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CLOSURE

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Fig. 1

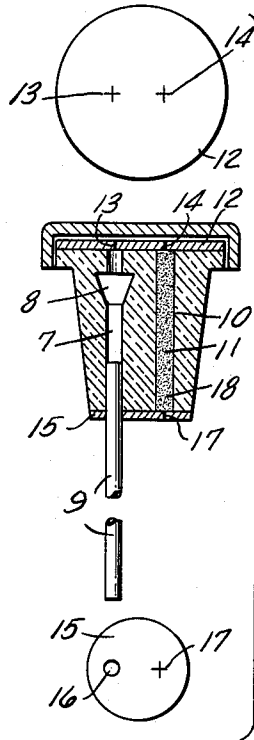
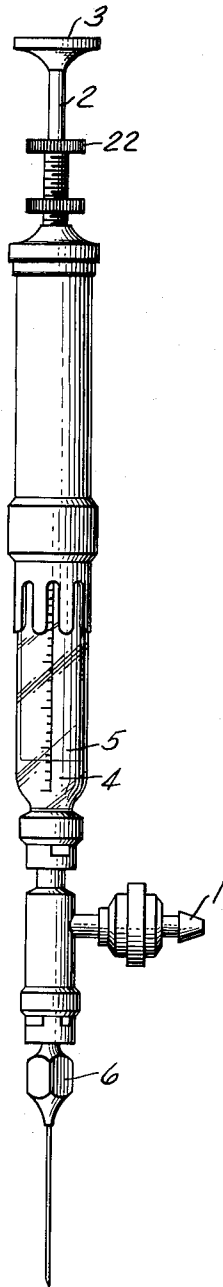


Fig. 3

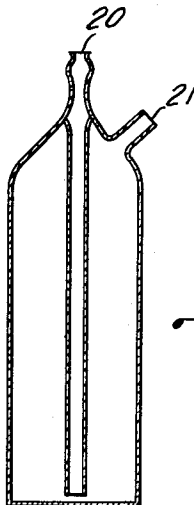


Fig. 2

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ATTORNEYS

1

2,744,648

CLOSURE

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1 Claim. (Cl. 215—79)

The object of this invention is a novel closure which, when used in combination with a bottle, and also a novel vial, either object when used in combination with an automatically refilling hypodermic syringe, will permit a greater dexterity and efficiency of operation of filling and inoculating with the automatic hypodermic syringe, without the risk of bacteria from the atmosphere contaminating the contents of the bottle and/or fluids to be injected.

In the drawings forming a part of my specification: Figure 1 illustrates the side view and outward appearance of an automatic refilling syringe.

Figure 2 is a cross-sectional view of a vial to be used in combination with an automatic refilling syringe.

Figure 3 is a cross-sectional view of a stopper in accordance with my invention together with the plan view of the two discs cemented to the top and bottom parts of the stopper.

The apparatus shown in Figure 1 represents a syringe-type of instrument used for dispensing and automatically refilling pre-determined quantities of a fluid. Since such an instrument is known in the profession, no detailed description of this unit need be given here. In operation, a flexible piece of tubing connected to the outlet 1 leads into a reservoir containing the liquid to be dispensed. Compression and release of the plunger 2, accompanied by pressure of one's hand on the handle 3, fills the barrel of the syringe with a quantity of fluid whose volume is predetermined by setting the depth of the plunger 5. Compression of the plunger handle 3 then releases the fluid contained in the barrel 4 through a syringe needle 6.

One feature of the invention described here is illustrated in cross-section in Figure 3 and is designed for use in combination with a bottle and an automatic refilling syringe such as that shown in Figure 1. This stopper should preferably be composed of a non-porous flexible material such as rubber. The stopper has one vertical bore 7 the top of which is funnel-shaped as shown 8 so as to receive the extension 1 (Figure 1). A tube 9, which may be of glass, metal, plastic, or other such rigid material, is inserted part way into the bottom opening of the bore 7. The length of this tube 9, depends upon the depth of the container into which the stopper is placed; in general, it would be desirable to have the tube reach very close to the bottom of the container.

Another vertical bore 10 runs through this stopper and is filled with a bacterial filter 11 such as non-absorbent cotton, glass wool, or some other such material frequently used in the bacteriological laboratory.

A disc of rubber 12 or other such flexible material is cemented to the stopper. This disc has two incised openings 13 and 14 so arranged as to be in juxtaposition with the two top openings in the stopper. The use of a flexible material for this top piece 12 permits a cover which is essentially sealed unless pressure is brought to bear on these incisions. The bottom of the stopper has

2

a similar piece of flexible material 15 cemented to it, except that an opening 16 permits the tube 9 to pass through it and the incised opening 17 is in juxtaposition with the end of the bore 18. A stopper such as shown in Figure 3 and described above would permit such operations as follows:

A vaccine bottle or similar container could be prepared so as to contain a liquid pharmacological preparation. The bottle and its contents, aseptically prepared, would be aseptically sealed with a sterile stopper such as illustrated in Figure 3, and perhaps capped 19 with some substance such as metal or rubber to further insure sterility. Such a container may be readily shipped and stored without risk of evaporation or contamination. The inoculating instrument illustrated in Figure 1 may be readily sterilized by the usual autoclaving methods and kept sterile, either wrapped or in some container, for extended periods of time. An investigator wishing to inject the solution from such a vaccine bottle into some living organism need only remove the cap 19 and plunge the end 1 through the opening 13, observing the usual precautions to insure aseptic technique. Compressing and releasing the plunger 2 will draw into the syringe an amount of fluid pre-determined by setting the depth of the plunger 5, using the adjusting screw 22. It is now possible to inject a number of animals, for example, with fixed amounts of a liquid preparation. The total amount of fluid that may be injected with the apparatus described above is governed not by the capacity of the syringe, but by the capacity of the vaccine bottle. Thus the frequent refilling required when the conventional syringe is used for making numerous inoculations is considerably reduced if not, in most cases, eliminated.

The filling operation of the conventional hypodermic syringe using a vaccine bottle with conventional stopper makes it necessary to inject into the vaccine bottle through a rubber or rubber-like stopper a quantity of air equal or similar in quantity to the volume of fluid that is to be withdrawn from the vaccine bottle. Since the air which is drawn into the syringe and then injected into the stoppered vaccine bottle comes from the atmosphere, it is not sterile and there is occasional risk that microorganisms will contaminate the fluid in the vaccine bottle. The stopper shown in Figure 3 and described above permits only sterile air to enter the vaccine bottle, since it must pass through the bore 10 which is filled with a bacteriological filter 11.

An empty vaccine bottle stoppered with a stopper such as shown in Figure 3 may also be filled more efficiently than a bottle containing a conventional rubber cap or stopper. The conventional vaccine bottle stopper necessitates the periodical removal of air from the vaccine bottle being filled, since a closed system exists and the air pressure within the bottle increases. An alternative operation would be to remove the vaccine bottle stopper entirely and pipette the liquid into the bottle, thus increasing the risk of contamination of the fluid. But with the stopper shown in Figure 3 an inoculating needle attached to a syringe may be introduced through the opening 13 and the vaccine bottle completely filled with fluid while the displaced air leaves through the vent 10.

The opening 8 in Figure 3 is here shown as being funnel-shaped and resembling in form the nozzle 1, Figure 1. This construction has the advantage of reducing the risk of the nozzle 1 slipping out of the opening 7 should the weight of the vaccine bottle in which the stopper is contained be too heavy.

It is clear that stoppers may have numerous shapes and sizes other than that shown in Figure 3 without deviating from the principles described in this invention. For example, the cavity 8 is indicated as being funnel-shaped in order that it will conform to the shape of the

3

protuberance 1. It is clear that this cavity may be any shape depending upon the shape of the connecting protuberance on the syringe or in fact the cavity may be omitted leaving a bore of equal diameter throughout if the protuberance designated here as 1 were to be tubular and also with a diameter equal throughout.

Although the tube 9 in Figure 3 is here illustrated as being straight, it is clear that this tube may be curved without deviating from the principles and innovations set forth in this invention.

Although the incisions in the discs 12 and 15 are here shown as being composed of two incisions so made as to resemble cross-marks or X-marks, such incisions may be of a number other than that shown here and in different geometrical patterns without deviating from the functions ascribed to these discs and incisions.

The stopper described above and shown in Figure 3 has been primarily designed for use with a vaccine bottle or other such container but glass vials such as that shown in cross-section in Figure 2 may also be used in conjunction with the inoculating instrument shown in Figure 1 without deviating from the principles involved in the aseptic dissemination of fixed quantities of a fluid. A vial such as that illustrated in Figure 2 may be sterilized after the openings 20 and 21 are plugged with a material such as non-absorbent cotton. It is then filled with any desired fluid, using the usual aseptic technique and attached to the projection 1 through a section of sterile flexible tubing after removing the plug placed in the opening at 20.

Having now set forth the nature and objects of my invention, what I claim as new and useful and of my own invention, and desire to secure by Letters Patent is:

A bottle stopper comprising a main body of compressible material, said body having a first axially di-

4

rected bore extending therethrough, said first bore being substantially filled with a bacterial filter material, a second axially directed bore in said main body and extending therethrough, said second bore having its wall cutwardly recessed at a point adjacent and inwardly spaced from the top of said main body to form a substantially funnel-shaped enlargement in said second bore, said funnel-shaped enlargement having its widest portion adjacent the top of said main body and tapering inwardly toward the bottom of said main body, a thin disc of compressible material cemented to the top of said main body and having a diameter equal to that of the top of said main body, said disc having an essentially X-shaped incision therein in alignment with said first bore and a second essentially X-shaped incision therein in alignment with said second bore and a second thin disc of flexible material cemented to the bottom of said main body and having a diameter equal to the diameter of the bottom of said main body, said second disc having an essentially X-shaped incision therein in alignment with said first bore and an aperture therein in alignment with said second bore.

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