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J. L. WOODBRIDGE

2,065,783

NONSPILL VENT PLUG

Filed May 3, 1935

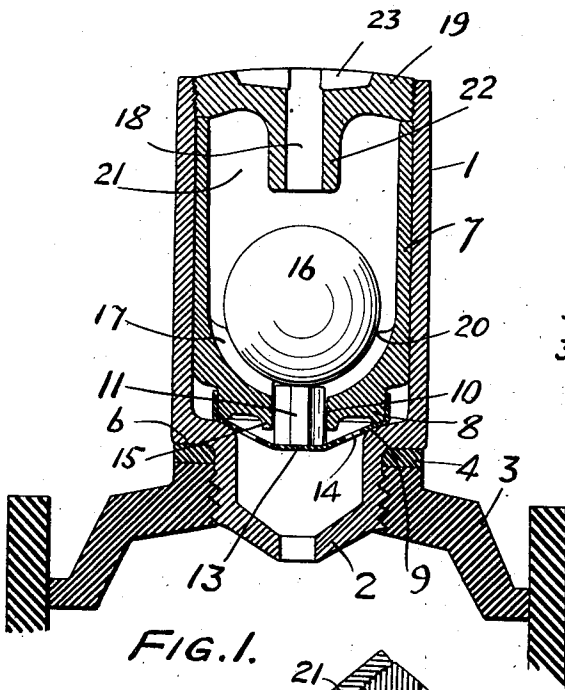


FIG. 1.

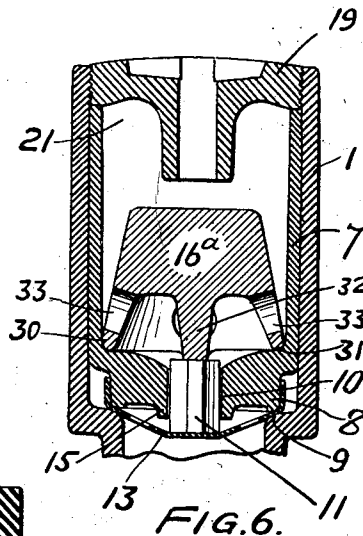


FIG. 6.

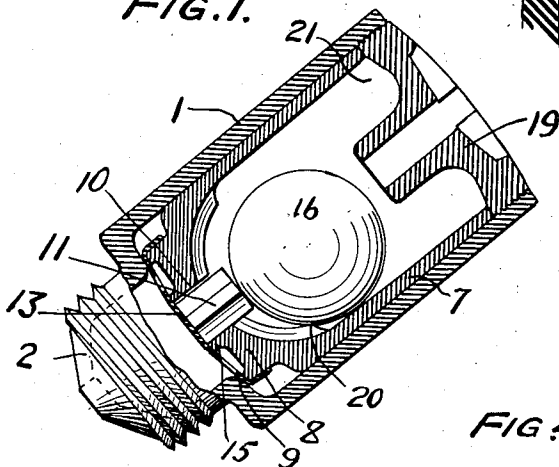


FIG. 2.

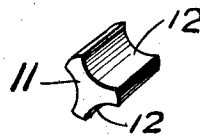


FIG. 3.

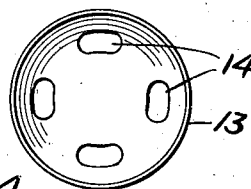


FIG. 4.

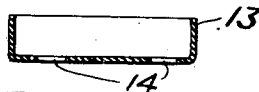


FIG. 5.

WITNESS:

Robert Mitchell

INVENTOR

Joseph Lester Woodbridge

BY

Augustus B. Straighton
ATTORNEY.

UNITED STATES PATENT OFFICE

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NONSPILL VENT PLUG

Joseph Lester Woodbridge, Philadelphia, Pa.,
assignor to The Electric Storage Battery Com-
pany, Philadelphia, Pa., a corporation of New
Jersey

Application May 3, 1935, Serial No. 19,638

5 Claims. (Cl. 136—178)

One object of the present invention is to improve and simplify the construction and operation of the device, more especially in respect to the means by which the cell is vented when in upright or normal position.

Other objects of the invention will appear from the following description at the end of which the invention will be claimed.

Generally stated, the invention consists of a vent plug having an axially disposed vent passage through it and equipped with a gravity-operated resilient diaphragm provided with an imperforate portion for sealing the outlet part of the vent passage when the device is in tilted position, and also provided with a perforated portion for affording access to the outlet part of the passage when the device is in upright position.

The invention also comprises the improvements to be presently described and finally claimed.

In the following description, reference will be made to the accompanying drawing forming part hereof and in which:

Fig. 1 shows in vertical section a vent plug involving features of the invention.

Fig. 2 shows the plug in the tilted position.

Fig. 3 shows, in a perspective view, the valve actuating plunger.

Figs. 4 and 5 show the valve diaphragm in plan and sectional elevation, respectively.

Fig. 6 shows a modification in which the actuating weight is in the form of a truncated cone.

Referring to Fig. 1, the vent plug comprises a cylindrical outer shell 1 having an extension 2 at the bottom of smaller diameter and externally threaded to engage the vent opening of the cover 3 of the storage battery cell. A soft rubber gasket 4 is located between the boss of the cover and the shoulder 6 of the vent plug to insure a tight seal.

Within the shell 1 is a second cylindrical shell 7 snugly fitting the interior wall of the shell 1 and provided at the bottom with an internally projecting portion 8 adapted to seat against the interior shoulder 9 of the shell 1. The lower end of the shell 7 is provided with an axial orifice 10, within which is a loosely fitting plunger 11 shown in perspective in Fig. 3. The plunger 11 is provided with vertical grooves 12 around its periphery.

The orifice 10 is adapted to be closed by a resilient valve diaphragm 13, shown in detail in Figs. 4 and 5.

The valve diaphragm 13 as shown is in the form of a cap of soft rubber or similar material

adapted to fit snugly over the lower projection of the shell 7. The valve diaphragm 13 is provided with openings 14 at a distance from the center sufficient to leave an unperforated area in the middle adapted to close the orifice 10 when the diaphragm is held against the boss 15 surrounding the orifice 10.

A cap 19 closes the upper end of the shell 1 with which it has screw-thread engagement, and, when in the position shown, it bears on the upper edge of the shell 7, holding this in position. The cap 19 is provided with a cylindrical projection 22 from its lower surface through which a vent duct 18 passes, extending from the interior of the plug to the outer air. A notch 23 is provided in the upper surface of this cap to receive a screw-driver for inserting or removing the cap.

A spherical weight 16 is located within the shell 7, and, in the normal position of the plug shown in Fig. 1, this weight rests on the interior lower spherical surface of the shell 7 and on the top of the plunger 11, thereby depressing the plunger, causing it to push the valve diaphragm 13 away from its seat. In this position vent passages are provided through the openings 14 in the diaphragm and the grooves 12 in the plunger and grooves 17 in the lower interior surface of the shell 7, into the interior chamber of the plug and thence out through the vent duct 18 in the cap 19.

When the vent plug is tilted into the position shown in Fig. 2, the spherical weight 16 will roll over the shoulder 20, releasing the pressure on the plunger 11 and permitting the diaphragm 13 to rise and close the opening, thus preventing liquid from escaping through this opening. If a small quantity of liquid should escape before the opening 10 is closed by the diaphragm 13, it will be retained in the space 21 if the cell is inverted, and, on restoring the cell to its normal upright position, this liquid will drain back through the grooves 17 and the opening 10 and the openings 14 in the diaphragm 13 and will thus be returned to the cell.

In Fig. 6 there is shown a modification in which the actuating weight 16a is in the form of a truncated cone rather than a sphere, the cone being provided with a depending skirt 30 which rests on the ledge 31 of the cylindrical shell 7. The weight 16a is also provided with an axial projection 32 from its lower surface which, in the position shown, bears upon the plunger 11, depressing it to push the diaphragm 13 away from the orifice 10. Openings 33 are shown in the

depending skirt of the weight 16a to permit the escape of gas and the return of liquid to the cell. When the vent plug shown in Fig. 6 is tilted through a sufficient angle, the weight 16a will rock about a point of contact between the depending skirt and the ledge 31, thus relieving the pressure on the plunger 11, and permitting the valve diaphragm 13 to close the orifice 10.

It will be obvious to those skilled in the art to which the invention relates that modifications may be made in details of construction and arrangement in matters of mere form without departing from the spirit of the invention which is not limited in respect to such matters or otherwise than as the prior art and the appended claims may require.

I claim:—

1. In combination in a non-spill vent plug for a liquid containing receptacle, walls defining a hollow chamber provided with a vent orifice adapted to communicate with the interior of the receptacle, a resilient pliable perforated diaphragm fixedly supported at its rim and having an imperforate area confronting and adapted to close said orifice, and gravity-operated means adapted when the receptacle is in its normal upright position to apply pressure to the diaphragm to separate it from the orifice to provide a venting passage from the interior of the receptacle through the perforations and the orifice, said gravity-operated means adapted to be displaced to relieve said pressure and permit the diaphragm to close the orifice when the receptacle is tilted from its normal vertical position.

2. A vent plug of the type recited having a vent passage including a seat and provided with a weight-operated resilient pliable diaphragm fixedly supported at its rim and having a central imperforate portion co-operating with the seat to open and close the passage and having a perforated portion between its rim and its central imperforate portion to provide a vent through the diaphragm when the device is in normal position, and a weight element operatively arranged in respect to the diaphragm and responsive to tilting motion of the plug.

3. A vent plug of the type recited having an axially disposed vent passage through it and equipped with a weight-operated resilient pliable

diaphragm fixedly supported at its rim and provided with an imperforate portion for sealing the outlet part of the vent passage when the device is in tilted position and with a perforated portion for affording access to the outlet part of the passage when the device is in upright position, and a weight element operatively arranged in respect to the diaphragm and responsive to tilting motion of the plug.

4. In combination in a non-spill venting device for a liquid containing receptacle, walls defining a hollow chamber, said chamber being divided into upper and lower compartments, each of said compartments being arranged so as to drain into and to communicate with the interior of the receptacle, said walls defining a vent orifice between said compartments, a resilient pliable perforated diaphragm fixedly supported at its rim and having an imperforate area confronting and adapted to close said orifice, and gravity-operated means adapted when the receptacle is in its normal upright position to apply pressure to the diaphragm to separate it from the orifice to provide a venting passage from the interior of the receptacle through the perforations and the orifice, said gravity-operated means adapted to be displaced to relieve said pressure and permit the diaphragm to close the orifice when the receptacle is tilted from its normal vertical position.

5. In combination in a non-spill vent plug for a liquid-containing receptacle, walls defining a hollow chamber provided with a vent orifice adapted to communicate with the interior of the receptacle, a valve seat surrounding the vent orifice exteriorly of the chamber, a pliable resilient diaphragm, fixedly supported at its rim, having an imperforate area confronting the valve seat and a perforated portion between the imperforate area and the rim, said diaphragm stressed to overlies the valve seat and close the vent orifice, and a weight member in the chamber adapted in the normal upright position of the receptacle to apply pressure to the diaphragm to force it away from the valve seat, said weight member adapted, when the vessel is tilted from its normal position to be displaced to relieve said pressure to permit the diaphragm to close the vent orifice.

JOSEPH LESTER WOODBRIDGE. 50