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E. E. HOFFMAN

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CLOSURE

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*Fig 1*

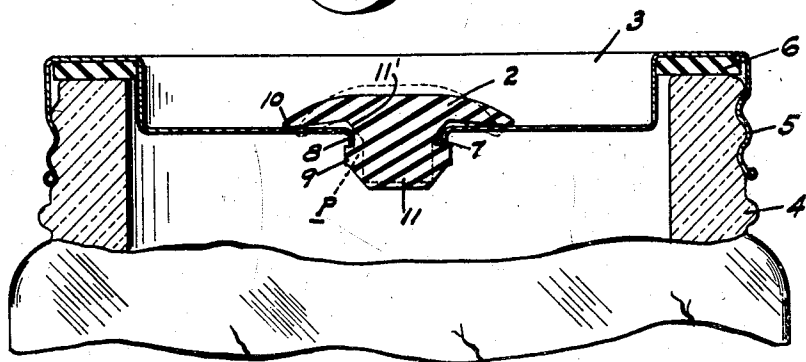


*Fig 3*

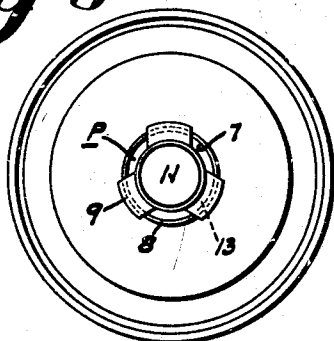


*Fig 4*

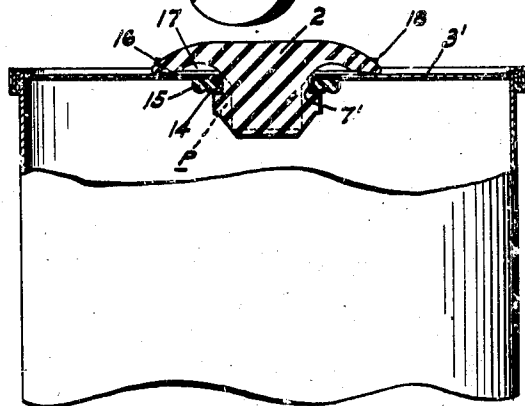
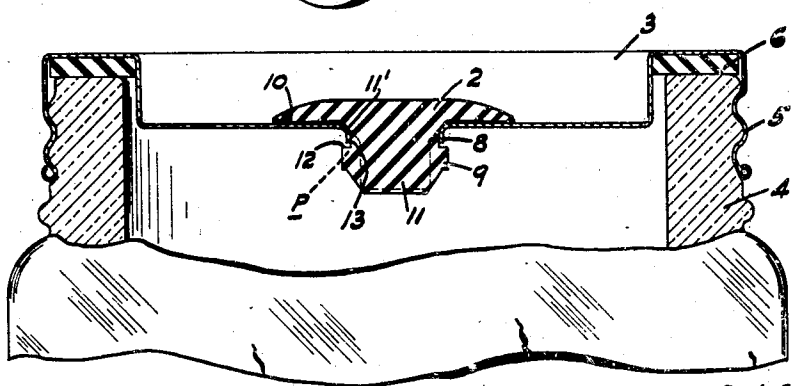


*Fig 2*



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## UNITED STATES PATENT OFFICE

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## CLOSURE

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3 Claims. (Cl. 215—56)

This invention relates to closures and more particularly to so-called "venting" closures wherein egress of fluids is permitted from a container to which a closure is applied in sealing position, but the ingress of fluids into the container is prevented.

In the packaging art, it is frequently desirable to package a commodity and apply to the container a closure which will permit the egress of fluids upon the development of gaseous pressure within the container, such as, for example, in the packaging of coffee. It is also desirable to apply venting type closures to containers which are to be subjected to vacuumizing and/or sterilizing processes after the closure is placed in sealing engagement with the package. In these instances, it is desirable to provide a valve for the opening which will normally seal the closure member but which requires a differential in pressure between the gaseous fluid within the container and the ambient atmosphere for opening the valve to vent the container, and which will, upon the pressure being equalized, or the pressure in the container reduced, be air tight so as to prevent the ingress of bacteria laden air into the container.

My improved closure provides a means whereby gas evolving materials may be packaged in sealed condition without incurring the hazard caused by development of dangerous pressure within the package by natural evolution of gas through decomposition or aging process or rising temperature either naturally or through subsequent sterilizing methods, while at the same time providing a normally sealed, air tight package when in sealing position on a container even though the pressure of the fluid within the container be equal to that of the atmosphere surrounding the receptacle and closure.

My invention also provides means whereby a receptacle having a closure in sealed position thereon may be vacuumized mechanically by a mere reduction of pressure of the ambient atmosphere without requiring special manipulation of the closure to effect a seal upon the establishment of atmospheric pressure on the outside of the closure and container.

In the accompanying drawing illustrating the present embodiment of my invention;

Figure 1 is a sectional view of my improved closure assembly applied to a jar intended for vacuumizing but prior to the reduction of pressure therein;

Figure 2 is a sectional view of the assembly

illustrated in Figure 1 after the vacuumizing step;

Figure 3 is a bottom plan view, to reduced scale, of the type of cap illustrated in Figure 1; and

Figure 4 is a view partly in elevation and partly in section showing a modification.

Referring to Figure 1, there is shown a closure including a valve 2 in a cap 3 engaged on a jar or other receptacle 4 by screw threads 5 formed on the skirt of the cap 3. The closure may take any one of a number of forms and the screw thread type illustrated is only one of the many types now in common use and to which my invention is applicable. A sealing gasket 6 is illustrated lying within the cap 3 and in engagement with the lip of the jar 4.

The valve 2 is positioned in an opening indicated at 7 formed in the top of the cap 3. A metal closure is shown and with this type of closure it is advantageous to form the opening by "eyeletting" in order that there be formed a downwardly extending flange 8. As will be noted from examination of Figures 1 and 3, the valve 2 is provided with ears 9 engaging the flange 8, the disposition of the parts being such that the edge 10 at least of the convexo-concave top of the valve 2 is held in sealing engagement with the top of the cap 3, as illustrated in Figure 1. The disposition of the ears 9 is governed by the distance from the uppermost top of the cap 3 to the lowermost portion of the flange 8 defining the opening occupied by the valve 2. The valve is preferably made of flexible material and the head is deformed slightly when inserted into position in the vent opening so that the edge 10 of the top of the valve 2 lies in sealed engagement with the top of the cap 3 surrounding the vent opening 7, thus providing a normally closed seal therefor. The position the head would normally assume is shown by the dotted lines in Figure 1. It is my purpose that the ears 9 be so disposed that in the assembled closure, the top of the valve 2 will normally engage the top of the cap 3 at a distance radially outwardly from the opening 7 to normally close the vent. I prefer that the valve be so proportioned that an area substantially in excess of the area of the opening 7 is included within the line defining contact between the valve 2 and the top of the cap 3. In this manner, I provide a valve in which a relatively small differential in pressure between the exterior and interior of the jar 4 will cause movement of the valve.

As illustrated in Figure 1, the convexo-concave head of the valve 2 and the ears 9 are connected

by a stalk 11 of substantially frusto-conical shape, having a smaller cross sectional portion disposed below the opening 7, whereby downward movement of the valve 2 will eventually result in the stalk 11 sealing the opening 7. As illustrated in Figure 1, the package has not been vacuumized and accordingly the valve 2 rests upon the top of the cap 3 with the enlarged portion 11' of stalk 11 lying above the opening 7, but with the edge 10 of the valve 2 in engagement with the top of the cap 3 as described above.

Figure 2 shows the component parts of my closure applied to a jar in which a vacuum has been created. Like numbers have been applied to the same parts in Figure 2 as shown in the other views. It will be noted that the enlarged portion 11' of stalk 11 sealingly engages the flange 8 defining the opening 7 and the convexo-concave top of the valve 2 is distended and flattened to engage a large area of the top of the cap 3 surrounding the vent opening 7.

In Figure 3 there is shown a bottom view of the closure illustrated in Figure 1 and it will be observed that intermediate the ears 9 there is discernible the edge of the flange 8 whereby exit passages P are provided for the ready egress of fluids desired to be vented through the valved opening. It will be noted by reference to Figure 2 that the ears 9 are provided with abutments 12 which are adapted to engage the inwardly turned portion of the flange 8. These abutments are of somewhat greater diameter than the diameter of the flange 8 and intermediate the ears 9 and the stalk 11 centering lugs 13 are provided which are adapted to engage the axially disposed surface of the flange 8 to position the valve member centrally of the opening 7. It will be noted that the centering lugs 13 are disposed only in the region of the ears 9 in order that the channels P intermediate the ears 9 be unrestricted to provide for ready venting.

It has been found desirable in order to permit rapid assembly on automatic machinery to provide the ears 9 and the lower portion of the stalk 11 with a chamfered end which permits the valve to be inserted from the top of the cap by mere downward pressure on the top thereof; the ears being readily distensible laterally into the spaces intermediate the ears and into the stalk upon pressure being applied. With the type of valve shown, the abutments 12 are effective for preventing the valve from being disengaged from the closure.

In Figure 4 there is illustrated an enlarged view showing a cross section of my present preferred form of valve applied to a tin can of conventional construction, except that the top 3' thereof is provided with an opening 7' defined by an intumed bead 14; the outer edge of which is embedded in a sealing gasket 15 to avoid the exposure of unprotected metal to the contents of the container. This may be found desirable in certain instances but generally the exposed edge of the flange 8 may be coated with lacquer or other coating material to prevent corrosion at the cut surface. As illustrated in Figure 4, the valve 2 has its edge 10 in engagement with the top of the top 3'; the normally sealed vent being desirable in the case of cans as well as jars or other receptacles.

It will be observed that the convexo-concave top of the valve 2 has a portion 16 extending inwardly from the edge 10 which follows a substantially conical form, such portion being relieved

on its inside whereby a relatively thinner and more flexible connecting annular ring 17 is provided. It will be apparent that upon downward movement of the valve 2 by the application of pressure to the top thereof, the top of the valve will be distended in an effort to adapt itself to the top of the cap against which it is being pressed and that upon the application of sufficient force the portion 16 will form an extended sealing surface. I prefer that this occur approximately coincidentally with the sealing of the opening by the enlarged portion of the stalk 11 which normally lies above the plane of the top of the cap. A further function of the relieving of the top by the provision of the annular ring 17 is to enhance the flexibility of the outermost portion of the top of the valve 2 for its ready adaptation to any slightly uneven contour existing in the top surface of the cap against which the valve must seal. I have found in practice that valves having substantially regular convexo-concave heads without the conical portion 16 or the connecting ring 17, such as the valve of Figure 1, for example, operate successfully and I do not wish to be limited to the provision of such refinements.

It will be noted in Figures 1 and 2 that the top of the cap has been depressed to provide a recess in which the valve is positioned. This obviates any possibility of dislodgment of the valve after a vacuum has been created in the container. For this same reason, it is desirable to taper the top of the valve 2 to a thin edge in order that there will be no abutment which might be accidentally engaged and consequently break the vacuum in the receptacle.

Referring again to Figure 4, it will be noted that the parting line 18 for the valve, which in this view is molded as an integral unit with the stalk and ears depending from the head, which parting line is formed by the joint between the mold members utilized in making the valve, lies about the outer surface of the head and is disposed above the edge 10. It is desirable to provide a smooth regular surface for sealing against the top of the closure and the parting line should, if possible, be disposed above the sealing surface or at some other position where the roughened surface resulting from extrusion at the parting line will not be found objectionable.

The valve 2 is preferably made of flexible material and, as mentioned above, may be formed as an integral unit. I have found that commercial vulcanized rubber having soft flexible characteristics is well adapted as a material for the formation of the valve, being inert to many commodities and foods which it is desired to sterilize or vent. Any natural or artificial material which is flexible, soft and resilient may be employed.

In the operation of my improved venting closure, gaseous fluids may pass through the channels P between the ears 9 and the centering lugs 13 upwardly through the opening 7 defined by the flange 8 upon development of pressure within the container or reduction of pressure of the ambient atmosphere. Since the head of the valve 2 normally engages the surface of the cap 3, the head need be moved away from the surface of the cap to permit the egress of such gaseous fluids. In the embodiment illustrated, this is accomplished by flexure of the head member whereby fluids may pass radially outwardly from the vent opening. With the valve normally closed, it will be obvious that immediately upon equalization of pressure or decrease of pressure

within the container, the head will be drawn into sealing engagement with the top of the cap 3. This seal is relatively light until sufficient pressure is applied to the top of the valve to cause the enlarged portion 11' of the stalk 11 to frictionally engage the flange 8, thus firmly sealing the vent opening. In order to break the vacuum, if the receptacle be vacuumized, it is only necessary to insert a suitable implement under the edge 10 and move it upwardly, thus urging the stalk 11 upwardly until the enlarged portion 11' lies above the flange and the seal is broken. Just as soon as the valve member is permitted to return to its original position, an effective air-tight seal is again provided so that the closure of my invention may be reused repeatedly and always furnishes an air-tight seal and one which may be subsequently used to vent the contents of the receptacle or to permit the ready creation of a vacuum therein.

From the above description, it will be clear that broadly stated my invention comprises a closure having a vent opening and a valve for the opening including a head portion larger than the opening, a stalk or other member passing through the vent but normally not closing or sealing the same and means tensioning the stalk to hold the head in engagement with the closure in a line circumscribing the vent to seal the orifice.

While I have illustrated and described my invention in connection with certain drawings illustrating a preferred construction, I do not desire to be limited to the specific constructions shown and described except as specifically pointed out in the appended claims.

I claim:

1. A closure for jars and other receptacles comprising a closure member having an opening therein and an integrally formed, flexible valve for said opening comprising a head member, a tapered stalk depending from the head member and spaced, radially extending projections formed on the stalk, said stalk passing through said opening and having a cross-sectional area adjacent the head at least as great as the cross-sectional area at the vent opening in order that movement of the stalk through the vent opening will effect sealing of the vent opening by the stalk and said stalk adjacent the projections having a cross-sectional area insufficient to close the vent opening, the spaces between adjacent projections providing channels for the passage

of gas through the vent opening, said head normally sealing the vent opening by being resiliently held in engagement with the upper exposed surface of the closure member along a line circumscribing the opening by the stalk which is tensioned between said head member and said spaced projections which lie in engagement with under surface of the closure member.

2. A closure for jars and other receptacles comprising a metallic cap having a vent opening therein defined by a downwardly extending flange, a flexible valve for normally sealing said opening but effective for venting upon the development of pressure within the receptacle to which the closure is applied, said valve including a flexible head member having a portion of its surface lying in sealing engagement with the upper exposed surface of the closure along a line circumscribing the vent opening, a stalk depending from the head and passing through the opening, the stalk being generally of frustoconical shape and having a radial projection underlying said flange, the portion of the stalk normally lying adjacent the flange being of insufficient cross-sectional area to close the vent opening and the cross-sectional area adjacent the head being greater than the cross-sectional area of the vent opening, said stalk being tensioned in an amount sufficient to hold said head in sealing engagement with the closure, but insufficient to cause said enlarged portion of the stalk to close the vent opening.

3. A flexible valve for use in venting closures comprising a convexo-concave head portion adapted to seal against the upper exposed surface of the closure to which the valve is applied by circumscribing the vent opening in the closure, a stalk integral with the head portion, and a radial extension on the stalk adapted to engage a surface of the closure opposite to the surface against which said head member will seal, said valve being so proportioned that a line drawn normal to the axis thereof at the line of intersection of the radial extension with the stalk will intersect the head portion at a point inwardly of the edge thereof, the arrangement being such that the head will normally be held in sealing engagement with the upper exposed surface of the closure to which the valve is applied, regardless of variations in the thickness of the head portion thereof.

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