Feb. 27, 1940. E. S. BEARDSLEY 2,191,447

CONTAINER CLOSURE

Filed April 21, 1937

Fig. 2.

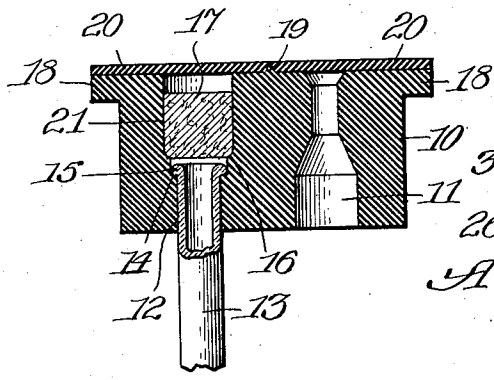


Fig. 1.

Fig. 3.

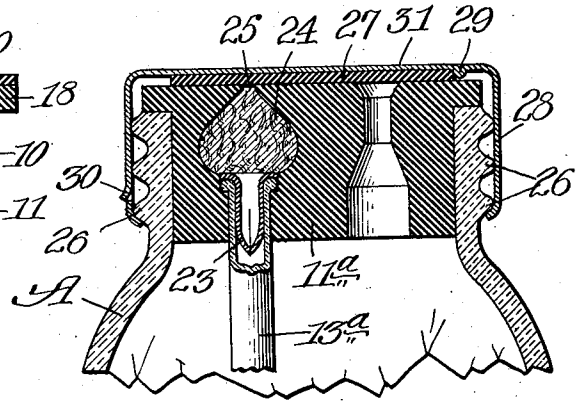
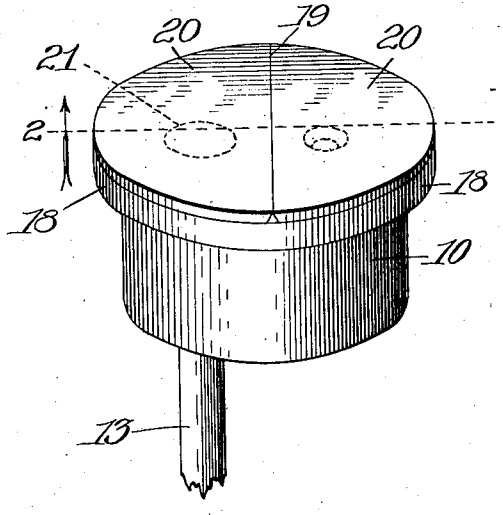
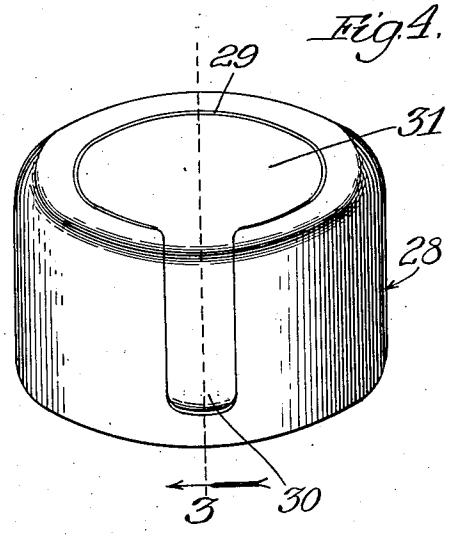


Fig. 4.





Inventor:
Emery S. Beardsley,
By Britton, Wiles, Davies, Hirsch & Dawson,
Attys.

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CONTAINER CLOSURE

Emery S. Beardsley, Glendale, Calif.

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4 Claims. (Cl. 215—37)

This invention relates to a container closure, and more particularly to a closure specifically adapted for the dispensing of sterile solutions, such as are used for intravenous injections.

In the packaging and dispensing of intravenous solutions or solutions which are to be injected subcutaneously, it is of the utmost importance that the solutions not only be kept sterile during shipment and before use but also that the liquid be kept free from the slightest contamination during the draining of the liquid from the container. It has heretofore been proposed that filters be employed for cleansing the air which is admitted into the container to promote an even flow of the liquid from the container. Such filtering mediums have, however, been unsatisfactory because it is necessary to attach them after or during the opening of the seal on the container, because ofter the filtering material itself becomes wet by contact with the liquid and no longer serves as an adequate air filter, and because if the filtering material is attached to the container at the time same is filled, it is practically impossible to form an air-tight closure for the container.

An object of the present invention is to provide a closure in which the filter is maintained below the sealing member and out of interference therewith, while at the same time the filter is maintained effective with its efficiency unimpaired by the solution. A further object is to provide a closure which can be readily and expeditiously sealed to render the container air-tight and, if desired, to maintain a partial vacuum in said container, while at the same time automatically filtering the air which enters the container during the dispensing operation. Other specific objects and advantages will appear as the specification proceeds.

The invention is described in preferred embodiments by the accompanying drawing, in which—

Figure 1 is a broken perspective view of a closure assembly showing one embodiment of my invention; Fig. 2, a sectional view, the section being taken as indicated at line 2 of Fig. 1; Fig. 3, a transverse sectional view of a container provided with a modified form of closure assembly, the section being taken as indicated at line 3 of Fig. 4; and Fig. 4, a perspective view of the structure shown in Fig. 3.

In the practice of my invention, I prefer to employ a container such as, for example, that illustrated in Baxter Patent No. 2,004,027, although it will be understood that many types of containers and closures therefor may be adapted to the present invention.

In the structure shown in Figs. 1 and 2, 10 designates a plug which may be formed of rubber or any other suitable material. The plug is provided with a pair of openings, one opening 11 being adapted to receive a connecting nipple with which a tube leading to the hypodermic needle, etc. may be connected. The other opening 12 is adapted to receive on its lower side a glass tube 13 through which air may pass to the opposite end of the container. The plug provides a seat 14 adapted to receive the bead 15 of tube 13. A short distance above the seat 14 and spaced above the bead 15 is a second seat 16 formed by widening the passage at that point and adapted to receive a filtering body 17. The filtering body may be of any suitable material. I prefer to employ a material which will not dissolve in water or in the solutions employed for the intravenous or subcutaneous injections.

The plug 10 is provided at its top with an outwardly flared flange portion 18 adapted to rest on the top edge of the container. In addition, I prefer to have the plug equipped at its top with a ridge 19 extending across the top surface and dividing the top surface of the plug. The ridge 19 is centrally disposed between the adjacent edges of openings 11 and 12.

Over the openings 11 and 12, I prefer to place flexible sealing members 20 formed of rubber or other suitable material. Preferably each of the members is in the shape of a part-circle and on its inner side is beveled to lie snugly against the ridge 19.

The plug may be placed in position in a container, as shown more clearly in said Baxter Patent No. 2,004,027, and the two flexible sealing members 20 placed in position after the container has been filled. The container may then be partially evacuated as described in the said patent, the flexible members serving as a sealing valve permitting the escape of air but preventing the ingress of air. After the evacuating operation, the container may be sealed by placing thereon a metal disk and a screw cap, as illustrated in Patent No. 2,004,027, or it may be sealed as illustrated in Figs. 3 and 4 hereof.

The filter member 17, as already mentioned, is preferably formed of a material which will not dissolve in water or in the solutions employed for intravenous injections, said solutions consisting of water containing salt or dextrose, or both, but sometimes containing other materials. For this purpose I have found a porcelain

filter very satisfactory. In order to prevent the porcelain from shedding or forming a dust which might contaminate the solution when the porcelain filter 17 is placed in position on seat 16, I prefer to round the corners of the porcelain as indicated by the numeral 21. Also, I have found that the formation of any dust or particles can be prevented by glazing the sides of the porcelain block 17 lying adjacent the walls of the plug. The porcelain does not dissolve in the water. It does not tend to retain any of the material of the solution. It serves as an effective filter for the air whether the filter be dry or wet. It is housed securely within the plug below the sealing elements 20 and does not interfere with such elements.

In the operation of the device, the sealing members are removed and then the sealing member 20, which lies directly over opening 12, is lifted out of position, thus causing the air which immediately enters the container to pass through opening 12 and the air filtering member 17. The nipple for draining off the liquid is secured in openings 11, and the container which is supported in inverted position permits the liquid to drain away through the nipple while the air which replaces the space left by the withdrawn liquid constantly passes through filter 17 and enters the container without carrying any impurities thereinto.

In the modification shown in Figs. 3 and 4, the rubber plug 11ª is provided with an integrally formed split tube 23 which is received within the air inlet tube 13ª. If desired, the tube 13ª may be omitted. The plug is provided with an enlarged opening 24 having a constricted upper outlet 25. In the opening 24 is placed cotton or other suitable filtering material. The split tube 23 serves to permit air to enter the container, but prevents the solution from escaping upwardly into opening 24 and wetting the cotton or other filtering material which might be rendered ineffective if brought into contact with the solution.

The container A is provided with a neck having its lower portion a bead 26. A rubber sealing disk is placed over the two openings of the plug and a single metal cap 28 is placed over the assembly and the lower portions spun under the bead 26 to lock the cap securely in position upon the container. If desired, a threaded cap member may be employed. In the construction shown, the top of the cap is scored deeply at the point indicated by the numeral 29, and connected to this portion is a tear flap 30. In operating the device, the operator may grasp the tear flap 30, draw the same upwardly and then remove the circular disk portion 31 by tearing the same along the circular scored or weakened line 29. The remainder of the disk 28 remains in position, locking the plug 11ª within the neck of the container and preventing its removal when the container is in its inverted position for the dispensing of the solution.

In the structure shown, it will be noted that the filtering material is constantly housed within the plug itself and need not be manipulated or even touched by the operator. It is rendered automatically effective by its being made non-water-soluble or by preventing water from reaching the chamber in which the filter is housed. Further, by the construction shown, the container can be evacuated readily without affecting the filter and sealed tightly by bringing the flexible sealing strips against the top smooth surface of the plug.

While I have shown a container and assembly especially adapted for preserving sterile solutions under vacuum, it will be understood that the solutions may be effectively housed within a container not under vacuum while at the same time utilizing the invention.

Furthermore, it will be obvious that the closure member itself may be modified in material, shape and form considerably while yet employing the spirit of my invention.

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 a closure body of the character set forth, a plug provided with an air passage and a liquid passage, said plug having a ridge extending between said openings, and semi-circular sealing members each extending over one of said openings and each having its straight side lying adjacent said ridge.

2. In combination with a liquid container having an opening at one end and adapted to be supported in inverted position for the dispensing of liquid, a closure body in said opening, said body having two vertical passages extending therethrough, a tube extending into one of said body passages and having its other free end extending into the interior of said container, and means within said last-mentioned passage and associated with said tube for maintaining a column of water within said tube when said liquid container is inverted, said means also permitting air to pass inwardly and through said body of water within said tube, said closure body having a substantially flat surface and a seal normally closing said openings when the container is in upright position.

3. In combination with a liquid container having an opening in one end and adapted to be supported in inverted position for the dispensing of liquid, closure means within said opening providing two vertical passages, and means associated with one of said vertical passages for providing a body of water which does not flow out of said container when the said container is inverted for the dispensing of liquid, said means permitting the inflow of air through said body of water, and a resilient seal normally closing said vertical passages when the container is in upright position.

4. In combination with a liquid container having an opening at one end and adapted to be supported in inverted position for the dispensing of liquid, a closure body in said opening having at least two vertical passages extending therethrough, a glass tube extending into one of said passages and having its free end extending toward the opposite interior end of the container, a porous body in said last-mentioned vertical passage and associated with said tube, said body having openings therein sufficiently minute to prevent the flowing of liquid therethrough while permitting the inflow of air, and means for sealing from the outer surface of said body to both of said openings.

EMERY S. BEARDSLEY.