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1. My present invention relates primarily to the art of packaging intravenous solutions for parenteral administration.

In the carrying out of my invention I utilize novel container apparatus involving the use of the common relatively large bottle or flask for holding the bulk liquid or water constituent of the ultimate intravenous fluid, and separate container means for holding the chemical or medicinal ingredient which is customarily admixed with the sterilized distilled water above referred to.

My invention involves primarily novel features of construction of the respective flask and its associated smaller container as mentioned above, whereby the two receptacles may be employed initially for the separate containing of the constituents of the parenteral fluid, and whereby they may be combined for the purpose of bringing the said constituents together or mixing them just previous to the time that they are required to be used.

A special novel feature of my invention lies in the provision of peculiar sealing means for the larger flask containing the sterile distilled water commonly used, which sealing means is of a nature such that it may be broken incidental to the union of the said flask with the bottle or small container of the chemical or medicinal ingredient of the ultimate solution in the operation of combining the constituents of the solution at the time of use.

A full understanding of my invention and the merits thereof will be had upon reference to the following detailed description including the technique of the operations employed in connection with the accompanying drawings, in which:

Figure 1 is a vertical sectional view showing the construction of my main flask or container for the bulk liquid that is to form part of the ultimate intravenous solution, and bringing out the manner of closing this container by the special closure means utilized.

Figure 2 is a view generally similar in nature to that of Figure 1 but illustrating in sectional view the auxiliary or smaller container for the chemical or medicinal ingredient to be admixed with the main bulk ingredient of the ultimate fluid, which is usually distilled water.

Figure 3 is a sectional view showing the main flask and auxiliary container after they have been connected together, and illustrating the manner in which the auxiliary container is utilized to break the seal closing the main flask, the latter being broken away at its lower portion.

Figure 4 is a view in elevation of the combined container features of my invention as they are assembled when in actual use.

Figure 5 is a view similar to Figure 2 but illustrating a slightly modified form of auxiliary container particularly suitable for receiving the chemical or medicinal ingredient of the parenteral solution, in powdered or liquid condition.

Figure 6 is a fragmentary view of a modification of my invention.

I first refer to Figure 1 of the drawing which shows the form of my main flask or container designed to hold the distilled water or similar ingredient of an intravenous solution. This container, generally designated 1, is a flask of known construction, of relatively large volume, having the screw neck portion 2 and the bottom outlet 3, the latter adapted to be closed and sealed by a rubber closure denoted 4. Applied to the screw neck portion 2 of the flask 1 is a special form of closure means including a reducing type coupling cap or closure member 5, the latter having the internally threaded depending skirt portion 6, and the central upwardly projecting tubular extension 7 of a diameter much less than that of the body of the closure 5. The extension 7 is internally threaded to permit it to receive the screw threaded portion of the closure cap 8, and the closure member 5 is formed with a central web 9 intermediate the parts 7 and 6, which web is centrally apertured as shown at 10.

Intermediate the lower end of the cap member 8 and the upper surface of the web 9 of the closure member 5 is a disc-like sealing member 11 which may be made of very thin tin, plastic substance, or any other substance suitable for the purposes of my invention. A gasket 12 is interposed between the upper end of the neck portion 2 of the flask 1 and the portion of the closure member 5 just above such end of the neck. This gasket permits of establishing an air-tight connection between the members 1 and 5 when the latter is screwed tightly upon the neck of the flask, and the seal 11 likewise affords an air-tight sealing means for the opening 10 beneath the cap 8.

I now refer to Figure 2 of the drawing which illustrates my auxiliary container to be used in conjunction with the main flask 1, the latter ordinarily holding the sterile distilled water constituent of the ultimate solution. The auxiliary container is designated 13 and comprises a relatively small body having at its upper end a reduced threaded neck portion 14, the latter being formed with a closure portion 15 from which
projects at the center thereof the tubular extension 16 having the aperture 17 therethrough.

For closing the combined inlet and outlet opening 17 of the auxiliary container 13 in an air-tight manner, I provide a sealing disc 18 adapted to be seated upon the upper or outer end of the portion 16 above mentioned, said disc being employed in conjunction with the closure member 19 in the form of a round or suitably shaped cap having internal screw threads whereby it may be screwed upon the threaded portion of the neck 14 of the container 13. The container 13 is adapted to contain the medicinal or chemical ingredient of the ultimate intravenous solution which is to be administered to a patient as the final parenteral solution, and the form of the container 13 is such that it will readily contain such particular ingredient, as for instance concentrated saline solution, dextrose solution, combination dextrose and saline solution, amino acid solution, or many other medicinal or chemical ingredients in liquid form.

Figure 5 shows an auxiliary container which is practically the same in form as that of Figure 2, except that the neck portion of the container is somewhat differently formed in order to provide a tapering or inclined wall outlet portion 20 leading to the apertured tubular outlet extension or nipple portion 16. The container 13 of Figure 5 is especially adapted for receiving the chemical or medicinal ingredient for admixture with the water in the flask 1 when such ingredient is in powdered form, as for instance of the character of protein-hydrate powders which contain amino acid.

With the foregoing understanding of the construction of the dual container apparatus of my invention, in respect to the specific construction of each of the flask and auxiliary container parts, I now proceed to describe the manner of use of the container apparatus as above set forth.

The flask 1 with the closure 4 applied to its lower discharge portion 3, and containing the requisite amount of distilled water therein as indicated by centimeter indicia on the outside of the flask, and while the flask is open at the neck portion 2, is placed in the usual autoclave and sterilized after the usual technique. Upon removal from the autoclave, the closure means for the flask, including the parts 5 and 8, and the sealing disc 11, is immediately applied to the neck portion 2 of the flask by screwing the closure member 5 at its internally threaded portion upon the screw threads of the neck 2. The flask 1 and its contents are then permitted to cool, and in this manner a vacuum is created in the space within the flask unoccupied by its liquid contents. The flask is now fully sealed and ready for transportation to its place of use with the distilled water therein.

In like manner it is contemplated to accomplish the sterilization of the auxiliary container 13 and the chemical compound disposed therein, whatever that compound may be, dependent upon the particular use for which the parenteral fluid is to be employed. With its chemical contents therein, therefore, the container 13 will be placed in an autoclave while the container is open at the opening 17. After the sterilizing process is concluded, the compound is applied to the portion 15 of the container 13 to seal the opening 17, and the cap or closure member 19 is then screwed in place on the upper end of the said container 13. The container 13 is then ready for transportation to the place of its use.

It is obvious that the hospital or physician may keep on hand a large number of the auxiliary containers 13 properly labelled to indicate the particular chemical content or other ingredient for the parenteral solution which is to be mixed with the distilled water in the flask 1, just prior to the administering of the intravenous solution by tubulating flask 1 at the outflow and coupling member 3.

The admixing of the compound in the auxiliary container 13 with the sterilized contents of the flask 1 will be effected in the following manner: Assuming that the person who is about to use the parenteral solution wishes to administer the same promptly, he will first partially unscrew the closure member 5 from the neck portion 2 of the flask 1, slightly releasing the tightness of the threaded connection between the parts 5 and 2 and thereby opening the interior of the flask to atmospheric pressure. This will release the vacuum in the flask 1 in the customary way. Thereupon, a selected one of these auxiliary containers 13 will be employed, dependent upon the needs of the contents thereof and the desired type of intravenous solution which is to be administered. The cap closure 3 having been now removed from the closure member 5 of the flask 1, the cap closure 15 of the auxiliary container 13 is removed therefrom along with the seal 18, and said container 13 is inverted and in such position is screwed at its neck portion into the tubular extension 7 of the closure member 5 after the manner illustrated in Figure 3 of the drawings. The flask or vessel 1 has meanwhile remained sealed by means of the seal 1 previously described. However, upon the application of the auxiliary container 13 to the flask 1 in the manner shown in Figure 3, it will become apparent that the screwing action of the neck 14 of the container 13, into the portion 1 of the closure member 5 will cause the tapering nipple or tubular extension 16 of the part 15 to engage the central portion of the sealing member in the manner shown in Figure 3, thereby rupturing or puncturing the sealing member, which permits the contents of the auxiliary container 13, consisting of the required chemical compound or concentrated chemical solution, to pass or gravitate down into the flask 1 and become mixed with the contents of the latter. This mixing may be facilitated by means of agitation, if so desired.

If the container 13c of the modified construction shown in Figure 5 is employed, the chemical compound in this container 13c in powdered or liquid condition will likewise pass to the flask or vessel 1 by the inverting operation and connection between the auxiliary container and flask 1 in the manner above described.

The operation of administering the intravenous solution is generally illustrated in Figure 4, in which the flask 1 is shown as having the administering tube applied to the discharge portion 3 thereof, said tube 21 being equipped with the usual injectors 22 or syringes. As shown as seen in the condition of Figure 4 will be susceptible of being suspended at a suitable elevation, for the administering process, by means of any suitable bale or like member 22.

It will of course be understood that in the use of my closing seal 18 is applied to the portion 15 of the container 13 to seal the opening 17, and the cap or closure member 19 is then screwed in place on the upper end of the said container 13. The container 13 is then ready for transportation to the place of its use.

Sterility is also assured by rigid bacteriologic control, as customary.
It will be apparent that there is practically no liability of contamination of the constituents of the infusion solution in the use of my invention. The flask 1 is sealed until the auxiliary container 13, by the screw action of the part 16, ruptures the seal. The small seal 18 of container 13 need not be removed until the container is inverted and just at the instant the neck 14 is introduced into the screw extension 7 of the closure member 5.

If desired, the vacuum in the flask 1 need not be released, by slightly unscrewing closure 5, until the two containers 1 and 13, or 1 and 13a, are united.

According to the modified form of my invention in Figure 6, the screw extension 7a of the member 5, and the neck 14a of container 13b, are vertically elongated so that, if desired, the container 13b may be affixed to the flask 1, and both sterilized, tested while together, and then sent as a unit to the place of use. The container 13b will be sealed by the seal 11 while in unruptured state. At the time of use, the container 13b will be screwed deeper into the tubular member 7a to establish communication between the receptacles by action of the part 16a on the seal 11. There are conditions in which such construction may be advantageously utilized.

Having thus described my invention, what I claim as new and desire to secure by Letters Patent of the United States, is:

1. In intravenous solution apparatus, in combination, a main flask having a solution introducing opening, a friction seal on said flask disposed so as to seal said opening, a closure member detachably connected with the flask at said opening and holding said seal in place, said closure member having an opening therethrough for communication with the atmosphere and closed by the said seal, and an auxiliary container having a screw-thread connection with the closure member and formed with an apertured extension disposed to engage said seal and movable by screwing action of its said connection to fracture said seal to establish communication between the interiors of the flask and container.

2. Apparatus as claimed in claim 1, in which the detachable connection of the closure with the flask is a screw connection, and in which the seal is clamped to the flask at its said opening by screw action of the closure against the flask.

3. In intravenous solution apparatus, in combination, a main flask for containing a liquid of the ultimate parenteral solution and provided with a charging opening, an auxiliary container having a charging opening, an instrumentality connecting the opening portions of the flask and container, and a seal common to the two opening portions of the flask and auxiliary container, one of said flask and container vessels having a seal rupturing member operable to puncture the seal by relative rotation of the vessels.

ROY R. RAUSCH.

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