

[54] STUFFING BOX ASSEMBLY
[76] Inventor: **Roland W. Mattoon**, P.O. Box 1302,
Drayton Valley, Alberta, Canada
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[58] **Field of Search**..... **277/2, 3, 30, 31, 32, 59,**
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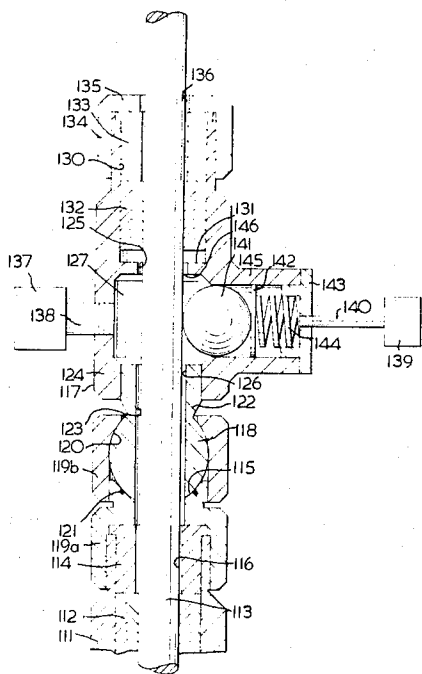
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Primary Examiner—Louis R. Prince
Assistant Examiner—Robert I. Smith
Attorney, Agent, or Firm—Ladas, Parry, Von Gehr,
Goldsmith & Deschamps

[57] **ABSTRACT**

A stuffing box assembly includes tubular means surrounding a pump piston rod and including a pair of longitudinally spaced stuffing boxes. The tubular means is formed as a pair of longitudinal portions having mutually engaging curved surfaces to provide a pivotal connection therebetween. Each portion includes a respective one of the stuffing boxes, and one of the portions forms a chamber surrounding the rod to receive fluid leaking through one of the stuffing boxes, this one portion having a passage communicating the chamber with the exterior of the one portion to enable a suitable pressure responsive means to be connected thereto.

8 Claims, 2 Drawing Figures



SHEET 1 OF 2

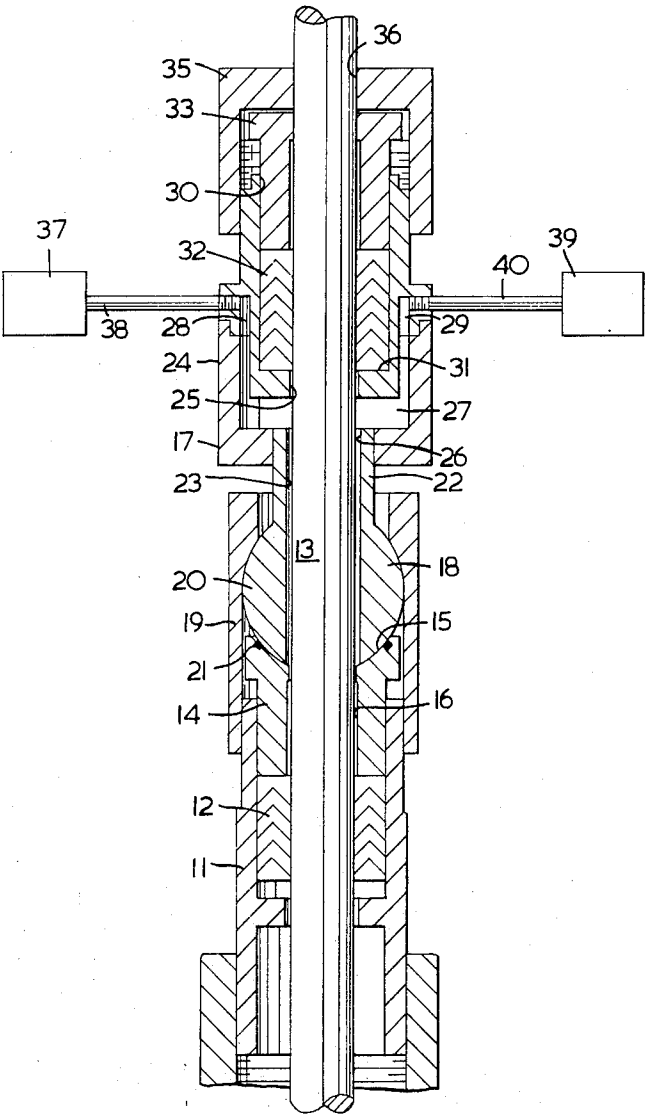


FIG. 1

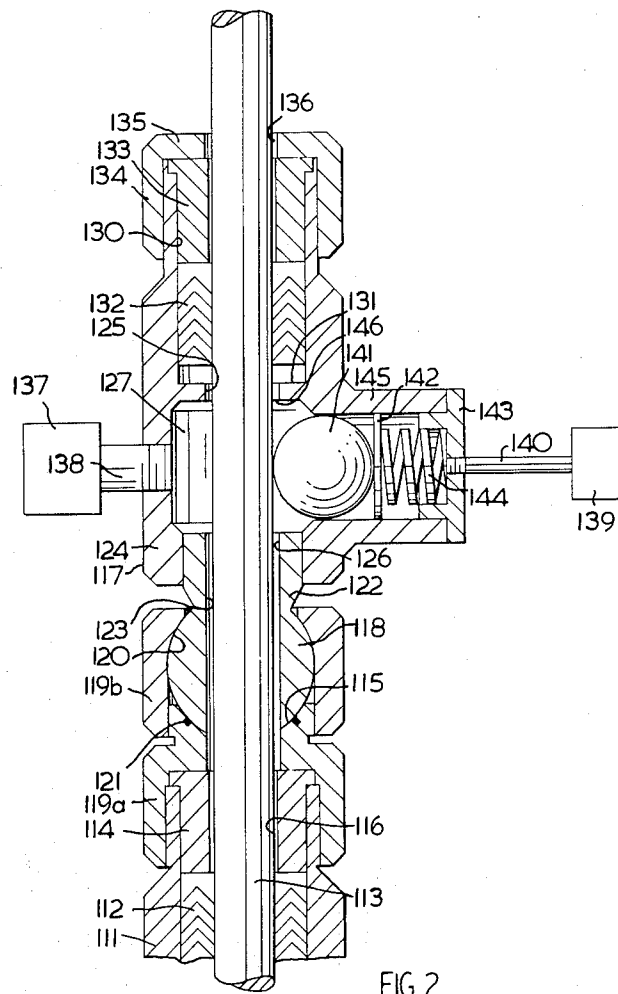


FIG. 2

STUFFING BOX ASSEMBLY

This invention relates to stuffing box assemblies.

In some uses of stuffing box assemblies, it is advantageous to provide means responsive to a leak of fluid between a stuffing box and a movable rod which passes therethrough. It is known to provide a chamber surrounding the rod on the downstream side of the stuffing box which will collect fluid leaking through the stuffing box, the chamber being connected to means responsive to a rise in fluid pressure therein to indicate the leak and/or actuate a device to stop operation of the machine with which the stuffing box is associated.

One application in which such an arrangement is known is in a sucker rod pumping unit for oil wells, in which oil is pumped upwardly by a pump operated by a reciprocating pump rod, sometimes known as a polished rod, which extends vertically downwardly into the oil well and is operated by drive means at the top. In such a case, it is also desirable to provide means to accommodate misalignment of the pump rod, and it is known to provide a tube forming the chamber which is sufficiently flexible to accommodate such misalignment which may occur, but this known arrangement is not particularly satisfactory.

It is therefore an object of the invention to provide a stuffing box assembly for a movable rod which includes a leak-receiving chamber, and has an improved means for accommodating misalignment of the rod.

According to the invention, tubular means surrounds the rod and includes a pair of longitudinally spaced stuffing boxes. The tubular means is formed as a pair of longitudinal portions having mutually engaging curved surfaces to provide a pivotal connection therebetween. Each portion includes a respective one of the stuffing boxes, and one of the portions forms a chamber surrounding the rod to receive fluid leaking through one of the stuffing boxes, this one portion having a passage communicating the chamber with the exterior of the one portion to enable a suitable pressure responsive means to be connected thereto.

The said other portion mentioned above may include a tube containing a stuffing packing forming part of the stuffing box associated with that portion, and a packing gland engaging the stuffing packing at one end of the gland, the packing gland having a curved surface at its opposite end, with the said one portion terminating in an end member with a complementary curved surface engaging the curved surface of the packing gland to form the pivotal connection, and a packing nut screwed onto the tube engaging the end member to retain the end member in engagement with the packing gland and to urge the packing gland against the stuffing packing.

The end member may be ball-shaped, and the curved surface of the packing gland may have a complementary outwardly concave shape, with the packing nut having a concavely curved inner surface engaging the ball-shaped end member.

A particular advantage of the invention is that it can be incorporated in a certain type of known stuffing box by the use of components which cooperate with the various parts of the known stuffing box.

Embodiments of the invention will now be described, by way of example, with reference to the accompanying drawings, of which:

FIG. 1 shows a longitudinal sectional view of a stuffing box assembly of a sucker rod pumping unit for an oil well according to one embodiment, and

FIG. 2 is a similar view of a second embodiment.

Referring to the drawings, FIG. 1 shows a stuffing box assembly forming part of a sucker rod pumping unit in an oil well includes a lower stuffing box formed by a tube 11 at the upper end of the oil well containing a packing 12 through which a vertically reciprocable pump rod 13 passes, the pump rod 13 commonly being known as a polished rod. A packing gland 14 surrounding the pump rod 13 at a lower portion which fits within the upper end of the tube 11 and engages the upper end of the packing 12. The upper end of the packing gland 14 has an outwardly concave upper surface 15 surrounding the upper end of a bore 16 through the gland 14 through which the rod 13 passes.

A tubular member 17 has a ball-shaped lower end portion 18 seated in the concave surface 15 of the gland 14. The ball-shaped end portion 18 is retained in assembly with the gland 14 by a packing nut 19 which has an internally threaded lower end screwed onto an externally threaded upper end of the tube 11. The nut 19 has an upper end portion with a curved inner surface 20 which engages an upper portion of the ball-shaped end portion 18. The concave surface 15 of the gland 14 has a sealing ring 21 seated therein and engaging the ball-shaped end portion 18.

The tubular member 17 also includes an intermediate connecting portion 22 extending upwardly from the ball-shaped end portion 18 above the sleeve 19. The intermediate connecting portion 22 and the ball-shaped end portion 18 have a bore 23 through which the rod 13 passes. The intermediate connecting portion 22 extends upwardly to the lower end of a body member 24 having middle and lower bores 25, 26, through which the rod 13 passes, and also having a pressure chamber 27 between the bores 25, 26. The body member 24 also contains a pair of passages 28, 29 which extend from the pressure chamber 27 to the exterior of the body member 24 on opposite sides thereof.

The body member 24 also has an upper bore 30 extending upwardly from, and of larger diameter than, the middle bore 25 so that the junction of the two bores 25, 30 forms an upwardly facing annular shoulder 31. The bore 30 contains a stuffing packing 32 which engages the annular shoulder 31, and a packing gland 33 which engages the packing 32 and projects above the upper end of the body member 24, thus forming a second stuffing box which is longitudinally spaced from the first stuffing box formed by the tube 11 and packing 12. A packing nut 34 has an internally threaded lower end screwed onto an externally threaded upper end of the tubular member 17, and also has an internally directed flange 35 at its upper end engaging the upper end of the packing gland 33. The rod 13 passes upwardly through the packing 32, the gland 33, and an aperture 36 in the upper part of the packing nut 34.

The passage 28 connects the pressure chamber 27 to a pressure switch 37 via a pipe 38, and when actuated the pressure switch 37 stops operation of the pump. The passage 29 connects the pressure chamber 27 to a pressure gauge 39 via a pipe 40.

The packing nut 19 is tightened sufficiently to cause the sealing ring 21 to seal against the ball-ended portion 18 while at the same time allowing pivotal movement of the ball-shaped end portion 18 relative to the

concave surface 15 of the packing gland 14 and the curved surface 20 of the packing nut 19. The sleeve 34 is tightened sufficiently to cause the packing 32 to operate effectively.

In use of the pump (not shown), the pump rod 13 reciprocates vertically in known manner. If the packing 12 should fail, oil will leak upwardly through the bore 16 of the gland 14, and through the bore 23 of the ball-shaped end portion 18 and connecting portion 23 into the pressure chamber 27, ultimately reaching the pressure switch 37 and pressure gauge 39. Thus, pressure gauge 39 will indicate the presence of leaking oil in the chamber 27, thus indicating the presence and seriousness of a failure of the packing 12. When the pressure reaches a predetermined value at which the pressure switch 37 is set, the pressure switch 37 will be actuated by the pressure and therefore the pump will be stopped. Advantageously, the pressure chamber 27 is initially filled with a corrosion inhibitor to reduce the likelihood of corrosion of the pump rod 13.

In practice, the pump rod 13 is frequently slightly misaligned with respect to the tube 11, and in such a case the swivel joint provided by the ball-shaped end portion 18 and the concave surface 15 of the packing gland 14 will permit the upper part of the described assembly to move angularly with respect to the lower part, thus taking strain off the packing 32 and thereby reducing the likelihood of its failure.

An advantage of the described embodiment is that it can readily be fitted to a known stuffing box and use all the existing components thereof. The tube 11, packing 12, gland 33 and nut 34 are the components of a known stuffing box.

FIG. 2 shows a modified arrangement. For simplicity, reference numerals applied to parts of the embodiment shown in FIG. 2 correspond to the reference numerals applied to the corresponding parts of the embodiment shown in FIG. 1, except that the reference numerals of FIG. 2 are increased by 100. Thus, the tube 111 of FIG. 2 corresponds to the tube 11 of FIG. 1, and so on.

The packing nut 19 of FIG. 1, which acts on the ball-shaped portion 18 and packing gland 14, has been replaced in FIG. 2 by two nuts 119a, 119b. The nut 119a is screwed onto the tube 111 and acts upon the packing gland 114. The upper end of the nut 119a is provided with a concave surface 115 on which the ball-shaped portion 118 is located. The second nut 119b is screwed onto the lower nut 119a, and has a curved upper inner surface engaging the ball-shaped portion 118 to retain it on the concave surface 115. This arrangement operates in the same manner as the corresponding arrangement of FIG. 1 to accommodate mis-alignment of the pump rod 113 and the tube 111.

The body member 114 forms a pressure chamber 127, which is larger than the chamber 27 of FIG. 1. The chamber 127 contains a ball valve 141 which is urged laterally inwardly against the pump rod 113 by a spring 144, a circular guide plate 142 being interposed between the spring 144 and the ball valve 141. It will be seen that the ball valve 141 and spring 144 are actually contained in a lateral tubular extension 145 projecting from the body member 124, and the spring 144 bears against a plug 143 closing the end of the extension 145, the pipe 140 being connected to the plug 143.

Failure of the packing gland 112 ultimately operates the pressure gauge 139 and pressure switch 137 as in the corresponding arrangement of FIG. 1, but the ball

valve arrangement provides the additional advantage of preventing leakage of oil if the pump rod 113 breaks. If the pump rod 113 breaks and vacates the chamber 127, the ball valve 141 is urged radially inwardly by the spring 144 and is then urged upwardly by the oil in the chamber 127 into engagement with the portion of the body member 124 forming the ball 125, and this portion therefore acts as a valve seat 146 which is engaged by the ball valve 114 to prevent upwardly leakage of oil.

I claim:

1. A stuffing box assembly including a movable rod, tubular means surrounding the rod, said tubular means including a pair of stuffing boxes surround the rod and longitudinally spaced along the rod, the tubular means being formed in two longitudinal portions having mutually engaging curved surfaces providing a pivotal connection therebetween, each portion including a respective one of said stuffing boxes, and one of said portions forming a chamber surrounding the rod to receive fluid leaking through one of the stuffing boxes, said one portion having a passage communicating the chamber with the exterior of said one portion.

2. A stuffing box according to claim 1 wherein the other of said portions includes a tube containing a stuffing packing forming part of the stuffing box associated with said other portion, a packing gland engaging the stuffing packing at one end of said gland, said packing gland having a curved surface at its opposite end, said one portion terminating in an end member with a complementary curved surface engaging the curved surface of the packing gland to form the pivotal connection, and including a packing nut screwed onto the tube and engaging the end member to retain the end member in engagement with the packing gland and to urge the packing gland against the stuffing packing.

3. A stuffing box assembly according to claim 2 wherein the packing gland has an outwardly concave surface at its opposite end, the end member is ball-shaped, and the packing nut has a concavely curved inner surface engaging the ball-shaped end member.

4. A stuffing box assembly according to claim 1 including a pressure switch connected to said passage.

5. A stuffing box assembly according to claim 1 including a pressure gauge connected to said passage.

6. A pump assembly including a pump having a reciprocable drive rod, and a stuffing box assembly as claimed in claim 1, said reciprocable rod constituting said movable rod of said stuffing box assembly.

7. A stuffing box assembly according to claim 1 wherein the other of said portions includes a tube containing a stuffing packing forming part of the stuffing box associated with said other portion, a packing gland engaging said packing, a first nut screwed onto said tube to urge said gland against said packing, said nut having a curved end surface engaged by a complementary curved surface on said one portion to form said pivotal connection, and a second nut screwed onto said first nut and engaging said one portion to retain said complementary curved surface on said one portion in engagement with said curved end surface on said first nut.

8. A stuffing box assembly according to claim 1 wherein said chamber contains a ball valve resiliently urged against said rod, and said chamber terminates at a valve seat surrounding the rod against which said valve member is forced if said rod breaks and vacates the chamber.

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