

March 10, 1964

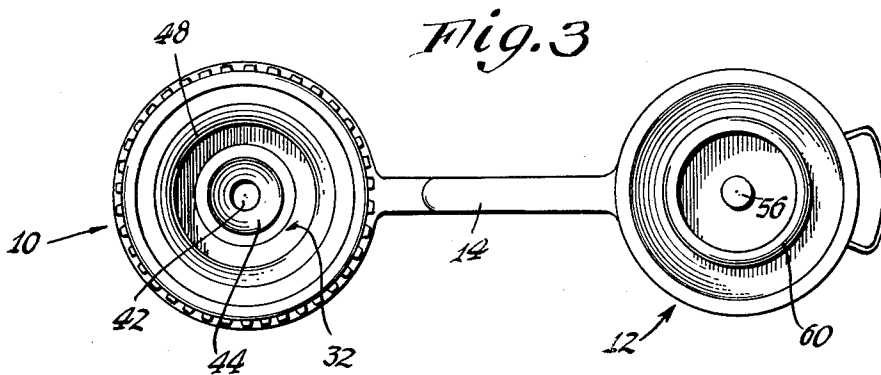
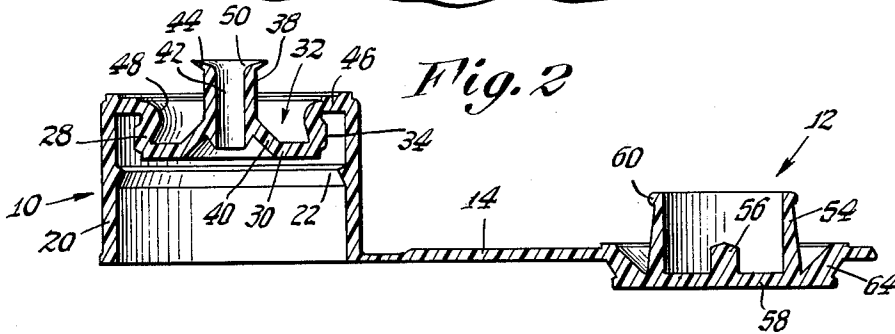
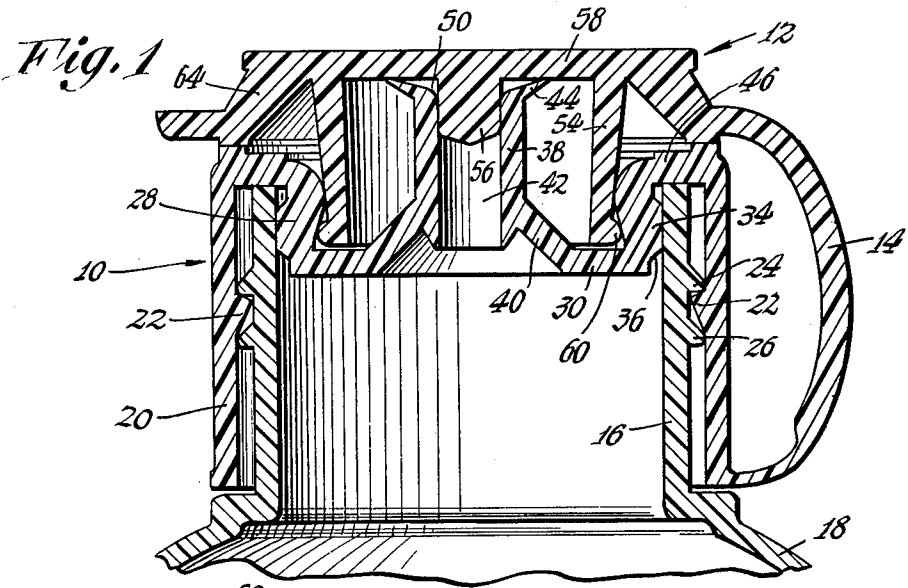
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3,124,281

CLOSURE CAP CONSTRUCTION

Filed June 8, 1961

2 Sheets-Sheet 1



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2 Sheets-Sheet 2

Fig. 4

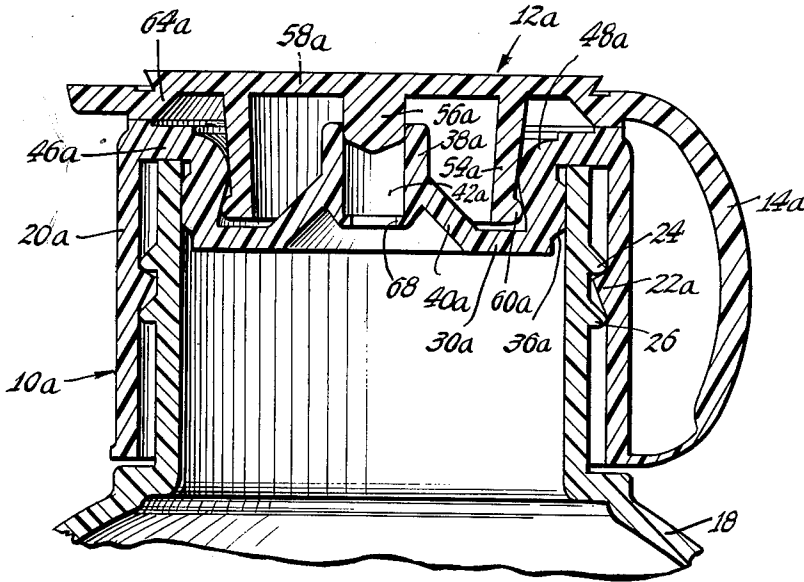
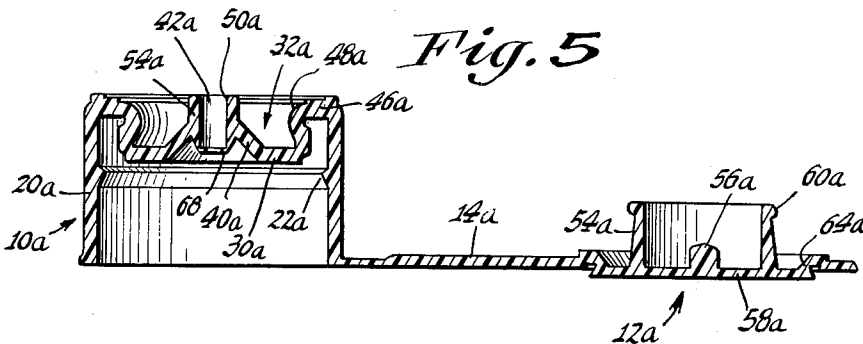


Fig. 5



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3,124,281

**CLOSURE CAP CONSTRUCTION**

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11 Claims. (Cl. 222-542)

This invention relates to closure caps, and more particularly to small resilient plastic caps which are adapted to be used with bottles, vials, small cans and the like.

An object of the invention is to provide a novel and improved resilient, plastic closure cap construction wherein there is had an effective, advantageous double seal between the cap body and the container neck.

Another object of the invention is to provide a two-piece resilient closure cap of the general type mentioned, wherein a desirable and effective double seal is had between the cap body portion and the cooperable closure or stopper portion.

A further object of the invention is to provide a novel combination of the two cap constructions as set forth above which effect multiple double seals, thereby to insure against leakage from a container to the maximum extent.

Still another object of the invention is to provide a novel multiple sealing cap construction wherein the various sealing portions or elements of the cap body constitute different parts of a common inner sealing wall area, thereby further to minimize the likelihood of leakage.

An additional object of the invention is to provide a novel multiple-seal type cap construction wherein a portion of the seal is effected by an inner annular flexible or resilient member constituted as a depending skirt, the organization being such that the said skirt has the maximum degree of resilience while at the same time retaining its shape to the extent necessary to carry out the desired sealing function.

A feature of the invention resides in the provision of a multiple-seal type cap body and stopper construction, wherein the stopper portion has a pair of sealing components so arranged and organized as to facilitate the application of the stopper by providing a guide means associated with the sealing elements, and by arranging for a sequential sealing action so as to minimize resistance to application of the closure portion, thus resulting in an easy sealing or closing action.

Another feature of the invention resides in the provision of an improved multiple seal cap construction having the above attributes and advantages and which is nevertheless extremely simple, fool-proof and reliable in its operation, and economical to mold or fabricate.

Other features and advantages will hereinafter appear.

In the drawings accompanying this specification, similar characters are used to designate like components throughout the several views, in which:

FIG. 1 is an axial sectional view of an improved closure cap construction as provided by the invention, shown in closed condition and mounted on the neck portion of a container, such construction constituting one embodiment of the invention.

FIG. 2 is an axial sectional view of the cap construction of FIG. 1 as it comes from the molds, prior to being closed and attached to the container.

FIG. 3 is a top plan view of the cap construction shown in FIG. 2.

FIG. 4 is an axial sectional view of a cap construction as provided by the invention, shown in closed condition and mounted on the neck portion of a container. The construction of FIG. 4 constitutes another embodiment of the invention.

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FIG. 5 is an axial sectional view of the cap construction of FIG. 4 as it comes from the molds and prior to being closed and attached to the container.

Referring first to FIGS. 1-3, the novel cap construction shown therein comprises essentially two distinct portions, a cap body portion indicated generally by the numeral 10 and a stopper or closure portion designated as 12. Preferably the cap body portion 10 and stopper portion 12 are molded at one and the same time, being permanently joined by a flexible thin connector or web 14 whereby the stopper portion is held captive on the cap body. Captive closures wherein a stopper portion is secured to a cap body portion by a thin flexible web are already well known in the art, and no claim is made herein to this broad general combination.

The cap body portion 10 is shown in FIG. 1 as being mounted on or carried by the neck portion 16 of a container or bottle 18, the mounting arrangement shown being known as a snap bead securement or retention, as distinguished from a screw threaded fastening means such as has been employed in the past on great quantities of containers. It should be understood, however, that the invention is not limited to a snap bead retention but instead has utility with threaded container necks or various other types of securing means.

In accordance with the present invention, an improved and advantageous seal is effected between the cap body portion 10 and the neck 16 of the container 18. Such double seal involves sealing means engaged with both the inner and outer surfaces of the container neck, in conjunction with a special, novel reinforcing or backing means associated with the inner sealing component, as will shortly be described.

The cap body portion 10 is seen as comprising an annular outer resilient depending skirt 20 which is adapted to extend around the container neck 16, said skirt having an inner annular detent and retention bead 22 arranged for engagement with the exterior of the neck 16. The container neck 16 may have a pair of spaced annular external sealing beads 24 and 26 as shown in FIG. 1, these being adapted to engage the inner wall of the depending skirt 20. The beads 22 and 24 cooperate to retain the cap body portion 10 on the container neck 16 by virtue of the obstruction effected thereby, as will be readily understood. In applying the cap body portion 10 to the container neck 16, the resilience of the depending skirt 20 of the cap body portion provides a yielding action by which the inner detent or retention bead 22 is enabled to bypass and ride over the outward facing detent and sealing bead 24.

By the invention, the cap body portion 10 further has an inner annular wall 28 and a backing-up or reinforcing transverse bottom wall 30 which is connected to and disposed inwardly of the lower portion of the inner wall 28. The walls 28 and 30 together define an outwardly opening recess 32, the construction being such that the annular inner wall 28 has a smaller inside diameter at the mouth of the recess as shown, than the inner diameter at the bottom portion of the recess.

Also, in accordance with the invention, the depending annular inner wall 28, which is seen as being spaced inwardly from the outer annular depending skirt 20 of the cap body portion 10 has an outwardly facing annular sealing bead or bearing surface 34 arranged for engagement with the inside of the container neck 16. It will now be seen that by the above construction the transverse bottom wall 30 of the recess 32 constitutes a backing or reinforcing means for the inner annular sealing wall 28 whereby the latter is stiffened an extent, enabling it to more forcibly grip and engage the inner surface of the container neck 16, thereby to provide a more effective seal therewith. This seal, in conjunction with

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the sealing action of the internal and external beads 22, 24 and 26 above described, constitutes a multiple-seal at the mouth of the container 18, which has been found to be extremely effective and reliable notwithstanding its simplicity. A sloping camming edge or area 36 is provided at the bottom of the inner annular depending wall 28 to constitute a guide means by which the lip or edge of the bottle neck 16 may be more readily forced over and around the annular sealing wall 28.

The bottom wall 30 of the recess has or carries a discharge orifice portion 38 which has a tubular or cylindrical configuration and further comprises an outwardly flaring lower portion 40 which is joined to the transverse bottom wall 30 as shown. The discharge orifice portion 38 has a discharge passage or bore 42 which is controlled as to its diameter, and is preferably provided with a dripless lip or tip portion constituted as an outwardly extending annular flange 44, as shown.

As seen in FIGS. 1 and 2, the cap body portion 10 further comprises an annular or ring-shaped top wall portion 46 which joins together the upper edges or portions of the outer skirt 20 and the inner annular sealing wall 28. A generous radius 48 is provided at the inner peripheral portion of the top wall 46, to constitute a leading surface for a depending sealing skirt shortly to be described, which comprises part of the stopper portion 12 of the cap construction.

Similarly a generous radius 50 is provided at the inner periphery of the anti-drip flange 44, to provide a lead-in or guide for a sealing plug shortly to be described, which constitutes another sealing means of the stopper portion 12.

For cooperation with the novel cap body construction 10 described above there is provided a novel structure or organization comprising the stopper portion 12, the said organization having a resilient depending sealing skirt 54 which is adapted to be retained in the recess 32 of the cap body portion 10, and having a sealing plug 56 which is concurrently receivable in the orifice portion 38, thereby to enable a double seal to be effected when the stopper portion 12 is put in place on the cap body portion 10 as illustrated in FIG. 1.

The stopper portion 12 further comprises a generally flat top wall 58 by which the sealing skirt 54 is joined to the sealing plug 56, and the lower edge of the skirt 54 is provided with an external detent bead 60 which is adapted to be nested in the lower portion of the recess 32 of the cap body portion 10.

During application of the stopper portion 12 to the cap body portion 10 the resilient skirt 54 and bead 60 are radially shifted inward and circumferentially reduced in dimension temporarily, as will be understood. The intimate engagement between the wall of the depending sealing skirt 54 and the mouth portion of reduced diameter of the annular wall 28 constitutes an effective seal. Where the container has slight internal pressures, the seal is further enhanced since any pressure existing within the skirt 54 such as might be occasioned by slight leakage of the contents of the container through the central passage or bore 42 and past the plug 56, will increase the force of the engagement between such skirt 54 and wall 28. This second seal constitutes an important feature of the invention, by which a secure and reliable overall seal of the contents of the container is had at all times, even when there is increased pressure existing in the container.

At the same time, the bead 60 on the skirt 54 constitutes an effective detent means which retains the stopper portion 12 in its closing position against accidental removal therefrom. Besides the seal effected by the skirt 54, the plug 56 has a press-fit in the bore 42 of the orifice portion 38, thereby to also constitute an effective primary or initial seal.

Considering FIGS. 1 and 2, the stopper portion 12 further has a depending outwardly flared flange 64 extending from the peripheral outer portion of the flat top

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wall 58 downward and outward so as to engage the upper peripheral portion of the top wall 46 of the cap body 10. Such construction provides an effective dust guard, keeping out dirt and other foreign matter. It will be understood that the flange 64 is somewhat resilient, and may engage the cooperable peripheral edge of the cap body 10 under continuous pressure, thereby to provide a desirable mechanical closure. As shown in FIGS. 1 and 2, the connecting web 14 is preferably secured to a lower peripheral portion of the flange 64 and also to the bottom edge of the depending skirt 20 of the cap body portion 10.

A closure cap construction as thus provided by the invention and illustrated in FIGS. 1, 2 and 3 is now seen to have a number of advantages. It provides multiple double seals, there being a double seal between the cap body portion 10 and the container neck 16 as well as a double seal between the stopper portion 12 and the cap body portion 10. Moreover, the sealing arrangement which embraces the bore 42 of the orifice 38, the sealing bead 34 of the wall 28, and the sealing bead 22 and inner surfaces of the skirt 20 involves all inner, continuous or unbroken wall areas of the cap body portion 10. That is, the above mentioned sealing components constitute parts of the unbroken inner wall area of the cap body portion 10, whereby the likelihood of leakage is greatly minimized by virtue of the continuity of such inner wall area.

It will be noted that the wall section at the base of the depending sealing skirt 54 where such skirt joins the flat top wall 58 of the stopper portion 12 is relatively thin, and is devoid of any stiffening means. In consequence, the sealing skirt 54 is characterized by appreciable resilience or flexibility, thereby facilitating the application of the stopper portion 12 to the cap body portion 10. The generous radius 50 at the mouth of the orifice 38, and the generous radius 48 at the mouth of the recess 22 constitute an effective guide means, in conjunction with the rounded bottom edges of the plug 56 and skirt 54, thereby facilitating placement of the stopper portion 12 on the cap body portion 10. The center location of the sealing plug 56 also facilitates the application of the closure portion 12, the cap body portion 10.

Further, it will be observed that the organization and structure of the stopper portion 12 as it involves the plug 56 and skirt 54 is such, in conjunction with the orifice 38 and the recess 32, that the lower bead 60 of the depending skirt 54 is first to come into engagement with the cap body portion, and only thereafter does the plug 56 become engaged. In consequence, this sequential engagement makes it easier to apply and push completely downward the stopper portion 12 on the cap body portion 10, minimizing the likelihood of improper application of the stopper and an improper ineffective seal.

The closure construction is seen to be extremely simple in its construction, easily and quickly molded and fabricated, and has been found to be reliable and effective in its operation.

A modification of the invention is illustrated in FIGS. 4 and 5. This modification also provides a double seal between the cap body portion of the construction and the container neck, as well as a double seal between the stopper portion and the cap body portion. Essentially the differences between the construction of FIGS. 4 and 5 and that of FIGS. 1, 2 and 3 reside in the orifice portion 38a of FIGS. 4 and 5 being shorter or less high than the orifice portion 38 with a corresponding reduction in the length or depth of the sealing skirt 54a as compared with the skirt 54 of the previous figures. It will be noted from FIGS. 4 and 5 that the outer edge of the orifice 38a is at the same level as the top or outermost portions of the depending skirt 20a. Further, the orifice portion 38a has a small depending annular flange 68 which extends downwardly and inwardly, and accordingly constricts or reduces the discharge passage 42a

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whereby a lesser flow or rate of discharge is had of the contents of the container 18. By such construction, any desired narrowing or reducing of the size of the discharge passage may be had without requiring a change in the sealing diameters of the plug 56a, wall 38a, skirt 54a etc.

Components and portions in FIGS. 4 and 5 which are similar generally to corresponding components or portions in FIGS. 1, 2 and 3 have been given like characters, with the added letter "a." The functioning of the closure construction of FIGS. 4 and 5 is accordingly seen to be in general similar to that already described above in connection with FIGS. 1, 2 and 3, and it is considered that further detailed description is unnecessary. The cap body portion 10a has components or elements 14a, 20a, 22a, 28a, 30a, 32a, 34a, 36a, 38a, 40a, 42a, 46a, 50a which are generally similar and function in a like manner respectively to the portions or components 14, 20, 22, 28, 30, 32, 34, 36, 38, 40, 42, 46 and 50 of the cap body 10. In a like manner, the stopper portion 12a has components or elements 54a, 56a, 58a, 60a, 64a which are similar generally and function in a like manner respectively to the components or portions 54, 56, 58, 60 and 64 of the stopper portion 12.

It will be noted that the provision of the flexible sealing assemblage, especially the skirt 54, will enable a satisfactory seal to be had at all times despite variations in the diameters of the wall portions 28 and 46 as these accommodate different sizes of container neck due to manufacturing tolerances thereof. Further, the appreciable length of the skirt 54 enhances the resilient action of the same in the above situation, and even wide or loose tolerances of the container will have no effect on the orifice size (as at 68, FIG. 4).

Variations at the lip of the neck 16 will not adversely affect the seal by the bead 34, which engages the interior of the neck below the lip thereof.

The slope of the wall 40 provides a desirable yieldability to the backing action offered by the wall 30 to the bead 34 whereby appreciable variation in the diameter of the neck 16 will not impair the seal at the bead nor alter appreciably the orifice size at 42 or 68 (FIGS. 1 and 4).

Variations and modifications may be made within the scope of the claims, and portions of the improvements may be used without others.

I claim:

1. In combination, a container neck having annular inner and outer surfaces and a plastic closure cap construction carried by the container neck, said cap construction being constituted of, a molded resilient plastic piece comprising a cap body portion and a cooperable stopper portion, said body portion having means engaging the exterior of and mounting it on the container neck and having an annular inner wall engaging the interior of the container neck to seal thereagainst and further having a transverse bottom wall connected to and disposed inwardly of the lower portion of the inner wall and together therewith defining an outwardly-opening recess, said bottom wall having a discharge orifice portion for dispensing the contents of a container on which the cap construction may be carried and the stopper portion having a depending resilient sealing skirt receivable in said recess and a sealing plug concurrently receivable in said orifice portion whereby a double seal is effected when the stopper portion is in place on the

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cap body portion, said annular inner wall having a sealing surface engaged with the container neck and disposed closely adjacent the said bottom wall for reinforcement thereby.

2. A combination as in claim 1, in which the annular inner wall has a smaller inside diameter at the mouth of the recess, and in which the depending resilient skirt has a larger outside diameter at its bottom edge, thereby to effect a detent action when the skirt is in the said recess.

3. A combination as in claim 2, in which the depending skirt has an external annular sealing bead providing the said larger outside diameter.

4. A combination as in claim 1 in which the said annular inner wall is provided with an outwardly facing annular sealing bead engaged with the inside of the container neck and backed by said transverse bottom wall whereby the seal effected by the bead is rendered more effective.

5. A combination as in claim 4, in which the mounting means comprises an outer annular depending skirt having an inner annular detent bead for engagement with the exterior of the container neck to effect a seal thereto.

6. The combination of claim 5, in combination with a resilient plastic container neck having an external detent bead cooperable with the said inner detent bead.

7. A combination as in claim 4, in which the inner surface of the skirt, the outer surface of the inner wall and the inner surface of the orifice portion constitute parts of the inner wall area of the cap body portion.

8. A combination as in claim 1, in which the discharge orifice portion is tubular, and in which there are cooperable means on the sealing plug and orifice portion, providing a guide for facilitating insertion of the plug in the orifice portion.

9. A combination as in claim 1, in which the stopper portion has a depending outer sloping flange extending from the top of the resilient sealing skirt outward and downward for engagement with the said body portion.

10. In a plastic closure cap construction a molded resilient plastic piece comprising a cap body portion having an annular outer depending skirt adapted to extend around a container neck and provided with detent means arranged to engage cooperable means on said neck, and having a depending annular inner wall spaced inwardly from said skirt and provided with an outwardly facing annular sealing bead for engagement with the inside of the container neck, said piece further having an inwardly extending transverse wall connected with said inner wall at locations immediately adjacent the sealing bead to reinforce the inner wall and bead and constitute a backing means therefor whereby the seal effected by the bead is rendered more effective.

11. A cap construction as in claim 10, in which the inwardly extending transverse wall is located at a level just below the said sealing bead.

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