

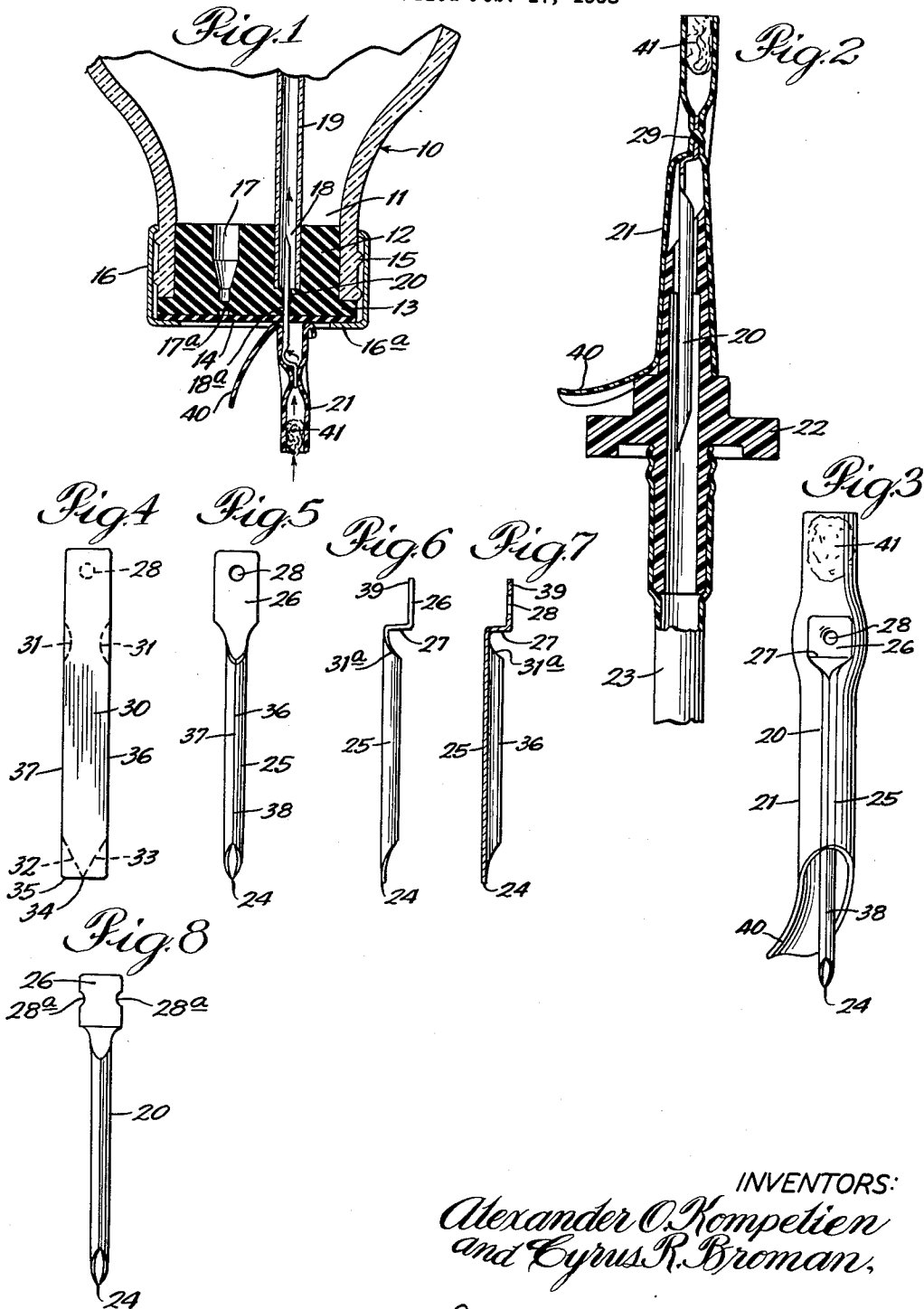
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AIRWAY CANNULA

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1

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AIRWAY CANNULA

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This invention relates to a cannula, and, more particularly, to an airway cannula employed for introducing air into a parenteral solution container.

Parenteral solutions are generally provided in a so-called "bulk" form, ranging in size from about 250 cc. to two liters, and housed within glass bottles. Since these solutions are intended to be introduced under the skin, quite frequently intravenously, of a human patient, it is mandatory that they be absolutely free of contamination. In view of the large quantity in a bulk solution, extraordinary precautions are taken to insure complete sterility. For this purpose, the solutions are generally provided in sealed bottles, with the interior of the bottle under vacuum. During the administration procedure, it is first necessary to "break" this vacuum, and thereafter introduce air into the bottle to replace the fluid that is withdrawn.

The matter of breaking the vacuum and introducing air into the bottle subsequently to replace withdrawn fluid, has given rise to a number of problems. Conventionally, a needle or cannula is employed to rupture a thin resilient seal to introduce air into the bottle and thus break the vacuum. In many instances, this same cannula remains in place during the course of the administration, and thus provides a channel through which replacement air flows. Use of a dull needle to puncture the thin diaphragm may result in coring of the diaphragm, which would result in the introduction of a contaminant into the carefully-prepared parenteral solution. Also, it is possible that if too much force is exerted on the needle or cannula, as might be the case if it were dull, it might be pushed into the bottle itself. Aside from the possibility of introducing contamination, the needle might block the air inlet passage and stop the administration at a critical point.

It is a general object of this invention to provide a novel airway cannula which overcomes the problems and disadvantages set forth above. Another object is to provide an airway cannula of simple manufacture and construction yet which is equipped with a sharp point. Still another object is to provide a cannula for the purposes described above which has a novel manipulating portion and which portion serves to prevent inadvertent loss of the cannula within a parenteral solution bottle. Yet another object is to provide a novel airway cannula having a manipulating portion spaced rearwardly of the sharp point thereof and which manipulating portion is equipped with a transverse step. Other objects and advantages of this invention can be seen as this specifications proceeds.

This invention will be explained in conjunction with the accompanying drawing, in which—

FIG. 1 is a fragmentary cross-sectional view of a parenteral solution container having associated therewith an airway cannula embodying teachings of this invention; FIG. 2 is a fragmentary elevational view, partially in section, of the plug-in portion of a parenteral administration set and having associated therewith the cannula of this invention embodied as part of the protector of the plug-in portion; FIG. 3 is an elevational view of a cannula constructed according to the teachings of this invention and housed within a protector sleeve of the character shown in FIG. 2, the view in FIG. 3 being taken substantially at right angles to the view shown in FIG. 2; FIGS. 4-6 are elevational views showing the cannula of this invention in various stages of development; FIG. 7 is a longitudinal

2

sectional view of the cannula shown in FIG. 6; and FIG. 8 is a view similar to FIG. 5 but showing a modified form of the invention.

Referring to the drawing, the numeral 10 designates generally a parenteral solution container, the throat portion of which only is shown in FIG. 1. As indicated above, container 10 conventionally takes the form of a glass bottle having a constricted neck or throat 11 in which is received a resilient stopper 12. Stopper 12 is equipped with a laterally-extending flange portion 13 that overlies the top lip of container 10 (here it is to be appreciated that the container 10 is shown in inverted condition in FIG. 1). Overlying the outer face of stopper 12 is a thin resilient diaphragm 14 which conveniently can be constructed of latex, or the like. Container 10 is equipped with outwardly-extending integral threads 15 and threads 15 provide a means for anchoring a clamping ring 16 to container 10, the clamping ring also extending inwardly as at 16a so as to secure a stopper 12 in the position shown in FIG. 1.

Stopper 12 is provided with a pair of flow passages 17 and 18. In the illustration given, these flow passages do not extend all the way through stopper 12, but are interrupted by thin rupturable diaphragms as seen at 17a and 18a, respectively. Passage 17a is adapted to receive one end of a parenteral administration set and thus dispense parenteral fluid (not shown) from container 10 into the body of a human patient. Passage 18 receives an inwardly-extending air tube 19 which, when container 10 is disposed in a mouth-downward or inverted condition, permits replacement air to enter container 10 above the level of the liquid container therein.

Shown inserted into passage 18 and through diaphragm 18a, is a cannula designated generally by the numeral 20 and which incorporates teachings of this invention. Wavy arrows are associated with cannula 20 and designate the flow of air from the atmosphere through cannula 20 and into container 10.

Cannula 20 is seen to have a sharply pointed forward end 24 (seen best in FIGS. 3 and 5) and a tubular portion or body 25 rearwardly of the sharp point 24. At the rearmost portion of cannula 20 is provided an integral flat manipulating portion 26, and flat portion 26 is equipped with a transversely-extending step or shoulder 27. Flat portion 25 is also provided with a cut-out portion or hole 28 (seen best in FIGS. 3 and 7), through which opposing portions of a thermoplastic protector sleeve 21 are united as designated by the numeral 29 in FIG. 2.

In the preferred embodiment, cannula 20, as seen in either FIG. 6 or 7, is thereafter mounted within a tubular sleeve 21 which ultimately provides a protector for the plug-in portion 22 of a parenteral administration set 23. Sleeve 21 is equipped with a finger-grasping tab 40 and has cannula 20 locked therein as by heat-sealing at 29. The end of sleeve 21 adjacent the manipulating end of cannula 20 is equipped with a cotton plug 41. Cotton plug 41 permits the passage of air therethrough, but filters out undesirable particles.

Through the modified form of the invention shown in FIG. 8, it is possible to secure cannula 20 in a slightly different way within sleeve 21. In FIG. 8, cannula 20 is also equipped with a sharp point 24 and an offset, rearwardly-extending flat portion 26 in place of cut-away portion 28, as seen in FIGS. 3 and 7, the flat portion 26 shown in FIG. 8 being equipped with opposed notches 28a. Opposed portions of the thermoplastic sleeve 21 can be brought together along a line which extends into notched-out portions 28a and thereby lock cannula 20 in place within sleeve 21.

In the manufacture of a parenteral administration set, it is essential that the same precautions against contami-

3

nation be observed as are observed during the production of the parenteral solution itself. This is readily appreciated when it is considered that the parenteral solution must flow through the set prior to its entry into a human body. Thus, each administration set is thoroughly sterilized prior to sale and use. Conventionally, two techniques of sterilization are employed. One technique involves the use of heat to kill viable organisms. Subjecting the set to heat in the range of 230-250° F., as in a steam autoclave, is adequate for this purpose. During heat sterilization in a confined area, the pressure of the air is increased over the normal atmospheric pressure. If the set were closed against air flow at each end, it is possible that the increased pressure of air within the set would cause it to rupture. Thus, it is necessary in heat sterilization to provide one end of the set with a port that permits passage of air out of and back into the set.

The alternative sterilization procedure involves flushing the set with a sterilizing gas such as ethylene oxide, and this also requires that one end of the set be free to pass air.

By the provision of a cotton plug 41 in protector sleeve 21, as seen in FIG. 2, the set 23 can be tightly closed at the other end (not shown), and yet amenable for either type of sterilization procedure. The employment of a cotton plug adjacent the plug-in end of set 23 provides an additional advantage in that it must be removed prior to filling the set with liquid as from container 10. The closure device used for the lower end of the set need not be removed and therefore serves as a safeguard against loss of fluid which might occur if the set were not clamped during filling. Thus, the use of a protector 21 having a plugged end that permits the passage of air not only permits the use of either sterilization procedure, but also automatically insures that no liquid will be inadvertently lost as by flowing through a set which may have had its lower end equipped with a protector having a cotton plug.

Cannula 20, however, can be satisfactorily employed apart from sleeve 21. The flat portion 26 which has a width at least as great as the outer circumference of the tubular portion of cannula 20, serves to prevent inadvertent thrusting of the cannula into the air tube 19 and thus into container 10. The sharp point provided by cannula 20 as at 24 is especially successful in eliminating coring, not only because of the extremely sharp character of the point itself, but also because the sharp point produces a tiny slit which thereafter is immediately widened by the inrush of air to break the vacuum and thus preclude the possibility of coring.

The step portion 27 in cannula 20 has been found to provide a superior bearing surface when flat portion 26 is finger-manipulated for the insertion of cannula 20 through diaphragm 18a. Not only does shoulder 27

4

act as a stop for the positioning of the fingers of the hospital attendant setting up the administration, but it also serves to prevent the fingers from contacting in arcuate notched-out portions 31a (designated only in FIGS. 6 and 7) which might result in cutting of the attendant's fingers. The step portion 27, when cannula 20 is mounted within sleeve 21, also serves to prevent slitting of sleeve 21 by the same arcuate portions 31a which would result in air by-passing plug 41. The step 27 also requires that air entering sleeve 21 on its way to container 10 follow a tortuous path as designated by the arrows in FIG. 1, which tortuous path further insures against the continued transport of any air-borne contaminants. By the same token, air entering cannula 20, when it is employed apart from sleeve 21, must follow a similar tortuous path so that a filtering action is achieved.

While, in the foregoing specification, an embodiment of the invention has been set forth in considerable detail for the purpose of explanation, those skilled in the art will readily appreciate that these details may be varied widely without departing from the spirit and scope of the invention.

We claim:

1. An airway cannula comprising an elongated tubular metal body having walls defining the forward end of said cannula, mating at one end in a sharp point, said body having at the other end a flat manipulating portion having a width at least as great as the outer circumference of the said tubular body and lying in a plane including said sharp point, said flat portion provided with an inwardly-directed transverse shoulder, the said shoulder providing thereby a rearmost part of said flat portion offset from said plane and adjacent the side of said body opposite the side having said sharp point.

2. The structure of claim 1, in which said body is housed in a plastic sleeve closed at one end thereof against entry therein of filterable particles but open to passage of air, said sleeve end being adjacent the said other end of said body, whereby said sleeve is adapted to be received over the puncturing end of the plug-in portion of a parenteral administration set.

3. The structure of claim 2, in which said flat portion is equipped with a cut-out portion through which opposed portions of said sleeve are united.

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