Jan. 8, 1952 H. C. ALLEN 2,581,897

GRAVITY OPERATED CLOSURE WITH MEANS TO FORM AN OPENING IN A CONTAINER

Filed Feb. 5, 1949

Fig. 1.

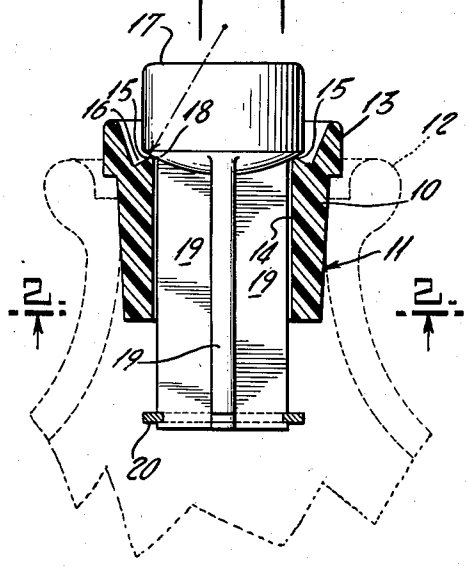


Fig. 3.

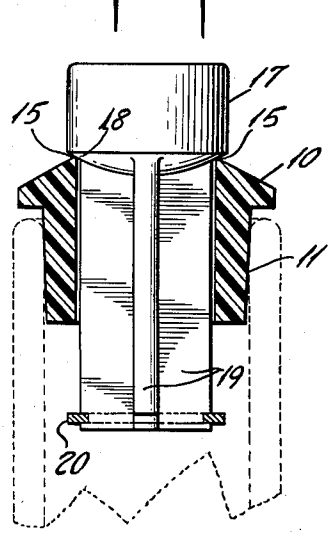


Fig. 2.

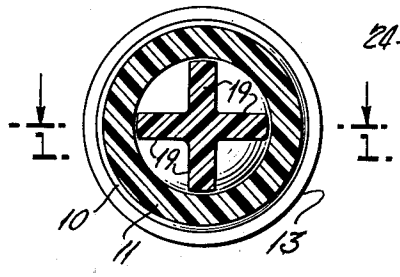


Fig. 5.

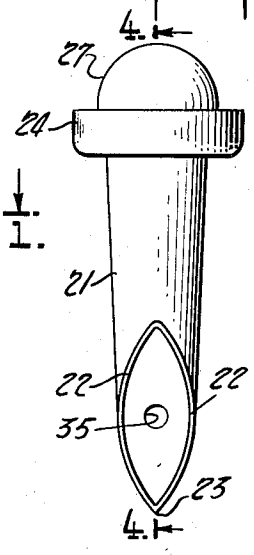


Fig. 4.

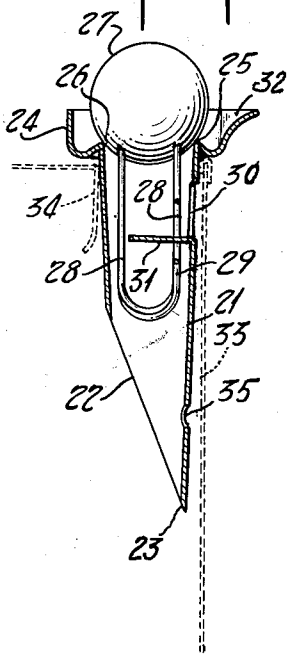
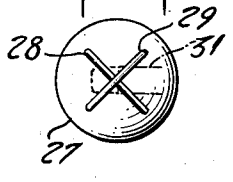


Fig. 6.



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GRAVITY OPERATED CLOSURE WITH MEANS TO FORM AN OPENING IN A CONTAINER

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5 Claims. (Cl. 222—81)

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The present invention pertains to improvements in automatic closures.

An object of the invention is to provide an improved pouring valve combination for use with receptacles such as bottles and cans, the valve being adapted to open as the receptacle is tipped for pouring and to close when the receptacle is returned to upright position.

Another object is to provide a combination of the above nature, including an adapting seat member or body which permits its use with bottles of differing neck sizes and which renders proper operation independent of irregularities in the mouths of the bottles.

Another object is to provide a combination of the above type adapted to avoid tendencies toward sticking when used with fluids such as milk.

A further object is to provide a bottle closure of the above nature which is particularly adapted to simple manufacture from plastic materials, of a resilient nature if desired.

Another object is to provide an embodiment of the invention which may be made of metal and in which the body member is adapted to be driven into the top of receptacles such as condensed milk cans.

A further object is to provide a closure device of the above nature including improved valve guiding and retaining means, and in which the valve head is of comparatively heavy construction with a spherical surface adapted to engage the seat member in substantially line contact.

Other objects and advantages of the invention will become evident during the course of the following description in connection with the accompanying drawings, in which

Figure 1 is a vertical partly cross-sectional view of a form of the device for use with bottles;

Figure 2 is a horizontal sectional view of the same in the plane 2—2, Figure 1;

Figure 3 illustrates an alternative form of seat ring or body;

Figure 4 is a vertical partly cross-sectional view of a metal embodiment for use with cans and the like;

Figure 5 is in a rear elevation of the same, and

Figure 6 is a bottom view of the valve member, Figures 4 and 5.

Referring to Figures 1 and 2, the numeral 10 generally designates a seat member or body having a tapered lower portion 11 adapted to be wedged into the mouth of a bottle, herein illustrated as a milk bottle 12. The upper portion 13 of the body 10 is cup-shaped. The cylindrical lower inner surface 14 meets the bottom inner

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surface of the cup-shaped portion 13 at an acute angle, thus forming an upwardly extending angular valve seat 15 surrounded by a circular depression or groove 16.

A valve head 17, which may be of comparatively heavy construction, has a spherical lower seating surface 18 adapted to engage the angular valve seat 15 in substantially line contact. Guide fins 19, extending downward from the valve head 17, form a loose sliding fit in the cylindrical interior 14. The fins 19 extend beyond the lower end of the member 10, and are fitted with a retainer ring 20, preferably of the snap-ring type.

While the bottle 12 stands upright the valve 17 normally remains seated by gravity on the seat 15. When the bottle is tipped for pouring, the rush of fluid into and through the cylindrical interior of the member 10 pushes the valve outward, guided by the fins 19, allowing the fluid to be poured from the cupped upper portion 13 as desired. The retainer ring 20 prevents the valve structure from escaping from the member 10 in case the bottle is tipped at a sharp angle or inverted.

When the bottle 12 is returned to upright position the valve drops into closed position, the fins 19 guiding the spherical surface 18 into engagement with the angular seat 15. The provision of the cylindrical surface 18 ensures accurate seating at all times, allowing the fins 19 to have sufficient play for free operation even with highly viscous fluid, while at the same time preventing any tendency toward cocking. Similarly, the substantially line contact on the seat 15 causes the heavy head 17 to exert a comparatively heavy unit seating pressure, ensuring a tight seal. The outward and downward slope from the valve seat 15 to the groove 16 drains away any residual fluid from the seat, a purpose of this arrangement being to prevent such residue from accumulating in and directly about the contact circle. This provision is of great importance in dealing with fluids such as milk, which if not effectively drained away at once from the seat, may congeal in the joint in suffcient quantity to hold the valve from subsequent automatic opening. The acute angular contour of the seat 15 itself further assists the clearing action by eliminating or minimizing any tendency to capillary accumulation such as occurs with flat, conical or widely rounded seating surfaces.

For some types of service the pouring rim of the upper portion 13 may be omitted as shown in Figure 3. In this case the residual liquid es-

capes down the outside of the device, draining away from the angular seat 15 to clear the latter in the manner previously described.

The taper of the lower body portion 11 makes each size of the device adaptable to bottles with considerable variation in neck diameters, while the accurate valve and seat combination provides proper operation at all times without any dependence on direct cooperation between a valve and the mouth of the bottle itself.

The forms of the device shown in Figures 1, 2 and 3 may be advantageously made of plastic materials, both the seat member 10 and the valve head 17 with its integral fins 19 being made of the same type plastic or of different types if desired. For example, for bottles having some degree of irregularity in the inside of the necks, or for fragile bottles in which it is desirable to limit the wedging pressure in installing the device, a certain amount of resilience in the member 10 is advantageous. For this purpose the member 10 may be made of a plastic such as polyethylene, the guide fins 19 being given sufficient clearance to move freely when the tapered portion 11 is slightly contracted.

The form of the invention shown in Figures 4, 5 and 6 has a slightly tapered sheet metal shell 21 which is cut off diagonally at 22 to form a piercing point 23. The upper cupped portion 24 is formed with an upwardly extending angular seat 25 of the general shape and for the purpose previously described. The seat 25 receives the spherical surface 26 of a valve 27 which may also be advantageously made of metal to provide weight. Two U-shaped stirrups of wire 28 and 29 are secured in the bottom of the head 27 in crossed relation as shown in Figure 6, forming guides which extend downward in the shell 21. The stirrups obviously may be welded or otherwise secured together at their crossing point to provide stiffness. A narrow vertical slot 30 is formed in the shell 21, the metal displaced therefrom being bent inward after the valve assembly has been installed, thus forming a retaining tab 31 extending across within the stirrups 28 and 29 as shown in Figure 4.

The upper cupped portion 24 may be formed with a spout 32 to facilitate pouring.

When it is desired to install the device, for example, in a condensed milk can 33, the point 23 is placed near the rim of the can top with the inclined rear side 22 directed inwardly, and the device is driven downward into the can. The point 23 and inclined side 22 cut a hole in the can top, laying the cut-away metal inward in a flap 34. The upper portion of the tapered shell 21 enlarges the hole in true circular shape and wedges therein to form a tight joint.

As the can is tipped, the fluid pushes the valve head 27 outward to allow pouring as previously described. The stirrups 28, as in the case of the fins 19, Figure 1, act as linear guides to direct the valve head outward to clear the seat for unobstructed pouring. However, the slightly loose fits of the guide members in both types permit the heavy valve heads a slight initial lateral movement from their seats as the receptacles are tipped, thus freeing the valves for easy opening by the fluid.

The use of the thin wire stirrup guides 28 in the metal type is of particular value in allowing free flow in small sizes of the device.

The provision of the inwardly struck tab 31, Figure 4, serves a double purpose. The tab 31 itself forms an effective limiting retainer for the valve structure, and being integral with the shell, cannot work loose or be dislodged. At the same time the slot 30 allows the last of the fluid to have access to the valve opening as the can is emptied. The advantages of the structure in simplicity and cheapness of manufacture will be obvious to those skilled in the art.

One or more additional holes 35 may be provided lower down along the shell 21 to further free the flow as the fluid runs low in the can.

When the can 33 is again placed upright the valve head 27 falls into place on the seat 25 and the residual fluid drains away from the raised angular seat to clear the latter in the manner previously set forth.

The enlarged upper portion 24, in addition to its operation as a pouring guide, also forms a convenient prying head for dislodging the device from an empty receptacle. The same, of course, applies to the upper cupped portion 13, Figure 1.

While the invention has been described in preferred form, it is not limited to the exact structures illustrated, as various changes and modifications may be made without departing from the scope of the appended claims.

What is claimed is:

1. In a closure device for receptacles such as cans and the like, in combination, a tubular metal body member adapted to be driven into the top of a receptacle, a pouring cup on the top of said body member of greater diameter than said body member, a valve seat on said body member at the juncture of said member and said cup, a valve head normally engaging said seat in substantially line contact and adapted to be moved away from said seat by outrush of liquid when said receptacle is tipped for pouring, guide means depending from said head in cooperative guiding relation with the interior of said tubular body member, and means within said body member to limit the movement of said valve and guiding means, the bottom of said cup having a depression encircling said seat, whereby residual liquid may be drained from said seating contact line.

2. In a closure device, in combination, a hollow body member adapted to engage a top opening of a liquid container in sealing relationship, said body member comprising a conical receptacle-engaging lower portion and a cupped upper pouring portion of enlarged diameter, an upwardly extending sharp valve seat on said member, a check valve normally engaging said seat in substantially line contact and adapted to be moved away from said seat by outrush of liquid when said receptacle is tipped for pouring, substantially rectilinear guide means including a plurality of slender spaced members slidable in said body member and adapted to control the opening and re-closing motion of said valve, and means to limit the extent of said opening motion, said seat having a downwardly sloping outer profile whereby residual fluid may drain away from said contact line, and the bottom of said cupped portion having an annular groove surrounding said seat to receive said drained residual liquid.

3. In a closure for receptacles such as cans, in combination, a hollow metal body having an upper valve seat and a conical lower portion adapted to be driven into the top of a receptacle, said conical lower portion being diagonally truncated to form a piercing point and an inclined cutting face, a valve head having a spherical surface normally engaging said valve seat in substantially line contact, said head being adapted to be moved away from said seat by rush of fluid

when said receptacle is tipped for pouring, guide means secured to said head and extending within said lower portion in sliding relation, means to limit the opening motion of said head and guide means, and a cupped upper pouring portion on said body having a depression in the bottom thereof encircling said valve seat, whereby residual fluid may be drained from said seating contact line.

4. In a closure for receptacles such as cans, in combination, a hollow metal body having an upper valve seat and a conical lower portion adapted to be driven into the top of a receptacle, said conical lower portion being diagonally truncated to form a piercing point and an inclined cutting face, a valve head having a spherical surface normally engaging said valve seat in substantially line contact, said head being adapted to be moved away from said seat by rush of fluid when said receptacle is tipped for pouring, guide means comprising substantially U-shaped stirrups secured to said head and extending within said lower portion in sliding relation, and means to limit the opening motion of said head and guide means comprising an integral tab struck inward from a wall of said body and extending within said stirrups, the displacement of said tab from said wall forming a passage for liquid into said body.

5. In a closure for receptacles such as cans and the like, in combination, a tubular metal body member adapted to be driven into the top of a receptacle, a pouring cup on the top of said body member of greater diameter than said body member, a valve seat on said member at the juncture of said member and said cup, a valve head normally engaging said seat in substantially line contact and adapted to be moved away from

said seat by outrush of liquid when said receptacle is tipped for pouring, guide means depending from said head in cooperative guiding relation with the interior of said tubular body member, and means comprising a tab struck inwardly from a wall of said tubular member and adapted to intercept said guiding means for limiting the movement of said valve and guiding means, the displacement of said tab from said wall forming an entry opening for liquid through said wall, the bottom of said pouring cup having a depression encircling said seat, whereby residual liquid may be drained from said seating contact line.

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