July 21, 1959 J. E. BUSKIRK 2,896,007

VENT CAP

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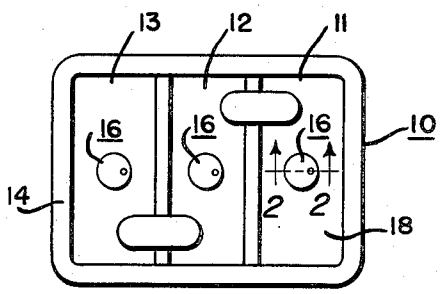


Fig. 1

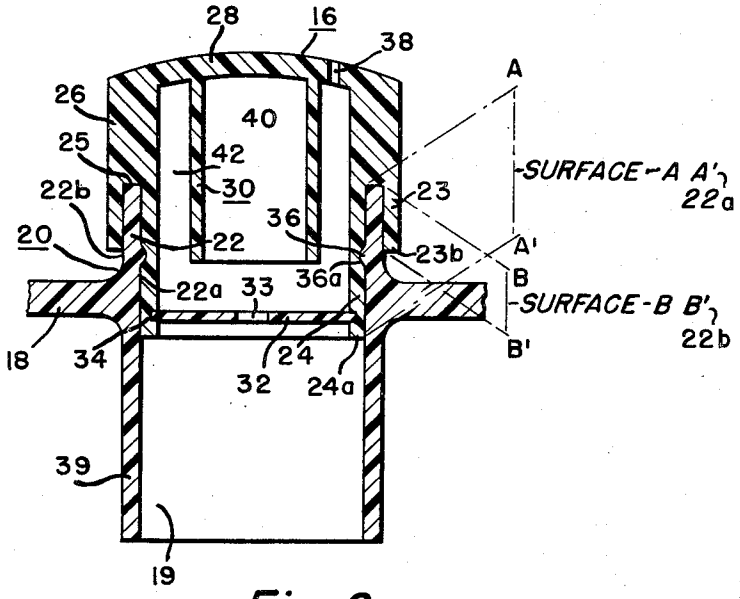


Fig. 2

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VENT CAP

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This invention relates to vent caps for storage battery cells and more particularly to a vent cap of a snap-in type made of semi-rigid plastic material having a different coefficient of expansion than material of which a battery case vent well is made.

It is therefore an object of the present invention to provide a battery vent cap having a dual and concentric skirt portion adapted to encase a vent well on opposite sides with semi-rigid plastic so that a seal will occur along an inside well top surface during skirt portion expansion at high temperatures and along an outside well top surface during contraction at low temperatures rather than a seal obtained using a screw fit.

In carrying out the above object, it is a further object of this invention to provide complementary snap-ring portions of one of dual vent cap skirts engageable to lock relative to an inside well top surface while a rigid annular member with a central vapor inlet and electrolyte drain-off opening serves as a base for the vent cap and maintains diametric dimensions of the one skirt such that snap-ring portions remain in engagement during either expansion or contraction when either inside or outside vent well sealing occurs respectively.

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

In the drawing:

Figure 1 is a top plan view of a storage battery equipped with a vent cap in accordance with the present invention.

Figure 2 is an enlarged, fragmentary cross sectional elevational view taken along line 2—2 of Figure 1.

Vent caps, sometimes called vent plugs, are provided for storage battery cells to permit relief of excess pressure of gases which must be emitted from the cell and to permit testing and filling of the battery with liquid, such as acid, water, or both. Figure 1 illustrates a storage battery generally indicated by numeral **10** and including a series of cells **11**, **12** and **13** electrically connected and contained in a casing **14** of acid-resistant material such as hard rubber or the like having a different coefficient of expansion than semi-rigid plastic material used for vent caps generally indicated by numeral **16**. Vent caps **16** of this invention are preferably made of a resilient material, such as polyethylene or other synthetic resilient plastic which is acid resistant and does not age harden appreciably and can be snap fitted or forced into a filler hole opening of a cell cover **18** to seal the cell against spilling or leaking of electrolyte.

A filler opening **19** is shown in the fragmentary sectioned view of Figure 2 along with a vent well generally indicated by numeral **20**. The vent well **20** is formed of acid-resistant material such as hard rubber or the like integral with cover **18** and having a coefficient of expansion like that of casing **14** but differing from the coefficient of expansion of the material used for the vent cap **16**. The well includes an upwardy extending cylindrical portion **22** having an inside top well surface **22*a*** and an outside top well surface **22*b***. These inside and outside surfaces extend concentrically relative to each other for sealing engagement relative to complementary cylindrical surfaces AA' and BB' of outer skirt **23** and inner skirt **24** of the vent cap having axial or longitudinal dimensions A—A' and B—B' respectively as outlined by projections to the right in Figure 2. Upper cylindrical portion **22** of the well vent opening **19** is encased on opposite sides by the semi-rigid plastic skirts **23** and **24** of the vent cap. Inner peripheral surface BB' of skirt **23** is smaller in area than outer peripheral surface AA' of skirt **24**.

Skirts **23** and **24** are joined to each other above a top edge **25** of cylindrical portion **22** by an annular downwardly extending lower body portion **26** which is integral with a top cover or inverted dish-shaped upper body portion **28** of vent cap **16**. Integral with and extending downwardly from the upper body portion **28** is a cylindrical baffle generally indicated by numeral **30**. Baffle **30** extends concentrically within lower body portion **26** and skirts **23**—**24** to a location terminating inside the vent cap at a point below a bottom peripheral edge **23*b*** of skirt **23** and above a bottom peripheral edge **24*a*** of skirt **24**.

A rigid member or disc **32** of phenol formaldehyde, acid-resistant material, or the like is provided to serve as a base for the vent cap and has a vapor inlet and electrolyte drain-off passage **33** centrally located therethrough. Disc **32** has an outer diameter greater than that of an inner surface of skirt **24** which is provided with a groove or recess **34** having a diameter slightly greater than that of disc **32** but less than or substantially equal to a radial inner diameter of an annular ridge or abutment **36** protruding from upper cylindrical portion **22**. This abutment is complementary with a groove or recess **36*a*** provided around surface AA' of skirt **24**. When skirt **24** is forced into filler opening **19**, the abutment **36** and groove **36*a*** are resiliently engaged and disc **32** assures locking of the surface **22*a*** positively in sealed relationship to surface AA' of skirt **24** as well as maintenance of engagement of abutment **36** relative to recess **36*a***.

The vent cap cover portion **28** has an exhaust vent or opening **38** located radially outwardly of baffle **30** on one side. Serving as a baffle to shield passage **33** against acid splash is a downwardly extending cylindrical portion **39** around filler opening **19**. Fumes and any acid splash passing through passage **33** into an inner chamber **40** inside baffle **30** of the vent cap are necessarily reversed in direction of flow back to the base or disc **32** and little, if any, liquid ever passes into an outer annular chamber **42** leading to exhaust vent **38** which is located extending through cover portion **28** radially outwardly of annular baffle **30**.

During variation of ambient temperature affecting either expansion or contraction of both the cell wall and vent well as well as the vent cap at different rates, previous semi-rigid plastic vent caps have not been practical due to difference in coefficient of expansion (or contraction) of plastic and hard rubber, for example. Using the vent cap of the present invention, a more positive seal is obtained concurrently with either dissimilar expansion or contraction due to the structure described above. By encasing the vent well on both sides with semi-rigid plastic, a seal occurs between inside surface **22*a*** of upper cylindrical portion **22** and outside surface AA' of skirt **24**; a similar seal occurs between outer surface **22*b*** of upper cylindrical portion **22** and inner surface BB' of skirt **23** during contraction at low temperatures. In either event, locking of abutment **36** with groove **36*a*** combined with placement of disc **32** in groove **34** of skirt **24** further assures positive snap-in fitting of the vent

cap relative to filler opening **19** but especially so during expansion at high temperatures when rigid member or disc **32** keeps peripheral edge **24***a* of skirt **24** at a proper diameter dimension to guarantee locking of abutment **36** relative to groove **36***a*. The advantages of having vent cap or plug skirts on both sides of cylindrical portion **22** of the cell cover as well as the interlocking snap fit of abutment **36** and groove **36***a* are apparent from the above description and drawing. The vent cap of the present invention is inexpensive to fabricate and also eliminates any necessity for progressive threading in the cell cover and vent cap. A tight, sliding, and positive seal is obtained as the vent cap of the present invention is snapped into place to stay under many and all operating conditions completely free of loosening and/or loss of screw-type vent caps where acid spray leaking out of the filler opening will cause corrosion of compartments surrounding the battery.

While the embodiments of the present invention as herein disclosed, constitute preferred forms, it is to be understood that other forms might be adopted.

What is claimed is as follows:

1. A vent cap for use in combination with a storage battery cell cover which includes a filler opening surrounded by an upwardly extending cylindrical portion, comprising, a cover and downwardly extending body for the vent cap made of semi-rigid plastic material having a coefficient of expansion different than that of material of the cell cover and cylindrical portion, a pair of concentrically spaced skirts extending downwardly from said body and encasing both sides of the cylindrical portion with semi-rigid plastic material, the outer of said concentric skirts sealing against a top outer surface of said cylindrical portion during expansion at higher temperatures and the inner of said concentric skirts being of greater length than the outer skirt and sealing against a top inner surface of said cylindrical portion during contraction at lower temperatures, snap-in abutment means engaged between said inner concentric skirt and said cylindrical portion, and an annular rigid member fitted inside said inner skirt for maintaining engagement of said snap-in means.

2. A vent cap for use in a storage battery cell cover opening variable in size due to difference in coefficients of expansion of material used for the vent cap and cell cover, comprising, a body of polyethylene or the like, material forming the vent cap with a cover portion having an exhaust vent located intermediate a downwardly extending annular baffle and a downwardly extending lower body portion, a pair of concentric skirts projecting downwardly from said lower body portion for encasing opposite sides of an upwardly protruding cylindrical portion of the cell cover, locking means between one of said skirts which is longer than the other of said skirts and the cylindrical portion of the cell cover, and a disc engaging a periphery of one of said skirts for assuring maintenance of engagement of said locking means during sealing of either of said skirts relative to said cylindrical portion upon expansion or contraction at different rates in the cell cover and said vent cap.

3. A snap-in type vent plug of polyethylene material for use in sealing peripherally about a cylindrical portion of a hard rubber well cover having a filler opening therethrough, comprising, a top cover portion with an exhaust vent and a downwardly extending body portion, said body portion including a pair of downwardly extending skirts to encase the cylindrical portion of the well cover on both sides with polyethylene material sealing surfaces, the sealing surface of the outer of said pair of skirts being shorter in length and less in area than that of the inner of said pair of skirts which extends longer to a lower level relative to the cylindrical portion of the well cover, a radial groove and abutment cooperable in a snap-fit between the inner of said skirts and the cylindrical portion, and a disc of rigid material secured inside the inner of said skirts below the level of said outer skirt and maintaining skirt diameter preventing upward sliding of said inner skirt relative to the cylindrical portion and maintaining engagement of said abutment relative to the radial groove, said disc serving also as a base for said vent plug and having a vapor inlet and electrolyte drain-off passage therein.

4. A snap-in type vent plug of semi-rigid plastic for use in sealing peripherally about a cylindrical portion surrounding an opening of a battery well cover of material with a coefficient of expansion different than that of the semi-rigid plastic, comprising, a plug body including a cover portion and an integral downwardly extending body portion, said body portion having inner and outer skirts with surfaces to encase both sides of the well cover cylindrical portion, an annular baffle integral with and extending downwardly from said cover portion and located radially of an exhaust vent in the cover portion, a disc made of material more rigid than that of said plug body and having a vapor inlet and electrolyte drain-off opening spaced remote from said baffle and exhaust vent, said disc backing up the inner of said skirts radially for sealing a surface greater than a surface of said outer skirt against the cylindrical portion, and a snap-in locking abutment and complementary groove provided for engagement of said inner skirt and cylindrical portion, said skirts alternately sealing against the cylindrical portion in response to differences in rates of expansion and contraction of materials of the well cover and vent plug, said inner skirt being longer than said outer skirt.

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