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(54) **RETAINED ENCLOSED OPENING MEANS**

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(57) **ABSTRACT**

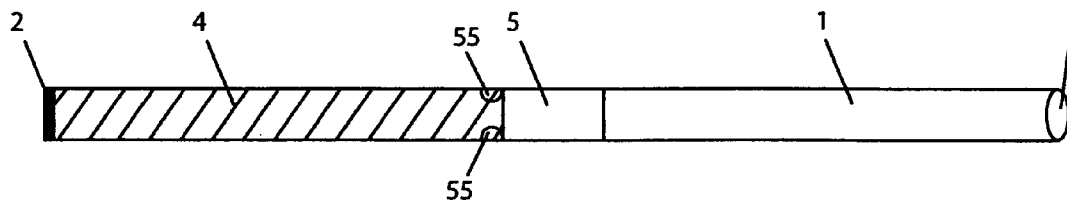
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**Related U.S. Application Data**

(63) Continuation-in-part of application No. 10/670,961,  
filed on Sep. 25, 2003.

An elongated sealed container with a self-contained opening means fully enclosed within the container to release the liquid sealed within the container is disclosed. The retained enclosed opening means may be operated by either squeezing or bending the elongated sealed container at or near the retained enclosed opening means to release the liquid sealed within the elongated sealed container for application. There are no loose parts that may be lost and all components are completely sealed within the container.



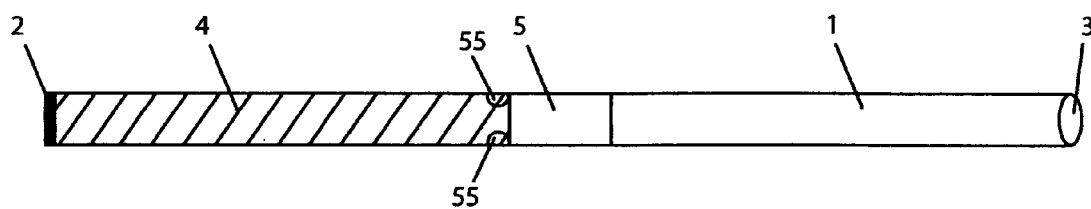


Figure 1

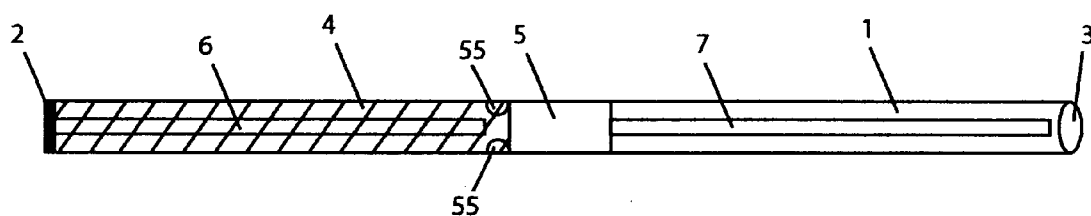


Figure 2

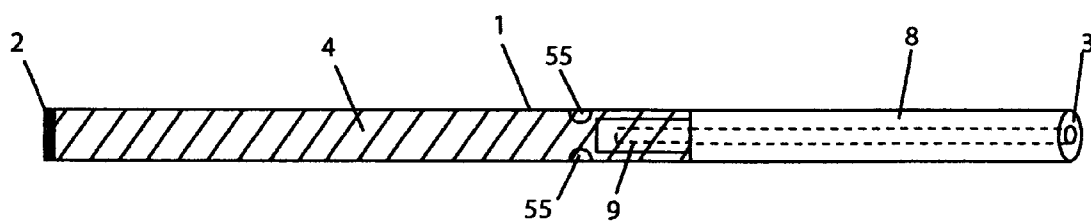
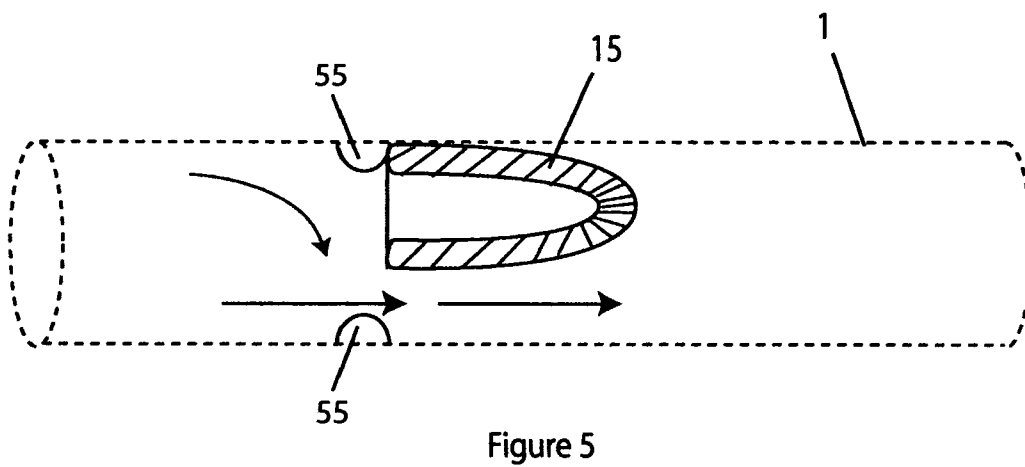
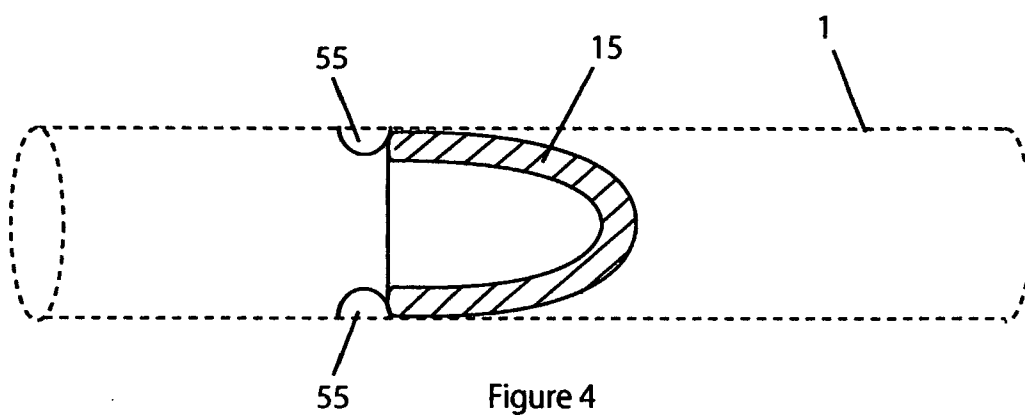


Figure 3



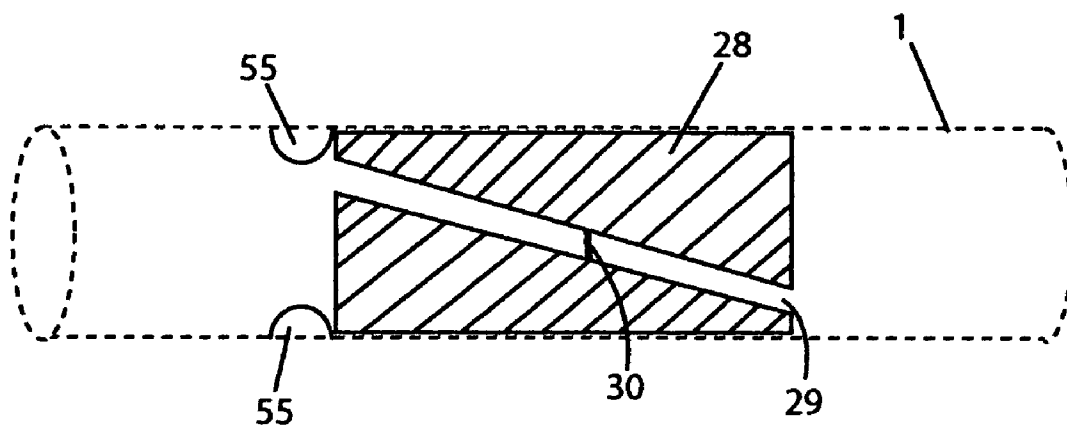


Figure 6

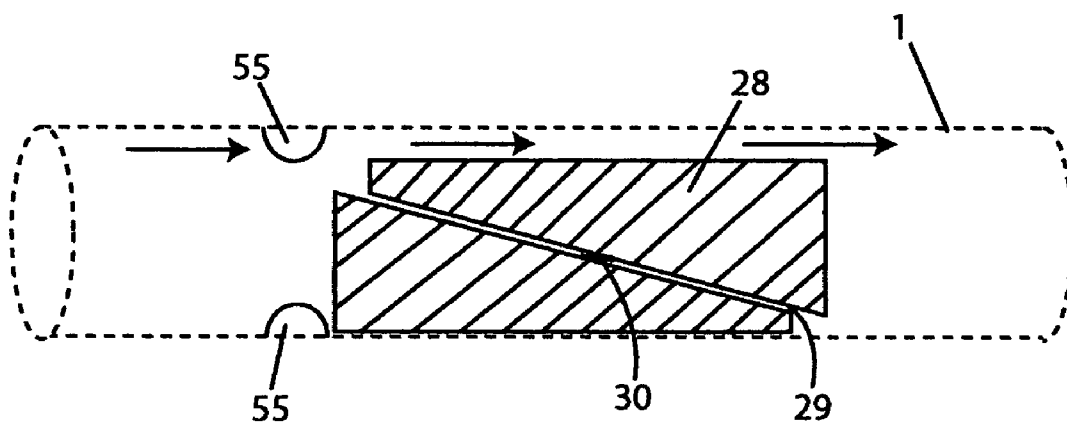


Figure 7

## RETAINED ENCLOSED OPENING MEANS

[0001] This application is a continuation-in-part of the prior nonprovisional U.S. patent application Ser. No. 10/670,961, filed on Sep. 25, 2003, entitled Sealed Container with Enclosed Opening Means.

## BACKGROUND-FIELD OF INVENTION

[0002] The present invention relates generally to a sealed container with an enclosed opening means retained within the container for releasing the liquids sealed within the container.

## BACKGROUND-DESCRIPTION OF RELATED ART

[0003] A variety of opening means exists for opening a container. Most opening means are in the form of a screw-on cap or a snap-on cap. Some opening means are in the form of a frangible seal or a score line on the container that will allow the contents of the container to be released upon fracturing of the frangible seal or the container at the score line. All of these opening means are either attached to the container externally, such as the screw-on cap and the snap-on cap, or are formed as part of the container, such as the frangible seal and the score line on the container. None of the opening means are designed to be enclosed within the container to seal a liquid in the container and yet still allow the release of the liquids easily and reliably. The availability of an effective and easy to use opening means is particularly lacking for a small elongated container with a small cross-sectional area.

## BRIEF SUMMARY OF THE INVENTION

[0004] The present invention is an elongated sealed container with a retained opening means fully enclosed within the container to release the liquid sealed within the container. The retained enclosed opening means may be operated by either squeezing or bending the elongated sealed container at or near the retained enclosed opening means. Once the retained enclosed opening means is opened, the liquid sealed within the elongated sealed container may be released for application. When the elongated sealed container has a small cross-section such that the liquid within it cannot be released due to its surface tension, a guiding member may be utilized to increase the capillary action and to overcome the surface tension of the liquid to release the liquid from the elongated sealed container. There are no loose parts that may be lost and all components are completely sealed within the container.

## BRIEF DESCRIPTION OF THE DRAWINGS

[0005] FIG. 1 shows the preferred embodiment of the retained enclosed opening means.

[0006] FIG. 2 shows another embodiment of the retained enclosed opening means.

[0007] FIG. 3 shows another embodiment of the retained enclosed opening means.

[0008] FIG. 4 shows one embodiment of the retained enclosed opening means in the closed condition.

[0009] FIG. 5 shows the retained enclosed opening means of FIG. 4 in the open position to release the liquids in the sealed container to be released.

[0010] FIG. 6 shows one embodiment of the retained enclosed opening means in the closed condition.

[0011] FIG. 7 shows the retained enclosed opening means of FIG. 6 in the open position to release the liquids in the sealed container to be released.

## DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENT

[0012] The following description and figures are meant to be illustrative only and not limiting. Other embodiments of this invention will be apparent to those of ordinary skill in the art in view of this description.

[0013] FIG. 1 shows the preferred embodiment of the retained enclosed opening means. In the preferred embodiment, the retained enclosed opening means comprises of an elongated tubular housing 1 with a sealed end 2 and an open end 3. A liquid 4 is enclosed within the elongated tubular housing 1 near the sealed end 2. An enclosed opening means 5 is affixed inside the elongated tubular housing 1 sealing the liquid 4 within the elongated tubular housing 1. The retained enclosed opening means 5 may be operated either by squeezing or bending the elongated tubular housing 1 at or near the retained enclosed opening means 5.

[0014] When the elongated tubular housing 1 has a small cross-section such that the liquid 4 within it cannot be released simply by opening the retained enclosed opening means 5 due to its surface tension, a guiding member 6, 7 may be utilized to increase the capillary action and to overcome the surface tension of the liquid 4 to release the liquid 4 from the elongated tubular housing 1 as shown in FIG. 2.

[0015] One embodiment of the retained enclosed opening means 5 is shown in FIG. 3 wherein the retained enclosed opening means 5 comprises of a cylinder 8 with an outside diameter approximately that of the inside diameter of the elongated tubular housing 1 defining a small liquid path from the open end 3 of the elongated tubular housing 1 to the liquid 4. The end near the liquid 4 has an elongated protrusion 9 that is smaller in diameter than the cylindrical body of the enclosed opening means 5 and is separable from the cylindrical body of the retained enclosed opening means 5. The elongated protrusion 9 seals the small liquid path in the cylinder 8 and prevents the liquid 4 in the elongated tubular housing 1 from being released through the retained enclosed opening means 5. The elongated protrusion 9 is further affixed to the inside wall of the elongated tubular housing 1 wherein the elongated protrusion 9 will be retained at approximately the same position when it is separated from the cylindrical body. This will retain the separated elongated protrusion 9 at a predetermined position and prevent it from interfering with the compression of the liquid 4 in the elongated tubular housing 1. The affixation 55 may be in the form of one or more indentations or restrictions that project into the interior of the elongated tubular housing 1 and restricts the elongated protrusion 9 from movement within the elongated tubular housing 1. The affixation 55 may also be designed into the elongated protrusion 9, wherein the elongated protrusion 9 has a cross-section that will allow liquid 4 to pass around it yet has an interference fit within the elongated tubular housing 1. This may be accomplished by forming the elongated protrusion 9 with a cross-section other than a similar cross-section as the interior of the

elongated tubular housing 1. The elongated protrusion 9 may have a cross-section in the form of a triangle, square, star shape, or any other shapes that will leave a liquid flow path from one end to the other. When the elongated tubular housing 1 is bent near the junction between the elongated protrusion 9 and the cylindrical body of the retained enclosed opening means 5, the elongated protrusion 9 will be separated from the cylindrical body and the small liquid path is exposed for the liquid 4 to be released from the elongated tubular housing 1 through the retained enclosed opening means 5.

[0016] FIG. 4 shows another embodiment of the retained enclosed opening means 5. In this embodiment, the retained enclosed opening means 5 comprises of a deformable cup 15 with a diameter approximately that of the inside diameter of the tubular housing 1 and a length that is longer than the diameter. The deformable cup 15 is inserted into the tubular housing 1 to seal the liquid 4 within the tubular housing 1. The deformable cup 15 is further affixed to the inside wall of the elongated tubular housing 1 wherein the deformable cup 15 will be retained at approximately the same position when it is deformed. As shown in FIG. 5, upon bending or squeezing the tubular housing 1 at or near the retained enclosed opening means 5, the deformable cup 15 is deformed and a liquid flow path is exposed to allow the liquid 4 to be released from the tubular housing 1. A deformable sphere such as a plastic hollow ball with approximately that of the inside diameter of the tubular housing 1 may also be used instead of the deformable cup 15. The deformable sphere is also affixed to the inside wall of the elongated tubular housing 1 wherein the deformable sphere will be retained at approximately the same position when it is deformed. Upon bending or squeezing the tubular housing 1 at the retained enclosed opening means 5, the deformable sphere will be deformed and a liquid flow path is exposed to allow the liquid 4 to be released from the tubular housing 1.

[0017] FIG. 6 shows another embodiment of the retained enclosed opening means 5 wherein the retained enclosed opening means 5 comprises of a cylindrical section 28 with sufficient length to prevent it from turning inside the tubular housing 1. The cylindrical section 28 has a diagonal slit 29 formed diagonally from one end to the other with a thin section of material 30 connecting the two halves of the cylindrical section 28 and sealing the liquid 4 in the tubular housing 1 behind the cylindrical section 28. The cylindrical section 28 is further affixed to the inside wall of the elongated tubular housing 1 wherein the cylindrical section 28 will be retained at approximately the same position when it is compressed. When the cylindrical section 28 is compressed by squeezing the tubular housing 1, the two halves of the cylindrical section 28 will slide against each other and press together thereby reducing the cross-section of the cylindrical section 28. A liquid flow path is therefore formed between the outside of the cylindrical section 28 and the inside wall of the tubular housing 1 to allow the liquid 4 to be released from the tubular housing 1 as shown in FIG. 7.

[0018] Although the invention has been described in terms of particular embodiments and applications, one of ordinary skill in the art, in light of this teaching, can generate additional embodiments and modifications without departing from the spirit of or exceeding the scope of the claimed invention. Accordingly, it is to be understood that the

drawings and descriptions herein are proffered by way of example to facilitate comprehension of the invention and should not be construed to limit the scope thereof.

What is claimed is:

1. A retained enclosed opening means comprising an elongated tubular housing with a sealed end and an open end, a liquid enclosed within said elongated tubular housing near said sealed end, an enclosed opening means affixed inside said elongated tubular housing sealing said liquid within said elongated tubular housing wherein said enclosed opening means may be operated to release said liquid from said elongated tubular housing and remains generally at the same position.

2. A retained enclosed opening means as in claim 1, wherein said enclosed opening means comprises of a cylinder with an outside diameter approximately that of the inside diameter of said elongated tubular housing defining a liquid flow path from said liquid to said open end of said elongated tubular housing and an elongated protrusion that is affixed to said elongated tubular housing and that is separable from said cylinder extending from an end of said cylinder near said liquid and sealing said liquid flow path.

3. A retained enclosed opening means as in claim 1, wherein said enclosed opening means comprises of a deformable cup that is affixed to said elongated tubular housing.

4. A retained enclosed opening means as in claim 1, wherein said enclosed opening means comprises of a deformable sphere that is affixed to said elongated tubular housing.

5. A retained enclosed opening means as in claim 1, wherein said enclosed opening means comprises of a cylindrical section affixed within said elongated tubular housing with sufficient length to prevent it from turning inside said tubular housing and with a diagonal slit formed diagonally from one end to the other with a thin section of material connecting the two halves of said cylindrical section and sealing said liquid in said tubular housing behind said cylindrical section wherein when said cylindrical section is compressed by squeezing said tubular housing wherein the two halves of said cylindrical section will slide against each other and press together thereby reducing the cross-section of said cylindrical section to form a liquid flow path between the outside of said cylindrical section and the inside wall of said tubular housing to allow said liquid to be released from said tubular housing.

6. A retained enclosed opening means comprising an elongated tubular housing with a sealed end and an open end, an elongated member affixed to said sealed end, a liquid enclosed within said elongated tubular housing near said sealed end, an enclosed opening means affixed inside said elongated tubular housing sealing said liquid within said elongated tubular housing wherein said enclosed opening means may be operated to release said liquid from said elongated tubular housing and remains generally at the same position.

7. A retained enclosed opening means as in claim 6, wherein said enclosed opening means comprises of a cylinder with an outside diameter approximately that of the inside diameter of said elongated tubular housing defining a liquid flow path from said liquid to said open end of said elongated tubular housing and an elongated protrusion that is affixed to said elongated tubular housing and that is

separable from said cylinder extending from an end of said cylinder near said liquid and sealing said liquid flow path.

8. A retained enclosed opening means as in claim 6, wherein said enclosed opening means comprises of a hollow cylindrical body with an open end disposed toward said liquid and a sealed end affixed to said elongated tubular housing and with an elongated member extending therefrom to said open end of said elongated tubular housing with a frangible section formed on the hollow cylindrical body near said sealed end of said hollow cylindrical body.

9. A retained enclosed opening means as in claim 6, wherein said enclosed opening means comprises of a deformable cup that is affixed to said elongated tubular housing.

10. A retained enclosed opening means as in claim 6, wherein said enclosed opening means comprises of a deformable sphere that is affixed to said elongated tubular housing.

11. A retained enclosed opening means as in claim 6, wherein said enclosed opening means comprises of a cylindrical section affixed within said elongated tubular housing with sufficient length to prevent it from turning inside said tubular housing and with a diagonal slit formed diagonally from one end to the other with a thin section of material connecting the two halves of the cylindrical section and sealing said liquid in said tubular housing behind said cylindrical section wherein when said cylindrical section is compressed by squeezing said tubular housing the two halves of the cylindrical section will slide against each other and press together thereby reducing the cross-section of said cylindrical section to form a liquid flow path between the outside of the cylindrical section and the inside wall of said tubular housing to allow said liquid to be released from said tubular housing.

12. A retained enclosed opening means comprising an elongated tubular housing with a sealed end and an open end, an elongated member affixed to said sealed end, a liquid enclosed within said elongated tubular housing near said sealed end, an enclosed opening means with an elongated member disposed inside and affixed to said elongated tubular housing sealing said liquid within said elongated tubular housing with said elongated member extending towards said open end of said elongated tubular housing wherein said enclosed opening means may be operated to release said liquid from said elongated tubular housing and remains generally at the same position.

13. A retained enclosed opening means as in claim 12, wherein said enclosed opening means comprises of a cylinder with an outside diameter approximately that of the inside diameter of said elongated tubular housing defining a liquid flow path from said liquid to said open end of said elongated tubular housing and an elongated protrusion affixed to said elongated tubular housing that is separable from said cylinder extending from an end of said cylinder near said liquid and sealing said liquid flow path.

14. A retained enclosed opening means as in claim 12, wherein said enclosed opening means comprises of a hollow cylindrical body with an open end disposed toward said liquid and a sealed end affixed to said elongated tubular housing and with an elongated member extending therefrom to said open end of said elongated tubular housing with a frangible section formed on the hollow cylindrical body near said sealed end of said hollow cylindrical body.

15. A retained enclosed opening means as in claim 12, wherein said enclosed opening means comprises of a deformable cup affixed within said elongated tubular housing.

16. A retained enclosed opening means as in claim 12, wherein said enclosed opening means comprises of a deformable sphere affixed within said elongated tubular housing.

17. A retained enclosed opening means as in claim 12, wherein said enclosed opening means comprises of a cylindrical section affixed within said elongated tubular housing with sufficient length to prevent it from turning inside said tubular housing and with a diagonal slit formed diagonally from one end to the other with a thin section of material connecting the two halves of the cylindrical section and sealing said liquid in said tubular housing behind said cylindrical section wherein when said cylindrical section is compressed by squeezing said tubular housing the two halves of said cylindrical section will slide against each other and press together thereby reducing the cross-section of said cylindrical section to form a liquid flow path between the outside of said cylindrical section and the inside wall of said tubular housing to allow said liquid to be released from said tubular housing.

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