May 8, 1945. L. L. DROWN 2,375,406

NONOVERFILL DEVICE

Filed May 27, 1942

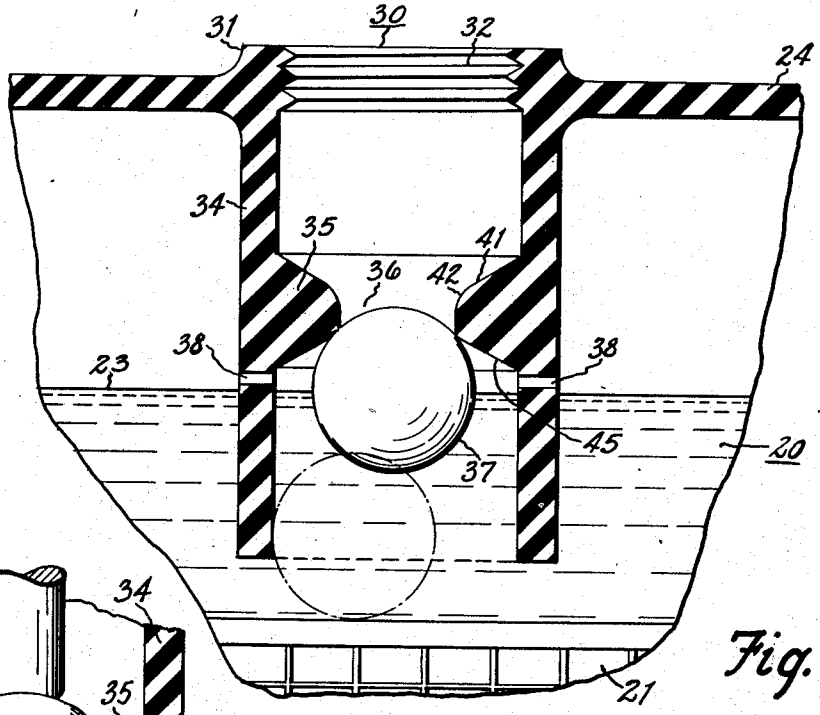



Fig. 1

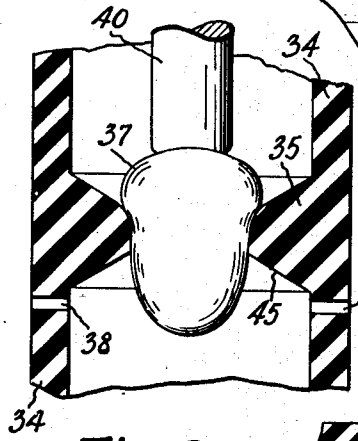



Fig. 3

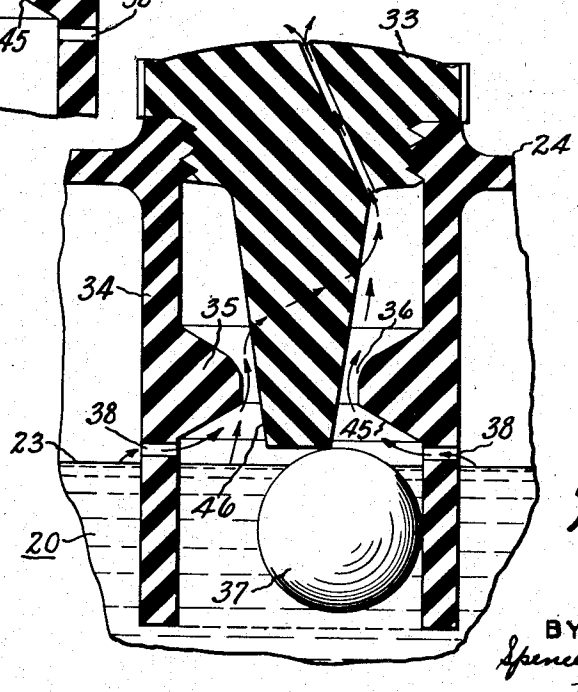



Fig. 2

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# UNITED STATES PATENT OFFICE

2,375,406

## NONOVERFILL DEVICE

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Application May 27, 1942, Serial No. 444,643

1 Claim. (Cl. 136—178)

This invention relates to improvement in nonoverfill devices for storage batteries and other electrolytic cells, and is especially useful in storage batteries for automobile use.

The primary object of the invention is to provide simple and reliable and inexpensive means for automatically closing the filling opening when the plug is removed to permit the cell to be filled only to the required level and insuring an adequate space for gas collection over the electrolyte, which space is vented through the filling opening when a vent plug closes the filling opening.

Another object of the invention is to provide a float-operated filling and venting structure for a storage battery cell.

Another object is to provide a floating valve member which may be easily assembled in the cell after all of the other elements have been assembled. According to the present invention I have accomplished these objects by providing a rubber ball capable of floating on the surface of storage battery electrolyte and said ball be forced through a restricted opening in the filler opening and expand to its normal size after it passes through the opening and adapted, when the vent plug is removed and the electrolyte level is raised to the proper level, to engage a seat and close the restricted opening. When the vent plug is attached to the cover the plug forces the floating rubber ball away from the seat and allows gas or air to pass through a vent or by-pass in the side walls of filler opening and through the restricted opening. The by-pass connects the space exterior to the skirt and under the cover above the electrolyte with the interior of the skirt below the restricted opening.

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 fragmentary sectional view of a cell cover showing a floating rubber ball valve held in a closed position by the liquid, the filler plug or cap being removed.

Fig. 2 is a view similar to Fig. 1 but showing a vent plug screwed down into its well for closing the latter.

Fig. 3 is a fragmentary sectional view showing the soft rubber ball valve being forced through a retricted opening in the filler duct.

Referring to the drawing 20 designates a cell or container within which is a plate assembly 21 normally covered by electrolyte, the normal level of which is indicated at 23. The cell is provided with the usual internal shoulders, not shown, upon which rest a cell cover 24. The joint between the cell and cover is sealed with the usual sealing compound, not shown.

The cover in the present instance is shown as having a filler opening 30 having a boss 31 above the surface of the cover which is preferably internally threaded as at 32 for engagement with external threads of a vent cap 33. The cover 24 is formed to provide a tubular extension or skirt 34 about the filler opening. This tubular extension projects downwardly to a predetermined distance, but spaced from the top edges of the plates of the plate assembly 21. The tubular extension 34 is provided with an internal ledge 35 defining a restricted opening 36. The under surface of the ledge serves as a valve seat for a floating ball 37. The ball is made of any suitable substance capable of floating, and resistant to the storage battery electrolyte. It may be made, for example, of soft rubber or other soft material. The material should be such as to yield sufficiently to seal a seat when the electrolyte level in the cell has been reached so that the liquid will rise rapidly in the filling opening above the ball to give a signal to the operator that the filling operation should stop. The tubular extension 34 has vents or by-passages 38 which are so arranged that they will communicate with the interior of the tubular extension below the valve seat. It will be observed that the cross dimensions of the ball 37 are greater than the cross dimensions of the restricted opening 36 so as to provide for a sealing fit therebetween and the cross-dimensions of the ball are less than the cross dimensions of the tubular extension 37 so as to provide for considerable play of the ball within the confines of the tubular extension below the seat. When liquid is poured into the cell the electrolyte level will rise until the ball engages the seat to seal the restricted opening 36. This ball together with the film generally formed on the surface of the ball will seal the restricted opening so that air will be trapped below the seat and the level and also in the space exterior of the tubular extension and the underside of the cover above the electrolyte level.

The rubber ball is preferably assembled with the cell after all of the other elements of the cell have been assembled and sealed. The ball is first inserted into the filler opening and rests upon the upper side of the ledge 35. The ball is then

forced through the opening by a tool **40** in the manner illustrated in Fig. 3. It will be observed that the upper surface **41** of the ledge **35** which merges with the walls of the restricted opening is rounded as at **42** in order to facilitate the forcing of the ball through the opening and also to prevent the ball from being marred while it is being forced through the opening **36**.

When the ball passes through the opening the ball will expand to its normal size due to its own resiliency and occupy the space between the seat and the upper edges of the plates of the plate assembly **21** which extend across the lower end of the tubular extension. It will be observed that the space between the lower edge of the tubular extension is considerably less than the cross dimensions of the ball, thus the ball cannot pass from the confines of the tubular extension should the level of the liquid drop below the upper edges of the plates **21**. The ball in that case would rest upon the plates as indicated by the dot-and-dash circle in Fig. 1. The lower edge of the ledge is preferably formed with tapered or cup-shaped surface **45**, said surface acting as a guide to direct positively the ball **37** over the opening **36** as the electrolyte level rises, thus insuring that the opening **36** will be sealed by the ball float valve when the desired electrolyte level has been reached.

The ball is moved away from the seat by the vent plug **33** having an extension **46** adapted to project through the restricted opening **36** and engage the ball **37** forcing same downwardly into the electrolyte, as in Fig. 3, and maintain same away from the seat permitting the trapped air and also gases to pass through the by-pass passages **38** and through the restricted opening **36** and thence through a duct **42** in the vent plug **30** to the atmosphere.

It will be seen that the present structure is extremely simple and inexpensive. Further it simplifies the assembly and charging procedure at the factory in that the ball valve can be left out until the battery is complete and ready for shipment if so desired.

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:

In combination with a container for liquid and including plates normally covered by the liquid; a cover having a filling opening adapted to receive and retain a vent plug, said cover having a skirt depending therefrom about the filling opening and extending below the normal liquid level with the lower end thereof spaced from the plates, said skirt having an inwardly extending rib defining an annular opening smaller than the skirt at a point above the normal liquid level, said rib joining the skirt with frusto-conical surfaces said skirt having a by-pass above the liquid level and below the smaller opening providing communication between the space outside the skirt and the space within the skirt above the level but below the smaller opening; a valve normally floating on the surface of the liquid and guided by the lower conical surface of the rib to seal the smaller opening to prevent communication from the space below the rib to outside atmosphere when the plug is removed and the liquid is at its normal level, said valve comprising a soft rubber ball having a cross dimension larger than the smaller opening and also the space between the lower edge of the skirt and the plates and adapted to be forced through the smaller opening under distortion and then expand to normal size below the rib and float on the liquid within the confines of the skirt, said ball contacting the upper conical surface of the rib to facilitate distortion of the ball when same is being forced through the smaller opening; and a readily attachable and detachable vent plug having an extension projecting loosely through the smaller opening when the plug is attached and moving the ball into the liquid to open the smaller opening to establish communication between the spaces above and below the rib and the atmosphere through the vent plug.

LYLE L. DROWN.