Jan. 22, 1963 P. C. JURS ETAL 3,074,590

COVER CONSTRUCTION

Filed Aug. 26, 1959 2 Sheets-Sheet 1

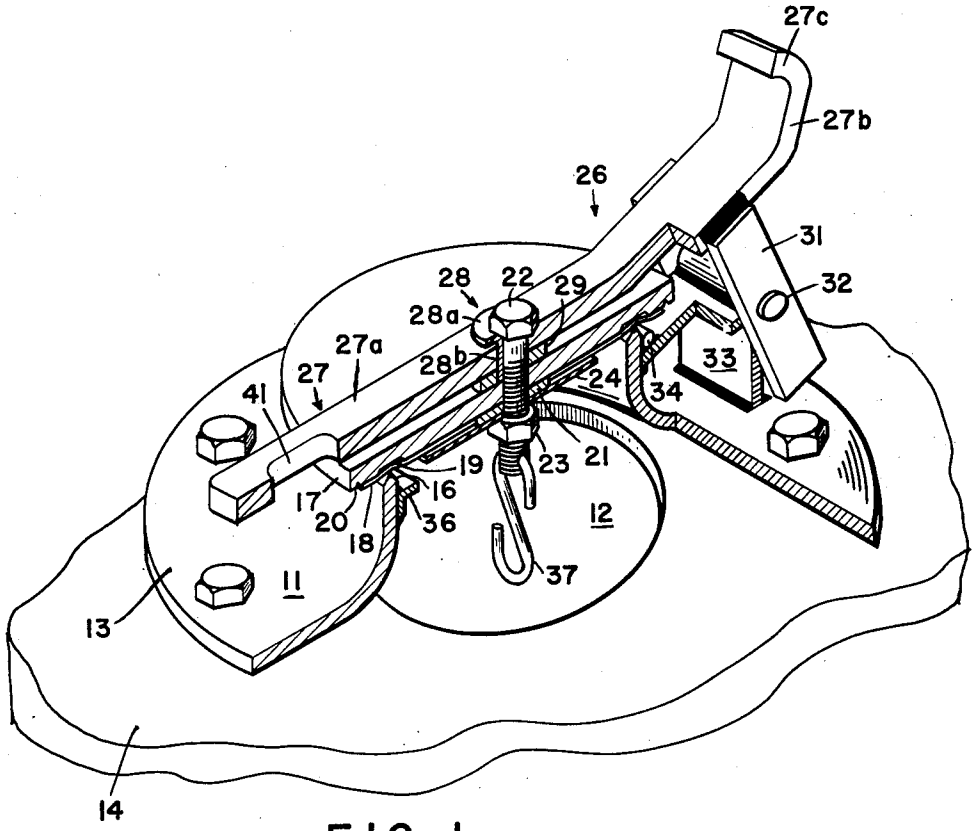


FIG. 1

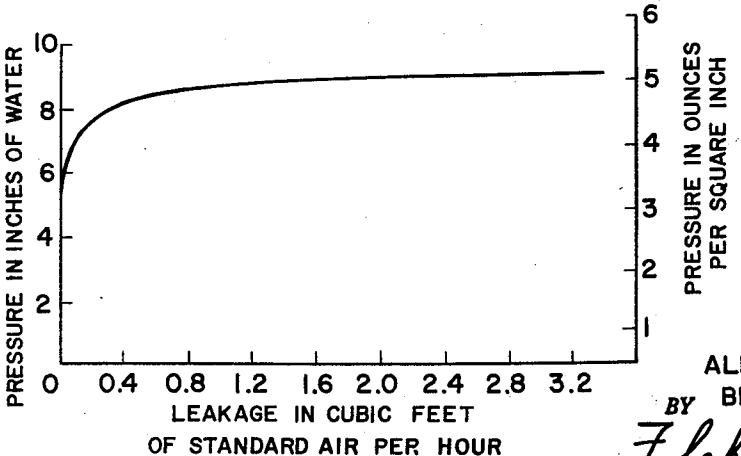


FIG. 2

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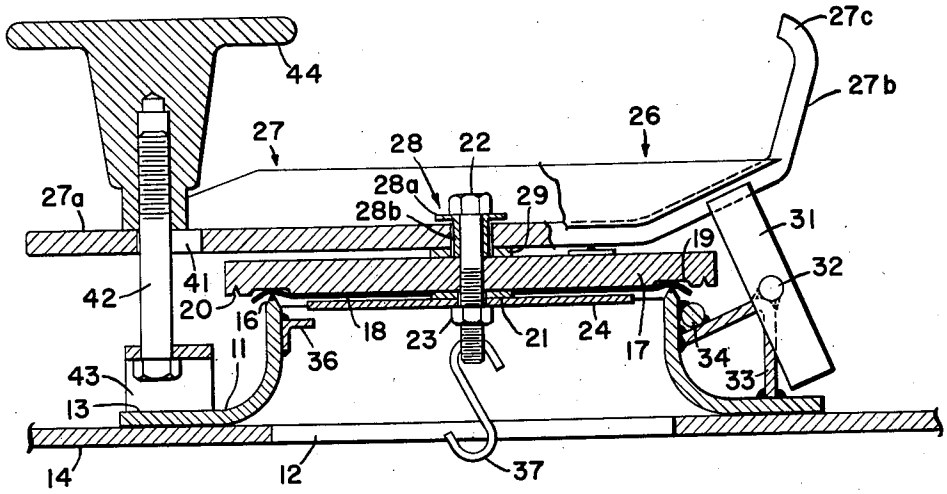


FIG. 3

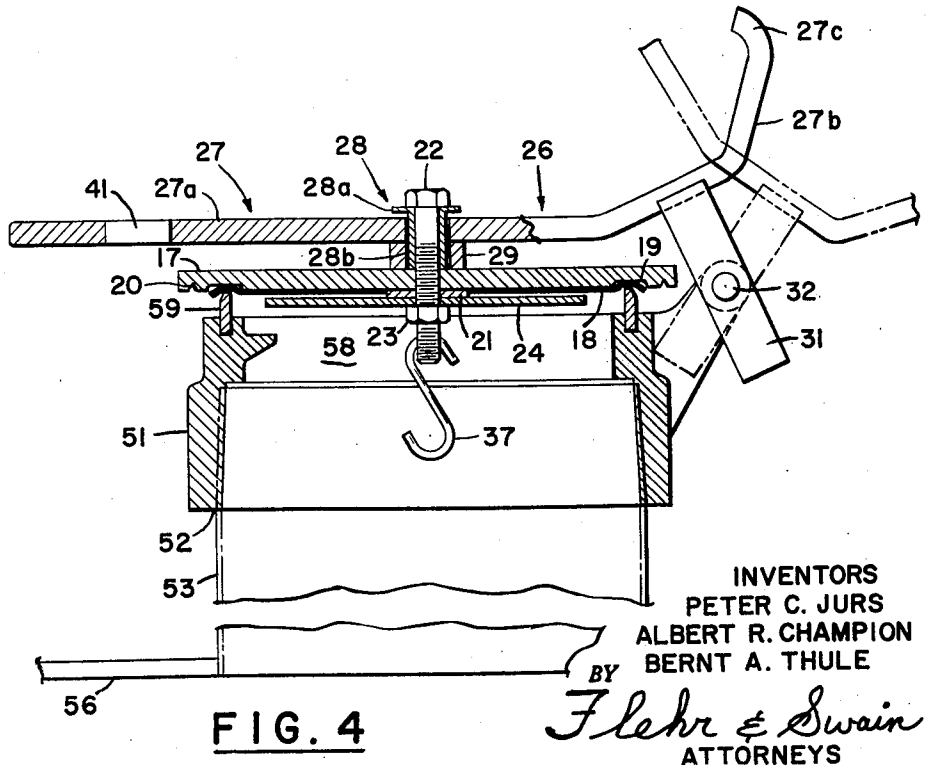


FIG. 4

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United States Patent Office 3,074,590 Patented Jan. 22, 1963

3,074,590

COVER CONSTRUCTION

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Filed Aug. 26, 1959, Ser. No. 836,127
1 Claim. (Cl. 220—46)

This invention relates to a cover construction and more particularly to a gauge hole cover construction for mounting on the walls or roofs of tanks.

Gauge hole covers provided heretofore have been relatively expensive to manufacture. In addition, such gauge hole covers have been found to have relatively high leakage rates. There is therefore a need for a gauge hole cover which can be inexpensively manufactured and which also has a low leakage rate to meet the recent trend to reduce vapor losses and to prevent pollution of the atmosphere.

In general, it is the object of the present invention to provide a cover construction which has exceptionally low leakage.

Another object of the invention is to provide a cover construction of the above character which has exceptionally low leakage up to the pressures closely approaching the relief point.

Another object of the invention is to provide a cover construction of the above character in which particularly novel means is utilized for mounting the cover.

Another object of the invention is to provide a cover construction in which particularly novel means is utilized for establishing a seal between the closure pallet and the seat ring.

Additional objects and features of the invention will appear from the following description in which the preferred embodiments have been set forth in detail in conjunction with the accompanying drawings.

Referring to the drawings:

FIGURE 1 is an isometric view, partially in cross-section showing a cover construction incorporating the present invention.

FIGURE 2 is a curve showing the leakage characteristics of my cover construction shown in FIGURE 1.

FIGURE 3 is a cross-sectional view of another embodiment of my cover construction.

FIGURE 4 is still another embodiment of my cover construction.

In general, the cover or hatch construction consists of a closure pallet which is adapted to cooperate with an annular seat mounted on the wall or roof of the tank. A flexible seal ring of resilient material is disposed on the lower face of the pallet so that it overlies the annular seat. The closure pallet is formed with a downwardly facing annular groove in its lower face which is immediately above the portion of the seal ring which engages the annular seat. The groove has such dimensions and the seal ring is formed of a material so that the seal ring is deformed into the groove when the pallet is resting on the seat ring. This construction makes possible an excellent seal with very low leakage. The closure pallet is hinged in such a manner that it it always maintained in relatively true concentric position with respect to the annular seat and exerts uniform pressure on the seat around the circumference.

The cover construction as shown in FIGURE 1 of the drawing consists of a body or base 11 provided with a central hatch opening 12. The base 11 is provided with a flange 13 which facilitates attachment of the body to the top wall 14 of a tank. The upper part of the body carries an annular seat 16 which can be formed of a

suitable material such as stainless steel by depositing stainless steel on the body and then machining the body to provide the seat ring.

An annular pallet 17 extends over the seat 16. The pallet 17 carries a seal ring 18 for cooperation with the seat 16. The seal ring is formed of a suitable material such as synthetic rubber designated as "Hycar" which is capable of some resilient deformation to facilitate good sealing engagement with the upper surface of the seat 16. The outer portion of the lower or bottom face of the pallet 17 which generally overlies the seat 16 is provided with a downwardly facing substantially U-shaped annular groove 19 which is machined into the lower face of the pallet. The dimensions of the groove 19 are particularly important and are primarily determined by the characteristics of the seat material, the forces involved and manufacturing tolerances as hereinafter described. The pallet 17 is also provided with another groove 20 which serves as a drip ring groove to prevent moisture collecting on top of the pallet from running over to the annular seat 16.

The inner margin of the seal ring 18 is secured to the pallet 17 by suitable means such as the disc-like seal retaining member 24 which is secured to the pallet by a bolt 22 which extends through the pallet and a nut 23 which is threaded onto the bolt. A disc-like spacer 21 is disposed within the opening in the seal ring 18 and is engaged by the member 24. The seal ring 18 is in close engagement with the spacer 21 and is sealed against leakage at this point. The outer margin of the seal ring 18 is free and the seal ring itself is not tightly clamped against the pallet 17 by the retaining member 24 so that the seal ring can expand and contract uniformly when in prolonged contact with certain product vapors without wrinkling and therefore without adversely affecting the leakage rate. It will be noted that the outer edge of the seal ring faces downwardly. It has been found that this forms a drip ring to prevent moisture from running over to the seat ring in addition to the drip groove 20.

A lever assembly 26 is provided for moving the pallet 17 between open and closed position with respect to the seat ring 16. It consists of a substantially L-shaped lever arm 27 which has one leg 27*a* which extends across the top of the cover or pallet and is attached to the central portion of the pallet by the bolt 22 which extends through a spacer sleeve 28 having a flanged portion 28*a* and a cylindrical portion 28*b*. The lever arm, however, is spaced from the pallet 17 by a spacer 29. The hole in the lever arm 27 is of a diameter slightly greater than that of the outside diameter of the cylindrical portion 28*b* and the portion 28*b* is of a length slightly longer than the combined thickness of the arm 27 and the spacer 29 so that the angle between the arm 27 and the pallet 17 may vary sufficiently for the pallet to bear uniformly on the seat to accommodate manufacturing tolerances. Also with this construction, a moderate range of cover thicknesses, with resultant differences in relieving pressures, may be accommodated by changing the thickness of the spacer 29. The leg 27*a* of the lever arm 27 extends beyond the cover and is adapted to be grasped by the hand to facilitate opening of the cover whereas the other leg 27*b* of the lever arm extends upwardlly from the pallet and is provided with an inturned portion 27*c* to facilitate opening of the cover or pallet 17 by foot.

To form a hinge connection between the lever arm 27 and the base 11, means is provided which includes a pair of hinge members 31 which are fixed to the lever arm 27 by suitable means such as welding and which are rotatably mounted on a hinge pin 32. The hinge pin 32 is fixed to a V-shaped member 33 that is secured to the base 11 by suitable means such as welding. A stop pin 34

is fixed to the base 11 and the V-shaped member 33 at the upper juncture of the V-shaped member and the base.

Upon assembly, to insure that the pallet 17 is in exact alignment, the pallet is placed in a jig at the time the hinge members 31 are welded to the lever arm 27. The hinge pin 32 is formed of stainless steel to prevent corrosion. The holes in the hinge members 31 are carefully bored so that the members 31 fit quite closely, but with adequate operating clearance, on the hinge pin.

A tape bench mark 36 is provided inside the base 11 and the center bolt 22 is provided with an S-hook 37 from which a thermometer or other sampling device may be suspended.

Operation of the device as described above can now be reviewed as follows:

FIGURE 1 of the drawings illustrates the pallet 17 when closed upon the base with a seal being established between the seal ring 18 and the seat 16. The pressure exerted by the lever arm 27 is evenly applied to the pallet through the spacer 28. The connection is also such that there is a uniform distribution of pressure throughout the circumference of the sealing surfaces. As shown in the drawing, it will be noted that the portion of the seal ring seating upon the seat ring is urged into the groove 19 so that sealing member is in engagement with the top of the groove as shown particularly in the drawing. It has been found to be important that the seal ring be formed of a material which is not so rigid or thick that it will bridge across the groove and not be depressed into the top of the groove as shown. The groove itself should be properly dimensioned in accordance with the sealing material chosen as hereinbefore explained.

It has been found that this construction, in which the seal ring is deformed into a carefully machined groove, provides exceptional sealing characteristics. It is believed that the deformation of the resilient seal ring into the groove makes this possible because the deformed seal ring is more able to accommodate irregularities which may occur in the annular seat ring and misalignments which may occur. The seal ring actually floats between the lower face of the pallet and the retainer member 24. Since the outer margin of the seal ring is free, the seal ring is free to swell outwardly without scalloping or distortion even though the cover may be subjected to unusual applications which normally cause swelling or shrinking.

The pallet or cover can be opened either by hand or by foot. If it is desired to open the pallet by hand, the portion 27*a* of the lever arm which extends beyond the pallet is grasped and lifted to raise the pallet. It can also be opened by the foot merely by kicking the heel against the portion 27*c* of the lever arm 27.

The stop pin 34 is provided so that the pallet is self-closing. The stop pin is positioned in such a manner that it is engaged by the ends of the hinge members 31 so that the pallet cannot be opened beyond the vertical position and thus when it is released it will drop to a closed position. For applications where self-closing action is not desired hinge members 31 may be shortened to clear the stop pin 34 to thereby permit the center of gravity of the moving parts to swing outboard of a vertical plane through the hinge axis.

It has been found that the sealing characteristics have improved with usage apparently because the flexible seal ring seats firmly in the groove and hugs very closely the contours of the seat ring to establish a tight and uniform seal around the entire seat surface.

It also has been found that our particular sealing arrangement seals almost perfectly even through the pallet may be slightly misaligned with respect to the seat. The seal ring in conjunction with the groove is able to accommodate any eccentricity of the pallet with respect to the seat due to manufacturing tolerances. It was found that when a seal ring of thicker and stiffer material was utilized so that the seal ring material did not deform into the groove so that it touched the top of the groove when in sealing engagement with the annular seat, a uniform sealing pressure was not obtained around the seat periphery, particularly where there was slight misalignment of the cover with respect to the seat.

With the particular pivotal connection shown, the possibility of misalignment of the pallet with respect to the seat ring is minimized. The stainless steel pin is fixed to minimize any movement at the hinge point. The only movement occurs between the hinge members 31 and the hinge pin. This is kept to a minimum by careful machining.

The pallet is weight loaded into a closed position. Although the device is conventionally used for a gauge hole cover the device may also serve as a relief valve when the pressure in the tank becomes too great. Normally, the pallet is weight loaded so that it will open at a pressure which is substantially above the pressure for which the breather valve is set. On small tanks, where no breather valve is utilized, the gauge hole cover is also utilized as a safety relief valve.

The leakage characteristics for one embodiment of the invention is shown in FIGURE 2. In this embodiment the seat ring had a diameter of six inches. A seal ring of Hycar 1/16" in thickness was utilized in conjunction with a groove having a depth of 1/16" and a width of 1/2". In the test shown in FIGURE 2, the pallet was loaded to relieve at 5.1 ounces per square inch or at 8.8 inches of water. As indicated by the curve in FIGURE 2 it was found that a pallet loaded in this manner allowed less than 0.1 cubic foot per hour of leakage at a pressure of 4.5 ounces.

Another embodiment of the invention is shown in FIGURE 3. It is substantially identical to that shown in FIGURE 1 with the exception that the lever arm 27 is provided with a hole 41 through which extends a cap screw 42 mounted in a bracket 43 fixed to the base 11. A hand operated clamp nut 44 threaded onto the cap screw 42 is utilized for locking the pallet into place so it cannot pop open. For convenience of manufacture all embodiments have the elongated hole 41 whether it is used or not.

This embodiment of the invention is utilized where it is not desired that the gauge hole cover be utilized as an emergency relief valve and where it is desired to hold tank pressures at greater pressures than can be obtained with only gravity loading.

Still another embodiment of our invention is shown in FIGURE 4. It is also similar to the device disclosed in FIGURE 1 with the exception that a screw type base is provided. The screw type base 51 as shown in the drawing is provided with an inner threaded portion 52 which is adapted to be threaded onto a pipe 53 which is secured to the top wall 56 of a tank. The base 51 is provided with an opening 58 which communicates with the pipe. A seat ring 59 of a suitable material such as stainless steel is carried by the upper extremity of the base 51.

It is apparent from the foregoing that we have provided new and improved gauge hole cover construction which is particularly adaptable for use with tanks or reservoirs in which volatile petroleum products are stored. The construction of the cover is such that it can be manufactured very economically. Since the seat ring is formed of stainless steel, corrosion is not a problem. The construction is such that a tight seal with exceptionally low leakage is obtained. The cover can be readily opened by hand or by foot.

We claim:

In a tank cover construction for application to a wall of a tank to prevent the escape of vapors therefrom and having an annular seat mounted on said wall and defining a service port through which vapors may pass, a pallet hingedly mounted on said tank and cooperating with said annular seat to close said port, said pallet being formed

with a downwardly facing open annular groove overlying said annular seat, a flexible substantially planar seal ring disposed adjacent the lower face of said pallet and in sealing engagement with said annular seat, an annular retaining member having a diameter substantially less than the diameter of the annular seat underlying the inner margin of said seal ring, a spacer member interposed between said retaining member and said pallet having a thickness greater than the thickness of said seal ring so that the seal ring has a free floating relationship between the retaining member and the pallet to permit expansion and contraction of the seal ring, the seal ring having a diameter substantially greater than the diameter of the retaining seat so that the outer margin of the seal ring is free of the pallet and extends beyond the groove, said groove having a planar upper surface adapted to be engaged by the seal ring and having a width which is substantially greater than the width of the annular seat, said groove also having a depth and said seal ring being formed of a material so

that when the pallet is in a closed position the portion of the seal ring in engagement with the annular seat is deformed into the groove by the weight of the pallet above and seated against only a portion of the width of the upper planar surface of the groove to establish a good seal between the pallet and the annular seat irrespective of shifting of position of the pallet on the seat in a plane substantially parallel to the plane of the seat.

References Cited in the file of this patent

UNITED STATES PATENTS

1,956,665	Cahall	May 1, 1934
2,206,848	McAvoy	July 2, 1940
2,261,457	Wiggins	Nov. 4, 1941
2,274,319	Chesterman	Feb. 24, 1942
2,828,176	Burgh	Mar. 25, 1958

FOREIGN PATENTS

735,862	Germany	May 29, 1943