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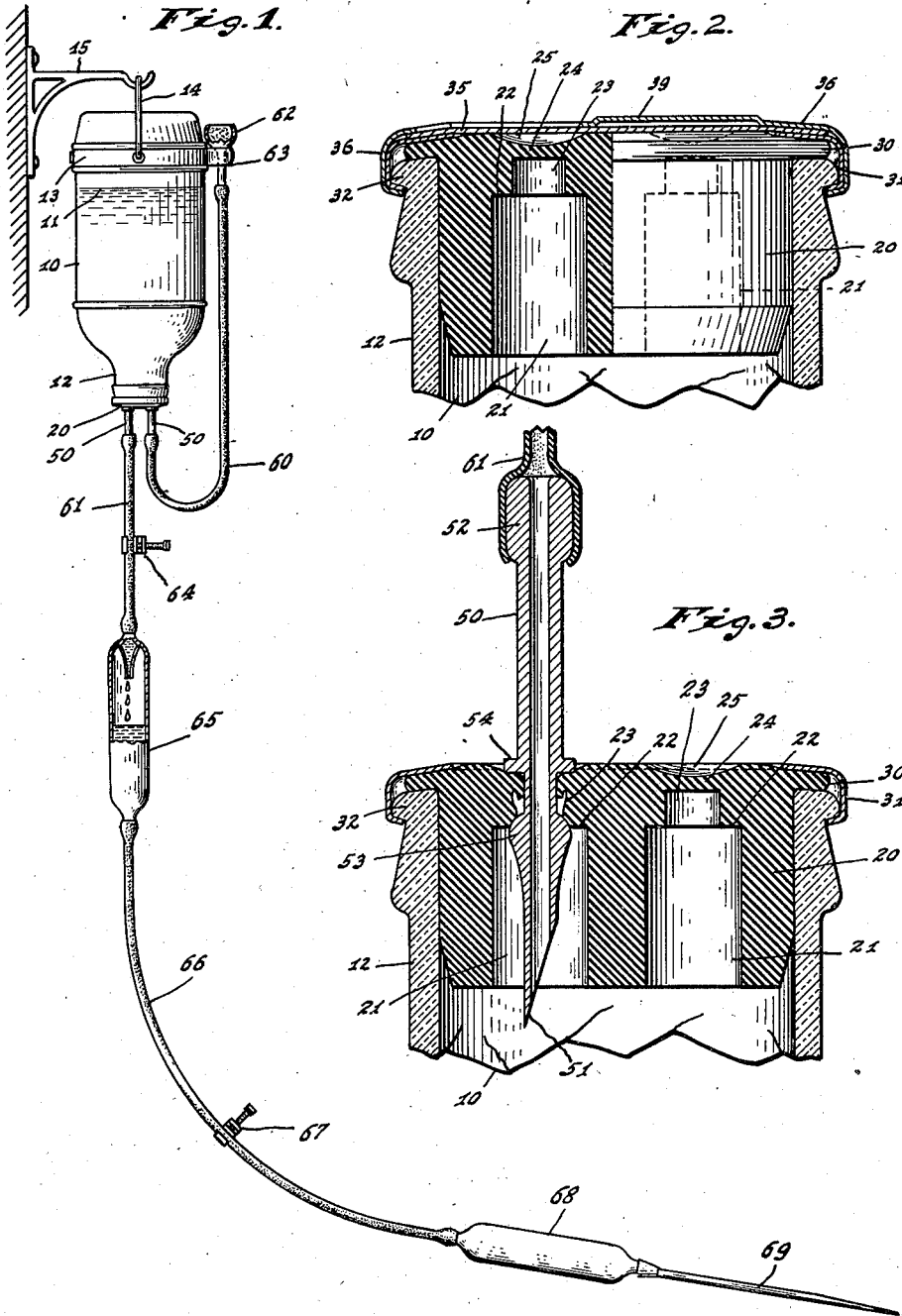
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2,231,418

LIQUID-ADMINISTERING APPARATUS

Filed March 2, 1940

2 Sheets-Sheet 1



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Fig. 4.

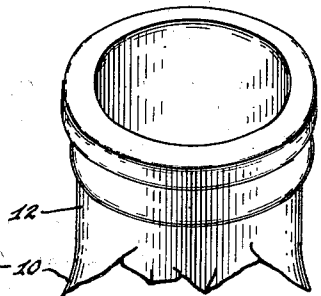
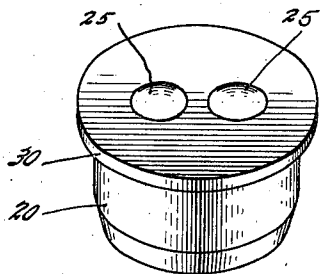
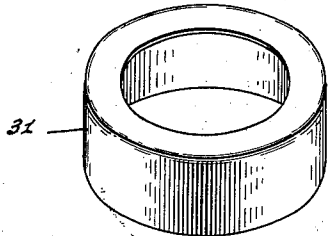
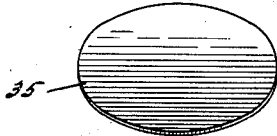
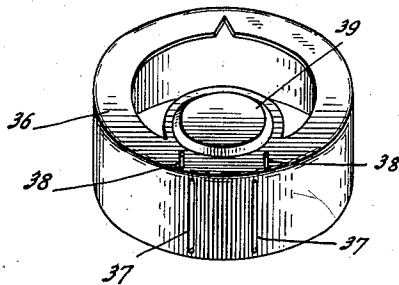


Fig. 5.

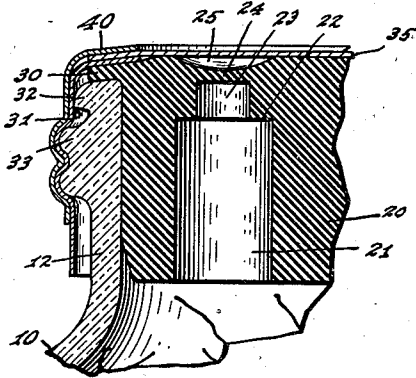


Fig. 6.

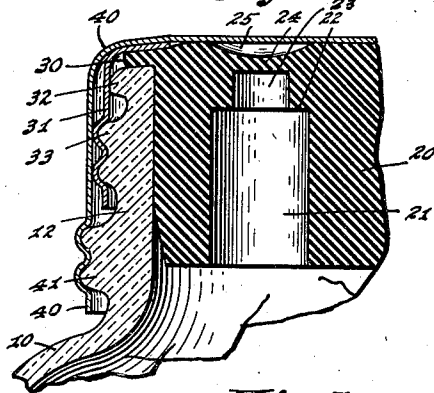
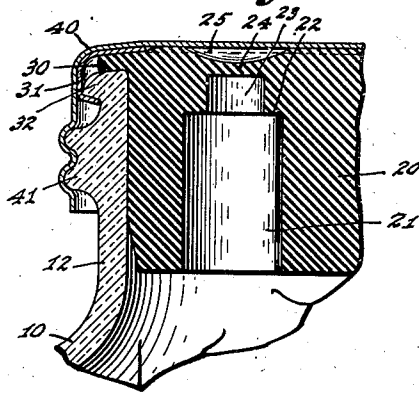


Fig. 7.



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## UNITED STATES PATENT OFFICE

2,231,418

## LIQUID-ADMINISTERING APPARATUS

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4 Claims. (Cl. 128-214)

My invention relates to apparatus for containing and supplying liquids for intravenous administration.

It is the object of my invention to provide a closure for containers for intravenously administrable solutions, such for instance as dextrose or salt or gum salt (such as acacia) solutions; and to provide in connection therewith a hollow supply needle by which the solution may be withdrawn from the container and administered intravenously with substantial freedom from danger of contamination and which is so related to the closure that when inserted therein it will stay in place against accidental removal and will provide a leak-proof joint.

The accompanying drawings illustrate my invention. In those drawings, Fig. 1 is a schematic view of the entire apparatus for the intravenous administration of the desired liquid, with the liquid container in the inverted position which it has when in use for supplying liquid; Fig. 2 is an enlarged fragmental view, mainly in section but with the rubber stopper partly in elevation, of the upper end of the liquid container, in upright position, showing the container mouth and one form of closure means embodying my invention, with the closure complete; Fig. 3 is a fragmental view generally similar to Fig. 2, but wholly in section, and showing the container mouth and the closure of Fig. 1 after the protecting device has been removed and one supply needle has been inserted in place; Fig. 4 is a disassembled isometric view of the container mouth and closure mechanism of Fig. 2, showing the various parts separately in position one above another in the order in which they are put together; and Figs. 5, 6, and 7 are fragmental sectional views showing modified forms of holding means of the closure assembly.

The liquid container 10, shown inverted in Fig. 1 and upright in the other figures, may contain any desired liquid 11 for intravenous administration, such for instance as a dextrose solution or a salt solution or a gum salt (acacia) solution; the nature of the solution to be administered is no part of my invention. The container 10 is usually in the form of a bottle, which at one end has a neck 12 terminating in an open mouth for receiving the closure mechanism. Near the end remote from its mouth the bottle conveniently has around it a suspending ring 13, conveniently located between circumferential beads on the bottle body; and the ring is provided with a bail 14 by which the bottle may be supported in inverted position from a bracket

15 during the process of administering the solution.

The open mouth of the container neck 12 receives a rubber stopper 20, which is put in place after the container has been filled with the desired liquid. This rubber stopper 20 is of peculiar construction. It has at least one hole 21, and desirably two holes 21, which extend from its lower face well up toward its upper face, where each hole is desirably provided with a transverse shoulder 22 extending inwardly toward the center line of the hole and from which a smaller hole-portion 23 extends upward still further toward the upper face of the stopper but not completely to that upper face. The upper end of each smaller hole-portion 23 is completely closed by a web 24 which lies just below the upper face of the stopper and is integral (of one piece) with the body of the rubber stopper 20. Above each web 24 the upper face of the stopper 20 is provided with a depression 25 which indicates the location of the hole beneath it.

The rubber stopper 20 fits within the mouth of the container neck 12, and at its upper peripheral edge it has a circumferential flange 30 which overlies and bears against the upper edge of the wall which forms the container neck. While the rubber stopper can be held in place merely by friction, due to its fit in the container mouth, I prefer to hold it in place by a ring 31, preferably of sheet metal, which has an inwardly extending and generally flat portion which overlies the stopper-flange 30, and also has a skirt portion which extends down past the flange 30 and past a bead 32 that is provided around the mouth of the container neck 12. The ring 31 is put in place over the rubber stopper 20 after that stopper has been put into the container mouth. The skirt of the ring 31 may have different forms. In the forms shown in Figs. 2, 3, 4, and 7, this skirt is unthreaded, and is crimped around and under the bead 32 to hold the ring and the rubber stopper 20 firmly in place. In the forms shown in Figs. 5 and 6, the skirt of the ring 31 is provided with screw threads which co-operate with screw threads 33 on the exterior of the container neck 12. In normal use, the rubber stopper 20 and the ring 31 are never removed.

After the container has been closed by the rubber stopper 20, and the rubber stopper has desirably been fastened in place by the ring 31, a removable protecting device is put in place over them. This removable protecting device may take different forms.

In the form of protecting device shown in Figs. 55

2, 4, and 5, a relatively rigid disk 35, conveniently of sheet metal, is laid over the upper face of the rubber stopper 20, and over the flat portion of the ring 31 when that ring is used. The disk 35 is conveniently of about the same diameter as the flange 30. In Figs. 2 and 4 the disk 35 is held in place by a second sheet-metal ring 36, which has an inwardly extending generally flat portion that extends inward and overlies the edge of the disk 35, and also has a skirt portion which fits over the skirt portion of the ring 31 and which is also crimped below the bead 32. The ring 36, however, is an easily breakable ring. In the form shown in these figures, it has two parallel slots 37 in its skirt portion, and two parallel slots 38 in its flat portion, to provide between the slots a strip which may be easily torn out. That intervening strip between the slots 38 is continuous with an inwardly extending tab or finger-clip 39 which lies fairly close against the top of the disk 35 and which can be lifted with the fingers to provide a handle by which the strip may be torn loose from the remainder of the ring 36 to break that ring and thus permit its easy removal from the container. When the ring 36 is thus removed, the disk 35 is released and may also be removed, to expose the upper surface of the rubber stopper 20, and thus to make accessible the two webs 24 which normally close the upper ends of the holes 21. But the ring 31 still remains in place.

In the modifications shown in Figs. 5, 6, and 7, the rubber stopper 20 and the ring 31 are the same as has already been described, with that ring 31 held in place either by crimping (Fig. 7) or by screw threads (Figs. 5 and 6). But the protecting device is a screw-cap 40, which is put over the stopper 20 and ring 31 and is screwed into place. The screw threads of the screw-cap 40 may co-operate with screw threads 41 provided on the exterior of the container neck 12 below the bead 32 in Fig. 7 or below and larger than the screw threads 33 in Fig. 6; or it may co-operate with screw-threads on the outside of the screw-threaded ring 31 of Fig. 5, in which case the skirt of the ring 31 may be extended downward to provide a portion which may be gripped by the thumb and fingers to prevent the ring 31 from unscrewing when the screw-cap 40 is unscrewed. When the screw-cap 40 is used, it may be a complete cap with no hole through its flat top portion, as in the structures of Figs. 6 and 7, in which case no separate disk 35 need be provided to overlie the stopper 20 and ring 31; or it may be of annular form, with a central hole through it, as in the structure of Fig. 5, in which case the separate disk 35 is needed. In any of these modifications, of Figs. 5, 6, and 7, the screw-cap 40 is unscrewed and removed, and the disk 35 is also removed if it is present, to give access to the top of the rubber stopper 20 and to the webs 24.

In any of the variations of my invention, the container 10 and its contents are made suitably sterile. For instance, the contents of the container 10 may be sterilized before being put into the container, as by sterilizing filtration or by heat, and the container 10 and all the parts that form the closure may be suitably sterilized before assembly and carefully kept sterile during assembly; and/or the container 10 and its contents may be sterilized by heat after the assembly is complete. In either case, the ring 36 or the screw-cap 40 will not be removed until it is desired to administer the contents of the container

10, so that until then the upper surface of the rubber stopper 20 is protected and kept sterile.

Also, in any of the variations of my invention, the ring 31 may be omitted; but if the ring 31 is used, as I prefer, it normally will never be removed in use.

Although the upper surface of the rubber stopper 20 is exposed in preparing for the administration of the liquid in the container 10, the rubber stopper 20 is also never removed in use. Instead, the integral rubber web or webs 24 of that stopper are punctured by special hollow supply needles 50, one for each web 24. Each supply needle 50 is a tubular member cut obliquely at one end to form a puncturing point 51, and provided at the other end with a bead or enlargement 52 for receiving a rubber tube and holding it in place. Above the oblique cut-off portion which provides the puncturing point 51, the tubular supply needle 50 is flared to provide an enlargement 53 which is slightly larger than the reduced-size hole portion 23 of the hole 21, and which desirably has its upper end rounded as is clear from Fig. 3. Slightly higher on the tubular supply needle 50 is a second enlargement 54, conveniently in the form of a substantially flat circumferential flange 54, which by engaging the face of the rubber stopper limits the distance the supply needle may be thrust therethrough.

The distance between the two enlargements 53 and 54 is desirably such that they may grip between them transverse faces of the rubber stopper around the hole through which the supply needle extends. In the preferred embodiment illustrated, in which the shoulder 22 is provided, that distance between the enlargements 53 and 54 is slightly less than the distance between the shoulder 22 and the face of the depression 25, so that by the resilient action of the rubber of the punctured web 24 on the supply needle 50, either by the frictional grip of the web on the supply-needle stem or by direct action against the enlargement 54 or by both, after the supply needle has been thrust through the web 24, the enlargement 53 may be drawn tight against the rubber corner between the shoulder 22 and the reduced-size hole extension 23, as is clear from Fig. 3. An effective seal is provided, both by that tight engagement and by the grip of the punctured web on the stem of the supply needle.

When it is desired to administer the liquid contents of the container 10, the ring 36 or screw-cap 40 is removed, and with it the disk 35 if one is used, as has already been described, and two sterile supply needles 50 are put in place through the two webs 24. Rubber tubes 60 and 61 are attached to the two sterile supply needles 50, preferably prior to their insertion through the stopper 20, by being slipped over the beads or enlargements 52 thereof. The rubber tube 60 leads to an air filter 62, which may be simply a glass tube open at both ends and provided with an enlargement filled with sterile cotton or glass wool, which air filter 62 is conveniently supported in spring fingers 63 provided on the suspending ring 13. The rubber tube 61, which may be provided with a tube clamp 64 for controlling the liquid flow through it, leads to a glass drip-tube 65 (conveniently a "Murphy drip") of standard construction, and a rubber tube 66, which may also be provided with a tube-clamp 67 to control the liquid flow through it, leads from the lower end of the drip-tube 65 to one end of a glass needle-adaptor observation tube 68, to the other end of which is attached the hypodermic needle 69 which is inserted

into the patient's vein for the desired intravenous administration. The parts 64 to 69 are of well-known construction.

The flow of the liquid from the container 10 into the patient's vein by way of the hypodermic needle 69 is controlled by the tube clamps 64 and/or 67, and the physician is informed as to the operation by inspection of the drip-tube 65 and the needle-adaptor observation tube 68.

10 I claim as my invention:

1. A container-closure for containers of liquids for intravenous administration, comprising a rubber stopper which has a hole extending from its lower face almost to its upper face and which also has between the end of the hole and said upper face an integral web which closes the hole-end, said hole having a smaller portion near said web and a larger portion remote from said web to provide a shoulder between said hole portions, in combination with a tubular supply needle which has one end pointed for puncturing and insertion through said web and also has two spaced enlargements which on insertion of the supply needle through said web grip between them the shoulder within the hole closed by said web and the upper face of the rubber stopper.

2. A container-closure for containers of liquids for intravenous administration, comprising a rubber stopper which has two holes, each extending from its lower face almost to its upper face and which also has between the end of each hole and said upper face an integral web which closes the hole-end, each of said holes having a smaller portion near said web and a larger portion remote from said web to provide a shoulder between said two hole portions, in combination with two tubular supply needles each of which has one end pointed

for puncturing and insertion through one of said webs and also has two spaced enlargements which on insertion of that supply needle through one of said webs grip between them the shoulder within the hole closed by said web and the upper face of said rubber stopper.

3. A container-closure for containers of liquids for intravenous administration, comprising a rubber stopper which has a hole extending from its lower face almost to its upper face and which also has between the end of the hole and said upper face an integral web which closes the hole-end, which rubber stopper also has transverse faces around the hole above and below said web, in combination with a tubular supply needle which has one end pointed for puncturing and insertion through the web of said rubber stopper and also has two spaced enlargements which on such insertion of the supply needle through said web grip said transverse faces between them.

4. A container-closure for containers of liquids for intravenous administration, comprising a rubber stopper which has two holes each extending from its lower face almost to its upper face and which also has between the end of each hole and said upper face an integral web which closes the hole-end, which rubber stopper also has transverse faces around each hole above and below said web, in combination with two tubular supply needles each of which has one end pointed for puncturing and insertion through one of the webs of said rubber stopper and also has two spaced enlargements which on such insertion of the supply needle through one of said webs grip said transverse faces between them.

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