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2,190,476

RESILIENT SEAL FOR FLOATING ROOFS

Filed Jan. 21, 1937

2 Sheets-Sheet 1

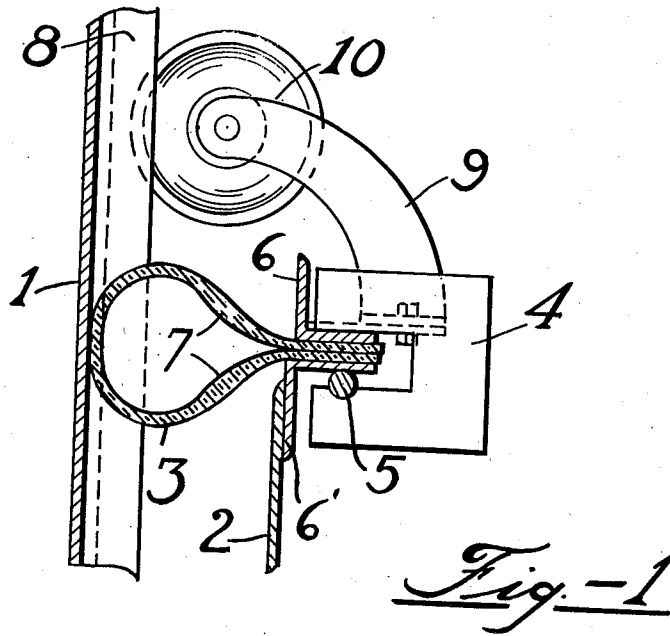


Fig. -1

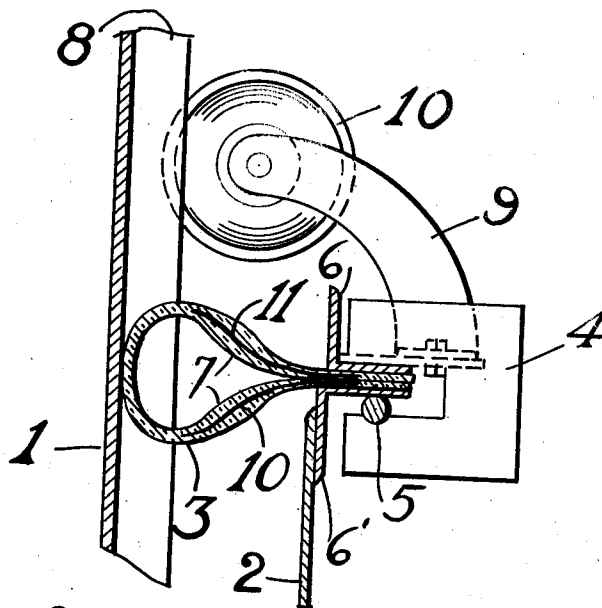


Fig. -2

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2 Sheets-Sheet 2

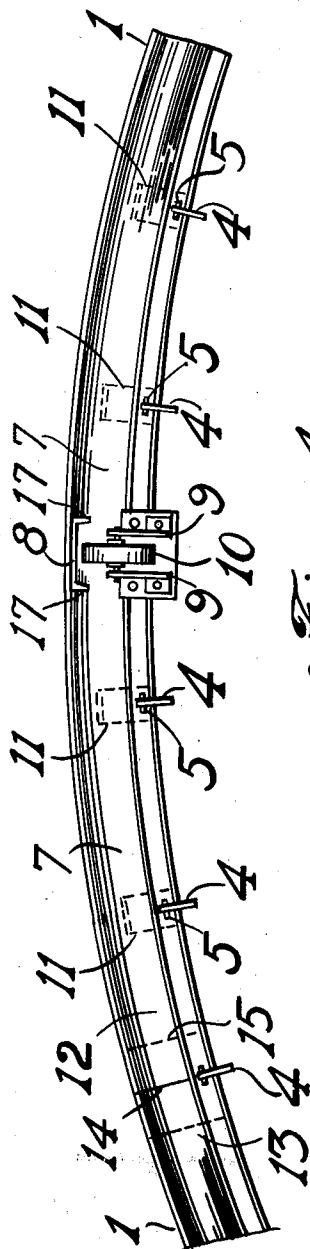


Fig. 4

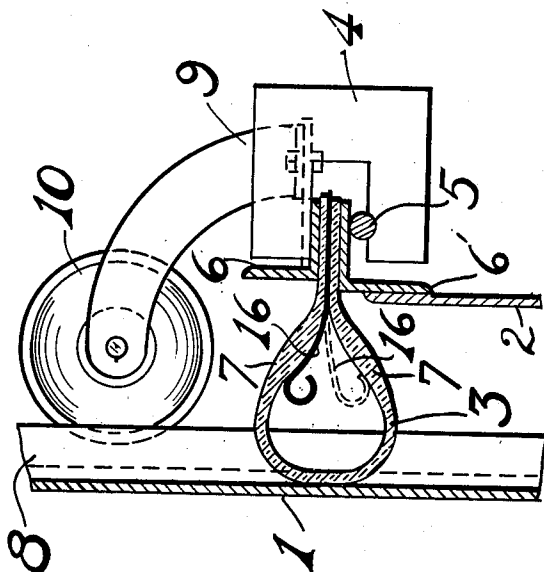


Fig. 3

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UNITED STATES PATENT OFFICE

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RESILIENT SEAL FOR FLOATING ROOFS

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velopment Company, a corporation of Delaware

Application January 21, 1937, Serial No. 121,452

9 Claims. (Cl. 220—26)

This invention relates to improvements in seals for floating roofs or decks, especially those designed for use in connection with storage tanks for volatile petroleum oils. A particular object of the invention is to provide against sagging of the seal even after long continued use.

A further object of the invention is to provide a seal resiliently supported by integral or supplemental means in such manner as to sustain the seal without damage or undue wear caused by unyielding contact with tank wall.

Further objects and advantages will appear from the following description read in connection with the accompanying drawings, in which:

Fig. 1 is a vertical transverse section through an elementary form of the seal.

Fig. 2 is a similar view through another form of the seal showing supplemental supporting means therefor.

Fig. 3 is a vertical transverse section through a form of the seal, in which an additional means of supplemental support is illustrated.

Fig. 4 is a plan view showing a portion of the tank in which the seal is installed.

Referring to Fig. 1, reference numeral 1 indicates the wall of the tank, 2 the enlargement of the floating roof and 3 the flexible sealing member which may be of any suitable material such as rubber, leather, rubberized fabric or the like. The seal has a substantially pear-shaped cross-section and may be formed of a substantially flat sheet, the edges of which are brought together throughout the length of the seal and at spaced intervals secured by clamps 4 and wedges 5 to the margin of the floating roof. Angle members 6 and 6', substantially annular in shape, are provided as bearing surfaces between the seal and the clamps. If desired, a tubular sealing member may be substituted for the flat sheet folded as shown, in which case one side of the tubular member will be compressed by means of the clamp 4 and the bearing members 6 and 6' so as to impart to said tubular member a conformation substantially equivalent to that secured by the use of the folded flat sheet. In either instance, one or both of those portions of the side walls adjoining the roof edge may be thickened to provide an integrally formed support for the seal. In Fig. 1 is shown a seal having both upper and lower portions thickened, as indicated by the numeral 7.

In order to prevent lateral movement of the tank roof as a result of which the seal would be crushed against one portion or another of

the tank, means are provided to maintain the roof in a substantially concentric relationship to the tank walls and to some extent also provide against rotation of the roof within the tank. Various means for accomplishing these ends may be adopted but, as illustrated, a plurality of channelled guideways 8 are disposed vertically about the tank walls and a corresponding number of guide members are provided on the roof consisting, in this instance, of arms 9 secured to the roof supporting rollers 10 in such manner that the rollers extend beyond the roof into the guideways 8 provided on the tank wall 1.

Referring to Fig. 2, another form of the seal is shown in which resilient metal strips 11 are embedded in spaced relation to each other in those portions of the sealing member adjacent the roof edge, in such manner that the inner ends of the strips 11 will lie within those portions of the sealing member engaged by the clamping means described in connection with Fig. 1 and the outer ends will terminate within the material of the sealing member in spaced relation to the tank wall 1 when the seal operatively engages said wall.

As shown in this figure, the sealing member is formed with thickened portions 7, within which the metallic strips 11 are disposed for a substantial portion of their length. In such instance the strips 11 supplement the supporting function of the thickened portions 7 but, if operating conditions are such that such additional support is not necessary, the sealing member may be formed without the thickened portions 7 and the principal support for the seal derived by the action of the metallic strips 11 alone.

If it is desired, the sealing member 3, having thickened portions 7, may derive additional support in the general manner shown by the co-pending application of Charles H. Haupt and Earle W. Hall, Serial No. 625,884, filed July 29, 1932.

In Fig. 3 is illustrated a combination in which the sealing member 3, having thickened portions 7, secures supplemental support against sagging by means of resilient metallic strips 16 spaced from each other, disposed with their inner ends between the ends of the sheet forming the sealing member and secured by means of the clamping members 4, 5, 6 and 6' and with the outer ends, formed substantially as shown, extending into the bulb-like chamber formed within the seal.

In Fig. 4 a more complete understanding of the relationship of the parts described in con-

nection with Figs. 1, 2 and 3 may be obtained. In this figure is shown the tank wall 1, the guideways 8, the sealing member 3, the clamping members 4 and 5, the guide arms 9, the rollers 10 supported thereby and the metallic strips 11. In addition, there is shown by this figure the manner in which, when the tank roof is of such size as to prevent the use of a continuous sealing member, the seal may be formed of sections as 12 and 13 joined as at 14 by the insertion of a loop 15 of somewhat smaller size, within the adjacent ends of the sections, the edges of the inserted member, as well as the edges of the loop sections, being brought together on the roof edge and secured by means of the clamping members, as previously described. The joint thus formed may be made air-tight, if desired, by uniting the material of the sections to the material of the insert. Fig. 4 also shows the manner in which the seal is made to encompass the protruding portions of the guideways 8 by means of slots 17 cut in the material of the seal, as required.

We are aware that various forms of sectional sealing tubes or loops and numerous kinds of spring supports have been proposed by the prior art. So far as we are aware, however, all have had for their purpose the forcing of the seal against the wall of the tank by pressure directly transmitted from the supporting means through the fabric to the wall. As distinguished from this, the support provided for the present seal is disposed in spaced relation to the tank wall and provides freedom of movement for that portion of the seal which engages the surface of the said wall.

Various changes and alternative arrangements may be made within the scope of the appended claims, in which it is our intention to claim all novelty inherent in the invention as broadly as the prior art permits.

We claim:

1. A sealing member for forming a substantially fluid tight seal in the space between the tank wall and a floating roof for the tank, comprising a substantially self-supporting annular loop of flexible resilient material and integral with said material, supplemental supporting means disposed in spaced relation to the tank wall by not less than the thickness of the flexible, resilient loop-material normally engaging the wall surface.

2. In combination with the floating roof of a tank, a seal comprising a flexible member closing the space between the roof and the tank, and a plurality of resilient metallic member adapted to support said flexible member in certain positions thereof, imbedded in the flexible member at spaced intervals from each other, with their inner ends secured, with the flexible member, to the roof of the tank, and their outer ends extending toward but spaced from the wall of the tank by not less than the thickness of that portion of the material of the flexible member normally engaging the tank wall surface.

3. A sealing member for forming a seal in the space between a tank wall and a floating roof, including a sealing member formed of flexible material protruding radially outwardly from the roof, and resilient strips embedded in the sealing member protruding radially outwardly at spaced intervals from the roof and terminating in spaced relation to the free end of the sealing member whereby the sealing member is yieldingly supported by the resilient strips in substantially

radial position when the sealing member is sliding over irregularities on the wall surface.

4. A sealing member for forming a seal in the space between a tank wall and a floating roof, including a tubular sealing member formed of flexible material protruding radially outwardly from the roof, and resilient strips embedded in the tubular sealing member protruding radially outwardly at spaced intervals from the roof and terminating in spaced relation to the free end of the tubular sealing member whereby the sealing member is yieldingly supported by the resilient strips in substantially radial position when the sealing member is sliding over irregularities on the wall surface.

5. A sealing member for forming a seal in the space between a tank wall and a floating roof, including a substantially annular clamping member supported on said roof, a sealing member formed on a strip of flexible material bent into bulb-like cross sectional shape and having its edge portions clamped against each other by said clamping member to cause the free end of the bulbous portion of said sealing member to engage said tank wall, and resilient strips embedded in the flexible material protruding radially outwardly at spaced intervals from said clamping member and terminating in spaced relation to the free end of the bulbous portion whereby the sealing member is yieldingly supported by the resilient strips in substantially radial position when the loop is sliding over irregularities on the wall surface.

6. A sealing member for forming a seal in the space between a tank wall and a floating roof, including a tubular sealing member formed of flexible material protruding radially outwardly from the roof, and a plurality of pairs of resilient strips, the strips of each pair being embedded in the opposite walls of the tubular sealing member, the pairs of strips protruding radially outwardly from the roof at spaced intervals from the roof and terminating in spaced relation to the free end of the tubular sealing member whereby the sealing member is yieldingly supported by the resilient strips in substantially radial position when the sealing member is sliding over irregularities on the wall surface.

7. A sealing member for forming a seal in the space between a tank wall and a floating roof, including a tubular sealing member formed of flexible material protruding radially outwardly from the roof, the portion only of the flexible material adjoining the roof being thickened, and resilient strips embedded in the thickened portion of the sealing member protruding radially outwardly at spaced intervals from the roof and terminating in spaced relation to the free end of the sealing member whereby the sealing member is yieldingly supported by the resilient strips and by the thickened portion in substantially radial position when the sealing member is sliding over irregularities on the wall surface.

8. A sealing member for forming a seal in the space between a tank wall and a floating roof, including a tubular sealing member formed of flexible material protruding radially outwardly from the roof, the portion only of the flexible material adjoining the roof being thickened, and a plurality of pairs of resilient strips, the strips of each pair being embedded in opposite thickened portions of the sealing member, the pairs of resilient strips protruding radially outwardly at spaced intervals from the roof and terminating

5 in spaced relation to the free end of the sealing member whereby the sealing member is yieldingly supported by the resilient strips and by the thickened portions in substantially radial position when the sealing member is sliding over irregularities on the wall surface.

10 9. A sealing member for forming a seal in the space between a tank wall and a floating roof, including a tubular sealing member formed of flexible material protruding radially outwardly from the roof whereby the upper and lower walls of the tubular sealing member are secured to the roof, only the lower wall of the sealing member

being thickened, and resilient strips embedded in the walls of the sealing member protruding radially outwardly at spaced intervals from the roof and terminating in spaced relation to the free end of the tubular member whereby the sealing member is yieldingly supported by the resilient strips and by the thickened portion in substantially radial position when the sealing member is sliding over irregularities on the wall surface.

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