Sept. 14, 1937. C. H. HAUPT ET AL 2,092,877

SPRING SEAL FOR FLOATING ROOFS

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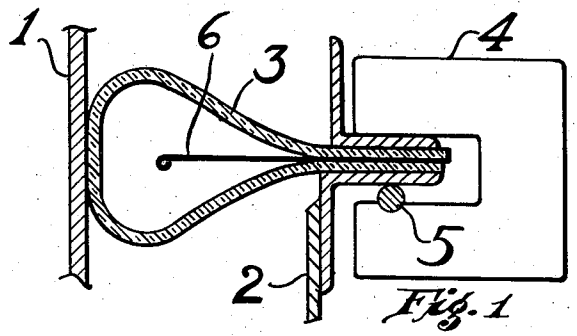


Fig. 1

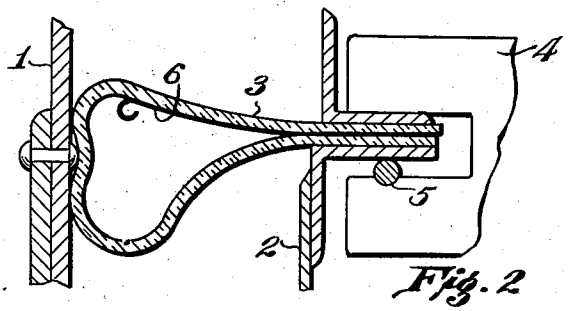


Fig. 2

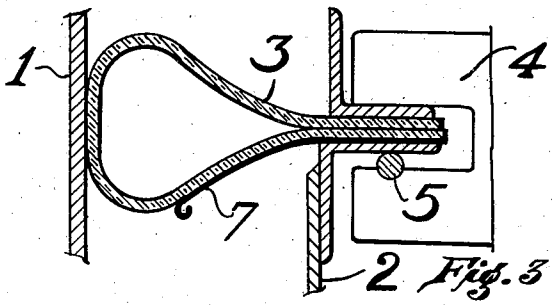


Fig. 3

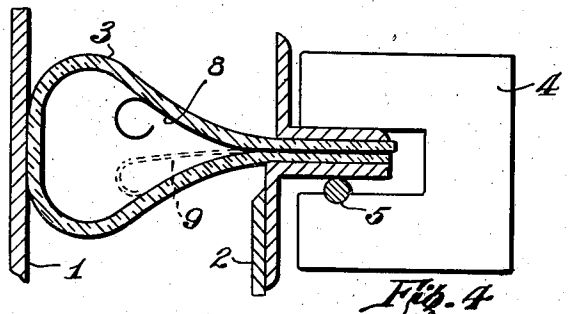
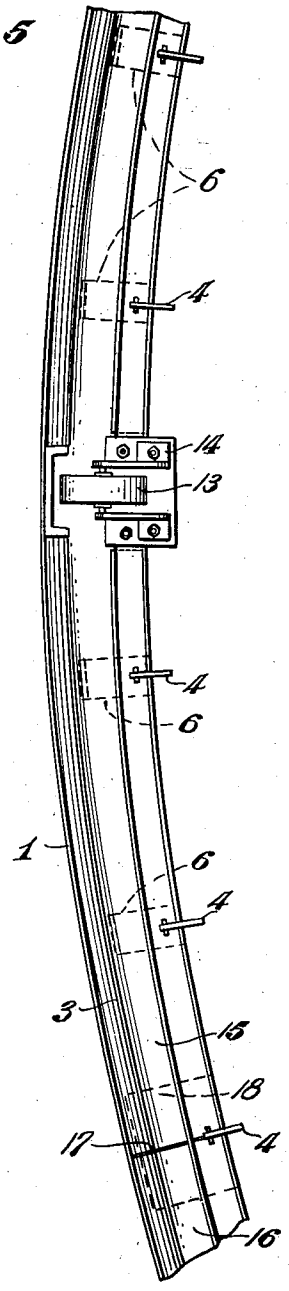


Fig. 4

Fig. 5



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SPRING SEAL FOR FLOATING ROOFS

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12 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 a seal which will be adequately supported by resilient means against sagging, even after long continued use.

A further object of the invention is to provide an improved form of resilient metal support arranged in such manner as to sustain the seal without damaging it or causing undue wear by the support forcing the seal into direct contact with the wall of the tank.

Another object is to provide a continuous ring sectional seal in which the sections are joined by inserts.

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

Fig. 1 is a vertical transverse section through a preferred form of seal with a substantially straight resilient metal support;

Fig. 2 is a similar view showing the seal in another of its operative positions;

Fig. 3 is a vertical transverse section through a seal in which the metal supporting means is arranged beneath the seal;

Fig. 4 is a similar view of a seal in which two resilient metal strips are used;

Fig. 5 is a plan view showing a portion of a tank in which the seal is installed.

Referring first to Figs. 1 and 2, reference numeral 1 indicates the wall of the tank, 2 the margin 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 is of elongated loop form. Its edges are brought together throughout the length of the seal and at spaced intervals secured by clamps 4 and wedges 5 which cooperate with an annular clamping member comprising elements 5' and 5''. A spring steel strip or similar supporting member 6 is arranged with its inner end clamped between the overlapping edges of the seal. A plurality of the clamps 4 and strips 6 are used, as indicated in Fig. 5. The outer end of the strip terminates at a substantial distance from the tank wall and is curved or otherwise shaped so as to prevent any cutting action on the fabric coming in contact with the strip.

In Fig. 2 the seal is shown bent downwardly, the position which it will assume when the roof is rising. In this position the strip 6 contacts with the upper part of the seal and supports it.

We have found that in the use of fabric seals of this general character deterioration takes place due to the contact with the oil or other fluid and the air. After extended use the natural resilience of the fabric has more or less disappeared. Although this has taken place, if resilient supports of the type described herein are used, the fabric will maintain adequate contact with the wall of the tank and substantially prevent the escape of vapors.

Fig. 3 shows an alternative form in which the spring strip 7 is arranged beneath the seal. The end of the spring strip is clamped beneath the bottom edge of the seal.

Fig. 4 illustrates the use of two resilient supporting members, one in contact with the upper and the other with the lower inner surface of the seal. These supports are designated respectively 8 and 9. Their ends are preferably bent as shown. It is desirable to secure these spring supports in position by bringing their ends, as described above, between the overlapping edges at spaced intervals throughout the length of the seal. However, any other suitable means for holding the spring strips and the free edges of the seal together may be adopted. The engagement of the edges of the seal as above described is substantially air-tight. It may be made completely so by placing the clamping means sufficiently close together. The connection between the several sections of the seal may also be made air-tight as described later on.

There is an advantage in the air-tight construction in that the loop may be inflated by means of air or gas forced into it. Various inflated tube seals have been suggested heretofore. The seal of the present invention embodies the inflated tube idea along with the support of the tube by means of resilient metal or equivalent means. With this additional support, material of lighter weight may be used for the inflated tube and expense saved without any loss of sealing effectiveness.

It will be understood that the thickening of the inner parts of the seal may be used in combination with separate spring supporting means. The lower side only of the loop may be thickened with reasonably good results and the saving of some expense as compared to the thickening of both upper and lower sides.

The arrangement of rollers 13 carried by supporting arms 14 which serve to center the roof in the tank and prevent undue pressure on the seal which would otherwise be caused by shifting of the roof as shown in Fig. 5. Rollers of this type are also intended to be used in connection

with the seals shown in the other forms of the invention.

In Fig. 5 the general lay-out of the seal, spring strips and the clamping devices is indicated. The number and kind of these devices will vary with the purpose for which the invention is to be used. By way of example, it may be said that for a floating roof designed for large tanks which are to contain gasoline, it is preferred to use stainless spring steel strips about 4" wide and $\frac{1}{32}$" thick and 7" long. These steel strips should be capable of just holding 50 lbs. applied at the end of the strip. The strips should be placed about 2 ft. apart around the roof.

When the floating roof is large it is desirable to make the seal in sections. Two of these sections 15 and 16 are indicated in Fig. 5 with their juncture at 17. The sections are connected by inserting a loop of somewhat smaller size within the adjacent ends of the loop. The edges of the inserted member as well as the edges of the loop sections themselves are brought together on the roof and secured by clamps 4 as described above. These end joints may be made air-tight by vulcanizing the rubber of the loop to the rubber of the insert, or in case other materials are used, securing the parts together by any suitable air-tight means. This way of connecting the sections is convenient in that one section may be installed, the insert placed in position, and the next section slipped over the protruding end of the insert.

We are aware that various forms of sectional sealing tubes or loops and numerous kinds of spring supports have heretofore been suggested. So far as we are aware, however, all these spring supports have had for their purpose the forcing of the seal against the wall of the tank by pressure directly transmitted from the spring through the fabric to the wall. As distinguished from this the resilient member of the present seal acts only through a portion of the seal laterally extending beyond the resilient member.

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 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 of 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 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.

2. 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 of 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 protruding radially outwardly at spaced intervals from said clamping member into the bulbous portion 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 bulbous portion is sliding over irregularities on the wall surface.

3. 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 of 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 a plurality of pairs of resilient strips protruding radially outwardly at spaced intervals from said clamping member into the bulbous portion engaging the upper and lower inner surfaces of the bulbous portion 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 bulbous portion is sliding over irregularities on the wall surface.

4. A sealing member for forming a seal in the place between a tank member and a floating roof, including a substantially annular clamping member supported on said roof, a sealing member formed of a strip of flexible material bent into bulb-like cross sectional shape and having its edge portions clamping 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 protruding radially outwardly from said clamping member exteriorly of the bulbous portion in engagement with the bulbous portion and terminating in spaced relation to the free end of the bulbous portion whereby the sealing member is yieldingly supported by the strips in substantially radial position while said 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 sealing member formed of flexible material protruding radially outwardly from the roof, and resilient strips protruding radially outwardly at spaced intervals from the roof and terminating in spaced relation to the free end of the sealing member in position to yieldingly support the sealing member in substantially radial position when the sealing member 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 resilient strips protruding radially outwardly at spaced intervals from the roof and terminating in spaced relation to the free end of the tubular sealing member in position to yieldingly support the sealing member 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 substantially annular clamping member supported on said roof, a sealing member

formed of a strip of flexible material bent into bulb-like cross sectional shape 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 means protruding radially outwardly from said clamping member and terminating in spaced relation to the free end of the sealing member adapted to yieldingly support the sealing member in substantially radial position when the bulbous portion 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 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 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.

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, the portion only of the flexible material adjoining the roof being thickened, and resilient strips 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 loop is sliding over irregularities on the wall surface.

10. 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 sealing member are secured to the roof, only the lower wall adjoining the roof being thickened, and resilient strips protruding radially outwardly at spaced intervals from said clamping member 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.

11. 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 of 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, the portion only of the strip of flexible material adjacent the edge portions being thickened, and resilient strips 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 and by the thickened portion in substantially radial position when the loop is sliding over irregularities on the wall surface.

12. 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 of a strip of flexible material bent into bulb-like cross sectional shape 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, the lower wall only of the bulbous portion being thickened, and resilient strips protruding radially outwardly from said clamping member and terminating in spaced relation to the the free end of the bulbous portion whereby the sealing member is yieldingly supported by the resilient strips and by the thickened portion in substantially radial position when the loop is sliding over irregularities on the wall surface.

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