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Ellis, Jr. et al.

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[45] **July 31, 1973**

[54] **RESEALABLE AMPOULE CLOSURE**

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[21] Appl. No.: **155,518**

[52] **U.S. Cl.** ..... **215/32**, 150/52 R

[51] **Int. Cl.** **B65d 1/02**, B65d 17/24

[58] **Field of Search** ..... 215/32; 206/63.2 R, 206/65 A; 150/52 R; 81/3, 4; 222/541; 128/272; 220/27

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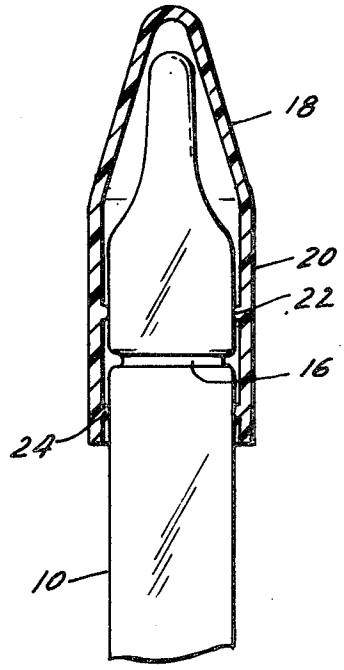
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[57] **ABSTRACT**

A glass ampoule is heat sealed at one end and has a necked down annular break line formed adjacent to but spaced from the sealed end. A plastic cap having two spaced annular sealing rings formed on an inner wall is pressed on the sealed end so that the break line is between the spaced sealing rings.

6 Claims, 6 Drawing Figures



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SHEET 1 OF 2

FIG. 1

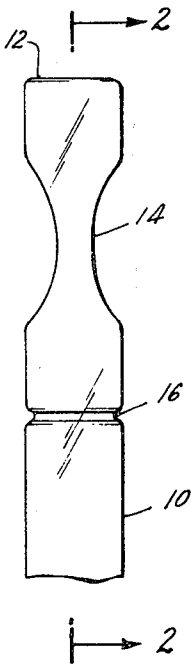


FIG. 2

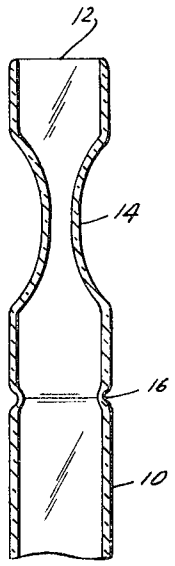


FIG. 3

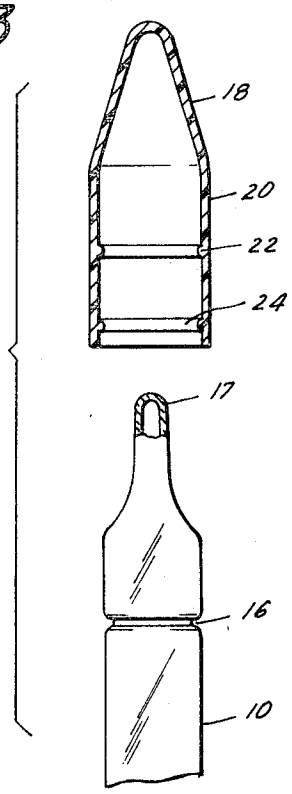
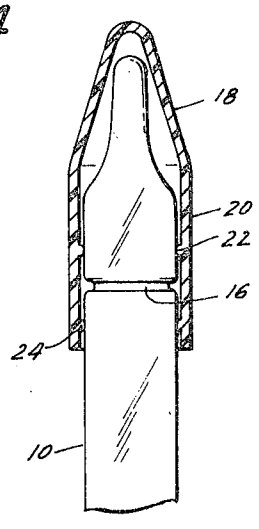
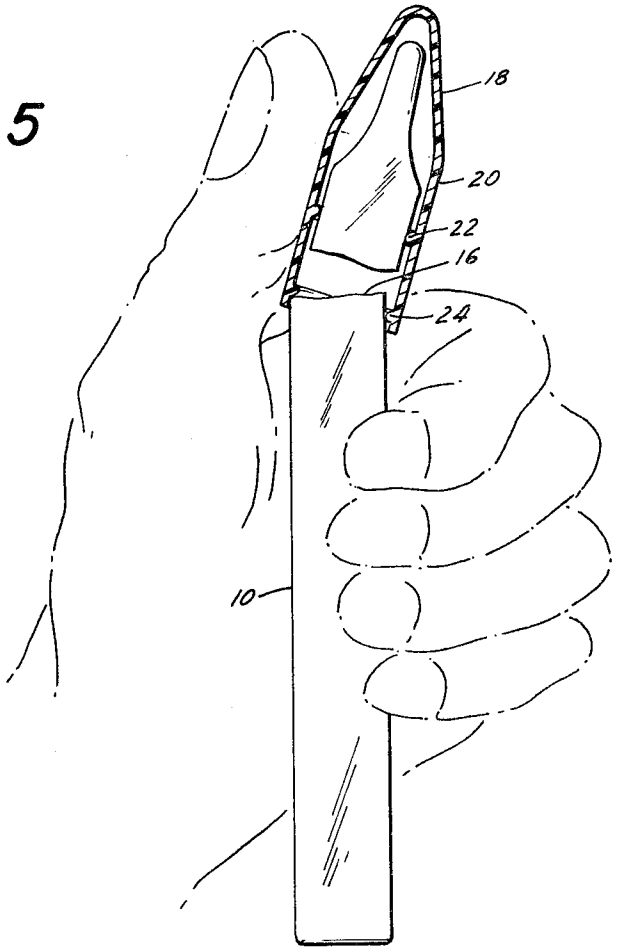


FIG. 4



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FIG.5



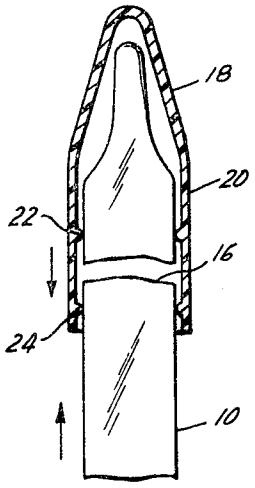


FIG.6

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RESEALABLE AMPOULE CLOSURE

BACKGROUND OF THE INVENTION

1. Field of the Invention

The present invention relates to heat sealed ampoules and more particularly to an ampoule having a resealable closure.

2. Description of the Prior Art

Heat sealed glass ampoules have been used for many years for the storage of liquid and semi-solid materials. This type of container was very useful because it assured the user that the material contained therein was not contaminated and, if applicable, that the material remained in a sterile condition. Heat sealing provided for long shelf life of the stored material; however, once the ampoule was opened, the shelf life was greatly reduced by the lack of a means for resealing the glass ampoules. Usually the ampoule would lie open exposing the contents to contaminants in the air, and thus rendering the contents unusable. On occasions, a cover would be placed over the open ampoule to eliminate contaminants; however, the unsterile cover tended to contaminate the material. Thus, the absence of a convenient resealing means outweighed the advantages of a heat sealed glass ampoule and limited its acceptance.

Another disadvantage of the heat sealed glass ampoule was the inconvenience involved in breaking the glass. This operation involved a risk of being cut by the broken glass and exposing the wound to the material contained in the ampoule. Another disadvantage associated with a heat sealed glass ampoule was that the exterior of the ampoule became contaminated and the exterior area adjacent the eventual opening of the ampoule would contaminate the contents of the ampoule after opening.

SUMMARY OF THE INVENTION

The present invention contemplates a resealable glass ampoule for storing sterile material for long shelf life. A sterile glass ampoule having a necked down annular break line formed adjacent to but spaced from an open end is filled with the sterile material and the opened end is then heat sealed. A cap molded from resilient material and having two spaced annular sealing rings formed on an inner wall is pressed over the sealed end of the ampoule and is positioned so that the break line is between the spaced sealing rings. The cap is placed over the ampoule while the ampoule is still in a sterile condition. The sterility of the exterior adjacent the break line is maintained by the tight fitting seals that engage the ampoule so that the contents of the ampoule are not contaminated when the ampoule is opened.

The ampoule is conveniently opened by applying pressure to the cap causing the ampoule to fracture along the break line and the broken end of the ampoule is safely retained within the plastic cap by one of the annular sealing rings. Thus, the risk involved in opening the ampoule is greatly reduced because the broken glass removed from the ampoule is safely retained in the cap and does not lie about the laboratory.

After a portion of the material within the ampoule is used, the remainder can be safely stored for a period of time by merely snapping the plastic cap in place over the opened end of the ampoule. The sealing ring tightly engages the ampoule to retain the cap in position. The portion of the cap to which the opening is exposed upon resealing is sterile and therefore does not contaminate the stored material as was the case with devices heretofore provided.

One objective of the present invention is to provide a resealable glass ampoule.

Another objective of the present invention is to provide a convenient and safe means for opening a heat sealed glass ampoule.

Another objective of the present invention is to provide a heat sealed glass ampoule having an outer surface adjacent a break line that remains sterile during storage.

Another objective of the present invention is to provide a sterile closure for a heat sealed glass ampoule that has been opened.

The foregoing objectives and advantages of the invention will appear more fully hereinafter from a consideration of the detailed description which follows, taken with the accompanying drawings wherein one embodiment of the invention is illustrated by way of example. It is to be expressly understood, however, that the drawings are for illustrative purposes only and are not to be considered as defining the limits of the invention.

DESCRIPTION OF THE DRAWINGS

FIG. 1 is an elevational view of a portion of an unsealed glass ampoule.

FIG. 2 is a sectional view of the ampoule of FIG. 1 taken along line 2—2.

FIG. 3 is an elevational view of the ampoule of FIG. 1 after it has been heat sealed and is shown with a cap in vertical section in position for placing on the ampoule.

FIG. 4 shows the ampoule and cap of FIG. 3 with the cap in position on the ampoule.

FIG. 5 shows the ampoule being opened.

FIG. 6 shows the ampoule resealed with the cap in place.

DESCRIPTION OF THE INVENTION

Referring to FIGS. 1 and 2, there is shown an upper portion of an unsealed glass ampoule 10. A lower portion of the ampoule which is not shown may have a flat or round bottom or any other configuration consistent with its contemplated use. The upper portion of the ampoule has an opening 12 formed in the end thereof and spaced from the end is a necked down portion 14. The opening 12 and the necked down portion 14 form a funnel to facilitate filling of the ampoule. Spaced from the necked down portion 14 is a break line 16 formed by an indentation in the wall of the ampoule. The indentation causes the wall of the ampoule to be thin around the break line and provides a frangible ring.

In use, the ampoule is thoroughly sterilized prior to filling with a material that is to be stored therein. Such material is usually sterilized or is a reagent type chemical. After sterilization, the material is poured into ampoule 10 through opening 12 and neck 14. After pouring the material into the ampoule, neck portion 14 is heated to melt the glass in the area of the neck. When the glass is melted the open ended portion above the neck is removed and upon removal of the heat, the molten glass solidifies and forms a seal 17 as shown in FIG. 3.

In FIG. 3 there is also shown a cap 18 molded from a resilient material such as plastic and having side walls 20. The cap is shown in position to be pressed over the sealed end of ampoule 10. Two spaced annular sealing rings 22 and 24 are formed on an inner surface of wall 20 and are molded to have an inside diameter slightly less than the outside diameter of ampoule 10.

After neck portion 14 is heat sealed, and the ampoule exterior is still in a sterile condition, cap 18 is sterilized and pressed into position over the sealed end of ampoule 10 as shown in FIG. 4. Cap 10 is positioned so that the break line 16 is disposed between sealing rings 22 and 24. Because of the resilient characteristic of the plastic from which cap 18 is molded, sealing rings 22 and 24 firmly engage the outer diameter of ampoule 10 to effect a seal therebetween. This seal maintains the sterility of the interior portion of cap 18 and, more importantly, the sterility of the exterior area adjacent break line 16.

If desired an alternate procedure may be followed whereby the cap is placed on the ampoule in an unsterilized condition and the ampoule and cap are then terminally sterilized.

The heat sealed ampoule prevents contaminants from entering the ampoule and contaminating the material contained therein and the seal is so effective and permanent that the material contained in the ampoule may be stored for extremely long periods of time. The sealed ampoule assures a future user that the material contained therein is sterile and uncontaminated and that no one has previously gained access to the interior of the ampoule. Cap 18 maintains sterility of the exterior area of the ampoule adjacent break line 16 and also protects the portions of the ampoule that are most subject to breakage, namely neck portion 14 and break line 16. Thus, cap 18 protects the ampoule from breakage and reduces costs by eliminating excessive loss of material resulting from broken ampoules.

The ampoule is conveniently and safely opened as shown in FIG. 5. The fingers of a hand grasp the ampoule 10 while the thumb exerts a pressure on cap 18 causing the ampoule to fracture along break line 16. Cap 18 including wall 20 protects the thumb from exposure to the sharp edge of the broken glass. The broken off end of the ampoule is retained within cap 18 by sealing ring 22, thereby eliminating the hazard of broken pieces of glass lying about a laboratory. Cap 18 greatly reduces the hazards involved in opening such a glass ampoule.

In most instances, all of the material contained within the ampoule isn't used at one time and it is desirable to store the material for a short period until a subsequent usage. Such storage is possible by the unique configuration of cap 18. The cap including the broken off end of ampoule 10 is snapped over the opened end of the ampoule as shown in FIG. 6. Sealing ring 24 maintains a tight engagement with the outer wall of ampoule 10 and thereby prevents contaminants from entering the ampoule and maintains the sterility and purity of the material contained within the ampoule during a short period of laboratory storage. The material in the ampoule is not contaminated by an unsterile closure because the cap was sterilized initially and the sterility was maintained by the sealing rings 22 and 24. The cap may be removed and replaced as often as necessary until all the material contained within the ampoule is consumed. It is advisable, however, that the ampoule once opened be stored in an upright position to prevent spillage when the cap is subsequently removed. If the ampoule is stored on its side after being opened in all probability sealing ring 24 will prevent leakage of the material contained in the ampoule; however, the material will flow into the space between the outer surface of the ampoule and the inner surface of wall 20 and will spill when the cap is subsequently removed.

The ampoule need not be made exclusively of glass, many other materials are available. A rigid inert plastic could be used and in such a case a heat seal could also be used to seal neck portion 14. Ampoule could also be made of a metallic substance or even a ceramic material; however, in these instances a heat seal would not be used but rather other sealing means well known in the art, such as a glass bead to seal the tip of the necked portion 14.

If it is desirable for some reason to permit the ampoule to breathe once it is opened, the cap 18 may be gently placed over the open end of ampoule 10 so that seal ring 24 rests upon the broken edge of break line 16. The jagged break line will not effect a tight seal between it and seal ring 24, thereby allowing air to pass into the ampoule, thus allowing the ampoule to breathe.

Thus, the present invention provides all the advantages of heat sealed glass ampoules and eliminates the disadvantages associated therewith. Cap 18 protects the vulnerable portions of the ampoule from breakage and also maintains sterility of the ampoule exterior surfaces adjacent the break line 16. Cap 18 also provides a safe and convenient means for fracturing the ampoule and thereby eliminates the hazards associated with opening a sealed glass ampoule. The cap also provides a means for resealing the ampoule without contaminating the material contained therein.

What is claimed is:

1. A container, comprising:
   - an ampoule having a cylindrical portion terminating in a sealed end;
   - an annular frangible breakline formed around the cylindrical portion adjacent to and spaced from the sealed end;
   - a resilient cup shaped cap fitted over the sealed end and having a cylindrical wall extending over the breakline; and
   - a pair of spaced annular sealing rings formed on an inner surface of the cylindrical wall, said sealing rings formed and arranged for engaging the cylindrical portion on each side of the frangible breakline to form a seal on each side of the breakline.

2. A container as described in claim 1, wherein the ampoule is made of glass and the end is heat sealed.

3. A container as described in claim 1, wherein the frangible breakline has a wall thickness substantially less than that of the cylindrical portion.

4. A container as described in claim 1, wherein the resilient cap is a one piece molded plastic cap.

5. A container as described in claim 1, wherein the sealing rings have inside diameters less than the outside diameter of the cylindrical portion.

6. A container as described in claim 1, wherein the ampoule and cap are sterilized.

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