May 15, 1945. H. A. COHEN 2,376,123

VENT PLUG

Filed Sept. 8, 1942

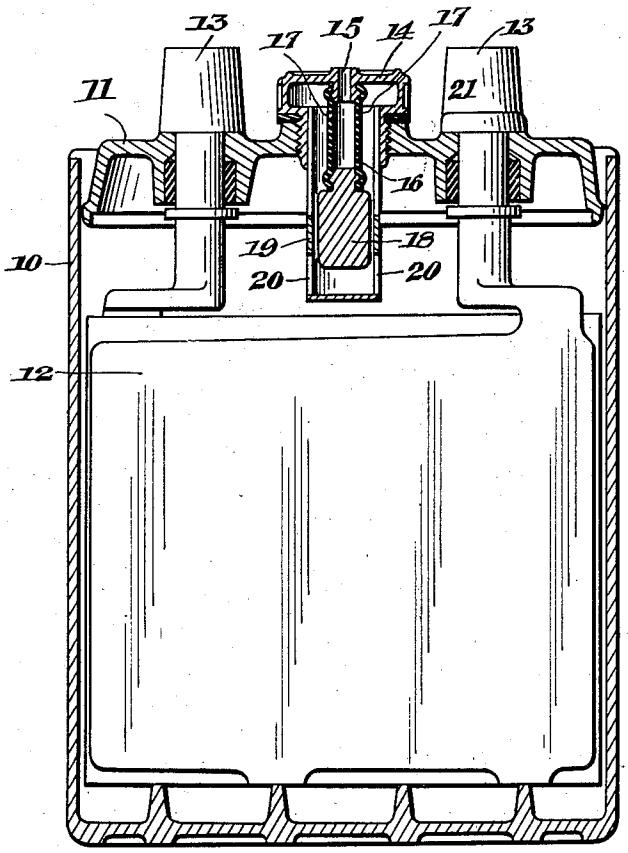


FIG. 1.

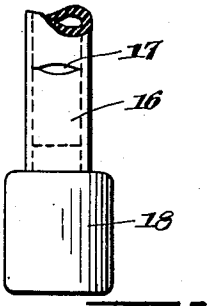


FIG. 2.

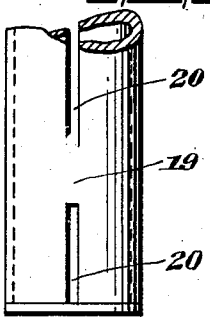


FIG. 3.

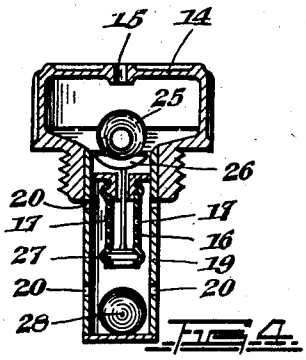


FIG. 4.

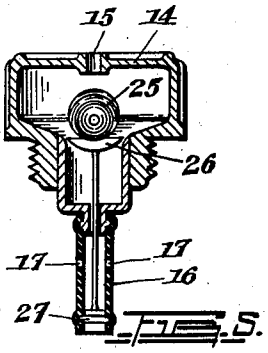


FIG. 5.

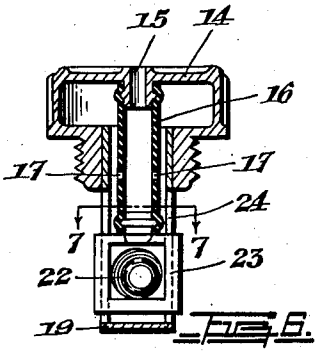


FIG. 6.

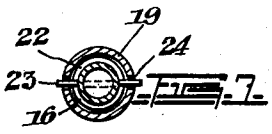


FIG. 7.

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VENT PLUG

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8 Claims. (Cl. 251—147)

This invention relates to non-spill vent plugs for liquid containing receptacles such as storage batteries and the like. Vent plugs of this type are used in storage batteries to allow the gases which are generated in the battery to escape into the atmosphere and to prevent the liquid electrolyte from escaping should the battery be tilted or inverted.

Various types of valves have been provided in vent plugs for this purpose usually involving a movable member and a valve seat but these have proven unreliable since it is difficult to provide a leak-proof valve of this type in view of corrosion and for other reasons. Flexible diaphragms have been used in a valve action but it is necessary to make the diaphragm quite delicate and as a result it soon becomes stretched and loses its sealing ability. Flexible tubes have also been provided in vent plugs with means for kinking or closing the tube upon inversion of the battery. This type of valve is not leak-proof since it is necessary to provide a plurality of baffle plates and chambers to collect the liquid electrolyte.

Accordingly it is the main object of the present invention to provide a non-spill vent plug for liquid containing receptacles which will allow gases to escape into the atmosphere when the receptacle is in normal position and which will prevent the liquid from escaping should the receptacle be tilted or inverted. It is also an object of the present invention to provide a vent plug which will be reliably leak-proof and which will retain its sealing ability for a long period.

In accordance with the present invention a closed flexible tube is provided communicating with the usual aperture in the cover portion of the vent plug. This tube has a plurality of circumferentially cut slits which are held open when the receptacle is in normal position and which are allowed to close when the receptacle is tilted or inverted. The slits are held open by a weight member which tends to stretch the flexible tube and are allowed to close by the force of elasticity of the flexible tube and by the force of gravity of the weight member.

The weight member is attached to the lower end of the flexible tube and the weight member and the flexible tube are mounted within a casing which is attached to the cover portion of the vent plug and which is provided with a plurality of apertures communicating with the interior of the receptacle. In a modification of the invention the weight comprises a metal ball which is free to roll within a cage member which is attached to the lower end of the flexible tube and which is adapted to travel in suitable slots in the casing. In a further modification the weight comprises a metal ball which is adapted to rest on a plunger member when the receptacle is in normal position and to roll clear of the plunger member when the receptacle is tilted or inverted, the plunger member passing through the flexible tube and being attached to the lower end thereof. In this modification the slits will close by the force of elasticity of the flexible tube. In a further modification a second metal ball is provided below the flexible tube to aid in the closing of the slits when the receptacle is inverted. The second metal ball and the tube are mounted within a casing which is attached to the cover portion of the vent plug and which is provided with a plurality of apertures communicating with the interior of the receptacle.

Further objects and advantages of the present invention will be apparent upon reference to the accompanying drawing which illustrates the invention as applied to a storage battery.

Fig. 1 is a vertical sectional view of a storage battery showing the construction of the vent plug.

Fig. 2 is an enlarged view of part of the flexible tube and weight member showing the circumferential slit in open position.

Fig. 3 is an enlarged view of part of the casing.

Fig. 4 is a vertical sectional view of a modification of the invention.

Fig. 5 is a vertical sectional view of a further modification of the invention.

Fig. 6 is a vertical sectional view of a further modification and

Fig. 7 is a sectional view taken on the line 7—7 of Fig. 6.

The storage battery illustrated comprises the usual receptacle 10, cell cover 11, positive and negative plates 12 and positive and negative posts 13. Each cell cover is provided with a flanged opening into which a vent plug is adapted to be screwed.

The vent plug has a cover portion 14 having an aperture 15 therein. A closed flexible tube 16 communicates with this aperture and is provided with a plurality of circumferentially cut slit openings 17. A single slit would be sufficient but it is preferable that the tube be provided with a slit on opposite sides thereof. Referring to Fig. 1 a weight member 18 is attached to the lower end of the flexible tube and the weight member and tube are mounted within a casing 19 which is attached to the cover portion 14 and which is provided with a plurality of apertures 20 communicating with the interior of the receptacle. The usual gasket 21 is provided between the vent plug and the flange of the cell cover. When the stor-

age battery is in normal position the slits are held open by the force of gravity of the weight member and when the battery is inverted the slits are closed by the force of elasticity of the flexible tube and by the force of gravity of the weight member.

With this construction the gases will pass through the apertures 20 into the casing 19, through the slits 17 into the tube 16, and hence through the aperture 15 into the atmosphere. When the battery is inverted the liquid electrolyte will pass through the apertures 20 into the casing 19 but will be prevented from escaping further because the slits 17 will be closed by the force of elasticity of the flexible tube and by the force of gravity of the weight member.

Referring to Figs. 6 and 7 the weight member comprises a metal ball 22 which is free to roll within a cage member 23. This cage member is attached to the lower end of the flexible tube, the cage member and the flexible tube being mounted within the casing 19. The casing is provided with suitable slots 24 in which the cage member travels. Mounting the metal ball in a cage reduces friction and increases the sensitivity of the device.

In the vent plugs shown in Figs. 4 and 5 there is room in the cover portion 14 for a metal ball 25 to roll freely. When the receptacle is in normal position the ball will rest on a plunger member 26, the shaft of which passes through the flexible tube 16 and is attached to the lower end thereof as at 27. When the receptacle is in normal position the force of gravity of the metal ball on the plunger member holds the slits 17 open. When the receptacle is tilted or inverted the metal ball will roll clear of the plunger member and the slits will be closed by the force of elasticity of the flexible tube. In Fig. 4 a second metal ball 28 is provided below the flexible tube to aid in the closing of the slits. The flexible tube and the second weight are mounted within the casing 19 which is attached to the cover portion and which is provided with a plurality of apertures communicating with the interior of the receptacle. In this modification the slits will be closed by the combined force of elasticity of the tube and force of gravity of the weight member 28.

The weight members mentioned above are preferably composed of lead so that they will not be subject to corrosion. The casings have been described as having a plurality of apertures but it is to be understood that a single aperture would operate quite satisfactorily.

Accordingly I have provided a novel non-spill vent plug for liquid containing receptacles which will allow gases to escape into the atmosphere when the receptacle is in normal position and which will prevent the liquid from escaping should the receptacle be tilted or inverted.

I claim:

1. A non-spill vent plug for a liquid containing receptacle, comprising a cover portion having an aperture therein, a closed flexible tube communicating with said aperture and provided with at least one slit opening, a weight member attached to the lower end of the flexible tube and a casing surrounding said flexible tube and weight member and in which said weight member is freely movable longitudinally, said casing having a plurality of apertures communicating with the interior of the receptacle.

2. A non-spill vent plug according to claim 1, in which the weight member comprises a cage attached to the lower end of the flexible tube and a metal ball free to roll within said cage.

3. A non-spill vent plug according to claim 1, in which the weight member comprises a cage attached to the lower end of the flexible tube and a metal ball free to roll within said cage, the casing being provided with longitudinally extending slots for guiding the travel of the cage.

4. A non-spill vent plug for a liquid containing receptacle, comprising a cover portion having an aperture therein, a closed flexible tube communicating with said aperture and provided with at least one slit opening, a weight member for holding said slit open when the receptacle is in normal position and for assisting to hold the slit closed when the receptacle is inverted.

5. A non-spill vent plug for a liquid containing receptacle, comprising a cover portion having an aperture therein, a closed flexible tube communicating with said aperture and provided with at least one circumferential slit opening, a weight member acting on the lower end of the tube and tending to stretch said tube when the receptacle is in the normal position and thereby hold the slit open and means for relieving the tube of the action of the weight member when the receptacle is tilted.

6. A non-spill vent plug according to claim 5, comprising a plunger member passing through the flexible tube and attached to the lower end thereof and in which the weight member comprises a metal ball adapted to rest on the upper end of said plunger member when the receptacle is in normal position and to roll clear of said member when the receptacle is tilted or inverted.

7. A non-spill vent plug according to claim 4, in which the slit opening is held open by one weight member and is held closed by a second weight member and the force of elasticity of the flexible tube.

8. A non-spill vent plug according to claim 5, comprising a plunger member passing through the flexible tube and attached to the lower end thereof and in which the weight member comprises a metal ball adapted to rest on the upper end of said plunger member when the receptacle is in normal position and to roll clear of said member when the receptacle is tilted or inverted, and comprising a casing for the flexible tube having apertures communicating with the interior of the receptacle and a second metal ball free to move in said casing adapted to exert pressure on the normally lower end of the flexible tube when said receptacle is inverted.

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