

June 22, 1943.

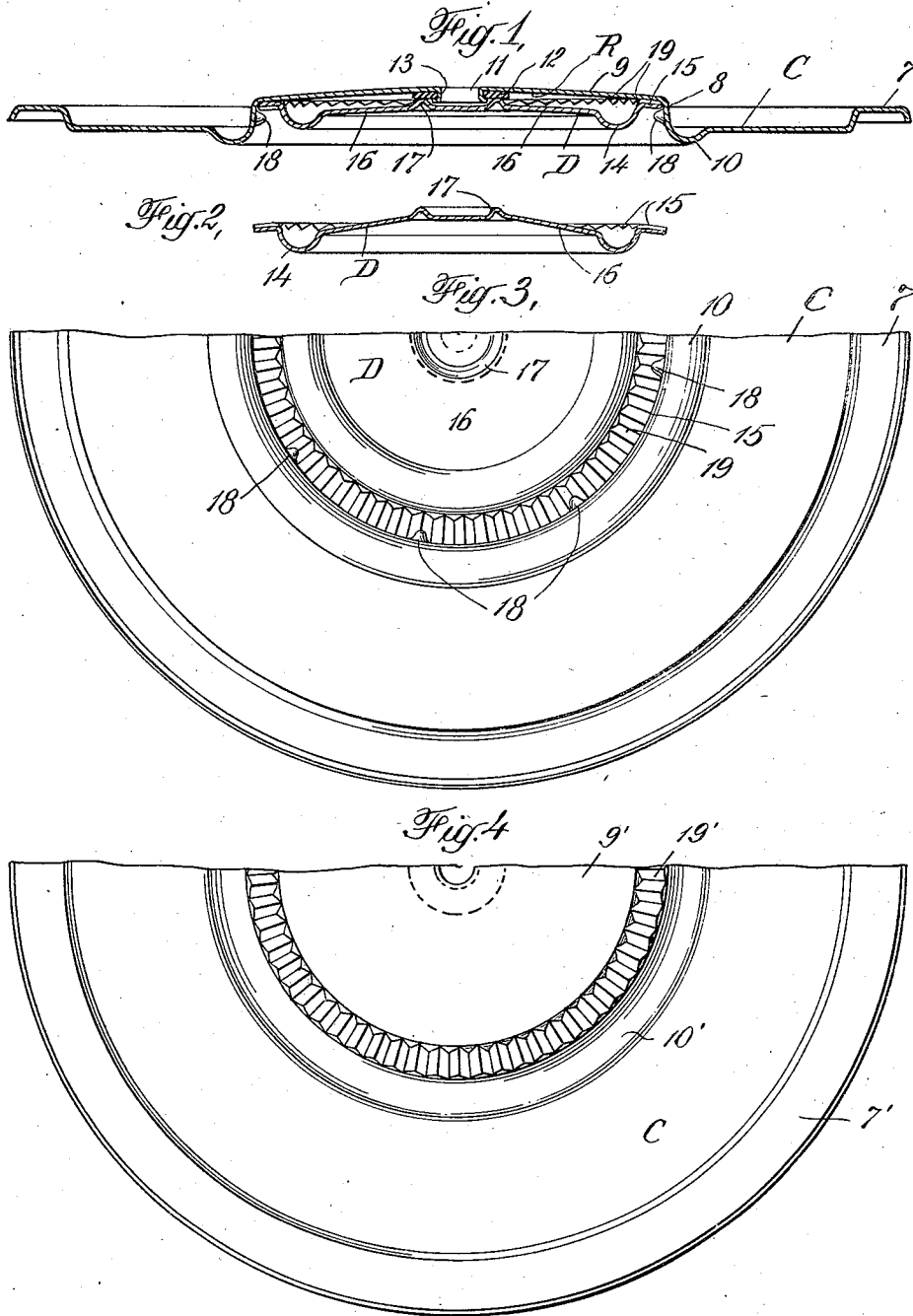
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2,322,236

VALVED CAN CLOSURE

Filed Nov. 7, 1939

2 Sheets-Sheet 1



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Fig. 5,

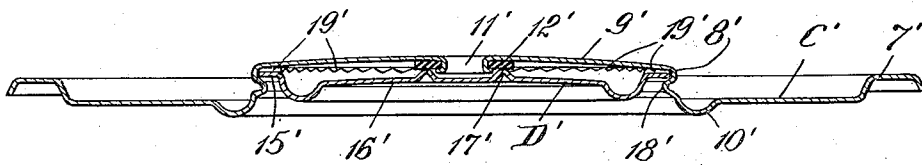
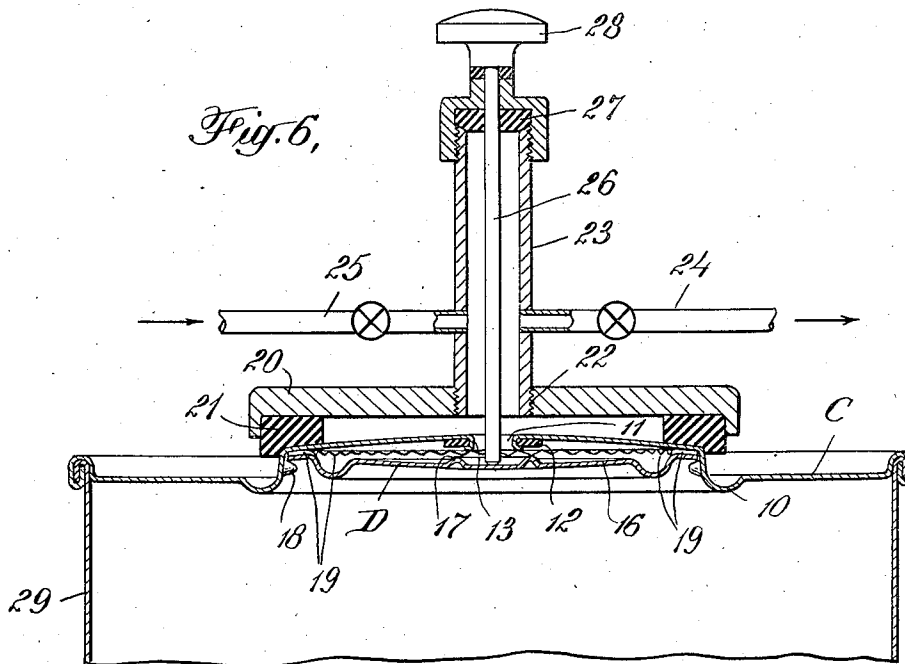


Fig. 6,



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UNITED STATES PATENT OFFICE

2,322,236

VALVED CAN CLOSURE

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Application November 7, 1939, Serial No. 303,174

4 Claims. (Cl. 220-44)

This invention relates to valved container closures and more particularly concerns an improved closure having an opening therein controlled by an improved form of mechanically operated check valve for permitting controlled egress and ingress of air and other gases and fluids.

It is frequently desirable to remove air or other gases or fluids 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, beverages and other perishable products where the flavor, color, consistency and keeping qualities of the product may be enhanced by removal of air or oxygen from the container.

It has heretofore been proposed to employ container closures provided with a vent hole or opening controlled by a check valve which is automatically opened by excess fluid pressure within the can or container, thus permitting venting or withdrawal of fluid, the valve closing automatically when the difference between the external and internal pressures drops below a predetermined value. One example of a valved closure of this type is disclosed in my Patent No. 1,576,763. Such valved closures permit the cans to be subjected to a vacuum after the closure is applied, whereby air can be withdrawn from the head space.

In certain canning operations, after vacuum removal of air from the head space, the closed cans are subjected to a cooking operation, usually in a pressure retort. With certain food products, this cooking heats the can contents to such a high temperature that considerable fluid expansion occurs. When cans having automatic check valve closures of the type described above are subjected to such an operation, fluid expansion sometimes forces the check valve open and some spilling and wastage of the canned product may result. Also, when the cans are cooled after such loss of contents, the contraction of the product leaves an undesirably large head space which gives the ultimate consumer the mistaken impression that the can was not completely filled by the manufacturer.

It is the object of the present invention to provide a closure for cans and other containers having a vent controlling valve mechanism capable of withstanding without leakage the highest internal pressure imposed in canning, cooking and sterilizing operations, and at the same time, being readily operable by simple mechanical means to permit the withdrawal of air or other gases and the introduction of inert gas or other fluid prior

to cooking or at any other time during the canning operation. Other objects of the invention include the provision of a valved closure incorporating an improved valve gasket and seat construction, improved straining means for preventing the escape of solid or semi-solid matter during withdrawal of air and gases, and other advantageous and novel features which will be apparent as the description progresses.

In describing the invention in detail, reference will be made to the accompanying drawings in which typical embodiments of the invention are disclosed. In the drawings:

Figure 1 is a sectional view of a container closure embodying the invention;

Figure 2 is a sectional view of the resilient valve operating member or diaphragm in the position it assumes when unconfined;

Figure 3 is a partial bottom plan view of the closure shown in Figure 1;

Figure 4 is a top plan view of a closure of modified form;

Figure 5 is a sectional view similar to Figure 1 of a modified form of closure embodying the invention; and

Figure 6 is a sectional view of a can provided with a closure embodying the invention and a diagrammatic representation of means for utilizing the improved closure valve mechanism in a canning operation.

Referring to the drawings, the embodiment of the invention there disclosed comprises a closure for an ordinary metallic can of the type generally used for food products and beverages. The closure comprises generally a unitary structure containing two major parts, a cap member C and a generally disk-shaped valve operating member or diaphragm D secured to and beneath 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. The cap member C, as well as the other parts of the device, can be formed of various other materials such as a molded phenolic condensation product, Celluloid, etc. The outer edge of the cap member C is provided with a skirted rim 7 of any suitable shape for use in securing the cap to a can, "Mason" jar or other glass or metallic container. In the embodiments shown in Figures 1, 2 and 3, the rim 7 is of a type which may be secured and sealed to the top edge of a metallic can by a seaming operation, as generally shown, for example, in Figure 6.

The cap member C is provided with a central upwardly extending recess R, preferably of circular form, which comprises an upwardly extending circular wall 8 and a circular valve supporting plate 9. The plate 9 is substantially rigid and is preferably domed upwardly as shown to resist upward movement for a purpose which will be explained. A reinforcing bead 10 may be formed in the cap member C adjacent the recessed wall 8 as shown. The entire cap member is preferably formed by stamping from a single piece of sheet metal or like material.

A central vent opening 11 is provided in the plate 9. In a preferred embodiment of the invention, a perforate valve gasket or washer 12 surrounds the opening 11 and is secured to the plate 9 by suitable means. As shown, this may be accomplished by providing an eyelet 13 integral with the plate 9 and extending downwardly from the opening 11 through the central opening of the gasket 12, the lower end of the eyelet being bent outwardly to engage the lower surface of the gasket 12 adjacent its central opening.

A substantially disk-shaped flexible resilient diaphragm D, which acts as the valve operating member, is disposed beneath and covers the lower surface of the valve supporting plate 9. The diaphragm D is so constructed as to have a strong upward bias at its central portion whereby the valve parts that control the flow of fluid through the opening 11 may be firmly interengaged to provide a fluid-tight seal. The bias of the diaphragm D may be produced in various ways. As illustrated in the drawings, a circular bead 14 is formed within the marginal edge portion 15 of the diaphragm and the metal of the central portion 16 of the diaphragm is so drawn or otherwise worked or treated that it normally springs upwardly, as shown in Figure 2, when not confined by the plate 9 within the recess R.

A suitable seat for engaging the gasket 12 is preferably formed at the center of the diaphragm D. In the disclosed embodiments, this seat takes the form of a circular upstanding ridge 17 disposed in alignment with the gasket 12 and of a size to engage the gasket outside of the eyelet 13, as shown in Figure 1. The valve seat ridge 17 is preferably formed integral with the diaphragm D by a stamping or equivalent operation.

The degree of resilient upward bias of the diaphragm D is preferably such that it cannot be forced inwardly by excess external fluid pressure acting on the area within the ridge 17, whereby the valve parts cannot be opened due to a vacuum within the can or other container. The magnitude of the upward bias of the diaphragm D also prevents opening of the valve by excess internal pressure, since upon upward movement of the substantially rigid plate 9, the diaphragm D also moves upwardly and the valve parts are maintained in engagement. A diaphragm which imposes a pressure of 5 to 10 pounds on the valve parts has been found to give satisfactory results, but the invention is not limited to any particular value of resilient upward bias.

The diaphragm D may be secured within the recess R by various means. As shown in Figures 1 and 3, the marginal edge portion 15 of the diaphragm is held in surface contact with the underside of the plate 9 by deforming the metal wall 8 inwardly to form a plurality of lugs 18 at points spaced around the wall, these lugs overlying the edge of the diaphragm. As an alternative to this means of attachment, the wall 8' may be continuously deformed inwardly beneath the

edge of the diaphragm D' by a suitable folding or spinning operation, as shown at 18' in Figure 5.

Suitable means are employed to provide restricted fluid passages between the marginal edge portion 15 of the diaphragm D and the under-surface of the plate 9. Such passages are necessary to permit the flow of fluid entering or leaving the container through the vent opening 11 when the valve parts are disengaged. As shown in Figures 1, 3 and 6, such passages may be provided by stamping a plurality of radially extending corrugations 19 in the marginal edge portion 15 of the diaphragm D. This forms restricted passages which permit the flow of fluid while preventing the passage of solid or semi-solid food products out of the container or into the space between the valve parts. As shown in Figures 1 and 5, a clearance is provided between the edge of the diaphragms D and D' and the recessed walls 8 and 8', so that air and other gases can flow between these parts. In place of the corrugations 19 at the diaphragm edge, similar radial corrugations 19' may be formed at the edge portion of the plate 9' where the marginal edge portion 15' of the diaphragm D' is in contact therewith. This arrangement is shown in Figures 4 and 5, wherein the closure construction is otherwise similar to that of Figures 1, 2 and 3 and wherein corresponding parts are designated by like reference characters with distinctive exponents.

The improved vented closure of the invention is useful in performing various operations incident to the canning of foods, beverages and other products. As illustrative of a typical operation in which the closure is useful, the food or other product may be deaerated and filled into cans, and the closures embodying the invention may then be secured thereto. Thereafter, a relatively high vacuum is imposed on the can contents to suddenly boil the liquid therein whereby water vapor is generated in the can and withdrawn, and air and oxygen are swept out of the head space. This operation may be accomplished by mechanically opening the valve mechanism in the closure, the vent opening 11 giving access to the diaphragm D whereby the diaphragm may be pushed downwardly by mechanical force to disengage the valve parts.

Suitable apparatus for mechanically operating the valve during evacuation or introduction of gas has been illustrated in Figure 6 which shows a closure engaging head 20 having a rubber or other sealing pad or gasket 21 on its lower surface. A central opening 22 is provided in the head 20 and a closed upstanding tube 23 is secured to the head 20 at this opening as shown. Valve controlled ducts 24 and 25 for withdrawing fluid from and admitting fluid to the can communicate with the tube 23. A pin or plunger 26 is disposed in the tube 23 and extends from the upper end thereof through a packed gland 27. An operating knob 28 is secured to the upper end of the pin 26 as shown.

In operation, the head 20 is lowered over a can 29 and the pad 21 is firmly pressed against the can closure around the vent opening 11 as shown in Figure 6, thus placing the opening in fluid-tight communication with the tube 23. The valve in the duct 24 is then opened, and the space within the tube 23, as well as that beneath the head 20, is evacuated by a suitable pump or other evacuating device, as shown, connected to the duct 24. The pin 26 is then depressed so that

it passes through the opening 11 in the closure and forces the diaphragm D downward, thus moving the valve seat 17 away from the valve gasket 12, and the can contents are subjected to vacuum which causes boiling of liquid and removal of air from the head space as above described. After the desired vacuumization, the pin 26 is released, permitting the diaphragm D to rise and engage the valve parts, whereby the can is sealed. The valve in the duct 25 is then opened to vent the space over the top of the can closure to atmosphere, after which the head 20 may be removed. If desired, an inert gas such as carbon dioxide, nitrogen or hydrogen may be introduced to the can through the duct 25 after vacuumization while the valve mechanism is held open by the pin 26 as explained.

The above described operation may be followed by cooking or sterilization of the product. In this operation, a number of the closed cans are customarily placed in a retort and subjected to heat and steam pressure such as to produce a temperature which may be in the neighborhood of 240 to 250° F. Such temperatures cause appreciable expansion of the liquid can contents and also generate some steam within the can with the result that the can ends, including the closure of the invention, are distended. Such bulging of the improved closure does not however, cause the valve mechanism to open, because the resilient upward bias of the diaphragm D, aided by the excess internal pressure, causes the valve seat 17 on the diaphragm to follow any upward movement of the cap plate 9, and so maintain the valve parts in sealing engagement. When the can and its contents cool following the cooking operation, the steam condenses within the can and a vacuum may be produced in the head space. The magnitude of the resilient upward bias on the diaphragm D prevents downward movement of this diaphragm by the excess external pressure, and the can remains sealed.

It will be apparent that my improved closure permits vacuum withdrawal of air and other gases from the cans and at the same time, prevents loss of the can contents during a subsequent cooking or sterilization operation, with the result that the can reaches the customer with as little head space as was present when the can was filled.

I claim:

1. A valved closure for sealing cans and like containers comprising a cap member including a substantially rigid plate portion having a central opening therethrough, a flexible resilient upwardly biased diaphragm secured adjacent its edge to said cap beneath and covering said plate portion, valve means disposed between said diaphragm and said plate portion for normally sealing said opening, said diaphragm having a sufficient upward bias to prevent opening of said valve means by excess external atmospheric pressure and said opening giving access to said diaphragm whereby said diaphragm may be moved downwardly by mechanical force to permit the flow of fluid through said opening.

2. A valved container closure comprising a cap member including a substantially rigid circular valve supporting plate having a central opening therethrough, a substantially disk-shaped flexible resilient diaphragm disposed beneath said plate with its marginal edge portion secured in contact with said plate, interengaging valve means between said plate and said diaphragm surrounding said opening for preventing fluid flow through said opening when said diaphragm moves toward said plate, said diaphragm having an upward bias of sufficient magnitude to prevent opening of said valve means by excess external atmospheric pressure, and means forming passages for the flow of fluid between the marginal edge portions of said diaphragm and said plate, said opening giving access to said diaphragm whereby said diaphragm may be moved downwardly by mechanical force to disengage said valve means and permit the flow of fluid through said opening.

3. A valved container closure comprising a cap member including a substantially rigid circular valve supporting plate having a central opening therethrough, a substantially disk-shaped flexible resilient diaphragm disposed beneath said plate with its marginal edge portion secured in contact with said plate, a valve gasket secured to the undersurface of said plate and surrounding said opening, a circular valve seat on said diaphragm aligned with said gasket and engageable therewith upon upward movement of said diaphragm to prevent fluid flow through said opening, said diaphragm having an upward bias of sufficient magnitude to prevent opening of said valve by excess external atmospheric pressure and means forming passages for the flow of fluid between the marginal edge portions of said diaphragm and said plate, said opening giving access to said diaphragm whereby said diaphragm may be moved downwardly by a mechanical force to disengage said valve seat from said gasket and permit the flow of fluid through said opening.

4. In a vented container closure, in combination, a cap member including an upwardly extending circular recess comprising an upwardly extending circular wall and a circular substantially rigid valve supporting plate with a central opening therethrough, a substantially circular resiliently upwardly biased disk within said recess having marginal edge portions in surface engagement with the inner surface of said valve supporting plate adjacent its edge, said upwardly extending wall of said recess being deformed inwardly at at least some points to underlie the edges of said disk whereby said disk is secured within said recess, a plurality of radial corrugations in the marginal edge portion of said disk providing restricted passages between said disk and said valve supporting plate, and means disposed between said disk and said plate and operable by relative movement of said disk and said plate for controlling the flow of fluid through said opening.

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