LIQUID PACKAGING AND DISPENSING MEANS

Frederick W. Bieberdorf and John W. Rhoades, San Antonio, Tex., assignors to American Hospital Supply Corporation, Evanston, Ill., a corporation of Illinois

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This invention relates to liquid packaging and dispensing means and methods. The invention is particularly useful in connection with a container for parenteral solutions and for the packaging and forming the interior and the dispensing of the solutions therefrom for injection.

This application is a continuation of our copending application Serial No. 151,638, filed March 24, 1950 and now abandoned.

An object of the invention is to provide a packaging method and means for the storing and dispensing of sterile liquids. A further object is to provide a container having new and highly useful functions. A further object is to provide dispensing containers and means for storing therein liquids and more particularly parenteral solutions from which such solutions may be introduced parenterally into patients. A still further object is to provide a unique method for storing solutions within a sterile container without introducing unsterile material into the container while at the same time providing means for withdrawing the liquid without contamination thereof.

Yet another object is to provide a method and means for filling a sterile container with a sterile solution while preventing contact between the solution and the inside surfaces of the container with the outside air and without requiring individual handling of the container until it is filled, labeled, and ready for the attachment of the dispensing tube and needles. Other specific objects and advantages will appear as the specification proceeds.

The invention is illustrated in specific embodiments, by the accompanying drawing, in which—

Fig. 1 is a side view in elevation of an empty container which may be employed in the practice of our invention; Fig. 2, a broken plan view of a tube equipped at each end with a needle; Fig. 3, a view similar to Fig. 1 but showing the container filled; Fig. 4, a side view in elevation of the container shown in Fig. 3; Fig. 5, a broken sectional view of a portion of the container and showing the withdrawal needle therein; Fig. 6, a top plan view of plastic tubing from which the containers may be formed and illustrating a method of forming individual containers from the tubing; Fig. 7, a plan view of an unfilled but sealed container; Fig. 8, a plan view of the container shown in Fig. 7 but illustrating a means for introducing sterile liquid within the sterile container; and Fig. 9, a plan view of the filled container and after the withdrawal of the filling tube or needle.

In the illustration given, 10 designates a container which may be formed of any suitable material. We prefer to form the container of plastic material which may be sealed along its end portions. 20

The container may be formed of extruded tubular thermoplastic material, or it may be formed of sheet material which is folded upon itself and then heat-sealed. It will be understood that the container may be formed by a variety of methods and in different shapes.

Methods are now known for the forming of plastic tubing so that the interior surfaces are sterile. In the forming of plastic tubes by extrusion, it is found that the interior surfaces of the tubes are sterile and the collapsed condition of the bag tends to maintain such interior surfaces sterile. We have discovered that after the extrusion or forming of the tubes with sterile inside surfaces, the tubes may be sealed while under the sterile conditions at the time of the forming of the tubes so that thereafter the interior surfaces are maintained in sterile condition. We have also discovered that the tubes may be filled readily and in the volume required for plant production, with sterile liquids and without introducing unsterile material into the container.

We have found that by employing a container having sterile inner surfaces and with the ends thereof sealed, liquid can be effectively introduced through a hollow needle or tube into the container and preferably through a passage at one end of the container so that the liquid is effectively introduced within the container and the container sealed thereafter before the withdrawal of the needle or tube. In other words, we have found a method and means for filling a sealed and sterile container with a sterile solution exposed only to the inner sterile walls of the container and, at no time, from the first formation of the container and through the filling process and the dispensing process, do the inside sterile surfaces come in contact with the outside air. Further, by the method and structure shown, it is not necessary that there be any individual handling of the container until it is filled, labeled, and ready for the attachment of the dispensing tubes and needles.

In the illustration given in Fig. 1, the container 10 is heat-sealed at the upper end 11 and this end may be provided with an opening 12 adapted for receiving a hook or the like for the suspending of the container when the liquid is to be dispensed. The lower end of the container consists of end flaps 13 which may be heat-sealed along the lines indicated. Preferably this end of the container is provided with an opening 14 for receiving the tube 15, as shown more clearly in Figs. 3, 4 and 5.

We prefer to provide a sterilized portion of the container 10 with a patch 16 which extends over a portion of the sterilized surface so that, upon the removal of the patch at a later time, there is provided a sterile surface for the insertion of the needle 17 attached to the tube 15. The patch may be plastic material or any other suitable material and may be secured to the plastic container 10 by heat-sealing along a thin line or by the application of any suitable adhesive, etc.

When the solution in the container is to be withdrawn for injection, the container is suspended upon a standard with the opening 12 in the upper edge thereof engaging a hook on the standard. The patch 16 is removed so as to leave a sterile surface therebelow. The needle 17 is then inserted through the sterile surface and into the interior of the container as shown more clearly in Figs. 3 to 5, inclusive. We prefer to draw the needle first through opening 14 in the lower sealed-end portion 13 of the container, as illustrated best in Fig. 5. This procedure
results in taking the strain off the tube 15 and the needle 17 which has pierced the container wall. The needle 17 may be of any suitable type or construction as illustrated, and, in the illustration given, it is provided with a tapered end portion 18 having an aperture 19.

At the lower end of the tube 15 the injection needle 20 is maintained in sterile condition by the use of a sealed tube 21. We prefer to enclose the needle 17 with a similar sterile tube to thereby maintain this needle in sterile condition and ready for insertion into the filled container 10.

We prefer to form the container 10 and also the tube 15 of plastic material, but it will be understood that other materials may be used. From the description hereinafter set out it will also be understood that there is an advantage in employing a thermoplastic material in the fabrication of the container 10. Any suitable plastic material may be employed. For example, polyethylene, polychloro-fluoroethylene, polymerized vinyl acetate, vinyl chloride (copolymer), cellulose acetate, and a large number of other plastic materials may be used. By using specially treated or formed plastics which are heat-resistant, the filled container can be subject to heat sterilization if desired.

While a number of methods may be employed for the forming of the container, we prefer to form the container and fill it in accordance with the sequence of steps illustrated in Figs. 6 to 9, inclusive. In Fig. 6 there is shown a tube 22 which may consist of a long body of tubing just as it is formed or extruded.

The lower end of the thermoplastic tubing may be heat-sealed as illustrated, or in any desired manner. In the illustration given, the lower end of the tubing is heat-sealed along the line 23 and the diagonal lines 24, and then along the transverse line 25. Also, the flap thus formed by the heat-sealing lines may be provided with an opening 26 which corresponds to the opening 12 as described in Figs. 1 to 5, inclusive. In the same operation, the tube is heat-sealed along the spaced longitudinal or central lines 26 to form sealed passage 29, along the lateral or horizontal lines 28, and along the diagonal lines 27 which extend laterally and at different elevations from the spaced longitudinal lines 26, as shown in Fig. 6.

While the sequence of operations may be varied, it will be assumed now for the purpose of illustration that there is a severance of the container portions outside of the lines of heat sealing 24 and 27 and that portion of line 26 contained between lines 24 and 27, thus forming the structure as illustrated at the bottom of Fig. 6. In the same operation, the bag may be severed transversely along the center of the sealed area 28 so that the bag portions are left sealed on both sides of the line 25. The severed portions of the line 25 are thus shown in Figs. 7, 8 and 9 at both ends of the container. A complete container is thus formed as illustrated in Figs. 7, 8 and 9 with both ends of the container sealed.

Fig. 7, 8 and 9 illustrate the bag formed as above described through several stages. The first stage is the sealed stage of the flat or collapsed bag as it comes from the extrusion machine and after the heat-sealing and cutting steps just described. The upper end of the container is sealed along the line 23. The lower end of the container is sealed along the lines 26, 28 and 25. Fig. 8 illustrates the method of filling. It will be noted that in the lower portion of the container as illustrated there is a sealed passage 29 lying between the walls 26.

We form a slit 30 in one wall of the container about the passage 29 and insert through this slit a hollow needle or tube which is connected to a flexible tube 32 leading to a container of sterile liquid.

The neck of the container or side wall over the passage 29 is preferably sterilized by an alcohol swab or some other convenient method and after the forming of the slit, the needle, which may be sterilized by the same method, is inserted through the slit 30, as illustrated in Fig. 8.

Sterile liquid may thus be introduced into the sterile container without contamination of the inner surfaces thereof. Fig. 9 shows the filled container. After the filling operation described in connection with Fig. 8, the container is heat-sealed along the line 33 to form a completely sealed end, as illustrated in Fig. 9. The needle 31 and tube 32 may then be removed. If desired, the lower end of the tubing may be cut away to form a lower flap somewhat similar to flap 13, as described in connection with Figs. 1 to 5, inclusive.

Operation

The container 10 may be formed from a continuous extruded body of tubing as above described, or from tubing formed in any other manner. The transparent plastic tubing is preferably sealed by heat-sealing, as described in Fig. 7, and the container is preferably filled by inserting the hollow filling needle through a wall thereof and the container after being filled is finally sealed, as illustrated in Figs. 8 and 9.

It will be understood that the container may have imprinted or impressed thereon directions or other indications and may be provided with a suitable scale to indicate to the physician the amount of liquid dispensed at any particular time.

In the dispensing operation, the container is suspended upon a hanger supported by inserting the hook, etc. through the opening 12. The needle 17, after the removal of its sterile covering, is inserted through the sterile surface below the tab or patch 16 and after the tab 16 has been removed, the position of the structure being as illustrated in Fig. 5. It is found that the plastic grips the needle 17 tightly and forms therewith a liquid- and air-tight seal. By bringing the tube 15 through the opening 14 of the end extension 13, the weight of the tube 15 is carried by the flap or end 13 and there is no strain exerted against the wall of the container 10 at the point where the needle has pierced it.

In the usual practice, the dispensing tube 15, which leads to the injection needle 20, is provided with a clamp for controlling the flow of the solution and also the tube may, if desired, be provided with a sight glass containing a drip meter so that the quantity of liquid being introduced into the patient can be determined.

We prefer that the transparent or translucent plastic material, although it will be understood that other suitable materials may be used. By employing a transparent or translucent plastic, the level of the liquid can be noted in connection with a scale or graduation marks on the container and the physician can thus determine the quantity of solution that is being dispensed.

Since the container is formed of flexible material, it is not necessary for air to be introduced into the container while the liquid is being dispensed, and thus contamination from contact with air is avoided. Further, after use, the plastic bag may be discarded along with the tube 15, if desired.

While we have described a method of introducing sterile liquid into a sterile container and sealing the same without contaminating the liquid or inside surfaces of the container, the container may be formed under other conditions and by other methods and the liquid and container may be sterilized by heat, sterilizing rays, or other suitable means.

In the use of the container, we were surprised to find that the needle and plastic container form an unusually tight seal so that the liquid does not leak from the container during the dispensing operation; in fact, it has been found that leakage does not occur over long periods of time, and by reason of this, it is possible to ship the filled container with the needle 17 inserted therein, to the consumer in a carton or other shipping container, should this be desired. We prefer to ship the container without the needle in such position and to insert the needle as above described when it is ready to dispense the liquid.
2,986,143 and after the removal of the tab or patch 16 to provide a sterile spot for the insertion of the needle.

By the means described, it is possible to form the containers with great rapidity while at the same time completing them in sterile condition and filling them without introducing unsterile material into the containers. At the same time, the filled containers are effective in keeping the liquids in sterile condition and through the insertion of the needle through the sterile spot in the container, the liquid may be withdrawn without contamination and in the withdrawal of the liquid air is not introduced into the container. Thus, at no time from the first formation of the sterile container and through the filling process and the dispensing process, inside sterile surfaces come in contact with the outside air.

While in the foregoing specification, we have set out certain structures and certain method steps in considerable detail for the purpose of illustrating the embodiments of the invention, it will be understood that such details may be varied widely by those skilled in the art without departing from the spirit of our invention.

We claim:

1. A liquid-dispensing package, comprising a flexible plastic container sealed at both ends and equipped at one end with an extension having an opening therein, a tube extending through said opening in the container extension, and a hollow needle secured to the end of said tube and extending through a wall of said container and into the liquid within said container, the wall of said container about the needle being drawn inwardly to form an inwardly-extending collar forming a seal about said needle.

2. A liquid-dispensing package, comprising a flexible plastic container sealed at both ends and equipped at one end with an extension having an opening therein, liquid in said container, a tube extending through said opening in the container extension, and a hollow needle secured to the end of said tube and extending through a wall of said container and into the liquid within said container, the wall of said container about the needle being drawn inwardly to form an inwardly-extending collar forming a seal about said needle.

3. A liquid-dispensing package, comprising a flexible container formed of a transparent plastic tube, the ends of the tube being sealed, liquid at least partially filling said container, said container being provided at each end with an extension of each of said extensions being provided with an aperture, a tube extending through the aperture in one extension of said container, and a hollow needle secured to the end of said tube and extending through a wall of said container and into the liquid within said container, the wall of said container about the needle being drawn inwardly to form an inwardly-extending collar forming a seal about said needle.

4. A liquid-dispensing package, comprising a flexible container formed of a translucent thermoplastic tube, one end of the tube being heat-sealed and the other end of the tube having a passage-providing neck formed by spaced longitudinal heat-sealed lines in the central portion of the tube, lines of heat-sealing extending laterally from said spaced longitudinal lines at different elevations and toward the sides of said tube to provide end flaps for supporting said neck, said neck being sealed at the outer end thereof to provide a closed tube.

5. The structure of claim 4, in which a tube extends into said neck.

6. The structure of claim 4, in which the sealed end of said tube is provided opposite said neck with a strap extension having an aperture therein for the suspension of the tube in inverted position.

7. A liquid-dispensing package, comprising a flexible plastic container sealed at both ends, a tube, means on said container for attaching the tube to the container, and a hollow needle secured to the end of said tube and extending through said tube wall of said container and into the liquid contained therein, the wall of said container about the needle being drawn inwardly to form an inwardly-extending collar forming a seal about said needle.

8. A liquid-dispensing package, comprising a resin plastic container having flexible walls against each other in the absence of liquid, said container being sealed to render it liquid-tight, liquid at least partially filling said container, one of said collapsible walls having a sterilized area, and a readily releasable sealing patch united to said wall and extending over at least a portion of said area in sealed relation thereto, said patch upon removal presenting a sterile surface for puncture by a pointed hollow member for the withdrawal of liquid.

9. A liquid-dispensing package, comprising a flexible plastic transparent container sealed at both ends and equipped with an extension at each end thereof, each of the extensions being provided with an opening, liquid in said container, and a hollow needle and tube unit adapted for the withdrawal of liquid from said container, said unit extending through an opening in one extension so as to be supported thereby, and said hollow needle extending through a side wall of said container and into the liquid contained therein, the wall of said container about the needle being drawn inwardly to form an inwardly-extending collar about said needle, said hollow needle having an opening extending through the side of the needle and communicating with the interior of the container.

10. A dispensing package for liquids, comprising a thermoplastic container, sealed to provide a hermetic enclosure and having flexible walls which collapse against each other in the absence of liquid, liquid at least partially filling said container, and a hollow tubular member for the withdrawal of liquid extending through a wall portion of said container, said member having a pointed closed end extending through the container wall and having an inlet opening spaced rearwardly of the point and communicating with the liquid therein below the level of said liquid, a wall portion of said container being drawn inwardly to form a continuous collar lying flat against said member and extending a distance greater than the thickness of said wall.

11. A liquid-dispensing package, comprising a resin plastic container sealed to provide a liquid-tight container, a liquid at least partially filling said container, said plastic being stretchable and having flexible walls which collapse in the absence of liquid, a hollow needle for the withdrawal of liquid extending through a collapsible wall portion of said container and having an inlet opening spaced from its point by a tapered surface free of cutting edges, said inlet opening communicating with the liquid in the container below the level of the liquid, the plastic wall being stretched about said needle to form a continuous liquid-tight and air-tight collar lying flat under tension against and gripping said needle and extending inwardly a distance greater than the radius of the opening through which the needle passes.

12. The structure of claim 11 in which the resin-plastic is polyvinyl chloride.

13. The structure of claim 11 in which the resin-plastic is polyethylene.

14. A liquid dispensing package comprising: a resin plastic container sealed to provide a liquid-tight container, liquid at least partially filling said container, said plastic being stretchable and flexible, and a hollow needle for the withdrawal of liquid extending through a wall portion of said container and having an inlet opening, said inlet opening communicating with the liquid in the container below the level of the liquid, the plastic wall being stretched about and gripping said needle to form a continuous liquid-tight and air-tight collar lying flat under tension against and gripping said needle and extending inwardly a distance greater than the radius of the opening through which the needle passes, said hollow needle having a tapered surface free of cutting edges between the inlet opening and the needle point.
15. A liquid dispensing package as set forth in claim 14 wherein said collar extends inwardly a distance greater than the radius of said needle.

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