

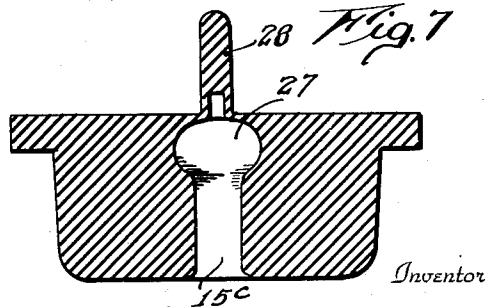
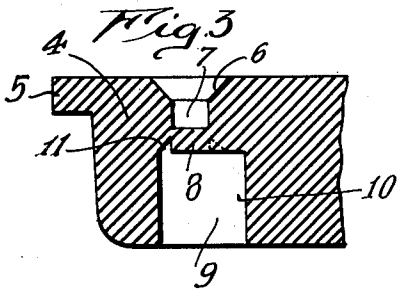
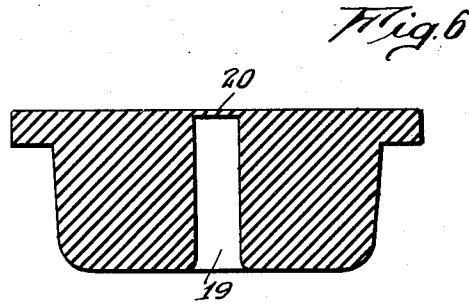
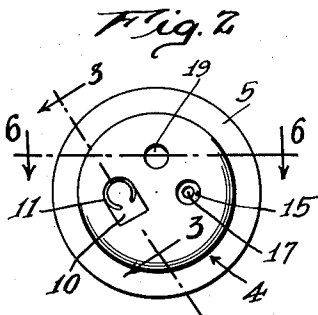
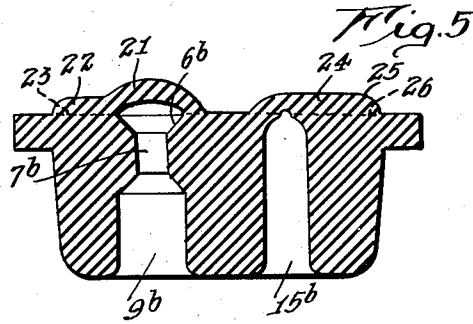
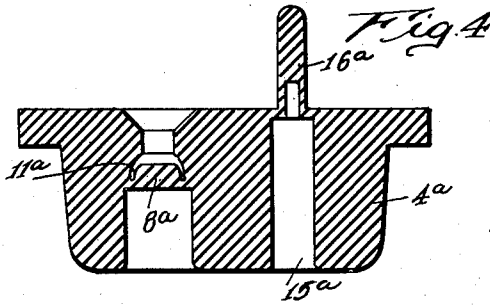
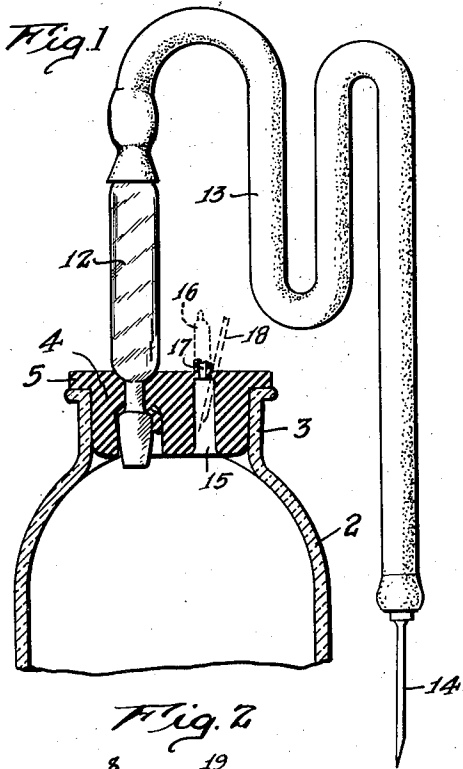
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A. CHERKIN

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CLOSURE FOR CONTAINERS

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# UNITED STATES PATENT OFFICE

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## CLOSURE FOR CONTAINERS

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3 Claims. (Cl. 215—37)

This invention relates to closures for containers and refers particularly to closures for containers intended to be hermetically sealed under vacuum, and is of special value as a closure for a container intended to hold an intravenous solution or to be used as a part of a blood transfusion set.

The closure of the present invention is in the form of a plug of rubber, or equivalent material, intended to be seated within the neck of a container. Closures of this type are intended to remain in position during the removal of the contents of the container and, therefore, are generally provided with two bores—one for the withdrawal of the fluid contents of the container and one for the admission of air into the container in the withdrawing operations. If these bores extend entirely through the closure, then it is necessary to provide auxiliary sealing means for hermetically sealing the container. Furthermore, at times it is desirable to insert glass tubes through the bores of the closure for withdrawing the contents of the container or introducing air thereto, while at other times it is desirable to employ hypodermic needles for this purpose. Heretofore, such closures have not been satisfactorily designed for the alternate use of either glass tubes or hypodermic needles.

It is a general object of the present invention to provide an improved closure which is capable of hermetically sealing the contents of the container without requiring the use of any supplemental means or discs, which closure is so constructed that either glass tubes or hypodermic needles may be readily inserted through the closure and properly held by the closure.

More particularly, an object of the present invention is to provide a closure including bores normally closed by diaphragms integral with the composition of the closure, which diaphragms are susceptible of being readily sheared to permit the insertion of glass tubes, and the walls of which bores and some of such diaphragms are so constructed and arranged that whether glass tubes or hypodermic needles are employed the closure is capable of firmly gripping and sealing itself to the walls of such tubes or hypodermic needles.

The closure of the present invention, together with numerous further important features and advantages of the invention, will be thoroughly understood from the following description of a number of preferred forms or examples of closures embodying the present invention.

The description is given in connection with the accompanying drawing, in which

Figure 1 is an elevation in vertical section of the closure after fracture of one of the diaphragms by the insertion of a glass tube forming part of a dispensing apparatus showing the closure in place in the neck of a container.

Figure 2 is a bottom view of a closure.

Figure 3 is a fragmentary section on the line 3—3 of Figure 2.

Figure 4 is an elevation in section of a modified form of closure.

Figure 5 is an elevation in vertical section of another modified form of closure.

Figure 6 is a section on the line 6—6 of Figure 2.

Figure 7 is a section illustrating a further modification.

Referring to the drawing, 2 indicates a container, which may be a glass bottle, provided with a neck 3. The closure 4 of the present invention is indicated as seated within the neck 3 and consists of a body part of substantially cylindrical form having a top annular flange 5 resting upon the top edge of the neck 3 in order to restrain the closure 4 from being forced or drawn through the neck 3 of the container.

The closure 4 is indicated as having a bore normally closed, which bore includes preferably a countersunk portion 6 at the outer face of the closure for assisting in guiding the glass tube into the bore, following which the bore includes a cylindrical wall portion 7 of suitable diameter and length to firmly grip the walls of the glass tube. Below the portion 7 the closure is provided with a diaphragm 8 which normally closes the bore. Below the diaphragm 8 the bore is enlarged, as indicated at 9, and in addition thereto extended laterally, as indicated at 10, for the purposes hereinafter pointed out.

The diaphragm 8 should be constructed of a sufficient thickness so that, if it is desired to withdraw the contents of the container 2 through the bore by means of a hypodermic needle, such needle after piercing through the diaphragm 8 will be firmly gripped by the composition of the diaphragm 8, for which purpose the diaphragm 8 should be of a thickness of about  $\frac{1}{8}$ ". The diaphragm 8 is also adapted to be sheared from its position, closing the bore by the act of inserting a glass tube through the bore. In order to permit this action, the diaphragm 8 is indicated as scored, as shown at 11, the scoring being preferably of arc form with the diameter of the arc nearly equal to that of the section 7 of the bore. The portion of the diaphragm 8 which is not scored faces the lateral extension of the en-

larged portion 9 of the bore. By means of the scoring 11, the insertion of a glass tube through the bore permits the diaphragm 8 to be sheared along the line of the scoring 11. The diaphragm 8 remains attached to the body of the closure, however, and pivots back, as indicated in Figure 1, into the enlargement 10 of the bore, permitting the glass tube to pass through the bore. By the construction thus described it is possible, as indicated in Figure 1, to attach a dispensing apparatus, such as the glass tube 12, rubber tube 13, and hypodermic needle 14 to the closure for the purpose of withdrawing the contents thereof. Before the insertion of the tube 12, the opening through which such tube is inserted is maintained hermetically closed by the closure without the necessity of there being employed any additional sealing means. Furthermore, connection between a dispensing apparatus and the closure may be made using a hypodermic needle. For example, the glass tube 12 may be replaced by a second hypodermic needle similar to the one indicated at 14 and said hypodermic needle pierced through the center of the diaphragm 8. The diaphragm 8 is of sufficient thickness to adequately grip and seal against such a hypodermic needle.

In order to permit the flow of air into the container 2 during the withdrawal operations, the closure might, if desired, be provided with a second bore, similar in form to that shown in Figure 3 but preferably of simplified form as shown at 15. As indicated at 15, the preferred form of bore extends from the inner face substantially, but not completely, to the outer face of the closure 4. There the bore connects with a shear nipple 16 and a small bore 17 extending to a height above the outer face of the closure 4. In use a hypodermic needle may be inserted, as indicated at 18, to allow the entrance of air to the container 2, or the nipple 16 may be sheared from the closure 4. In either of such cases connections may be made with suitable air filters, if desired.

In certain cases, the closure 4 may be provided with an additional bore 19, as indicated more particularly in Figure 6. This bore extends from the lower face of the closure to nearly the outer face of the closure 4, leaving a thin diaphragm 20. The purpose of such bore 19 is to act as an indicator to indicate whether a vacuum has been maintained within the container 2, the diaphragm 20 being made sufficiently thin so as to be depressed by the presence of vacuum within the container 2 and thereby indicate such vacuum.

Obviously, the closure of the present invention may assume various alternative forms. Thus, in Figure 4, I have indicated a closure 4a which may be similar to closure 4, except that the diaphragm 8a in Figure 4 is indicated as having its scoring 11a formed from above the diaphragm 8a. Such closure 4a may have a suitable bore 15a normally closed by the shear nipple 16a. In Figure 5, I have indicated a further modification in which the bore for connection with the dispensing apparatus includes the tapered portion 6b, cylindrical portion 7b, and an enlarged bore 9b, but in place of the diaphragm 8 this modification is provided above the countersunk portion 6b with a protruding cap 21 having a laterally extending portion 22 which may be partially underscored, as indicated at 23. The air inlet bore 15b is indicated as likewise closed at its upper end with a cap 24 having an extension 25, which may be partially underscored as indicated at 26. In this

form of apparatus, a glass tube may be inserted by first shearing the cap 21 along shear lines 23 and pivoting the same away from the bore. Alternate communication may be made by piercing through the center of the cap 21 with a hypodermic needle. Obviously, the cap should be of suitable width to properly grip such a hypodermic needle. Similar connections may be made through the bore 15b by either piercing the cap 24 with a hypodermic needle or shearing the cap along the scoring 26 and pivoting the same from the bore 15b and inserting a glass tube through the bore.

Now, referring to Figure 7, I have indicated a further modification which may be made in the air inlet of the bore in order that such air inlet may also serve as a vacuum indicator. In such a case, the bore 15c is enlarged, as indicated at 27, near the upper end of the closure and there connects with the shear nipple 28. By suitably enlarging the bore 15c near the upper end of the closure, the closure may be sufficiently weakened at the enlargement 27 to allow the vacuum within the container 2 to cause the surface of the closure at the bore 15c to assume a depressed position under the influence of vacuum within the container, thereby indicating such vacuum.

From the foregoing description, it will be seen that the present invention provides a closure for a container, which closure is normally capable of retaining the container hermetically sealed but is adapted for making ready connections with either tubing or hypodermic needles.

The present invention is capable of numerous modifications and is not limited to the exact form shown, but includes such variations and changes as come within the scope of the appended claims.

I claim:

1. A closure plug for a container, comprising a body having a bore extending from the inner face towards the outer face, said bore including a portion of relatively smaller diameter adjacent the outer face of the body and a portion of larger diameter adjacent the inner face of the body, said body forming a diaphragm extending across the bore between said portions and normally closing the bore, said diaphragm being partially scored to permit shearing of said diaphragm.

2. A closure plug for a container, including a body having a bore extending from its inner to its outer face, said bore having a portion of relatively smaller diameter adjacent its outer face and a portion of relatively larger cross-sectional area adjacent its inner face, said latter portion being enlarged laterally from the axis of the bore at one point, the body forming a diaphragm between said portions normally closing said bore and scored, except in the region of said lateral enlargement, to facilitate the partial shearing of said diaphragm from said body.

3. A closure plug for a container, comprising a body having a bore extending from the inner face towards the outer face, said bore including a portion of relatively smaller diameter adjacent the outer face of the body and a portion of larger diameter adjacent the inner face of the body, said body forming a diaphragm and extending across the bore between said portions and normally closing the bore, said diaphragm being of sufficient thickness to form a seal with a hypodermic needle when punctured thereby, said diaphragm being partially scored to permit shearing of said diaphragm.

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