June 28, 1966 S. CHERBA 3,258,179

DISPENSING CONTAINER CLOSURE

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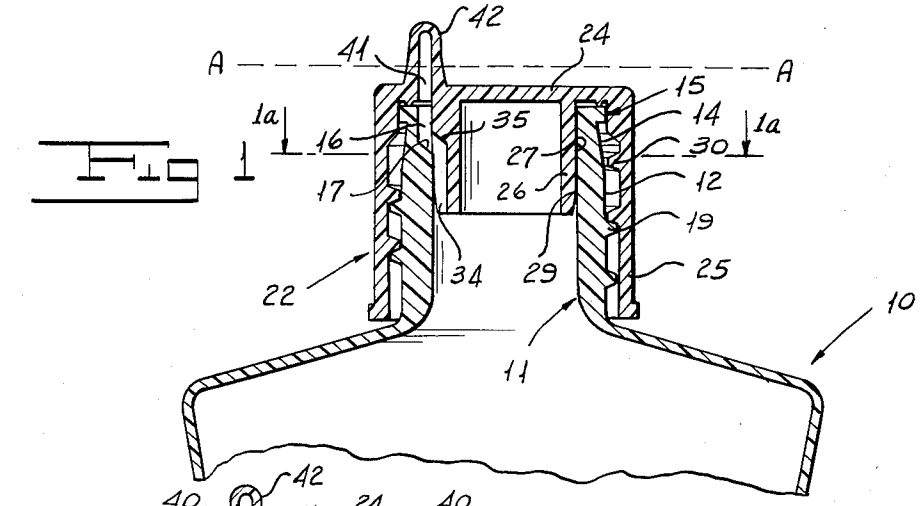


FIG 1

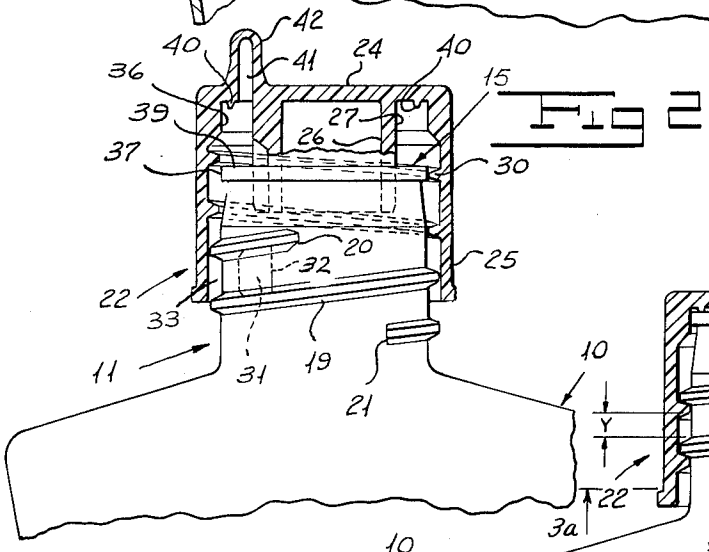


FIG 2

FIG 3

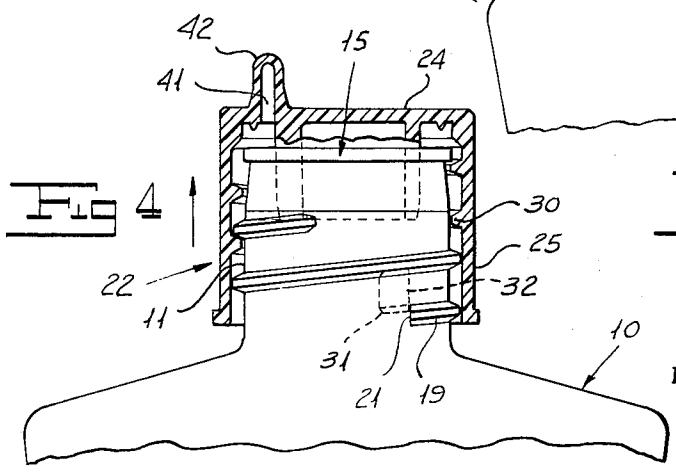


FIG 4

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FIG. 1a

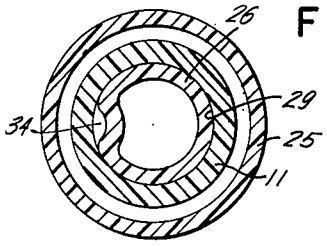


FIG. 3a

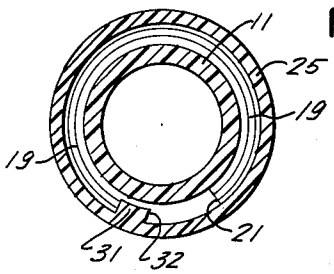


FIG. 3b

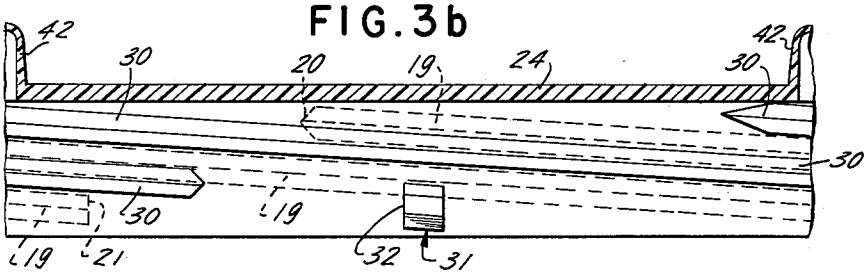


FIG. 3c

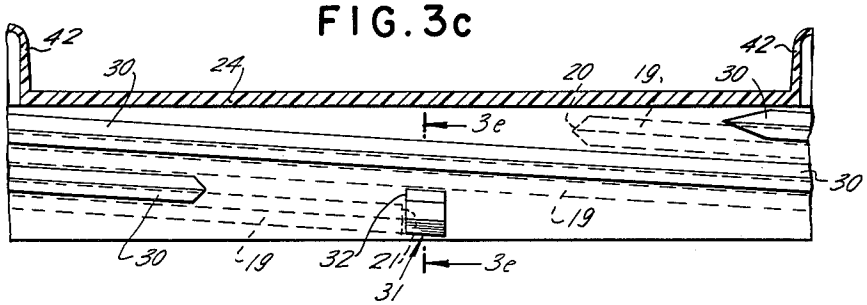


FIG. 3d

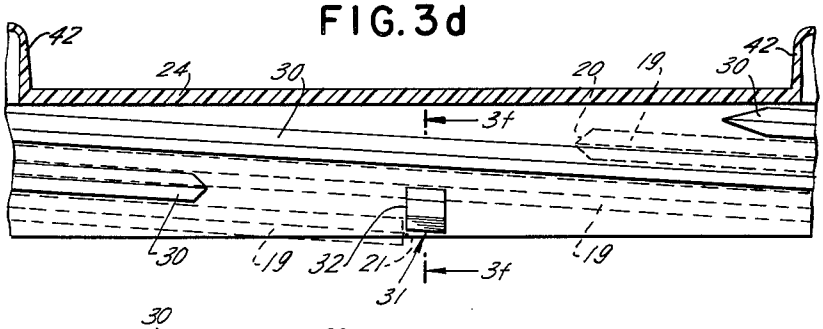


FIG. 3e

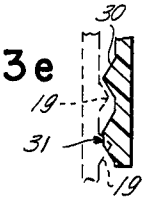
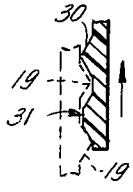


FIG. 3f



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FIG 5

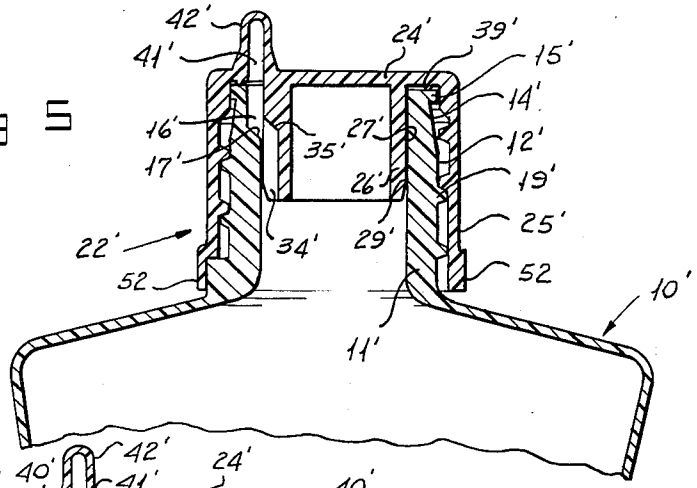
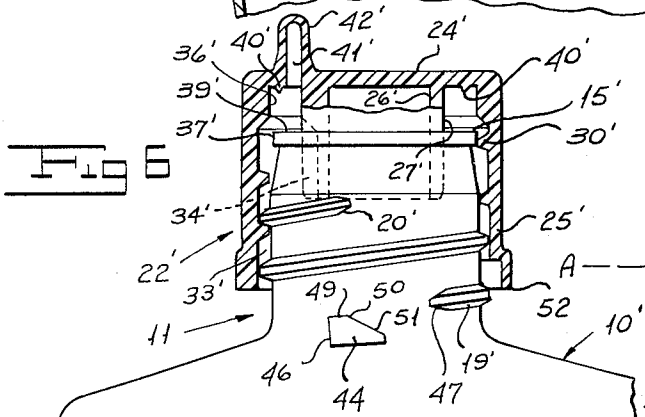


FIG 6



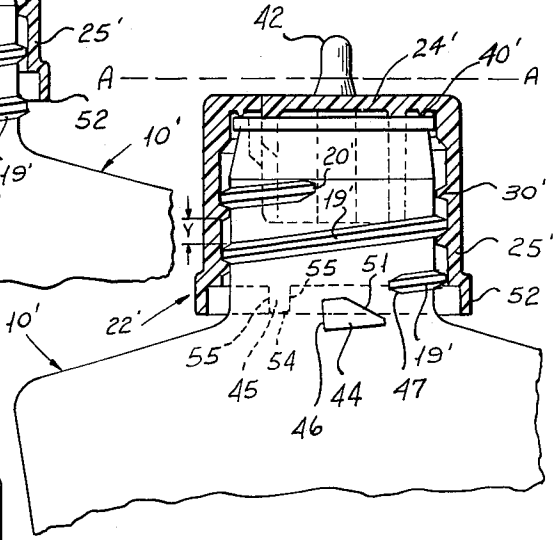
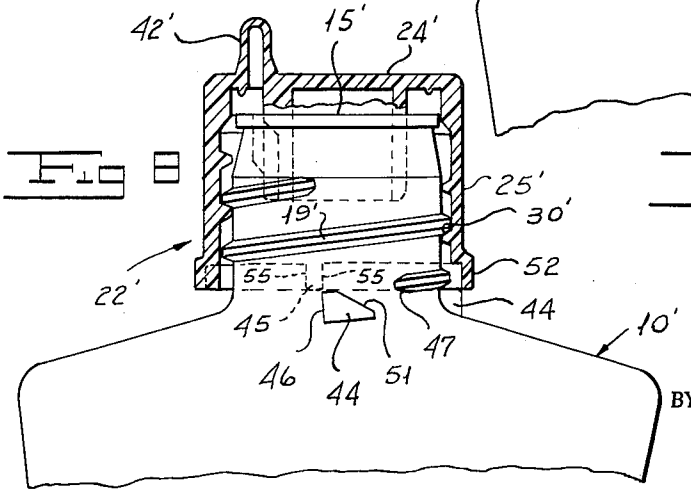


FIG 7

FIG 8



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DISPENSING CONTAINER CLOSURE

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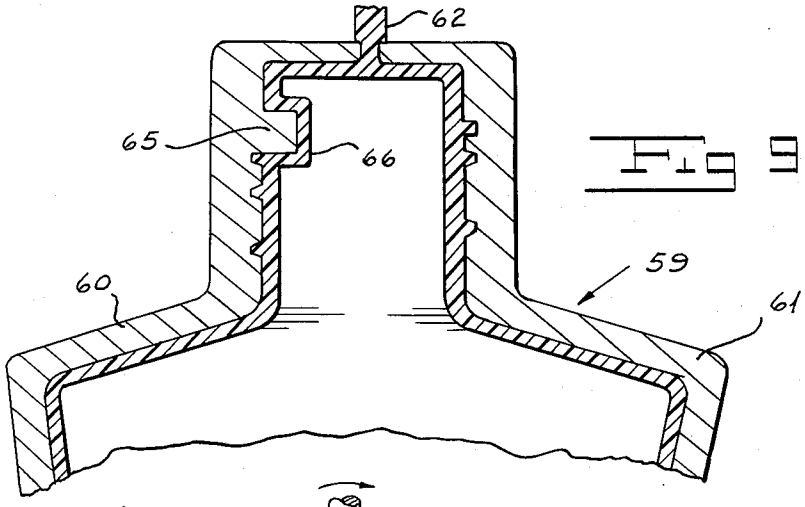


Fig 9

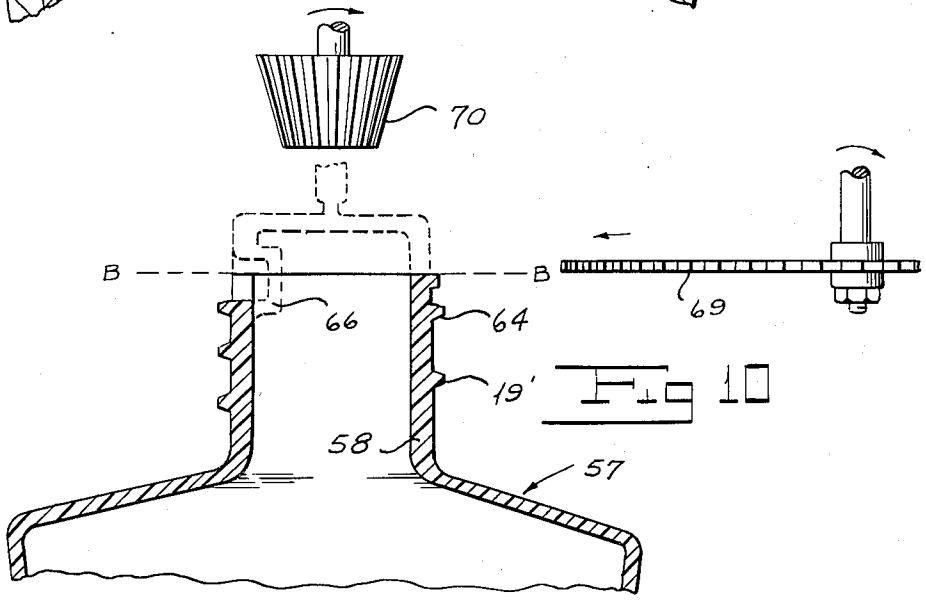


Fig 10

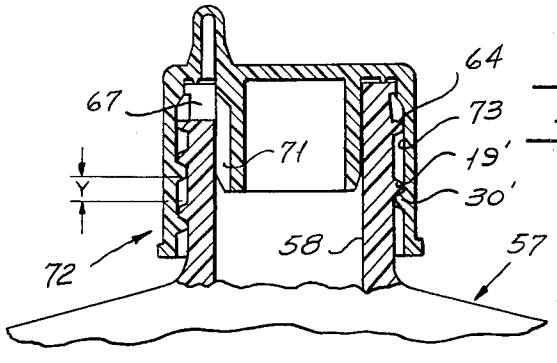


Fig 11

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DISPENSING CONTAINER CLOSURE

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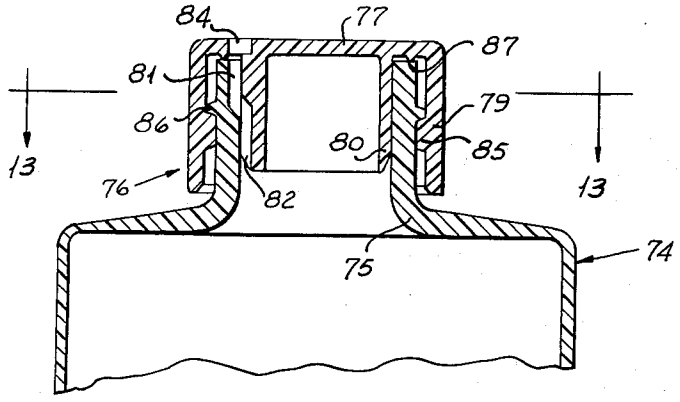


Fig 12

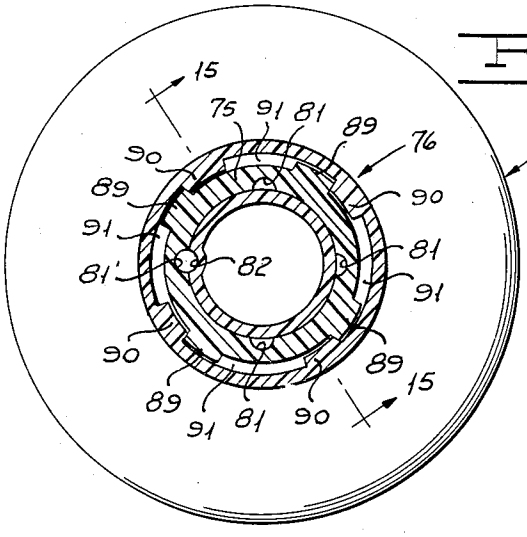


Fig 13

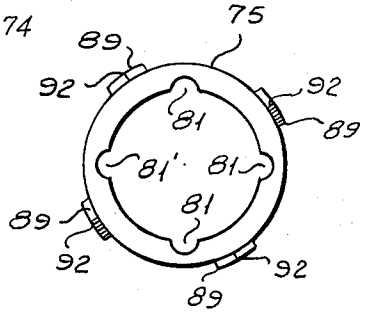


Fig 14

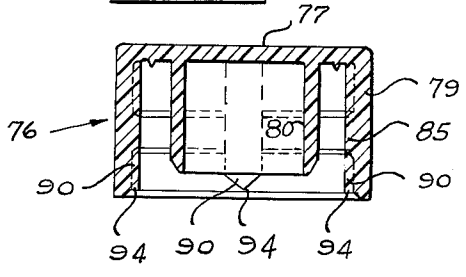


Fig 15

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United States Patent Office 3,258,179 Patented June 28, 1966

3,258,179

DISPENSING CONTAINER CLOSURE

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Filed Feb. 12, 1964, Ser. No. 344,273
12 Claims. (Cl. 222—549)

This invention relates to a dispensing container closure having a container closure device in combination therewith, to such container closure, to a method of making the container of such combination, and to a method of assembling a disclosed embodiment of dispensing container with its closure.

The invention has among its objects the provision of an improved, simplified combination of a dispensing container and a closure device therefor.

A further object of the invention lies in the provsion of an improved, simplified dispensing closure adapted for use with dispensing containers.

Another object of the invention resides in the provision of a novel method of making dispensing containers adapted for use with dispensing closure devices of the invention.

Still a further object of the invention resides in the provision of an improved novel method of assembling one disclosed embodiment of container and dispensing closure device therefor.

The above and further objects and novel features of the invention will more fully appear from the following description when the same is read in connection with the accompanying drawings. It is to be expressely understood, however, that the drawings are for the purpose of illustration only, and are not intended as a definition of the limits of the invention.

In the drawings, wherein like reference characters refer to like parts throughout the several views.

FIG. 1 is a fragmentary view in axial section through the neck of a dispensing container provided with a first disclosed embodiment of dispensing device, the cap member of the device being shown in fully assembled condition upon the container neck and in open dispensing position with respect thereto;

FIG. 1*a* is a view in transverse section through the neck of the contained and the cap member thereon with the cap member in open dispensing position, the section being taken along the line 1*a*—1*a* in FIG. 1;

FIG. 2 is a view partially in elevation and partially in axial section through the container and dispensing device of FIG. 1, the dispensing device in the central portion thereof being shown in phantom lines, the cap member of the dispensing device being shown in the act of being initially mounted upon the neck of the container;

FIG. 3 is a view similar to to FIG. 2 but with the cap member of the dispenser device being shown fully applied to the neck of the container and the closure device being shown in closed position relative to the container neck;

FIG. 3*a* is a view in transverse section through the dispensing container and the cap member on the neck thereof, the cap member being shown in closed position, the section being taken along the line 3*a*—3*a* in FIG. 3;

FIGS. 3*b*, 3*c*, and 3*d* are developments of the container neck and the closure member as such parts would be seen if the container neck were cut off the container, the container neck and closure were cut along the vertical axial plane normal to the paper of FIG. 3 at the location furthest from the reader in such figures, and the resulting cut structure were then unrolled. In FIGS. 3*b*–3*d* the closure member is shown in the same position, the container neck being shown rotated relative to the closure member in FIGS. 3*c* and 3*d*;

FIG. 3*b* corresponds to the closed position of the parts shown in FIG. 3;

FIG. 3*c* corresponds to the closure member-open position of the parts shown in FIG. 1, the closure member being in its axially lower position with respect to the container neck, from which position the closure member cannot normally be unscrewed;

FIG. 3*d* corresponds to the closure member-open position of the parts shown in FIG. 4, the closure member being in its axially upper position with respect to the container neck, from which position the closure member can be directly unscrewed;

FIG. 3*e* is a view in transverse vertical section through the developed container neck and closure member, the section being taken along the line 3*e*—3*e* of FIG. 3*c*;

FIG. 3*f* is a view in transverse vertical section through the developed container neck and closure member, the section being taken along the line 3*f*—3*f* of FIG. 3*d*;

In all of FIGS. 3*b*–3*f*, inclusive, parts of the closure member are shown in solid lines, parts of the container neck being shown in dash lines.

FIG. 4 is a view taken similarly to FIG. 3 but with the cap member of the dispensing closure device turned with respect to the neck of the container to open the dispensing closure device, the cap being shown raised axially with respect to the container neck so that such cap may then be removed from the container neck by being unscrewed therefrom;

FIG. 5 is a fragmentary view in axial section of a portion of a dispensing container at the neck thereof, a cap member of a dispensing closure in accordance with a second embodiment of the invention shown assembled upon the container neck and in open dispensing position with respect thereto;

FIG. 6 is a view partially in elevation and partially in axial section of the combination shown in FIG. 5, the cap member of the dispensing closure having its central portion thereof shown in phantom lines, the cap member of the dispensing closure device being shown in the act of being initially mounted upon the neck of a container;

FIG. 7 is a view partially in elevation and partially in axial section of the neck of the container and the closure device therefor, the cap member of the closure device being shown fully applied to the container neck and in closed position relative thereto;

FIG. 8 is a view similar to FIG. 7 but with the cap member of the closure device turned with respect to the container neck to open the closure device, the cap being shown raised axially with respect to the container neck so as to permit the cap member to be removed from the container neck by being unscrewed therefrom;

FIG. 9 is a somewhat schematic fragmentary view in axial section of a blow molding mold engaged in the preliminary shaping of a parison from which one embodiment of dispensing container in accordance with the invention is to be formed;

FIG. 10 is a fragmentary view partially in elevation and partially in axial section through the container blank produced by the mold in FIG. 9;

FIG. 11 is a fragmentary view of the product of the method illustrated in FIGS. 9 and 10, assembled with a cap member to form a dispensing closure device;

FIG. 12 is a fragmentary view in axial section through the neck of a fourth embodiment of combination of dispensing container and a cap member forming a dispensing closure device therewith;

FIG. 13 is a view in transverse section through the container neck and cap member of the closure device of FIG. 12, the section being taken along the line 13—13 of FIG. 12;

FIG. 14 is a view in plan of the upper edge of the neck of the container shown in FIGS. 12 and 13; and

FIG. 15 is a view in axial section through the cap member of the dispensing closure device shown in FIGS. 12,

13, and 14, the section being taken along the line 15—15 of FIG. 13.

As will be apparent from the above four embodiments of combinations of a dispensing container with a closure device therefor in accordance with the invention are disclosed herein. The first such embodiment is shown in FIGS. 1 to 4, inclusive. The second embodiment is shown in FIGS. 5 to 8, inclusive. FIGS 9 to 11, inclusive, illustrate a method by which a dispensing container employed with the closure of either the first or second embodiments may be formed, and a third combination of a dispensing container and a closure device therefor in accordance with the invention. The fourth embodiment is shown in FIGS. 12 to 15, inclusive. All of the disclosed closure devices are of two-piece construction, the neck of the container constituting one of said pieces. All of the disclosed closure devices are of the type wherein the device is selectively opened and closed by turning one piece of the closure device through a part of one turn with respect to the other piece thereof.

Turning now to the first disclosed embodiment of closure device in accordance with the invention shown in FIGS. 1 to 4, inclusive, the container there shown is generally designated by the reference character 10. Container 10 has an upstanding hollow neck 11 thereon which is shown integrally connected to the body of the container. The lower portion of the neck has a circular cylindrical exterior surface designated 12, the neck tapering inwardly from the upper end of surface 12 in a frusto-conical portion 14 which is joined at its upper end to a radially outwardly flanged portion 15. Although the container neck 11 is shown as an integral part of the container 10, it is to be understood that, if desired, it may be made separately from the body of the container and subsequently sealed or otherwise connected thereto. As above set forth, the container neck 11 forms one part of a two-part closure device for the container.

As shown, the neck 11 is provided at one zone thereof with a vertically disposed relatively narrow groove 16 in its inner surface. The groove 16 extends from the upper end of the neck downwardly to an intermediate portion thereof, and terminates in an outwardly and downwardly slanting lower surface 17. The groove 16 forms one portion of a selectively opened and closed discharge passage through the dispensing device, the outer end of the groove 16 communicating with an opening through the upper end of the cap of the device. When the cap is turned to closed position relative to the container neck, an imperforate portion of the top of the cap then overlies the upper end of groove 16 and closes the closure device (FIG. 3).

The neck 11 of container is provided with a helical rib projecting outwardly of the surface 12 thereof, the rib constituting a thread 19 which in the embodiment shown extends for somewhat less than two turns about the neck. Thread 19 has a tapering entering upper end 20 and a lower end having an abrupt radially disposed end in the form of a shoulder 21. The thread 19 cooperates with thread 30 on the inner surface of the skirt of the cap 22, to be described, in such manner that the cap may be applied to the neck by being turned with respect thereto, the cap in its fully assembled position being shown in FIG. 3. Stop means 31 on the cap then cooperates with the stop shoulder 21 on the neck 11 to prevent the reverse turning of the cap, when the latter is in its fully assembled, lower position, past the point at which the closure device is open. When, however, the cap is deliberately raised, it may be removed from the container neck by unscrewing it therefrom.

The cap 22 is generally in the form of an inverted cup having a top wall 24, an outer skirt 25 depending from the outer edge thereof, and an inner skirt of generally circular cylindrical tubular shape coaxial with the outer skirt and spaced radially inwardly therefrom. The inner skirt 26 of the cap is adapted to be telescoped within the

neck 11 of the container, the outer circular cylindrical surface 27 of skirt 26 then sealingly engaging the circular cylindrical inner surface 29 of the neck 11.

The outer skirt 25 of the cap is provided with thread 30 of the same hand and pitch as the thread 19 on the container neck. The widths of the lands of threads 19 and 30 are the same in the embodiment shown, such widths being substantially less than the width of the spaces between the lands of the respective threads, so as to provide a substantial axial clearance between the threads when they are engaged, as shown in FIG. 3. Such clearance is designated by the character Y. The skirt 25 of the cap is provided adjacent the lower edge thereof with an inwardly projecting stop member or lug 31 which is angularly spaced somewhat from the lower end of the continuous thread 30 on the cap. Lug 31 has an abrupt shoulder 32 on its trailing end, shoulder 32 being adapted to cooperate with the shoulder 21 on the lower end of thread 19 on the container neck to stop the cap, as above generally described, with the portions of the dispensing passage through the container neck and cap in communication. The lug 31 on the skirt 25 has a shape in cross section which is accurately complementary to the shape of the groove 33 between the lands of the thread 19, the upper surface of lug 31 being disposed in alignment with the helix upon which the upper surface of the thread 30 on the cap lies.

The dispensing passage through the closure device is formed in part by the above described groove 16, 17 in the neck of the container and by a groove 34 having an upper slanting portion 35 located in one zone of the inner skirt 26 of the cap. When the cap is turned relative to the container neck to lie as shown in FIG. 1 with respect thereto, the grooves 16, 17 and 34, 35 are in alignment so that communication is afforded through the aligned grooves with the interior of the container. The upper end of such dispensing passage communicates with a hole 41 which is disposed laterally offset from the center of the neck and cap. In the embodiment shown, the cap 22 is formed with an initially closed-ended spout 42 having a passage therein which is a prolongation of the hole 41. When the contents of the container are to be used, the spout 42 may be cut off at any desired location, such as along the line A—A to open the spout.

Sealing between the cap and the container neck in all of their operative positions is afforded by relatively tight contact between the outer surface 27 of the inner skirt 26 and the inner surface 29 of the container neck into which the inner skirt is telescoped. Two further sealing zones are provided between the container neck and the cap, such further seals being particularly effective when the cap lies in container closing position. The first of such further seals is provided by an annular recess in the cap having a circular cylindrical side wall 36, surface 36 snugly engaging the similarly shaped surface 37 on the outer edge of the flange 15 on the container neck. The second such further seal is provided between the upper flat annular surface 39 of the container neck and an annular bead 40 which is molded integrally with the cap and overlies and sealingly engages surface 39 when the cap is fully engaged upon the container neck in closed position relative thereto.

The cap is assembled upon the container neck by being placed in alignment therewith and being advanced toward the neck so that the stop lug 31 on the cap first engages the thread 19 on the container neck. The cap is then turned clockwise (as viewed from above) until the lug 31 enters between the entering end 20 of thread 19 and the continuous land of the thread 19 positioned therebelow. Turning of the cap in the same direction is then continued, the cap now being positively axially positioned with respect to the container neck by engagement of the lug 31 in the groove between the lands of the thread 19; in such condition the upper surfaces of the threads 30 on the cap engage the lower surfaces of the threads 19 on

the container neck. The cap is thus held under such condition against any substantial axial movement with respect to the container neck unless the cap is turned relative thereto. When, however, the cap approaches its fully assembled position, the trailing end of the stop lug **31** will clear the shoulder **21** of the thread **19** on the container neck. Further downward movement of the cap as it is further turned is then caused by the engagement between the lower surfaces of thread **19** and the upper surfaces of thread **30**, such threads pulling the cap downwardly into the position of FIG. 3 wherein surfaces **36** and **37** are fully telescoped and the bead **40** sealingly engages the upper surface **39** of the container neck.

When it is desired to dispense the contents of the container, the cap is retained in the axial position which it had in its fully assembled, closed position and is turned counterclockwise relative to the neck of the container so as to bring surface **32** of stop lug **31** into engagement with the stop shoulder **21** on the bottom end of thread **19**. The dispensing passage through the closure is, as we have seen, now open. In such open position of the closure, as shown in FIG. 1, the cap is free to rise or move axially through the clearance distance Y with respect to the container neck. The friction between the parts, particularly between the inner skirt of the cap and the inner surface of the container neck, is such that normally the cap retains its fully applied axial position unless it is deliberately pulled outwardly on the container neck. The surface **32** of the lug **31** and the shoulder **21** of thread **19** thus function to stop the cap in its open, dispensing position, as well as effectively retaining the cap on the container neck during the normal operation of the closure device.

If, however, it is desired to remove the cap from the container neck, this may be readily accomplished. To remove the cap, the cap is turned counterclockwise and at the same time is lifted with respect to the container neck. As a result, the lug **31** may be made to enter between the lands of thread **19** at the lower end thereof, so that continued turning of the cap in a counterclockwise direction results in its being lifted by reason of the interaction of lug **31** and thread **19**, the cap thus being eventually removed from the container neck.

In the embodiment shown and described the parts, including the stop members, are so constructed and arranged that the lug **31** will clear stop shoulder **21** completely upon the lifting of the cap at the beginning of the cap-removing operation. In other embodiments the parts may, however, be so constructed that the stop members will snap past each other at the end of the cap-applying operation. With such construction, the stop members continue partially to overlap when the cap is turned reversely to place them in contact, even though the cap is then pulled axially outwardly on the container neck. To remove the cap from the container neck it is then necessary to apply considerable turning force to the cap to distort one or both of the stop members to permit them to clear each other so that unscrewing of the cap from the container neck can commence.

The cap **22** of the closure device may be made of a variety of suitable materials, which may be either substantially rigid, when the neck of the container **10** is made of flexible resilient material, or somewhat flexible in character. When the cap is made of resilient material such as a distortable plastic, the stop lug **31** may be made of such size and shape that it and the portion of the container neck engaging it, including the portion of the neck including the groove between the lands of the thread **19** are resiliently distorted as the lug **31** is screwed down the neck of the container. Thus, for example, the lug **31** may be made with a relaxed width which somewhat exceeds the width of the groove between the lands of thread **19**. With such construction, when the cap is to be removed, it is first turned to the closure-open position, following which the cap is raised axially on the neck of the container. The cap can then be unscrewed only upon the application of considerable torque to the container and cap to cause the lug **31** to enter the groove between the lands of thread **19**. In general, at least one of the (1) container neck and (2) the cap will be made of flexible resilient material for the purpose of securing a good seal therebetween. The container **10** may be, for example, a squeeze bottle made of polyethylene, the neck of the container being made integral with its sidewall. When the container neck is thus made, the cap may be made of rigid material.

The embodiment of container and closure device therefor shown in FIGS. 5 to 8, incl., is similar in many respects to the first embodiment thereof shown in FIGS. 1 to 4, incl., and described above. The parts in FIGS. 5 to 8, incl., which are similar to those of FIGS. 1 to 4, incl., are designated by the same reference characters as those employed in the description of the first embodiment, but with an added prime. Consequently, there is no necessity for the further description of the parts of the container and closure device therefor in FIGS. 5 to 8, incl., which are also common to the combination of FIGS. 1 to 4, incl.

The device of FIGS. 5 to 8, incl., differs from that of FIGS. 1 to 4, incl., in the character of the stop means employed on the cap and container neck of the closure device both normally to stop the cap, when turned in the cap-removing direction, in the closure open position, and to retain the cap against inadvertent removal from the container. Such stop means in the embodiment of FIGS. 5 to 8, incl., includes a plurality (three shown) of angularly spaced radially outwardly directed lugs **44** on the container neck **11'** adjacent the base or root thereof. Cooperating with the lugs **44** in a manner to be described are three depending stop lugs **45** affixed to the lower edge of the outer skirt **25'** of the cap **22'**. Lugs **44** and stop members **45** are spaced angularly through equal angles about the axis of the respective members. Stop members **44** and **45** pass each other when the cap member is advanced toward its fully assembled position; the stop members interfere when the cap, in the axial position shown in FIG. 5, is turned counterclockwise on the container neck so as normally to stop the cap in a closure open position as shown in FIG. 5. If the cap is raised axially along the neck of the container, as shown in FIG. 7, continued turning in the same direction of the cap relative to the container neck causes the cap to be retracted axially from the container neck so that it may be removed therefrom upon disengagement of the threads.

In the illustrative embodiment shown, the lugs **44** on the container neck have abrupt ends **46** disposed remote from the tapered trailing end **47** of the thread **19'** on the container neck. In such embodiment the upper surface **49** of lug **44** is flat from its corner **50** at which it intersects the upper end of surface **46**. The upper surface of lug **44** thereafter slants downwardly in a ramp **51** which faces but is separated from the end **47** of thread **19'**. The corner **50** in the embodiment shown is located at a level which is somewhat below the helix upon which the root of the trailing end **47** of the thread **19'** is located.

The stop members or lugs **45** on the cap **22'** are in the form of radially outwardly extending thickened portions of the lower edge **52** of the outer skirt **25'** of the cap, the stop members having lower end surfaces **54**, which in the embodiment shown are curved, the sides **55** of the members **45** being straight and extending parallel to the axis of the cap above the curved lower ends of such members. The radially inner surfaces of members **45** lie generally in alignment with the bottoms of the grooves between the lands of the thread **30'** on the cap **22'**. It is to be understood that surfaces **54** of stop members **45** may be made with other suitable shapes, if desired, such as flat and lie in a transverse plane.

Cap 22' is applied to the container neck 11' by being axially aligned therewith and preliminarily telescoped thereof. Following this, the cap is turned clockwise with respect to the container neck so that the leading end of the thread 30' on the cap enters into the groove 33' between the lands of the thread 19'. As before, the groove between successive lands of both threads 19' and 30' has a width which substantially exceeds the width of the threads themselves. Consequently substantial axial play is present between the cap and the container neck during the turning of the cap in the cap-assembling operation until the lower ends 54 of the stop members 45 contact the ramps 51 of the respective stop lugs 44. The parts may be so constructed that as members 45 climb up the ramps 51 they thrust the upper surfaces of thread 30' on the cap into forcible engagement with the lower surfaces of the thread 19' on the container neck. The relationship of the parts in such embodiment is such that one or both of each set of stop members 44 and 45, depending upon the materials of which they are made, must be resiliently distorted before members 45 can travel across the surfaces 49 of stop members 44. Upon passing the corners 50 of stop members 44, the members 45 drop downwardly along shoulder 46 so that the cap is now free to descend axially along the container neck 11' into the fully assembled position thereof shown in FIG. 7.

When the closure device is in its closed position, the stop members 45 will have travelled clockwise somewhat beyond the lugs 44. In such position the upper surfaces of thread 30' on the cap are in forcible contact with the lower surfaces of the thread 19' on the container neck, so that the cap is then held forcibly downwardly on the container neck with the annular sealing bead 40' of the cap in sealing contact with the upper surface 39' of the neck of the container. As before, the cap and container neck have sealing engagement with each other at all times when they are operatively assembled by reason of the forcible telescoped connection between the outer surface 27' of the inner skirt 26' of the cap and the inner surface 29' of the container neck. A further seal is also afforded during normal operation of the device between the circular cylindrical outer surface 37' of flange 15 of the container neck and the similar surface 36' on the cap.

As stated, the closure device is opened by turning the cap counterclockwise relative to the container neck until the sides of the stop members 45 otact the shoulders 46 of the lugs 44. The friction between the cap and the container neck is such that during normal opening and closing of the device the cap remains substantially in its inner fully assembled position with respect to the container neck. If it should be desired to remove the cap from the container neck, the cap is pulled axially outwardly with respect to the neck and is turnd counterclockwise. When the cap reaches its open position, substantial portions of members 44 and 45 still axially overlap. The yielding character of one or both of such members, however, permits them to be snapped past each other upon forcibly turning the cap in a counterclockwise direction. Once members 44 and 45 have cleared each other, the lower surfaces of thread 30' operatively engage the upper surface of thread 19'; thus continued turning of the cap in the same direction causes the cap to be withdrawn axially from the container neck.

In some instances it may be desired to form the stop members 44 and 45 so that they may be freed from each other upon their reaching the closure closing position, simply by pulling the cap axially outwardly of the container neck. To achieve this result, it is merely necessary to make such stop members so that they do not overlap in an axial direction when the cap is pulled outwardly of the neck to take up the clearance between the threads proper on the cap and container neck.

The containers 10 and 10' of the first two disclosed embodiments may be formed by a two-step method involving first molding the container neck, as by injection molding, and then blow molding the body of the container. As above noted, the container and the neck therefor may be formed in a number of other manners, if desired. Thus the neck of the container may be formed as a separate piece, following which the neck is sealed to the separately formed body of the container. FIGS. 9 and 11, incl., illustrate somewhat diagrammatically a preferred method and apparatus by means of which a dispensing container having a modified neck construction may be formed in one blow molding operation, the neck then being completed by simple operations such as cutting and reaming. The thus formed container, designated generally by the reference character 57 in FIGS. 9 to 11, incl., may be employed with a cap such as that of the above described first and second embodiments, and may incorporate stop means which cooperate with stop means on the cap in the same manner as in the two prior disclosed embodiments. The cap and the stop means thereon disclosed in FIGS. 9 to 11, incl., are similar to those of FIGS. 5 to 8, incl.

FIGS. 9, 10, and 11, illustrate the forming of the container, there designated 57. As shown in FIG. 9, there is employed a mold 59 which is composed of two opposed halves, 60 and 61, the constructions of which are generally similar. Mold 59 functions to engage a parison 62 in the form of an extruded plastic tube at zones spaced longitudinally of the tube to press the walls of the tube together at the said zones and render the included tube section air-tight. With the thus gripped tube section still in plastic condition, air is injected into such closed tube section thereby causing it to expand and be pressed in an outwardly direction into faithful contact with the interior wall of the mold. The two mold halves 60 and 61 include cavities for forming a thread 19' upon the neck 58 of the container, and an annular cavity disposed above the thread forming cavity for forming a sealing ring 64 on the neck of the container. Mold half 60 in a location immediately above the cavity for forming sealing ring 64 is provided with an inwardly extending protuberance 65 so that upon blowing of the parison in the mold the plastic material at such location is given an inwardly dimpled formation 66. The mold halves 60 and 61 include angularly spaced cavities therein disposed to form a plurality of stop lugs 44' thereon, such lugs being of the same configuration as the previously described lugs 44 and cooperating with stop members 45' on the cap 72 in the same manner as in the first disclosed embodiments.

After the plastic material of the container 57 and its neck 58 has cooled somewhat so as to be self-sustaining, the air pressure to the interior of the thus formed hollow container blank is cut off and the mold halves are separated to remove the blank therefrom. The thus formed container blank is then cut off as by a saw 69 along a transverse cut B—B intermediate length of the dimpled formation 66 in the container neck. Such operation is depicted in FIG. 10. The neck of the container is now reamed by a tool 70 which enters the open end of the neck in an axial direction, the reamer functioning to remove from the container neck all of the portion of dimpled formation 66 which projects inwardly from the circular cylindrical inner main wall of the neck, as well as accurately to ream and size the passage through the neck. The resulting product thus has a generally circular cylindrical neck in the upper edge of which at one zone thereof there is a vertically extending notch 67 which, as more particularly shown in FIG. 11, cooperates with the vertical groove 71 disposed on the inner skirt of the cap 72 at once location thereon to provide a dispersing passage therethrough when the cap is in open position.

As shown in FIG. 11, the annular sealingring 64 on the neck of the container sealingly engages a circular cylindrical surface 73 on the inner surfaces of the outer skirt of the cap at all times while the cap is operatively mounted on the container neck. The thus resulting

sealing means 64, 73 is located above the cooperating threads on the container neck and cap and thus prevent flow of the contents of the container downwardly onto such threads. A seal is also in effect, as before, between the ungrooved outer surface of the inner skirt of the cap and the imperforate portion of the container neck at its upper end. Thus an additional seal is provided between the cap and the container neck, such seal being continuous when the cap is in closed position.

The fourth embodiment of container and dispensing closure therefor is shown in FIGS. 12 to 15, incl., wherein the container is generally designated by the reference character 74 and the cap therefor by the reference character 76. The container has an upstanding hollow neck 75 over which the cap 76 is telescoped. The cap has a transversely extending disc-like top portion 77, an outer skirt 79 depending from the outer edge of such top portion, and an inner skirt 80 coaxial of the outer skirt and lying within and spaced from the outer skirt. As in the first two described embodiments, the upper edge portion of the container neck and the inner skirt of the cap have cooperating vertically disposed grooves 81 and 82, respectively, which when aligned form a dispensing passage through the cap. The inner skirt 80 of the cap is provided with one groove 82. In FIG. 13 groove 82 is shown cooperating with a groove 81 (there designated 81') in the inner surface of the upper end of the container neck 75. When grooves 81' and 82 are in communication they are in alignment with a dispensing opening 84 in the top portion 77 of the cap 76.

The cap of the present embodiment is retained upon the container neck by interengaging annular ribs on the respective members, rather than by screw-threaded engagement therebetween as in the container and cap combination of the above first three described embodiments. Such last described construction permits the cap and container neck to be somewhat shorter than those of the other described embodiments, and also permits the cap to be applied to the container neck by purely straight-line relative movement. Thus the container neck is provided with a generally V-shaped annular rib 86 on its outer surface intermediate its length, and the skirt 79 of the cap is provided with a somewhat broader inwardly projecting generally V-shaped rib 85. The ribs 85 and 86 are so located upon the cap and container neck, respectively, that upon being snapped past each other into the position of FIG. 13, the cap is forcibly held in its fully mounted position. As before, either one or both of the container neck and the cap are made of resilient plastic material, so as to permit the described snapping of the ribs 85 and 86 past each other.

Seals are provided, in this instance, at two locations between the cap and the container neck. A first such seal is provided, as before, between the outer surface of the inner skirt 80 of the cap and the inner surface of the container neck 75. A second seal is provided by an annular V-shaped sealing rib 87 which is disposed on the radially outer lower surface of the top portion 77 of the cap so as to overlie the unbroken annular transverse surface on the upper end of the container neck. The described engagement between the ribs 85 and 86 is such as constantly to urge the lower edge of sealing ring 87 into forcible engagement with the upper end of the container neck.

The container neck 75 and the cap 76 are provided with cooperating stop members whereby the cap may be turned through a limited angle in order selectively to place the passage-forming grooves 82 and 81' in in and out communication with each other. Thus the outer surface of the container neck at its upper end and above rib 86 is provided with a plurality of radially outwardly extending stop lugs 89 (four shown), and the inner surface of the skirt 79 confronting such lugs 89 is provided with a plurality of part-annular recesses 91 each of which receives its respective lug 89. Recesses 91 extend through angles substantially exceeding the angular extents of lugs 89, whereby the cap may be turned from the open position thereof, shown in FIGS. 12 and 13, to a closed position wherein grooves 81' and 82 lie completely out of communication with each other.

As above noted, the cap 76 may be mounted upon the container 74 by purely straight-line relative movement. It is desirable, particularly when the container and cap combination is to be assembled by automatic machinery, that no preliminary angular orientation of the cap relative to the container neck be necessary. For this purpose, the container neck 75 is provided with a plurality of additional grooves 81, such grooves 81 with grooves 81' being equally angularly spaced about the axis of the container neck and, with groove 81', being equal in number to the number of lugs 89 and recesses 91. As shown more particularly in FIGS. 14 and 15, the upper ends of the lugs 89 on the container neck are in the shape of inverted V's 92, and the lower ends of the inwardly projecting portions 90 between successive recesses 91 on the cap are in the form of upright V's 94.

When an angularly unoriented cap 76 is axially advanced toward the container neck 75, the pointed lower edges 94 of portions 90 on the outer skirt thereof automatically turn the cap, if necessary, so that portions 90 find their way downwardly between the lugs 89. The grooves 81 of the container neck are in effect unused once the cap has been mounted upon the neck. Grooves 81 are of limited angular extent; their presence does not disturb the first described sealing between the outer surface of the inner skirt of the cap above such grooves and the ungrooved inner surface of the container neck. After the cap has been mounted upon the container neck as above described, the cap may be turned clockwise (as viewed from above) to close the dispensing passage through the closure device before the container is filled. Such turning of the cap to closed position may be done automatically, as by means frictionally engaging and turning the cap on the containers as the containers approach a filling station.

Although only a limited number of embodiments of the invention have been illustrated, herein, it is to be especially understood that various changes, such as in the relative dimensions of the parts, materials used, and the like, as well as the suggested manner of use of the apparatus of the invention, may be made therein without departing from the spirit and scope of the invention will now be apparent to those skilled in the art.

What is claimed is:

1. A dispensing closure device for a container, said device having a first, tubular member and a second, sleeve-like member mounted on the first member in telescoped relation with respect thereto, the second member being rotatable with respect to the first member about the axis of the first member, the two members having passage portions so disposed that when said passage portions are aligned they are adapted to afford communication outwardly therethrough from the interior of the container and that the closure device is closed when the first and second members are turned to place said passage portions out of communication, the first and second members having interfitting threads thereon whereby the members may be selectively assembled and disassembled upon turning them in reverse directions relative to each other, the threads having substantial axial play during their initial and intermediate engagement with each other during their assembly, means on the members which engage to stop the members in an inner terminal axial position relative to each other, the members when fully assembled axially with respect to each other being reciprocable a substantial distance axially relative to each other upon turning of the members to loosen the engagement of the threads thereon, and cooperating stop means on each of the two members having stop surfaces positioned to engage each other at the closure open position when the

members are fully telescoped inwardly with respect to each other in order normally to prevent turning of the two members past each other in a closure opening direction past the open position of the closure, the stop means being so constructed and arranged that the stop surfaces thereof may pass each other when the members are pulled outwardlly with respect to each other and turned in a member unscrewing direction relatively to each other.

2. A dispensing closure as claimed in claim 1, wherein when the closure is in closure open position, the stop surfaces of the stop means at least substantially clear each other axially after the members are pulled axially outwardly relative to each other.

3. A dispensing closure as claimed in claim 1 wherein when the closure is in closure open position the stop surfaces of the stop means partially overlap in an axial direction after the members are pulled outwardly relatively to each other, and wherein at least one of the stop means is made of resiliently distortable material, whereby the threads may be engaged and the members disassembled upon further turning of the members relative to each other in the same direction past the open position of the closure device, the stop surfaces of the stop means snapping past each other in the initial portion of such further turning.

4. Apparatus as claimed in claim 1, comprising means for sealing the first and second members to each other to prevent the escape of the contents of the container therebetween.

5. Apparatus as claimed in claim 1, wherein the container includes said first tubular member mounted as a neck on the container, the closure device comprises a cap having a transverse cover portion spanning the outer end of the passage through the neck, and the sleeve-like member is in the form of a skirt attached to the cover portion of the cap.

6. Apparatus as claimed in claim 1, wherein the container includes said first tubular member mounted as a neck on the container, the closure device comprises a cap having a transverse cover portion spanning the outer end of the neck, the first recited sleeve-like member is in the form of a skirt attached to the cover portion of the cap and confronting one peripheral side surface of the neck, and comprising a second skirt attached to the cover portion of the cap, and confronting the other peripheral side surface of the neck.

7. A dispensing closure device as claimed in claim 1, wherein the thread on at least one of said members terminates at its inner end somewhat short of the inner end of such member, and wherein the stop means on said one member comprises a stop lug disposed on said one member angularly spaced from the inner end of the thread on such one member.

8. A dispensing closure device as claimed in claim 7, wherein the stop lug on said one member is disposed axially inwardly of the inner end of the thread on said one member.

9. A dispensing closure device as claimed in claim 8, wherein the stop lug on said one member is disposed generally in helical alignment with the inner end of the thread on the one member.

10. A dispensing closure device as claimed in claim 1, wherein the threads on the two members are of the same hand and pitch, the width of the lands of the threads is substantially less than the width of the grooves between successive lands of the threads, the thread on at least one of said members terminates at its inner end somewhat short of the inner end of such member, and wherein the stop means on said one member comprises a stop lug disposed on said one member angularly spaced from the inner end of the thread on such one member, said stop lug being adapted to fit into the groove between the lands of the thread on the other member.

11. A dispensing closure device as claimed in claim 10, wherein the stop means on the other member comprises an abrupt generally radially disposed shoulder at the inner end of the land forming the thread on the said other member.

12. A dispensing closure device as claimed in claim 11, wherein the upper surface of the stop lug is disposed in substantial helical alignment with the upper surface of the land forming the thread on the other member, the stop lug being generally complementary to the groove between the lands of the thread on the other member and being adapted to interfit with said groove, the stop lug substantially axially overlapping the stop means on the other member when the two members are in their axially inward terminal position with respect to each other.

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