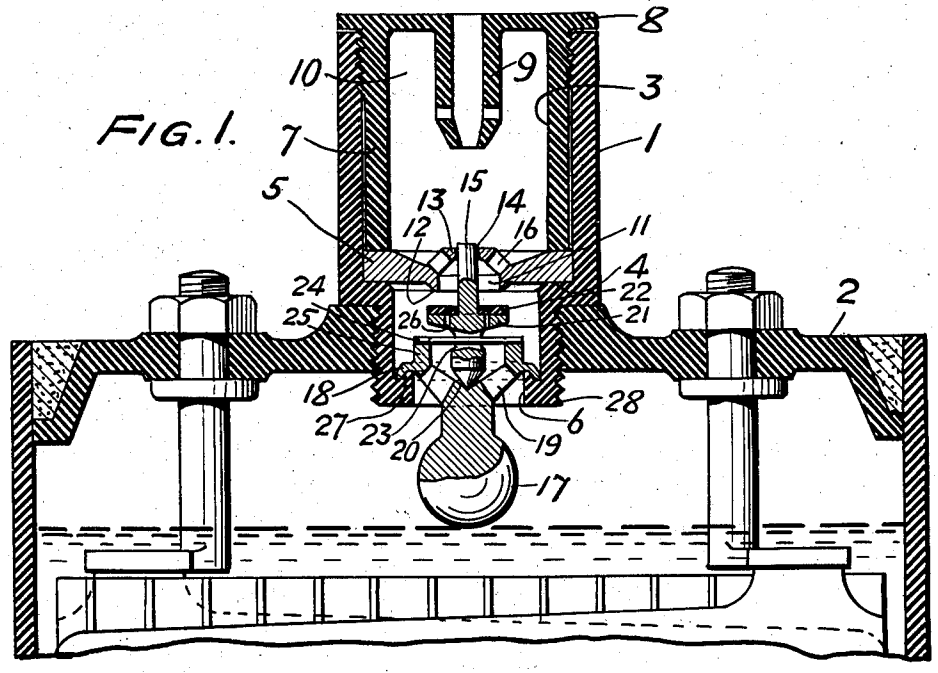
Jan. 14, 1936. J. L. WOODBRIDGE 2,028,113

NONSPILL VENT PLUG

Filed Sept. 27, 1933

FIG. 1.



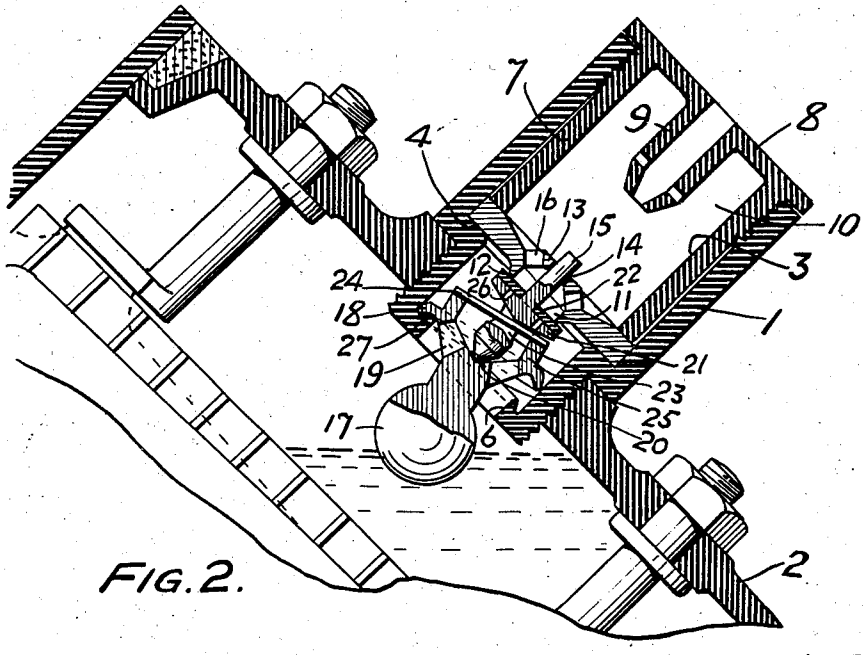


FIG. 2.

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NONSPILL VENT PLUG

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

Application September 27, 1933, Serial No. 691,149

7 Claims. (Cl. 136—178)

The subject of my invention is a non-spill vent plug for containers of fluids which evolve gas, especially electric storage batteries. This vent plug permits the escape of gas but closes to prevent the escape of liquid if the container is tilted or upset.

The present invention is an improvement upon the device shown in my prior Patent No. 1,942,630, granted January 9, 1934.

Among the improved features of my present device are the following:

1. The downwardly projecting conical portion of the valve which is supported by and seats in a larger conical depression in the upper face of the weight.

2. The pin on the weight which passes loosely through and forms a lost motion connection between the valve and the weight to move the valve toward open position and normally hold the valve in open position.

3. The arrangement whereby the valve seat is clamped between two portions of the body of the vent plug.

4. The guide means for the valve on the valve seat.

5. The flexible or soft rubber washer between the valve and the valve seat.

6. The perforations through the valve behind the washer.

My invention includes in general and with all the advantages inherent therein the device more specifically illustrated in the annexed specification and drawing, to which reference is here made, and which will be hereinafter pointed out or will be apparent and which will finally be claimed.

In the drawing:

Fig. 1 is a vertical cross-section of my device and a portion of the cooperating parts of a storage battery; and

Fig. 2 is a view similar to Fig. 1 showing the device in tilted position.

In the drawing 1 represents a hollow vent plug screwed into the opening of the cover 2 of a storage battery cell. The balance of the cell forms no part of this invention and is only partially shown for purposes of illustration. The vent plug 1, as here shown, is cylindrical in shape, having a cavity 3 provided with an annular seat 4 near its lower end and an inwardly projecting ledge 28 at or adjacent the bottom of the cavity, the circular opening 6 providing communication between the interior of the vent plug and the upper portion of the cell. On the seat or shoulder 4 rests a disk-like member 5 which is clamped firmly to the seat 4 by the downwardly extending cylindrical skirt 7 of the cap 8 which is screwed into the top of the vent plug 1. The cap 8 has a downwardly projecting vent duct 9, permitting gas to escape from the cell into the air but providing a space 10 to retain and prevent the escape of any liquid which may be in the vent plug when the cell is tilted into an inverted position.

The disk member 5 is provided with a central opening 11, surrounding which, on the lower surface of the disk 5, is a lip 12 which forms a valve seat. The disk 5 is also provided with an upwardly projecting portion 13, having a central opening 14 which serves as a guide for the stem 15 of the valve described below. The structure 13 has openings 16 connecting the interior of the vent plug with the passage 11 to permit any liquid in the space 3 to drain back into the cell when the latter is in its upright position.

A weight or weighted member 17 is shown having an annular projection or lip 18 normally resting on the ledge 28, this ledge being provided with an upwardly projecting annular lip 27 to prevent lateral motion of the weighted member 17 when tilted. Openings 19 are shown between the lip 18 and the body of the weighted member to permit liquid to drain back into the cell. The upper surface of the weighted member 17 is formed as a conical cavity with its apex at 20, this apex being located slightly below the plane of the lip 18. In this apex the conical point of the valve 21 is supported. The valve 21 may be made of any suitable acid resistant material such as hard rubber or lead alloy and on its upper surface rests the soft rubber disk 22, adapted when the valve is in its closed position to seat against the lip 12 and thereby close the passage 11. As already noted, the valve has an upwardly projecting stem 15 which is guided in the opening 14 of the disk 5. The valve has a horizontal opening 23 through its stem, through which passes a pin 24 attached at its outer ends to the projections 25 of the weighted member 17. This pin may be made of lead antimony alloy resting in notches of the projections 25 and soldered thereto. The valve 21 has vertical openings 26 extending from the under surface of the valve to the under surface of the soft rubber disk 22. The purpose of these openings will be later explained.

The operation of this vent plug will now be described. When the cell is in its normal upright position the parts will be located as shown in Fig. 1 of the drawing and the valve will be open, providing free exit for any gas which may be developed in the cell through the openings 19, the opening 11, the openings 16 and the vent tube 9. If the cell is tilted from the horizontal position the weighted member 17 will rotate about a point of contact between the lip 18 and the ledge 28, and the apex 20 of the cavity in its upper surface will move about such point of contact as a center in a nearly axial line, pushing the valve 21 up until the rubber disk 22 seats on the lip 12, thus closing the orifice 11 and preventing the escape of liquid from the cell. If the cell remains in this position for any appreciable length of time,

especially while gas is developed in the cell by charging current or by local action, a certain amount of pressure will be developed in the cell which will tend to hold the valve in its closed position after the cell is returned to its upright position. When this occurs, however, the pin **24** will bear upon the lower surface of the opening **23** and the weight of the element **17** will exert additional force to open the valve. Should the pressure be sufficient to support the weight of the element **17** under these conditions and additional pressure be developed by the gas in the cell, a point will finally be reached when the pressure of this gas exerted on the under side of the rubber disk **22** through the openings **26** will lift this disk from its seat by causing that portion of the disk between lip **12** and pin **15** to flex upward and thus allow the gas to escape around the base of the pin **15**. The gas pressure being thus relieved, the valve will be opened by the weight **17**.

I do not intend to be limited save as the scope of the prior art and of the attached claims may require.

I claim:

1. A vent plug for a container of fluids which evolve gas, said plug including, in combination, a body having a cavity therein and an inlet and an outlet therein connecting with said cavity, a valve seat in said cavity between said inlet and said outlet, a ledge on said body forming a support, a valve co-operating with said valve seat and having a downwardly projecting portion, and a weight having an edge normally supported on said ledge and capable of tilting movement on said ledge at the lateral wall of said cavity and having a cavity to receive said downwardly projecting portion of said valve therein, the engagement between said valve and said weight being at a surface of limited area just beneath the plane of said ledge so that tilting movement of said weight closes said valve on said seat.

2. A vent plug for a container of fluids which evolve gas, said plug including, in combination, a body having a cavity therein and an inlet and an outlet therein connecting with said cavity, a valve seat in said cavity between said inlet and said outlet, a ledge on said body forming a support, a valve cooperating with said valve seat and having a downwardly projecting conical portion, and a weight having a portion normally supported on said ledge and having a conical depression in its upper surface of larger size than the conical portion of said valve to receive the conical portion of said valve therein and thereby normally to support said valve and, upon tilting movement, to close said valve.

3. A vent plug for a container of fluids which evolve gas, said plug including, in combination, a body having a cavity therein and an inlet and an outlet therein connecting with said cavity, a valve seat in said cavity between said inlet and said outlet, a ledge on said body forming a support, a valve cooperating with said valve seat and having a downwardly projecting conical portion, a weight having a portion normally supported on said ledge and having a conical depression in its upper surface of larger size than the conical portion of said valve to receive the conical portion of said valve therein and thereby normally to support said valve and, upon tilting movement, to close said valve, and means on said weight for moving toward and normally holding said valve in open position.

4. A vent plug for a container of fluids which evolve gas, said plug including, in combination, a body having a cavity therein and an inlet and an outlet therein connecting with said cavity, a valve seat in said cavity between said inlet and said outlet, a ledge on said body forming a support, a valve cooperating with said valve seat and having a downwardly projecting conical portion, a weight having a portion normally supported on said ledge and having a conical depression in its upper surface of larger size than the conical portion of said valve to receive the conical portion of said valve therein and thereby normally to support said valve and, upon tilting movement, to close said valve, a flexible washer between said valve and said valve seat, and perforations in said valve in contact with and on the opposite side of said washer from said valve seat.

5. A vent plug for a container of fluids which evolve gas, said plug including, in combination, a body having a cavity therein and an inlet and an outlet therein connecting with said cavity, a valve seat in said cavity between said inlet and said outlet, a ledge on said body forming a support, a valve cooperating with said valve seat and having a downwardly projecting conical portion, a weight having a portion normally supported on said ledge and having a conical depression in its upper surface of larger size than the conical portion of said valve to receive the conical portion of said valve therein and thereby normally to support said valve and, upon tilting movement, to close said valve, and means adjacent said valve seat for guiding said valve.

6. A vent plug for a container of fluids which evolve gas, said plug including, in combination, a body having a cavity therein and an inlet and an outlet therein connecting with said cavity, a valve seat in said cavity between said inlet and said outlet, a ledge on said body forming a support, a valve cooperating with said valve seat and having a downwardly projecting conical portion, a weight having a portion normally supported on said ledge and having a conical depression in its upper surface of larger size than the conical portion of said valve to receive the conical portion of said valve therein and thereby normally to support said valve and, upon tilting movement, to close said valve, and a pin on said weight passing loosely through an opening in said valve for moving toward and normally holding said valve in open position.

7. In a non-spill vent plug for a closed container containing liquid, a valve seat defining an orifice opening from the vent plug into the container, an annular supporting ledge below the the valve seat, a weighted member having an annular lip adapted to be supported from said ledge and having a cavity in its upper surface with an apex in the bottom of said cavity, and a valve member adapted to be supported by said weighted member beneath and normally out of contact with the valve seat and adapted to be brought into contact therewith by the rocking of the weighted member on the supporting ledge caused by the tilting of the container, the supporting contact between the weighted member and the valve member being in the form of a pin projecting from the valve member and resting at the apex of the cavity in the weighted member, said contact being located just beneath the plane of said annular lip.

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