

Nov. 25, 1941.

H. INGRAM

2,263,969

CAN CLOSURE

Filed May 23, 1939

2 Sheets-Sheet 1

Fig. 1,

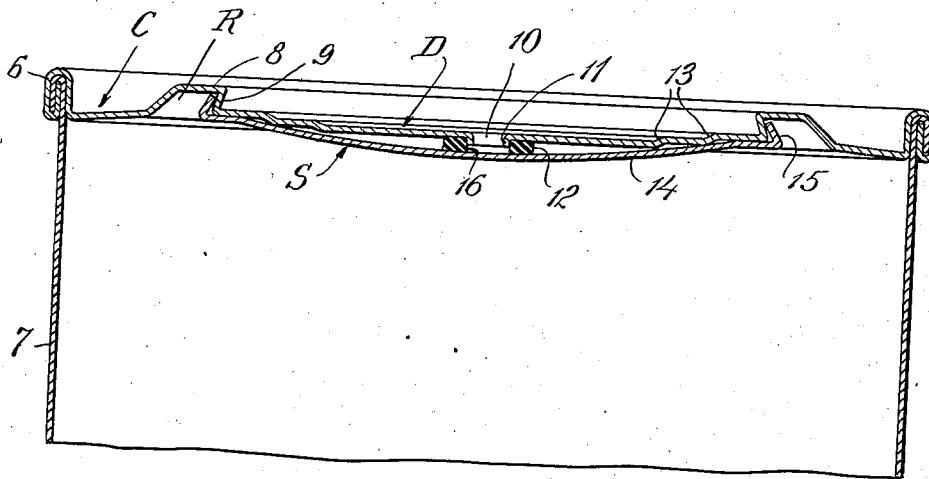


Fig. 2,

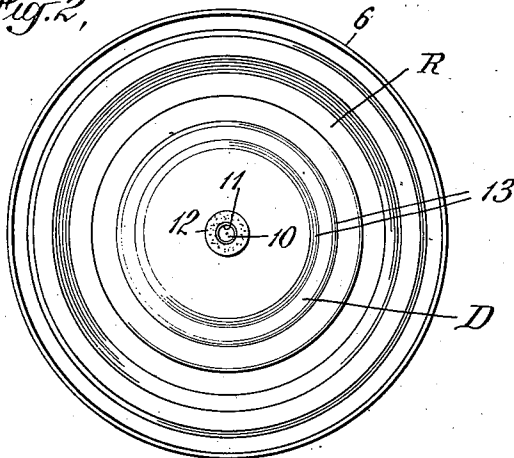


Fig. 3,

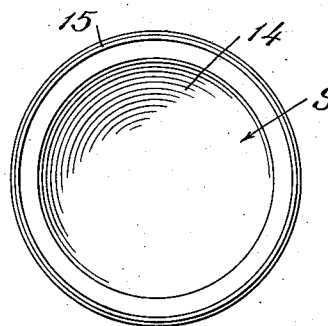
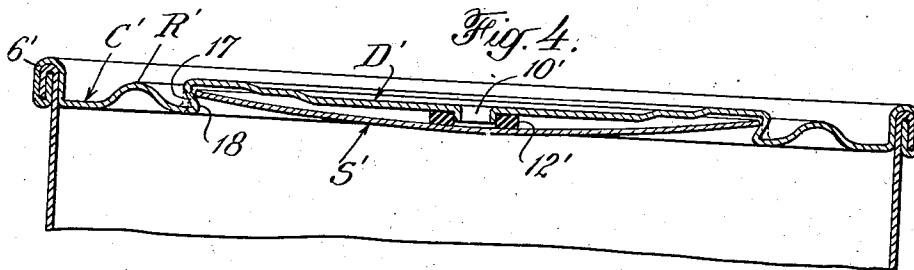


Fig. 4,



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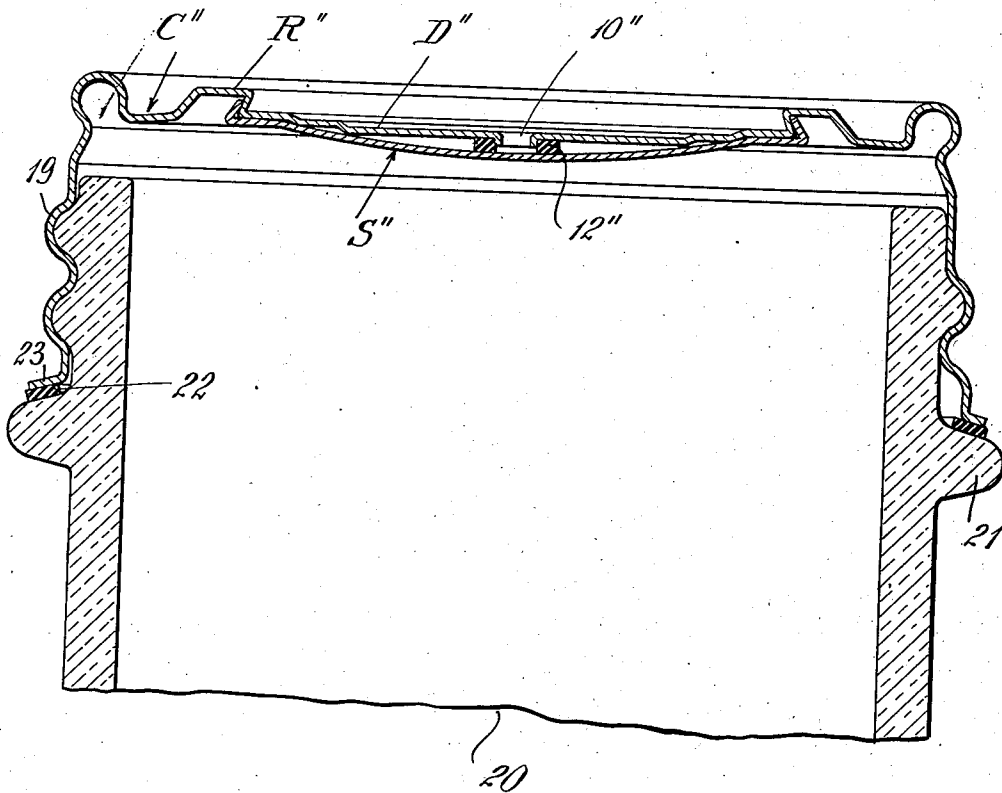
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2 Sheets-Sheet 2

Fig. 5.



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UNITED STATES PATENT OFFICE

2,263,969

CAN CLOSURE

Harry Ingram, Wheeling, W. Va.

Application May 23, 1939, Serial No. 275,141

4 Claims. (Cl. 220-44)

This invention relates to can closures and more particularly concerns an improved can or container closure embodying an improved form of self-closing check valve for permitting venting of air or gases from the can or container after the closure has been applied and while preventing ingress of air or other fluid to the container.

This application is a continuation in part of my copending application, Serial No. 146,395, filed June 4, 1937, now Patent No. 2,193,420 for Venting closures for jars and other receptacles.

It is frequently desirable to remove air, non-condensable gas or other vapor or fluid from a can or other container after the cover or closure has been applied thereto. This procedure is particularly advantageous in the canning or preserving of foods or other perishable products, where the flavor, color, consistency and keeping qualities of the product may be enhanced by removal of air, oxygen or other gases from the container.

It is an object of the present invention to provide an improved unitary closure for containers, such as cans, glass jars such as "Mason" jars and other containers, which closure incorporates a simple and highly effective mechanism for permitting outward flow of vapor and gases through the closure when the absolute pressure within the container exceeds the external absolute pressure by a predetermined amount, while preventing ingress of air or other fluid when the external pressure equals or exceeds that within the container. The invention contemplates the provision of a closure check valve mechanism which tightly and permanently seals the container and which cannot be accidentally or intentionally opened to permit ingress of air through the valve by any means ordinarily available to the consumer. One feature of the invention is the provision of a valve support which completely overlies and protects the valve mechanism and cooperates with the remaining parts to strain out or remove particles of solid or semi-solid matter from the effluent passing out of the container through the valve mechanism, whereby improper operation of the valve due to lodgment of such particles therein is prevented. The closure of the invention preferably incorporates means forming a rigid seat surrounding the check valve opening whereby the gasket of suitable suction apparatus may be readily applied to the closure in gastight relation to permit evacuation of the can. Other objects of the invention include the provision of a closure of

the type described which is simple in design, inexpensive to manufacture and use and highly reliable in operation.

In describing the invention in detail, reference will be made to the accompanying drawings in which certain embodiments thereof have been illustrated. In the drawings:

Figure 1 is a sectional view of a closure embodying the present invention connected to a can;

Figure 2 is a bottom plan view of the closure of Figure 1 with the valve supporting disk removed;

Figure 3 is a top plan view of the valve supporting disk of Figure 1;

Figure 4 is a sectional view similar to Figure 1 showing a modified structure embodying the invention; and

Figure 5 is a sectional view similar to Figure 1 showing a valved closure embodying the present invention and designed for use with "Mason" type glass containers.

Referring to the drawings, the embodiment of the invention illustrated in Figures 1 through 3 comprises a cap or closure for an ordinary metallic can of the type generally used for foods and beverages. The closure comprises generally a unitary structure including two major parts; a cap member C and a rigid valve support S permanently secured to the cap member as hereinafter described.

The cap member C is shown circular although other forms may be used if desired, and is preferably stamped or otherwise formed from a single piece of sheet metal such as tin plated steel or a corrosion resistant alloy. The cap C, as well as the other parts of the device, can, of course, be formed of various other materials such as a molded phenolic condensation product, Celuloid, etc. The outer edge of the cap member C is provided with a skirted rim 6 of any suitable shape for use in securing the cap to a can, "Mason" jar or other glass or metallic container. In the embodiment shown in Figure 1, the rim 6 disclosed is of a type which may be secured and sealed to the top edge of a metallic can 7 by a seaming operation, as generally shown in Figure 1.

Inside of the cap rim 6, and preferably disposed concentrically with respect thereto, is an upstanding annular bead or ridge R having a substantially flat upper surface 8. This arrangement permits the tight connection of a suction or gas supply duct to the cap by merely pressing a rubber or other gasket on the end of such

duct onto the flat upper surface 8 of the ridge R, although such gasket can be applied to the upper surface of securing rim 6 if desired. One of the walls of the ridge R, in the illustrated embodiment, the inner wall 9, is formed with an overhang as shown to facilitate the attachment of the valve support S to the cap member C as hereinafter described. The ridge R is of such size and shape as to materially reinforce the cap member C, and as a consequence, the entire annular portion of the cap member lying outwardly from the inner wall 9 is substantially rigid.

The central portion of the cap member C comprises a flexible diaphragm D having an opening 10 therethrough, preferably at the center thereof. The opening 10 may be formed with a downwardly extending lip or flange 11 thereabout for the purpose of positioning a sealing gasket 12 as hereinafter described. The diaphragm D is resilient as well as flexible and is preferably formed integrally with the remainder of the cap member C as shown. The diaphragm D is permanently set or sprung downwardly by suitable treatment such as slight enlargement of its area over that of a plane area bounded by the lower edge of the inner ridge wall 9. Such enlargement is indicated in the drawings by the offsets 13 formed by stamping or drawing the central portions of the diaphragm D downwardly. The downward set or bias of the diaphragm D is sufficient to cause a snap action thereof similar to the action of an oil can base so that when the diaphragm is lifted past a dead center position, its central portion will snap upwardly a considerable distance but will forcibly snap back to its original downwardly bowed position as soon as the lifting force is reduced below a predetermined value. The reinforcing action of the ridge R is preferably sufficient to bear all such stresses and strains as may be imposed by the operations such as reaming or spinning that are employed to secure the closure to the can or other container. For this reason, the above described operation of the central diaphragm D is not adversely affected by such stresses or strains.

The valve support S is secured to the rigid portion of the cap member C. In accordance with the present invention, this valve support is substantially rigid so that it cannot be forced downwardly away from the diaphragm D to cause opening of the valve. To this end, the support S preferably comprises a disk shaped or circular member of sheet metal or the like formed to have a downwardly convex or dome shaped section as shown at 14. An integral upwardly extending edge flange 15 is formed on the support disk S and is bent inwardly adjacent its upper edge over the overhanging wall 9 of the ridge R, thus securing the support S to the cap C. The dome-like or downwardly convex shape of the support disk S makes it strongly resistant to downward forces and so effectively prevents the separation of the disk S from the diaphragm D by movement of the support.

According to the invention, the connection between the valve support disk S and the cap C is such as to provide a fluid passage of limited dimensions between these parts which produces a straining action whereby the passage of solid or semi-solid material or particles into the valve mechanism is prevented. If solid or coherent particles or masses pass to or through the valve mechanism, its closing action might be impaired. Thus the lodgment of such particles between the

valve gasket 12 and the cooperating surface of the disk S might hold the valve open to permit ingress of air and leakage of the container contents after the vapor removal operation. The straining action between the cap C and the support disk S may be formed by bending the flange 15 inwardly to engage or nearly engage the upper portion of the ridge wall 9. The flange 15 may be thus bent inwardly around its entire periphery into approximate engagement with the upper portion of the wall 9 whereby the disk S is securely fastened to the cap C but a limited space is provided to permit the passage of vapor and gas and prevent the passage of solid material into the space between the diaphragm D and the disk S. Alternatively, the flange 15 may be bent into firm engagement with the ridge wall 9 at points spaced about the periphery of the disk S, these parts being slightly spaced apart between the bent points to provide the straining passage desired.

Various forms of valve gaskets may be used. In the embodiment of Figures 1 and 2, the valve gasket 12 comprises a perforated disk of suitable packing material such as rubber, the central opening 16 of which receives the downwardly extending lip or flange 11 around the diaphragm opening 10. The lip 11 is considerably shorter than the depth of the gasket 12 and this lip accordingly holds the gasket in proper position without preventing compression of the gasket by the downward force exerted thereon by the diaphragm D. If desired, a gasket comprising a flat pad or imperforate disk of rubber or other suitable composition may be fixed at the center of the supporting disk S beneath the opening 10, and the lip 11 may be omitted. This type of construction is shown, for example, in my Patent No. 1,576,763.

With the parts assembled as described above, the downwardly sprung or biased diaphragm D presses the gasket 12 firmly against the valve support disk S and so seals the check valve opening 10 against ingress of air or other fluid. Any excess of external over internal pressure merely increases the force with which the diaphragm D is biased inwardly, and so increases the sealing force exerted by the diaphragm on the gasket 12. Since the valve support disk S is substantially rigid, the check valve cannot be opened by force accidentally applied to the container top, or even by inserting an instrument through the opening 10 and pressing downwardly on the support S. Due to its domed or downwardly convex structure, the support disk S cannot be depressed appreciably by such downward pressure, and any slight downward flexure of the support is nullified by a corresponding downward movement of the downwardly biased diaphragm D. In other words, the fact that the maximum downward flexure of the support disk S is considerably less than the maximum downward movement of the diaphragm D due to its downward bias precludes any possible opening of the check valve by mechanical force applied from outside the can.

When the internal pressure in the container exceeds the external pressure by a predetermined amount, the excess pressure lifts the diaphragm D and so opens the check valve, permitting vapor and gas to escape from the container. As gas or other fluid flows out of the container through the opening 10, the internal pressure falls relative to the external pressure and the downward bias of the diaphragm D causes it to snap down and seal the container before equal-

zation of internal and external pressures. While the valve remains open due to excess internal pressure, the entry of air or gas into the container is prevented by this excess pressure and the outward flow of fluid resulting therefrom. Since the valve is closed by the spring pressure of the biased diaphragm while the internal pressure exceeds the outside pressure, the outward flow of fluid continues up to the very instant that the valve closes, and no air or gas can possibly re-enter the container.

In a modified form of the device as shown in Figure 4, the rigid valve supporting disk S' is secured to the cap member C' in a different fashion than that described above. The cap member C' is provided with a peripheral skirted can engaging portion 6' and with an annular reinforcing ridge R' spaced inwardly from the periphery. Within the ridge R' is an upstanding annular wall 17, and the downwardly sprung resilient diaphragm D' with its central opening 10' comprises the continuation of the cap metal inwardly from the upper edge of the wall 17. The wall 17 supplements the reinforcing action of the ridge R'. The peripheral edge of the valve supporting disk S' is inserted within the confines of the annular wall 17 with the valve gasket 12' disposed between the diaphragm D' and the disk S', and the lower portion of the wall 17 is then spun or otherwise bent inward beyond the edge of the disk S' as shown at 18, thus securely locking the valve supporting disk S' to the cap member C'. The parts are so proportioned that a limited space is left for the passage of gas or other fluid between the edge of the disk S' and the inner surface of the wall 17. The space so provided is too small however, to permit the passage of solid or semi-solid masses or particles into the space between the diaphragm D' and the supporting disk S'. The disk S' is dome shaped or downwardly convex in section and because of this construction, it strongly resists flexing by downward pressure. The form of the device illustrated in Figure 4 operates in the same manner as has been described above in connection with the form shown in Figures 1 through 3.

It will be readily apparent that my improved valved closure can be applied to containers other than cans, such as "Mason" and other types of glass jars. One such application has been illustrated in Figure 5. The cap C' there illustrated has a flexible downwardly biased resilient diaphragm D' with a central orifice 10' therethrough, and a valve supporting disk S' completely covering the diaphragm and secured to the inner wall of a reinforcing ridge R' in such fashion as to produce the solids straining action described above. These parts, as well as the valve gasket 12'', cooperate to provide a dependable check valve sealing action in the same manner as do the corresponding parts described above in connection with the modification of Figures 1 through 3. The cap C' is provided with a screw threaded skirt 19 at its outer edge, this skirt extending axially of the cap and serving as a means for securing the cap to a receptacle 20 of the "Mason" jar type. The receptacle 20 has a sealing shoulder 21 against which a sealing ring or gasket 22 is positioned and is engaged and compressed by an outwardly and downwardly extending flange 23 on the skirt 19.

It will be evident that my improved closure may be secured to various jars and containers other than those illustrated by employing suit-

able peripheral container engaging means at the edge of the cap.

I claim:

1. A unitary valved closure for sealing cans and like containers comprising a cap member having a substantially rigid outer annular portion and an integral flexible central diaphragm with a centrally disposed opening therethrough, a substantially rigid imperforate valve supporting disk disposed beneath and completely covering said diaphragm, means adjacent the outer edge of said rigid outer annular portion of said cap member for connection to a container, means for connecting the peripheral edge of said valve supporting disk to and in close engagement with said outer portion of said cap member inwardly from said container connection means, said connection between the valve supporting disk and said cap member providing a restricted fluid passage between said disk edge and said cap member, and a gasket disposed between said diaphragm and said valve supporting disk in line with said diaphragm opening, said diaphragm having a resilient downward bias whereby said gasket is normally compressed between said diaphragm and said valve supporting disk.

2. A unitary valved closure for sealing cans and like containers comprising a circular cap member having an outer annular portion and an integral resilient central diaphragm with a centrally disposed opening therethrough, means adjacent the outer edge of said outer annular portion of said cap member for connecting the same to a container, at least one upstanding annular reinforcing wall formed in said outer annular portion of said cap member and spaced inwardly from said container connecting means, a substantially rigid downwardly convex imperforate valve supporting disk disposed beneath and completely covering the lower surface of said diaphragm, said disk being connected to said cap member by close engagement between the edge thereof and said upstanding reinforcing wall, said connection between the valve supporting disk and said cap member providing a restricted fluid passage between said disk edge and said cap member, and a gasket disposed between said diaphragm and said valve supporting disk and surrounding said diaphragm opening, said diaphragm being biased downwardly to normally compress said gasket between said diaphragm and said disk.

3. A unitary valved closure for sealing cans and like containers comprising a circular cap member having an outer annular portion and an integral resilient central diaphragm with a centrally disposed opening therethrough, an upstanding annular reinforcing ridge in said outer annular portion of said cap, said ridge having an outwardly flared inner wall, a substantially rigid imperforate valve supporting disk disposed beneath and completely covering said diaphragm, said disk having a peripheral flange thereon extending around and in close engagement with the inner wall of said reinforcing ridge and overlying the outward flare of said wall whereby said disk is secured to said cap member and a circuitous fluid passage is provided between said flange and said wall from the undersurface of said disk to the space between said disk and said cap member, and a gasket disposed between said diaphragm and said valve supporting disk and surrounding said diaphragm opening, said diaphragm being biased downwardly to normally compress

said gasket between said diaphragm and said disk.

4. A unitary valved closure for sealing cans and like containers comprising a circular cap having a substantially rigid outer annular portion and an integral flexible central diaphragm with a centrally disposed opening therethrough, means adjacent the outer edge of said outer annular portion of said cap for connecting said cap to a container, an upstanding annular reinforcing ridge in said outer portion of said cap spaced inwardly from said container connecting means and forming an upwardly extending wall on the inner surface of said cap, a substan-

5 tially rigid imperforate valve supporting disk disposed beneath and completely covering the lower surface of said diaphragm with its edge sufficiently close to said rigid wall of said cap to provide a restricted fluid passage between said disk edge and said cap, a portion of said rigid wall extending laterally beneath the edge of said disk whereby said disk is secured to said cap, and a gasket disposed between said diaphragm and said valve supporting disk around said diaphragm opening, said diaphragm being biased downwardly to normally compress said gasket between said diaphragm and said disk.

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