March 10, 1953 C. M. ORR ET AL 2,630,937

SEAL SUPPORT FOR FLOATING ROOF TANKS

Filed Aug. 28, 1947 2 SHEETS—SHEET 1

Fig. 1.

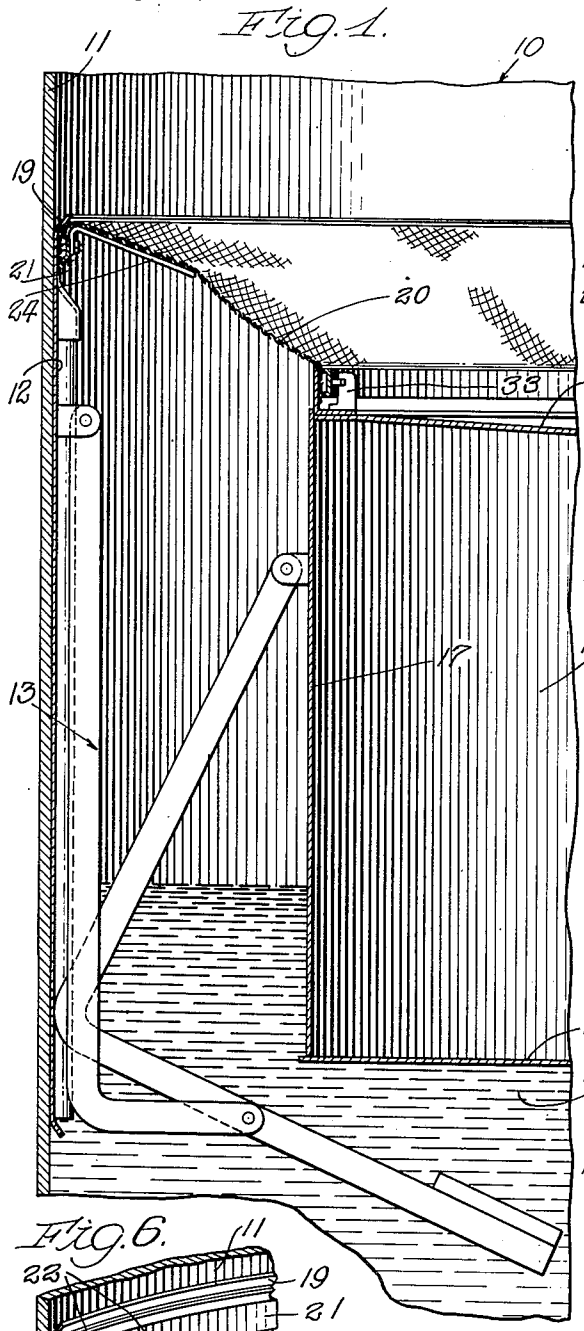


Fig. 2.

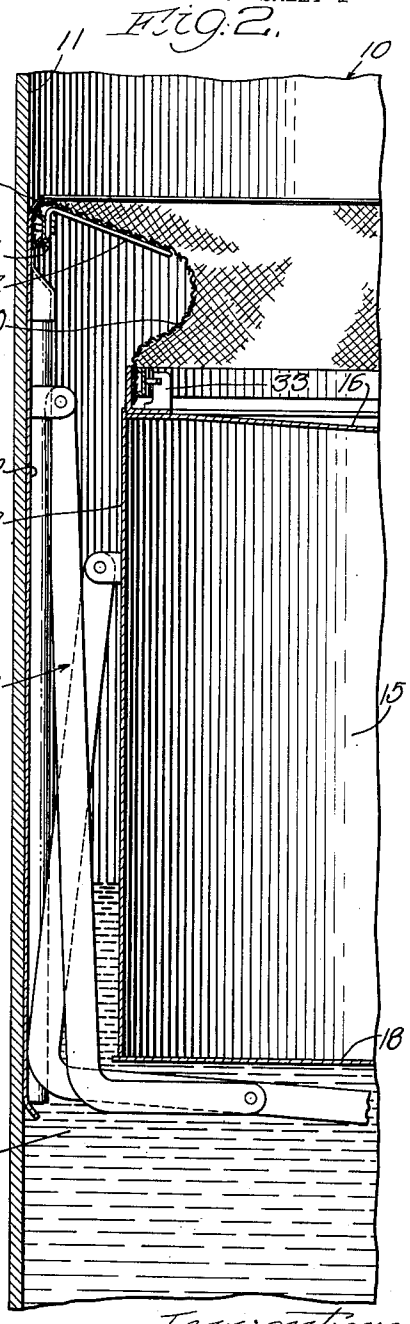
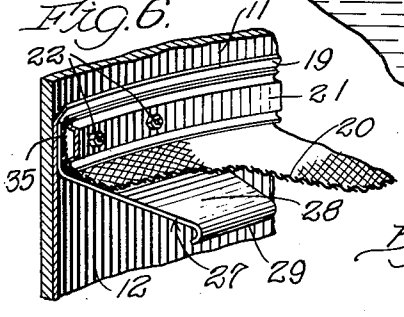


Fig. 6.



Inventors:
Clifford M. Orr,
Luther C. Bannister,
By Christie, Schroeder, Merriam & Hofgren,
Attys.

March 10, 1953 C. M. ORR ET AL 2,630,937

SEAL SUPPORT FOR FLOATING ROOF TANKS

Filed Aug. 28, 1947 2 SHEETS--SHEET 2

Fig. 3.

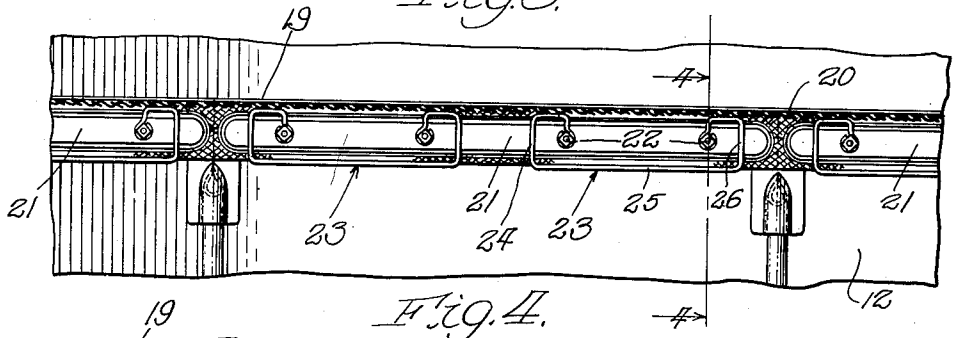
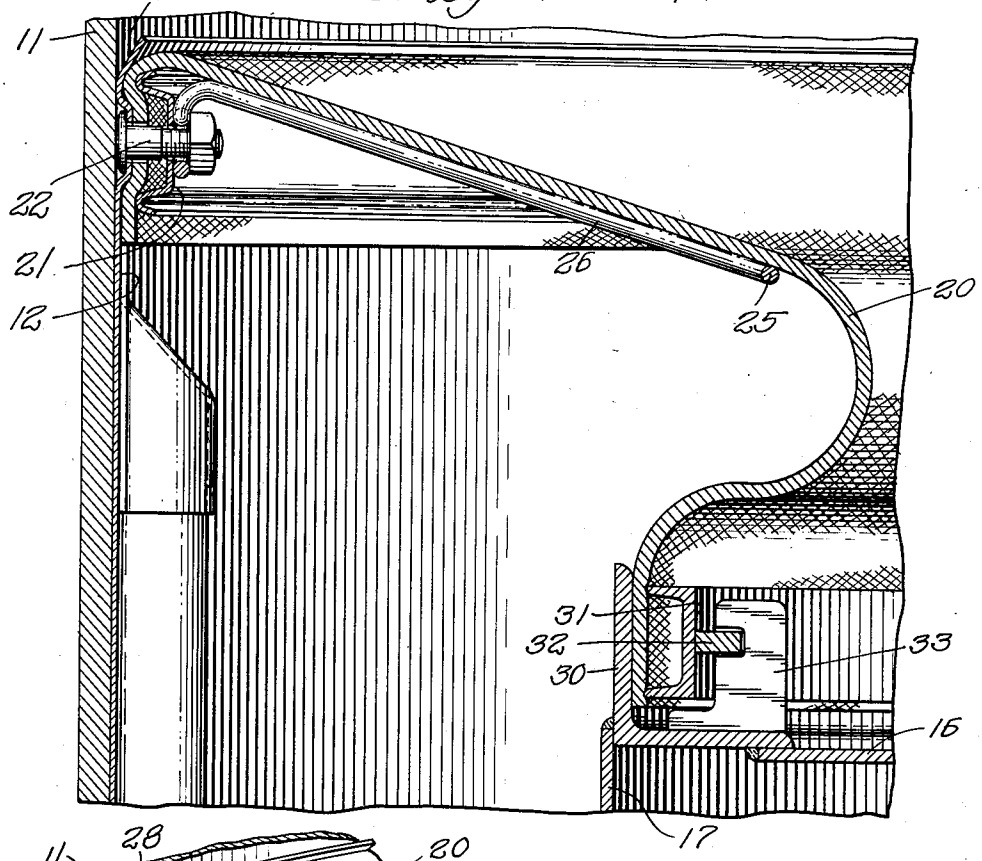


Fig. 4.



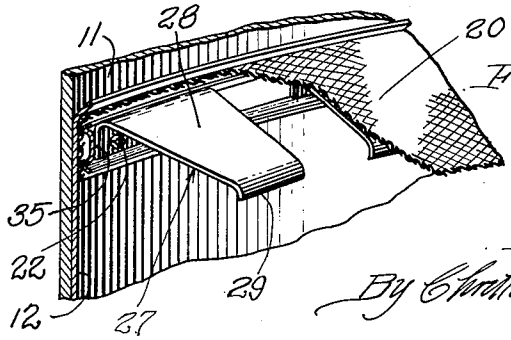


Fig. 5.

Inventors:
Clifford M. Orr,
Luther C. Bannister,
By Charlton, Schroeder, Merriam & Hofgren,
Attys.

Patented Mar. 10, 1953

2,630,937

UNITED STATES PATENT OFFICE

2,630,937

SEAL SUPPORT FOR FLOATING ROOF TANKS

Clifford M. Orr and Luther C. Bannister, Chicago, Ill., assignors to Chicago Bridge & Iron Company, a corporation of Illinois

Application August 28, 1947, Serial No. 770,984

1 Claim. (Cl. 220—26)

1

This invention relates to floating roof tanks, and more particularly to a means for preventing the formation of a trough in an annular seal between the floating roof and the shoes of a floating roof tank.

The advantages flowing from the use of floating roof storage tanks for storage of volatile liquids are receiving widespread recognition. Such storage tanks generally comprise a tank, a roof within the tank adapted to float upon the surface of the liquid stored therein, a plurality of shoes slidably contacting the side walls of the tank and an annular seal of flexible material sealing the space between the edge of the roof and the shoes. The annular seal is usually made of a vapor impervious, non-corroding, rubbery material, such as neoprene, and is generally constructed of a width greater than the distance between the roof and the shoes when the roof is centered in the tank. This additional width permits the roof to move horizontally within the tank without rupturing the seal. Therefore, when the roof is centered in the tank, the flexible seal sags downwardly in the space between the shoes and the roof forming a trough. As the roof moves horizontally within the tank, the trough may disappear on one side and deepen on the other. Rust, dirt and trash are caught in the trough, which accumulation is unsightly in all cases and positively damaging to the flexible seal in many cases.

We have invented and are disclosing and claiming a novel means for preventing the annular seal from sagging downwardly in the space between the roof and the shoes which comprises broadly a seal supporting member attached to the shoes beneath the seal and adapted to support the seal in a position where any curvature formed therein will be convex outwardly, as contrasted to the concave trough which would be formed in the absence of such supporting member.

The invention will be described as embodied in the accompanying drawings in which:

Fig. 1 is a vertical section of a portion of a liquid storage tank having seal supporting means embodying the invention;

Fig. 2 is a view like Fig. 1 showing the roof in a position closer to the side of the tank;

Fig. 3 is a top elevation of the device shown in Fig. 1;

Fig. 4 is a vertical section along lines 4—4 of Fig. 3; and

Figs. 5 and 6 are side elevations partly broken away for clarity of illustration, of modified forms of the device.

Referring now to the drawings, 10 indicates a

2

liquid storage tank having a side wall 11 and a plurality of shoes 12 held against the side walls of the tank by shoe supporting means generally indicated at 13. While any desired shoe supporting means may be used, which means form no part of this invention, the particular means shown are more fully described and claimed in the copending application of Frederick D. Moyer and Edward S. Fraser filed February 5, 1947, Serial No. 726,468, now Patent No. 2,518,488. The top portion 19 of the shoes is bent inwardly, as shown, to facilitate sliding of the shoes against the tank wall.

Floating upon the surface of the liquid 14 within the tank is a floating roof 15 having a top 16, a side 17 and a bottom 18. An annular seal 20 of flexible material is secured to the upper portion of the shoes and to the top of the roof to seal the space existing between the roof and the shoes. The seal is held in fluid-tight relationship against the shoes by means of a fabric clamp 21 bolted by bolts 22 to the shoe. The fabric clamp is preferably formed in sections, as shown, which sections extend around the periphery of the seal to form a substantially annular clamp.

The inner edge of the annular seal is clamped against an upstanding rim 30 on the top edge of the roof by means of a U-shaped clamp 31. The seal is wedged between the edge 30 and the clamp 31 by means of a wedge 32 driven between the member 31 and an upstanding lug 33 secured to the top 16 of the roof.

Two forms of a brace for supporting the seal are shown in the drawings. In Figs. 1 to 4, inclusive, the brace comprises a substantially U-shaped tubular rod 23 secured to the shoe by the bolts 22. The rod has a first portion 24 extending inwardly and downwardly from the point of attachment to the shoe, an intermediate portion 25 which extends substantially on a horizontal plane and a second portion 26 extending inwardly and upwardly from the end of the intermediate portion to its point of attachment to the fabric clamps by means of another bolt 22.

In the particular form shown in Fig. 5, the brace comprises a bracket 27 having a substantially flat top portion 28, a downwardly bent inner edge 29, and an outer edge 35, bent downwardly as shown. The edge 35 is provided with holes to receive the bolts 22 and is attached to the fabric clamp in a manner similar to that previously described.

The brace of Fig. 6 is similar in most respects to that of Fig. 5, with the exception that the outer edge portion 35 is bent upwardly. The brace is

secured to the shoes by being positioned under the fabric clamp and the seal and held in position by the bolts **22**. This arrangement locates the clamp and bolts above the seal, as shown, and therefore removes the clamp and nuts from the vapor space beneath the seal and away from possibly corrosive gases.

From the previous description, it will be noted that the braces have been attached to the bolts securing the fabric clamp **21** to the shoe. As such bolts are generally found on completed floating roof tanks, it can be seen that our brace can be attached to such tanks by means pre-existing thereon, thus eliminating the necessity of additional construction, welding and the like. If desired, however, the brace may be attached by means other than those shown.

From an examination of the drawings, it can be seen that no trough is permitted to form in the annular seal either when the roof is at its maximum distance from the edge of the tank (as shown in Fig. 1), or when the roof approaches minimum distance (shown in Fig. 2). Not only does our brace prevent a debris collecting trough from forming in the seal, but in addition, horizontal movement of the roof serves to remove such debris from the seal. It is evident that such debris would have a tendency to slide down the downwardly inclined portion of the seal directly above the brace, and with the roof in the position of Fig. 2, debris resting upon that portion of the seal between the end of the brace and the inner edge of the seal, would fall to the top of the roof.

While we have shown and described our invention in its preferred embodiment, it is to be understood that it is capable of many modifications. Changes, therefore, in the construction and arrangement may be made without departing from the spirit and scope of the invention as disclosed in the appended claim.

We claim:

A sealing structure for floating roof tanks, comprising an annular side wall shoe, a flexible gas-tight curtain-like sealing element bridging the space between said shoe and the floating roof and having its circumferential edges attached to said shoe and roof, and inwardly-projecting supporting arms on said shoe disposed beneath said sealing element, said arms being in the form of a substantially U-shaped rod having two points of attachment to the shoe, the rod at each point of attachment extending first upwardly to form a substantially vertical U-shaped member and then extending inwardly and downwardly to form an inclined U-shaped member conforming to the slope of the sealing element to form with the extension of the rod from the other point of attachment a U-shaped member, said arms supporting the intermediate portion of said element at points which cause said arms effectively to prevent the intermediate portions of the sealing element from assuming the shape or form of a pocket having an opening on the top side of said sealing element in which substantial quantities of water, dirt, etc., can collect.

CLIFFORD M. ORR.
LUTHER C. BANNISTER.

REFERENCES CITED

The following references are of record in the file of this patent:

UNITED STATES PATENTS

Number	Name	Date
2,066,292	Kuehn	Dec. 29, 1936
2,092,877	Haupt et al.	Sept. 14, 1937
2,329,966	Wiggins	Sept. 21, 1943