

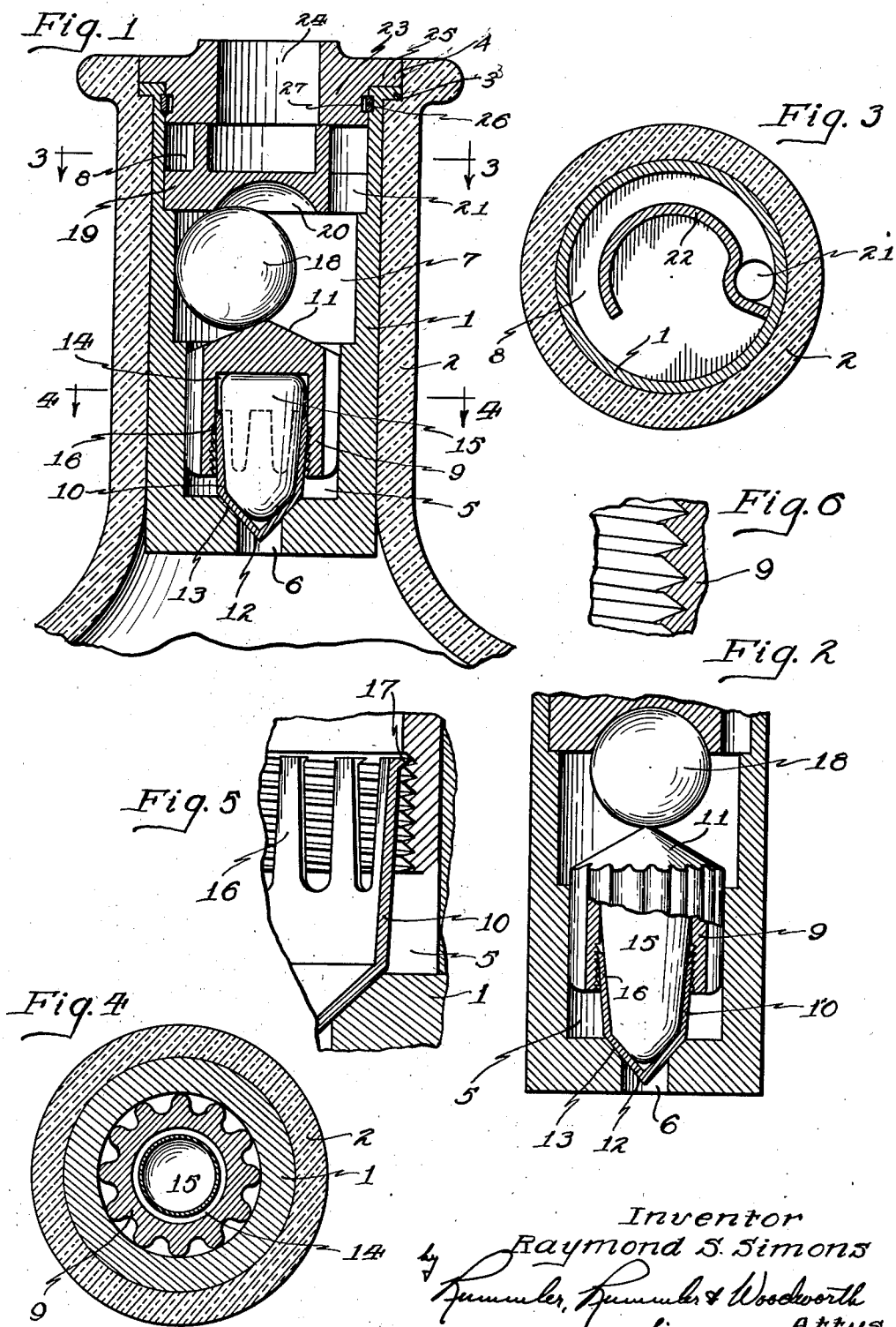
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NONREFILLABLE CLOSURE

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NONREFILLABLE CLOSURE

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This invention relates to closures for bottles and other containers, and particularly to such devices for use where it is desired to render a bottle or other container nonrefillable.

The main objects of this invention are to provide an improved closure for bottles and other containers; to provide an improved valve actuating means for nonrefillable closures; to provide such a means that will obviate vacuum manipulation for either extracting liquid through the closure or refilling the container through the same; to provide such a means that may be readily incorporated in many existing meritorious closure devices; and to provide a nonrefillable closure in which a control valve is permanently locked in its closed position upon any attempted vacuum manipulation.

An illustrative embodiment of this invention is shown in the accompanying drawing in which:

Fig. 1 is a sectional elevation of the closure applied to a bottle neck.

Fig. 2 is a fragmentary sectional detail showing the valve in a closed and locked position as a result of vacuum manipulation.

Fig. 3 is a sectional view as taken on line 3—3 of Fig. 1, showing the construction and arrangement of the closure baffle plug.

Fig. 4 is a sectional view taken on line 4—4 of Fig. 1 showing the arrangement of the valve in detail.

Fig. 5 is a fragmentary sectional view of the valve illustrating the manner in which it is locked in an expanded closing position.

Fig. 6 is an enlarged fragmentary sectional detail of the threads shown in Fig. 5.

Numerous ingenious nonrefillable closure constructions have been heretofore devised. However, in substantially all of these devices it is possible to pass a liquid through the device in either direction when vacuum means are employed, either for the liquid extraction or filling operation.

The present invention is intended to overcome this difficulty and defect by means of an arrangement and valve operating principle that may readily be incorporated in substantially any practical closure construction. Thus, for the purpose of illustration, the invention is herein shown as embodied in a closure construction patented after the disclosure of Patent No. 2,048,699, issued July 28, 1936 to Gilbert Jackson, since that closure construction is possessed of the advantages of simplicity, ease and practicability of manufacture, and hence, low cost.

In the form shown in the drawing, the closure

comprises a cylindrical, hollow body 1, formed to fit into a bottle neck 2, and having an outwardly projecting radial flange 3 at its upper end formed to fit in an annular channel 4 on the inner margin of the bottle neck top opening. The cylindrical body 1 is formed with three annular chambers of increasing diameter upwardly from the lower end of the body, the lowermost chamber 5 communicating with the interior of the bottle through the bottom end of the body 1, by means of a passage 6. The second or intermediate chamber 7 is an enlarged continuation of the chamber 5 and the uppermost chamber 8 is an enlarged continuation of the chamber 7 extending to the top of the body 1.

A valve, comprising an externally and axially fluted, hollow cylindrical body 9 as its upper portion and a cup-shaped valve member 10 as its lower portion, is disposed within the lowermost chamber 5 of the body 1, the valve body 9 having an upwardly tapered conical top 11 and being proportioned so that the crests of the fluted side wall will slidably engage with the side wall of the chamber 5.

The cup-shaped valve member 10 is formed with a split resilient side wall arranged to telescopically interfit with the open lower end of the hollow body 9, and is also provided with a downwardly tapered conical end portion 12 which projects from the bottom of the body 9 and is arranged to seat on a conically tapered valve seat 13 formed at the inner margin of the passageway 6. In the telescoping assembly of the valve member 10 with the valve body 9 an enclosed internal pocket or cavity 14 is formed within the valve and within this cavity, which serves as an air chamber, is housed an expansive air bag or sac 15 which is so designed that upon a reduction of the surrounding atmospheric pressure inside the closure body 1, the bag or sac 15 will expand and push the cup-shaped valve member 10 outwardly from the valve body 9.

Normally the cup-shaped valve member 10 will be held in a withdrawn position in the valve body 9, as shown in Fig. 1, through friction of the segments of its resilient side wall upon the inner wall surface of the valve member 9. However, upon expansion of the air bag or sac 15, through reduction of the surrounding atmospheric pressure, the valve portion 10 will assume a projected position as shown in Fig. 2, which has the mechanical effect of lengthening the valve axially with respect to the closure body 1.

In order to provide means to lock the cup-shaped valve member 10 in its outwardly pro-

jected position relative to the valve body 9, in the form shown the lower portion of the internal side wall of the body 9 is threaded or otherwise grooved, as shown in Fig. 5, and the side wall of the cup-shaped member 10 is axially split in several places about its periphery so that the side wall of the valve member 10 will comprise a plurality of resilient fingers 16, which, due to their resiliency will tend to spread outwardly against the inner side wall of the body 9. Also, as shown in Fig. 5, the upper ends of the fingers 16 are formed as outwardly projecting pawls or detents 17 which extend into and engage the grooves on the inner side wall of the valve body 9. Thus, upon outward movement of the valve member 10 relative to the valve body 9, under the influence of the expanding air bag 15, the resilient fingers 16 and pawls 17 will prevent the valve member 10 being returned to its telescoped position relative to the body member 9.

As shown in Fig. 5, the threads or grooves preferably progress helically inwardly from the open end of the valve body 9, and the crests of the thread teeth thus formed are preferably shaped so as to provide square shoulders against which the pawls 17 may engage. Also the lower sides of the said threads are tapered downwardly away from the tips of the pawls 17 at a greater angle relative to the horizontal than the upper sides of the threads taper toward the pawls 17. With this arrangement, as the tips of the pawls 17 engage the lower side walls of the threads there is a camming action which tends to seat the valve member 10 tightly against the valve seat 13 under a constant resilient pressure, even though the atmospheric pressure surrounding the air sac 15 has been returned to normal and the air sac has contracted to its normal size.

As shown in Fig. 1, the intermediate chamber 7 of the closure body 1, houses a relatively heavy ball 18, which when the bottle neck is in an upright position rests on the conical top 11 of the valve body 9. A baffle plate or upper contact member 19 is seated in the uppermost chamber 8 and its lower surface is provided with a central cavity 20 into which the ball 18 may drop when the bottle neck is in an inverted position.

As shown in Fig. 1, the ball 18 is of such size that when the bottle neck is in an upright position the ball 18 will engage both the inner or lower surface of the baffle plate 19 at the margin of the cavity 20 and the conical surface 11 of the valve body 9, so that the valve cannot unseat and open until the bottle neck has been substantially inverted.

The baffle plate 19 is provided with a passage 21 at one side communicating with the interior of the intermediate chamber 7 and extending to the top surface of the baffle plate; and on the top surface is a baffle wall 22 which projects upwardly and, in conjunction with the wall of the chamber 8, provides a curved passage leading from the opening 21 to the central portion of the plate 19.

The plate 19 is held in place in the upper chamber 8 by means of a plug or cap 23 which fits into the upper end of the chamber 8 and bears upon the upper edge of the baffle wall 22. The plug 23 is provided with a central opening 24 and has an outwardly projecting flange 25 which rests upon the flange 3 of the closure body 1, the flange 25 being preferably of the same external diameter as the flange 3.

As shown in Fig. 1 the marginal channel 4 at the upper end of the bottle neck is preferably of

such depth as to completely receive both of the flanges 3 and 25.

In the arrangement shown, the plug 23 is locked to the closure body 1 by means of a resilient outwardly expansible split ring 26 which is seated in a peripheral groove or channel 27 on the plug 23 and engages in an oppositely disposed channel or groove formed on the inner wall of the closure body 1 when the plug 23 is inserted in the open upper end of the body 1.

In operation the closure is applied to the bottle or container neck after the bottle or container has been filled and the closure is cemented or otherwise secured in the bottle neck in any suitable manner. The top opening 24 of the closure is then plugged and sealed by any suitable or convenient means. When it is desired to remove the contents of the bottle or container the plug or seal closing the opening 24 is removed and the bottle contents can be poured out by simply inverting the bottle.

When in such inverted position the relatively heavy ball 18 will drop into the cavity 20 of the contact or baffle plate 19 and the valve will shift axially in the closure body and unseat to permit the passage of the bottle contents, the bottle contents flowing through the passageway 6 and over the fluted walls of the valve body 9 through the intermediate chamber 7 and the passage 21 to the upper central position of the baffle plate 19 where it may be readily discharged through top opening 24.

When the bottle is returned to its upright position, the weight of the ball 18 against the conical top 11 will cause the valve to seat itself and close the inner passageway 6, thus preventing any refilling of the bottle when the same is in upright position. Should refilling of the bottle be attempted when the bottle is in an inverted position by forcing liquid under pressure through the closure means, the hollow, air-filled valve will float on top of the entering liquid column and close the passageway 6 before any liquid can pass through the same.

Upon any attempt of vacuum manipulation, that is, extracting the contents from the bottle when in its inverted position by applying vacuum to the end of the bottle neck or closure, the reduction of the normal atmospheric pressure within the closure chambers will result in expansion of the air bag or sac 15, housed within the valve member, due to the outward pressure of the air contained in the sac 15, and thus cause axial expansion or elongation of the valve through outward movement of the valve member 10. Such expansion, or outward movement of the valve member 10 will cause the upper conical portion 11 of the valve to engage the ball 18 and the conical end 12 of the valve member 10 will engage the conical seat 13 at the margin of passageway 6, thus automatically closing the passageway and preventing any further passage of fluid therethrough.

Because of the locking engagement of the valve member fingers 16 with the threaded or grooved inner surface of the walls of the valve body 9, the valve will be permanently held in its expanded position, thus serving as an indication of the fact that illegal tampering with the bottle closure has been attempted. The bottle will thus be rendered unfit for any further use and the practical result will be its ultimate destruction.

Due to the fact that it is imperative that bottle closures be of a type and construction wherein there will be no metal that could possibly come

into contact with the bottle contents, practical closure devices must be made of non-metallic materials. The herein described device was chosen to illustrate a specific embodiment of this invention because it was believed that it is of such form and construction that it can be readily and cheaply made from any of several well-known and suitable materials in the class of plastics, such as bakelite and the like. The heavy ball 18 may be given sufficient weight by providing a metallic core and covering the same with non-metallic material, however, the metal used must be non-magnetic to prevent any magnetic manipulation of the ball in order to defeat its purpose.

The main advantages of this invention are found in the simplicity of the pneumatic principle upon which it is based and in the ease and practicability of the application of that principle to numerous existing closure constructions, to render them tamper-proof and absolutely nonrefillable. A further advantage is found in the fact that in many closure constructions and arrangements it is only necessary to add one element to those already involved; and in any case the use or embodiment of this invention will not materially affect the cost of the finished product.

In spite of the numerous and ingenious mechanical valves and other devices that have been devised to prevent the refilling of a container, and particularly a bottle, after the container or bottle has once been emptied, the problem has not been heretofore completely solved. Many of these devices are practical in construction and operation insofar as ordinary manipulation is concerned, however, any person who can profitably replace the original contents of a container with some other or inferior product will not be stopped by a mere matter of inconvenience or the time and patience necessary to accomplish his purpose. A common method of circumventing the usual nonrefillable devices is by the use of vacuum and none of the mechanisms or valve arrangements heretofore employed has been able to prevent the inleakage of liquid into a container when the container has been first exhausted of air. The present invention cures this difficulty not only by preventing the attempted use of vacuum, but also by enlisting such vacuum as an aid to block the liquid passage and lock the container.

Although but one specific embodiment of this invention is herein shown and described, it will be understood that numerous details of the construction shown may be altered or omitted without departing from the spirit of this invention as defined by the following claims:

I claim:

1. In a device of the class described, the combination with a body member having a passageway therethrough for fluid, and valve means arranged to close said passageway, of means providing an air pocket within said body member and arranged to actuate said valve means so as to close said passageway in response to expansion of air in said air pocket, and means to lock said valve means in closed position upon expansion of air in said air pocket.

2. In a device of the class described, the combination with a body member having a passageway therethrough for fluid, and valve means arranged to close said passageway, of means providing an enclosed air pocket within said body member subject to surrounding atmospheric

pressure variations, said last named means being arranged to cause closure of said passageway by said valve means upon expansion of air in said air pocket, and means to lock said valve means in closed position upon expansion of air in said air pocket.

3. In a device of the class described, the combination with a body member having a passageway therethrough for fluid, and valve means arranged to close said passageway, of means providing an air pocket within said body member and arranged to permanently lock said valve means in a position closing said passageway upon expansion of air in said air pocket.

4. In a device of the class described, the combination with a body member having a passageway therethrough for fluid, and valve means arranged to close said passageway, of means providing an enclosed expansive air pocket within said body member subject to surrounding atmospheric pressure variations, and means operable upon expansion of said air pocket to permanently lock said valve means in a position closing said passageway.

5. In a device of the class described, the combination with a body member having a passageway therethrough, of means providing an air chamber within said body member and having an open end, other means telescopically fitting the open end of said air chamber means and shiftable outwardly therefrom upon expansion of air in said air chamber, means arranged to close said passageway upon shifting of said other means, and detent means to lock said other means in its shifted position.

6. In a device of the class described, the combination with a body member having a passageway therethrough, of means providing an air chamber within said body member having an open end, other means telescopically fitted into said open end of said air chamber and shiftable outwardly upon expansion of air in said air chamber, means arranged to close said passageway upon outward shifting of said other means, and a detent arranged to prevent re-opening of said passageway.

7. In a device of the class described, the combination with a body member having a passageway therethrough for fluid, of a hollow air-filled expansive member disposed in said passageway and arranged to expand upon reduction of the atmospheric air pressure in said passageway and close said passageway against passage of fluid therethrough, and detent means operable upon expansion of said expansive member to lock and permanently close said passageway.

8. In a device of the class described, the combination with a body member having a passageway therethrough for fluid, of a shiftable hollow air-filled expansive valve member disposed in said passageway and arranged to open and close the same, and means to limit the opening movement of said valve member, said valve member being arranged to expand upon expansion of the air therein and close said passageway.

9. In a device of the class described, the combination with a body member having a passageway therethrough for fluid and an inlet opening having a valve seat, of a hollow air-filled expansive valve member disposed in said passageway and axially shiftable therein to open and close said inlet opening, and means to limit the opening movement of said valve member, said valve member being arranged to expand axially

upon reduction of the atmospheric pressure in said passageway and close said inlet opening.

10. In a device of the class described, the combination with a body member having a passageway therethrough for fluid and an inlet opening having a valve seat, of a hollow air-filled expansive valve member disposed in said passageway and axially shiftable therein to open and close said inlet opening, means to limit the opening movement of said valve member, said valve member being arranged to expand axially upon reduction of the atmospheric pressure in said passageway and close said inlet opening, and means to lock said valve member in its expanded position.

11. A container closure having a passageway therethrough, means to provide an air pocket in said closure, means arranged to be actuated by expansion of air in said air pocket to close said passageway, and a detent to lock said last named means in passageway closing position.

12. A container closure having a passageway therethrough for liquid, an air pocket within said closure, shiftable means arranged to be actuated by expansion of air in said air pocket, means arranged to close said passageway upon actuation of said shiftable means by said air expansion, and detent means to lock said last-named means in closed position.

13. A container closure having a passageway therethrough for liquid, an air pocket within said closure, shiftable means arranged to close off one end of said air pocket and to be actuated by expansion of air in said air pocket, means arranged to close said passageway upon actuation of said shiftable means by said air expansion, and a detent coacting with said last-named means to prevent re-opening of said passageway.

14. In a device of the class described, the combination with a body member having a passageway therethrough, of means providing an expansible air chamber within said body member,

said means comprising associated members arranged to shift relative to each other upon expansion of air in said air chamber, one of said members causing closure of said passageway upon such shifting, a shoulder on one of said members, and a detent on the other of said members for engaging said shoulder upon relative shifting of said members to lock said members in shifted position.

15. In a device of the class described, the combination with a body member having a passageway therethrough, of means providing an expansible air chamber within said body member, said means comprising associated members arranged to shift relative to each other upon expansion of air in said air chamber, one of said members causing closure of said passageway upon such shifting, a shoulder on one of said members, a laterally resilient detent on the other of said members for engaging said shoulder upon relative shifting of said members to lock said members in shifted position, and means operable upon shifting of said members to constantly urge continuation of such shifting independently of said air expansion.

16. In a device of the class described, the combination with a body member having a passageway therethrough for fluid and an inlet opening having a valve seat, of a hollow air-filled expansive valve member disposed in said passageway and axially shiftable therein to open and close said inlet opening, said valve member comprising telescopingly associated members arranged to shift axially relative to each other and expand said valve member upon reduction of atmospheric pressure in said passageway and close said inlet opening, a helical shoulder on one of said members, and a plurality of detents on the other of said members for engaging said shoulder upon relative shifting of said last-named members to lock said members in shifted position.

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