

July 14, 1959

H. A. STEVENS ET AL

2,894,530

VENT CAP FOR GASOLINE TANKS AND THE LIKE

Filed June 7, 1955

2 Sheets-Sheet 1

FIG. 1

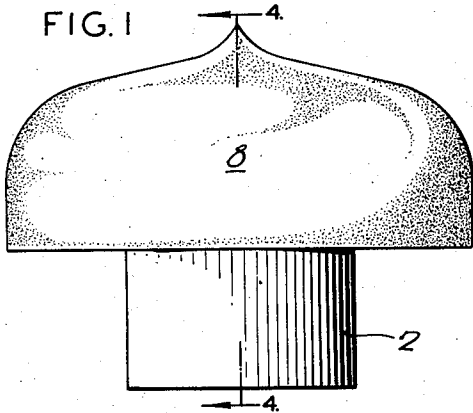


FIG. 2

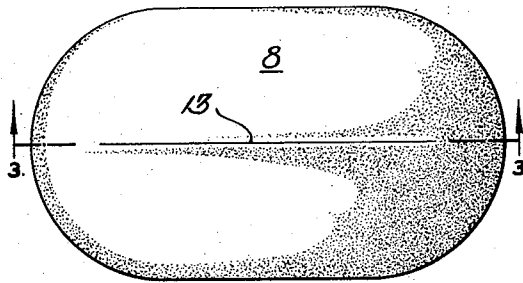


FIG. 3

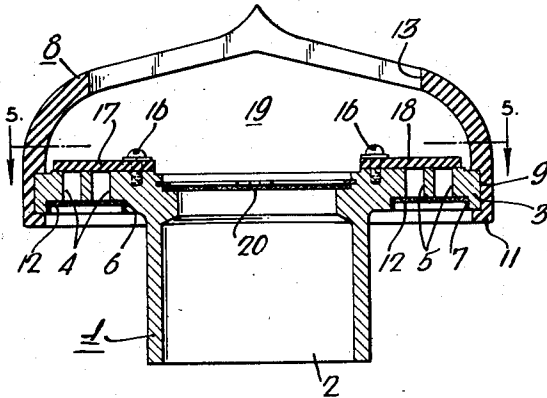


FIG. 4

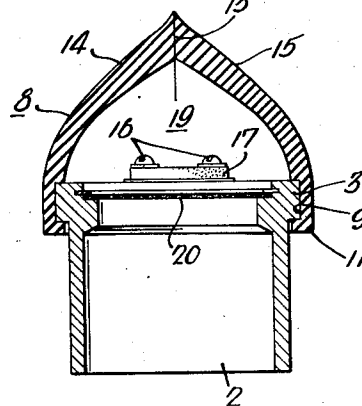


FIG. 5

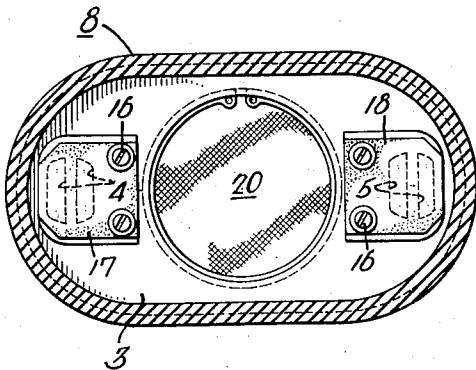
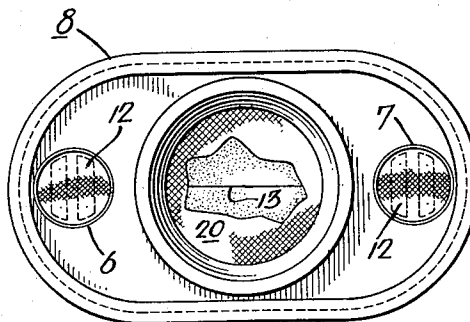


FIG. 6



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2 Sheets-Sheet 2

FIG. 7.

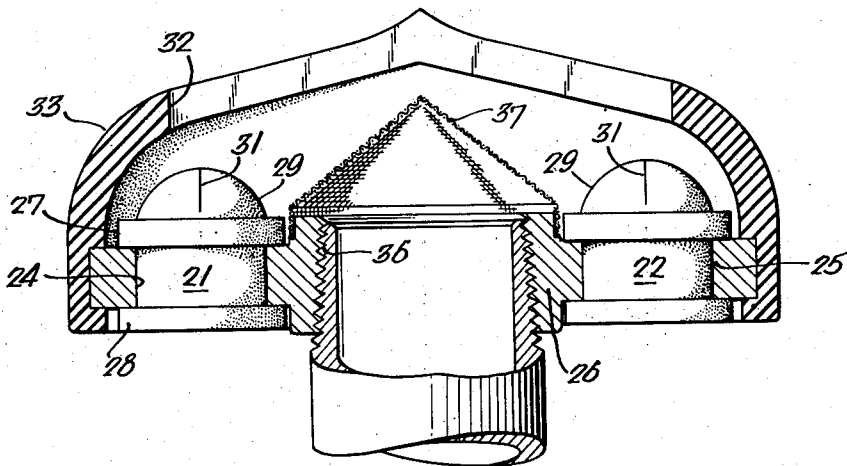


FIG. 9.

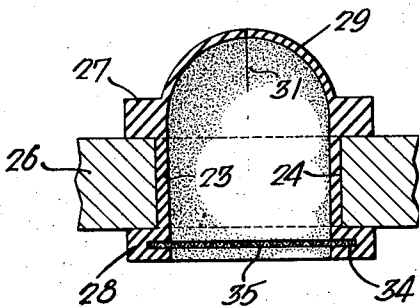


FIG. 10.

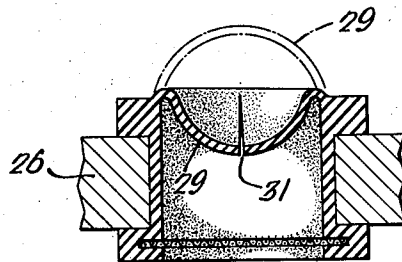
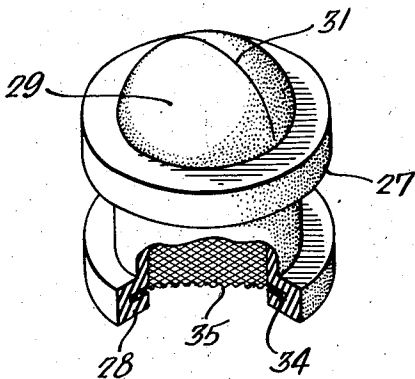


FIG. 8.



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1

2,894,530

VENT CAP FOR GASOLINE TANKS AND THE LIKE

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1 Claim. (Cl. 137—493.7)

This invention relates to improvements in vent valves for containers for volatile liquids, such for example as the gasoline tanks of service stations.

A general object of the invention is to provide a vent valve of this class having improved characteristics of safety, functional efficiency, and durability, and having also a relatively low production cost.

A specific object of the invention is to provide a vent valve of the stated class having means for admitting air to the associated container as the contents are withdrawn, and means for venting the contained gases as the tanks are being filled with liquid and under any internal pressure condition, both of said means being normally closed and effectively seal the container against undue evaporation of the volatile contents, and wherein further the means for venting the gases are designed to direct the gases upwardly so as to prevent accumulations of the relatively heavy and inflammable gases at the ground level.

The invention contemplates also a novel form of valve device which while substantially immune to malfunction will have the built-in safety characteristics to insure proper functioning to the primary ends under even the most adverse conditions.

The invention resides also in certain novel structural features and details hereinafter described and illustrated in the attached drawings wherein:

Fig. 1 is a side elevational view of a vent valve made in accordance with our invention;

Fig. 2 is a plan view of the valve;

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

Fig. 4 is a sectional view on the line 4—4, Fig. 1;

Fig. 5 is a sectional view on the line 5—5, Fig. 3;

Fig. 6 is an inverted plan view of the valve;

Fig. 7 is a view similar to Fig. 3 illustrating a preferred embodiment of the invention;

Fig. 8 is a view in perspective partly in section of one of the intake valve elements shown in Fig. 7;

Fig. 9 is a vertical sectional view of the valve element shown in Fig. 8, and

Fig. 10 is a vertical sectional view of the valve element of Fig. 8 illustrating the manner in which it may function to relieve excess pressures within an associated container in event of malfunction of the primary vent valve element.

In the embodiment of the invention illustrated in Figs. 1 to 5 in the drawings, the vent valve is shown as consisting of two primary parts. One of these parts, termed the base member and identified by the reference numeral 1, comprises a cylindrical tubular nether portion 2 which terminates at the top in a transversely projecting flange 3 of generally oval peripheral contour. In its major dimension this flange is provided at each side of the cylindrical portion 2 with a pair of elongated ports 4, 4 and 5, 5, respectively, the upper ends of these ports lying in the flat top of the flange, and the lower ends of each

2

pair of the ports terminating in a circular countersunk recess, 6 and 7 respectively.

The other primary member of the valve structure consists of a dome-like member 8 which seats upon and is suitably attached to the flange 3 of the base member 1. In the present instance the lower edge portion of the member 8 assumes the oval shape of the flange 3 and is provided with a rabbet 9 which receives the edge of said flange as illustrated in Figs. 3 and 4, the lower terminal wall portion 11 of the member 8 closely embracing the sides of the flange. The upper portion at least of the member 8 is composed of resilient rubber-like material or plastic and is provided with a longitudinal slit 13. As best shown in Fig. 4, the upper surface of the member 8 at opposite sides of the slit 13 converge upwardly at an angle, approximating 45° in the present instance, and these converging inclined surfaces 14 and 15 meet at the slit 13. Thus the upper surface of the member 8 falls away relatively sharply at opposite sides of the slit and throughout the length of the latter. The slit is formed in the resilient material of the member 8 in a manner to insure the slit being normally tightly closed preferably by the resilient action of the material itself.

As shown in Figs. 3 and 4, the flange 3 has attached to the upper surface thereof by any suitable means, such for example, as screws 16, a pair of valve flaps 17 and 18 which normally lie in the positions shown in Fig. 3 in which they immediately overlie and close the upper ends of the ports 4 and 5. These flaps 17 and 18 may be made of suitable flexible material such for example as artificial rubber, and will act as check valves admitting air through the ports 4 and 5 to the chamber 19 in the interior of the member 8 but precluding discharge or escape of gases from the chamber through the said ports. As shown in Fig. 3, the chamber 19 communicates directly with the upper end of the hollow cylindrical lower portion 2 of the base member 1. The circular countersunk recesses 6 and 7 are adapted for reception in each case of a suitable screen element 12 as shown in Fig. 4 which function also as flame arrestors, and a like screen 20 is provided over the inner end of the tubular portion 2.

It will now be apparent that when this vent valve is mounted at the upper end of a vent pipe of a gasoline tank (for example), by insertion of the cylindrical bottom portion 2 of the base member into the interior of the pipe, or by application of the cylindrical portion to the exterior of the upper end of the pipe, as the case may be, the valve will function effectively to seal the upper end of the vent pipe and the associated tank under normal conditions. Thus, the ports 4 and 5 are normally closed by the check valves 17 and 18; and the slit 13 at the top of the member 8 is similarly tightly closed with the lips on opposite sides of the slit in solid contact with each other. If now, gasoline is withdrawn from the tank, the resultant semi-vacuum will permit the atmospheric air to elevate the check valves 17 and 18 and admit air to the chamber 19 and to the interior of the tank to replace the withdrawn liquid. When, on the other hand, gasoline is fed to the tank in a normal filling operation, or if by reason of extraordinary temperature conditions the pressure of the vapors within the tank become excessive, the pressure will be relieved by way of the slit 13, the lips at opposite sides of the slit being forced apart to permit discharge of the vapors from the tank upwardly above the vent valve. In this venting process, the valve elements 17 and 18 will function to preclude escape of the gases through the ports 4 and 5 in the downward direction.

The above-described valve structure has been found particularly well-suited to the venting of tanks or con-

tainers to the atmosphere. Vent valves of this class are necessarily exposed to the weather and must function effectively to exclude moisture. They must also be of a character to preclude any possibility of malfunction of the vent resulting in a build-up of internal pressures in the container or tank to a dangerous degree. It is highly desirable also, if not essential, that the venting of the volatile vapors shall be upwardly so as to obtain a dispersion of the vapors in the air and to avoid dangerous accumulations of the relatively heavy and usually explosive vapors in the ground areas. With these essential requirements, a vent valve should be structurally uncomplicated and capable of economical production. All of these requirements are met in full degree by the afore-described valve.

It will be apparent, for example, that by placing the venting slit 13 at the top of the member 8 in a position wherein the upper surfaces of the member fall away sharply from the upper edge of the slit, the objective of upward dispersion of the vented gases is obtained as well as an effective exclusion of water or contaminants by way of the slit to the interior of the tank. Since the wall of the member 8 in and adjoining the slit area are resilient and flexible, the member 8 will be self-cleaning with reference to ice formations that might otherwise interfere with the free opening of the vent slit. If ice tends to form on the upper surface of the member 8 at the sides of the slit there will not only be a minimum formation at the upper edge and in the slit area, but any gas pressure imposed on the member from the inside will cause a flexure by expansion of the resilient wall of the member at opposite sides of the slit, with consequent rupture of the ice coating, and a progressive spreading of the slit 13 from the inside resulting in an immediate opening of the slit for venting of the gases. The manner in which the valve meets the other requirements of a valve of this class will be apparent. As a further means for discouraging ice formation on the upper surface of the member 8, the resilient material of this member may be of a character to resist wetting; or the same result may be obtained by suitable treatment of the surface with moisture resisting chemicals.

The structure of the valve may vary considerably without departure from the principles of the invention.

One such alternative embodiment of the invention is shown in Figs. 7 to 10. In this case the flap valves 17 and 18 are replaced by double acting valve elements 21 and 22. These elements comprise a cylindrical tubular body 23 which fits cylindrical apertures 24 and 25 in the base 26 and which are retained in the apertures by radial flanges 27 and 28. Each element has a domed top 29 which contains a normally closed slit 31 which will open under pressure to admit air to the container. The dome 29 is sufficiently flexible to permit distortion thereof to the reversed position shown in Fig. 10, and if the primary venting slit 32 in the cap 33 should become inoperative for any reason, the excessive pressures tending to build up in the container will cause the above described reversal of the dome 29 of one or both of the elements 21 and 22 with consequent relief of the pressure through the slit or slits 31. The valve elements 24 and 25, therefore, in addition to their primary function of admitting air to the container when required, function also as safety valves to relieve excessive internal pressures if the primary vent becomes inoperative.

With reference more particularly to Fig. 8, it will be

noted that the flange 28 is slotted radially from the inside to form a socket 34 for reception of the edge portions of a flame-arresting screen 35. In this embodiment also the base member has been modified by elimination of the cylindrical position 2 and the central opening 36 is threaded for attachment to the correspondingly threaded upper end of the vent pipe of the container, and a screen 37 is preferably installed, as shown in Fig. 7, at the inside and over the said central opening.

The base members 1 and 26 may be made of metal, plastic, or rubber or of synthetic rubber materials resistant to gasoline oils and chemicals, such for example as neoprene. The upper members or caps 8 and 33 of the valve structure may also be made entirely of resilient rubber, rubber-like material or plastic, or may be composed in part of such materials and in part of metal or hard rubber or plastic. It is essential only in the sense that the upper portion of the cap member which contains the venting slit 13 be resilient. It is possible also to construct the valve so that in whole or in part the members 1 and 8 are formed integrally with each other.

We claim:

A vent valve for gasoline and like bulk containers, said valve comprising an elongated base member and means adapted for mounting said base member on a vent pipe, the base being adapted, when mounted on a vertical pipe, to have its elongated dimension extend substantially horizontally, and a domed top forming with the base a normally sealed chamber having a flow path thereinto through said mounting means, said base member only slightly exceeding the diameter of the said mounting means widthwise, and materially exceeding said diameter in the lengthwise direction so as to extend beyond the mounting means, a port in the extended portion of the base member opening from the said chamber to atmosphere, and a check valve cooperating with the said port so as to permit flow from atmosphere to the chamber, while precluding flow in opposite direction, said top being composed of resilient material and having upwardly converging exterior surfaces and a normally closed slit at the juncture of said surfaces, said slit extending completely through the wall and lengthwise of the cover and terminating at each end within the body of the resilient top and thereby forming a normally sealed vent port adapted to open under a predetermined fluid pressure within the said chamber to relieve said pressure solely by spreading apart of the confronting and normally contacting surfaces defining said slit without other relative displacement of said slit-defining surfaces, the said exterior surfaces of the top declining sharply from said slit-defining surfaces so as to shed water from extraneous source away from the slit.

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