

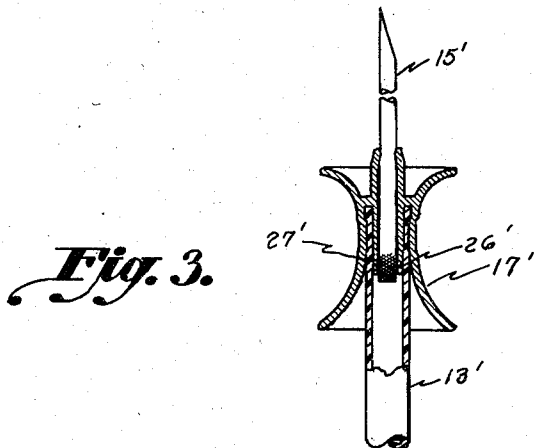
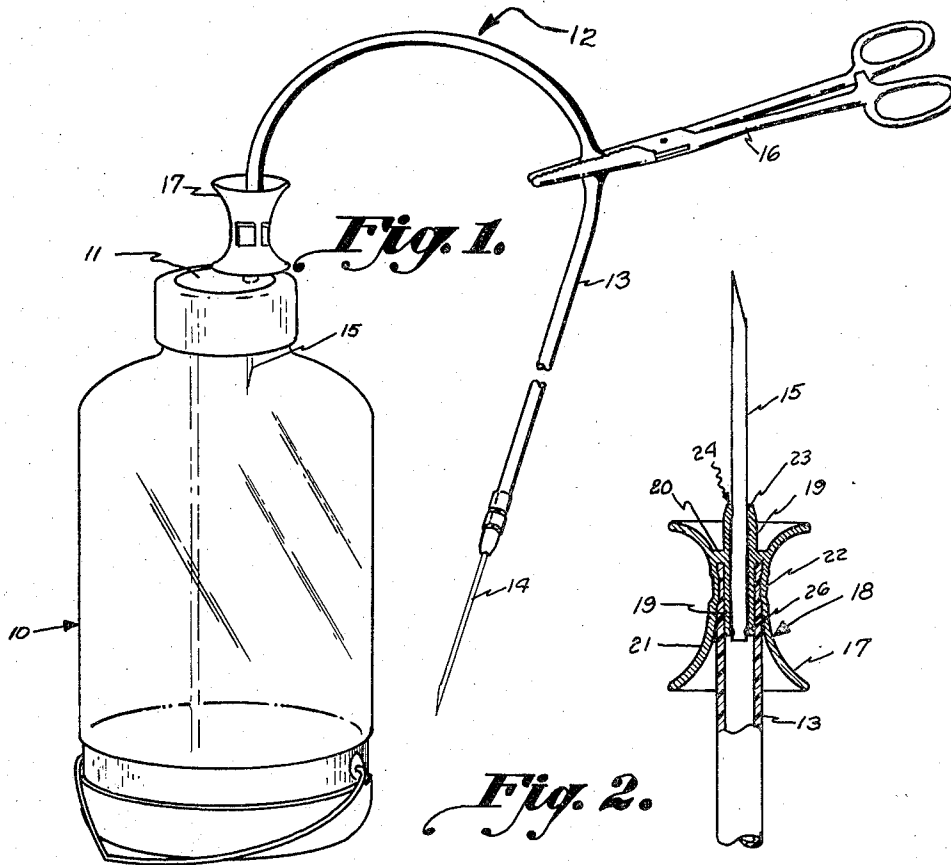
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NEEDLE HUB SEAL

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NEEDLE HUB SEAL

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This invention relates to a seal and, more particularly, to a liquid- and gas-tight seal in a barrier separating a gas from a liquid.

The seal of my invention has particular application to the field of conducting parenteral fluids wherein it is important that the fluid be collected or dispensed, as the case may be, completely free of possible contamination by air. Specifically, in the art of collecting blood from a human donor into an evacuated container for later administration, it is highly desirable that the sterile condition of the container be preserved during the donation. Air finding its way into the container might contain bacteria or other contaminants. The prevention of contamination is ordinarily achieved by utilizing rubber or plastic tubing having puncture needles previously attached in an air-tight fashion to the ends of the tubing so as to provide a sterile collection set. One needle is introduced into the vein of a donor and the other needle introduced to a self sealing stopper mounted in the neck of the blood collection container. Both the skin of the donor and the material of the stopper act as seals to prevent possible admission of air around the various needles. My invention is directed to providing a suitable seal in the region where the tubing is connected to the stopper puncture needle.

It is important that this connection be made air-tight not only for the prevention of possible contamination mentioned above, but also to preserve the vacuum provided in the collection container. The preservation of this vacuum until the collected blood is to be administered has been found useful since the inrush of air to break the vacuum when the blood is about to be administered serves as an audible signal to the doctor or nurse supervising the administration that the blood has been preserved under substantially aseptic conditions. This vacuum condition also serves to assure collecting the desired quantity of blood. Furthermore, should air find its way into the collection container during donation there might be an adverse effect on the person supervising the collection, since even a small quantity of air would be converted into an extraordinarily large bubble because of the low pressure of the collection system. The presence of air as pointed out above is undesirable since it might contain bacteria or other contaminants.

It is, therefore, an object of my invention to provide a liquid- and air-tight seal in a barrier separating a liquid from a gas. Such a barrier is commonly found in liquid conducting pipes wherein a first pipe member is secured concentrically to a second pipe member, a seam occurring between the two pipe members at the area of securement. Other objects and advantages of my invention will be seen as the specification proceeds.

My invention will be explained in conjunction with the accompanying drawing in which Fig. 1 is an elevational view of a typical blood collection apparatus including a puncture needle assembly equipped with the seal of my invention; Fig. 2 is an enlarged cross-sectional view of the puncture hub assembly shown in Fig. 1; and

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Fig. 3 is a view similar to Fig. 2 but showing a modification of the seal of my invention.

Referring now to the drawing and, in particular, Fig. 1, the numeral 10 designates a blood collection bottle. Usually blood collection bottles are provided with a fairly high internal vacuum which is preserved by closing off the interior of bottle 10 by stopper 11. Stopper 11 is usually constructed of a self-sealing material such as rubber, permitting the insertion and removal of a hypodermic needle without substantial loss of the internal vacuum.

A typical blood collection set is generally designated 12 and includes flexible tubing 13, donor puncture needle 14 affixed to one end of tubing 13, and adapted to be inserted in the vein of a donor (not shown). Affixed to the other end of tubing 13 and inserted through stopper 11, so as to communicate with the interior of bottle 13, is puncture needle 15. Hemostat 16 is mounted on tubing 13 to prevent flow of fluid or possible entrance of air into the system until the various punctures outlined above have been made.

Bottle puncture needle 15 is generally provided with a handle or hub 17 in order to facilitate stopper puncture. Such a hub is not provided for donor needle 14 since it is desirable to make a puncture substantially parallel to the skin surface of the donor, which type of puncture would be almost impossible if a hub were provided for donor needle 14.

Referring now to Fig. 2 wherein the stopper puncture needle portion of collection set 12 is set forth in an enlarged cross-sectional view and generally designated 18, it is to be noted that hub 17, which in the pictured embodiment includes a sleeve 19, is mounted concentric to and unremovably secured to stopper puncture needle 15. In order to provide suitable finger bearing surface to facilitate insertion and removal of needle 15 into stopper 11, sleeve portion 19 is provided with integral annular flange portion 20. Mounted over sleeve portion 19 and secured thereto in air-tight relation is flexible tubing 13. To achieve this securement, hub 17 is provided with a depending annular skirt portion 21 which, in cooperation with sleeve portion 19, forms an annular trough for the reception of tubing 13. By deforming depending skirt portion 21 as at 22, tubing 13 is compressed against sleeve portion 19 so as to prevent liquid leakage or air infiltration and inadvertent removal of tubing 13 during use.

Air most commonly finds an entry into such a needle assembly by entering the restricted annular space 23 between needle 15 and sleeve portion 19, as indicated schematically by arrow 24. The air so entering proceeds longitudinally of the needle under the influence of the evacuated system and eventually enters the unsharpened end of needle 15. To prevent this air passage, various expedients have been used in the past, such as soldering the connection between sleeve portion 19 and needle 15. Although this has proved suitable in many instances, it is an expensive expedient, especially since it requires a time-consuming operation.

I have found that air infiltration, such as outlined in the paragraph immediately above, can be substantially prevented by providing an air-tight seal adjacent the point of possible air entry in the barrier between blood in the set and air, which consists of sleeve portion 19 of hub 17 and the wall needle 15. This air-tight seal can be readily achieved by means of a heat-flowable solid. For example, I have successfully used two types of greases; one, a petroleum jelly such as is marketed under the trade name "Vaseline," and, another, a high vacuum silicone grease such as Dow-Corning H-13. I prefer the petroleum jelly, since the air-tight seal achieved thereby is improved by the flow of the grease into conformity

with annulus 23 which occurs during sterilization at which the assembled donor set is subjected to temperatures in the range 220-250° F.

In the aforementioned barrier I have also provided a liquid seal consisting of the cooperation of a portion of sleeve 19 deformed to fit closely about the outer wall of needle 15. When hub 17 is constructed of a comparatively soft metal, it can be readily staked to provide the deformation shown at 26.

A similar staking operation is performed on sleeve 19 of hub 17 adjacent the opposite or sharpened end of needle 15 so as to provide a more firmly mounted needle. It is to be understood that such deformation of sleeve portion 19 can be achieved without damage to needle 15, since the latter is usually constructed of a stainless steel.

A modification of my invention is shown in Fig. 3, which is a view similar to Fig. 2, and wherein like parts are designated by like numerals but with the addition of a prime. Referring now to Fig. 3, it is to be noted that a portion of the outer wall of needle 15' adjacent the unsharpened end thereof is provided with a knurl 27'. It has been found that this will substantially aid the formation of a secure mounting of hub 17' to needle 15'.

It is to be understood that the foregoing detailed description has been set forth for clearness of understanding only, and no unnecessary limitations are to be inferred therefrom.

I claim:

1. A puncture needle assembly for a blood collection set comprising a needle provided with a knurled portion in its outer wall adjacent its unsharpened end, a hub unremovably secured concentric to said needle over said knurled portion, and a grease, heat flowable at ordinary sterilization temperatures, between said hub and said needle.

2. A needle assembly for a tubing and needle set, comprising a needle having a hub secured thereto adjacent the unsharpened end of said needle to form a liquid-tight seal therebetween but not necessarily an air-tight seal therebetween, and a grease, heat-flowable at ordinary sterilization temperatures, between said hub and said needle.

3. A needle assembly for a tubing and needle set, comprising a needle having a hub staked thereto adjacent the unsharpened end of said needle, and a grease, heat-flowable at ordinary sterilization temperatures, between said hub and said needle.

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