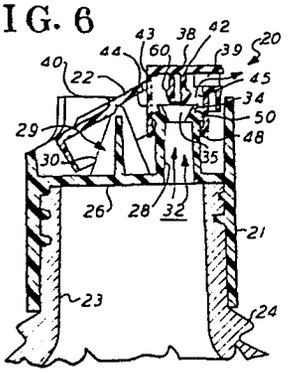
(54) **Closure cap.**

(57) A closure cap for opening and closing a discharge passage extending from the interior to the exterior of a container of flowable material, e.g. a cream liquid, comprises two members (28, 42, 44) in sliding, telescopic interconnection with the interior of each member providing a duct (32, 45) which forms a part of the discharge passage. One of the members is mounted stationarily on a lid (26) for closing the container and the other of the members is mounted on the spout (39) defining forward portion (38) of a lever (22) mounted on the lid for pivotal movement between sealing and dispensing positions in which the forward portion (38) of the lever (22) is moved towards and away from the lid. The forward portion is interconnected to the rearward portion (40) of the lever (22) by a hinge, which provides translation motion to the forward portion of the lever and the other member (42, 44) upon the rearward portion of the lever being pivoted to maintain such members (28, 42, 44) in fluid-tight engagement to prevent the flowable material from escaping therebetween and accumulating on the closure cap. One of the two members may be provided with a resilient member (34) for being compressed upon relative movement between the two members. The resilient member upon being compressed applies force to the other of the two members (28, 42, 44) to force the two members into engagement to close the discharge passage upon the lever being pivoted into the sealing position.

FIG. 6



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Closure Cap

BACKGROUND OF THE INVENTION

This invention relates to closure caps for alternately opening and closing a discharge passage for flowable material extending between the interior and exterior of a container.

As known to those skilled in the art, closure caps are typically used on containers of flowable material, e.g. soap, detergent, shampoo, etc., for closing and sealing the container when in disuse and for being opened to permit the contents of the container to be dispensed as desired by the user. Such prior art closure caps are disclosed in U.S. Patent No. 3,276,640 issued October 4, 1966 to Kessler, U.S. Patent No. 3,439,843 issued April 22, 1969 to Corsette, U.S. Patent No. 3,516,581 to Micallef issued June 23, 1970, and U.S. Patent No. 3,572,559 to Stull issued March 30, 1971.

As further known to those skilled in the art, a common problem associated with such closure caps is that the component members between which relative movement is provided to open and close the passage do not remain in fluid tight engagement during the act of dispensing or during the acts of opening and closing the passage. This lack of fluid-tight engagement permits the dispensed flowable material to escape between the component members between which relative movement is provided and the material accumulates on the exterior and interior of the closure cap providing an unsightly and undesirably messy condition and, depending upon the material being dispensed, sometimes an unsanitary condition.

It has been found that this escape of flowable material problem is particularly prevalent in the closure caps

known to the prior art which includes a lever mounted for angular movement in a plane perpendicular to the lid for closing the container and wherein the lever is provided with a downwardly extending member in engagement with an upwardly extending member mounted stationarily on the lid; the interiors of such members are provided, respectively, with ducts each of which forms a portion of the discharge passage. Since the lever experiences angular movement, the member mounted on the lever providing part of the discharge passage also must experience angular movement and since the member is in telescopic engagement with a stationarily mounted member, it has been found that the angular movement of one such member relative to the stationarily mounted other member causes the members not to always remain in fluid-tight or sealing engagement during dispensing and during the acts of opening and closing the closure cap. Obviously, either or both the member experiencing angular movement and the stationarily mounted member must be flexible to permit such telescopic, sliding movement therebetween and this may be seen and better understood from viewing FIGS. 1 and 2 of the accompanying drawings.

In FIG. 1, there is shown prior art closure cap 10 mounted threadedly on the neck of a container 12 and which closure cap 10 upon being opened as shown in FIG. 2 provides a discharge path indicated by the arrows for communicating the interior of the container 12 with the exterior thereof for dispensing flowable material contained therein. The closure cap includes a lever 14 mounted pivotally at 16 with the forward portion of the lever including downwardly extending members 18 for sealingly engaging the upper portion of an upwardly extending and stationarily mounted member 20

to close the discharge path. For dispensing, the rearward portion of the lever 14 is forced downwardly causing the forward portion of the lever to pivot upwardly, as shown in FIG. 2, to open the discharge passage and since the members 18 mounted on the forward portion of the lever 14 also experience angular movement, the member 20 is distorted, as shown in FIG. 2, to permit relative movement between the sealing members 18 moving angularly and the member 20 remaining stationary. Of course, as known to the prior art, efforts to permit such relative movement--angular movement relative to a stationarily mounted member--the members have been made of flexible material, such as a suitable plastic, but even so, it has been found that such members do not remain in fluid-tight engagement and the dispensed material escapes therebetween. This may be better understood by reference to FIGS. 3 and 4 wherein, as shown in FIG. 2, the members 18 and 20 easily remain in fluid-tight contact upon the closure cap being closed for sealing, but upon the lever 14 and members 18 experiencing angular movement while member 20 remains stationary, member 18 as shown in FIG. 2 must bend or distort to permit the relative sliding, telescopic movement and upon being bent or distorted, the members 18 and 20, as shown in FIG. 4, do not always remain in fluid-tight engagement and openings 61-61 have been found to exist between such members. These openings have been found to permit the unwanted escape of the flowable or dispensable material which may then accumulate on the interior and exterior of the closure apparatus causing the above-noted undesirable prior art problem. The conditions illustrated in FIGS. 3 and 4 may also be noted by reference to FIG. 7 of the above noted U.S. Patent No. 3,516,581 where there is shown in broken lines the positions assumed by the parts between which such relative

movement is experienced when the closure apparatus is in the dispensing or open position. Accordingly, it is an object of the present invention to provide improved closure cap wherein the telescopically interconnected members remain in fluid-tight engagement during dispensing and during the acts of moving such members into the dispensing and closing positions.

In addition, as is also known to those skilled in the art, it is desirable to provide such closure cap with some means for causing the closure cap to be fluid-tight while in the closed or sealed position. Several detent type structures are known to the prior art for this purpose, such as for example the well-known prior art technique of providing an interference fit between the end of a spout defining arm and the surrounding cylinder whereby upon the arm being depressed into the sealing position the end of the spout defining arm is forced into engagement with the surrounding cylinder. However, it has been found that such prior art detent structures do not always provide the desired closing force to maintain the cap fluid-tight in the closed or sealing position. Hence, it has been found to be desirable to provide new and improved closure cap for maintaining the apparatus fluid-tight in the closed or sealing position during disuse; accordingly, another object of the present invention is to provide such improved closure cap.

SUMMARY OF THE INVENTION

The present invention, in particular, is an improvement of the closure cap of the type illustrated in U.S. Patent No. 3,516,581 and shown in FIGS. 1-4 of the accompanying drawings, and provides a novel and improved closure cap structure wherein translational or straight-line relative movement is provided between the members which are in telescopic,

sliding engagement, upon the improved closure cap being in the dispensing position and during the acts of moving the cap between the dispensing and sealing positions whereby the telescopically interconnected members remain in fluid-tight engagement.

Further, the present invention provides an improved closure cap wherein one of the two members in telescopic, sliding engagement is provided with a resilient member which is compressed upon the associated lever being depressed to close the discharge passage and which resilient member upon being compressed provides force to the other of the two members to force the two members into sealing or fluid-tight engagement during disuse whereby prevention of fluid escape is enhanced.

DESCRIPTION OF THE DRAWINGS

FIGS. 1 and 2 are vertical, cross-sectional views of a prior art closure cap over which the present invention is an improvement;

FIGS. 3 and 4 are, respectively, cross-sectional views taken generally along the lines 2-2 and 4-4 in the direction of the arrows, respectively, in FIGS. 1 and 2;

FIG. 5 is a vertical cross-sectional view of a closure cap embodying the present invention and shown in the closed position, the cap being shown in threaded engagement with the neck of a partially shown container;

FIG. 6 is a vertical cross-sectional view of the cap of FIG. 5 but shown in the open or dispensing position;

FIG. 7 is a top view of the cap of FIG. 5 but shown as it would appear in full or complete view;

FIG. 8 is a vertical cross-sectional view taken generally along the line 8-8 in FIG. 7 and in the direction of the arrows;

FIGS. 9 and 10 are partial side views taken generally along the lines 9-9 and 10-10 in FIG. 8 and in the direction of the arrows; and

FIG. 11 is an irregular cross-sectional view taken generally along the line 11-11 in FIG. 5 in the direction of the arrows.

DESCRIPTION OF THE PREFERRED EMBODIMENT

Referring now to FIGS. 5-11 and in particular to FIGS. 5 and 6, there is shown an improved dispenser closure apparatus or closure cap embodying the present invention and indicated generally by numerical designation 20. As may be noted from FIGS. 5, 6, 7 and 11, the closure cap 20 ist generally of cylindrical shape or configuration , but may also have a generally rectangular shape, if desired. In its preferred embodiment the closure cap 20 comprises two parts, namely a generally cylindrically shaped lower portion 21 and a generally disk-shaped upper portion or lever 22.

The lower portion 21 is provided with internal threads, as shown, for threaded engagement with the external threads provided on the neck 23 of a container 24 of flowable material of the type noted above. In addition, the lower portion 21 is provided with a lid portion 26 for closing the container 24 and an upwardly extending member 28 of generally cylindrical or tubular configuration. Provided on the upper portion of the lid 26 is a fulcrum indicated by general numerical designation 29 and in the preferred embodiment of the present invention illustrated in FIGS. 5, 6 and 11, the fulcrum 29 is formed integrally with the lower portion 21. The fulcrum 29 includes two generally triangularly shaped members 30-30 supported transversely by a cross member 31; the apexes of the triangular members 30-30 provide the fulcrum point for the lever 22. The interior of the member 28 provides an outlet duct 32 and the upper portion of the member 28 is

provided with a hollow, inverted, generally conical resilient member 34, best seen in cross-section in FIG. 6, mounted coaxially on top of the member 28 and extending upwardly and outwardly therefrom with the interior 35 of the conical resilient member in communication with the outlet duct 32.

Referring now to the lever 22, the lever is provided with a forward arm 38 in turn provided with a spout 39 and the lever is further provided with a rearward arm 40 fulcrumed on the apexes of the triangular members 30-30 for angular movement in a plane normal to the lid portion 26 between sealing and dispensing positions, as described in detail below, in which the forward arm 38 is moved toward and away from the lid portion 26 and in particular toward and away from the upwardly extending tubular member 28 and the conical resilient member 34. The forward arm 38 is further provided with a downwardly extending generally cylindrically shaped member 42, FIG. 6, which depends downwardly from a surrounding flat surface 43, FIG. 6, provided on the underside of the forward arm 38. Also depending downwardly from the forward arm 38 is a generally cylindrical or tubular member 44, FIGS. 5 and 6, which coaxially surrounds the cylindrical member 42 and is mounted on the underside of the forward arm 38 for movement with the cylindrical member 42 toward and away from the cylindrical member 28. The interior of the tubular member 44 surrounding the exterior of the cylindrical member 42 provides an intake duct 45 in communication with the spout 39.

It will be understood, and referring again to FIG. 6, that the outlet duct 32, the interior 35 of the conical resilient member 34, the inlet duct 45 and the spout 39 cooperatively form a discharge path or passage, indicated by the arrows, from the interior to the exterior of the container 24 upon the lever 22

being in the dispensing position shown in FIG. 6.

The cylindrical or tubular members 28 and 44, as may be understood from FIGS. 5 and 6, are interconnected in a sliding, reciprocating, telescopic relationship with the interior of the lower portion of the tubular member 44 being provided with an inwardly extending annular projection 48 and with the exterior of the upper portion of the tubular member 28 provided with an outwardly extending annular projection 50; upon such sliding, reciprocating, telescopic movement, described in detail below, the annular projections 48 and 50 are in sliding interference engagement, respectively, with the exterior and interior of the respective tubular members and provide sliding seals between the tubular members preventing flowable material from escaping therebetween and unwantedly accumulating between the members and on the interior of the closure cap 20.

The manner in which translational or straight line relative movement is provided between the tubular members 28 and 44 will now be described in detail by reference primarily to FIG. 7. The forward arm 38 of the lever 22 is interconnected with the rearward arm 40 of the lever by hinge or hinging structure indicated generally by numerical designation 54. The hinge or hinging structure includes a centrally formed, semi-circular slot 56, FIGS. 5 and 7, extending between the forward and rearward arms of the lever 22 and in the direction of the rearward arm 40; in addition, the hinge or hinging structure 54 includes a pair of axially aligned sections or portions 58-58 of reduced wall thickness, shown in FIGS. 9 and 10, formed integrally between the rearward and forward arms of the lever 20 and extending outwardly, respectively, as shown in dashed outline in FIG. 7 between the ends of the semi-circular slot 56 and the edge of the disk-shaped lever 22.

Thus, upon the rearward arm 40 being depressed by the finger of the user to pivot the rearward arm 40 downwardly as shown in FIG. 6, the forward arm 38 will pivot about the hinge or hinging structure 54 and will be moved vertically upwardly in translational or straight line relative movement with respect to the tubular member 28 whereby the tubular member 44 and cylindrical member 42 will be provided with translation or straight line movement with respect to the tubular member 28. Thus, contrary to the telescopically interconnected members 18 and 20 described above and shown in FIG. 2, the telescopically received tubular members 28 and 44 will not be bent or distorted and will remain in sealing engagement with the annular projections 48 and 50, described above, remaining in sliding, sealing engagement thereby preventing escape of the flowable material therebetween either during dispensing, as illustrated in FIG. 6, or during the acts of moving into the sealing and closing positions, with the closing position being indicated in FIG. 5. Such translational relative movement has been found to provide an advance and improvement in the closure apparatus art and to prevent the unwanted escape of flowable material described above.

A further feature of the present invention, and in accordance with the further teachings thereof, is provided by the conical resilient member 34 described above and best seen in FIG. 6. As will be recalled, the conical resilient member 34 is mounted coaxially on the upper portion of the tubular member 28 and extends generally upwardly and outwardly as shown in FIG. 6. The conical resilient member 34 acts in cooperation with an outwardly extending annular projection 60 formed on the lower portion of the cylindrical member 42 to seal the closure cap when in disuse to provide the cylindrical member 42 with some inward flexibility, the interior thereof may be hollowed as

shown in FIGS. 5 and 6 and the conical resilient member 34 may be formed of suitable flexible material more fully described below in the general description of the material of which the members of the closure apparatus of the present invention may be preferably formed. Hence, upon the downward translational movement of the forward arm 38 and the cylindrical member 42, the upper portion of the conical resilient member 34 will engage the flat under surface of the forward arm 38 surrounding the cylindrical member 42 and, as shown in FIG. 5, the conical resilient member will be compressed outwardly and downwardly and hence upon the annular projection 60 formed on the cylindrical member 42 being forced through the conical resilient member as shown in FIG. 5, the compressed conical resilient member 34 will provide and apply upwardly acting force acting upwardly against the forward arm 38 causing the annular projection 60 provided on the lower portion of the cylindrical member 42 to be forced into sealing engagement with the lower portion of the conical resilient member 34 thereby closing and sealing the above-described discharge passage. It will be understood that while the sealing engagement between the projection 60 and the lower portion of the conical resilient member 34 provided by the compressed conical resilient member 34 is sufficient to maintain sealing while the closure cap of the present invention is in disuse, it is not sufficiently great to prevent it to be overcome by downwardly acting force applied to the rearward arm 40 of the lever 22 by a user which downwardly acting force is sufficient to force the cylindrical member 42 upwardly, with some compression thereof due to its resilience as described above, and permit the cylindrical member to be forced upwardly through the conical resilient member to open the discharge path described above and illustrated in FIG. 6.

The inwardly and outwardly extending annular projections 48 and 50 provided respectively on the tubular members 44 and 28 perform a dual purpose. In addition to providing the above described sliding, sealing engagement during translational movement between the telescopically interconnected tubular members, such annular projections also provide the snap-fit between the lever 22 and the lower portion 21 of the closure cap 20 thereby providing means for assembly and prevention of easy disassembly of the two members when in the open position.

Referring now to FIG. 12, there is shown an alternate embodiment of the present invention which provides top rather than side dispensing. In this embodiment, structure corresponding to that identified in the earlier embodiment is given the same numerical designation and the embodiment of FIG. 12 in addition to providing the top dispensing through orifice or spout 39A in addition is also provided with a post or member 62 shaped for insertion into the orifice 39A and upon each closure of the apparatus, the post 62 cleans the orifice 39A.

It will be understood by those skilled in the art that the closure cap of the present invention, instead of being provided with threads for mounting and dismounting from a container may, if desired and if the economics involved permit, be formed integrally with a container; that is, the lower portion 21 of the closure apparatus may be formed integrally therewith with the lever member thereafter assembled thereto as described above or may be provided with suitable structure providing a snap-fit with the neck of the container.

The lower portion 21 and lever 22 of the closure of the present invention may be suitably formed by injection molding and may be preferably formed from a suitable plastic material

material such as any one of several suitable polymers or co-polymers known to those skilled in the art.

Still further, it will be understood by those skilled in the art that many variations and modifications may be made in the present invention without departing from the spirit and the scope thereof.

Patent Claims

1. A closure cap for opening and closing a discharge passage for flowable material extending between the interior and the exterior of a container, characterized by

a first member (28) having an interior passage (32) forming a part of said discharge passage,

a pivotally mounted lever (22) having a second member, said lever when pivoted in a first direction causes said second member to engage said first member to close said discharge passage, and when pivoted in a second direction to disengage said first member to open said discharge passage, and

means (54) for providing translational movement between said first and second members upon said lever pivoting in said first and second directions to prevent said flowable material from escaping from between said first and second members.

2. The closure cap according to claim 1 wherein said means for providing translational movement between said first and second members comprises a hinge (54) providing a hinged interconnection between a forward portion (38) of said lever (22) having said second member and a rearward portion (40) of said lever along which said lever ist pivotally mounted.

3. The closure cap according to claim 1 or 2, characterized by pivot means (29) for mounting said lever (22) pivotally intermediate said rearward portion (40), said hinge means (54) providing said hinged interconnection between said forward and rearward portions of said lever being

intermediate said pivot means and said forward portion of said lever to provide translational movement between said forward portion of said lever and said second member with respect to said first member (28) upon said forward portion of said lever and said second member being moved toward and away from said second member.

4. The closure cap according to one of the preceding claims wherein said lever (22) is generally disk-shaped and wherein said hinge means (54) comprise a centrally formed, semi-circular slot (56) extending between said rearward and forward portions (38, 40) of said lever and in the direction of said rearward portion of said lever and a pair of axially aligned portions (58) of reduced thickness formed integrally between said rearward and forward portions of said lever and extending respectively between the ends of said semi-circular slot and the edge of said lever.

5. The closure cap according to one of the preceding claims characterized by

a lid portion (26) for closing the container,

means defining a spout (39) at the forward portion (38) of said rigid lever (22), said rearward portion (40) fulcrumed on the cap for angular movement of the lever in a plane normal to the lid portion between predetermined sealing and dispensing positions in which the forward portion is moved toward and away from the lid portion, the forward portion also provided with means defining an intake duct (45), said intake duct opening towards the lid portion and communicating with the spout (39),

means defining an outlet duct (32), said outlet duct opening from the container towards the intake duct and with the outlet and inlet ducts and spout cooperatively forming said discharge path from the interior to the exterior of the container, the intake duct defining means and the outlet duct defining means being telescopically interconnected to form a coupling therebetween and for translational sliding, reciprocating, telescopic movement therebetween upon the forward portion (38) of the lever (22) being moved toward and away from the lid portion (26), the intake and outlet duct defining means also being mutually conformed to render the coupling fluid tight during the telescopic movement, and

cooperating sealing means provided respectively on the intake duct and outlet duct defining means for closing one of the ducts upon the lever being in the sealing position.

6. The closure cup according to one of the preceding claims, wherein said first member (28) is provided with resilient means (34) for being compressed upon said forward portion (38) of said lever (22) and said second member being moved toward said first member, said resilient means upon being compressed applying force to said lever to force said second member into engagement with said first member to facilitate the closure of said discharge passage.

7. The closure cap according to one of the preceding claims, wherein

said first member (28) is a first cylindrical tubular member having a central axis coincident with said interior passage,

said resilient means is a hollow, inverted, generally conical resilient member (34) mounted coaxially on top of said tubular member and extending upwardly and outwardly therefrom with the interior of said conical resilient member providing a portion of said discharge passage,

the forward portion (38) of said lever (22) is provided with a flat bottom surface (43),

said second member is a cylindrical member (42) depending downwardly from said flat bottom surface, said cylindrical member (42) is dimensioned for movement into and through said conical resilient member (34) and provided at its lower portion with a generally annular outwardly extending projection (60) slightly larger in diameter than the lower portion of said conical resilient member (34) and being resiliently compressible to permit said outwardly extending projection (60) to be forced through said lower portion of said conical resilient member upon said forward portion (38) of said lever (22) and said second member (42) being moved towards said first member (28),

said conical resilient member (34) having an effective height greater than the length of said cylindrical member (42) between said flat bottom surface (43) and said generally annular outwardly extending projection (60),

whereby upon said annular projection (60) being forced through said lower portion of said conical resilient member (34) said flat bottom surface (43) engages the upper portion of said conical resilient member and bends the upper portion outwardly to cause said conical resilient member to produce force acting generally upwardly against said flat bottom surface to force said

generally annularly outwardly extending projection (60) upwardly into engagement with said lower portion of said conical resilient member thereby closing and sealing said discharge passage.

8. The closure cap according to one of the preceding claims, wherein said cap further includes a second cylindrical tubular member (44) depending from said flat bottom surface (43) of said forward portion (38) of said lever (22), said second cylindrical tubular member (44), coaxially surrounding said cylindrical member (42), and being movable in a translational manner with respect to said second member (28), said second cylindrical tubular member (44) having an interior larger than the exterior of said first cylindrical tubular member (28) and being provided at its lower portion with an inwardly extending annular projection (48) for sliding engagement with the exterior of said first cylindrical tubular member (28), the latter being provided at its upper portion with an outwardly extending annular projection (50) for sealing interference engagement with the interior of said second cylindrical tubular member (44) whereby upon said translational movement said sliding interference engagements provide sliding seals between said first and second cylindrical tubular members (28, 44) preventing said flowable material from escaping therebetween and accumulating on said closure cap.

9. A closure cap for opening and closing a discharge passage for flowable material extending from the interior to the exterior of a container, characterized by two members (28, 22) mounted for first and second relative movement therebetween, upon said first relative movement said two members engaging each other to close said discharge passage (32) and upon said second relative movement said two members disengaging each other to open said discharge passage, wherein one of said two members being provided

with resilient means (34) to be compressed upon said first relative movement between said two members, said resilient means upon being compressed applying force to the other of said two members to force said members into engagement to close said discharge passage.

10. The closure cap according to claim 9, wherein

said one member (28) is mounted stationarily and is a first cylindrical tubular member having a central axis with the interior thereof providing a portion of said discharge passage,

said resilient means (34) is a hollow, inverted, generally conical resilient member mounted coaxially on top of said tubular member and extending upwardly and outwardly therefrom with the interior of said conical resilient member providing a portion of said discharge passage,

said other member (22) includes a generally flat surface (43) and a cylindrical member (42) depending downwardly from said flat surface, said flat surface and cylindrical member mounted generally for coaxial reciprocally telescopic movement with respect to said central axis and said cylindrical member dimensioned for movement into and through said conical resilient member, and

the lower portion of said cylindrical member is provided with a generally annular outwardly extending projection (60)slightly larger in diameter than the lower portion of said conical resilient member (34) and being resiliently compressible to permit said outwardly extending projection to be forced through said lower portion of said conical resilient member upon said first relative movement between said two members, said conical resilient member

having an effective height greater than the length of said cylindrical member (42) between said flat surface and said generally annular outwardly extending projection,

whereby, upon said annular projection (60) being forced through said lower portion of said conical resilient member (34), said flat surface engages the upper portion of said conical resilient member and bends the upper portion of said conical resilient member outwardly to cause said conical resilient member to produce force acting generally upwardly against said flat surface to force said generally annularly outwardly extending projection upwardly into engagement with said lower portion of said conical resilient member thereby closing and sealing said discharge passage.

11. The closure cap according to claim 9 or 10 wherein said other member (22) includes a second cylindrical tubular member (44) depending from said flat surface (43), coaxially surrounding said cylindrical member (42), and mounted generally for coaxial telescopic movement with respect to said central axis and said first cylindrical tubular member, said second cylindrical tubular member (44) having an interior larger than the exterior of said first cylindrical tubular member (28) and being provided at its lower portion with an inwardly extending annular projection (48) for sliding interference engagement with exterior of said first cylindrical tubular member, the latter being provided at its upper portion with an outwardly extending annular projection (50) for sliding interference engagement with the interior of said second cylindrical tubular member (44) whereby upon said generally coaxial telescopic movement said sliding interference

engagements provide sliding seals between said first and second cylindrical tubular members (28, 44) preventing said flowable material from escaping therebetween and accumulating between said two members of said closure apparatus.

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FIG. 1

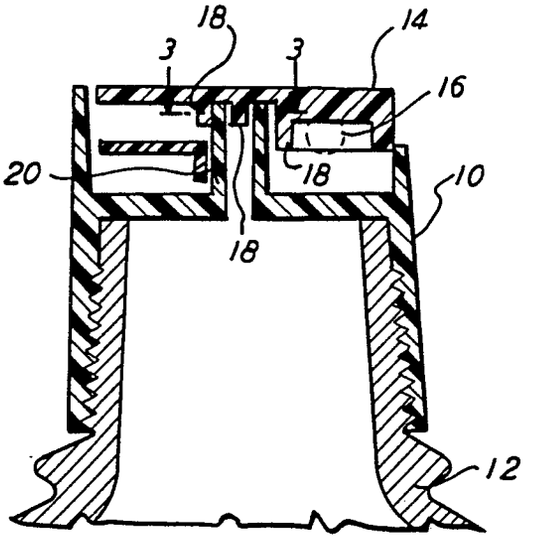


FIG. 2

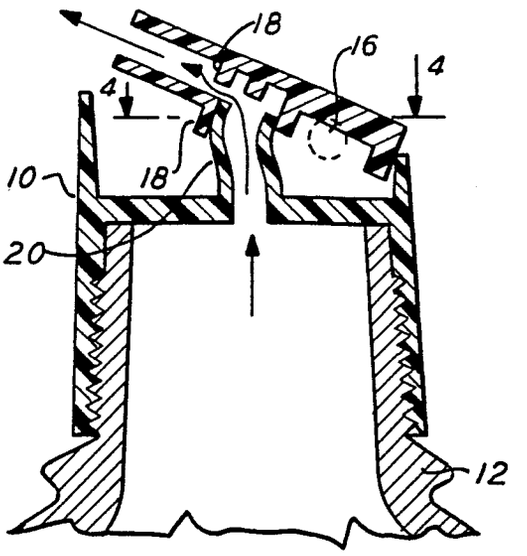


FIG. 3

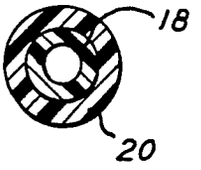
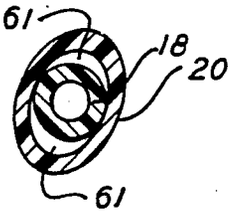


FIG. 4



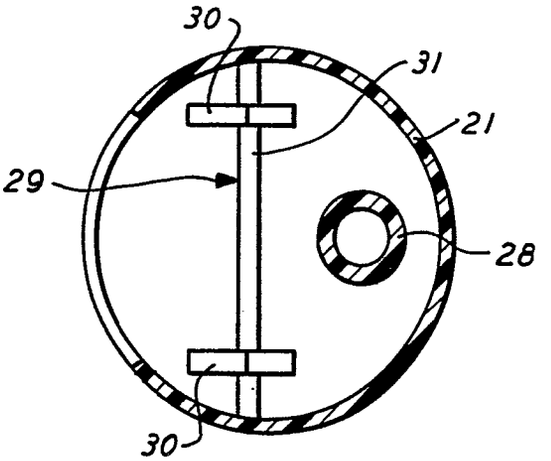


FIG. 11

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FIG. 5

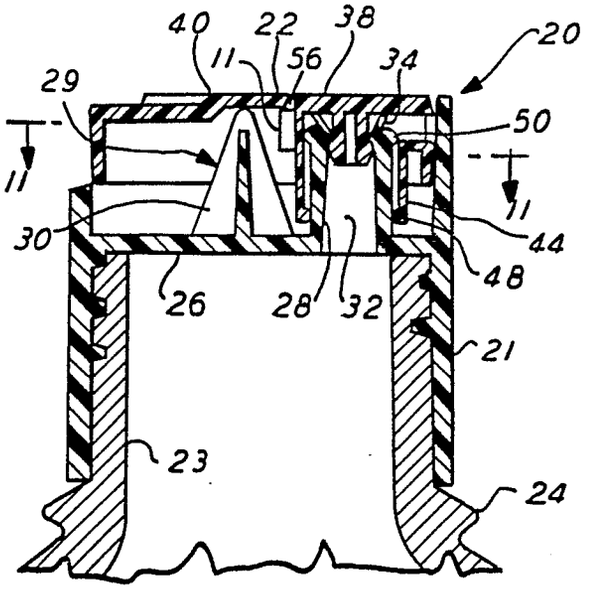

FIG. 6

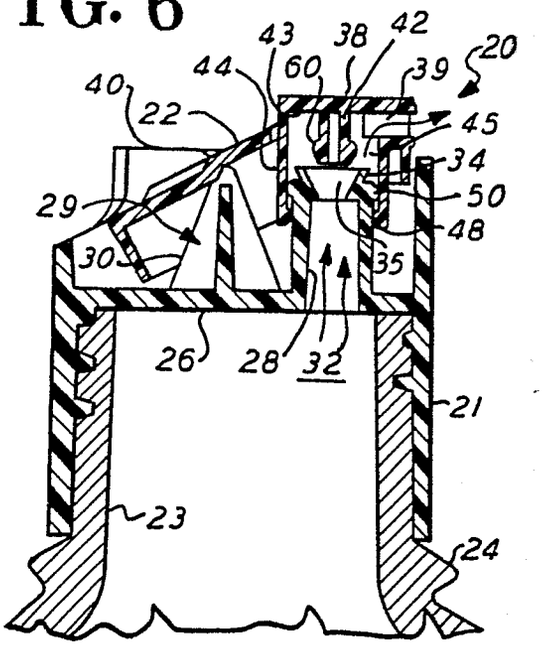

FIG. 9

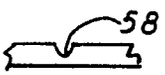

FIG. 7

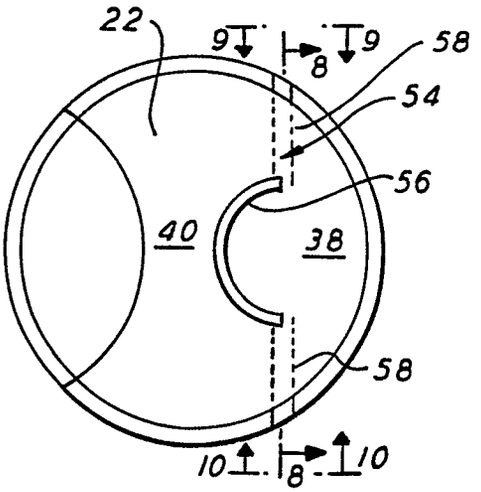

FIG. 8

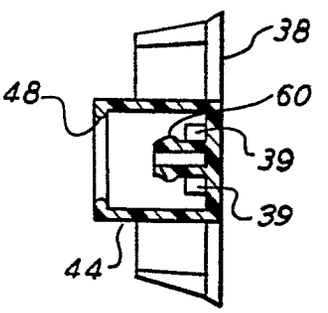

FIG. 12

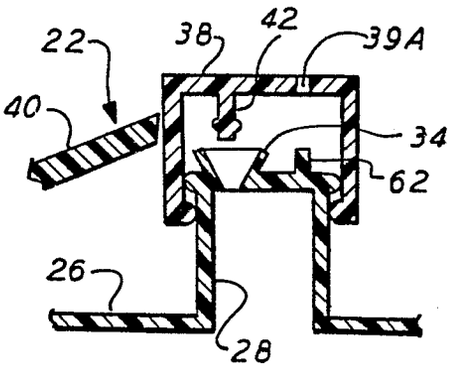

FIG. 10