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N. M. NESSET

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CLOSURE

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Fig. 2

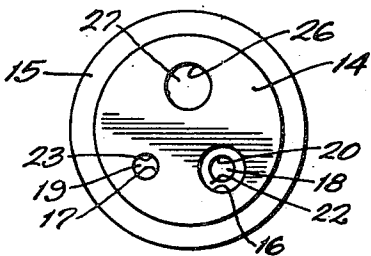


Fig. 1

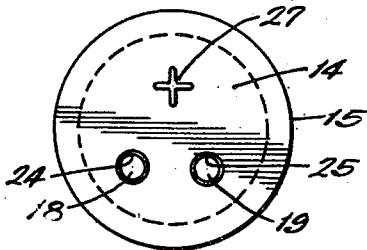
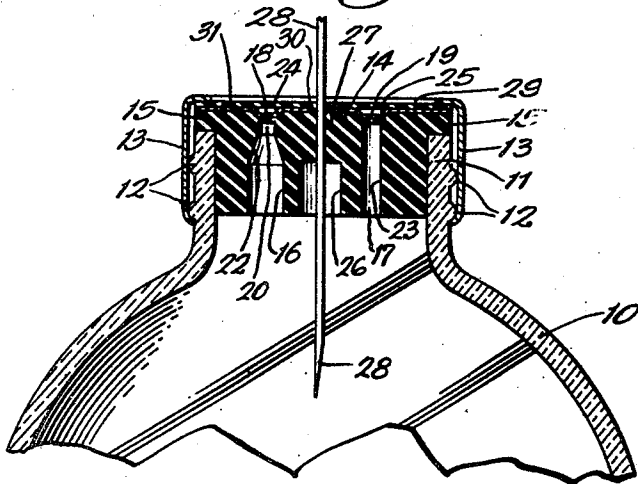


Fig. 3



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1 Claim. (Cl. 215-47)

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This invention relates to a closure, and more particularly to a closure for containers for sterile liquids and the like which contains a diaphragm that is effectively self-sealing after being punctured by a needle.

An object of the invention is to provide in a resilient plug, a diaphragm for sealing a passage therein which is substantially completely self-sealing, so that a container which is closed with the plug will remain sealed under vacuum for long periods of time, even after the diaphragm is punctured by a needle. Another object is to provide a closure plug which may be readily punctured with a thin needle and, after withdrawal of the needle, will be self-sealing and will remain so for substantial periods of time. A further object is to improve the self-sealing properties of a resilient diaphragm in a closure plug.

Another object of the invention is to provide a closure plug for an open neck container, the plug having at least a pair of passages therein sealed by diaphragms, and to lubricate at least one of the passages and to render the diaphragm in the other passage substantially completely self-sealing. Other features and advantages will appear from the following specification and drawings, in which—

Figure 1 is a plan view of the closure plug; Figure 2 is a bottom view of the plug; and Figure 3 is a sectional view of the plug in position in the neck of a container and showing a needle inserted within the plug.

The invention contemplates a resilient closure plug for the open neck of a container and the use of a film of a liquid of low vapor pressure on the upper surface of the closure plug so as to improve the self-sealing properties of an integral thick diaphragm in the plug. The invention further contemplates the use of the liquid of low vapor pressure to lubricate other passages in the plug when the closure plug is of this construction.

In the embodiment of the invention described herein, a container 10 is provided with an open neck 11, the neck 11 being equipped with annular ribs 12, to which a closure clamp or member 13 may be secured. The container 10 may be of any suitable type or character, and is preferably of the conventional type used for intravenous solutions, blood plasma, or other liquids which are to be kept in sterile condition.

Within the open neck 11 of the container 10 may be placed a resilient plug 14 of rubber or other suitable material. The plug 14 may be provided

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with an outwardly-extending annular member 15 which is received on the upper surface of the neck 11 of the container 10, while the body of the plug is received within the open neck of the container.

The resilient plug 14 may be equipped with a pair of passages 16 and 17 extending partially through the plug. Integral diaphragms 18 and 19 extend across the passages 16 and 17 respectively to seal the same. Preferably, the passage 16 is provided with a constriction 20 immediately below the diaphragm 18. Immediately below the constriction 20 is a shoulder 22 which is adapted to engage an enlarged head of a fitting which may be passed through the diaphragm 18. The walls 23 of the passage 17 below the diaphragm 19 may be substantially uniform in character to provide a passage of uniform cross-section area. The diaphragms 18 and 19 may be disposed slightly below the upper surface of the plug 14 so as to provide recesses 24 and 25 in the upper surface of the plug.

The plug may also be equipped with a passage 26 and a thick integral diaphragm 27 extending across passage 26 to seal the same. The thick integral diaphragm 27 is adapted to be punctured by a thin dispensing needle 28, which is of the size of the conventional hypodermic needle. The resilient diaphragm 27 is also sufficiently thick to be substantially self-sealing when the needle 28 is withdrawn therefrom. Thus, the diaphragm 27 is of a thickness less than that of the plug 14, but is much thicker than the diaphragms 18 and 19.

A sealing member 29, which is preferably a thin resilient rubber disk of an area substantially the same as the upper surface of the plug, is adapted to be received on the upper surface of the plug, as shown in Fig. 3, and to extend across and cover the diaphragms 18, 19 and 27. The closure member or clamp 13 may be of any suitable construction, and preferably corresponds to the conventional closure members which are received on the projecting threads or ribs 12 on the outer surface of the neck of the container and may be tightened down upon the resilient sealing disk 29 to bring the same into tight engagement with the upper surface of the plug 14.

Upon the upper surface of the plug 14 is placed a thin film 31 of a liquid of low vapor pressure, such as glycerin. The film of glycerin extends over and covers the upper surface 30 of the thick diaphragm 27. Preferably, the liquid also covers the upper surface of the diaphragms 18 and 19. The liquid may be any liquid of low vapor pres-

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sure which will not evaporate in the atmosphere over a period of time.

Water is not suitable for this purpose, but glycerin, ethylene glycol, sorbitol, sodium r-lactate, and derivatives of diethylene glycol, such as the mono-ethyl-ether, have been found to be suitable. Preferably, the liquid of low vapor pressure extends over the upper surface of the plug and the diaphragms therein in a very thin film. The sealing disk 29 aids in maintaining the film of liquid on the surface of the diaphragm over long periods of time.

In operation, the plug is placed within the neck of the container to seal the same under vacuum. The upper surface of the plug is covered with a thin film of glycerin or other liquid of low vapor pressure. The resilient sealing disk 29 is then placed in position on the upper surface of the plug and the closure clamp 13 is used to fix the disk in sealing relation with the surface of the plug.

When the container is to be used in connection with blood transfusions or as a storage container for blood plasma, the needle 28 is inserted through the resilient sealing disk 29 and diaphragm 27 in the plug 14 to the position shown in Fig. 3. The blood or blood plasma may then be passed through the needle 28 into the container 10. When the blood or blood plasma has been received within the container 10, the needle 28 is withdrawn from the plug 14 and resilient sealing disk 29. The diaphragm 27, after the needle 28 is withdrawn therefrom, closes the opening formed by the needle to become self-sealing. The presence of the thin film of liquid on the upper surface 30 of the diaphragm 27 greatly improves the self-sealing properties of the diaphragm. With this thin film of liquid on the surface of the diaphragm 27, it has been found that a vacuum can be maintained in the container over very long periods of time, even periods as long as several months. Without the use of the thin film of liquid of low vapor pressure, the diaphragm under ordinary conditions tends to be subject to leakage over periods of time and the vacuum in the container may be substantially lost.

When the blood, blood plasma, or other liquid within the container is to be removed therefrom, the closure member 13 is removed from the neck of the container and the resilient sealing disk 29 is removed from the surface of the plug 14. The diaphragm 19 may then be punctured, and a needle or tube inserted to permit the introduction of air into the container. The diaphragm 18 may then be punctured with a fitting or dispensing equipment which will receive the liquid from the interior of the container. The presence of the thin film of liquid of low vapor pressure on

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the surface of the diaphragm 18 permits the fitting, which will normally be equipped with an enlarged head, to be introduced into the passage 16 and to engage the shoulder 22. The liquid on the surface of the plug and the surface of the diaphragm 18 acts as a lubricant to provide for easier passage of the fitting.

The container and the closure plug described in connection with the invention may, of course, be used for many different purposes and in many operations. The closure of the invention is particularly suited for use in connection with sterile liquids and solutions which are to be maintained under vacuum.

Although the invention has been described in connection with a particular embodiment, it will be readily understood that changes and modifications may be made without departing from the spirit and scope of the invention.

I claim:

In a container for sterile liquids and the like provided with an open neck, a resilient plug equipped with at least a pair of passages extending partially therethrough, an integral diaphragm extending across each of said passages and sealing the same, one of said diaphragms being of a sufficient thickness to be substantially self-sealing after being punctured with a thin needle, and the other diaphragm being thinner and being readily punctured by a dispensing fitting, a thin film of lubricating liquid of low vapor pressure on the upper surface of said plug and covering the surface of each of the diaphragms, a resilient disk, adapted to be punctured by a thin needle, on the upper surface of the plug protecting the film of liquid on the diaphragms, and closure means for securing said disk in sealing relation with the upper surface of said plug.

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