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A. E. OSTERBERG

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APPARATUS FOR INTRAVENOUS ADMINISTRATION OF FLUIDS

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Fig. 1.

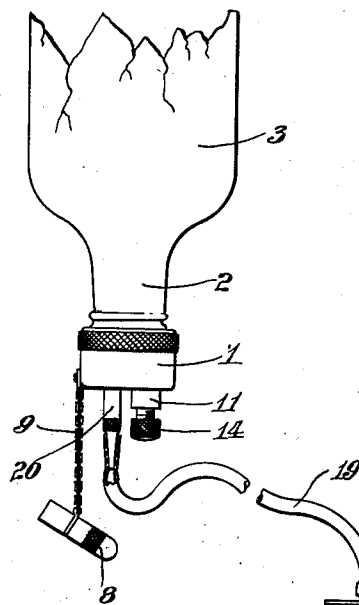


Fig. 2.

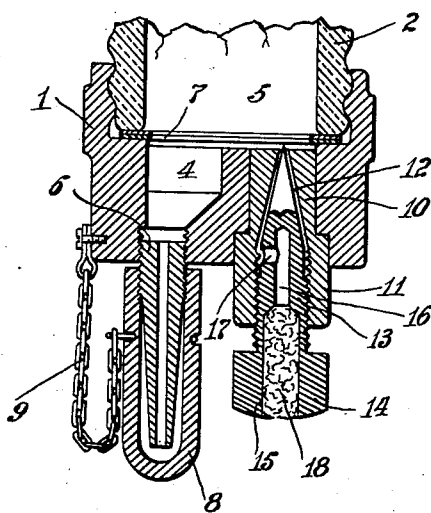


Fig. 4.

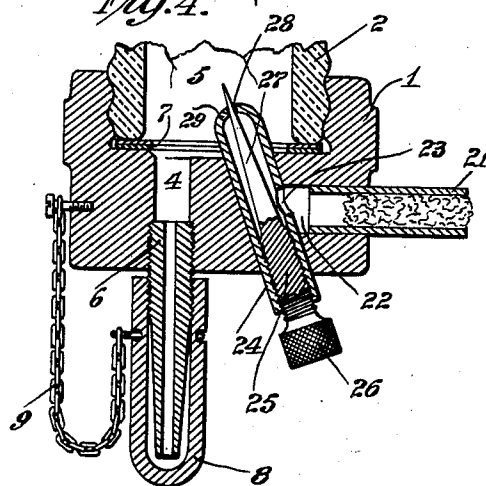
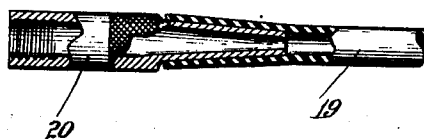


Fig. 3.



INVENTOR
Arnold E. Osterberg

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APPARATUS FOR INTRAVENOUS ADMINISTRATION OF FLUIDS

Arnold E. Osterberg, Rochester, Minn., assignor
to The Chemical Foundation, Incorporated, a
corporation of Delaware

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3 Claims. (Cl. 128—214)

This invention relates to apparatus for intravenous administration of fluids in large quantities, and particularly to a valved cap and closure construction adapted for use not only with containers employed in the preparation, sterilization, preservation and administration of solutions beneficial in intravenous therapy, but also with those employed for blood transfusion procedures employing the indirect method utilizing citrated blood.

The object of my invention is to simplify and facilitate these administration and transfusion procedures; to promote their safety, safeguard their sterility, and economize the medium transmitted; and to provide means whereby these objects are attained, and which means will permit the administration of various fluids in large quantities and the injection of fluids possessing a viscosity greater than that of physiologic salt solution, such as a twenty-five per cent. solution of dextrose or sucrose.

With these objects in view, my invention more particularly consists in those features of the closure construction set forth and described herein and illustrated in the accompanying drawing, forming a part of this specification, in which Figure 1 represents an elevational view showing the neck end of a container to which is attached my improved cap with its associated elements, from which has been detached the pendant nozzle cover to show the nozzle with the tubing connection to a needle.

Figure 2 represents a median vertical section on an enlarged scale showing the cover on the nozzle.

Figure 3 represents a longitudinal cross-section of an adapter for connection of the nozzle to a tubing; and

Figure 4 represents a cross-section of an alternative disposition of the nozzle and air inlet valve in the cap.

In these several figures 1 is the cap shown as adapted for screw-threaded engagement with the neck 2 of a container 3. An irregular chamber 4 extends through said cap, adapted to receive at one end the mouth 5 of the container, and at the other end the outlet nozzle 6. 7 is a gasket, preferably of soft metal, interposed between the mouth of the container and the cap. The cap 1 is threaded to engage the said neck 2 and the exit port of chamber 4 is threaded to engage said nozzle. 8 is a protecting cover adapted to enclose said nozzle and threaded to engage therewith. 9 is a chain securing the cover to the cap. A second chamber extending through said cap

is fitted with a bush 10. This bush has an internally threaded extension 11 at its outer end and a conical bore 12 at its inner end.

A conically-tapered bolt 13 is screw-fitted in the opening in 11. Its tapered end seats in the conically-tapered bore 12 and projects beyond it towards the mouth of the container, constituting an adjustable needle-valve for regulating the admission of air to the container. The head 14 of the bolt has a recess 15 communicating with an axial chamber 16 having a port 17 communicating with the bore 12. The recess 15, chamber 16, and port 17 afford air-admission to the container when the bolt 13 is retracted; and effect a closure when the bolt end is seated in the conical bore 12. Cotton 18 is placed in the recess 15 to afford air-filtering means. 19 is the rubber tubing connected either directly to the outlet nozzle, or, alternatively, to an adapter 20, which may be, and preferably is, fitted to said nozzle. The tubing is terminated by the hollow needle 19' mounted therein. The customary screw-clamp, not shown, may be attached to the tubing for controlling the flow of fluid. The several rotatable parts are preferably knurled, as shown, for greater ease of manipulation.

In the alternative form of embodiment of my invention illustrated in Figure 4, there is substituted for the air-inlet formed in the valve-stem, a separate air-inlet tube 21 fitted in a recess 22 in the cap, which recess opens into a port 23 in the cylindrical shell 24 having threaded engagement with the valve-stem 25. The valve-stem 25 has a head 26 and terminates in the conical tip 27 which seats in the orifice 28 in the rounded head 29 of the shell 24, and may project into the mouth 5 of the bottle 3.

In operation, the fluid to be administered is prepared in the container; the cap is placed thereon, and the capped container is autoclaved until sterilization is assured. The cover of the outlet nozzle is then removed, the needle valve unscrewed slightly, and the rubber tubing attached to the nozzle by means of the adapter. The container is next inverted, in which position the air-inlet nozzle is pointed upward and the fluid-outlet nozzle is pointed downwardly. As the fluid in the container seeks an outlet, it fills the recess in the cap, the outlet nozzle and tubing. While it has a tendency to escape through the air-inlet nozzle, it is prevented from doing so by the weight of the fluid in the outlet nozzle column and by the size of the aperture in which the needle of the air inlet valve seats, this aperture being a passage approximately but 0.015 inch in

diameter and controllable at will. The container having been inverted and placed upon a suitable support, such as a holder mounted on a ring-stand, a small amount of liquid is allowed to run out of the tubing in order to insure removal of air. The tubing is next attached by means of a customary adapter to the needle which has previously been inserted into the vein, and the rapidity of injection regulated preferably by lowering or raising the holder on the ring-stand relative to the point of injection. If desired, such regulation may be effected by the use of a screw-clamp on the tubing, as is common practice. If the nozzle outlet is approximately 15 inches above the site of injection, the fluid will flow at approximately 20 c. c. per minute through a number 18-gauge needle. Increasing the height to approximately 18 inches will increase this rate of flow approximately twofold. The rate of injection may be gauged by noting the rate at which air passes through the air inlet, rendering insertion of a Murphy drip tube into the circuit unnecessary.

If, by any cause, there is plugging or clogging of the needle or tubing, air ceases to flow through the inlet, indicating such condition.

Among the notable advantages attained by this structure are the fact that if the container be left on its side, there will be substantially no leakage; at most, but a few drops, if any; that the needle valve, when closed, serves to close the aperture in which it seats and to keep it closed, thereby preventing any clogging between that point and the cotton air-filter; and that, when ready for use, slight unscrewing of this valve will allow air to enter and will then afford a free passage for it; and that, on the other hand, any clogging or plugging of this aperture, which may occur from drying out of the solution, can be relieved by closing this needle valve, and a free passage reopened. Thus a free air passage is assured at all times by the manually controllable air-inlet needle-valve, without impairment of sterile conditions.

The alternative type, shown in Figure 4, presents an arrangement of the air inlet valve which may be desirable from the machining standpoint, or molding operations such as would be used in fashioning it of Bakelite, or in casting it from suitable corrosion-resistant alloys, without sacrifice of the structural advantages attainable by virtue of the provision of an air inlet valve having a lumen at the point of air entrance to the valve passage, and the additional advantage, if desired, of a second lumen between that point and the

valve-seat orifice, in which cotton may be plugged to afford additional air-filtration, as may be desired. The cover for the outlet nozzle preserves sterility of the latter in times of storage, and its attachment to the cap minimizes its contacts and handling, and insures its accessibility when required.

Having thus described my invention, I claim:

1. In an apparatus for the intravenous administration of fluids, a container and a closure therefor, said closure having a liquid outlet chamber and an air inlet chamber, the former terminating in a nozzle for hose connection and the latter adapted to house a valve; a bush fitted in said latter chamber, said bush having a cylindrical passage therethrough terminating at the inner end thereof in a conical bore opening into said container; said passage having at its outer end a threaded wall; a threaded valve-stem engaging said wall and having a conical tip at its inward end adapted to vary the opening through the bush and to close same; a head on said stem; an axial opening through said head extending partially through said stem, and a port connecting said opening with the interior of said bush.

2. In an apparatus for intravenous administration of fluids, a container and a closure therefor, said closure having a liquid outlet chamber in open communication with the container, and an air outlet chamber; the air outlet chamber communicating with the container through a restricted opening, which opening is adapted normally to be wetted by the solution within the container, and adjustable means for controlling the admission of air through the restricted opening, such means comprising a needle valve which is adapted to project through said opening and into the container when in closed position.

3. In an apparatus for the intravenous administration of fluids, a container and a closure therefor, said closure having a liquid outlet chamber in open communication with the container, and an air outlet chamber, the air outlet chamber comprising a tubular member having a port communicating with the atmosphere and a restricted opening communicating with the container, which opening is adapted normally to be wetted by the solution in the container, and adjustable means for controlling the admission of air through said port and restricted opening, such means comprising a needle valve which is adapted to project through said restricted opening and into the container when in closed position.

ARNOLD E. OSTERBERG.