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BATTERY NONSPILL VENT PLUG

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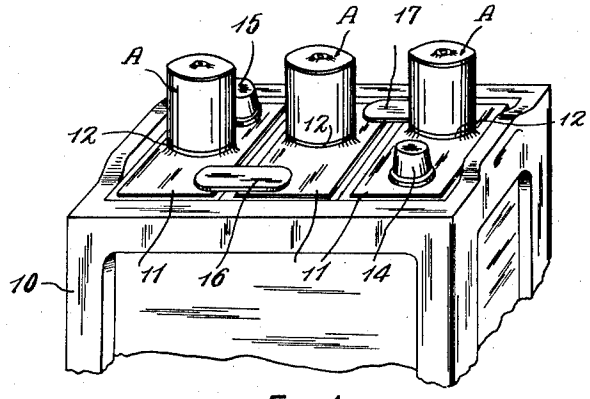


FIG. 1

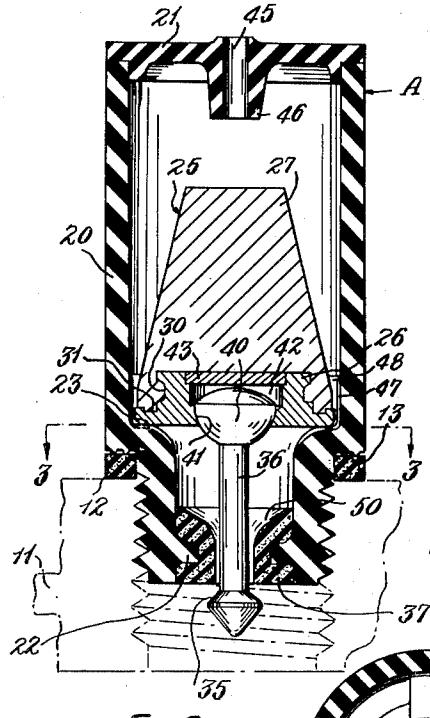


FIG 2

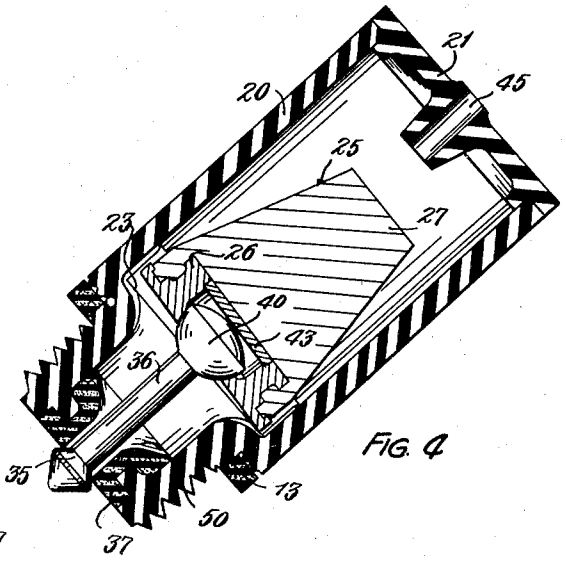


FIG. 4

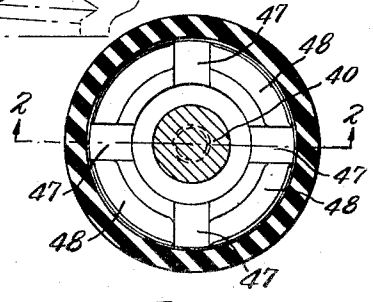


FIG. 3

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BATTERY NONSPILL VENT PLUG

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2 Claims. (Cl. 137—139)

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The present invention relates to a non-spill vent for a device containing liquid and which requires venting and may be tilted temporarily in such a manner that it cannot be left permanently open without the liquid spilling out. More particularly, the invention relates to a non-spill vent for a storage battery intended to be used on an airplane and the like.

One of the principal objects of the invention is the provision of a novel and improved, non-spill vent for a device of the character referred to which will be simple in construction, inexpensive to manufacture, and reliable and positive in operation.

Another of the objects of the invention is the provision of a novel and improved, non-spill vent of the character referred to wherein the vent passage is closed by a valve operatively connected to a weight located thereabove and in the vent passage and actuated to close said valve upon the device being tilted a predetermined amount from normal position.

Another object of the invention is the provision of a novel and improved, non-spill vent of the character referred to, the weight assembly of which is composed of a metal part fixedly secured to a non-metallic base member operatively connected to the valve by a headed valve stem, the upper part of which is enclosed within an aperture in the base member.

Another object of the invention is the provision of a novel and improved, non-spill vent of the character referred to, the weight assembly of which is composed of a base member made of a plastic and having an undercut portion adjacent to the top thereof embedded in metal cast thereon and which metal forms the weight proper.

Another object of the invention is the provision of a novel and improved, non-spill vent of the character referred to having grooves or the like either in the wall of the weight or weight assembly adjacent to the base thereof or in the wall or walls of the passage adjacent to the base of the weight so that the portion of the vent passage within which the weight is located is always maintained open and wherein the vent passage is otherwise so formed that any liquid escaping past the valve and retained in the upper part of the vent passage will readily flow back into the device.

The invention resides in certain constructions and combinations and arrangements of parts and further objects and advantages thereof will be apparent to those skilled in the art to which the invention relates from the following description

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of the preferred embodiment of the invention hereinafter described with reference to the accompanying drawings forming a part of this specification in which similar reference characters designate corresponding parts and in which:

Fig. 1 is a perspective view of the upper part of a three-cell storage battery, each cell of which is provided with a closure plug for the filler opening thereof, which closure plugs embody the present invention;

Fig. 2 is a longitudinal sectional view, approximately on the line 2—2 of Fig. 3, of one of the closure plugs shown in Fig. 1;

Fig. 3 is a sectional view on the line 3—3 of Fig. 2; and

Fig. 4 is a view similar to Fig. 2 but showing the vent plug tilted to close the vent passage therethrough.

While it is to be understood that the invention is susceptible of general application and may be embodied in different structures, it is particularly applicable to storage batteries and is here shown as embodied in a plug or cap for the filler opening of a conventional storage battery. Alternatively the invention may be incorporated in the cell cover or any other suitable part of the battery as distinguished from the filler plug or cap.

As previously stated, the battery shown is of commercial construction and will not be described in detail. Suffice it to say that it is of the three-cell type and includes a case 10 provided with suitable chambers for receiving the cells, electrolyte, etc., which chambers are closed by the cell covers 11. Each of the covers 11 is provided with a filler opening normally closed by a removable plug or cap, designated generally by the reference character A. The plugs A may be secured to the cell covers 11 in any suitable manner. As shown, the lower ends of the plugs are of reduced size, cylindrical in shape, and externally threaded for engagement with internal threads in the filler openings. Rubber washers 12 interposed between shoulders 13 formed on the plugs by the reduction in size referred to and the cell covers prevent leakage of the electrolyte around the plugs. The reference characters 14, 15 indicate the terminal posts of the battery and the reference characters 16, 17 the connector straps.

Each if the plugs A, all of which are alike, comprises a body assembly including a tubular member 20, circular in cross-section and of reduced size at its lower end forming the shoulder 13 previously referred to. The upper end of the member 20 is provided with a disk-like member

21 fixedly secured thereto after the weight or weight assembly and valve, etc., hereinafter referred to, are assembled in the member 20. The members 20, 21 are preferably made of an acid-resistant plastic or the like, such as, polystyrene, hard rubber, etc., and the disk 21 may be cemented to the member 20, if desired. Alternatively the disk 21 may be detachably connected to the member 20 in a suitable manner.

The side wall of the tubular member 20 is of approximately the same thickness throughout with the exception of an internal flange 22 adjacent to the lower end of the lower reduced portion of the member and the fact that the side wall of the upper unthreaded portion is slightly thinner than that of the lower threaded portion. The construction provides an internal shoulder 23 on the member 20 of the body assembly, upon which shoulder the weight assembly, designated generally as 25, rests and upon which shoulder it is adapted to rock when the body is tilted a predetermined amount.

The weight assembly 25 shown comprises a non-metallic base member 26 preferably made of a plastic similar to the members 20 and 21, and a lead part 27 cast to the base member. The upper part of the base member 26 is of reduced size and is provided with an external groove 30 adjacent to the top forming an undercut boss around which a part of the lead 27 flows or extends to securely lock the parts together. A groove 31 in the upper face of the lower part of the base member also helps to secure the base member 26 to the weight proper 25. Any suitable interlocking construction may be employed for securing the parts 26, 27 of the weight assembly together so long as a large area or large areas are provided for taking the strains tending to separate the same when the device is in use and subject to shock, etc. Referring to the preferred construction shown, it will be seen that the lead 27 is securely connected to the base member 26 around the entire periphery of the latter.

The lower end or the base of the weight assembly 25 is circular and of slightly less diameter than the interior diameter of the member 20 adjacent thereto, however, the clearance between the weight assembly and the wall of the member 20 adjacent thereto increases considerably toward the top of the weight assembly. In the embodiment shown, this is produced by making the weight assembly frusto-conical in shape. Alternatively, the wall of the upper part of the member 20 could be flared outwardly, etc. The construction just described limits the lateral shifting of the weight assembly in the vent passage through the body assembly and allows the weight assembly to rock on the shoulder 23 and the side wall of the member 20 adjacent thereto when the body assembly is tilted, as is clearly shown in Fig. 4.

A valve 35 formed integral with a valve stem 36 operatively connected to the weight assembly 25 is actuated by the weight assembly 25, rocking upon the shoulder 23, to close the vent passage through the body assembly. As shown, the seat-engaging portion of the valve 35 is frusto-conical in shape and engages the lower face of a soft rubber grommet 37 as a valve seat. Alternatively any suitable valve and valve seat construction may be employed and the lower end of the body assembly may enclose the same, if desired. The grommet 37 shown forms a part of the body assembly and is retained in the lower end of the member 20 by the flange 22, previously referred to.

The upper end of the valve stem 36, which is preferably made of the same material as the base 26, is provided with an enlarged head 40, the lower surface of which is of spherical, segmental shape and engages a spherical, segmental socket 41 formed at the lower end of an aperture 42 in the center of the base member 21. As shown, the aperture 42 extends through the base member proper and its upper end is closed by a disk 43 fixed to and forming a part of the base member 26. Alternatively, an integrally molded socket or base member may be used. A slight clearance is provided between the head 40 on the valve stem 36 and the disk 43 for providing controlled, predetermined, relative movement between the head 40 and, in turn, the valve 35 and the weight assembly. Unless the upper part of the head 40 is enclosed or substantially enclosed in the base member 26, this cannot be accomplished because of the difficulty of casting the lead onto the base member and maintaining uniform clearance between the top of the head on the valve stem and the bottom of the lead in successive devices. The valve stem shown is rigid and the provision of limited clearance or lost motion between the weight assembly and the valve causes the weight assembly to tap or knock the valve open when the latter is righted if it tends to stick or remain closed incident to any gas pressure within the cell. Alternatively the valve stem may be semi-rigid.

Electrolyte which may leak past the valve 35 when the device is tilted will be caught in the enlarged portion of the vent passage within which the weight assembly is located if the amount is not too great. This is accomplished in closing the upper end of the opening or vent passage through the member 20 except for a relatively small aperture or conduit 45 in the center of the member 21, the inner part of which is formed in an inwardly projecting part or boss 46 on the member 21 causing the conduit 45 to open into the interior of the member 20 at a point spaced from the side and top walls thereof.

In order to permit all of any electrolyte trapped above the base of the weight assembly when the device is righted after having been tilted or inverted, the side wall of the member 20 including the shoulder 23 adjacent to the lower end of the weight assembly, is provided with a plurality of grooves 47 which maintain the vent passage around the weight assembly open at all times and thereby assure proper venting of the cell around the weight assembly. As shown, the grooves 47 are formed by slightly raised portions 48 on the interior of the member 20. As an alternative construction the grooves 47 could be formed in the base of the weight assembly. The ridges 48 forming the grooves 47 help to guide the weight assembly and the grooves provide for the return of any electroylte which may escape into the upper part of the vent passage before the valve closes, etc. The inner part of the shoulder 23 is rounded off and the interior of the body assembly is otherwise so formed as to facilitate the return of any electrolyte in the vent passage to the battery cell when the battery returns to normal position.

From the foregoing description of the preferred embodiment of the invention shown, it will be apparent that the objects heretofore enumerated and others have been accomplished

and that there has been provided a novel and improved, non-spill vent for devices, such as, storage batteries, etc., which is simple in construction, inexpensive to manufacture, and reliable and positive in operation. While the preferred embodiment has been described in considerable detail, the invention is not limited to the construction shown and it is our intention to hereby cover all adaptations, uses and modifications thereof which come within the spirit and scope of the appended claims.

Having thus described our invention, what we claim is:

1. In a device of the character referred to, the combination of a body having a passage therethrough and a shoulder intermediate the ends of said passage, a weight in said passage comprising a metal part and an annular base member formed of non-metallic material fixedly secured to said part and adapted to rest upon said shoulder, said base member having a portion thereof provided with an undercut boss part embedded in said metal part of said weight, the open side of the under cut part of said base member facing outwardly with respect to said metal part and said metal part embracing said base member adjacent to and extending into said undercut portion whereby shrinkage of the metal tends to draw metal into the undercut part, said passage adjacent to said base member being generally circular and of slightly greater diameter than the diameter of said base member and the clearance between the side walls of said passage adjacent to said weight and said weight being greater above said base member than adjacent to said base member, said body having a valve seat located to the side of said shoulder opposite said weight, a valve adapted to move toward and from said shoulder into and out of engagement with said valve seat for closing and opening said passage through said body, and means operatively connecting said weight and said valve whereby said valve is moved toward and from said valve seat upon said weight rocking on said shoulder incident to tilting of said body.

2. In a device of the character referred to, the combination of a body assembly having a passage therethrough and a shoulder intermediate the ends of said passage, a weight assembly in said passage comprising a metal part and an annular base member adapted to rest upon said shoulder, said base member being formed of non-metallic material and having a portion thereof provided with an undercut boss embedded in said metal part of said weight, the open side of the undercut part of said base member facing outwardly with respect to said metal part and said metal part embracing said base member adjacent to and extending into said undercut portion whereby shrinkage of the metal tends to draw metal into the undercut part, said passage adjacent to said base member being generally circular and of slightly greater diameter than the diameter of said base member and the clearance between the side walls of said passage adjacent to said weight assembly and said weight assembly being greater above said base member than adjacent to said base member, one of said assemblies having grooves in the side wall thereof adjacent to the other whereby a continuous passageway is maintained about said weight member, said body assembly having a valve seat located adjacent to said passage and to the side of said shoulder opposite said weight, a valve adapted to move toward and from said shoulder into and out of engagement with said valve seat for closing and opening said passage through said body, a valve stem member operatively connecting said weight assembly and said valve whereby said valve is moved toward and from said valve seat upon said weight rocking on said shoulder incident to said body assembly being tilted, said valve stem member including a spherical segment in engagement with a spherical segmental socket formed in said base member, and means operatively connected to one of said members and adapted to contact the other for limiting movement of said stem in a direction to disengage said segment from its socket.

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