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DISPENSING AND PACKAGING DEVICE FOR FLUIDS

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2 Sheets-Sheet 2

Fig. 4.

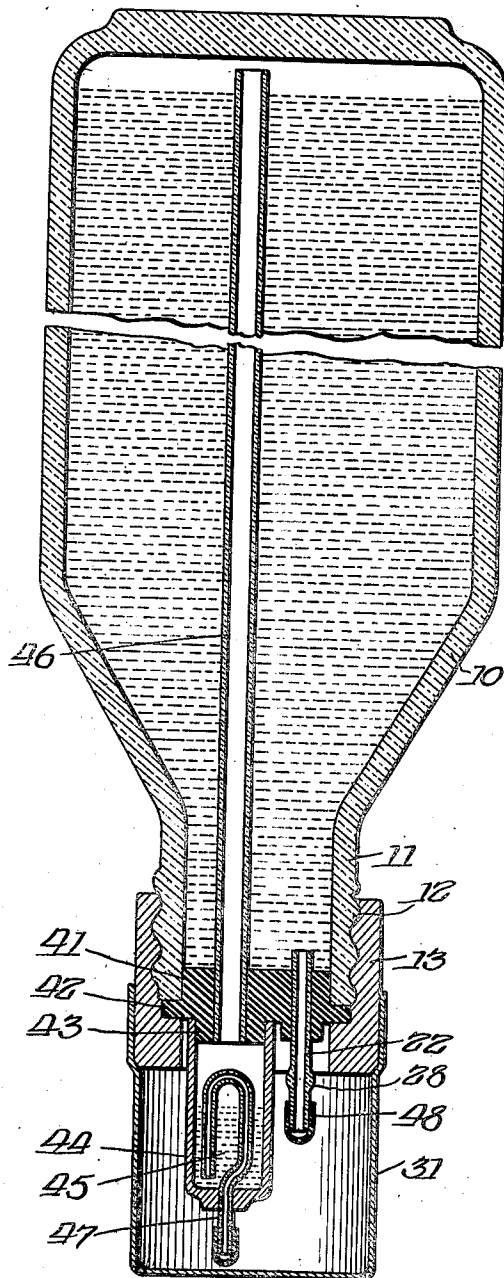
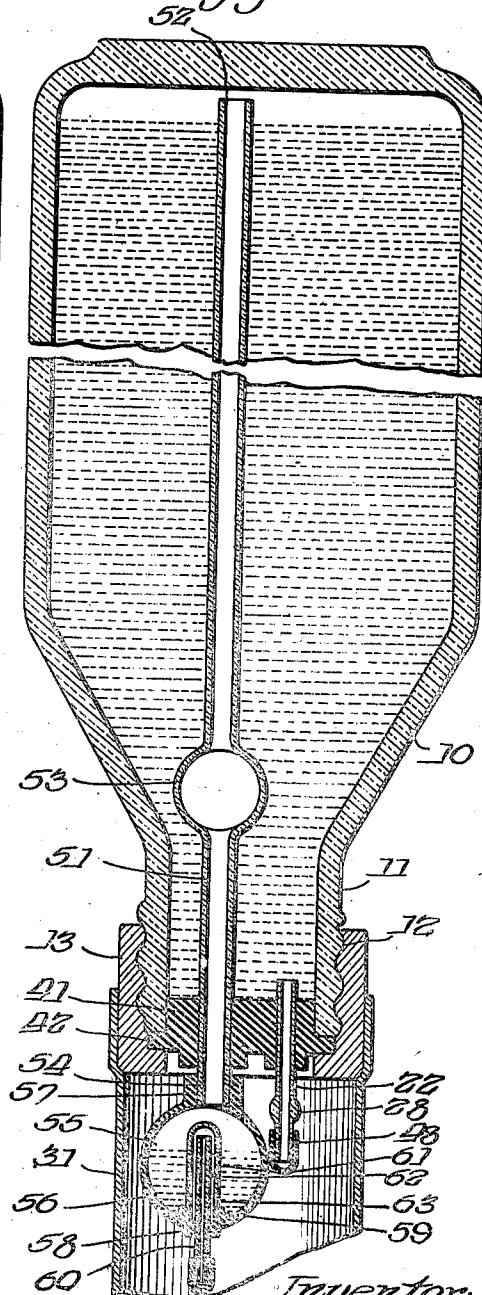


Fig. 5.



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DISPENSING AND PACKAGING DEVICE
FOR FLUIDS

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6 Claims. (Cl. 128-214)

This device relates to liquid dispensing apparatus and more particularly to devices for dispensing sterile liquids for subcutaneous or intravenous injections or like uses. In the continuous withdrawal of liquids from containers generally, it is necessary that air or other gas or fluid be permitted to enter the container to replace the liquid withdrawn, and in devices to be employed for the purposes herein specifically pointed out, it is particularly important that the air entering the container upon withdrawal of the liquid be filtered or washed in order to prevent contamination of the sterile liquids within the container.

The practice of injecting liquids intravenously, subcutaneously or intramuscularly into tissue is well known to medical science, and it is also well known that the introduction of aseptic medicinal liquid for this purpose may be dangerous to the patient, owing to the possibility of foreign matter in the form of dust, spores and other impurities becoming entrained in the liquid to be injected from the air with which the liquid comes in contact within the container, thus rendering the liquid septic and unfit for injection purposes.

A primary object of the invention is to provide improved apparatus for washing the incoming air or gas prior to its entry into the liquid container, and an important feature of the invention is the provision of a construction in which the incoming air may or may not bubble through the liquid to be dispensed as in devices known to the art. A further object of the invention is to provide liquid dispensing apparatus in which a portion of the liquid to be dispensed serves as the medium for washing incoming air. Further objects are to provide a device of this type of simple construction and which may be readily sterilized and assembled.

A further particularly important object of the invention is the provision of a unitary package which includes the previously sterilized dispensing apparatus. It will be seen that the dispensing apparatus including a dispensing tube may be delivered in a sealed package to hospitals or other users and the device rendered ready for use by removing the housing shell, and the seal over the air inlet tube, without again sterilizing the dispensing apparatus or tube which are preferably sterilized at a central distributing point when the sterile liquid is placed in the container.

A feature of one embodiment of the invention is the provision of improved means for drawing liquid into the air washing device, thereby in-

suring at all times an adequate supply of washing fluid.

It will be understood that the invention may be employed in connection with other liquid dispensing devices other than in the field of utility particularly specified, and, it, therefore, finds a wide industrial field of utility wherever it is desired to dispense a sterile or uncontaminated liquid.

The invention will be readily understood from the following description in conjunction with the accompanying drawings wherein certain preferred embodiments of the invention are illustrated, in which:

Fig. 1 is a broken, vertical, sectional view of a preferred embodiment of the invention;

Fig. 2, a fragmentary, vertical, sectional view of an embodiment quite similar to that shown in Fig. 1;

Fig. 3, a sectional view taken along the line 3-3 of Fig. 1;

Fig. 4, a broken, vertical, sectional view of another embodiment of the invention;

Fig. 5, a broken, vertical, sectional view of a further modification.

Referring generally to the drawings, it will be seen that in all of the figures the improved container and dispensing device are shown in the inverted position, and it is in this inverted position that all of the various embodiments illustrated operate, although it is to be understood that the devices may be modified within the scope of the invention to be employed upon containers operable in an upright position.

Referring to Figures 1, 2 and 3 of the drawings, wherein quite similar embodiments of the invention are shown, the reference character 10 indicates a container, preferably made of glass provided with a neck 11 having external screw threads 12. The combined packaging unit, liquid dispensing means and air washing means are retained in position by a collar 13 removably mounted on the threads 12 of the container neck. The inner surface of the collar 13 is provided with a seat for the flange portions 14 and 15 of plug members 16 and 17 which may be formed of any suitable material such as hard rubber, plastics or glass. The plug member 16 is disposed adjacent the opening in the neck of the container. The plug member 16 is provided with a recessed portion 18 terminating in a restricted portion opening into the container and adapted to support the lower end of a tube 19 provided with an expanded portion 20 adapted to serve as a charging chamber, which may be omitted if desired,

the tube having an open end 21 preferably adjacent the bottom of the container in the upright position of the container. The plug member 16 is likewise provided with a bore in which is frictionally retained a liquid dispensing tube 22, the upper end of the dispensing tube extending slightly above the upper portion of the plug member 16, thereby forming a sedimentation zone from which liquid cannot be withdrawn from the container.

The lower plug member 17 is secured against the member 16 and is similar thereto and is provided with a recessed portion 23 corresponding to the portion 18 and forming therewith a single air washing chamber 24. The lower end of the member 17 is provided with a boss 25 having a constricted bore adapted to frictionally retain therein the lower end of an air inlet tube 26 preferably in the form of a goose neck disposed within the air washing chamber 24 and having an opening 27 therein. The member 17 is provided with a second bore frictionally retaining the lower portion of the liquid dispensing tube 22, the dispensing tube having a beaded end 28 below the member 17 upon which is retained the end of a flexible dispensing tube 29 provided with a clamp 30.

As shown in Figures 1 and 2, the invention may be employed in the form of a unitary package, particularly when the container is to be used for dispensing fluids used in intravenous or subcutaneous injections such as physiological salt solutions, glucose solutions, blood for transfusion purposes, and other fluids in the field of medicine, and for these uses and other related uses, the container may be employed as a package for such fluids which are retained in sterile condition and ready for use. As shown in the drawings, the rubber tube 29 fitted over the beaded end 28 of the liquid dispensing tube 22 adapted to carry the sterile solution to its point of discharge, is coiled below the neck of the container. A shell 31 of sheet material houses the coiled tubing and is provided with an offset annular flange 32 adapted to frictionally engage the outer surface of the plug member 13 and retain the shell 31 and the tubing in the position shown in the drawings until the device is to be used.

The construction shown in Fig. 2 is similar to that of Fig. 1, the principal differences being that a shorter air inlet tube 33 is employed or eliminated entirely, the inner end 34 of the tube opening at an intermediate point within the container, thus permitting the previously washed incoming air to bubble through the sterile liquid. The collar member 13 is provided with an annular slot adapted to receive and frictionally retain the flanged extensions 35, offset inwardly, of the tube housing 31.

The container 10 is preferably filled with the desired sterile liquid at a suitable central distributing point before the plug members and collar are secured to the neck of the container. If desired, the container may be filled, after the air washing and plug members are inserted, by forcing the liquid through the tube 22, the air within the container being displaced through the air inlet 19, the chamber 18, and the air inlet 26. The air washing assembly, collar 13, and the liquid dispensing members 22 and 29 are sterilized before and after the members are assembled in the package form shown in Figs. 1 and 2, and before the cover 31 is applied, so that the device is ready for use upon removal of the cover shell

31 and the seal 36 placed over the end of the air inlet tube 26.

The device is readily assembled by inserting the air inlet tubes 19 and 26 and the liquid dispensing tube 22 in their respective bores in the plug members 16 and 17, mounting the flanges 14 and 15 of the plug members in the shoulder portion of the collar 13, securing the collar to the neck of the container, and then heating the liquid and the members of the dispensing and washing assembly to a sterilizing temperature. The clamp 30 may then be closed, while the container and its contents are hot, to form an area of reduced pressure at the top of the container above the liquid contents thereof when the container returns to normal room temperature. The cover shell 31 is then fitted over the edge portion of the collar 13 and the device is ready for shipment in the form of a unitary package.

In its upright position, the container is preferably filled with the sterile liquid to a point just below the neck of the bottle, and in this position it will be apparent that the liquid will enter the tube 19 through the orifice 21 and will approximately seek its level in the tube which will be well within the charging chamber 20. When the container is inverted prior to dispensing, liquid from the charging chamber 20 and the tube 21 will enter the air washing chamber 23 to approximately the level indicated in Figure 1, and this liquid portion serves as the filtering medium for the incoming air. The chamber 23 is of such diameter and length as to prevent any possibility of fluid siphoning out through the air inlet tube 26 prior to the flow of liquid through the dispensing duct 22.

When the clamp 30 is released on the dispensing tube 29, a constant flow of liquid therethrough is assured by the admission of air through the air inlet tube 19. Air enters the container through the goose neck inlet tube 26, bubbles upwardly through the washing liquid within the air washing chamber 24, through the air tube 19, and out of the orifice 21 into the then upper portion of the container 10. It will thus be seen that the air entering the container has been thoroughly cleansed of any dust, lint, spores or other foreign matter in passing with considerable ebullition through the washing liquid in the chamber 24. The provision of the charging chamber 20, which may serve as an expansion chamber, effectually removes any possibility of washing liquid being returned to the container by ebullition within the washing chamber 24.

The embodiment of Fig. 4 is similar to that shown in Figs. 1, 2 and 3 and differs therefrom in that only a single plug member 41 is employed. The member 41 is provided with side flanges 42 and depending flanges 43. The side flanges 42 are adapted to rest in the shoulder of the collar 13, threaded upon the neck of the container 11. A shell 44 preferably molded of a plastic material, is frictionally fitted on the outer surface of the depending flange 43 and provides an air washing chamber 45. The upper portion of the air washing chamber 45 opens into the lower end of an air inlet tube 46 mounted in a centrally located bore in the plug member 41 and preferably extends adjacent to the bottom of the container 10 in its upright position, although, if desired, the air inlet tube 46 may terminate at an intermediate point in the container. The air inlet tube 47 is preferably in the form of a goose-neck within the air washing chamber, and it, together with the liquid dispensing tube 22 and the

cover shell 31, are similar in construction to the members described in Fig. 1. The liquid tubing adapted to convey the solution to its point of discharge, is not shown, but it is to be understood that it may be coiled within the cover shell 31, as described in connection with the embodiment of Fig. 1, to form a unitary package of the container, sterile liquid, and air washing assembly. Similarly, the air inlet tube 46 may be provided with a charging chamber (not shown) positioned similarly and of similar outline to the charging chamber 20 shown in Fig. 1. The container of Fig. 4 may be filled in the manner previously described, and in operation sterile liquid is dispensed and the incoming air washed in the manner set forth in connection with the embodiments of Figs. 1-3.

The construction shown in Figure 5 is somewhat similar to the embodiments previously described in that the device may be included in the form of a package with the liquid to be dispensed, and the dispensing tube (not shown) may be included within the cover shell 31. The collar member 13 and the plug member 41, are similar in construction to the members shown in the embodiments previously described, although it is to be understood that a plurality of plug members may be employed, as shown in Fig. 1. In like manner, the liquid dispensing tube 22 is frictionally retained within a bore of the plug member 41 and is provided with a temporary seal 48 over its lower end. Likewise, the air inlet tube 51 is mounted within the container and has an opening 52 preferably adjacent the top of the container in its inverted position, as shown in the drawings, and is provided at an intermediate portion with a charging chamber 53. The lower end 54 of the air inlet tube 51 preferably extends slightly below the plug member 41 in the inverted position of the container. The air washing chamber 55 of this embodiment is in the form of a collapsible ball 56, preferably formed of rubber, and is provided at its upper end with an annulus 57 adapted to frictionally engage the lower end 54 of the air inlet tube. The lower end of the rubber sphere is provided with a boss 58 and shoulder members 59. A primary air inlet tube 60 of restricted diameter extends through a bore in the boss 58 and is positioned within a tubular member 61 supported within the sphere 56 by the shoulder members 59. An overflow chamber 62 is formed between the tubular members 61 and 60, and it is to be noted that the tubular member 61 is provided with a passage 63 between the overflow chamber 62 and the air washing chamber 55. The members 61 and 60 may be formed of glass, thin metal or plastics.

In operation, the container 10 is preferably filled with sterile liquid at a central distributing point, the members of the dispensing assembly are then sterilized and mounted upon and within the container, as shown in Fig. 5. In the normally upright position of the container prior to use, a portion of the liquid will extend into the air inlet tube 51 to an intermediate point within the chamber 53. Upon inversion of the container and removal of the cover shell 31 and the temporary seals 48 over the ends of the liquid dispensing tube 22 and the primary air inlet 60, a rubber tubing, equipped with a flow control and means for injection or other use, is fitted over the beaded end 28 of the liquid dispensing tube. The expanded spherical member 56 is then collapsed by the fingers of the operator to force out the air normally contained

therein and upon return of the member 56 to its normal spherical position, a charge of washing fluid will be drawn therein from the air inlet tube 51 and the charge chamber 53. A primary purpose of this construction is the fact that an adequate supply of washing fluid will be present in the air washing chamber 55. Prior to dispensing of the liquid within the container through the tube 22, a portion of the washing liquid within the chamber 55 will enter the overflow chamber 62 through the passage 63. Upon withdrawal of sterile liquid through the dispensing tube 22, air will enter the overflow chamber 62 through the primary air inlet tube 60 and will force a portion of the liquid in the overflow chamber back into the air washing chamber 55. The incoming air thus passes downwardly through the overflow or expansion chamber 62, through the passage 63 and bubbles upwardly through the washing liquid in the chamber 55 where it receives a thorough washing before entering the air inlet tube 51 and emerging into the top of the container 10, thus permitting an even flow of the liquid within the container 10. If desired, the charging chamber 53 may be omitted.

It is to be noted that in all of the embodiments there is no possibility of the washing fluid becoming commingled with the sterile liquid to be dispensed, as in some of the devices known to the art. Likewise, in all of the embodiments it will be understood that the size of the fluid outlet is related to the size of the air inlet, so that the rate of flow of liquid from the dispensing tubes will maintain a balanced condition.

While the novelty of the construction has been emphasized in the field of medicine, it will be understood that my improved device is not limited to such use, but that the dispensing device has a wide field of utility, which will be readily appreciated by those skilled in the art.

As apparent from the foregoing description, a particular advantage of the improved self-contained package is that, unlike similar devices, the interior of the container is not open to the atmosphere until the device is ready for use in the inverted position, since there is no outer core to be removed or cap to be added, thereby eliminating the possibility of contamination of the liquid to be dispensed prior to the dispensing of the liquid, due to inrush of unwashed air particularly when a reduced pressure prevails within the container.

What I claim is:

1. In combination with a container having an open neck and operable upon inversion, a plug member removably mounted in the neck of said container and having an annular flange, a collar member removably secured to the neck of said container and adapted to engage said flange to retain the plug member within the container, an air washing chamber formed adjacent said plug member, an inlet to convey air to said chamber during the dispensing operation, a tube conveying air from said chamber to the interior of said container, said tube being provided with an expanded portion serving as a charging chamber for the air washing chamber, and a liquid outlet extending through said plug.

2. In combination with a container having an open neck and operable upon inversion, a plug member removably mounted within the neck of the container, an air washing chamber directly below said plug, an inlet conveying air to said chamber terminating in a goose neck within said chamber adapted to discharge below the liquid

level in said chamber, a tube mounted on said plug to convey washed air to said container, and a liquid outlet extending through said plug and spaced from said air chamber.

3. In combination with a container having an open neck, plug members within the neck of said container, a collar removably mounted on the neck of said container retaining said plug members within the mouth of the container; corresponding bores within said plug members forming an air washing chamber, an inlet tube extending through the lower plug member to supply air to said chamber, and a tube mounted on the upper plug conveying washed air into said container, and a liquid outlet extending through said plug members and spaced from said air washing chamber.

4. In combination with a container operable upon inversion and having an open neck, a plug member within the neck of the container, a corresponding member adjoining said plug member, said members being retained in adjoining position by a member removably mounted on the neck of the container, corresponding bores in said plug members adapted to form an air washing chamber, an air inlet mounted in one of said members and forming a goose neck within said air washing chamber having an opening below the normal liquid level within said chamber, a tube extending through the other member into the interior of said container, said tube having an expanded portion adapted to supply washing liquid to said air washing chamber, said liquid forming a portion of the liquid to be dispensed, and a liquid outlet extending through

said plug members and spaced from said air washing chamber.

5. In combination with a container having an open neck, a plug disposed in the neck of said container, a liquid outlet extending through said plug, a tube mounted in said plug extending therethrough and into said container further than said liquid outlet, a hollow member depending from said plug below said tube and forming an air washing chamber, and an air inlet tube extending through the bottom of said hollow member and having an opening within said air washing chamber below the normal liquid level therein.

6. In combination with a container having an open neck and operable upon inversion, a plug member having a flange resting on the end of the container neck, a collar member removably mounted on the neck of the container adapted to retain said flange on the end of the container, a liquid outlet extending through said plug, an air inlet tube mounted on said plug extending therethrough and into the interior of said container, a hollow member depending from said plug below said air inlet tube and forming an air washing chamber, a tube extending through said hollow member and into said chamber and discharging below the normal liquid level in said chamber, and a closure secured to said collar and housing said hollow member and second air inlet tube to form a presterilized package including said container, its liquid content, and the dispensing and air washing assembly.

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