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T. R. HOLMES ET AL

3,207,374

DISPENSER

Filed Nov. 14, 1963

Fig. 1.

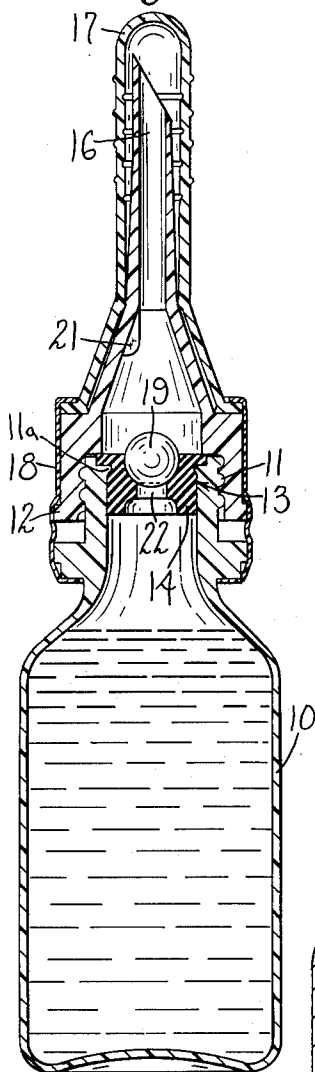


Fig. 2.

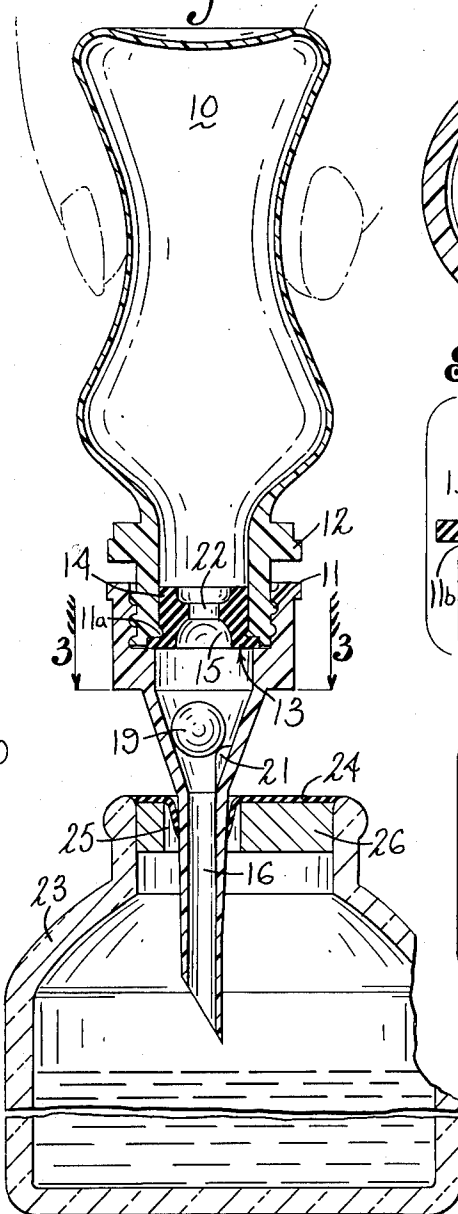


Fig. 3.

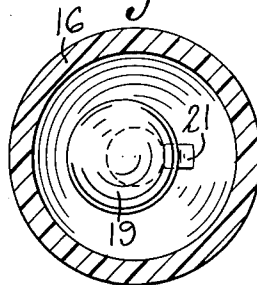


Fig. 4.

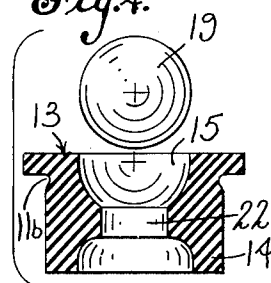


Fig. 5.

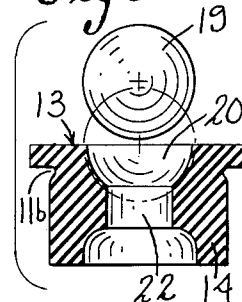
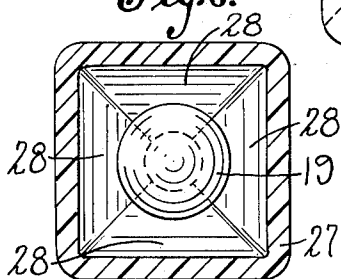


Fig. 6.



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3,207,374 DISPENSER

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2 Claims. (Cl. 222—80)

The present invention relates to a novel method and device for dispensing liquid, semi-liquid and solid materials such as powders. The device is particularly designed and useful for dispensing liquid drug concentrates such as concentrates of muscle relaxant drugs such as succinyl choline.

In the issued United States Patent 2,957,609 of a co-inventor of the present application, there is described a collapsible container particularly designed for powdered succinyl choline including a valve device adapted to be ejected from the valve seat by pneumatic pressure created as the result of pressure applied to the collapsible walls of the container.

Although eminently adapted for the dispensing of powdered material, this device is not appropriate for the dispensing of a liquid material such as a propylene glycol concentrate of succinyl choline. Although the device will be described and illustrated in connection with the dispensing of a liquid drug concentrate, it is understood that the construction is readily adaptable to many other uses in the cosmetic, food and insecticidal fields, for example.

Prepared sterile solutions of isotonic saline and saline solutions containing small quantities of glucose are commonly employed for the intravenous or parenteral administration of various types of drugs including muscle relaxant drugs. The maintenance and preservation of these solutions under completely sterile conditions during storage and use is of the utmost importance.

Sterile solutions of the aforementioned type are supplied by a number of manufacturers but the addition to such solutions of additives under absolutely aseptic conditions has presented a substantial problem. One proposed solution consists of packing the diluent under diminished pressure and providing the concentrate container with a hypodermic needle by means of which the transfer is effected through puncture of a frangible diaphragm in the closure for the diluent bottle. By these means the drug is automatically drawn into the bottle of diluent and the solution thereby prepared for administration. This method has not proven entirely satisfactory since the success of the mixing operation depends upon the preservation of an accurate vacuum in the diluent container.

The present invention discloses a novel form of valve device in combination with a collapsible container preferably designed for the dispensing of drug liquids in conjunction with a solution container for a diluent designed to be administered parenterally to the patient.

Reference to the drawings appended hereto will reveal that:

FIG. 1 is a sectional elevation of a typical form of device incorporating the features of the present invention.

FIG. 2 shows the use of the novel valve arrangement in the preparation of isotonic sterile solutions of the drug for parenteral administration.

FIG. 3 is a transverse section illustrating the valve device of the invention in tilted relation with respect to the outlet channel of the container.

FIG. 4 is an exploded view showing one embodiment of the valve device of the invention.

FIG. 5 is an exploded vertical section showing a further embodiment of the valve device of the invention.

FIG. 6 is a transverse section showing the valve device

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in operational position with respect to a modified form of outlet channel.

In general, the device of the invention comprises a collapsible dispensing container having an outlet channel and a ball valve frictionally engaged in a semi-spherical valve seat and adapted to be ejected from the said seat upon the application of manual pressure or vacuum to the walls of the collapsible container.

Referring in detail to the drawings, it will be observed that numeral 10 designates a flexible plastic container of polyethylene or similar flexible material with the neck portion provided with conventional threads 11 of the type for application of the screw cap. The collapsible container 10 is provided with an external flange 12 having a series of knurls or lugs for the retention of a plastic sealing band 18 to preserve the sterile integrity of the container contents.

The neck of the bottle is adapted for the reception of an elastic valve device 13 of polyethylene or other plastic or rubber material having a dependent annular skirt portion 14 which is received in the neck portion of the collapsible container as clearly shown in FIGURE 1 of the drawings. The upper portion of the valve device 13 is in the form of a disk of greater diameter than the skirt portion to provide a supporting ledge for the valve device when positioned in the mouth of the collapsible container. The valve device 13 is also held against displacement from the neck of the bottle by a bead 11a formed near the mouth of the bottle which interlocks with an annular groove 11b formed in the valve device 13. As shown in the drawings, an internally threaded piercing device 16 is adapted to be threaded onto the mouth portion of the collapsible container 10 in such a manner that the outer flanged portion of the valve device 13 is clamped between an annular shoulder formed internally above the threaded section of the piercing device and the lip of the container mouth. A protective sheath of plastic or other material 17 is positioned over the piercing device 16 and aseptically seals the upper part of the assembly from contamination.

In accordance with the present invention, the valve device 13 is provided with a semi-spherical seat portion 15 having a ball valve 19 shown in detail in FIGURES 4 and 5 of the drawings. The dimensions of the semi-spherical valve seat in all embodiments are such to frictionally engage and retain the ball valve 19 when it is manually or mechanically pressed down into the seat portion in the manner clearly illustrated in the drawings. This may be accomplished in the manner illustrated in FIGURES 1 and 4 by the expedient of forming the semi-spherical valve seat with dimensions such that the said seat extends slightly beyond the imaginary axis of the said ball valve in the manner illustrated by FIGURE 4 of the drawings. In this embodiment the ball valve may be said to "snap" into the socket provided by the semi-spherical valve seat 15.

Essentially the same effect may be achieved, however, by following the teaching of FIGURE 5 wherein it will be observed that the radius of curvature of the valve seat 20 is slightly less than the radius of curvature of the ball valve 19 so that when the ball valve is pressed into the socket provided by the valve seat 20, it is frictionally held therein by pressure from the surrounding valve device 13. The dome of the piercing device 16 may be provided with an integral inwardly directed fin or tilting device 21 as shown particularly in FIGURES 1 and 2 of the drawings so that when the ball valve is ejected through pressure applied to the walls of the collapsible container in the manner illustrated by FIGURE 2 of the drawings, the ball valve 19 is suspended against the adjacent inner wall of the piercing device 16 allowing the liquid or other contents of the collapsible container 10 to flow through

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the opening 22 in the valve device 13 downwardly and around the ball valve 19 and thence through the channel of the piercing device 16 and into the solution container 23. This operation involves piercing the frangible diaphragm 24 which normally closes an opening 25 in the stopper 26 of the solution container 23 as will be readily understood.

On applying pressure manually to the sides of the collapsible container in the manner illustrated by FIGURE 2, or alternatively by vacuum applied from the parenteral solution bottle, the liquid or other material within the collapsible container 10 functions to "pop" the ball valve 19 out of its semi-spherical seat 15 in the manner illustrated clearly in the drawings. By varying the dimensions and/or degree of sphericity of the valve seat relative to the size of the ball valve 19, it will be understood by those skilled in the art that it is possible to vary the pressure applied to the collapsible container 10 in order to expel the valve from its seat.

A modified form of piercing device is illustrated by FIGURE 6 of the drawings wherein it will be observed that the cross section of the modified form of piercing device 27 is of square or rectangular cross section, thereby eliminating the deflecting device 21 shown in the other embodiments of the drawings. In this modification, the ball valve on being ejected from its seat 15 rests on the sides of the sloping walls 28 so that the liquid or other contents of the collapsible container can flow around the ball valve 19 through the corners of the modified type of piercing device 27 and thence into the outlet as will be readily understood.

Although the container 10 has been shown in the drawings as being manually operated to produce the pressure necessary to dislodge the ball valve 19 as shown in FIGURE 2, this pressure may consist simply of atmospheric pressure created by a vacuum present in the parenteral solution bottle 23.

These and other modifications of the invention will be readily apparent to those skilled in the art without departing from the spirit and scope of the invention as defined in the claims.

What we claim is:

1. A dispensing device comprising a collapsible container having an outlet passage therefrom and a pouring

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spout terminating in a piercing device, the outlet passage from the collapsible container being formed with a semi-spherical valve seat external to the outlet passage and a ball valve normally closing the semi-spherical valve seat, the semi-spherical valve seat extending circumferentially beyond the midpoint of the ball valve to retain the ball valve in said seat, said ball valve being adapted to be displaced by manual pressure on the collapsible container to eject the contents thereof through said outlet passage, and a projection disposed on the interior of the pouring spout below the semi-spherical valve seat, when the container is inverted, for tilting the ball valve when displaced from its seat by the application of pressure to the collapsible container and to allow passage of the drug concentrate through the said pouring spout.

2. A dispensing device comprising a collapsible container having an outlet passage therefrom and a pouring spout terminating in a piercing device, the outlet passage from the collapsible container being formed with a semi-spherical valve seat external to the outlet passage and a ball valve normally closing the semi-spherical valve seat, the said semi-spherical valve seat having a radius of curvature slightly less than the radius of curvature of the ball valve so that the ball valve when closing the outlet passage is frictionally retained in the semi-spherical valve seat against displacement until manual pressure is applied to the collapsible container to eject the contents thereof through the outlet passage and the pouring spout and a projection in the pouring spout for tilting the ball valve away from at least one side of the interior of the piercing device to permit passage of the container contents there-through.

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