

July 2, 1963

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3,096,103

DUAL PASSAGE ROTARY SWIVEL

Filed Oct. 13, 1959

3 Sheets-Sheet 1

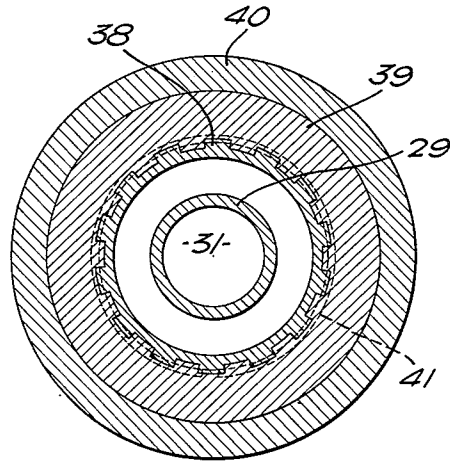
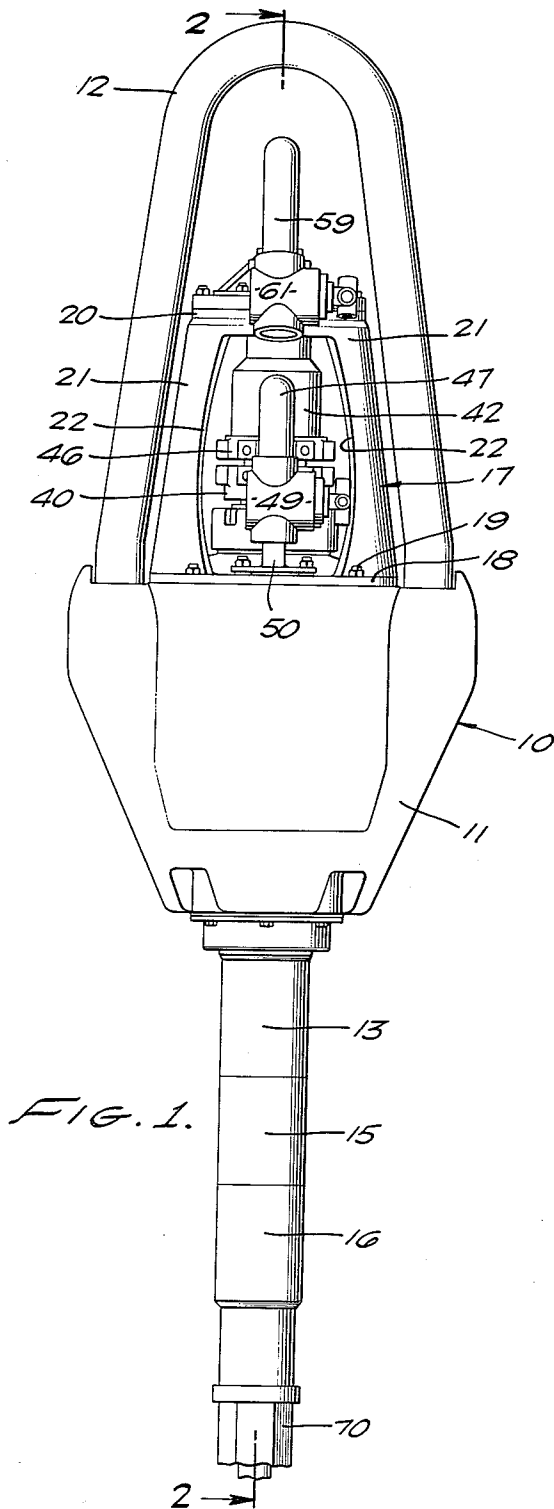


FIG. 3.

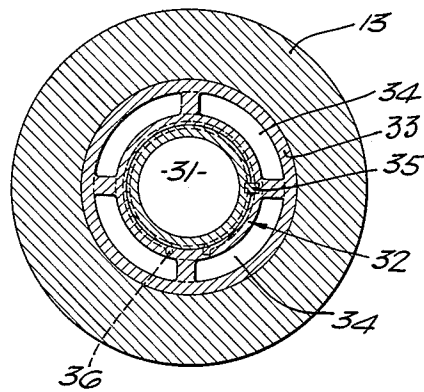


FIG. 4.

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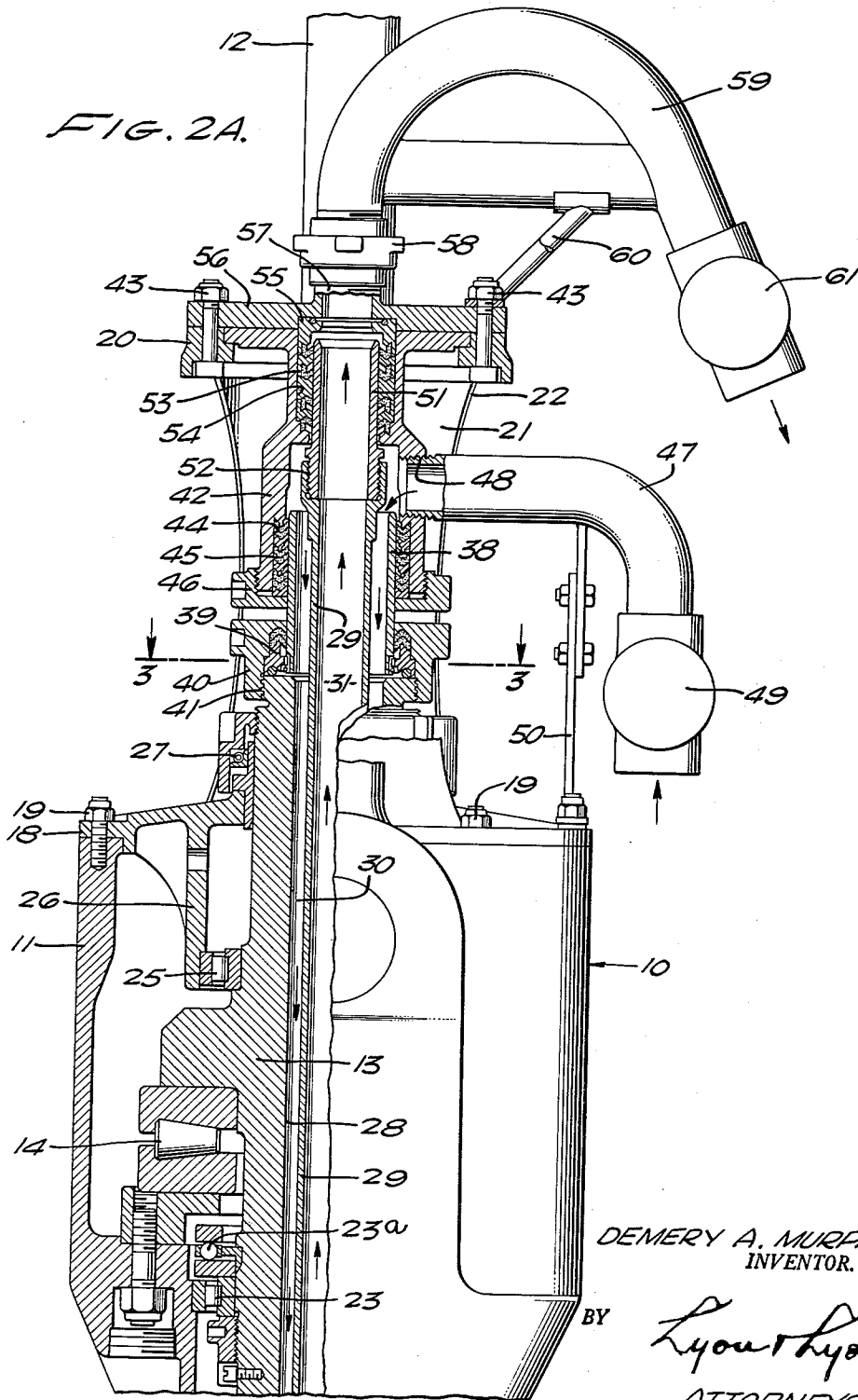
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FIG. 2A.



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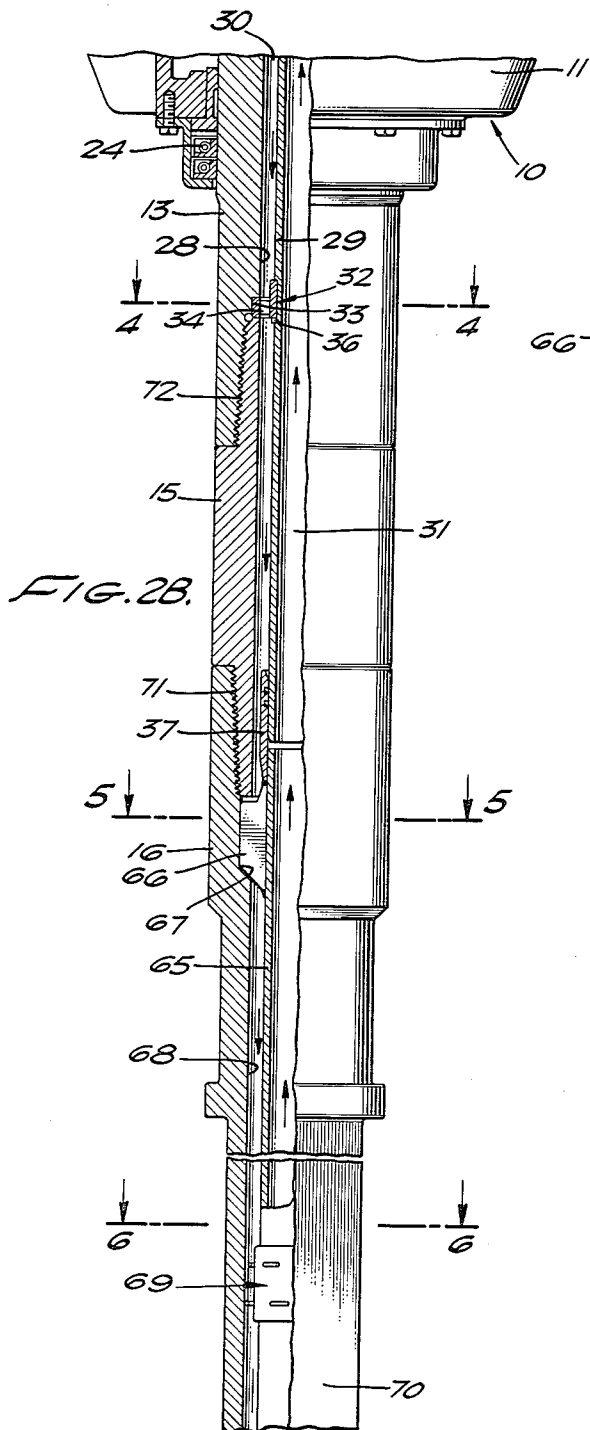


FIG. 2B.

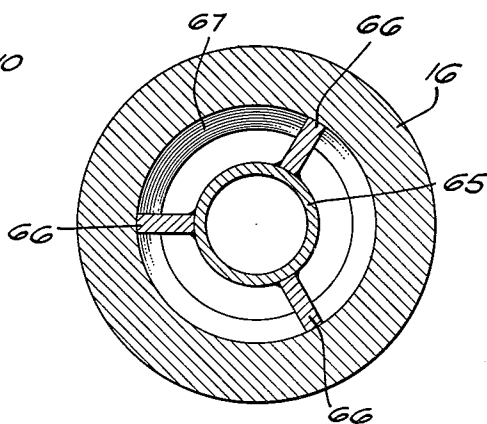


FIG. 5.

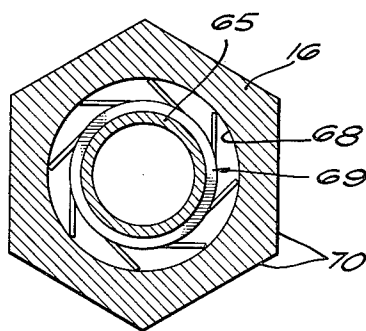


FIG. 6.

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DUAL PASSAGE ROTARY SWIVEL

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Filed Oct. 13, 1959, Ser. No. 846,173

1 Claim. (Cl. 285-134)

This invention relates to rotary swivels of the type used in the drilling of wells and it is particularly directed to improvements which provide a plurality of concentric passages for carrying fluids through the swivel.

Conventional swivels used in the process of drilling wells by the hydraulic rotary method have a single central passage for carrying mud fluid through the swivel and into the upper end of the drill string which the swivel supports. This mud fluid passes through the interior of the drill pipe and emerges through openings in the bit. This mud fluid serves to carry cuttings from the bit upward from the bottom of the hole and back to the surface.

In certain types of rotary drilling techniques using a rotary drill string supported by a rotary swivel, it is desirable to have more than one passage extending through the swivel and drill string to the bit. As an illustrative example, one form of drilling technique uses a column of air moving at high velocity, instead of drilling mud, for removing cuttings from the bit. Such a technique is disclosed in the Grable Patent No. 2,657,016. In this latter system using air, it is desirable that the return flow of air carrying the cuttings continue to move at high velocity, and therefore it is desirable to have this return flow occur within the drill string itself. Accordingly, both the drill string and the swivel must be provided with dual passages, one for air travelling down to the bit and one for air returning the cuttings from the bit.

Accordingly, it is the principal object of this invention to provide a novel form of rotary swivel having a plurality of passages extending therethrough. Another object is to provide a device of this type having dual concentric passages. A more particular object is to provide a dual passage rotary swivel having novel means for connecting each of a pair of conduits to one of the concentric passages, respectively.

Other and more detailed objects and advantages will appear hereinafter.

In the drawings:

FIGURE 1 is a front elevation showing a preferred embodiment of my invention.

FIGURE 2A is a sectional elevation taken substantially on the lines 2-2 as shown in FIGURE 1, representing the upper portion thereof. FIGURE 2B is a sectional elevation taken substantially on the lines 2-2 as shown in FIGURE 1, representing the lower portion thereof. FIGURE 2B is a continuation of the lower end of FIGURE 2A.

FIGURE 3 is a transverse sectional view taken substantially on the lines 3-3 as shown in FIGURE 2A.

FIGURE 4 is a transverse sectional view taken substantially on the lines 4-4 as shown in FIGURE 2B.

FIGURE 5 and FIGURE 6 are transverse sectional views taken substantially on the lines 5-5 and 6-6 respectively as shown in FIGURE 2B.

Referring to the drawings, the swivel generally designated 10 includes a non-rotary housing 11 pendantly suspended by means of a bail 12 in a conventional manner. A load carrying shank 13 is mounted on a main bearing assembly 14 within the housing and projects through the lower end of the housing. A sub 15 connects the lower end of the shank 13 to the upper end of the kelly 16.

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A bonnet 17 is provided with a lower flange 18 which closes the upper end of the housing 11. Threaded fastenings 19 hold the bonnet 17 in place on the housing 11. An elevated support ring 20 is integrally formed on the bonnet 17 and curved walls 21 connect a support ring 20 to the flange 18. Apertures 22 are provided in the walls 21.

In addition to the main bearing assembly 14, the housing 11 contains a radial bearing 23, the upthrust bearing 23a and sealing means 24 for retaining lubricant within the housing. Another radial bearing 25 may be mounted on the lower end of the skirt 26 extending downward from the flange 18. The rotary shank 13 projects upward through the upper sealing assembly 27.

The rotary shank 13 is provided with a central axial opening 28 and a rotary tube 29 is mounted concentrically within this opening, thereby defining a first passage 30 in the annular space between the tube 29 and the rotary shank 13, and a second passage 31 within the tube 29. An apertured ring 32 is fixed on the outer surface of the tube 29 and has a peripheral portion 33 which is clamped between the rotary shank 13 and the upper end of the sub 15. The ports 34 in the ring 32 form a part of the first passage 30. An axially extending key 35 prevents relative rotation between the ring 32 and the tube 29, and accordingly the tube 29 turns as a unit with the rotary shank 13. A snap ring 36 received in a groove on the tube 29 may be provided to anchor the ring 32 in place on the tube 29.

The lower end of tube 29 is slidably received within the collar 37 and the upper end of the tube 29 projects through the tubular wash pipe 38 which is connected to rotate with the tubular shank 13 and which forms a continuation of the first passage 30. The lower end of the wash pipe 38 is connected to rotary shank 13 by means of the spline ring 39 and the clamp nut 40. This construction is described in detail in my prior Patent No. 2,764,428 granted September 25, 1956. This clamping nut 40 is connected by threads 41 to the upper end of the rotary shank 13.

A tubular sleeve 42 is clamped to the non-rotary support ring 20 by means of the bolts 43 and the lower end of this sleeve 42 is provided with the bore 44 which receives a packing assembly 45 engaging the upper portion of the outer surface of the wash pipe 38. A nut 46 on the lower end of the sleeve 42 holds the packing assembly 45 in place. A flow conduit 47 is threadedly connected to the lateral port 48 in the sleeve 42 and communicates with the interior of the wash pipe 38 and the passage 30. A valve 49 of conventional design is provided on the flow conduit 47, and a bracing strut 50 may be provided for the flow conduit 47, if desired.

A second wash pipe 51 is provided, and is connected to the upper end of the tube 29 by means of the threads 52. A packing assembly 53 is provided in a bore 54 in the sleeve 42 and provides a seal against the outer cylindrical surface of the rotating wash pipe 51. This packing assembly 53 provides a rotary seal to prevent leakage between the first passage 30 and the second passage 31. The packing assembly 53 is held in place in the bore 54 by means of the ring 55 which is clamped in place by the flange 56 engaged by the bolts 43. This flange 56 is formed integrally with the threaded projection 57 and the latter is connected by means of the union 58 with the flow conduit 59. Suitable bracing struts 60 may be provided for the conduit 59, if desired. A conventional valve 61 controls flow through the conduit 59.

The collar 37 which slidably receives the lower end of the tube 29 is fixed on the upper end of the tube 65 positioned concentrically within the kelly 16. Radial fins

66 projecting outward from the tube 65 rests on an inclined shoulder 67 provided in the upper end of the kelly 16. These fins 66 support and center the tube 65 within the bore 68 of the kelly. The annular space between the tube 65 and the kelly bore 68 forms part of the passage 30 while the interior of the tube 65 forms a part of the passage 31. Additional means are provided for centering the tube 65 within the kelly 16 and as shown in the drawings this means includes a plurality of scratcher devices generally designated 69. These scratcher devices may be of any conventional style, for example as shown in the Wright Patent 2,506,405. The scratchers 69 are welded to the tube 65. They are not employed for their usual scratching function; they are used only to hold the tube 65 in central position within the kelly bore 68.

In operation, the kelly 16 is turned in the usual manner by means of a rotary machine and drive bushing (not shown) engaging the non-circular periphery 70. The kelly drives the sub 15 through the threaded connection 71 and the sub 15 drives the rotary shank 13 of the swivel 10 through the threaded connection 72. The ring 32 drives the tube 29. Air under pressure is delivered to the conduit 47 through the valve 49 and this air passes through the interior of the wash pipe 38 into the annular passage 30. The air passes downward through the passage 30 through the rotary shank 13 of the swivel, and through the sub 15, kelly 16 and down through the drill string to the bit (not shown). Air returning from the bit passes upward through the inner passage 31 through the tube 65 and tube 29. The rapidly moving stream of air carrying cuttings passes upward through the wash pipe 51 and into the conduit 59 and out through valve 61.

When it is desired to change one or both of the packing assemblies 45 and 53, the conduits 47 and 59 and their associated bracing struts are removed. The bolts 43 are then removed to permit disassembly of the flange 56. The sleeve 42 may then be moved upward through the central opening in the support ring 20. The wash pipes 38 and 51 may be replaced if desired in the absence of the sleeve

42. After new wash pipes and packing assemblies have been installed the sleeve 42 may be returned to position and the parts reassembled.

Having fully described my invention it is to be understood that I do not wish to be limited to the details set forth above, but my invention is of the full scope of the appended claim.

I claim:

In a rotary swivel of the type used in the drilling of wells, the combination of: a housing, bearing means within the housing, a shank mounted on said bearing means and projecting through the lower end of the housing, the shank having a central opening extending therethrough, a tube extending centrally through the shank opening and defining a first passage in the annulus between the shank and the tube and a second passage within the tube, a sub threadedly secured to the lower end of said shank, means connecting the tube and the shank so that they rotate as a unit, said means including an element fixed to said tube and having a portion thereof clamped between the shank and said sub, a first washpipe detachably connected to the upper end of said shank and encircling a portion of said tube, a second washpipe detachably connected to the upper end of said tube, a sleeve detachably secured relative to said housing and having axially spaced sealing means engaging said washpipes, a flow conduit connected to said sleeve at a location between said sealing means and communicating with said first passage, and a second flow conduit fixed with respect to said housing and communicating with said second passage.

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