July 16, 1940. H. SMITH 2,208,201

CAP FOR COLLAPSIBLE TUBES AND OTHER CONTAINERS

Filed March 9, 1939

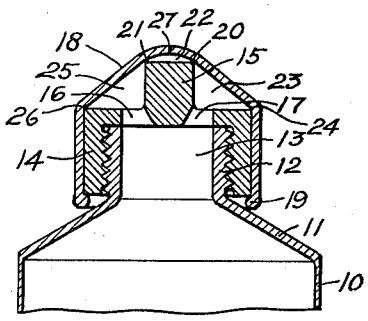

Fig. 1

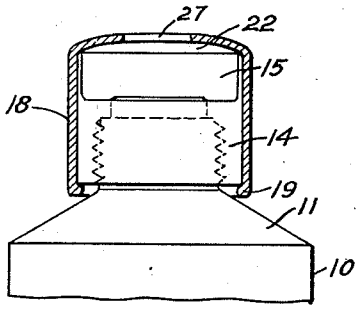

Fig. 2

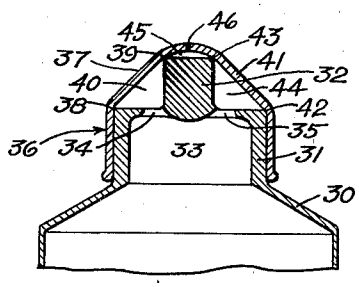

Fig. 4

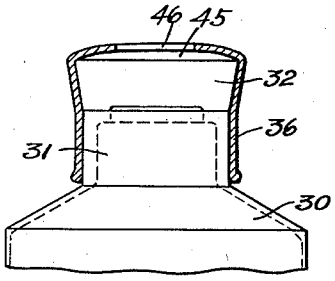

Fig. 5

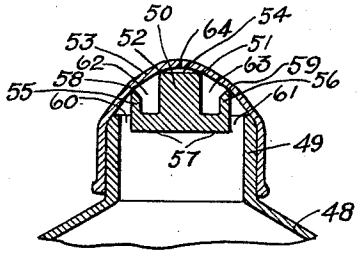

Fig. 6

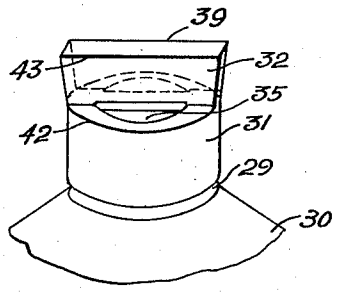

Fig. 3

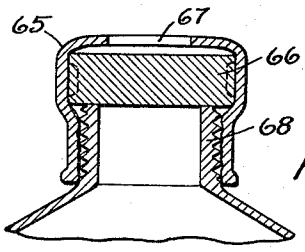

Fig. 7

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CAP FOR COLLAPSIBLE TUBES AND OTHER CONTAINERS

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In Great Britain March 9, 1938

10 Claims. (Cl. 221—60)

This invention relates to improvements in caps for collapsible tubes and other containers, and has for an object the provision of a cap for collapsible tubes which while normally sealing the contents from the exterior, freely permits the contents to be ejected from such tubes and the like without removing or otherwise handling said cap, thereby eliminating the bother of having to remove and replace the cap and the hazard of losing it.

Caps for collapsible tubes of the prior art had to be unscrewed in order to gain access to the contents, and after a desired quantity had been removed, it was necessary (unless the cap in the meantime had been lost) to replace the cap on the neck of the tube, screwing the same sufficiently tight to seal the contents from the deleterious effects of the atmosphere. If the closing or replacing operation is neglected, the contents of the tube may, due to exposure, become dried out, hardened, or otherwise deteriorate.

An object of the present invention is the provision of a self-sealing cap applicable to collapsible tubes or containers which normally seals the contents thereof from the outside air, said cap including a plurality of seals which are broken while and as the user applies reasonable pressure to the tube proper and which are automatically established upon the cessation of said pressure.

Another object of the invention is the provision of an annulus of comparatively non-resilient material adapted to embrace the neck or discharge end of the tube, said annulus carrying a bridge member or web preferably of rectangular cross section spanning one end of said annulus and having openings on each side of said bridge communicating with the opening in the neck of the tube, and a resilient cap member adapted to envelop said annulus and bridge and to normally engage the free edges of the bridge and form seals therewith, said cap having a slit portion lying above and parallel to the longitudinal axis of the bridge.

In this arrangement a chamber is formed within said cap adjacent to said slit portion and the upper edges of said bridge, and when the user applies pressure to the tube to eject material therefrom, this pressure raises the resilient material and thereby breaks said seals, permitting the material to pass into said chamber whence (also due to the pressure) it is discharged via said slit portion. When the pressure ceases the seals are automatically re-established and at the same time the slit closes up tight and the material in the tube is doubly sealed from the outside atmosphere.

A further object of the invention is the provision of a resilient cap adapted to be applied to the necks of existing collapsible tubes or containers, said cap having a slit formed in the apex thereof and the provision of a non-resilient member of square or rectangular cross-section of sufficient length to form at each end an air tight fit, said member being adapted to be mounted within said cap parallel to said slit so that its upper edges will form, with said cap, sealing valves.

After the member is mounted in the cap the assembly is applied to the neck of the tube so that the resiliency of the cap, in addition to effecting sealing, also firmly holds said member, which when so mounted spans the opening in the neck of the tube, solidly against the end of the neck. When pressure is applied to the tube to eject material therefrom, the material passes through portions of the tube opening to each side of said member, and thence via said sealing valves and said slit in the manner described.

Another object of the invention is the provision of a necked collapsible tube or vessel which has a bridge member of square or rectangular cross-section formed integral therewith and the provision of a resilient cap member adapted to be applied to the neck end of the tube in cooperative relationship with said bridge member to normally form a plurality of seals for isolating the contents of the tubes from the atmosphere.

Yet another object of the invention is the provision of a collapsible tube or vessel carrying on its neck end means to form with a resilient cap, adapted to be applied to the tube, a plurality of series of chambers normally isolated from each other, thereby forming a series of sealings of the contents of the tube from the undesirable effects of the outside air.

Other objects will be apparent to those skilled in the art upon the perusal of the specification.

In the accompanying drawing which is given by way of example to illustrate the invention:

Figure 1 is a sectional elevation of one embodiment of the invention particularly adapted to be applied to existing collapsible tubes after the usual screw cap has been removed;

Figure 2 is a side elevation of the device shown in Figure 1 taken in a plane at right angles to the plane in which Figure 1 appears;

Figure 3 is a perspective view of a modification of the invention in which a longitudinal bridge or web spanning the neck of the tube is

formed integral with the tube and arranged to cooperate with a resilient cap when the latter envelops said bridge and tube neck;

Figure 4 is a sectional elevation of the neck end of the arrangement shown in Figure 3, the relation between the bridge member and the resilient cap being clearly shown;

Figure 5 is an elevation of the device shown in Figure 4 as viewed in a plane at right angles to the plane of Figure 4;

Figure 6 is a sectional elevation of the neck end of a tube embodying a further modification in which a plurality of series of normally sealed chambers normally isolate the contents of the tube from the atmosphere; and

Figure 7 depicts a modification in which the resilient cap has a bridge member inserted and properly located therein in respect to the slit, whereby the assembly of cap and bridge may be bodily applied to the necks of existing collapsible tubes.

Referring to Figure 1, a portion of an existing tube 10 has a tapered portion 11 which terminates in the usual threaded neck 12 having the usual discharge opening 13 through which material is discharged from the tube.

A non-resilient member comprised of an annular portion 14 having a bridge member 15 secured thereto or formed integral therewith has an opening therein adapted to accommodate and be supported by the neck 12.

To one side of the bridge member 15 is a passage 16 and to the other side of the bridge member is a passage 17, both said passages communicating with the discharge opening 13.

A resilient cap 18 is preferably made of rubber of suitable consistency (such for example as the rubber used for nipples on nursing bottles) although other resilient or flexible materials may also be used. This cap envelops the non-resilient member and may be provided with a skirting bead 19.

One portion of the wall of the cap 18 engages and forms a sealing valve with the longitudinal edge 20 of the bridge 15 and another portion engages and forms a sealing valve with the longitudinal edge 21, defining therebetween a chamber 22. The cap with said non-resilient member also forms a chamber 23 between the longitudinal edge 20 and the curved edge 24 of the non-resilient member, and a chamber 25 between the longitudinal edge 21 and the curved edge 26 of the non-resilient member.

The chambers 23 and 25 are normally isolated from the chamber 22 by the engagement of the edges 24 and 26 by the portions of resilient cap above referred to.

The resilient cap has formed therein a slit 27 which also remains normally closed. This slit is preferably parallel to the axis of the bridge member 15.

When pressure is applied to the exterior of the tube to eject some of the contents, the material in the tube passes from the neck discharge opening 13 via the passages 16 and 17 into the chambers 25 and 23 respectively. The material presses against the portions of the resilient cap bounding said chambers, thereby raising them and breaking the seals between said cap and the edges 20 and 21.

This permits the material to pass into the chamber 22 where it still under pressure engages the portion of the resilient cap bounding the chamber 22, forcing the slit 27 open and the material is discharged via the slit 27.

As soon as the required quantity of the material is ejected, the user ceases to apply pressure and as a result the following actions take place automatically, thereby reestablishing a double seal between the material in the tube and the atmosphere outside.

(1) The slit 27 immediately closes, sealing off the chamber 22.

(2) The walls of the resilient cap 18 adjacent to the edges 20 and 21 of the bridge 15 immediately establish contact with said edges and seal off the chambers 23 and 25 from the chamber 22.

This makes it impossible for the outside air to have any effect upon the material within the tube, therefore clean, fresh material of even consistency is always available from collapsible tubes or vessels equipped with the herein described device.

In the embodiment shown in Figures 3, 4 and 5, the collapsible container 30 is provided with a neck 31 which need not be threaded. In some instances the neck 31 may be provided with an annular groove 29 adapted to be engaged by a skirting bead such as that indicated by the numeral 19 in Figure 1.

The neck 31 preferably has formed integral therewith a bridge or web 32 of substantially square or rectangular cross-section, spanning the discharge opening 33 of the tube and leaving a passage 34 on one side of the bridge and a passage 35 on the other side.

Where the tube is preformed when manufactured in the manner just described, it is only necessary to apply the cap 36 of flexible rubber or other resilient material.

The portion 37 of the cap extending from the curved edge 38 of the neck to the straight edge 39 of the bridge 32 bounds a chamber 40. Likewise the portion 41 of the cap extending from the curved edge 42 of the neck to the straight edge 43 of the bridge 32 bounds a chamber 44.

The passage 34 communicates with the chamber 40 and the passage 35 communicates with the chamber 44.

Where the walls of the cap 36 contact the straight edges 39 and 43 of the bridge, effective seals are normally established and a chamber 45 formed therebetween is thereby normally isolated from the chambers 40 and 44. A normally closed slit is formed in the apex of the cap 36 preferably parallel to the longitudinal axis of the bridge 32.

In ejecting material from the tube 30 the same procedure is followed and the same effect is obtained as that described in connection with Figures 1 and 2.

The advantages of the embodiment shown in Figures 3, 4 and 5 is that the tubes will cost practically the same as the tubes of the prior art, and the cost of the live rubber caps 36 is less than that of the usual metal, "Bakelite" or plastic caps, thereby providing a more desirable collapsible tube at the same or less cost than that of the old fashioned screw cap types of collapsible tubes.

In the modification shown in Figure 6 the tube 48 is provided with a neck 49. Three bridge members are formed integral with the neck of the tube. A center bridge 50 is provided with valving edges 51 and 52 which cooperate with the cap 53 to form a chamber 54.

A bridge member 55 is on one side of and spaced apart from the bridge 50 and a bridge member 56 is on the other side of and spaced apart from the bridge 50 and a web 57 connects

the bridge 50 and the bridge members 55 and 56 together. The bridge members 55 and 56 are respectively provided with straight contact edges 58 and 59 which are engaged in sealing relation by portions of the cap 53. Passages 60 and 61 are formed in the neck of the tube to lead material outwardly as pressure is applied to the tube.

The spaces between bridge members 55 and 56 and the bridge respectively form therebetween chambers 62 and 63 which are isolated from the passages 60 and 61 and are also isolated from the chamber 54. A slit 64 is formed in the cap preferably parallel to the major axis of the bridge 50. When pressure is applied to the tube the material in passages 60 and 61 lift the cap walls from the edges 58 and 59 and the material passes into chambers 62 and 63, after which the material lifts the walls of the cap and passes between the same and the edges 51 and 52 into the chamber and out via the slit 64.

In the modification in Figure 7, the cap 65 is provided with locating means in the interior thereof and before the cap is applied to an ordinary collapsible tube (after the cap has been screwed off) a bar 66 of square or rectangular cross-section and of a length not less than the diameter of the tube neck is inserted into the cap and located by said locating means into proper relation to the slit 67. After this is done the assembly is ready to be applied to the neck of the tube, designated by the numeral 68. When properly positioned thereon the cap holds the bar tightly against the end of the neck 68, and the material, when the tube is squeezed passes via passages 69 and 70 into chambers 71 and 72 respectively and thence, as described above in connection with Figures 1 through 5, into chamber 73, and out via the slit 67. In this embodiment as with the others, when the pressure on the tube walls ceases the ejection of material also immediately ceases and the material in the tube is doubly sealed off from the atmosphere.

Although I have described my invention and several modifications thereof, it must be understood that these are given by way of example and I should not be limited thereby except insofar as set forth in the annexed claims.

What is claimed is:

1. In combination, a collapsible container having a neck and a discharge opening, a resilient cap having a slitted apex and adapted to be applied to said neck, a bar member of a length at least equal to the diameter of said neck and having a plurality of longitudinal sealing edges adapted to cooperate with the interior of said cap to normally form a chamber within the apex thereof when said bar member is mounted within the cap and the cap is applied to said neck, and locating means within said cap to insure the placing of said bar in parallel relation to the slit, said cap having a skirt of such length that it holds said bar member in intimate contact with the end of said neck and spanning the mid portion of said discharge opening.

2. In combination, a collapsible container having a neck and a discharge opening, a bridge member extending across and maintained in fixed relation to said neck and spanning the mid portion of said discharge opening, said bridge having a pair of longitudinal edges spaced apart from each other, a resilient cap adapted to envelop said bridge and said neck and having an apex, said longitudinal edges being normally engaged by portions of the interior walls of said cap in sealing relation thereby forming an isolated chamber bounded by said apex and the space surface of said bridge between said edges, and a slit formed in said apex between and parallel to said edges, said sealing relation being adapted to be broken when sufficient pressure is applied to said container thereby permitting the contents of said container to pass into said chamber and out therefrom via said slit.

3. In combination, a collapsible tube having a neck and a discharge opening, a rigid member adapted to be attached to said neck comprised of a bridge portion of rectangular cross-section and an annular portion embracing said neck and supporting said bridge member, said bridge member spanning the mid-portion of said discharge opening and having a pair of longitudinal edges spaced apart from each other, a resilient cap adapted to embrace said annular portion and envelop the same, said neck and said bridge, said cap having an apex which normally lies above said bridge and interiorly engaging said longitudinal edges thereby form a chamber isolated and normally sealed off from said discharge opening, and a slit formed in said apex between and parallel to said edges, said normally sealed relation being adapted to be broken when sufficient pressure is applied to said container to eject contents therefrom, thereby permitting said contents to pass into said chamber and out therefrom via said slit.

4. In combination, a collapsible tube, an annular discharge member on said tube, said annular member having a discharge passage therethrough, a bar spanning the outer end of said passage and defining therewith two openings, said bar having a length at least equal to the outer diameter of said annular member, and a resilient cap enveloping said bar and said member and having an apex and a normally closed outlet in said apex, said bar having outer longitudinal edges engaging said cap to define a chamber between said bar and said apex.

5. In combination, a collapsible tube having a neck and a discharge opening, means forming a chamber normally isolated from said opening and comprised in part of the apex of a live rubber cap, said cap also having a skirt portion supported on said neck, a bridge member forming another part of said means and having longitudinal edges normally contacted by portions of the interior of said cap and forming valves sealing off and effecting the isolation of said chamber, and a normally closed slit formed in said apex, whereby when the user applies pressure to the body of said tube to eject material therefrom said material deforms the walls of said cap and opens said valves to permit said material to pass into said chamber and out via said slit which is forced open by the pressure exerted thereon by the material in contact therewith.

6. In combination, a collapsible tube having a neck and a discharge opening, a resilient cap adapted to be applied to said neck, said cap having a slitted apex comprised of edges or lips which are normally closed, a bar member of a length equal to the diameter of said neck and a width which will enable the bar to at least partially cover said discharge opening, the upper edges of said bar forming in cooperation with portions of the interior wall of said cap, a plurality of valves which normally form an isolated chamber within said apex, and locating means within said cap for holding said bar in substan-

tially parallel relation to said slit, said cap having a skirt of sufficient length to maintain said bar in contact with said neck and spanning said discharge opening.

7. In combination, a collapsible tube having a neck and a discharge opening, a rigid bridge portion formed integral with said neck and having a pair of longitudinal edges spaced apart from each other, a passage formed in said neck on each side of said rigid member and communicating with said discharge opening, said rigid member being in length at least equal to the diameter of said neck, a resilient cap adapted to embrace said neck, enveloping the same and said bridge, said cap having an apex normally closed and lying above said bridge member and having walls adjacent thereto interiorly engaging said longitudinal edges to form a chamber isolated and normally sealed off from said discharge opening, and a normally closed slit formed in said apex communicating with said chamber, said normally sealed relation being adapted to be broken when the walls of said cap are deformed by the application of sufficient pressure to said container to eject material therefrom, thereby permitting said contents to pass into said chamber and out therefrom via said slit.

8. In combination, a collapsible tube having a neck and a discharge opening, a plurality of chambers formed integral with said neck and each being bounded by a wall having an engageable longitudinal edge, a resilient cap mounted on said neck and enveloping the same, the interior walls of said cap normally adapted to sealingly engage said edges thereby isolating said chambers from each other, said walls being adapted to be deformed by material from said tube when under pressure thereby placing said chambers in communication with each other whereby said material may pass therethrough, and a normally closed slit formed in said cap overlying one of said chambers via which material from said last chamber may pass out into the open air when the walls of the tube are subjected to pressure.

9. A collapsible tube carrying means forming a plurality of chambers, one of said means comprising a deformable cap cooperating with edges of the boundaries of said chambers to isolate said chambers from each other, the walls of said cap being adapted to be deformed by material within the tube when pressure is applied to the body of said tube for the purpose of ejecting material therefrom, and a slit formed in said flexible cap overlying one of said chambers whereby said material under pressure may pass to the outside.

10. In combination, a collapsible tube having rigid sealing members carrying sealing edges, a sealed non-rigid member including wall portions cooperating with said sealing edges to normally seal the interior of said tube against the outside atmosphere, a plurality of chambers formed by said rigid members and said non-rigid member, said chambers being bounded by said sealing edges, the slit formed in said non-rigid member being comprised of edges or lips which are normally closed thereby providing, together with the cooperation of said wall portions and said sealing edges, double insurance of the contents of said tube against deleterious effects of the atmosphere.

HARRY SMITH.