March 16, 1943. J. H. WIGGINS 2,313,856

SIDE WALL SHOE SUPPORTING MEANS FOR FLOATING TANK ROOF SEALS

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FIG. 2.

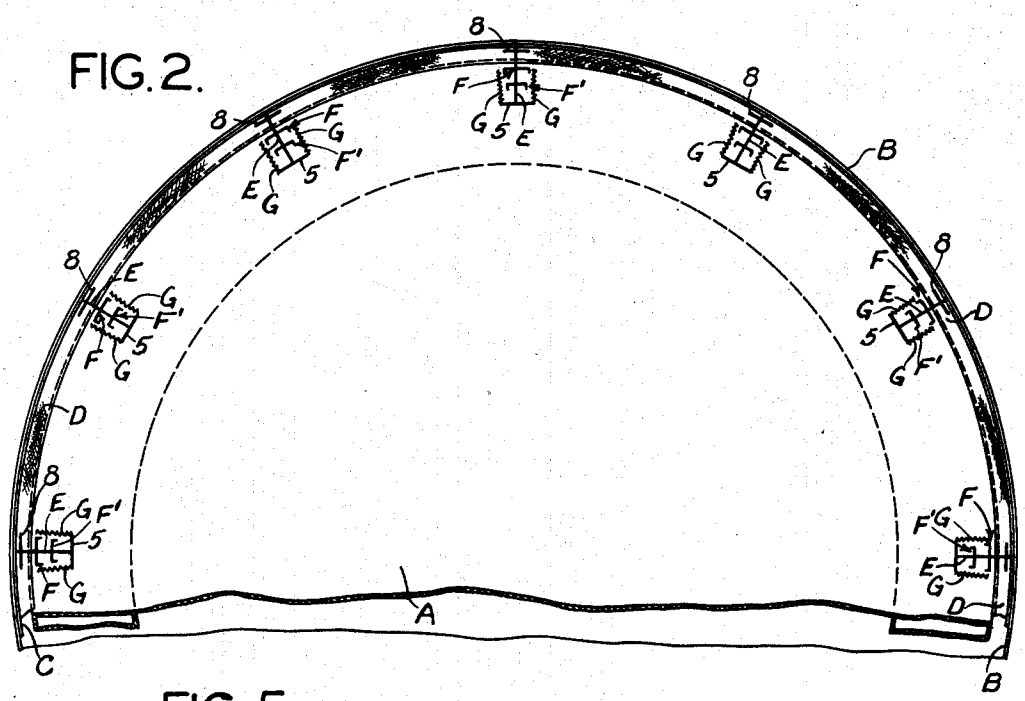


FIG. 5.

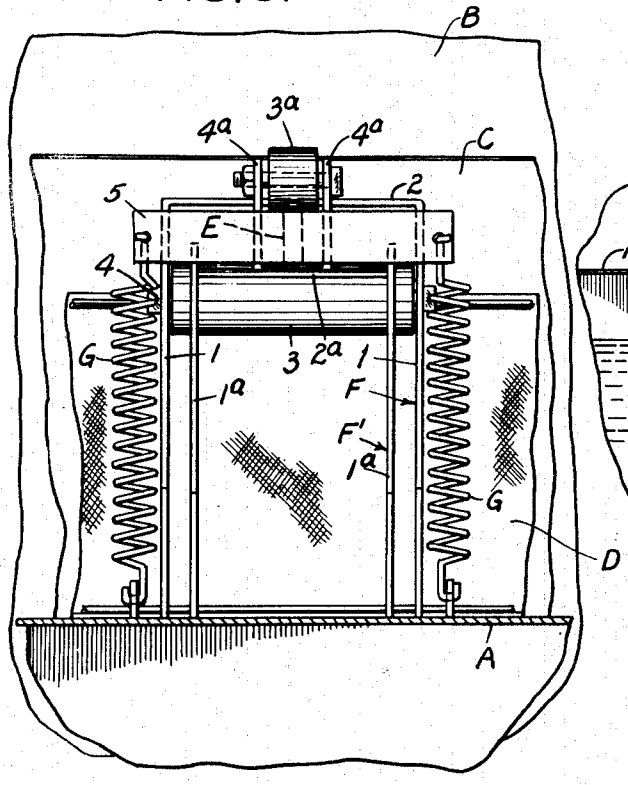
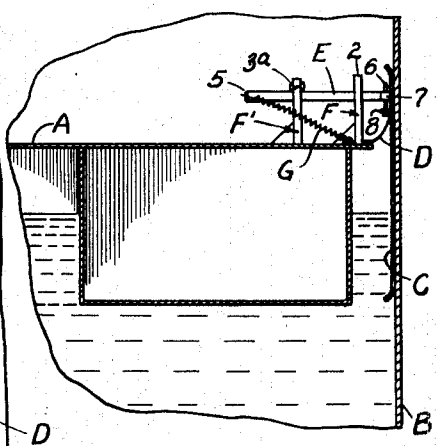


FIG. 1.



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FIG. 4.

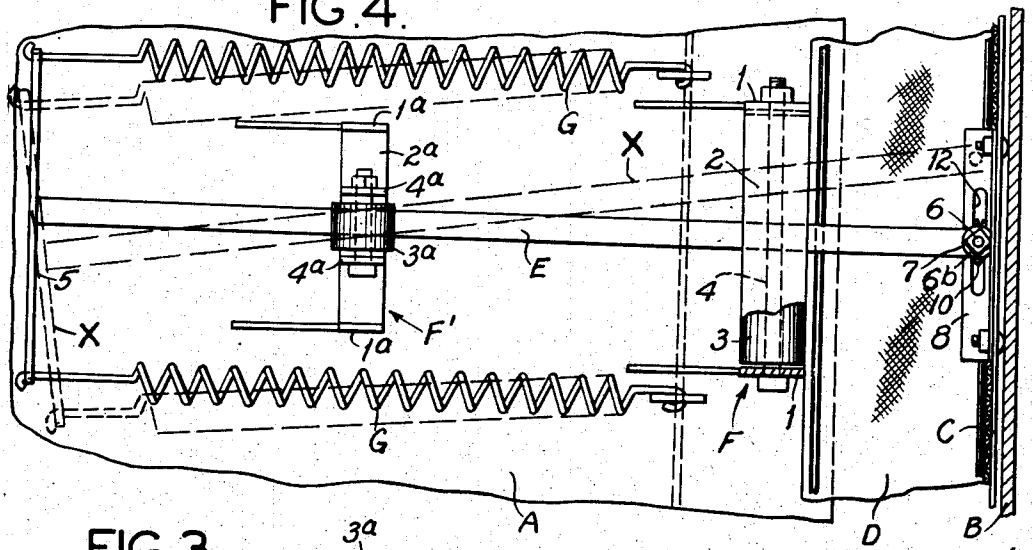


FIG. 3.

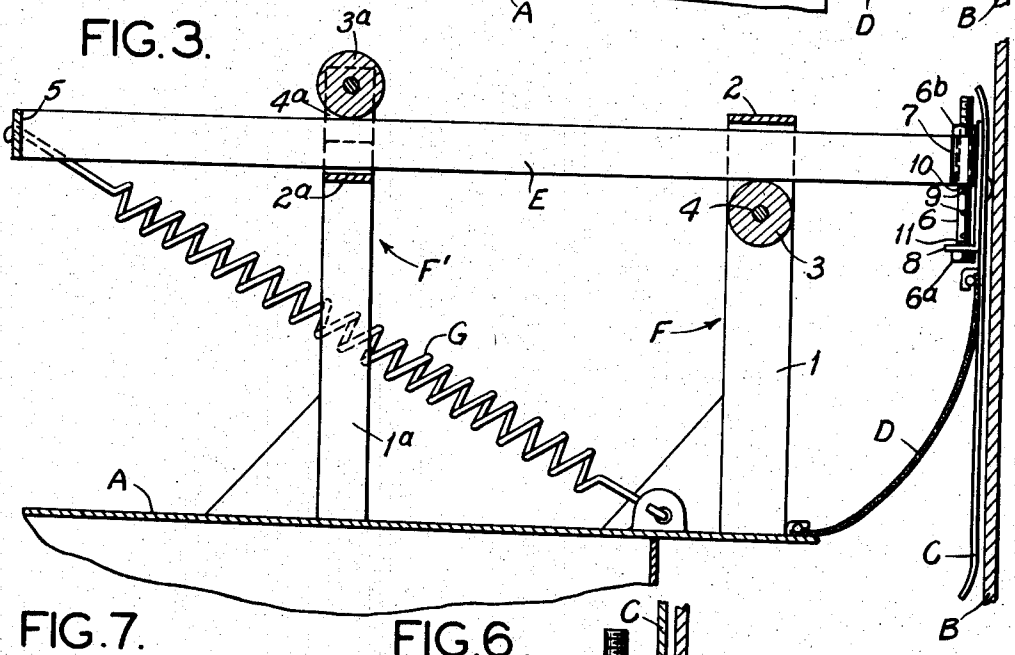


FIG. 7.

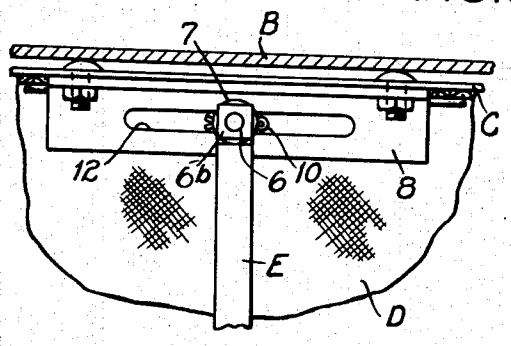
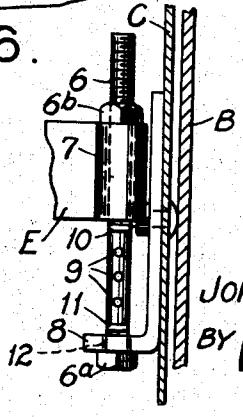


FIG. 6.



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UNITED STATES PATENT OFFICE

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SIDE WALL SHOE SUPPORTING MEANS FOR FLOATING TANK ROOF SEALS

John H. Wiggins, Chicago, Ill.

Application January 27, 1942, Serial No 428,421

2 Claims. (Cl. 220—26)

This invention relates to floating tank roof seals of the type that comprise an annular side wall shoe surrounding the peripheral edge of the roof, and particularly, to the means used in such structures for mounting the shoe on the roof in such a manner that the shoe is capable of moving radially, i. e., towards and away from the roof.

One object of my present invention is to provide a side wall shoe mounting or supporting mechanism of improved construction, that effectively holds the shoe in a true horizontal plane while said shoe moves radially, or inwardly and outwardly, relatively to the roof.

Another object is to provide a mounting or supporting means for a side wall shoe, which is of such design or construction that it permits the shoe to move circumferentially a limited distance relatively to the roof, while the shoe is maintained in a true horizontal plane.

Another object is to provide a side wall shoe supporting mechanism, which, in addition to maintaining the shoe in a horizontal plane and permitting it to move radially and circumferentially a limited distance relatively to the roof, also tends to hold the shoe in its original circumferential relationship with the roof.

Another object is to provide a side wall shoe mounting or supporting mechanism of the kind previously described, that is particularly adapted for use in a floating tank roof seal equipped with a circumferentially flexible side wall shoe, and with a closure made of fabric or similar flexible material, for the annular space between the roof and the side wall shoe.

And still another object of my invention is to provide a commercially practicable side wall shoe mounting or supporting mechanism, that is of rugged construction and composed of parts which are of such design that snow or ice will not seriously affect the operation of the mechanism, and long usage will not render the mechanism inefficient. Other objects and desirable features of my invention will be hereinafter pointed out.

Figure 1 is a fragmentary vertical sectional view of a floating tank roof equipped with a side wall shoe supporting means or mechanism embodying my present invention.

Figure 2 is a fragmentary top plan view of the structure shown in Figure 1.

Figure 3 is an enlarged side elevational view of one of the radially-movable, horizontally-disposed supporting members and the parts that cooperate with the same.

Figure 4 is a top plan view of the parts shown in Figure 3.

Figure 5 is an end view of the parts shown in Figure 3, looking outwardly towards the side wall of the tank, or, in other words, looking to the right from the left hand end of Figure 3.

Figure 6 is an enlarged detail view in side elevation, illustrating the adjustable connection between the side wall shoe and one of the supporting members on the roof; and

Figure 7 is a top plan view of the parts shown in Figure 6.

In the drawings A designates a floating roof, B designates the side wall of the tank, inside of which said roof is arranged, C designates an annular shoe that is arranged in opposed relationship to the tank side wall, and D designates a gas-tight closure for the annular space between the side wall shoe and the peripheral edge of the roof. The shoe supporting mechanism that constitutes my present invention is capable of use with various types and kinds of side wall shoes, but it is particularly adapted for use with a circumferentially flexible side wall shoe, because no parts of the shoe supporting mechanism interferes with the circumferentially flexing of the shoe or segments or sections of the shoe. Accordingly, in the preferred form of my invention herein illustrated, the shoe C consists of an annular member composed either of a substantially continuous, circumferentially flexible metal band, or a plurality of relatively long, limber metal shoe members joined together in a gas-tight manner and each capable of flexing circumferentially intermediate its ends so as to adapt itself to the curvature of the side wall of the tank, as described in my prior Patent No. 2,082,194, dated June 1, 1937.

The mechanism that is used to mount the shoe C on the roof A comprises a plurality of horizontally-disposed supporting members E reciprocatingly mounted on the top side of the roof in spaced relation around the circumferential portion of the roof, and constructed so that in addition to being capable of moving radially, inwardly and outwardly, the outer ends of said supporting members are capable of a limited swinging movement clockwise and counter-clockwise. The supporting members E are capable of moving independently of each other, and all of said members are mounted on the roof in such a way that during the reciprocating and swinging movement of said members, they are effectively held against vertical movement, either upwardly or downwardly. The particular number

of supporting members E with which the roof is equipped is immaterial, so long as sufficient supporting members are used to maintain the shoe C or the individual sections or segments of said shoe in a truly horizontal plane at all times.

In the preferred form of my invention herein illustrated each of the supporting members E is mounted on or within two vertically-disposed supports F and F' attached to the top side of the roof, and constructed so as to securely hold the supporting members E against vertical movement, either upwardly or downwardly, and permit any one of said members to reciprocate radially and also turn angularly sufficiently to cause the outer end of the member to move through a horizontal arc. The support F is set near the peripheral edge of the roof and the support F' is set inwardly some distance from the edge of the roof and is arranged in radial alignment with the support F. The support F is constructed so that it serves as a load carrying bearing for the supporting member E, with which it is associated and permits the front end of said supporting member to move a limited distance clockwise and counter-clockwise, and the rear support F' is constructed so that it co-acts with the front support to hold the supporting member E in a horizontal position and also serves as a guideway that holds the supporting member E against bodily lateral movement, but permits said member to swing horizontally sufficiently to result in a limited circumferential movement of the front end portion of said member. The particular way in which the supports F and F' are constructed to effect the results above described is immaterial, but in the form of my invention herein illustrated, the front support F consists of a relatively wide, vertically-disposed yoke on the top side of the roof provided with two parallel side pieces 1 spaced relatively far apart and joined together at their upper ends by a horizontally-disposed cross piece 2 located above or at the top side of the supporting member E, as shown in Figures 3 and 4. A horizontally-disposed roller 3 is arranged between the side pieces 1 at a point below the cross piece 2, so as to form a load-carrying bearing for the supporting member E, said roller being mounted on a shaft or axle 4 sustained by the side pieces 1. The distance between the cross piece 2 and the top side of the roller 3 is only a trifle greater than the depth of the supporting member E, so as to permit said member to reciprocate freely in a radial direction and to swing a limited distance in a horizontal arc while performing its function. The rear support F' also comprises parallel side pieces 1^a joined together at their upper ends by a cross piece 2^a, said cross piece having attached to the top side of same a substantially yoke-shaped part, whose side pieces are formed by a pair of relatively closely spaced, upwardly-projecting arms 4^a that carry a roller 3^a, which is arranged above or on the top side of the supporting member E. Bearing in mind that the side wall shoe C is attached to the front end of the supporting member, it will be seen that the weight of said shoe tends to hold the bottom edge of the supporting member E firmly down on the roller 3 of the front support F, and tends to force the top edge of said supporting member E upwardly against the roller 3^a on the rear support F', thereby causing said front and rear supports to co-operate with each other to effectively hold the supporting member E in a truly horizontal position. During the upward movement of the roof, the weight or load imposed on the outer end of the supporting member E is applied downwardly on the roller 3 of the front support, and applied upwardly against the roller 3^a of the rear support. During the downward movement of the roof, if the shoe C sticks to the side wall of the tank, the cross piece 2 of the front support F exerts pressure on the supporting member E in a direction to dislodge the shoe or break it away from the tank side wall. The arms 4^a on the rear support F' that carry the roller 3^a are spaced apart a distance only slightly greater than the width of the supporting member E, but the side pieces 1 of the front support that carry the roller 3 are spaced relatively far apart, as shown in Figure 4. Consequently, the supporting member E is capable of rocking horizontally in the rear support F', so as to permit the front end of said supporting member to move a limited distance clockwise and counterclockwise, the side arms of the rear support effectively holding the supporting member E against bodily lateral movement, and the side pieces 1 of the yoke-shaped front support serving as stops that limit the swinging movement of the front end portion of the supporting member E.

A means is provided for exerting outward pressure on the supporting members E, so as to hold the shoe C in snug engagement with the tank side wall. Various means may be used for this purpose, but I prefer to employ contractile springs G attached to the top side of the roof A and to the inner ends of the shoe supporting members E, and disposed so as to constantly exert outward pressure on the shoe supporting members E, i. e., press them outwardly towards the side wall of the tank. As previously explained, the side wall shoe C is preferably constructed in the form of a substantially continuous, circumferentially flexible, metal band, or else is made up of a plurality of relatively long, limber or circumferentially flexible shoes that will conform to the shape or curvature of the tank side wall, when said side wall goes out of round, as is bound to occur in a storage tank of great diameter provided with a cylindrical metal side wall. In order that the side wall shoe or segmental sections of said shoe, will properly contact the side wall of the tank at all times, it is essential that the shoe C be mounted on the roof in such a manner that the shoe is capable of moving circumferentially relatively to the roof A, which always retains its original circular shape. It is for this reason that the supporting members E are mounted on the roof in such a way that the outer ends of said supporting members, which are attached to the side wall shoe C, are capable of a limited circumferential movement clockwise and counter-clockwise. It is essential, however, that for best results, the supporting members E be mounted on the roof in such a way that if the side wall shoe moves circumferentially, the supporting members E will restore the shoe C to its original circumferential relationship with the roof A. Accordingly, I prefer to employ two coiled springs G for each of the supporting members E, arranged at the opposite sides of the supporting member and attached to a cross bar 5 fastened to the inner end of the supporting member. So long as the supporting member E is in a radial line, as shown in solid lines in Figure 4, the springs G exert no pressure on the supporting member E in a direction tending to move said member E circumferentially relatively to the roof, but if the supporting member E moves from

the position shown in full lines in Figure 4 into the position *x* shown in broken lines in said figure, due to circumferential movement of the side wall shoe relatively to the roof, then one or the other of the springs G, depending upon whether the outer end of the supporting member E has swung clockwise or counter-clockwise, will exert pressure on the supporting member E in a direction tending to restore the member E to its former truly radial position, and hence, bringing the side wall shoe back to its original circumferential relationship with the roof. In order to produce an efficient structure, in which the rear support F' will not interfere with the horizontal swinging movement of the supporting member E, the cross bar 5, to which the springs G are attached, is made of substantially the same length as the width of the front supporting yoke F, and the rear supporting yoke F' is made narrow enough so that the springs G will never strike against the same. In fact, the rear support may consist simply of an upright provided at its upper end with a substantially yoke-shaped, horizontally-disposed guideway that need only be made wide enough to receive the supporting member E, inasmuch as its main function is to serve as a support in which or on which the supporting member E can pivot when the front end of said supporting member swings horizontally to provide for the circumferential movement of the shoe relatively to the roof.

The side wall shoe is attached to the supporting members E preferably by a means which suspends said shoe from the outer ends of said members, and permits the shoe to move circumferentially a limited distance, as previously explained. While various means may be used for this purpose, I prefer the construction herein illustrated, which comprises a vertically-disposed member 6 mounted in a tubular bearing 7 on the outer end of each of the supporting members E, and having its lower end fastened to a horizontally-disposed bracket 8 that projects inwardly from the inner side of the side wall shoe C. The vertically-disposed member 6, which serves to suspend the side wall shoe from the outer end of the supporting member E, is herein illustrated as consisting of a long bolt, whose head 6a is positioned on the underside of the bracket 8, and whose nut 6b is positioned on the top side of the bearing 7. The shank of said bolt is provided with a plurality of horizontally-disposed holes 9 that are adapted to receive removable fastening devices, such as cotter keys 10 and 11, arranged on the underside of the bearing 7 and on the top side of the bracket 8, respectively, so as to prevent the bolt 6 from moving vertically relatively to said bearing 6 and bracket 8. As shown in Figure 7, the bolt 6 extends upwardly through an elongated slot 12 in the bracket 8. In the operation of mounting the shoe C on the roof A, the bolts 6 can be vertically adjusted so as to raise or lower the shoe relatively to the supporting members E, and thus bring the shoe into proper horizontal relationship with the roof, after which the cotter keys 10 and 11 are inserted to hold said bolts in adjusted position. When the structure is in use, the elongated slots 12 in the brackets 8 make it possible for the side wall shoe to move circumferentially a limited distance relatively to the supporting members E from which said shoe is suspended.

A side wall shoe supporting means of the construction above described has the following desirable features or characteristics, to wit, it is inexpensive; it is easy to install; it insures that the supporting members E will hold all portions of the shoe, or all the segments of said shoe in snug engagement with the tank side wall; it provides for the circumferential movement of the shoe relatively to the roof; it permits the shoe to be adjusted vertically relatively to its supporting members; it prevents the shoe from sticking to the tank side wall; it insures that the shoe will slide properly over the tank side wall and remain in snug engagement with same when the roof rises and falls; it tends to hold the shoe in its original circumferential relationship with the roof; it is of such design that the co-acting parts of same will not bind or be prevented from functioning properly, due to the accumulation of snow or ice thereon, and, in addition to having all of the above described desirable characteristics, it makes certain that the shoe will be maintained in a truly horizontal plane when the shoe moves radially and/or circumferentially.

Having thus described my invention, what I claim as new and desire to secure by Letters Patent is:

1. A supporting mechanism for the side wall shoe of a floating tank roof seal, comprising a horizontally-disposed, reciprocating supporting member connected to the shoe, and a pair of guide bearings for said supporting member mounted on the top side of the roof in substantially radial alignment with each other, the outer bearing being constructed so as to permit the outer end portion of said supporting member to swing horizontally a limited distance, clockwise and counter-clockwise, and the inner bearing being constructed so as to act as a pivot for said supporting member during such horizontal swinging movement.

2. A supporting mechanism of the kind described in claim 1, equipped with a resilient means that tends to resist horizontal, swinging movement of the outer end portion of said supporting member.

JOHN H. WIGGINS.