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TANK VENT ASSEMBLY

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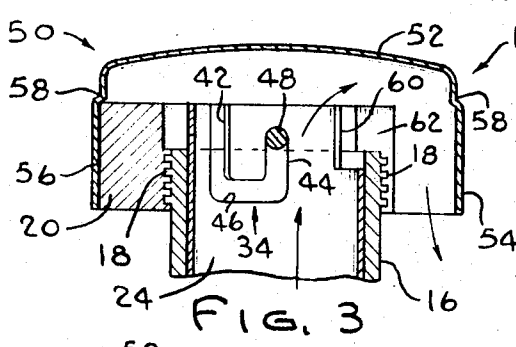


FIG. 3

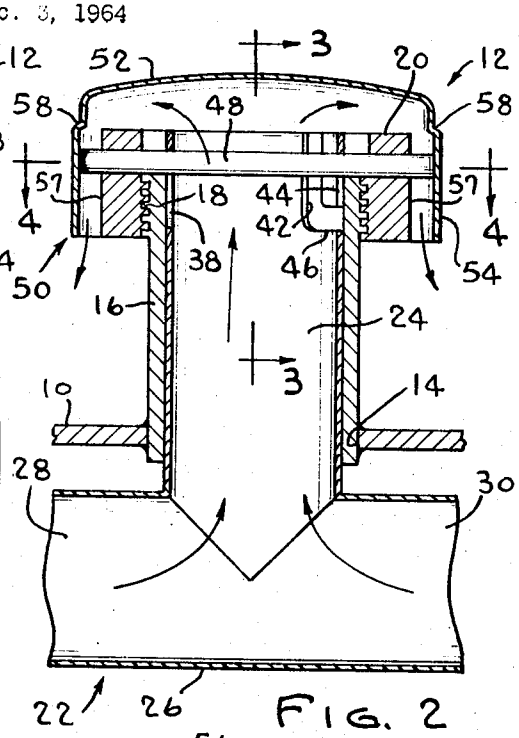


FIG. 2

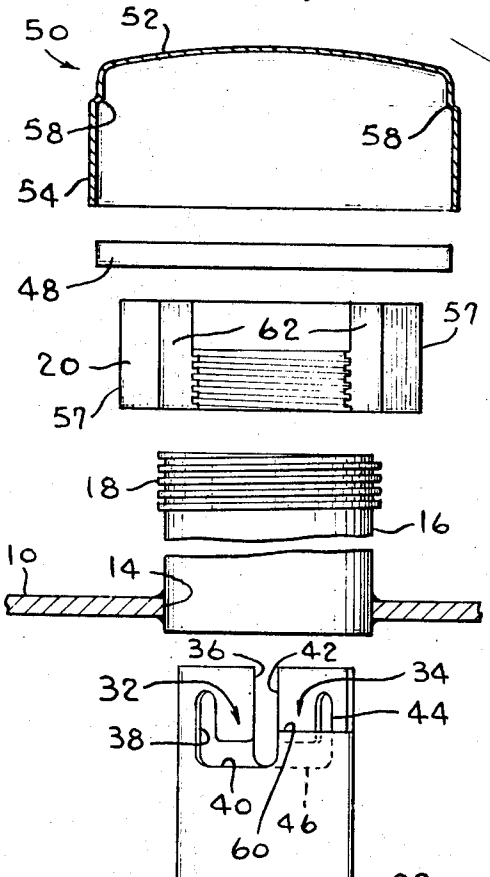


FIG. 1

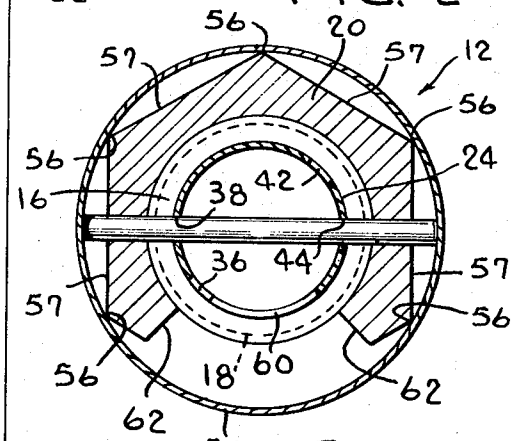


FIG. 4

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TANK VENT ASSEMBLY

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ABSTRACT OF THE DISCLOSURE

A vent hole in a tank has a tubular ferrule vertically mounted through it and projecting from it. The exterior of the ferrule is threaded to support a hex nut with a rod mounted diametrically through it. A hollow T has a tubular central portion telescoped through the ferrule and suspended from the rod in the hex nut by slots in its walls. A tubular cross portion intersecting the bottom of the tubular central portion of the T is suspended inside the tank. A cap telescopes over the ferrule and rides on the points of the hex nut.

This invention relates to vent assemblies for liquid transport tanks, liquid storage tanks or the like.

Tanks of this type must be vented to permit air to be exhausted from within the tank as it is being filled to prevent tank blow-out and also to permit air to be drawn into the tank as it is being emptied to prevent tank collapse. Various types of vent assemblies have been proposed in the past but these have not provided a completely satisfactory solution in that they have been susceptible to clogging and, since such tanks may be exposed to freezing temperatures, to freeze-up thereby rendering the vent assembly incapable of functioning in the intended manner. Taking, for example, a milk transport truck, where liquid splash out of the vent must also be prevented, a class of presently accepted vent assemblies is of the check valve type using relatively movable parts which increase the susceptibility of the vent assembly to closing and freeze-up.

A general object of this invention is to provide a vent assembly which permits adequate passage of air to and from the tank interior, prevents liquid splash, and is not susceptible to clogging and freeze-up.

A further object of this invention is to provide a vent assembly which is readily assembled and is made up of a minimum of parts.

For the achievement of these and other objects, this invention proposes a vent assembly having a baffling arrangement at an opening in the tank wall which permits air flow into and out of the tank interior through a tortuous path so that although free flow of air is permitted the liquid contents of the tank cannot splash out and entry of dirt and other foreign matter into the tank is obstructed.

Other objects and advantages will be pointed out in, or be apparent from, the specification and claims, as will obvious modifications of the embodiment shown in the drawings, in which:

FIG. 1 is an exploded view of a vent assembly constructed in accordance with this invention;

FIG. 2 is a sectional view of the vent assembly assembled;

FIG. 3 is a sectional view taken generally along line 3—3 of FIG. 2; and

FIG. 4 is a sectional view taken along line 4—4 of FIG. 2.

The vent assembly of this invention can be used in connection with a tank of any suitable construction and for that reason no specific tank construction has been illustrated in the drawings nor will it be described. With particular reference to the drawings, only that portion

10 of the tank in the immediate vicinity of vent assembly 12 has been illustrated. It will be appreciated that portion 10 can be a portion of the manhole cover usually provided in liquid tanks or a portion of the main tank wall.

In accordance with conventional practice, an opening 14 is provided in the top or uppermost portion of the tank so that the liquid being handled is disposed below the opening A hollow, generally cylindrical ferrule 16 is welded in opening 14 and extends exteriorly of tank portion 10. As was stated above, a problem encountered in liquid transport or storage tanks is tank collapse and blow-out and to alleviate this problem it is necessary to properly vent the tank to prevent either air being compressed in the tank as the tank is filled or a vacuum being drawn in the tank as it is emptied. In accordance with this invention, air is vented through the opening formed by ferrule 16, but through a baffle arrangement which, although providing a path for substantially free air flow through to the opening, prevents liquid from being splashed out of the tank or dirt and other foreign matter from being drawn into the tank.

More particularly, ferrule 16 is externally threaded at 18 to receive hex nut 20. The hex nut and ferrule cooperate to form wall means around the tank opening from which other elements of the vent assembly are supported. Hollow T 22 is arranged interiorly of the tank and includes central portion 24 and cross portion 26 having opposite open ends 28 and 30. Diametrically opposed, U-shaped slots 32 and 34 are formed in central leg 24. With particular reference to slot 32 which is provided in the side of central leg portion 24 facing outwardly in the drawings, this slot includes open leg portion 36, closed leg portion 38 and portion 40 extending between and connecting legs 34 and 36. Similarly slot 34 includes open leg portion 42, which is in alignment with leg 36 in FIGS. 1 and 2, closed leg portion 44 and connecting portion 46. Slots 32 and 34 cooperate with fixed pin 48 to provide a bayonet-type connection for the tee in the opening formed by ferrule 16. Preferably, pin 48 is fixed on hex nut 20, however, it will be appreciated that other suitable connections of the pin with respect to the T can be used. For example it could be fixed to ferrule 16. With this construction T 22 is assembled in the vent opening by sliding slot portions 36 and 42 over the pin, rotating the T to position the pin in slot portions 38 and 44, and then allowing the T to hang from the pin by gravity and assume its assembled position in the vent assembly.

Cross portion 26 of the T extends over the vent opening and prevents direct passage of air through the vent opening, causing air either entering or leaving the tank to follow a somewhat tortuous path around the cross portion through either of its open ends 28 or 30. Therefore, although air will flow freely through the vent opening, liquid cannot splash out of the tank through the vent opening as direct passage of liquid to the vent opening is obstructed. This construction prevents liquid from splashing exteriorly of the tank without the use of any relatively movable parts thereby eliminating any problems of freeze-up and, furthermore, does so with a construction which permits complete drainage of any splashed liquid back into the tank preventing liquid entrapment which could result in spoilage of such liquid to adversely affect the sanitary condition of the tank and also contributing to the avoidance of vent freeze-up.

In addition to the problem of liquid splash from the interior of the tank through the vent assemblies, a further problem exists of foreign matter entering the tank either during the storage as liquid is being drawn from the tank which results in air being drawn into the tank. As a solution to this problem, a baffling arrangement is also pro-

vided to control air flow from exteriorly of the tank. Preferably, this baffling arrangement takes the form of a cup-shaped or generally U-shaped in cross section cap **50** which is positioned on nut **20**. Structurally, cap **50** includes a base portion **52** arranged to extend over the vent opening and also including depending leg portion **54** arranged to extend around and telescope over nut **20**, and correspondingly, over a portion of ferrule **16**. Leg portion **54** of the cap is formed so that its inner surface slides onto points **56** of the hex nut to provide a frictional connection between the cap and the hex nut to hold the cap in assembled relationship in the vent assembly. Preferably, the length of pin **48** is such that it extends beyond flats **57** of the hex nut and engages the cap to further contribute to the frictional engagement between the cap and the nut. With regard to providing baffling exteriorly of the vent opening without interfering with air flow through the vent, the use of hex nut **20** is particularly advantageous in that the nut configuration (points **56** and flats **57**) inherently provides air passages between the nut and cap. To insure proper spacing between cap base **52** and the nut to achieve desired air flow, the cap is formed to include an inwardly extending ridge **58** which engages the top of the nut to limit cap movement into the nut to a point where base portion **52** is in spaced relationship from the top of the hex nut.

In assembly, ferrule **16** will have been attached to tank portion **10** and nut **20** is threaded onto the ferrule. With the nut in position T **22** is assembled onto the pin and cap **50** is slipped over the nut to complete the vent assembly. The air flow path defined by the baffle arrangement is illustrated by the arrows in FIG. 1, namely through the open ends of cross portion **26**, through central leg portion **24** and ferrule **16** and between cap **50** and the wall formed by nut **20** and ferrule **16**.

In many applications the vent assembly as described to this point will provide adequate venting. However, it is desirable to achieve a maximum flow of air through the vent assembly and to this end a wedge-shaped portion of nut **20** is removed to form an opening **62** and central leg portion **24** is notched out to form an opening **60** for registry with opening **62**.

Preferably opening **60** is provided adjacent open leg **34** of slot **32** so that the open leg has a substantial circumferential extension and will be aligned with opening **62** when T **22** is assembled on pin **48**. An opening such as notch **60** can be provided at only one of the slots **32** and **34** or if desired, it can be provided adjacent both slots so that a particular orientation of the T is not necessary during assembly to insure registry of a slot with nut opening **62**. In this regard pin **48** positions nut **20** so that at least a portion of its opening **62** extends above the ferrule and also positions the T so that its notch registers with the nut opening. Furthermore, the relative positioning of pin **20** and cap **50** and the length of slots **32** and **34** is such that when the vent assembly is completely assembled, as illustrated in FIG. 3, the cap limits the upward movement of the T to an amount insufficient to free the pin from the slot and permit removal of the T. The T can only be removed if cap **50** is removed, therefore, it cannot jar or shake loose with the cap in place.

The vent assembly constructed in accordance with this invention utilizes essentially standard parts is relatively simple to assemble and contains no moving parts, while providing adequate venting, not being susceptible to freeze-up and maintaining a sanitary tank condition. Where a sanitary installation is of concern the structural vent elements, the ferrule, nut, cap and T, are all constructed of stainless steel.

Although but one embodiment of the present invention has been illustrated and described, it will be apparent to those skilled in the art that various changes and modifications may be made therein without departing from the spirit of the invention or from the scope of the appended claims.

What I claim is:

1. A vent assembly for a tank comprising, in combination,
means defining an opening in said tank wall,
a fixed threaded ferrule attached to said tank wall at said tank wall opening and extending exteriorly of said tank,
a nut having peripheral flats releasably engaged on said fixed ferrule,
a T-shaped hollow member,
means connecting said T-shaped member to said tank with the central leg portion thereof aligned with said opening and the cross portion thereof disposed interiorly of said tank and open at its opposite ends to the interior of said tank,
and a cap means of generally inverted U-shaped diametrical cross section disposed exteriorly of said tank, said cap means frictionally engaging said nut with the leg portion of said cap means overlapping a portion of said nut and ferrule, the base thereof in alignment with said tank wall opening and with the cap means spaced from said ferrule and the flats of said nut to cooperate therewith in defining a passage for ingress of air to and egress of air from said tank through said tank wall openings.

2. A tank vent assembly comprising the combination of
a vent opening communicating with an interior of a tank;
a hollow ferrule surrounding said vent opening and projecting outwardly from said vent opening;
a suspension member supported by said ferrule;
a hollow T conduit having a cross portion in said interior of said tank, and a central portion intersecting said cross portion, said central portion engaging said suspension member to be suspended thereby telescoped snuggly inside said ferrule;
projections extending radially from and supported by said ferrule
and a downward opening cup-shaped cap telescoped over said ferrule and supported by said projections.

3. A tank vent assembly as set forth in claim **2** wherein
an exterior of said ferrule is threaded;
said projections extending radially from said ferrule are formed by an interiorly threaded nut member screw fitted onto said ferrule.

4. A tank vent assembly as set forth in claim **2** wherein
said cap has a round interior horizontal cross section with an annular ridge protruding therefrom to rest on said projections;
and said projections on ferrule are formed by an annular collar means about the outside of said ferrule and having lateral intersecting flats defining a plurality of laterally projecting points.

5. A tank vent assembly as set forth in claim **2** wherein
said suspension member is a rod supported across the top of said hollow ferrule;
and said central portion of said T conduit has upwardly opening U-shaped slots through its walls to receive and engage said rod and to form a bayonet type connection therewith.

6. A tank vent as set forth in claim **3** wherein
a portion of said nut member projects above said ferrule;
said suspension member is a rod press fitted through holes in said portion of said nut member to extend diametrically across said nut member and diametrically across the top of said ferrule;
said central portion of said T conduit has slots through its walls to engage said rod and to suspend the top of said central portion above the top of said ferrule;
and aligned portions of said nut member and the top of said central portion of said T conduit are cut away to form a passage for gases communicating with said interior of said tank.

7. A tank vent assembly as set forth in claim 2 wherein said cross portion and said central portion of said T conduit are thin walled tubular members intersecting perpendicularly to each other, and said cross portion is suspended closely beneath said vent opening to block said opening and prevent escape of contents from said interior of said tank;

and said cup-shaped cap is a stamped sheet metal member frictionally engaging said projections to anchor it in place and spaced above the top of said central portion of said T conduit to prevent removal of said T conduit without prior removal of said cap.

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