Nov. 19, 1940. N. M. NESSET 2,222,371

LIQUID WITHDRAWAL AND DISPENSING MEANS

Filed June 27, 1938

Fig. 1.

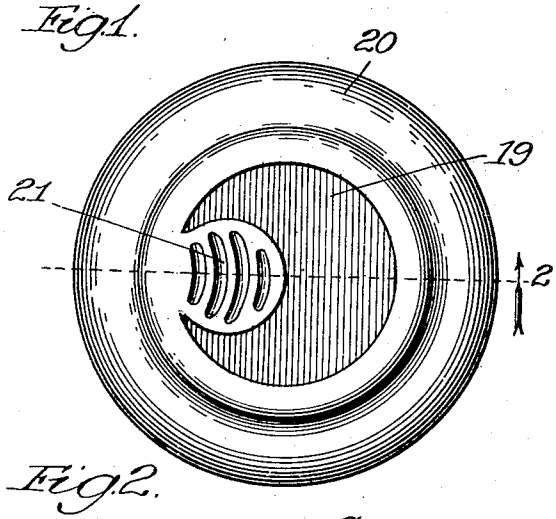


Fig. 2.

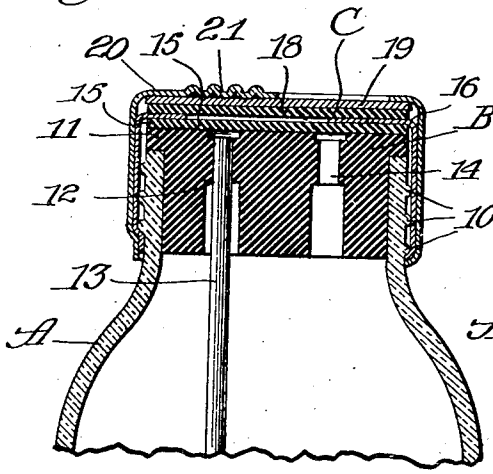


Fig. 3.

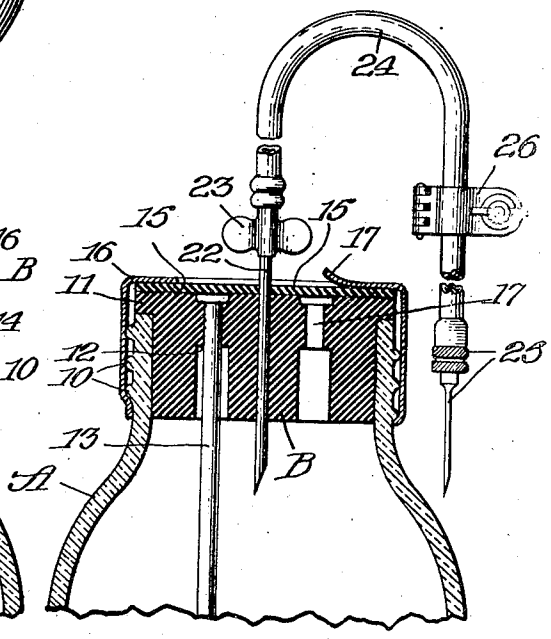
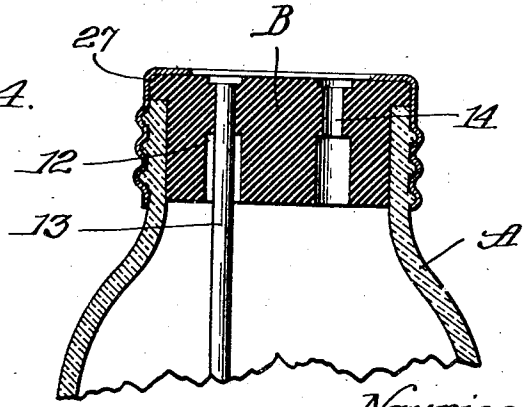


Fig. 4.



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LIQUID WITHDRAWAL AND DISPENSING MEANS

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3 Claims. (Cl. 128—214)

This invention relates to liquid withdrawal and dispensing means. It is particularly useful in the withdrawal of blood, and the storing and dispensing of the same.

An object of the invention is to provide extremely simple mechanism and means whereby liquids may be withdrawn and stored in sterile condition and later employed as parenteral liquids. A further object is to provide a blood transfusion set or bank whereby blood may be withdrawn and stored and later injected, a single container being employed and the liquid being maintained in sterile condition. Other specific objects and advantages will appear as the specification proceeds.

The invention is illustrated, in a preferred embodiment, by the accompanying drawing, in which—

Figure 1 is a plan view of a container and closure embodying my invention; Fig. 2, a vertical sectional view, the section being taken as indicated at line 2 of Fig. 1; Fig. 3, a view similar to Fig. 2 but showing a portion of the closure being removed; and Fig. 4, a view similar to Fig. 2 but showing the cap and sealing members removed and the closure ready for the application of the liquid dispensing or injecting apparatus.

While the invention is applicable for the withdrawal and dispensing of liquids, for the purpose of clearness it will be described herein in connection with the transfusion of blood.

Heretofore, it has been proposed that apparatus for the transfusion of blood employ vacuum within a container, the vacuum being produced and maintained through the use of various devices connected with the closure of the container. Such devices have to be manipulated during the blood withdrawal operation for the maintenance of the vacuum while at the same time the physician must move the container continuously in a circular or other motion for the mixing of the blood with citrate or some other anti-coagulant. Furthermore, such additional apparatus must be kept sterile and there is always a danger that unsterile surfaces may be brought into communication with the interior of the container.

In the apparatus disclosed herein, I dispense entirely with such vacuum drawing means and employ only an evacuated container which is maintained sterile by outer closure means until its use is desired. The outer closure is then removed and blood is withdrawn through needle mechanism employed with the inner closure member in combination with means for controlling the rate of inflow of blood. The closure in this form, after the withdrawal of the needle from the closure, serves to automatically seal the container and the withdrawn blood may then be stored for substantial periods of time. When it is desired to inject the blood, the inner closure may be partially removed to permit the application of the withdrawal tube to the closure member. With this arrangement, it will be observed that a single container is employed, that no vacuum withdrawal means is necessary, that the physician after setting the control member for the desired rate of flow of blood has both hands free for manipulating the container for mixing the blood with the citrate. It will be further noted that two sterile surfaces are provided, one surface being employed for keeping the entire container sterile up to the time when the withdrawal of blood is desired, and that the second surface is effective after the withdrawal of the blood and up to the time that the blood is to be injected. By this arrangement, the apparatus is reduced to the utmost in simplicity and ease of operation.

In the specific illustration given, A designates a container; B, a resilient closure for the neck of the container; and C, removable sealing means.

The container A may be of any suitable type. In the illustration given, the glass container, which is partially illustrated, is of the type shown in Baxter Patent No. 2,004,027, the bottom of the container being equipped with a supporting bail member (not shown) by which the container can be supported in inverted position for the withdrawal of liquids.

The neck of the bottle A is provided with threads 10.

The closure B may be of any suitable construction and resilient material. I prefer to employ a resilient rubber material which is quite elastic and forms a good seal with the neck of the container A. The plug B is provided in its upper side with an integral flange 11 which rests upon the top of the container neck. The plug B is provided with an air intake passage 12 through which extends a glass tube 13. The tube extends almost to the bottom of the container. A liquid withdrawal passage 14 also extends through the plug B and is adapted to receive a glass coupling member to which a tube is secured leading to the injection needle.

The sealing means C may also be of any suitable construction. In the illustration given, I provide a thin flexible and resilient sealing mem-

ber 15 directly over the plug B. This serves to seal the openings 12 and 14. The seal 15 is maintained against plug B, and also plug B is thereby maintained in position within the container by means of the clamp member 16. It will be observed that the clamp member on its lower side engages the lower beads 10 of the threads, whereby it is firmly locked in position. If desired, the threads 10 may be omitted and beads employed only near the lower portion of the bottle neck, and clamp 16 may be retained as a permanent part of the closure. With this construction, the inner flexible seal 15 could be removed by tearing it and, if desired, a portion of clamp 16 may be cut away along its upper flange to facilitate the grasping of the seal 15 to aid in its removal. In the specific illustration given, I have shown the inner clamp 16 removable, a tear flap 17 being provided whereby a strip may be torn vertically along the sides of the clamp to separate it so that it can be then drawn off the container neck.

Above the clamp 16 I provide another resilient seal 18 which is identical to seal 15 and which provides an uncontaminated and sterile surface so that the sterile hollow needle may be passed through plug B without becoming contaminated and thus obviating the danger of contaminating the interior of the container. Above the seal 18 is a metal disk 19 and above the disk 19 is an outer clamp or cap 20. The outer cap 20 is provided with a tear tab 21, similar to the tab 17 with which the inner clamp 16 is provided. The cap 20 has its lower portion spun about the lower bead of the threads 10 so as to confine it in position.

For the introduction of blood in the container, a hollow needle 22 is employed, the needle being provided with winged members 23, and a tube 24 connects the needle 22 to the injection needle 25. A clamp 26 is provided adjacent needle 25 or adjacent needle 23 for closing the tube and also for partially opening it to control the flow of blood therethrough, the clamp being preferably provided with a fine adjustment screw whereby accurate control can be maintained.

In the dispensing of the blood, I provide a screw cap 27 which can be threaded on the neck of the bottle A so as to confine the closure member B in position. In this position a dispensing tube is connected by means of a coupling member to the outlet passage 14 of the plug B.

Operation

In the operation of the apparatus, I place the seal 15 upon the closure member B and draw a vacuum within the container preferably in accordance with the method described more fully in Baxter Patent No. 2,004,027. Upon removal of the container from the vacuum drawing apparatus, the seal 15 maintains the openings 14 and 12 closed so that a very tight vacuum is maintained within the container. The clamp 16 is then spun into position so as to confine the seal 15 in the position shown. Next, I place the second seal 18 above the flange of clamp 16 whereby the two seals are maintained in spaced relation. Over the seal 18 is placed a metal disk 19 and then cap 20 is spun into the final position shown. The container is then sterilized by any means readily available to those skilled in the art, preferably steam under pressure, for example, 15 pounds for 20 minutes. The apparatus is now ready for shipment to the physician.

When it is desired to use the apparatus in a blood transfusion operation, the physician draws the tear tab 21 so as to release the outer cap 20. When the cap is removed, the disk 19 and outer seal 18 are taken off so as to provide the structure shown in Fig. 3. The needle 22 is then thrust through the resilient closure B, the outer end of tube 24 being maintained in closed position by the clamp 26. Needle 25 is injected into the vein in the usual manner. The clamp 26 is then opened slightly to permit the blood to flow into the container at the desired rate. In the preferred practice, I maintain a desired small amount of citrate in the container A, being placed there before the evacuation of the bottle so that as the blood enters the container, the container can be moved in a circular or other direction to mix the blood with the anti-coagulant, or the anti-coagulant may be added to the evacuated container by the operator using the needle assembly as in drawing blood. After the desired amount of blood has been drawn, the clamp 26 is set to close the tube 24 and the needle 25 is withdrawn from the donor. As the needle 22 is withdrawn, the resilient plug B immediately closes the opening caused by the needle so as to form an airtight closure. Likewise, the seal 15 closes the opening formerly made by the needle 22. At the same time, the seal 15 maintains its closure of the openings 12 and 14, the seal being effective not only by the partial vacuum which remains in the container but also by the clamp 16.

The container, as just described, may now be set in a cold place or otherwise preserved until it is desired to dispense the blood, or the blood may be given at once. In the specific illustration given, the inner clamp 16 is removed by drawing the tear tab 17 and the seal 15 lifted off. Cap 27 is then screwed in place, as shown more clearly in Fig. 4. The withdrawal tube may then be connected to passage 14 by a glass coupling member and, upon the inversion of the container A as described more fully in Baxter Patent No. 2,004,027, the blood may be injected. Prior to injection, it will be understood that the temperature of the blood will be raised to the point desired.

From the foregoing description, it will be observed that there are two sterile surfaces provided by the container, one sterile surface being outermost and protecting the apparatus up to the time when blood is to be withdrawn. The second sterile surface is provided by inner seal 15 which is effective during the withdrawal of blood and the preserving of the same up to the time when the blood is to be injected. By this means, a single container may be employed for the entire blood transfusion operation and no apparatus other than the container itself need be employed.

While in the illustration given, I have shown a clamp 26 for controlling the flow of blood, it will be understood that a graduated valve or other control means may be employed for enabling the physician to accurately control the rate of flow. Other changes may be readily made in the structure without departing from the spirit of my invention. The form of the cap and the clamp and the sealing mechanism may obviously be considerably modified by those skilled in the art.

The foregoing detailed description has been given for clearness of understanding only, and no unnecessary limitations should be understood therefrom, but the appended claims should be

construed as broadly as permissible, in view of the prior art.

I claim:

1. In combination, a container having an opening, a resilient closure for said opening, said closure being provided with at least one passage therethrough, a resilient seal over said closure, said container being evacuated and being maintained under vacuum by said seal, a clamp member confining said seal upon said closure, a second seal above said clamp, and cap closure means about said outer seal.

2. In combination with a container having an open neck, a resilient plug closing said neck and provided with a pair of passages therethrough, a resilient seal over said plug and closing said passages, said container being evacuated and maintained under vacuum by said seal, a clamp member engaging the neck of said container and confining said seal against said plug, a second resilient seal over said clamp, a metal disk over said second seal, and a removable cap confining said disk over said second seal.

3. In combination, a partially evacuated container having a neck, a resilient closure for said neck, said closure being provided with at least one passage therethrough, sealing means over said closure, and a cap secured to said neck and enclosing said sealing means, said sealing means consisting of two separable resilient films over said closure and means engaging the container neck for maintaining one of said films in sealing position after the cap has been removed.

NAURICE M. NESSET.