June 1, 1965 B. W. BRUNDAGE 3,186,737

EXTERNAL ROTARY SEAL FOR A SWIVEL JOINT

Filed March 9, 1962 2 Sheets-Sheet 1

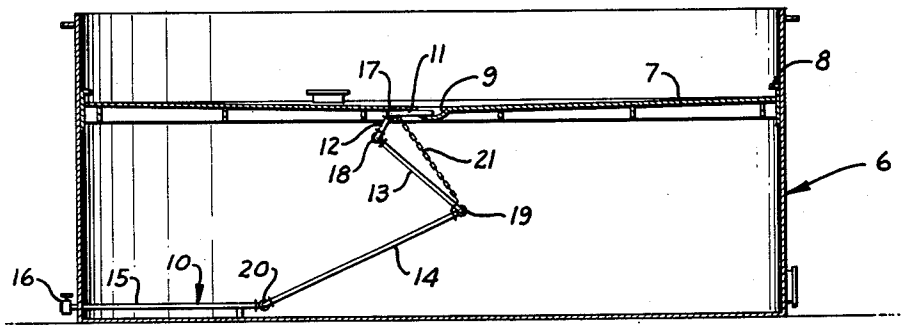


FIG. 1.

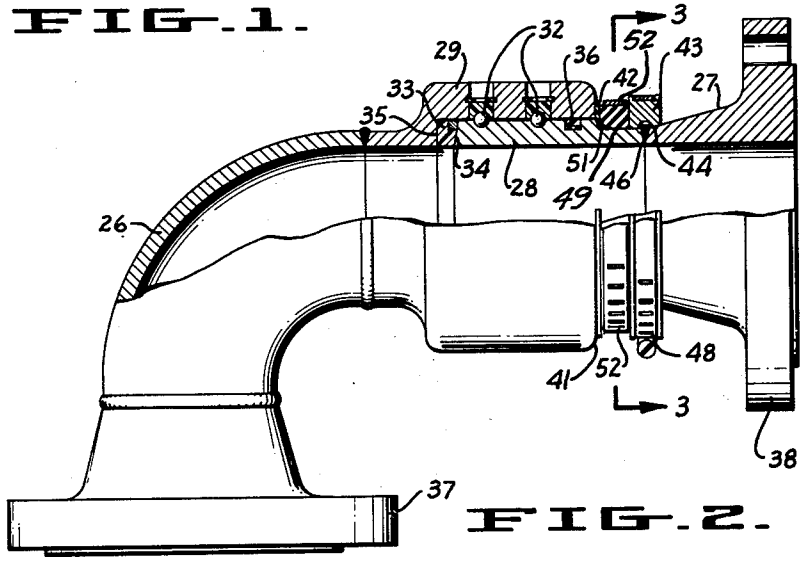


FIG. 2.

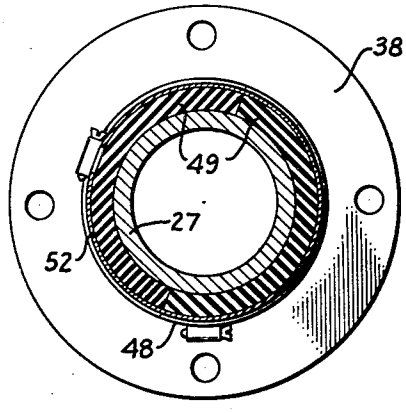


FIG. 3.

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EXTERNAL ROTARY SEAL FOR A SWIVEL JOINT

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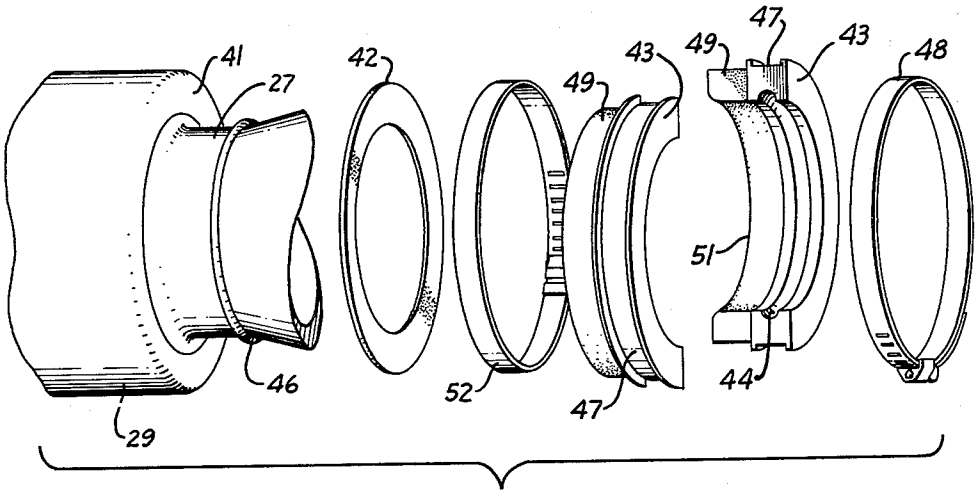


FIG. 4.

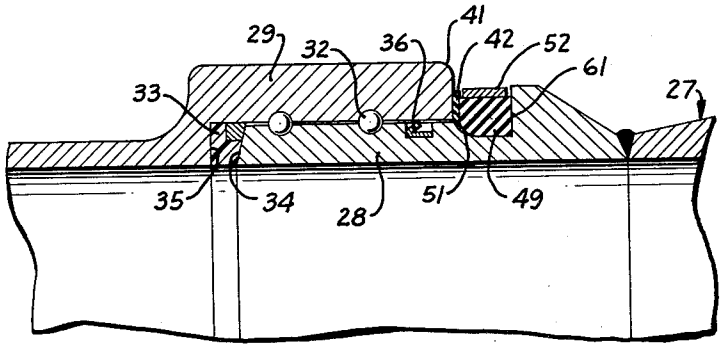


FIG. 5.

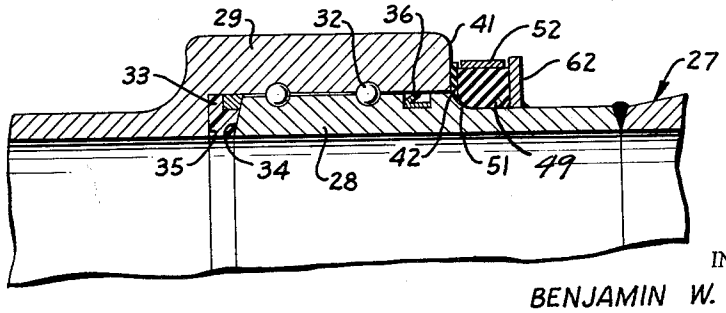


FIG. 6.

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3,186,737

EXTERNAL ROTARY SEAL FOR A SWIVEL JOINT

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2 Claims. (Cl. 285—45)

This invention relates to an improved swivel joint such as is employed in providing a drain for a floating roof on a tank.

To reduce fire and explosion hazard and evaporation, and to prevent contamination, it is usual to provide a floating roof on a tank used for the storage of liquid hydrocarbons such as various petroleum products. The tanks employed are usually of relatively large size, frequently being of the order of several hundred feet in diameter. It will be obvious that in the event of rainfall or melting snow, the removal of water from the tank roof can provide a problem, particularly if it is either desirable or essential that the water not mix with the liquid stored in the tank.

As will be presently related in further detail, the usual means provided for effecting water removal includes several lengths of pipe extending downwardly from a sump in the roof to lead the water off from a sump in the floating roof to the outside of the tank. The drain pipe must be capable of accommodating itself to the height of the roof above the bottom of the tank. This is usually achieved by joining the several pipe lengths together with swivel joints. It will be obvious that if the joints are not fluid tight, the liquid stored in the tank will find its way into the drain and, as a consequence, the valuable product of the tank may be lost to a sewer. In some instances, when it becomes apparent that one or more of the swivel joints are leaking, the drain line may be closed with a valve. However, if this drain is not opened, in the event of a rainfall the collected water on the roof may cause the roof to sink.

In accordance with the present invention, I have provided a novel and improved swivel joint which is effectively sealed against entrance of the product in which the swivel joint is immersed.

It is generally a broad object of the present invention to provide a novel and improved seal for a swivel joint.

A further object of the present invention is to provide an improved swivel joint for use in the drain on a floating roof.

The invention includes other objects and features of advantage, some of which, together with the foregoing, will appear hereinafter when the presently preferred form of swivel joint of this invention is disclosed.

In the drawing accompanying and forming a part hereof:

FIGURE 1 is a section taken through a tank equipped with a floating roof and showing the typical drain structure provided for removing rain water from the roof.

FIGURE 2 is a side elevation with portions thereof broken away to illustrate the construction of the swivel joint embodying this invention.

FIGURE 3 is a section taken along the line 3—3 of FIGURE 2.

FIGURE 4 is an exploded view in perspective showing the assembly of the swivel joint and the seal of FIGURE 2.

FIGURES 5 and 6 are sections taken through other forms of seals embodying the present invention.

Referring to FIGURE 1, the tank 6 is provided with a floating roof 7. The construction of the tank and roof are, of course, conventional and well known, the roof being adapted to float on the surface of the liquid in the tank and slide up and down, sealing contact with the side walls thereof being maintained by shoes 8. Generally, such a floating roof will slope inwardly to a central sump 9 for the collection of water which may result from rain or melting snow.

To remove the water from the sump, the drain, generally indicated at 10, is provided. This drain is made up of several lengths of pipe indicated at 11, 12, 13, 14 and 15. The last length extends to a valve 16 outside of the tank; the valve 16 is left open to drain off water. Each of the pipe sections is joined to the next by a swivel joint, these being indicated respectively at 17, 18, 19 and 20. A flexible element such as chain 21 may be extended between the roof and the pipe length 14 so that at least a portion of the weight of the pipes is carried by the roof and the pipes are not forced to support themselves.

As appears in FIGURE 2, each swivel joint generally includes an L section 26 and a straight section 27, the two being mounted one upon the other so that one can rotate with respect to the other. Thus, the cylindrical end 28 of section 27 is received within the tubular portion 29 of the L section 26. Two sets of ball bearings 32 mount the end 28 for an easy rotational movement in the tubular portion 29. A seal structure generally indicated 33 is provided between end 34 on cylindrical end 28 and wall 35 on the tubular portion 29 to seal one side of the bearings. Another seal structure 36 is provided on the other side of the bearings between end 28 and tubular portion 29.

In the form of the swivel joint shown in FIGURE 2, the L 26 and the straight section 27 are each provided with flanged ends 37 and 38, and the structure is shown as generally assembled by welding.

The swivel joint structure can be otherwise provided. For example, instead of the flanged ends 37 and 38, one can provide threaded ends. In general, the structure so far described is that of a swivel joint which is currently on the market and which is sold as the "Chiksan" swivel joint. One can use any swivel joint, however, and the invention is not limited in application to the exact structure disclosed, for there are numerous swivel joints available.

In accordance with the present invention, I provide an additional seal for the annular space between end 41 of the tubular portion 29 and the exterior surface of the end 27. Thus, as appears particularly in FIGURES 2, 3 and 4, I provide an annular washer 42 of a suitable resilient material fitting snugly along section 27 and over end 41. As appears in FIGURE 2, washer 42 fits over and extends on both sides of the annular opening between the end 28 and the receptacle 29. Preferably, the exterior of section 27 and the end 41 are faired into one another to provide a smooth support for the washer.

To retain the flexible washer 42 in place under adequate sealing pressure, I provide a backup ring 43. To permit this ring to be removably mounted, it is provided in like halves, each having an inner semi-circular recess 44 to enable a ring half to fit snugly on the bead of weld 46. The outer periphery of each ring half is recessed as at 47 to receive a clamping ring 48 which mounts the ring halves in position.

Mounted on one side face of each ring half is a semi-circular resilient member 49 having a curved or chamfered inner face 51. Upon the resilient members being compressed, the curved or chamfered face forces the annular washer 42 in snugly against the annular end 41 of the tubular portion 29 and against the side wall of section 27 to effect a seal. Compression of the ring halves 49, upon their assembly, is effected by the clamp 52.

In place of utilizing split rings 43 to provide the backup for the resilient members 49, the side wall of the section 27 may be provided with an annular shoulder 61 which provides a stop or backup as in FIGURE 5. Or,

if desired, a ring **62** may be welded in place as in FIGURE 6.

In use, the only portion of the flexible washer **42** which is subject to wear is that which is engaged with the annular end **41** of the tubular portion **29**. The ring is held effectively over the annular opening between end **41** and the side wall of section **27**, so that the liquid in the tank **6** cannot pass the ring and so enter the joint to attack the bearing. If the bearings are attacked, the nice fit of the rotating parts will be lost. Thereafter, upon rotation of the elements of the joint, the seal **33** will be damaged and so will become ineffective; this will permit the product to leak through the joint into the open drain line and so be lost.

I claim:

1. In a swivel joint:

(a) a first cylindrical member having a tubular portion terminating in an end;

(b) a second cylindrical member having an end rotatably mounted within said tubular portion of the first member;

(c) bearing means mounting and retaining said end of the said second member for rotation in the tubular portion of the first member with the end of the tubular portion of said first member fitting closely adjacent to but spaced from the second member to provide an annular space between the said first and second members;

(d) a shoulder on the said second member immediately adjacent said end of the said first cylindrical member and disposed substantially in the same radial plane therewith whereby to provide a substantially

continuous surface including the said end of the said first cylindrical member and the said shoulder;

(e) a washer lying against said end of the said first cylindrical member and against the shoulder of the said second member and extending across the annular space therebetween;

(f) a resilient ring fitted about said second member and engaged with the said washer;

(g) a stop secured to the said second cylindrical member on the side of said resilient ring opposite from said washer and engaged with the said resilient ring whereby to prevent the resilient ring from sliding away from the said washer; and

(h) a means for compressing said ring to force the ring into engagement with said washer.

2. The structure of claim **1** wherein said compressing means comprises a clamp about said resilient ring to force the ring into engagement with said washer.

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