June 29, 1954 O. G. DUNCAN 2,682,569

VENT PLUG FOR STORAGE BATTERIES

Filed Aug. 4, 1952

Fig. 1.

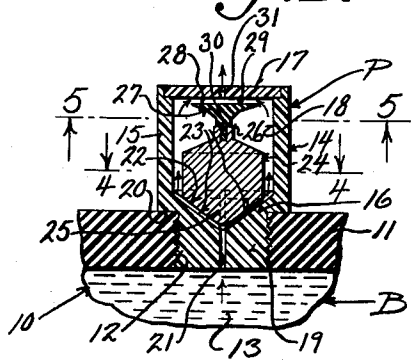


Fig. 2.

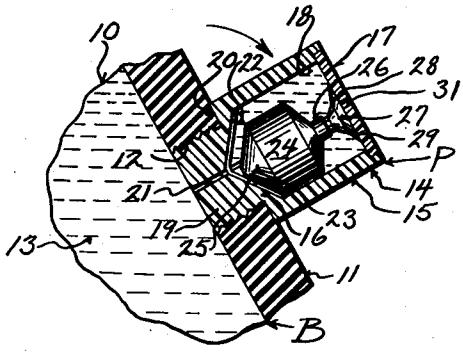


Fig. 3.

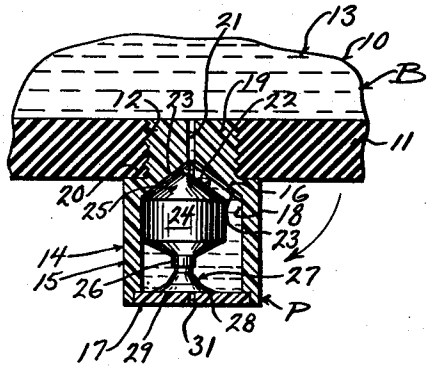


Fig. 4.

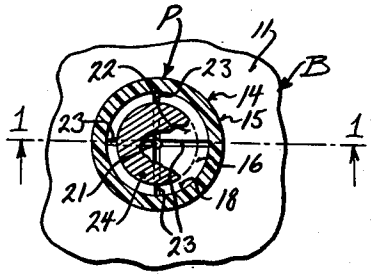
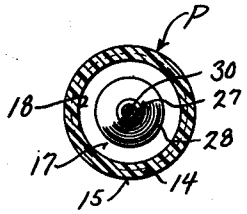


Fig. 5.



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VENT PLUG FOR STORAGE BATTERIES

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2 Claims. (Cl. 136—178)

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This invention appertains to storage batteries, and more particularly to a novel vent plug therefor.

In storage batteries of the type utilized for aeroplanes, much difficulty is experienced with the leakage of the electrolyte from the battery through the vent openings, when the aeroplane executes its various maneuvers of flying upside down, at an angle to the vertical, etc. The same difficulty is had in motorcycle batteries, when the motorcycle leans over or spills.

It is, therefore, one of the primary objects of my invention to provide an improved vent plug for storage batteries, in which a positive means is provided for immediately and automatically sealing the vent opening in the plug when the battery is tipped on its side, or is turned completely over, the construction being such that the vent opening is immediately reopened when the battery is in its normal upright position.

Another salient object of my invention is to provide a vent plug having an interior chamber and a vent opening communicating with the upper end of the chamber, and a weight carrying a sealing valve disposed in the chamber for positively closing and sealing the vent opening when the battery is tilted or turned over.

A further object of my invention is to provide novel means for forming the weight and novel means for forming a seat for the weight in the chamber, so that, as the battery tilts, the weight will be immediately directed outwardly away from its seat, to cause the valve to move over the vent opening in sealing contact with the inner surface of the outer wall of the chamber.

A further important object of my invention is the provision of a flexible valve carried by the weight for sealing contact with the upper wall of the chamber over the vent opening, the flexible connection between the valve and weight allowing lateral or radial movement of the weight incident to turning and vibratory movement of the battery independent of the valve, when the valve is in its sealing position, so that accidental displacement of the valve from its sealing position is eliminated.

A still further object of the invention is to provide a self-closing vent plug which will be durable and efficient in use, one that will be simple and easy to manufacture, and one which can be placed upon the market at a reasonable cost.

With these and other objects in view, the invention consists in the novel construction, arrangement and formation of parts, as will be hereinafter more specifically described and

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claimed and illustrated in the accompanying drawing, in which drawing,

Figure 1 is a fragmentary vertical sectional view through the upper end of a storage battery showing my novel vent plug associated therewith; the plug being shown in vertical section; the battery and plug being in their normal upright position.

Figure 2 is a view similar to Figure 1, but showing the battery in a partially tilted position, and the weight moved off of its seat to cause the sealing of the vent opening.

Figure 3 is a view similar to Figures 1 and 2, but showing the battery completely turned over with the vent sealed or closed.

Figure 4 is a horizontal sectional view through the plug taken on the line 4—4 of Figure 1, looking in the direction of the arrows illustrating the vented seat for the weight.

Figure 5 is a horizontal sectional view through the plug taken on the line 5—5 of Figure 1 looking in the direction of the arrows, illustrating the construction of the valve.

Referring to the drawing in detail, wherein similar reference characters designate corresponding parts throughout the several views the letter B generally indicates a storage battery and the letter P my novel vent plug therefor.

The battery B can be considered of a type now commonly found in the open market but preferably of a character for use with aeroplanes, motorcycles and the like. Hence, the battery will not be described in detail, but the same includes a casing 10 having a top wall 11 provided with an opening 12, the wall of which is threaded. The casing 10 houses the cells of the battery and contains the acid or electrolyte 13. The opening 12 may, or may not, be used for replenishing water to the battery. My novel vent plug P includes a hollow body 14 having a side wall 15, a bottom wall 16 and a top wall 17. This provides an interior chamber 18, for a purpose which will later appear. The bottom wall 16 has formed thereon the depending solid stem 19 which is threaded for engaging the threads of the wall of the opening 12 for tightly sealing the same, and it is to be noted that the stem 19 is of a slightly less diameter than the diameter of the hollow body 15 so that a stop shoulder 20 is formed for sealing contact with the upper surface of the cell cover or top wall 11. The stem 19 is provided with an axial bore 21, which opens into the chamber 18 and the bore, of course, communicates with the interior of a battery cell. The upper face of the lower wall 16 is provided with

a conical or tapered seat 22, for a purpose, which will also later appear and the face of this seat is provided with a series of grooves 23 which lead from the bore 21 to the interior of the chamber.

Mounted within the chamber 18 is a weight 24 of a desired material and the lower end of this weight is tapered to provide a conical extension 25. The taper of the extension 25 of the weight corresponds to the taper of the seat 22. It is to be noted, however, that the diameter of the weight 24 is considerably less than the interior diameter of the chamber 18, so that the weight will have free movement within the chamber. Formed on the upper end of the weight 24 is an axially disposed hollow stud 26 which forms means for supporting a flexible valve 27. The valve is preferably formed from soft rubber or other desired material which will not be affected by the acid or electrolyte in the battery. The valve 27 is of a particular shape and includes a disc shaped sealing head 28 defining an upper broad sealing face 29. The valve tapers downward from the head 28 and terminates in a reduced stem 30 which is fitted within the hollow stud 26. The stem can be secured in the stud in any desired way, such as by the use of an adhesive and by the compressing of the stud around the stem.

By referring to Figure 1, it can be seen that the taper of the seat 22 of the chamber and the taper of the extension 25 of the weight 24, normally centers the weight and the valve in the chamber and that the valve is slightly spaced from the top closure wall 17 of the hollow body 14. In normal position of the battery, as shown in Figure 1, the escape of vapor from the battery is freely permitted through the bore 21, grooves or channels 23, chamber 18 and vent opening 31 formed centrally in the closure plate or top wall 17.

In operation of the improved vent plug, upon tilting of the battery as shown in Figure 2, the weight 24 will move by gravity toward the side wall 15 of the hollow body 14, and the taper of seat 22 and the taper of the conical extension 25 of the seat will move the weight bodily outward and will bring the head 28 of the valve into sealing contact with the closure wall 17 over the vent opening 31. This will completely seal the opening 31 and thus prevent the leakage of the battery acid or electrolyte from out of the battery.

Upon the complete turning over of the battery, as shown in Figure 3, the weight 24 functions perfectly to hold the valve 27 in its sealing contact with the inner surface of the closure plate or wall 17 over the vent opening and consequently, the leakage of liquid from the battery and chamber is absolutely precluded.

Great importance is placed on the flexible valve and the flexible connection between the valve and the weight. The flexibility of the valve insures its sealing engagement with the inner surface of the wall or closure plate 17, and the weight is free to vibrate on the valve without disturbing the valve from its sealing engagement with the closure plate or wall 17.

When the battery reassumes its upright position, the weight will immediately move the valve away from the vent opening and the weight will again center itself in the chamber.

From the foregoing description, it can be seen that I have provided an exceptionally simple and effective form of closing vent plugs for storage batteries, which is completely automatic in its operation.

Changes in details may be made without departing from the spirit or the scope of this invention, but what is claimed as new is:

1. A self-closing vent plug for storage batteries comprising a hollow body having an interior chamber and an opening for communication with the interior of a storage battery and the lower portion of the chamber and an atmospheric vent opening communicating with the axial center of the chamber at the upper end thereof, the walls of the chamber tapering inwardly toward the opening communicating with the interior of the battery defining a conical seat, a weight having less diameter than the diameter of the chamber and provided with a lower conical terminal normally received in the conical seat when the battery is in an upright vertical position, said weight being shiftable laterally and outwardly upon movement of the battery to a predetermined angle relative to the vertical, and a flexible valve having a smooth outer upper face carried by the upper end of the weight at the axial center thereof for engaging the upper wall of the chamber over the vent opening when the weight shifts laterally and outwardly.

2. A self-closing vent plug for storage batteries as defined in claim 1, and said valve body having a flexible resilient connection with the weight, whereby the weight can vibrate relative to the valve body.

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