Nov. 5, 1963 O. C. FERRIS 3,109,562

NOZZLE PERFORATING CAP FOR COLLAPSIBLE TUBES

Filed Sept. 7, 1954

FIG. 1

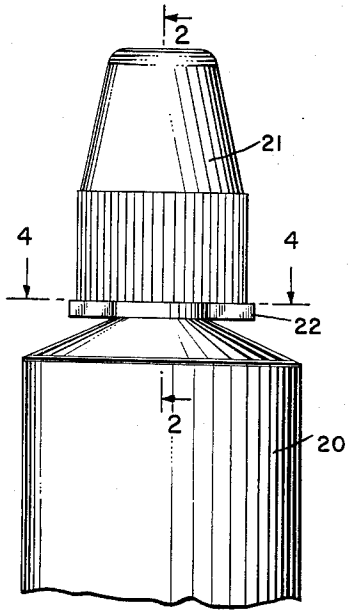


FIG. 2

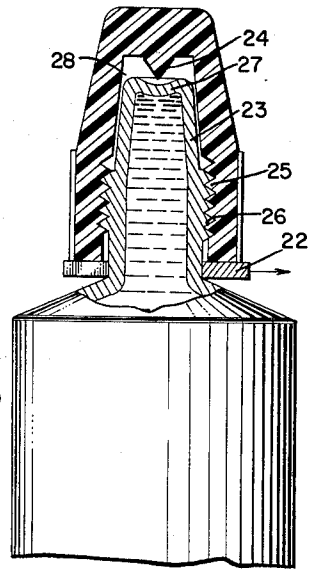


FIG. 3

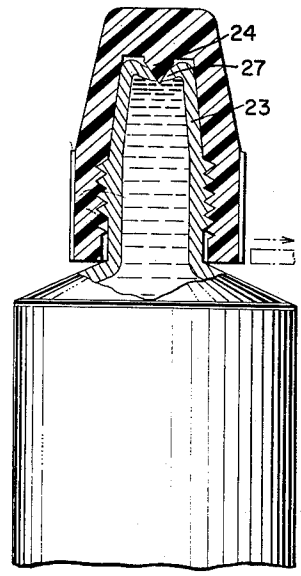


FIG. 4

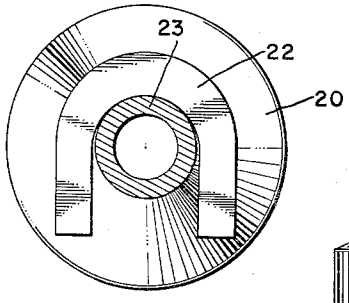


FIG. 5

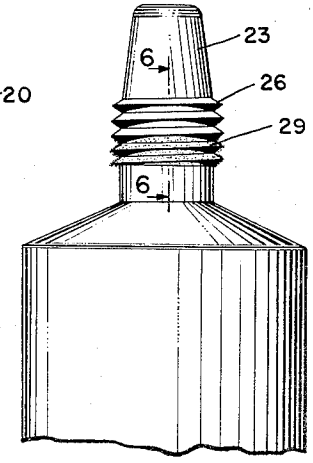
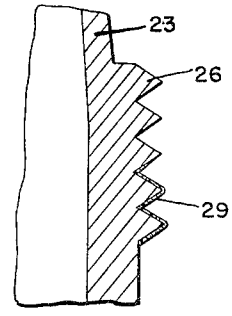


FIG. 6



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NOZZLE PERFORATING CAP FOR COLLAPSIBLE TUBES

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This invention relates to collapsible tubular dispensers, and in particular to a dispenser wherein the discharge nozzle thereof may be perforated by a piercing member incorporated within a screw nozzle cap or closure which seals the dispenser.

The collapsible tubular dispenser has been found to be of particular advantage in the packaging of various medicinal and hygienic substances which are in the form of a paste or in a semi-solid state. These substances include ophthalmic ointments and various other preparations for application to the eye, ear and other organs and/or parts of the body. It has also been found that if an elongated, tapered discharge nozzle is incorporated on the body of the collapsible tubular dispenser, a medicinal substance may be applied directly to a specific part of the body, for example, the eye, without the necessity of the hands or fingers coming into contact with the therapeutic agent. This tends to lessen the possibility of the medicinal substance becoming contaminated and, correspondingly, tends to eliminate the likelihood of infection within the organ or the part of the body that is receiving the medication.

In order to make dispensers of this character simple and convenient for use, it has been heretofore proposed that the cap or cover of the discharge nozzle include a sharp point or spur on the interior surface thereof, whereby the tip of the discharge nozzle may be perforated upon turning the screw cap in the closing direction. After perforation has been effected, the cap is removed and the tube with its perforated nozzle is ready for use.

However, in the known perforating cap construction (see patent to Miller, No. 1,909,209, dated May 16, 1933) there exists an interspace of considerable size between the nozzle and cap even in the closed condition of the cap, into which the contents of the tube can leak if the cap has not been screwed tight, or if the tube is accidentally squeezed. The medicament will accordingly collect in such interspace and be exposed to contamination, so that the primary function of the tube of keeping the contents sterile will be defeated. Also, on repeated use of the tube, the cap is likely to be forced more and more deeply on the nozzle, so that the opening will become enlarged, and if the cap is not subsequently screwed tight after every use, the seal intended to be effected by the perforating member will be incomplete, so that the contents of the tube will ooze into the interspace. Moreover, as the substance which has leaked into the interspace dries out, the ointment or salve will become hard and render difficult both the removal of the cap and the extrusion of the substance within the tube.

Accordingly, one of the primary objects of my invention is to provide a collapsible tubular dispenser which is so constructed that the interspace between the cap and nozzle is substantially completely eliminated in the closed position of the cap, so that leakage of the contents of the tube is prevented.

Another important object of my invention is to provide a collapsible tubular dispenser having a cap provided with a nozzle piercing member wherein the body of the cap itself forms a seal with the body of the tube nozzle.

Still another object of my invention is to provide a collapsible tubular dispenser of the type indicated wherein the body of the cap engages the body of the nozzle as the sealing position is reached and thus effectively stops further movement of the cap, whereby enlargement of the nozzle opening is prevented.

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Still a further object of my invention is to provide a tube closure which prevents the medicinal substance within the discharge nozzle and proximate its tip from undergoing evaporation and causing encrustation, whereby the nozzle is kept clean and sterile at all times.

Briefly described, the dispensing unit of this invention comprises a collapsible tube, a discharge nozzle projecting axially from one end thereof, a cap snugly encompassing the said nozzle along its length in the closed position, and a nozzle piercing member projecting from the interior of the said cap, the said member being aligned axially with the said nozzle, the aforementioned relationship of cap and nozzle being such that seepage in and about the cap is prevented after the nozzle has been perforated.

A fuller understanding of the invention and the manner in which its objectives and advantages may be realized will become apparent from the following detailed description thereof taken in connection with the accompanying drawings wherein:

FIG. 1 is a fragmentary side elevation of one embodiment of the dispenser of this invention showing the upper half of the collapsible tube, including the cap therefor;

FIG. 2 is a longitudinal sectional view of the dispenser taken through line 2—2 of FIG. 1, showing the dispenser before the nozzle is perforated;

FIG. 3 is a view similar to FIG. 2, but showing the dispenser after the nozzle has been perforated;

FIG. 4 is a cross-sectional view of the dispenser taken through line 4—4 of FIG. 1 illustrating the placement of the U-shaped washer;

FIG. 5 shows a fragmentary side elevation of a modification of the dispenser of this invention wherein a coating is utilized to maintain the cap and nozzle in an unpunctured relationship prior to use; while

FIG. 6 is an enlarged detail taken through line 6—6 of FIG. 5 and illustrates the positioning of the coating on the threaded base of the nozzle.

Referring to the accompanying drawings, the embodiment of the invention shown in FIG. 1, consists of a collapsible tube designated generally by the reference character 20, the said tube being of a soft metal composition. In this embodiment of the invention the dispenser cap 21 is shown resting upon a removable, comparatively thin U-shaped washer 22 which may be similarly composed of a soft metal or of plastic material, resin-impregnated paper, or the like.

As shown in FIGS. 2 and 3, the dispenser is provided with a discharge nozzle 23, while the top of the cap is provided with an interiorly projecting piercing member 24, preferably of conical shape, positioned directly above the discharge nozzle. The cap is preferably composed of a plastic composition and is manufactured in known manner. I have found it preferable to mould or cast the piercing member as an integral part of the cap during the manufacture thereof. As is shown in FIG. 2, the cap is threadedly engaged with the discharge nozzle, the cap and the nozzle being provided with threaded cylindrical portions 25 and 26, respectively. The washer or disc 22, positioned at the base of the discharge nozzle and bearing against the shoulder of the tube, insures against accidental turning of the cap and so prevents the piercing member from puncturing the tip or diaphragm 27 of the discharge nozzle prematurely.

In accordance with the invention, the outer wall of the discharge nozzle and the inner wall of the cap are so shaped that the two parts fit snugly together after the

nozzle has been perforated and the cap is in sealing position.

To this end, the upper non-threaded portions of the nozzle and of the interior wall of the cap are of conical form and of substantially the same inclination, i.e., the vertex angle is in both cases the same or very nearly so. Hence, in the closed position of the cap, the inner wall of the latter bears directly upon the nozzle throughout substantially the whole extent of the non-threaded portions of the nozzle and cap. The top inner wall of the cap preferably comes into contact, or nearly so, with the tip of the nozzle in the closed position of the cap, so that as the cap is turned in the nozzle to seal the tube, the volume of the interspace 28 between nozzle and cap is reduced to practically zero.

By reason of the engagement of the conical or tapered walls of the cap and nozzle, an effective stop is provided for the closing movement of the cap, so that enlargement of the opening in the nozzle is prevented and leakage out of the tube obviated.

In use, the tip of the discharge nozzle is punctured after the disc or washer has been removed from the base of the nozzle. In this embodiment of the invention the washer is in the form of a U-shaped member and may be removed simply by being pulled away by hand. Thereupon, the cap is depressed towards the collapsible tube by rotation on the threaded sections provided therefore until, as can be seen in FIG. 3, the piercing element has punctured the tip of the discharge nozzle. As can be seen from FIG. 3, when the cap has been brought to its final position the interspace 28, between nozzle and cap is practically completely eliminated, thereby ensuring a leakproof seal between the parts.

In the embodiment of the invention illustrated in FIGS. 5 and 6, a plastic varnish or other coating 29 may be applied to the last two or three threads of the nozzle so as to more or less fill the threads and prevent the cap from being completely depressed unless some force be applied to it. To puncture the nozzle, the cap is rotated with sufficient force to break through the varnish coating. Alternatively, the last threads of the threaded section on the nozzle may be pitched differently from the other threads so that a greater force will have to be applied to make the piercing member puncture the diaphragm.

While the invention has been described in detail with respect to several preferred embodiments thereof, it will be understood by those skilled in the art, after reading this specification, that various changes and modifications may be made without departing from the spirit of the invention and the scope of the appended claims.

What is claimed as new and desired to be secured by Letters Patent is:

1. The combination with a collapsible tube having a collapsible body, and a discharge nozzle constituted of a relatively rigid, threaded cylindrical portion and a tapered non-threaded end portion extending axially from the cylindrical portion thereof and sealed at its tip, of a removable hollow cap encompassing the said nozzle and provided with a nozzle tip piercing member projecting inwardly thereof, the upper portion of the interior wall of the cap being of conical non-threaded form and having substantially the same vertex angle as the nozzle end portion so that the latter is capable of fitting snugly against the upper portion of the said interior wall of the cap over substantially its whole area, the lower portion of the inner wall of the cap being cylindrical and threaded to fit the threaded portion of the nozzle, the cap being normally threaded on the nozzle with the piercing member in close proximity to the tip of the nozzle and with the tapered walls of the nozzle and cap in spaced relation to each other, the cap in such relationship being capable of further axial movement on the nozzle for a distance such that the tapered nozzle end portion and the upper interior wall portion of the cap are brought into contact, whereby on further threading the cap onto the nozzle the piercing member is caused to perforate the nozzle tip, and the conical walls of the nozzle and cap are caused to engage each other in sealing relation and coact to limit the perforating movement of the piercing member, the parts being so dimensioned that in the lowermost, closed condition of the cap, wherein the nozzle has been perforated, the top inner wall of the cap is in contact with the tip of the nozzle, said combination including a plastic coating only on the lower threads of the nozzle acting to limit the movement of the cap along the nozzle to prevent premature puncturing of the nozzle but capable of being penetrated by the threads of the cap on forcible turning of the latter.

2. The combination with a collapsible tube having a collapsible body, and a discharge nozzle constituted of a relatively rigid, threaded cylindrical portion and a tapered non-threaded end portion extending axially from the cylindrical portion thereof and sealed at its tip, of a removable hollow cap encompassing the said nozzle and provided with a nozzle tip piercing member projecting inwardly thereof, the upper portion of the interior wall of the cap being of conical non-threaded form and having substantially the same vertex angle as the nozzle end portion so that the latter is capable of fitting snugly against the upper portion of the said interior wall of the cap over substantially its whole area, the lower portion of the inner wall of the cap being cylindrical and threaded to fit the threaded portion of the nozzle, the cap being normally threaded on the nozzle with the piercing member in close proximity to the tip of the nozzle and with the tapered walls of the nozzle and cap in spaced relation to each other, the cap in such relationship being capable of further axial movement on the nozzle for a distance such that the tapered nozzle end portion and the upper interior wall portion of the cap are brought into contact, whereby on further threading of the cap onto the nozzle the piercing member is caused to perforate the nozzle tip, and the conical walls of the nozzle and cap are caused to engage each other in sealing relation and coact to limit the perforating movement of the piercing member, and a plastic coating only on the lower threads of the nozzle acting to limit the movement of the cap along the nozzle to prevent premature puncturing of the nozzle but capable of being penetrated by the threads of the cap on forcible turning of the latter.

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