Nov. 27, 1951 F. D. MOYER 2,576,136

SUPPORT FOR A SEAL FOR A FLOATING ROOF

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Fig. 1.

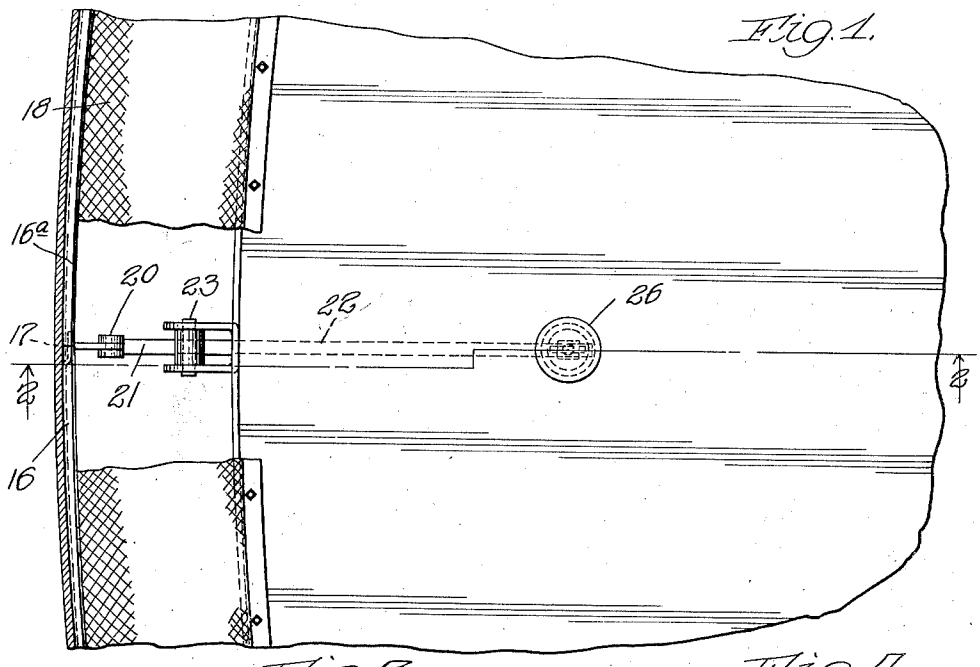


Fig. 3.

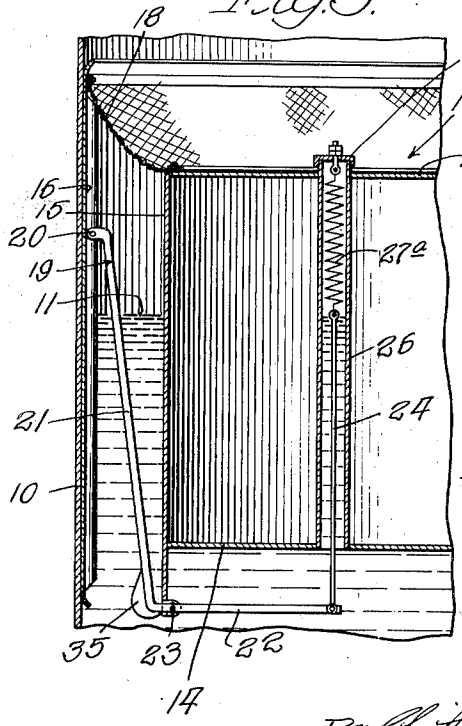
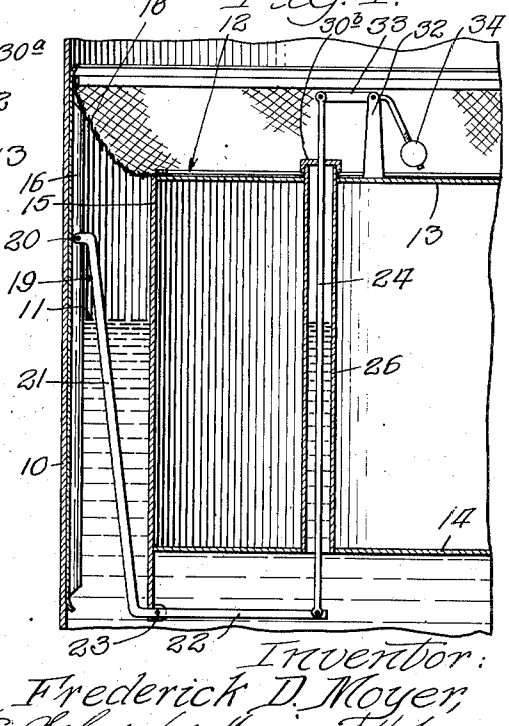


Fig. 4.



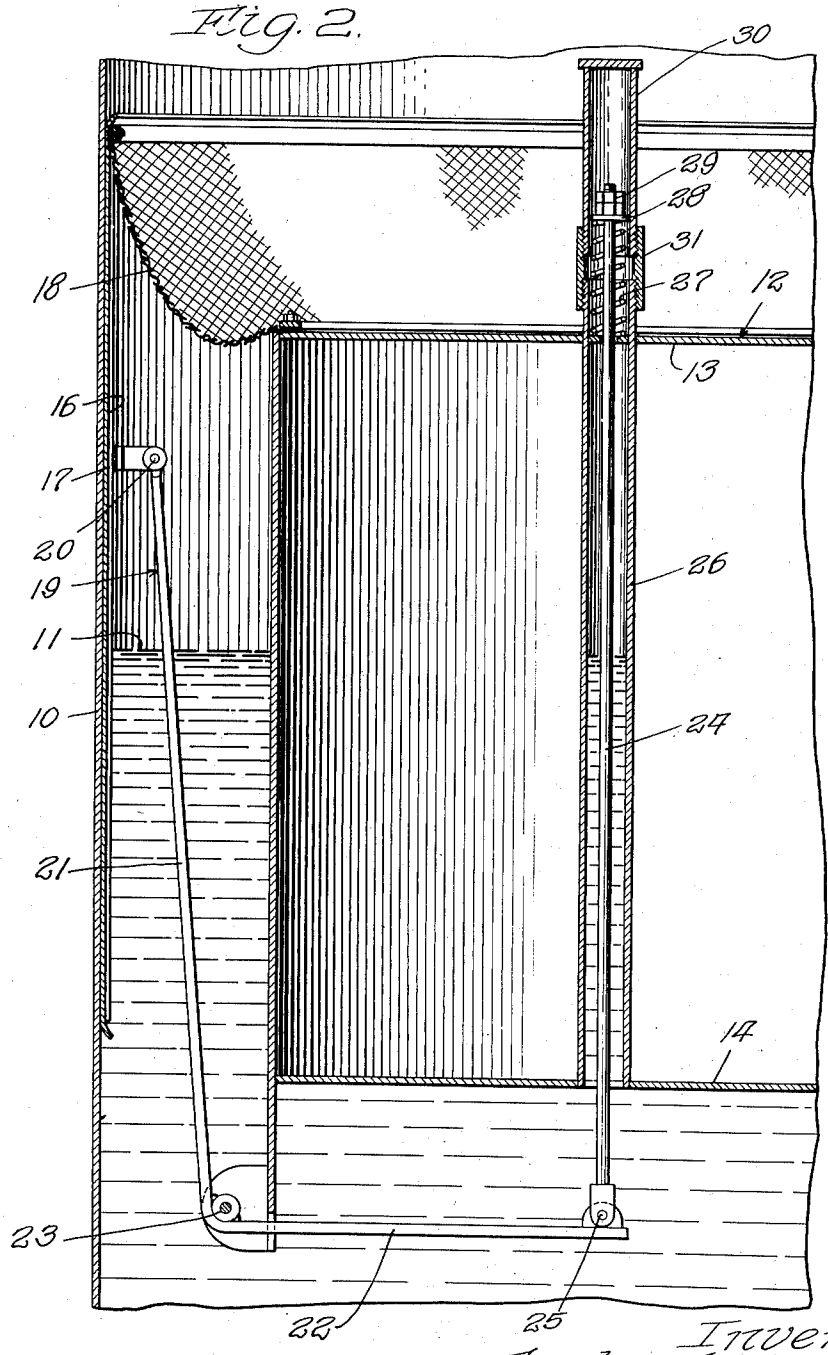
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Fig. 2.



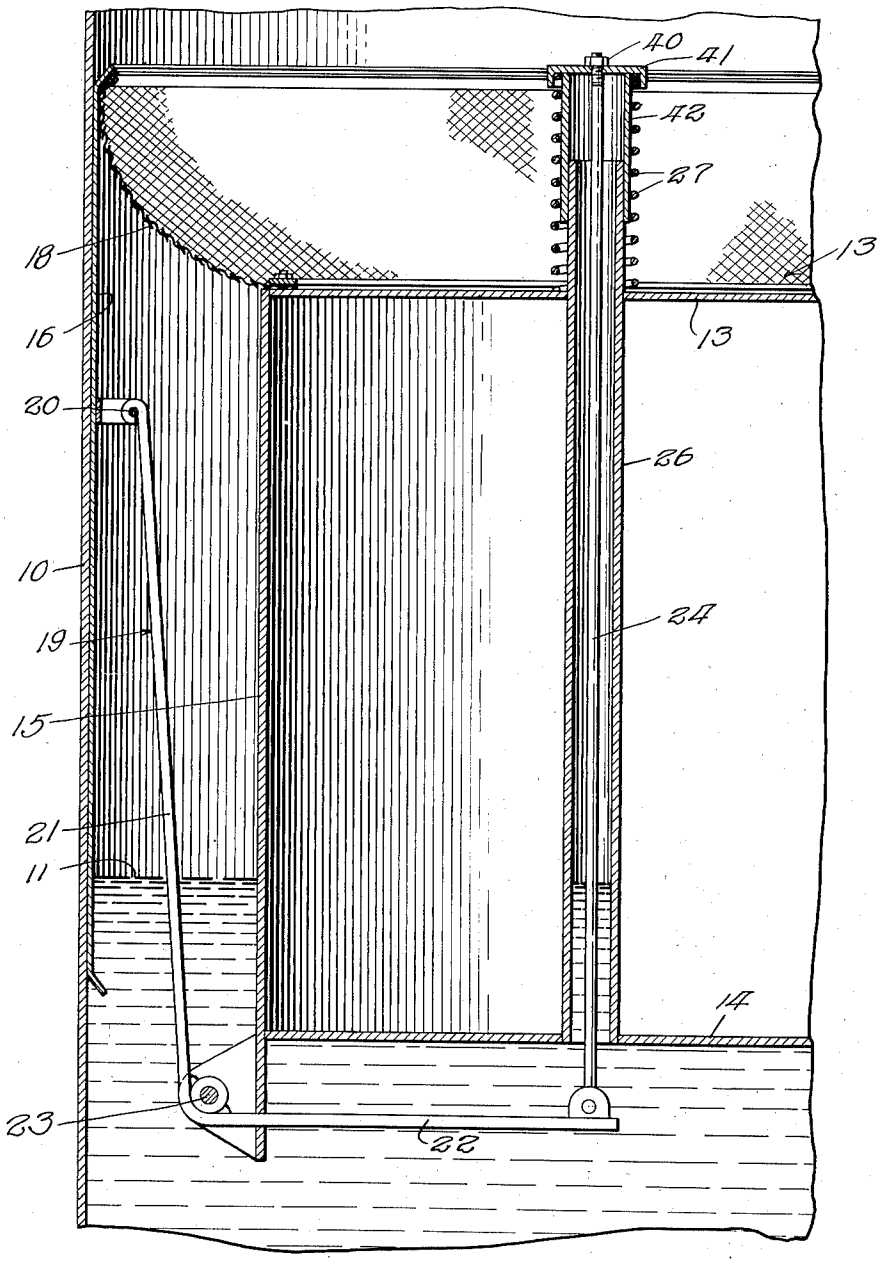
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Fig. 5.



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Patented Nov. 27, 1951 2,576,136

UNITED STATES PATENT OFFICE

2,576,136

SUPPORT FOR A SEAL FOR A FLOATING ROOF

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Application March 5, 1947, Serial No. 732,420

10 Claims. (Cl. 220—26)

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This invention relates to improvements in liquid storage tanks and more particularly to a seal hanger and centering device for a floating roof.

Liquid storage tanks are often provided with floating roofs designed to float upon the surface of the liquid present in the tank and to rise and fall with changes in the level of the liquid. In the usual construction, the roof is of lesser diameter than the tank, to eliminate possibilities of the roof becoming jammed during its vertical movement. It has been custmoary to provide a flexible seal, to seal the space between the roof and the tank to prevent the escape of gases.

I have invented and am herein disclosing and claiming an improved seal hanger wherein the seal is attached at its inner edge to the floating roof and at its outer edge to a plurality of shoes slidably contacting the inner surface of the tank walls, and means for pressing the shoes against the tank walls and simultaneously centering the roof.

In the accompanying drawings:

Fig. 1 is a plan view, partly in section and partly broken away, for clarity of illustration, a portion of a floating roof and a liquid storage tank showing the apparatus embodying my invention;

Fig. 2 is a sectional view along lines 2—2 of Fig. 1; and,

Figs. 3, 4 and 5 show modifications of the apparatus shown in Fig. 2.

In the drawings, 10 indicates a side wall of a liquid storage tank, being partially filled with liquid 11; 12 indicates a floating roof having a top portion 13, a bottom portion 14, and a side portion 15. A plurality of shoes 16 and 16*a* slidably contact the inner surface of the tank wall 10 about its periphery, said shoes overlapping at their juncture at 17, as shown. A flexible seal 18, attached to the top of the roof 13 and to the upper portion of the shoes, seals the space between the roof and the tank wall.

In the embodiments shown in Figs. 1 to 5 inclusive, the shoe 16 is supported in position by supporting arm 19 pivoted to the shoe at 20, as shown. The arm 19 has a downwardly extending portion 21 and an inwardly extending portion 22 in the form of a bell crank and is pivoted to the lower portion of the side 15 at its fulcrum 23, as shown. A rod 24 is pivoted to the inwardly extending portion 22 at 25 and projects upward through a cylinder 26 formed in the roof 12.

Means are provided for constantly exerting an upward force on rod 24, the means comprising,

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in the embodiment shown in Figure 2, a compression spring 27 interposed between the top 13 of the roof and a washer 28, the washer being held in position at the upper portion of the rod 24 by nuts 29. A cap portion 30 seals the top of the cylinder 26, which portion is threaded into a nipple 31 for ease of removal for inspection of the spring assembly.

In the embodiment shown in Fig. 5, the compression spring is positioned on the outside of the cylinder 26. A cap 41 is secured to the upper end of the rod 24 by means of a nut 40. The spring 27 presses at its lower end against the top portion 13 of the roof, and at its upper end against the underside of the cap 41. The cap is provided with a downwardly extending cylindrical portion 42 adapted to have a sliding fit over the projecting end of the cylinder 24 to maintain the rod and spring centered over the cylinder.

In the embodiment shown in Fig. 3, the upward force on the rod 24 is exerted by a tension spring 27*a*, the spring being attached to the upper portion of the rod and to a cap 30*a*, capping and sealing the cylinder.

In the embodiment shown in Fig. 4, the force exerting means comprise a fulcrum 32 mounted on the top of the roof and lever 33 pivoted to the fulcrum. One end of the lever is pivoted to the upper end of the rod 24, and a weight 34 mounted on the opposite end of the lever constantly exerts an upward force on the rod. The cap 30*b* closes the upper end of the cylinder. If desired, a bumper, such as 35 (as shown in Fig. 3) may be provided on the arm 19.

As the level of the liquid in the tank rises and falls, the roof will rise and fall a corresponding amount, and the shoes 16 and 16*a*, being attached to the roof by the means disclosed, will also slide up and down against the tank wall.

It can be seen that the forces created by the means shown in the drawings, presses the shoes against the tank wall and the pressure will vary inversely as the distance between the roof and the side of the tank, thus counteracting any force or tendency of the roof to move off center.

The structure shown in the drawings if, of course, duplicated about the entire periphery of the tank and roof, the number of cooperating arms and shoes provided depending upon the size of the tank involved.

The foregoing detailed description is given for clearness of understanding only, and no unnec-

essary limitations should be understood therefrom, for some modifications will be obvious to those skilled in the art.

I claim:

1. In a liquid storage tank having a floating roof, a plurality of shoes slidably contacting the tank wall and a flexible seal between said shoes and the roof, a seal hanger comprising a substantially L shaped supporting arm having one leg attached to said shoes and extending downwardly therefrom in the space between the roof and the sidewalls of the tank and with the angle of the L being pivoted to the lower portion of the roof, said arm having an inwardly extending leg forming a bell crank and the point of pivot to said roof being at the fulcrum; a substantially vertical cylinder formed in the roof and extending therethrough; a rod in said cylinder pivoted to said inwardly extending leg; spring means in said cylinder for constantly urging said rod in an upward direction, and means for sealing the upper end of the cylinder.

2. In a liquid storage tank having a floating roof, a plurality of shoes slidably contacting the tank wall and a flexible seal between said shoes and the roof, a seal hanger comprising a substantially L shaped supporting arm having one leg attached to said shoes and extending downwardly therefrom in the space between the roof and the sidewalls of the tank with the angle of the L being pivoted to the lower portion of the roof, said arm having an inwardly extending leg forming a bell crank and the point of pivot to said roof being at the fulcrum; a substantially vertical cylinder formed in the roof and extending therethrough; a rod in said cylinder pivoted to said inwardly extending leg; a fulcrum mounted on said roof; a lever pivoted to the fulcrum, said lever having a weight mounted on one end thereof and being pivoted at the other end to said rod; and means for sealing the upper end of the cylinder.

3. Apparatus of the character described in claim 1, wherein said arm is provided with a bumper.

4. In a liquid storage tank having a floating roof, a plurality of shoes slidably contacting the tank wall and a flexible seal between said shoes and the roof, a seal hanger comprising a substantially L shaped supporting arm having one leg attached to said shoes and extending downwardly therefrom in the space between the roof and the sidewalls of the tank with the angle of the L being pivoted to the lower portion of the roof, said arm having an inwardly extending leg forming a bell crank and the point of pivot to said roof being at the fulcrum, a substantially vertical cylinder formed in the roof and having a portion extending above the roof, a rod in said cylinder attached to said inwardly extending leg and a spring surrounding said portion of the cylinder and connected to said rod for constantly urging said rod in an upward direction.

5. In a liquid storage tank having a floating roof, a plurality of shoes slidably contacting the tank wall, and a flexible seal between the top portion of the shoes and the top portion of the roof, a seal hanger comprising, a supporting arm substantially in the form of an L having one leg pivotally connected near the top of each shoe and extending downwardly therefrom in the space between the roof and the sidewalls of the tank with the angle of the L being pivotally attached to the roof, said arm having its other leg extending inwardly from the angle to form a bell crank, and means for exerting an upward force on said other leg to press the shoe against the tank wall.

6. Apparatus of the character described in claim 5 in which said force exerting means comprises a substantially vertical cylinder formed in the roof and extending therethrough with said cylinder having an upper portion extending above the roof, a rod in said cylinder pivoted to said inwardly extended leg and spring means encircling the upper portion of the cylinder and connected to the rod for constantly urging said rod in an upward direction.

7. Apparatus of the character described in claim 5, wherein said force exerting means comprises a spring.

8. Apparatus of the character described in claim 5, wherein said force exerting means comprises a lever pivoted to a fulcrum mounted on said roof, a weight adjacent one end of said lever, and means securing the other end of the lever to said extension.

9. Apparatus of the character described in claim 5, including means whereby said force varies inversely as the distance between the shoe and the roof.

10. In a liquid storage tank having a floating roof, a plurality of shoes slidably contacting the tank wall and a flexible seal between the shoes and the roof, a seal hanger comprising: a downwardly extending substantially L-shaped supporting arm having one leg pivoted to each shoe with the angle of the L pivotally attached to the roof, said arm having its other leg extending inwardly beneath the roof from the angle to form a bell crank, and means for constantly urging said other leg in an upward direction including a lever pivoted to a fulcrum mounted on said roof, a weight adjacent one end of said lever, and means securing the other end of the lever to said other leg whereby the shoe is pressed against the tank wall.

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