

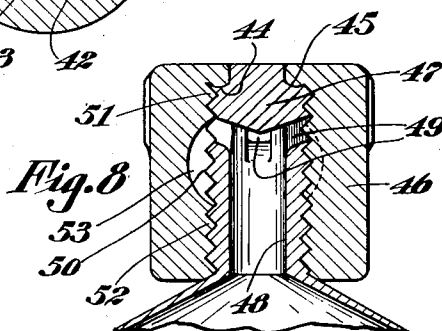
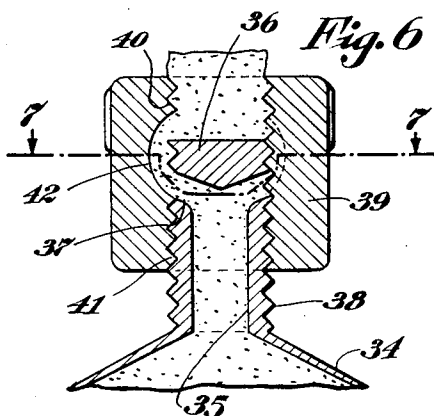
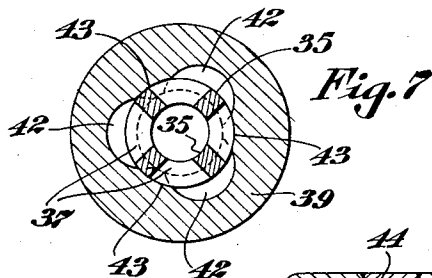
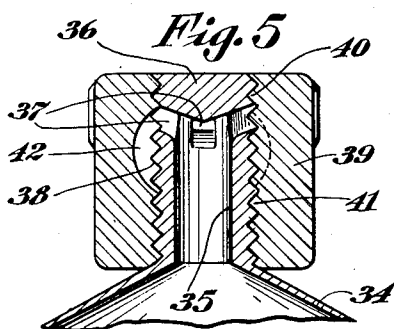
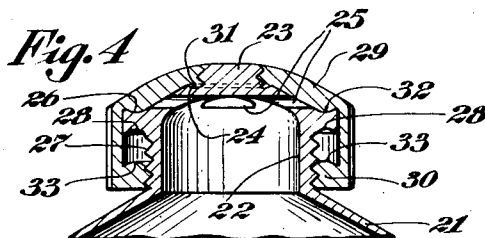
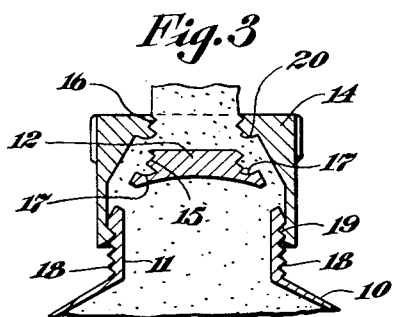
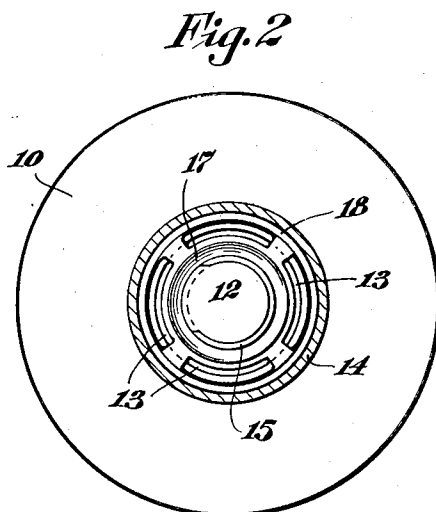
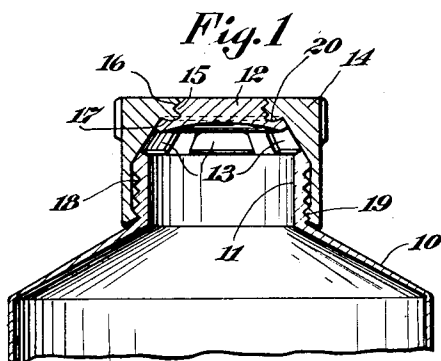
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LEAKPROOF COLLAPSIBLE TUBE

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LEAKPROOF COLLAPSIBLE TUBE

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3 Claims. (Cl. 221-60)

My present invention relates generally to containers, and has particular reference to collapsible tubes of the character conventionally used for toothpaste and similar materials.

5 It is a general object of my invention to provide an improved type of outlet neck for a collapsible tube of this character, whereby the use of the tube may be facilitated.

10 A tube constructed in accordance with my present invention is of the general character wherein the outlet neck terminates in a central closed stem or dome, and wherein lateral outlet openings are provided through the neck to the rear of such stem or dome. Constructions
15 of this general character are not broadly new, and they are usually provided with a cap enclosing the neck and adapted to be adjusted forwardly or rearwardly to open or close the tube. The cap is provided with an outlet opening
20 through which the material in the tube may emerge when the cap is positioned forwardly.

25 One of the reasons why constructions of this general character have not been widely accepted, commercially, appears to lie in the fact that the tubes are not entirely leak-proof. It is in this respect that the conventional construction, wherein a screw-threaded cap engages with a screw-threaded neck, is superior. At the same time, there is no doubt that the conventional
30 construction is relatively crude and has the extreme disadvantage of requiring the cap to be completely withdrawn from the tube whenever material is to be squeezed out.

35 It is a more particular object of my present invention to provide an improved construction of the general type first above mentioned, wherein means are provided for assuring a tight and leak-proof joint or closure of the tube.

40 One of the features of my present invention lies in providing the central stem with exterior threads, and in providing an outlet portion in the cap with complementary threads, whereby the forward and rearward movement of the cap, to open and close the outlet of the tube, may
45 be accompanied by the advantageous sealing effect which obtains with a screw-threaded engagement of parts. At the same time, my construction obviates the conventional disadvantage
50 of a completely removable cap.

A further feature of my invention lies in the provision of one or more shoulders on the neck, and the corresponding provision of one or more sealing ridges on the cap, for the purpose of
55 enabling each ridge to bear or seat against the

corresponding shoulder and thereby provide a secure and leak-proof joint.

In one embodiment of my invention, one forwardly directed shoulder is provided rearwardly of the threaded stem, and the cap has an annular sealing ridge which is adapted to seat itself against the shoulder when the cap is screwed down. In another embodiment, I provide two such shoulders, with two corresponding ridges, one shoulder being arranged forwardly of the outlet openings in the neck, and the other shoulder being arranged rearwardly thereof, whereby the sealing of the tube is even more efficient.

In a further embodiment of my invention, I provide a rearwardly directed shoulder on the neck, which cooperates with a corresponding ridge on the cap for effecting a seal behind the outlet openings when the cap is unscrewed, thereby assuring the passage of the material forwardly out of the cap.

Another feature of my invention lies in providing the shoulders hereinbefore mentioned with concave configurations, thereby enhancing the firmness with which the joints are made leak-proof.

It is a particular feature of my present invention to provide a construction in which the outlet neck is provided not only with a closed threaded stem, and with lateral outlet openings behind the stem, but also with additional threads rearward of the outlet openings; this type of neck being associated with an open-ended cap which has two sets of threads, one engaging the stem threads of the neck, the other engaging certain additional threads of the neck, and the cap portion between said two sets of threads being at least partially unthreaded. In a preferred embodiment, this intermediate cap portion is provided with a series of longitudinal recesses which facilitate the emanation of the material from the tube when the cap is unscrewed.

I achieve the foregoing objects, and such other objects as may hereinafter appear or be pointed out, in the manner illustratively exemplified in the accompanying drawing, wherein—

Figure 1 is a longitudinal cross-section through the outlet portion of a collapsible tube, illustrating one embodiment of my present invention and showing the tube in closed condition;

Figure 2 is a plan view of Figure 1, with the cap shown in cross-section;

Figure 3 is a view similar to Figure 1, showing the parts in opened relationship;

Figure 4 is a view similar to Figure 1, illustrating a modification;

Figure 5 is a view similar to Figure 1, illustrating a further modification;

Figure 6 is a view similar to Figure 5, showing the parts in opened relationship;

5 Figure 7 is a cross-sectional view taken substantially along the line 7-7 of Figure 6; and

Figure 8 is a view similar to Figure 5, illustrating a further modification.

Referring for the moment to Figures 1-3, I have shown a collapsible tube 10 provided with an outlet neck 11 which terminates in the central closed stem or dome 12. Rearwardly of the stem 12 are the lateral outlet openings 13. A cap 14 is adapted to enclose the neck of the tube 10. In accordance with my present invention, the stem 12 is exteriorly threaded, as at 15, and the cap 14 has an outlet portion 16 which is correspondingly threaded.

In the embodiment illustrated in Figures 1-3, the stem 12 is of reduced diameter, and the neck portion in which the outlet openings 13 are provided is tapered, the cap 14 being suitably shaped so that it conforms substantially to the shape of the neck when it is screwed down as shown in Figure 1.

In this embodiment, I have also shown the preferred arrangement of a forwardly directed shoulder 17, formed on the stem 12, and shown for illustrative purposes at the rear end of this stem.

In accordance with my present invention, the neck 11 is provided, rearwardly of the outlet openings 13, with the additional threads 18, the longitudinal extent of which is somewhat greater than that of the threads on the stem 12. The cap 14 is provided also with the second set of threads 19 adapted to engage the neck threads 18.

The cap is also provided with the annular ridge 20 which is adapted to bear against the shoulder 17 when the cap is screwed down. In the embodiment of Figures 1-3, the sealing ridge 20 is provided at the rear of the cap threads 16.

The manner of using the device is clearly illustrated in Figures 1-3. When the cap is screwed down, as in Figure 1, leakage is positively prevented by virtue of the firm seating of the ridge 20 upon the shoulder 17, and also by virtue of the threaded engagement between the threads 16 of the cap and the stem threads 15. If desired, a gasket or washer may be provided along the seat 17. When material is to be withdrawn from the tube, the cap 14 is unscrewed to an amount sufficient to release the cap from the stem threads 15. This positions the parts as shown in Figure 3, and it is to be observed that this release of the cap does not interfere with the permanent association of the cap with the tube, the cap remaining in association with the neck of the tube by virtue of the engagement of the cap threads 19 with the additional neck threads 18.

By squeezing the tube, the material is permitted to emanate through the outlet openings 13, and thence around the threaded stem 12, and out of the open end of the cap 14. After the desired amount of material has been withdrawn, the cap is screwed down again, and the threads 16 will again engage the stem 12, the ridge 20 seating itself firmly and securely against the shoulder 17.

In Figure 4, I have illustrated a modification in which two additional shoulders or seats have been provided. The tube 21 is provided with the neck 22, the latter terminating in the central closed stem 23, again of reduced diameter, and exteriorly threaded. Just behind the stem 23 is the forwardly directed annular seat or shoulder 24; behind this are the lateral outlet openings

25; and behind these openings is a second forwardly directed shoulder 26. The neck 22 is provided with the additional threads 27 at the rear portion thereof; and at the forward ends of these additional threads I have shown the possibility of providing the rearwardly directed shoulder 28.

The cap 29 has a threaded outlet portion adapted to engage with the stem 23, a threaded rear portion 30 adapted to engage with the threads 27, and a series of ridges adapted to engage or seat, respectively, against the shoulders on the neck. More particularly, the cap is provided with the annular ridge 31 adapted to seat itself against the shoulder 24; it is provided also with the sealing ridge 32 adapted to seat against the shoulder 26; and it is provided with the oppositely disposed ridge 33 adapted to seat itself against the shoulder 28.

When this tube is closed, as shown in Figure 4, leakage through the openings 25 is prevented by virtue of the ridges 31 and 32 and their firm engagement with the corresponding shoulders 24 and 26. Leakage is further prevented by the fact that the forward portion of the cap 29 is in screw-threaded engagement with the threaded stem of the neck. When the cap is unscrewed, its outlet portion disengages or releases itself from the stem 23, thereby permitting the material to emanate through the openings 25 and upwardly around the stem 23, in substantially the manner illustrated in Figure 3. At the same time, the unscrewing of the cap causes the ridge 33 to seat itself against the shoulder 28, whereby any escape or leakage of the material rearwardly is prevented during the process of squeezing the material forwardly out of the tube.

Obviously, the forwardly directed shoulder 26 may be provided, without necessarily providing the rearwardly directed shoulder 28; and in a similar manner, it will be understood that the rearwardly directed shoulder 28 is in itself a structural feature which may be independently employed without the other shoulders.

In Figures 5-7, I have illustrated a further modification in which the threaded stem is not of reduced diameter but is of substantially the same diameter as the remainder of the neck. Thus, I have shown a tube 34 provided with the outlet neck 35, the latter terminating in the forward closed stem 36 which is exteriorly threaded. Rearwardly of this stem I provide the lateral outlet openings 37; and rearwardly of the latter I provide the additional neck threads 38. The cap 39 has an open outlet end, as before, and is provided with a forward set of threads 40 adapted to engage with the stem threads, and a rearward set of threads 41 adapted to engage with the additional neck threads 38. In this embodiment, the cap portion between the threads 40 and 41 is partially unthreaded, and is also recessed, so as to provide the three longitudinal passageways or recesses 42. The areas between these recesses 42, designated by the reference numeral 43, are threaded in continuation of the forward set of threads 40.

The rear or additional threads 38 of the neck are again of greater longitudinal extent than the forward set on the stem 36, and it is therefore possible to unscrew the cap so as to release it from the stem 36, without impairing its permanent association with the neck 35.

When the tube is closed, as shown in Figure 5, emanation of material is prevented by virtue of the threaded engagement between the cap and the threads of the stem 36. Leakage is also

prevented rearwardly by virtue of the threaded engagement between the cap and the rear threads of the neck. When the cap is unscrewed into the position of Figure 6, the material of the tube is permitted to emanate out of the openings 37, thence through the recesses 42, and around the stem 36. During this procedure, material is prevented from escaping rearwardly by virtue of the maintained threaded engagement between the cap and the neck of the tube.

In sealing the tube, the procedure is reversed, the cap being screwed down to resume the position of Figure 5.

So that there may always be a passageway for the material, I prefer to provide a number of recesses 42 which is different from the number of outlet openings 37. I have illustratively shown four outlet openings 37 and only three recesses 42.

In Figure 8, I have illustrated a further modification, which is similar to Figure 5, but in which the threaded stem of the neck is provided with a shoulder 44 adapted to be engaged by the sealing ridge 45 provided on the cap 46 when the tube is to be closed. In this embodiment, I have illustratively shown the manner in which this sealing shoulder may be provided at the forward end of the stem 47, as distinguished from the arrangement of the shoulder 17 at the rear end of the stem 12 of the embodiment of Figure 1.

In other respects, the construction of Figure 8 is similar to that of Figure 5, the neck 48 having the outlet openings 49 arranged behind the stem 47, having the additional threads 50 arranged behind the outlet openings 49, and the cap 46 having the forward set of threads 51, the rearward set 52, and the intermediate unthreaded recesses 53.

It will be understood that additional shoulders and sealing ridges may be provided, as desired, in the embodiment of Figure 5 or that of Figure 8 so as to provide for additional leak-proof assurance, as indicated in Figure 4.

Furthermore, it will be understood that the cap portion between the forward and rearward sets of threads may be entirely unthreaded, if desired, and need not be partially threaded, as indicated by the areas 43 in Figure 7.

In all cases, the parts are preferably so constructed that when the tube is closed the outer surface of the cap will lie substantially flush with the outer surface of the stem.

In general, it will be understood that changes in the details, herein described and illustrated for the purpose of explaining the nature of my invention, may be made by those skilled in the art without departing from the spirit and scope of the invention as expressed in the appended claims. It is, therefore, intended that these

details be interpreted as illustrative, and not in a limiting sense.

Having thus described my invention, and illustrated its use, what I claim as new and desire to secure by Letters Patent is—

1. In a collapsible tube, an outlet neck of substantially uniform exterior diameter throughout, the front end of the neck being closed and exteriorly threaded, lateral outlet openings through the neck rearwardly of said front end, additional exterior threads on the neck rearwardly of said openings, and an open-ended cap enclosing said neck and provided with two sets of threads adapted, respectively, to engage said forward threads and said additional threads, the cap portion between said two sets of threads being provided with a longitudinal recess to permit the material in the tube to emanate through said outlet openings and around said stem when the cap is unscrewed.

2. In a collapsible tube, an outlet neck terminating in a closed central stem exteriorly threaded, lateral outlet openings through the neck rearwardly of said stem, additional exterior threads on the neck rearwardly of said openings, and an open-ended cap enclosing said neck and provided with a forward and a rearward set of threads adapted, respectively, to engage said stem threads and said additional threads, the cap portion between said forward and rearward threads being provided with a series of spaced longitudinal recesses, and the areas between said recesses being threaded in continuation of said forward threads, whereby the material in the tube may be caused to emanate through said outlet openings, thence through said recesses, and thence around said stem by unscrewing the cap but without releasing the threaded engagement between the cap and said stem threads.

3. In a collapsible tube, an outlet neck of substantially uniform exterior diameter throughout, the front end of the neck being closed and exteriorly threaded, lateral outlet openings through the neck rearwardly of said front end, additional exterior threads on the neck rearwardly of said openings, an open-ended cap enclosing said neck and provided with two sets of threads adapted, respectively, to engage said forward threads and said additional threads, the cap portion between said two sets of threads being provided with a longitudinal recess to permit the material in the tube to emanate through said outlet openings and around said stem when the cap is unscrewed, an annular shoulder at the front end of said neck, and an annular sealing ridge on the cap adapted to seat against said shoulder when the cap is screwed down.

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