

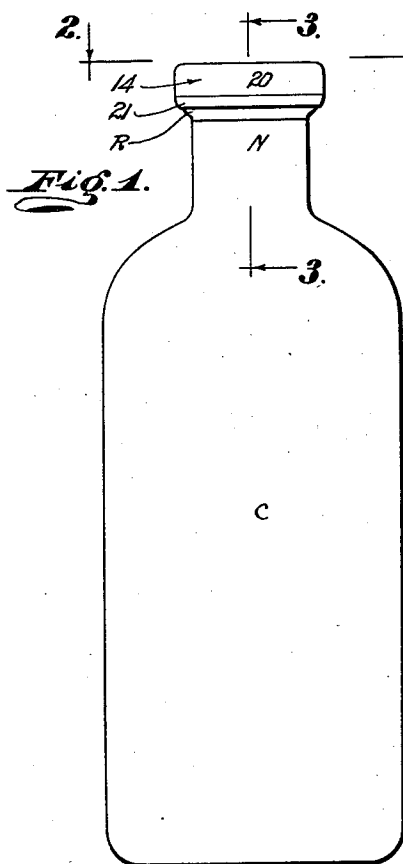
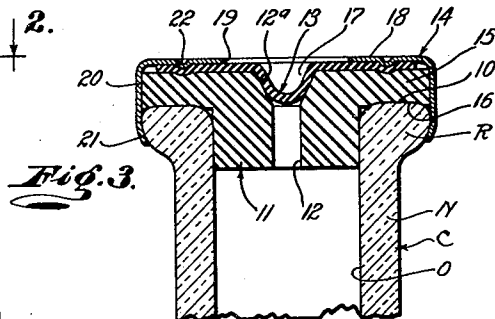
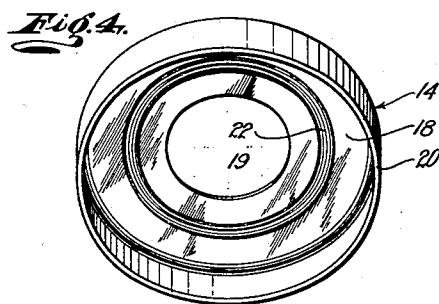
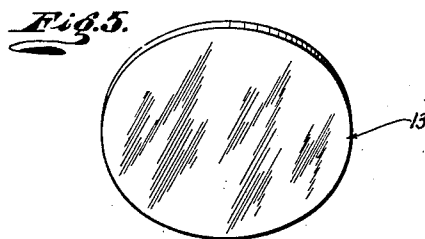
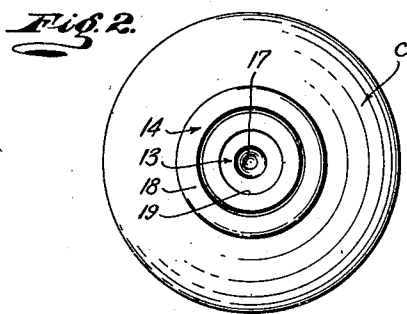
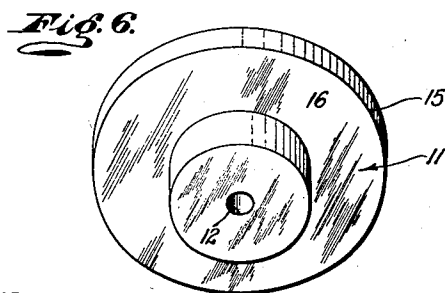
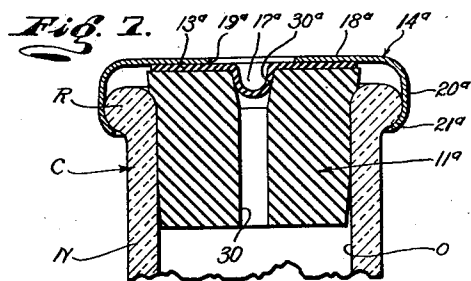
March 9, 1937.

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2,072,853

CLOSURE

Filed Dec. 1, 1934



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2,072,853

CLOSURE

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Application December 1, 1934, Serial No. 755,565

12 Claims. (Cl. 215—47)

This invention relates to a closure and relates more particularly to a closure means for a container. A general object of the present invention is to provide a simple, practical air tight closure for a container such as a bottle, jar, flask or the like.

Another object of the invention is to provide a closure for a container that forms a perfectly air tight seal and that positively prevents the entrance of foreign matter into the container whereby the contents of the container may be preserved indefinitely.

Another object of the invention is to provide a closure for a container that visibly indicates that the air tight seal is perfect and is maintained whereby the condition of the contents of the container may be readily and immediately determined.

Another object of the invention is to provide a closure means of the character mentioned that is substantially tamper proof so that there is practically no danger of breaking the seal by handling the container or by investigation of the closure.

Another object of the invention is to provide a closure of the character mentioned that includes a penetrable or frangible sealing member that may be easily ruptured, broken or penetrated by a hypodermic needle to allow the contents to be drained from the container.

Another object of the invention is to provide a closure of the character mentioned that is simple and inexpensive of manufacture and that embodies but three simple parts.

A further object of the invention is to provide a closure of the character mentioned that allows the air to be exhausted from the container and that facilitates the preservation of the contents of the container.

The various objects and features of my invention will be fully understood from the following detailed description of typical preferred forms and applications of my invention, throughout which description reference is made to the accompanying drawing, in which:

Fig. 1 is a side elevation of a typical container or bottle illustrating one form of the invention positioned thereon. Fig. 2 is a top or plan view of the container and the closure means being a view taken as indicated by line 2—2 on Fig. 1. Fig. 3 is an enlarged vertical detailed sectional view taken as indicated by line 3—3 on Fig. 1. Fig. 4 is an enlarged perspective view of the under side of the cap. Fig. 5 is an enlarged perspective view of the sealing member. Fig. 6 is an enlarged perspective view of the under side of the closure

body and Fig. 7 is a view similar to Fig. 3 illustrating another form of the invention.

The present invention is adapted to be embodied in forms for use on containers of various types and for use on containers holding different classes of fluids. Throughout the following detailed disclosure I will describe typical forms of the invention employed on simple containers or bottles of the type used for holding intravenous solutions, etc., it being understood that the invention is not to be construed as restricted or limited to the specific forms or applications about to be described.

The typical bottle or container C illustrated in Figs. 1, 2 and 3 of the drawing is of conventional shape and is provided at its upper end with a reduced neck N. The neck N is cylindrical and is provided at its upper end with an outwardly projecting annular bead or rim R. The upper end 10 of the neck N is substantially flat and normal to the longitudinal axis of the container C. The longitudinal opening O in the neck N which communicates with the interior of the container C is cylindrical and substantially uniform in diameter.

The form of closure means illustrated in Figs. 1 to 6 inclusive, of the drawing includes, generally, a plug or closure body 11 for arrangement in the opening O and having an opening 12 for communicating with the interior of the container C, a seal or sealing member 13 for closing or sealing the opening 12 and means 14 for holding the sealing member 13 on the closure body 11.

The plug or closure body 11 is adapted to occupy the upper portion of the container opening O and is preferably proportioned to tightly fit the opening. The body 11 is resilient so that its exterior or periphery may tightly bear on and seal against the wall of the opening O. The body 11 is preferably formed of a good grade of gum rubber to have sufficient resiliency to properly bear on and seal against the wall of the opening O. The portion of the body 11 which fits the opening O may be substantially cylindrical, it being understood that this portion of the closure body may be tapered to wedge in the opening. In the form of the invention being described the closure body 11 has an annular outwardly projecting flange 15 on its upper end to cooperate with and bear on the rim R. The outer or peripheral surface of the flange 15 may be cylindrical and may be substantially flush with the periphery of the rim R. The lower side or surface 16 of the flange 15 is preferably flat and normal to the longitudinal

axis of the body 11 to evenly fit on and seal with the upper end 10 of the neck N.

The upper end or surface of the body 11 receives or carries the sealing member 13. In the preferred construction the upper surface of the closure body 11 is flat and at right angles to the longitudinal axis of the body. The flat upper surface of the body 11 continues across the flange 15 to its periphery. In the form of the invention illustrated in the drawing the body 11 has a single opening 12 through which the contents of the container C may be drained, it being understood that the body 11 may have as many openings as found necessary. The opening 12 extends vertically or longitudinally through the body 11 from its lower side and its upper end portion 12^a is enlarged. The wall of the opening portion 12^a is preferably inclined downwardly and inwardly. The opening 12 allows the air to be exhausted from the container C whereby the contents of the container may be preserved and allows the contents to be drained from the container after the sealing member 13 has been pierced or ruptured. The opening 12 is adapted to receive a tube for draining the contents from the container C and its tapered enlarged portion 12^a facilitates the reception of such a tube.

The seal or sealing member 13 normally closes or seals the upper end of the opening 12 to positively prevent the entrance of air and foreign matter into the container C. The sealing member 13 is adapted to act as a valve to allow the air to be exhausted from the container C and immediately following the drawing of the vacuum is operable to close under the action of atmospheric pressure to maintain the reduced pressure in the container. In accordance with the invention the sealing member 13 is frangible being adapted to be cut by a suitable instrument or broken or ruptured by a tube being inserted in the opening 12. The sealing member 13 is normally or initially flat and is a comparatively thin sheet or disc which lies on the upper surface of the body 11. The sealing member 13 is somewhat smaller in diameter than the upper end of the body 11 but is sufficiently large to extend across the upper end of the opening 12 and have substantial bearing and sealing cooperation with the surface or wall of the upper portion 12^a of the opening 12 and have substantial bearing and sealing cooperation with the upper surface of the body 11.

In accordance with the invention the sealing element 13 has a substantial degree of flexibility so that it may be forced or flexed into the upper portion 12^a of the opening 12 by atmospheric pressure when a reduced pressure exists in the container C. The sealing member 13 is formed of rubber or a rubber composition having a desired degree of flexibility and that is impervious and impermeable to fluids. When a reduced pressure exists in the container C the atmospheric pressure acting on the external surface of the sealing member 13 forces or flexes the central portion of the member into the upper portion 12^a of the opening 12 to form or provide therein a depression 17 and holds the under side of the sealing member in tight sealing contact with the upper surface of the body 11. The sealing member 13 in being flexed or forced into the upper portion 12^a of the body opening has sealing cooperation with its wall. The sealing member 13 is thus held in sealing contact with the body 11 by the action of atmospheric pressure to positively seal the upper end of the opening 12 against

the entrance of air and foreign matter. The recess or depression 17 formed in the central portion of the sealing member 13 visibly indicates that a reduced pressure or vacuum is maintained in the container C and that a perfect air tight seal is preserved.

When it is desired to draw a reduced pressure or vacuum in the container C the closure body 11 is inserted in the opening O and the sealing member 13 is arranged on the upper surface of the body. A bell or fitting is then placed on the exposed peripheral portion of the body 11 and engages the member 13 at a point spaced from the opening 12. The bell or fitting is connected with a vacuum pump and the air is exhausted from the container C through the fitting, at which time the sealing member 13 lifts from the upper side of the body 11 to allow the air to pass from the container. A bell or fitting of the character referred to above is described and claimed in my co-pending application entitled Device for exhausting air from containers, Serial No. 695,483, filed October 27, 1933. Upon a suitable vacuum being drawn atmospheric pressure is admitted to the bell or fitting and this atmospheric pressure returns the sealing member 13 to the position where it seals with the upper surface of the body 11. The bell or fitting is then disengaged from the closure body and the atmospheric pressure acting on the sealing member 13 forces or flexes the member into the opening portion 12^a and maintains the member in tight sealing engagement with the body 11.

The means 14 holds the sealing member 13 on the closure body 11 to prevent it from being shifted, displaced or raised and thus prevents the air tight seal from being broken. The means 14 also clamps or forces the sealing member 13 against the upper surface of the closure body 11 to hold it in sealing cooperation with the body and thus provide a positive mechanical seal between the member 13 and the body 11. It is an important feature of the invention that the holding means 14 is such that the depressed central portion or depression 17 of the sealing member 13 is exposed and at all times visible so that the condition of the seal may be determined without disturbing any parts of the closure means.

The means 14 comprises or is in the nature of a cap which bears downwardly on the sealing member 13 and which has mechanical engagement with the container C. The cap comprising the means 14 is a simple, integral member of metal or other material having a suitable degree of rigidity and capable of being distorted or bent. The top or top wall 18 of the cap is flat and adapted to evenly cooperate with or bear on the upper surface of the sealing member 13. A central opening 19 is provided in the top wall 18 whereby the central portion of the sealing member 13 and its depression 17 are exposed to view, and are engageable without removing the caps. The opening 19 is preferably larger than the upper portion 12^a of the body opening whereby the entire depression 17, as well as the portion of the sealing member around the depression 17 is visible and engageable.

A downwardly projecting peripheral flange 20 is provided on the top wall 18 of the cap. The flange 20 projects downwardly around the periphery of the body flange 15 and cooperates with the rim R of the container neck N. The flange 20 is initially cylindrical. After the cap

comprising the means 14 has been arranged in its proper position the lower portion of the flange 20 is crimped or bent inwardly to engage under the rim R at 21. This inward bending of the lower end portion of the flange 20 forces the top wall 18 downwardly against the sealing member 13 and permanently attaches the cap to the container C. The cap comprising the means 14 tightly holds the flange 15 in sealing cooperation with the upper surface 10 of the neck N. In the form of the invention being described the top wall 18 of the cap has a downwardly projecting or facing annular ridge 22 on its under side. The ridge 22 is suitably spaced between the opening 19 and the flange 20 and is preferably regular and continuous. The ridge 22 distorts or forces the sealing member 13 into the resilient upper face of the body 11 thus providing an effective outer or secondary seal between the sealing member and the closure body.

It is believed that the utility and practicability of the form of closure means illustrated in Figs. 1 to 6, inclusive, of the drawing, will be readily understood from the foregoing detailed description. After the air has been exhausted from the container C in the manner described above the atmospheric pressure acting on the upper side of the sealing member 13 flexes the central portion of the member into the upper portion 12^a of the body opening 12 to provide the depression 17 and holds the surrounding adjacent portion of the sealing member in even sealing engagement with the upper surface of the closure body 11. In this manner the atmospheric pressure acts to maintain the sealing member 13 in engagement with the body to provide a perfectly air tight seal for the container. As long as the proper reduced pressure is maintained in the container C the atmospheric pressure holds or flexes the central portion of the initially flat sealing member 13 in the upper portion 12^a of the body opening providing the depression 17. The depression 17 thus indicates that the contents of the container are preserved and that the container is properly sealed. The cap comprising the means 14 clamps the sealing member 13 against the upper surface of the closure body 11 to hold the member in tight sealing engagement with the body. The cap also prevents shifting of the body 11 and sealing member 13. The central portion of the sealing member 13 and its depression 17 are exposed to view through the opening 19 so that the condition of the seal may be instantly determined without moving or disturbing any parts of the closure means.

When it is desired to remove or drain the contents from the container C the central portion of the sealing member 13 at the bottom of the depression 17 may be pierced by a suitable cutting instrument to permit the easy insertion of a tube in the opening 12 for the purpose of draining the contents of the container. The central portion of a sealing member 13 may be broken or ruptured by the insertion of a suitable tube, needle, or the like in the opening 12 and it may not be necessary to pierce the sealing member 13 with a cutting instrument. The closure means is extremely simple and inexpensive and facilitates the sterilization of the contents of the container C. The closure means is adapted to maintain a perfectly air tight seal for an indefinite period to preserve the contents of the container. The condition of the seal may be readily determined at any time by merely examining the central portion of the

sealing member and the depression 17 exposed through the opening 19 in the cap.

Fig. 7 of the drawing illustrates a form or modification of the invention in which the closure body 11^a is longitudinally tapered to tightly wedge or fit the opening O in the neck N of the container. The closure body 11^a is sufficiently long to have effective sealing engagement with the wall of the opening O and has a flat smooth upper end. The body 11^a is proportioned to project above the upper end of the neck N and has a central longitudinal opening 30. The upper portion 30^a of the opening 30 is enlarged and has an upwardly and outwardly tapered wall.

The sealing element or member 13^a embodied in the form of the invention illustrated in Fig. 7 may be identical with the sealing member 13. The sealing member 13^a is arranged on the upper surface of the body 11^a to seal therewith and to cover and close the upper end of the opening 30. When a reduced pressure exists in the container the atmospheric pressure distorts or flexes the sealing member 13^a into the upper portion 30^a of the body opening to form a depression 17^a. The cap 14^a included in the device illustrated in Fig. 7 of the drawing may be substantially identical with the cap comprising the means 14. The top wall 18^a of the cap 14^a is flat and is adapted to bear against the sealing member 13^a. A central opening 19^a is provided in the wall 18^a whereby the depression 17^a and the central portion of the sealing member are exposed to view. The cap 14^a has an annular downwardly projecting peripheral flange 20^a which is turned or bent under the rim R as at 21^a to hold the top wall 18^a in tight cooperation with the member 13^a. The closure means shown in Fig. 7 of the drawing operates in the same manner as the previously described form of the invention.

Having described only typical forms and applications of my invention, I do not wish to be limited or restricted to the specific forms and applications herein set forth, but wish to reserve to myself any modifications or variations that may appear to those skilled in the art or fall within the scope of the following claims.

Having described my invention, I claim:

1. A closure for the opening of a container including a closure body closing said opening and having an opening in communication with the interior of the container, a flexible sealing member covering the outer end of the opening in the body and held in sealing engagement with the body and flexed into the opening in the body by the action of atmospheric pressure, and a cap permanently attached to the container engaging the sealing member to hold it on the body, the cap having an opening through which the flexed portion of the sealing member is exposed to be visible.

2. A closure for the opening of a container including a closure body closing said opening and having an opening in communication with the interior of the container, a sealing member arranged on the outer end of the body and sealing the outer end of the opening therein through the action of atmospheric pressure, and a cap connected with the container and bearing against the sealing member to hold it on the body.

3. A closure for the opening of a container including a closure body arranged in said opening to close the same and having an opening in communication with the interior of the container, a sealing member covering the outer end of the

body and sealing therewith to seal the opening in the body through the action of atmospheric pressure and penetrable to allow the contents to be drained from the container, and means holding the sealing member on the body with a portion exposed for such penetration, said means including a retaining part engaging the outer surface of the sealing member.

4. A closure for the opening of a container including a plug body closing said opening and having an opening in communication with the interior of the container, a flexible sealing member covering the outer end of the body and sealing the opening in the body and flexed therein by the action of atmospheric pressure, and means preventing displacement of the sealing member from the body and leaving its flexed portion exposed for penetration to remove the contents from the container, said means including a part engaging the sealing member at a point removed from said flexed portion.

5. A closure for the opening of a container including a closure body closing said opening and having an opening in communication with the interior of the container, a flexible sealing member on the body sealing the opening in the body and flexed therein by the action of atmospheric pressure, and means holding the sealing member on the body with its flexed portion exposed for penetration to remove the contents from the container, said means including a cap secured to the container.

6. A closure for a container having an opening and a projecting rim at the mouth of the opening, said closure including a body closing the opening and having an opening communicating with the interior of the container, a sealing member on the body sealing the opening therein through the action of atmospheric pressure, and a cap holding the sealing member on the body, the cap including a part engaging under the rim.

7. A closure for a container having an opening and a projecting rim at the mouth of the opening, said closure including a body closing the opening and having an opening communicating with the interior of the container, a sealing member on the body sealing the opening therein through the action of atmospheric pressure, and a cap holding the sealing member on the body, the cap including a part engaging under the rim, and the cap having an opening leaving the portion of the sealing member over the opening in the body exposed.

8. A closure for a container having an opening

and a projecting rim at the mouth of the opening, said closure including a body closing the opening and having an opening communicating with the interior of the container, a sealing member on the body sealing the opening therein through the action of atmospheric pressure, and a cap holding the sealing member on the body, the cap including a peripheral flange engaging under the rim.

9. A closure for a container having an opening and a projecting rim at the mouth of the opening, said closure including a body closing the opening and having an opening communicating with the interior of the container, a flexible sealing member on the body sealing the opening in the body and flexed therein through the action of atmospheric pressure, and a cap cooperating with the rim to urge the sealing member against the body and having an opening leaving the flexed portion of the sealing member exposed.

10. A closure for a container having an opening and a projecting rim at the mouth of the opening, said closure including a body closing the opening and having an opening communicating with the interior of the container, a flexible sealing member on the body sealing the opening in the body and flexed therein through the action of atmospheric pressure, and a cap engaging the outer side of the sealing member and having an opening leaving the flexed portion of the member exposed, the cap having a flange engaging under the rim to force the sealing member against the body.

11. A closure for a container having an opening and a projecting rim at the mouth of the opening, said closure including a tapered body closing the opening and having an opening communicating with the interior of the container, a sealing member on the body sealing the opening therein through the action of atmospheric pressure, and a cap holding the sealing member on the body, the cap including a part engaging under the rim.

12. A closure for a container having an opening and a projecting rim at the mouth of the opening, said closure including a body closing the opening and having an opening communicating with the interior of the container, a flange on the body seating on the rim, a sealing member on the body sealing the opening therein through the action of atmospheric pressure, and a cap holding the sealing member on the body, the cap including a part engaging under the rim.

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