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M. P. GASSMAN ETAL

3,377,708

COMBINED ULLAGE ROD AND BREATHER CAP

Filed April 19, 1965

FIG. 1

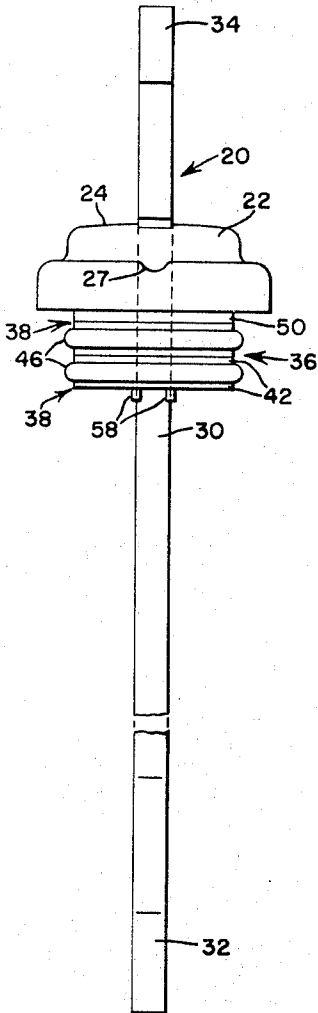


FIG. 2

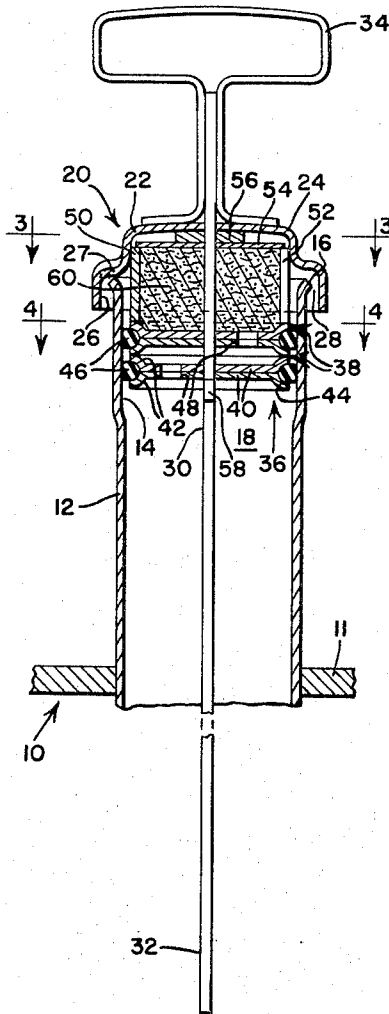


FIG. 5

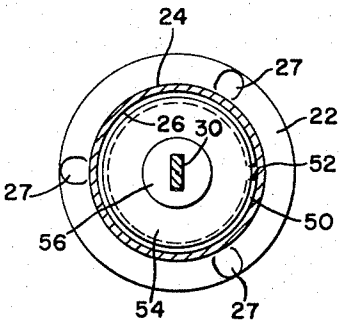
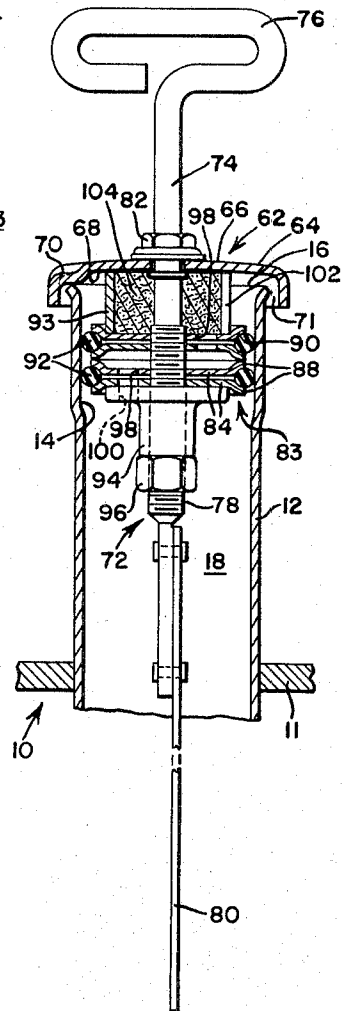


FIG. 3

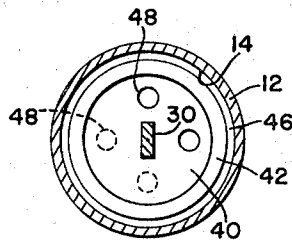


FIG. 4

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3,377,708

COMBINED ULLAGE ROD AND BREATHER CAP
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ABSTRACT OF THE DISCLOSURE

A combined ullage rod and breather cap removably mounted in the access opening of an oil reservoir measures the oil level therein, and has a cap fittable over the access opening and attached to the rod, and further has a handle on the cap exterior by which the rod is rotated to contract or expand a sealing member mounted on the rod and engageable with the walls of the opening loosely or tightly to seal the opening. A filter element is provided between the cap and the sealing member. The latter has a vent passage for venting the oil reservoir through the filter and past the cap to the atmosphere.

This invention relates to a device which measures the liquid level in a container and also functions as a filter cap and breather for the container. More particularly, this invention relates to an improved type of such a device for use on an oil reservoir, such as is found in a tractor transmission, engine crankcase, or hydraulic system.

The oil level in such a reservoir is conventionally measured by an ullage rod or dip stick. It is frequently desirable to vent such containers to the atmosphere to maintain the container at a relatively constant pressure. While it is known to combine a dip stick with a breather type filler cap to accomplish this, previous devices of this type have permitted the introduction of foreign material, such as dust or moisture, into the container.

It is the object of the present invention to provide an improved combination ullage rod and breather type filler cap which prevents the introduction of foreign material into the container, and more particularly, to provide such a device with a filter through which the container is vented and also to provide such a device with a novel seal which engages the container access opening for securely mounting the device in the opening.

Another object is to provide such a device which is easy to remove and replace in the container, and which is of simple and inexpensive construction.

These and other objects will become apparent from a consideration of the following detailed description and accompanying drawings wherein:

FIG. 1 is an elevation view of the combined ullage rod and breather cap.

FIG. 2 is a longitudinal central section of the ullage rod and breather cap mounted in a conventional container access opening.

FIG. 3 is a section taken along the line 3-3 of FIG. 2.

FIG. 4 is a section taken along the line 4-4 of FIG. 2.

FIG. 5 is a section similar to FIG. 2 showing a slightly different embodiment of the invention.

It is to be understood that such terms as "upwardly," "downwardly," "top," "bottom," etc. in the ensuing description are used to more clearly describe the invention, and such terms are not to be construed as limiting the geography or orientation of the components.

A container 10, such as a transmission housing, engine crankcase, or hydraulic system reservoir, is partly shown in FIGS. 2 and 5, and includes an upper wall 11 and an elongated tubular neck portion 12 extending upwardly

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from the upper wall 11 and having a cylindrical inner wall 14 and an annular upper edge 16. The neck portion 12 forms an opening 18 for access to the interior of the container. While the access opening 18 is shown as being formed by the elongated tubular neck portion 12, the access opening could be formed by a relatively short neck portion or by the upper wall of the container.

The combined ullage rod and breather cap 20, shown in FIGS. 1 through 4, includes an inverted cup-shaped cap 22, mounted over the upper edge 16 of the neck portion 12 and covering the access opening 18. The cap 22 has an exterior surface 24, an interior surface 26, and a plurality of depending lugs 27, which project from the surface of the cap and engage the upper edge 16 to space the cap 22 a relatively short distance above the upper edge, the gap between the cap 22 and the upper edge 16 forming a passage or vent means 28 between the access opening 18 and the atmosphere.

An ullage rod or dip stick 30 extends axially through the cap 22 and the opening 18 into the container interior, the depending lower portion 32 forming an indicator means for measuring the fluid level in the container. The exterior portion of the rod 30, above the exterior surface 24 of the cap 22, forms a handle 34 rigidly attached to the cap 22.

A sealing means, indicated generally by the numeral 36, includes a pair of radial members 38, each radial member being formed by a pair of circular plates 40 adjacently mounted on the ullage rod 30 within the neck portion 12, the outer edge of each circular plate 40 having a flared portion 42 directed away from the adjacent plate to form a groove 44 around the outer periphery of each radial member 38. An annular sealing member 46, preferably a rubber O-ring, is mounted in each groove and engages the inner wall 14 of the neck portion 12. While the sealing means 36 is shown to include a pair of radial members 38, a greater or lesser number of radial members and sealing members could be utilized within the scope of the invention.

Each radial member 38 has a plurality of axially directed apertures 48 forming a passage or vent means between the opposite sides of the sealing means 36. The apertures 48 through the adjacent radial members 38 are preferably unaligned to impede the passage of non-gaseous material through the sealing means.

An annular member 50 having a radial opening 52 is coaxially mounted between the cap 22 and the uppermost radial member 38, the aperture 48 through the uppermost radial member 38 communicating with the interior of the annular member 50.

A circular plate 54, coaxially mounted on the upper edge of the member 50, compresses a sealing washer 56 around the rod 30 against the inner surface of the cap 22 to seal the connection between the rod and the cap. The washer 56, the plate 54, the annular member 50, and the radial members 38 are axially stacked around the rod 30 between the cap 22 and a retaining means 58 on the rod 30, the retaining means 58 being shown as a swaging on the rod 30 which engages the lowermost plate 40.

A filter element 60 is mounted in the interior of the annular member 50 and preferably comprises a mass of corrosion resistant metallic wire, interwoven into a metallic wool, which can be either loosely packed into the annular member interior or supplied in a preshaped pellet substantially conforming to said interior.

When the combined ullage rod and breather cap 20 is installed in the container opening 18, as shown in FIG. 2, it is securely maintained in this position by the sealing means 36, which tightly closes the opening except for the apertures 48. Since the filter element 60 is interposed between the apertures 48 and the vent means

28, gases moving to and from the container interior pass through the filter element 60 for removal of undesirable foreign material. To check the level of fluid in the container or to add fluid, the entire device 20 is removed, the liquid level being marked on the indicator portion 32 of the rod 30.

In FIG. 5, there is shown a slightly different embodiment of the invention, mounted in the container 10, and including means for more securely maintaining the device in the access opening 18 of the container 10. The combined ullage rod and cap 62 again includes an inverted cup-shaped cap 64 having an outer surface 66 and an inner surface 68 and a plurality of depending lugs 70 which space the cap 64 from the upper edge 16 to form a vent means 71.

An ullage rod 72 includes a cylindrical upper portion 74 which extends axially and rotatably through the cap 64 and terminates in a handle 76 on the exterior side of the cap. The rod 72 also includes a threaded portion 78 on the interior side of the cap 64 and a depending indicator portion 80, which extends into the container interior for indicating the level of liquid in the container. The rod 72 extends through a rotary seal 82 mounted on the cap 64 for sealing the connection between the rod and the cap and maintaining the axial position of the rod relative to the cap.

A sealing means 83 includes two pair of circular plates 84 coaxially rotatable and axially and unthreadably movable on the threaded portion 78. Each plate has a flared portion 88 at its outer periphery, the flare on adjacent plates being in opposite directions so that each pair of plates 84 forms a peripheral groove 90. An annular sealing member 92, preferably a resilient O-ring, is mounted in each groove 90 and engages the side wall 14.

An annular spacer 93 is coaxially mounted around the rod 72 between the upper most circular plate 84 and the interior surface 68 of the cap 64. A sleeve nut 94 is affixed to and depends from the lowermost plate 84 and is threadably mounted on the threaded portion 78 of the rod 72 for axial movement, in response to rotation of the rod, between a first or lower position against a stop means 96 mounted on the rod and a second or upper position wherein the spacer 93 and the stacked plates 84 are compressed to their solid height. In the first position, there is an axial spacing between the opposite plates in each pair of plates, whereby the effective circumference of the peripheral groove 90 is reduced so that each O-ring only lightly engages the wall 14. As the handle 76 is rotated, the circular plates 84 and the sleeve nut 94 are prevented from rotating, since the O-rings 92 engage the wall 14, and the sleeve nut 94 moves upwardly away from the stop means 96 toward its second position, increasing the effective circumference of the groove 90 and forcing each O-ring into a tighter engagement against the wall 14. When the sleeve nut 94 reaches its second position, the access opening 18 is tightly closed, and the device is securely mounted in said opening.

To incorporate that filtered breathing feature of the device 72, each circular plate 84 is again provided with a plurality of axially directed apertures 98, and the sleeve nut 94 is provided with an aperture 100 aligned with the lowermost aperture 98, connecting the interior of the container to the interior of the spacer 93. The annular spacer 93 has a radial slot or opening 102 for connecting the interior of the spacer to the atmosphere via the vent means 71. A filter element 104 is mounted in the interior of the spacer 93 between the apertures 98 and the opening 102 and vent means 71, whereby gases moving to and from the container interior must pass through the filter element 104 for removal of undesirable materials.

Other features and advantages of the present invention will readily occur to those skilled in the art, as will many modifications and alterations in the preferred embodiment of the invention described herein, all of which may

be achieved without departing from the spirit and the scope of the invention.

What is claimed is:

1. In a container adapted to contain fluid at a predetermined level and having an upwardly disposed circular opening for access to the container interior, a combined closure and ullage device removably mounted in said opening and comprising: a cap removably mounted over said opening; an ullage rod rotatably extending through said cap in an axial direction relative to said opening, the ullage rod having a handle portion on the exterior side of said cap, a threaded portion on the interior side of said cap, and a depending indicator portion for measuring the fluid level in the container; at least one pair of adjacent circular plates coaxially mounted in said container opening, and unthreadably rotatable and axially movable on said rod between a first position wherein they are axially spaced and a second position wherein they are axially compressed, each plate being flared at its outer periphery to form a peripheral groove; an O-ring of resilient material mounted in each peripheral groove and engaging the wall of said container opening; a spacer means mounted between the cap and the uppermost circular plate for spacing the uppermost plate from the cap; a sleeve nut threadably mounted on the threaded portion of the rod and attached to the lowermost circular plate for axial movement along the rod in response to rotation of the rod between a first position, wherein each pair of plates is allowed to axially separate to its first position to decrease the effective circumference of the peripheral groove so that each O-ring lightly engages the opening wall, and a second position, wherein the sleeve nut axially compresses the plates against the spacer means into their second position to hold their solid axial dimension, increasing the effective circumference of the groove and compressing each O-ring tightly against the wall.

2. The invention defined in claim 1 wherein the first position of the sleeve nut is established by a stop means mounted on the rod.

3. The invention defined in claim 1 wherein the cap includes a first vent means connecting the cap interior to the atmosphere, and the spacer means includes an annular member around the rod having an opening for connecting the annular member interior to the first vent means, and the circular plates and the sleeve nut form a second vent means between the container interior and the annular member interior, and including a filter element mounted in the annular member interior between the first and second vent means.

4. In a container adapted to contain fluid at a predetermined level and having an upwardly disposed circular opening with a cylindrical wall for access to the container interior, the combination therewith of a combined closure, venting, and ullage device removably mounted in said opening and comprising: a cap removably mounted over said opening; an elongated ullage rod depending from the cap, axially extending through the container opening into the container interior and coaxially rotatable relative to the walls of the opening when the cap is mounted over said opening; at least one sealing member having a generally circular cross-section coaxially mounted on and rotatable relative to the ullage rod, and including a resilient, radially expandable annular sealing element coaxially disposed on its periphery and engageable with the walls of the opening when the device is mounted in the opening, said sealing member substantially closing the opening and being shiftable between an axially expanded, radially contracted condition wherein the sealing element lightly engages the wall of the opening and an axially compressed radially expanded condition wherein the sealing element is deformably compressed against the wall; means mounted on the ullage rod and operatively connecting the rod and the sealing member to shift the sealing member between its

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alternate conditions; a first vent means operatively associated with the cap for venting the cap interior to atmosphere; and a second vent means through the sealing member and operative to vent the container interior to the cap interior; the ullage rod including a threaded portion and the sealing member being unthreadably rotatable and axially shiftable on the threaded portion, and the connecting means including a sleeve nut non-rotatably engageable with the sealing member and threadably rotatable on the threaded portion of the rod for axial shifting in response to rotation of the ullage rod.

5. The invention defined in claim 4 and including a gas-permeable filter means between the first vent means and the second vent means for filtering gas moving through the vent means, between the container interior and the atmosphere.

6. The invention defined in claim 4 wherein the sealing member includes a pair of adjacent circular plates axially shiftable and unthreadably rotatable on the threaded portion of the rod and axially shiftable relative to each

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other, the outer periphery of the respective plates being flared in opposite directions to form a peripheral groove, the effective diameter of which increases or decreases as the plates respectively move axially toward and away from each other, the sleeve nut being attached to the lower plate for shifting said plate toward and away from the opposite plate in response to rotation of the rod, and the sealing element includes an O-ring of resilient material coaxially mounted in said groove.

References Cited

UNITED STATES PATENTS

2,032,800	3/1936	Haltenberger	-----	33—126.7
2,096,358	10/1937	Gautier	-----	220—24.5
3,296,703	1/1967	Stade et al.	-----	33—126.7

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