March 10, 1942. R. H. HILL 2,275,526

NON-OVERFILL DEVICE

Filed May 17, 1939

Fig. 1A

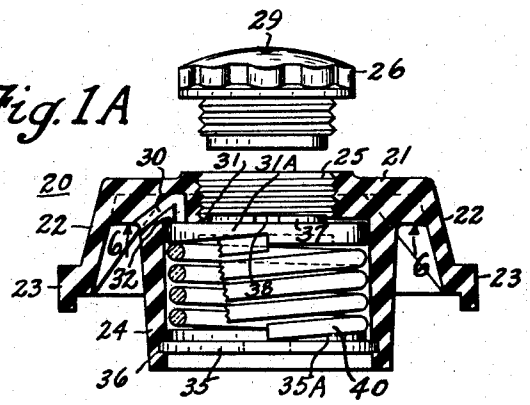


Fig. 1

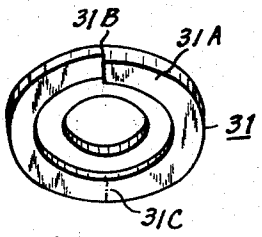


Fig. 3

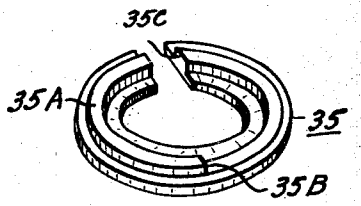


Fig. 4

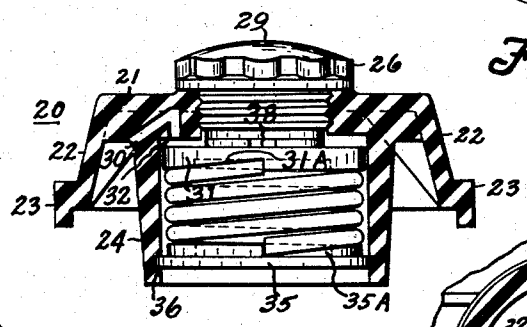


Fig. 2

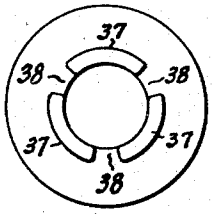


Fig. 5

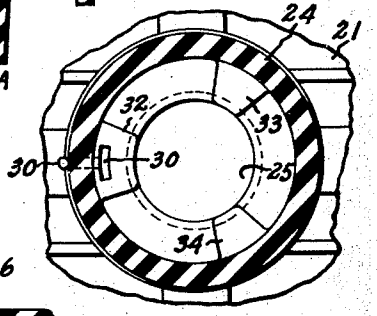


Fig. 6

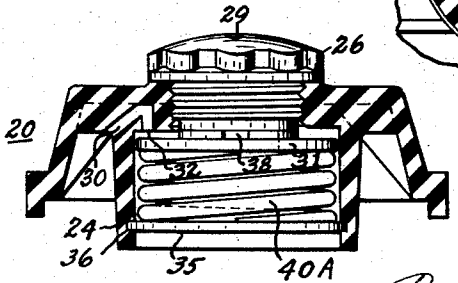


Fig. 7

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NONOVERFILL DEVICE

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Application May 17, 1939, Serial No. 274,150

3 Claims. (Cl. 136—178)

This application is a continuation in part of my copending application Serial No. 264,885, for Storage battery filed March 30, 1939, and relates to non-overfill devices for storage batteries and other electrolytic cells.

A common expedient employed for the purpose of preventing overfilling a storage battery with liquid is that of trapping air above the surface of the electrolyte between the walls of the cell and its cover and an annular skirt which is provided by the cover and through which the liquid is poured into the cell. The skirt extends from the cover top-wall to substantially the desired level of the electrolyte. In order to vent the battery while in use, the cover provides a by-pass for connecting the space exterior to the skirt (and in which air may be trapped) with the space within the confines of the skirt. The by-pass is controlled by a valve, which is automatically closed when the filler hole plug is removed from the cover and is opened when the plug is screwed in place, so that the venting of the air-trapping space may take place through the by-pass, through the space within the skirt and out through a hole provided by the plug. In order that the valve will close automatically when the plug is removed, it is necessary to provide means which will urge the valve against its seat and which will yield when the valve is pushed away from its seat by screwing the filler hole plug in position.

It is an object of the present invention to provide a resilient valve closing means which will not be corroded by the electrolyte of the battery. According to the present invention, I have accomplished this object by the use of a helical coil spring of acid resisting material such as glass and preferably Pyrex glass.

Further objects and advantages of the present invention will be apparent from the following description, reference being had to the accompanying drawing wherein a preferred embodiment of the present invention is clearly shown.

In the drawing:

Fig. 1 is a sectional view of a battery cell cover showing the vent valve held in closed position by a helical spring of acid resisting material, the filler plug or cap being removed as shown in Fig. 1A.

Fig. 2 is a view similar to Fig. 1 showing the filler plug screwed into position and the vent valve open.

Fig. 3 is a perspective view showing principally the under side of the vent valve.

Fig. 4 is a perspective view showing principally the upper side of a C-shaped resilient hard rubber snap ring for retaining the vent valve spring.

Fig. 5 is a top plan view of the vent valve.

Fig. 6 is the sectional view taken on the line and looking in the direction of arrows 6—6 of Fig. 1.

Fig. 7 is a view similar to Fig. 2 showing a modified form of vent valve spring.

Referring to Fig. 1, battery cell cover 20 includes a top wall 21 and side walls 22 having flanges 23 adapted to be supported on ledges provided by the side walls of the battery cell, not shown. It will be understood that the cell construction is such that the top wall of the cover will be substantially flush with the top edges of the battery cell. From the top wall 21 of the cover, a skirt 24 extends downwardly to substantially the desired level of the electrolyte in the battery cell. The skirt is annular and is substantially concentric with a threaded filler opening 25 which is adapted to receive a filler plug or cap 26 provided with a vent 29.

The cover 20 is provided with a by-pass 30 connecting the space exterior to the skirt 24 with the space within the skirt 24. This by-pass is controlled by a valve 31 made of hard rubber or other acid resisting material. When the cap 26 is removed, as shown at Fig. 1A, the valve 31 is urged upwardly on its seat 32 by a helical coil spring 40 of acid resisting material such as Pyrex glass. As shown in Fig. 6, the seat 32 is one of three pads 32, 33 and 34, which provide a three point bearing for the valve 31.

The spring 40 is confined between the valve 31 and a hard rubber C-washer 35 which is sufficiently resilient to be compressed and pushed within the skirt 24 and then allowed to snap into a groove 36 provided by the skirt. When the cap 26 is screwed into position to close the filler opening 25, as shown in Fig. 2, the lower edge of the cap engages an interrupted boss 37 separated by notches 38 and provided by the valve 31. The spring 40 yields to permit the screwing of the plug into completely closed position and the movement of the valve 31 downwardly from its seat 32 thus opening the by-pass 30 in order to provide for the venting of the space above the electrolyte level and exterior to the skirt 24. The venting is provided by the by-pass 30 which is in communication with the space within the skirt 24 which is open to the outside air through the notches 38 between the boss segments 37 of the valve 31 and through the vent hole 29 of cap 26.

When the cap 26 is removed as shown in Fig. 1A to permit the pouring of liquid into the cell

through the filler hole 25 in cover 20, the vent valve 31 is caused to move upwardly by expansion of spring 40, thereby closing the by-pass 30 so that air will be trapped in the space between the exterior of the skirt 24 and the side wall of cover 20 and the battery cell. As the liquid is poured into the cell, its level will rise to that of the lower edge of the skirt 24 and thereafter air will be trapped in the space mentioned whereupon the additional liquid will fill the interior of skirt 24 without causing appreciable rise of the electrolyte in the region exterior to the skirt. The sudden rise of liquid within the skirt indicates that the electrolyte has been brought up to the desired level and that further addition of liquid would result in the liquid overflowing the cover; however, the battery cell will not be overfilled.

When the cap 26 is replaced upon the cover, as shown in Fig. 2, the by-pass 30 is opened so as to relieve the pressure of the air trapped in the space exterior to the skirt whereupon the liquid remaining in the skirt recedes as the electrolyte seeks a common level. As the liquid within the skirt recedes, the level of the electrolyte outside the skirt is raised by a trifling amount, since the volume of the space within the skirt is but a small percentage of the total volume of the space above the electrolyte and within the confines of the battery cell and cover. In this connection, it will be understood that the cover is oblong in contour and that the sectional views shown in Figs. 1 and 2 are taken across the shorter dimension of the cover.

In the manufacture of helical springs of glass it is easier to make the spring of uniform cross section throughout as the spring is made by winding a round bar of glass, while heated to the plastic state, around a mandrel. This process produces a spring of uniform section throughout as shown in section in Figs. 1 and 2. In order that such a spring can be used most effectively, the under side of the valve 31 can be provided with an annular boss 31A, the upper surface of a portion of which is helically inclined at least from the shoulder 31B to the line diametrically opposite 31C. Similarly the upper side of the C-washer 35 is provided with an annular boss 35A, the upper surface of which is partly helically inclined as from the shoulder of line 35B to the line 35C. In this way substantial portions of the end turns of the spring are in engagement with the valve 31 and the washer 35.

The helical glass spring 40A shown in Fig. 7 is one in which the end turn material has been tapered so that the ends of the spring will be substantially flat and perpendicular to the axis thereof, thus conforming in shape to that of a conventional steel spring having its ends ground off. The spring 40A is more expensive than the spring 40 on account of the additional steps required to reduce or taper the material of the end turns. These steps must be taken while the glass is plastic as it is not commercially practical to grind off the end turns to make them flat as in the case of a metal spring. If springs like 40A are available, then the bosses 31A of valve 31 and 35A of washer 35 can be omitted. However, it is believed that the simplification of the parts 31 and 35 by omitting the bosses 31A and 35A would not compensate for the additional cost of the spring 40A. Therefore, the construction shown in Figs. 1 and 2 is preferred on account of cost.

While the embodiment of the present invention as herein disclosed, constitutes a preferred form, it is to be understood that other forms might be adopted, all coming within the scope of the claims which follow.

What is claimed is as follows:

1. A cell cover construction for storage battery containers comprising a cover having a filler opening and a skirt providing a space communicating with the filler opening, said skirt extending from the top wall of the cover to such distance that, when the cover is assembled with the battery container, the lower edge of the skirt will be at the proper level of the electrolyte within the container, said cover providing a by-pass passage connecting the space surrounding the exterior of the skirt with the space within the skirt and filler opening, a valve of acid resisting material having an aperture communicating with the filler opening located in the space within the skirt and engageable with a seat provided by the cover in order to close the by-pass, a vented plug for closing the filler opening and for engaging the valve to move it from its seat when the plug is assembled with the cover, and a helical spring of glass located in the space within the skirt and supported thereby for urging the valve toward its seat.

2. A cell cover construction according to claim 1 in which the spring is uniform in cross-section throughout its length, in which the skirt is provided internally near its lower edge, with an annular groove which receives a resilient C-washer or split ring of acid resisting material which supports the spring, and in which the valve and the C-washer are provided with spring contacting surfaces so shaped that the valve and C-washer engage substantial portions of the end turns of the spring.

3. In a storage battery, a cover having a filler opening and a skirt depending a predetermined distance below the underside of the cover and providing a continuation of the filler opening, said cover providing a seat within the skirt, said cover also being provided with a by-pass having one end terminating in the space exterior of the skirt and under the cover and the other end terminating at the seat, a hard acid resisting ring located within the skirt and adjacent the seat; a C-washer of hard acid resisting insulating material supported at the lower end of the skirt; a helical glass spring disposed between the ring and the washer; and a vent plug screwed into the top of the cover and having a portion adapted to engage the ring to move the ring away from the seat and compress the glass spring, said spring urging the ring against the seat to seal the by-pass when the plug is removed from the cover.

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