

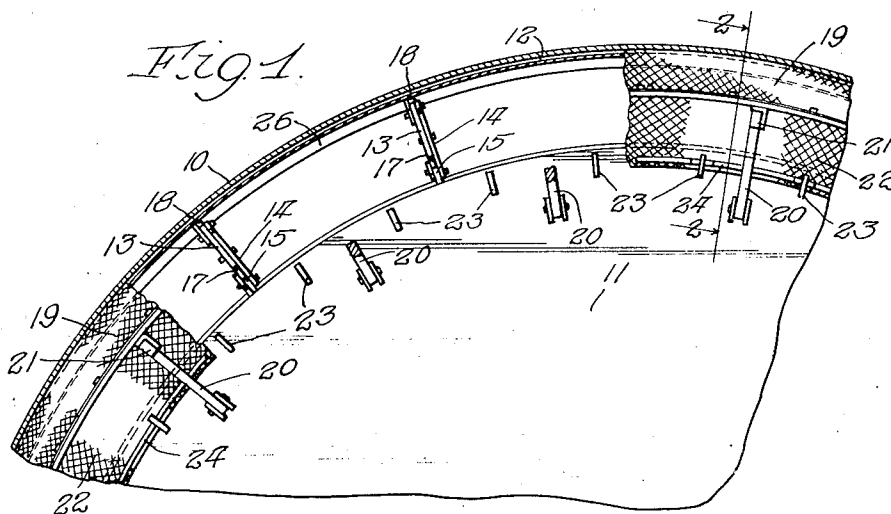
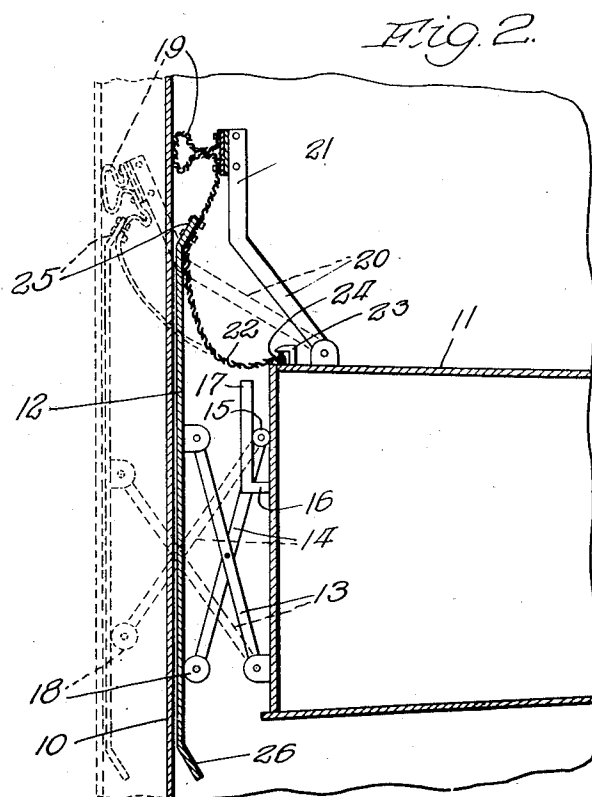
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SEAL FOR FLOATING ROOFS

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SEAL FOR FLOATING ROOFS

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This invention relates to a floating roof tank, and particularly to a seal for sealing the area between the edge of the roof and the shell of the tank.

Floating roof tanks are used for storing volatile liquids, with the roof floating on top of the stored liquid. This serves to reduce evaporation losses, as there is no large volume above the surface of the liquid. In these tanks it is necessary that the area between the edge of the roof and the shell of the tank be sealed so as to reduce evaporation and to prevent contamination by rain water, dirt, and the like.

I have invented an improved seal for a floating roof tank that provides a positive seal and that readily adjusts itself to varying distances between the edge of the floating roof and the shell of the tank. This improved seal comprises a shoe to be held against the shell of the tank and means for holding the shoe in vertical position. Means are also provided for sealing the top of the shoe and the shell and for sealing the floating roof and the shoe.

The invention will be described as related to the embodiment shown in the accompanying drawings. Of the drawings Fig. 1 is a fragmentary plan view of a floating roof tank embodying the invention, and Fig. 2 is a vertical section taken along line 2-2 of Fig. 1.

The tank shown in the accompanying drawings comprises a shell 10 and a floating roof 11. Around the inner surface of the shell there are provided a number of flat shoes 12 placed in end-to-end relationship in order to cover substantially the entire circumference of the shell. These shoes are held opposite the periphery of the floating roof by means of a plurality of spaced hanger bars 13 hingedly attached to the edge of the floating roof and to the shoe with the upper end of each bar attached to the shoe. There are also provided positioning bars 14 with each bar being hingedly attached to a hanger bar at the midpoint of the hanger bar and the positioning bar. The top end of the positioning bar is provided with a roller 15 held against the edge of the roof by means of a bracket 16. The bracket 16 has a long arm 17 spaced from the vertical edge of the roof and substantially parallel thereto with a roller 15 held between the arm 17 and the vertical edge of the roof. The lower end of the positioning bar 14 is provided with a second roller 18 in contact with the shoe 12. With this construction the shoe 12 is supported in substantially vertical position at all times, as the arrangement of hanger bars 13, positioning bars 14, rollers 15 and

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18, and bracket 16 acts as a pantograph to keep the shoe 12 and the vertical edge of the floating roof always substantially parallel, no matter what the distance is between the shoe and the edge of the roof.

There is also preferably provided a sealing means between the top of the shoe and the shell. This sealing means may have the form of a secondary seal 19 of fabric attached to the top of the shoe and held by a plurality of arms 20 spaced around the top edge of the floating roof. These arms are hingedly attached to the floating roof and have their upper portion 21 substantially vertical when the floating roof is substantially centrally positioned within the shell. This vertical portion 21 is a substantial part of the seal supporting arm 20, and as shown consists of slightly less than one-half of the total length of the arm 20. The vertical portion 21 serves to prevent the secondary seal assembly from moving out too far radially if the secondary seal should rise above the top of the shell. The force of gravity is usually sufficient to hold the secondary seal 19 in sufficiently tight contact with the shell 10, but spring means or the like may be provided on the arms 20 if desired.

The top of the shoe 12 may also be provided with a flexible sealing member 22 extending from the top of the shoe to the edge of the roof. The flexible sealing member 22 and the secondary seal 19 may both be made of a fabric impregnated with a flexible impervious material. The roof edge of the sealing member 22 is fastened to the edge of the roof by any suitable fastening device, such as a plurality of spaced hooks 23 holding a bar 24 in contact with the edge of the sealing member 22. It is preferred that the top marginal portion 25 and the bottom marginal portion 26 of the shoe 12 be bent back from the vertical away from the shell 10. The secondary seal 19 and the sealing member 22 may be fastened to the top marginal portion 25.

When the shell 10 is constructed it is usually of cylindrical shape. However, uneven settling of the foundation, wind, and the like, often cause the shell to get out of round. The seal as shown and described readily adjusts itself to this out-of-roundness, as is shown in dotted lines on Fig. 2.

Having described my invention as related to a typical embodiment of the same, it is my intention that the invention be not limited by any of the details of description unless otherwise specified, but rather be construed broadly within its spirit and scope as set out in the accompanying claims.

I claim:

1. In a seal for a floating roof tank, sealing means comprising a hanger bar hingedly attached to the edge of the floating roof and extending upwardly, a shoe hingedly carried by the upper end of said hanger bar and adapted substantially to fit against the shell of the tank, a positioning bar hingedly attached to the hanger bar at a point substantially midway between the ends of the hanger bar and the positioning bar with one end of the positioning bar contacting the side of the roof and being permissibly movable thereagainst and the other end movably contacting the shoe, means for holding said ends of the positioning bar in said contacting relationship, and a secondary seal attached to the top end of the shoe and adapted to contact the shell of the tank, said secondary seal being carried by a second hanger bar hingedly attached to the floating roof and extending upwardly toward the shell of the tank.

2. The seal of claim 1 wherein the hanger bar and the positioning bar are arranged between the vertical edge of the floating roof and the shoe and the roof end of the positioning bar is held substantially against horizontal movement while vertical movement is permitted.

3. The seal of claim 1 wherein at least one end of the positioning bar is provided with a roller.

4. In a seal for a floating roof tank sealing means comprising a hanger bar hingedly attached to the vertical edge of the floating roof and extending upwardly, a shoe hingedly carried by the upper end of said hanger bar and adapted substantially to fit against the shell of the tank, a positioning bar of substantially the same effective length as the hanger bar hingedly attached to the hanger bar at substantially their mid-points with one end of the positioning bar contacting the vertical edge of the roof above the roof end of the hanger bar and the other end of the positioning bar contacting the shoe below the shoe end of the hanger bar, said positioning bar having both its ends provided with rollers, a bracket mounted on the vertical edge of the roof having an extended portion substantially parallel to the vertical edge of the roof with the roller on the roof end of the positioning bar held in rolling contact between said extended portion and the vertical edge of the roof, a second hanger bar hingedly attached to the top edge portion of the roof and extending upwardly toward the shell of the tank, and a secondary seal carried by the upper end of the second hanger bar and attached to the top of the shoe.

5. The seal of claim 4 wherein the top and bottom marginal areas of the shoe are bent back toward the floating roof and the secondary seal is attached at the top marginal area.

6. The seal of claim 4 wherein the second hanger bar has its outer end substantially vertical when the floating roof is substantially centrally positioned within the shell, with the secondary seal carried by said outer end.

7. In a seal for a floating roof tank, shoe and hanger means comprising a hanger bar hingedly attached to the edge of the floating roof and extending upwardly, a shoe hingedly carried by the upper end of said hanger bar and adapted substantially to fit against the shell of the tank, a positioning bar hingedly attached to the hanger bar at a point substantially midway between the ends of the hanger bar and the positioning bar

with one end of the positioning bar contacting the side of the roof and being permissibly movably thereagainst and the other end movably contacting the shoe, and means for holding said ends of the positioning bar in said contacting relationship.

8. The seal of claim 7 wherein the hanger bar and the positioning bar are substantially equal in effective length.

9. The seal of claim 8 wherein the hanger bar and the positioning bar are arranged between the vertical edge of the floating roof and the shoe and the roof end of the positioning bar is held substantially against horizontal movement while vertical movement is permitted.

10. The seal of claim 8 wherein at least one end of the positioning bar is provided with a roller.

11. The seal of claim 8 wherein both ends of the positioning bar are provided with rollers and the roller on the roof end of said bar is held in rolling contact with the vertical edge of the roof by means of a bracket having an extended portion substantially parallel to the said vertical edge with the roof roller held between said extended portion and the vertical edge of the roof.

12. In a seal for a floating roof tank, shoe and hanger means comprising a hanger bar hingedly attached to the vertical edge of the floating roof and extending upwardly, a shoe hingedly carried by the upper end of said hanger bar and adapted substantially to fit against the shell of the tank, a positioning bar of substantially the same effective length as the hanger bar hingedly attached to the hanger bar at substantially their mid-points with one end of the hanger bar contacting the vertical edge of the roof above the roof end of the hanger bar and the other end of the positioning bar contacting the shoe below the shoe end of the hanger bar, said positioning bar having both its ends provided with rollers, a bracket mounted on the vertical edge of the roof having an extended portion substantially parallel to the vertical edge of the roof with the roller on the roof end of the positioning bar held in rolling contact between said extended portion and the vertical edge of the roof.

13. In a seal for a floating roof tank, secondary sealing means comprising a shoe adapted to fit substantially against the shell of the tank, a hanger bar having its lower end hingedly attached to the top edge portion of the roof and extending upwardly toward the shell of the tank, and a looped secondary seal located at the upper end of the hanger bar and secured directly thereto, said secondary seal extending downwardly therefrom in sealing relationship to the shoe, said hanger bar having its upper end portion normally substantially vertical when the floating roof is substantially centrally positioned within the shell.

14. In a seal for a floating roof tank, sealing means comprising a hanger bar hingedly attached to the edge of the floating roof and extending upwardly, a shoe hingedly carried by the upper end of said hanger bar and adapted substantially to fit against the shell of the tank, a positioning bar hingedly attached to the hanger bar at a point intermediate the ends of the hanger bar and the positioning bar with one end of the positioning bar contacting the side of the roof and being permissibly movable thereagainst and the other end movably contacting the shoe, a roller at each end of the positioning bar, the

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roller on the roof end of said bar being held in rolling contact with the vertical edge of the roof by means of a bracket having an extended portion substantially parallel to said vertical edge and with the roof roller held between said extended portion and the vertical edge of the roof, and a secondary seal attached to the top end of the shoe and adapted to contact the shell of the tank, said secondary seal being carried by a second hanger bar hingedly attached to the floating roof and extending upwardly toward the shell of the tank.

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