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SWIVEL COUPLING WITH INSERTED SECTION TYPE SWIVEL UNIT

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FIG. 1.

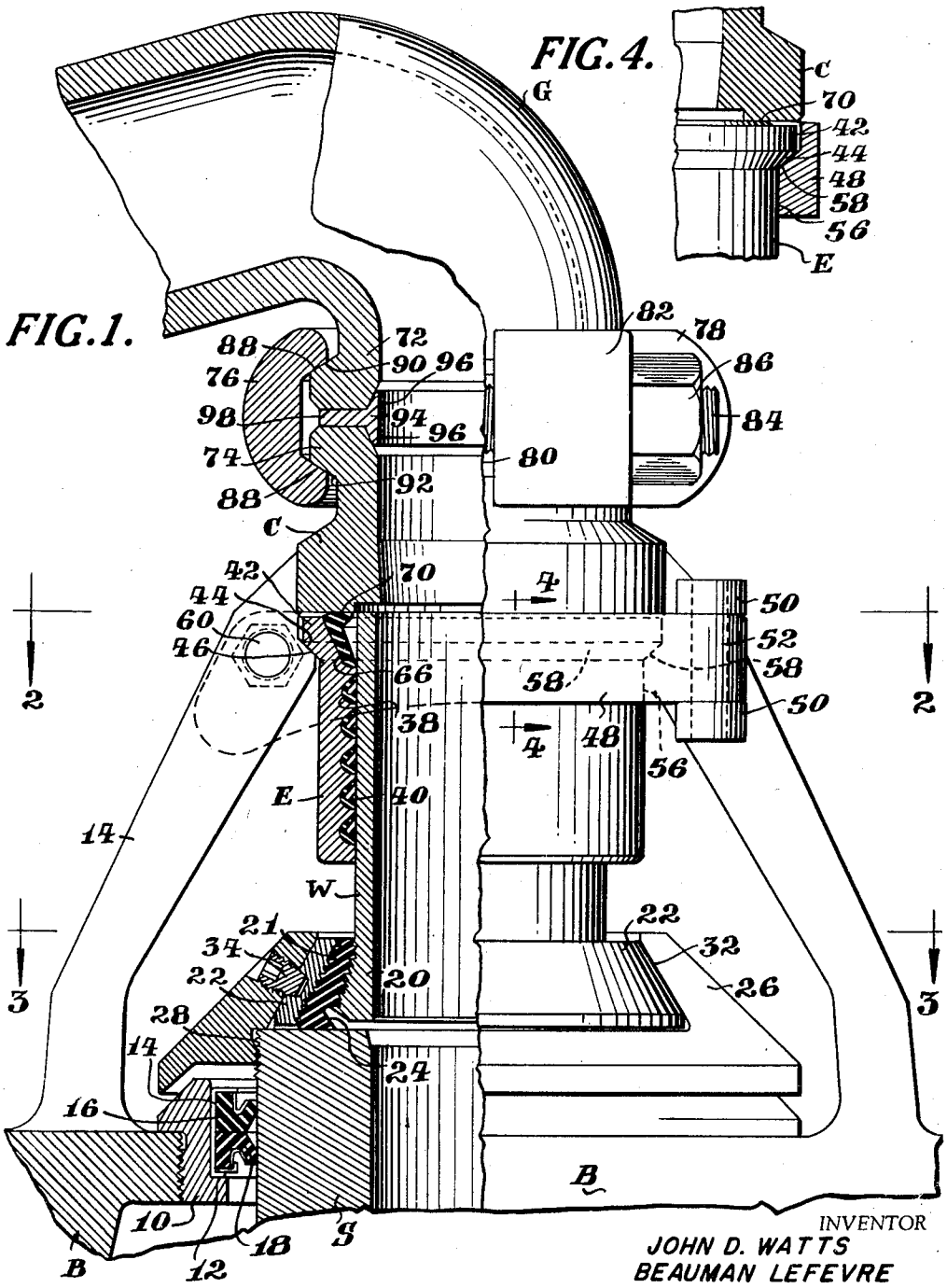



FIG. 4.




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FIG. 2.

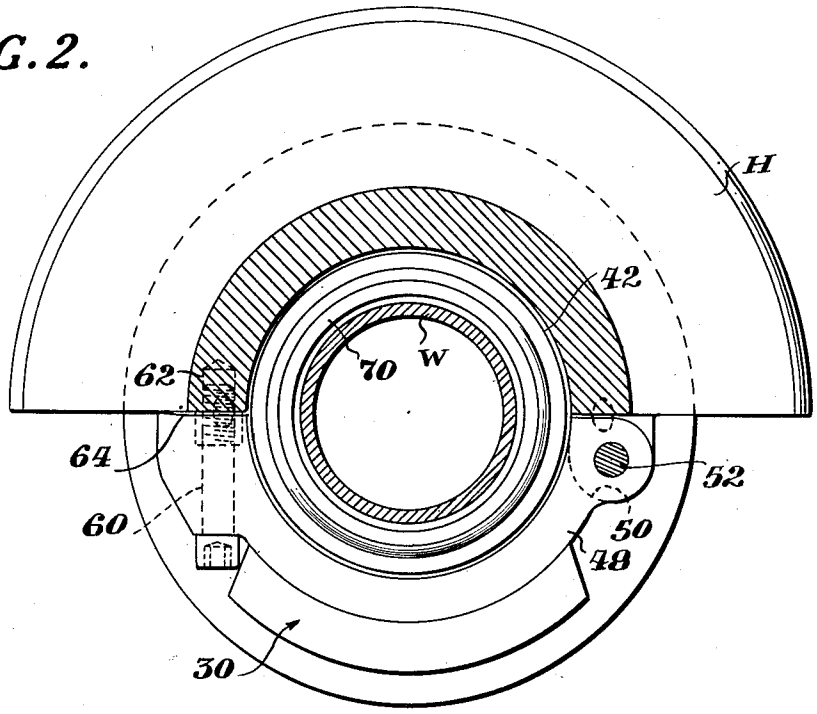
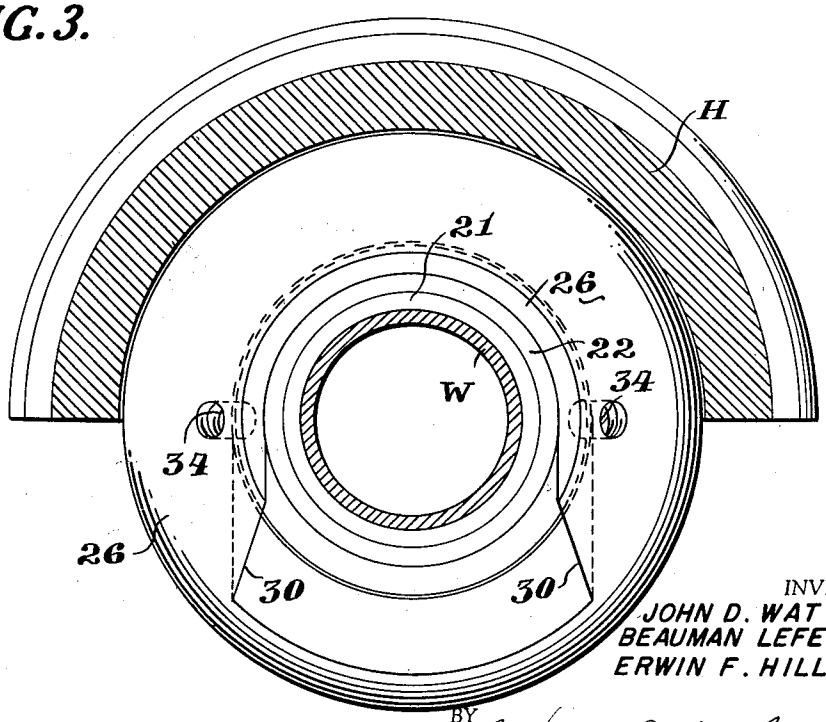



FIG. 3.




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2,867,453

# SWIVEL COUPLING WITH INSERTED SECTION TYPE SWIVEL UNIT

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Application November 5, 1953, Serial No. 390,303

4 Claims. (Cl. 285—31)

The present application relates to oil well swivels of the general type disclosed in the patent to Gray, No. 1,746,036.

The principal object of the invention is to improve and simplify the mounting of the wash pipe in the upper housing of the body of such a swivel, and to improve and simplify the manner of connecting the goose neck to the upper housing of such a swivel, whereby to provide a fluid tight conduit assembly extending from the goose neck to the swivel stem.

In the drawings:

Figure 1 is a side elevational view, partly in section, of the upper end of a swivel, showing the mounting and arrangement of the wash pipe and associated parts, and the goose neck, with respect to the upper housing of the swivel body and the swivel stem.

Figure 2 is a horizontal sectional view taken along the line 2—2 of Figure 1.

Figure 3 is a horizontal sectional view taken along the line 3—3 of Figure 1, and

Figure 4 is a partial vertical sectional view taken along the line 4—4 of Figure 1.

It is unnecessary to disclose the whole body of the swivel herein, as the invention is concerned with those parts which are located in the neighborhood of the upper end of the body of the swivel. In Figure 1, the body is designated by the letter B, and with reference to the said Gray patent, and other patents well known in the art, it will be understood that this body of the swivel is adapted to be supported from the travelling block and hook of the derrick rig by means of a suitable bail, not shown, the bail carrying the weight of the entire swivel and the oil well tools and pipes which are suspended therefrom. Extending above the body B, and integrally connected therewith, is a metal housing H. This housing is substantially semi-circular, in horizontal section, as shown in Figures 2 and 3, being open on one side thereof (from the side as viewed in Figure 1) for purposes hereinafter described.

The upper end of the housing terminates in a relatively thick integral collar C, and this collar constitutes a union to which is connected the lower end of the goose neck G.

Still referring to Figure 1, the upper end of the swivel stem is shown at S. It is, of course, to be understood that the lower end of the swivel tube may be connected to a rotatable drill string (not shown), the mud fluid pumped into the swivel tube via the goose neck and wash pipe flowing downwardly into the drill string and outwardly through the openings at the lower end thereof adjacent the rotary drilling bit. The swivel stem is, of course, supported for rotation on bearings in the body of the swivel, as is well known in the art, and the upper end of the swivel stem is shown extending for a short distance into the lower part of the upper housing H.

A wash pipe W, and its associated assembly, is used to effect a fluid tight connection between the upper end of the swivel stem, and the collar union C at the upper end



of the housing H, and the wash pipe is separable from the swivel stem and collar union, for purposes of replacement.

It will be further understood that the swivel stem S, wash pipe W and collar union C constitute an ordinary fluid conduit, the wash pipe being for convenience a replaceable part thereof, and the open formation of the upper housing H is such that the wash pipe and its associated parts may be conveniently replaced when necessary, without disturbing the remaining connecting parts of the swivel.

The upper end of the wash pipe is surrounded by a substantially cylindrical seal box E, which forms a part of the wash pipe assembly, and may be replaced therewith, as necessary. The seal box E is rigidly mounted in the upper housing H, in a manner hereinafter described.

The swivel stem extends upwardly into the upper housing H, through a circular opening in the top of the main body B of the swivel, there being an annular nut **10** threaded in this opening which is formed with a ledge **12** thereon, and on this ledge any suitable type of packing to seal with the outer wall of the swivel stem, is mounted. For this purpose, we disclose a suitably formed jacket **14** which contains conventional lip packing rings **16** and **18**, the lips of these packings, respectively, extending obliquely upwardly and downwardly in contact with the outer wall of the swivel stem to provide a suitably tight seal.

The lower end of the wash pipe W is suitably enlarged as at **20** and the outer tapering surface of this enlargement is formed with serrations or threads, whereby a quantity of rubber **21** or other suitable flexible yet strong and rugged material, such as any selected plastic, may be permanently molded to the enlarged portion **20**, and to similar serrations and threads formed on the tapering interior surface of the substantially circular drive ring **22**. It will be understood that the wash pipe and drive ring are thus permanently molded to one another, by the rubber or plastic **21**, the drive ring thus forming a part of the wash pipe assembly, fo replacement purposes. The rubber or plastic part **21** may be formed at its lower end with an inwardly extending lip **24**, which contacts the upper end of the swivel stem S, and is tightened into sealing engagement therewith, by pressure of fluid from within the swivel stem or wash pipe.

Surrounding drive ring **22**, and serving to secure the wash pipe assembly, is a mud guard **26**. The mud guard is of substantially frusto-conical shape, and is interiorly threaded as at **28**, so that it may be connected by engagement with suitable threads on the outer end of the swivel stem S.

One side of the upper portion of the mud guard is cut out, or open, as shown at **30** in Figure 3, thus forming a side opening of such width that the drive ring and the wash pipe may be pulled outwardly for replacement purposes, when required. When the drive ring and wash pipe are inserted all the way home into the interior conical portion or sprocket **32** of the mud guard, as shown in Figures 1 and 3, these parts may be permanently locked therein by a locking screw **34**, which is threaded through an opening in the wall of the mud guard, and which has a tapered end which enters a similarly formed depression in the outer wall of the drive ring. We show the use of two of such connections in Figure 3 of the drawings.

The seal box E is substantially cylindrical in shape, and its inner wall has a plurality of equally spaced circular depression **38**, throughout its length, and an appropriate sealing material, such as a durable plastic, is molded to the interior wall of the seal box, as shown. This packing material is molded in each depression, to present a number of upwardly directed lips **40**, the packing being hollowed out inwardly of these lips, as

shown, for the purpose of insuring that a tight seal will be formed throughout the interior of the bearing box, against the escape of fluid under pressure acting downwardly through the seal box. At the upper end of the seal box, which is made of metal, there is an enlargement 42 extending around the box. This enlargement has a downwardly and inwardly tapering shoulder 44, which is adapted to rest upon the corresponding circular shoulder 46, a semi-circular portion of which extends around the interior of the upper housing H, just below the collar union C. This tapering shoulder 44 will rigidly support the bearing box throughout substantially half of its circumference.

The seal box is positioned around the upper end of the wash pipe, as shown, and constitutes a part of the wash pipe assembly, and when the wash pipe, drive ring and seal box are pushed inwardly until the drive ring is all the way home in its socket 32, the seal box will likewise be fully inserted into the semi-circular recess in the housing, formed in part by the shoulder 46 as previously referred to.

As indicated, one half of the shoulder 46 extends around the interior of the upper housing H and forms an integral part thereof. The remainder of shoulder 46 is formed on the interior semi-cylindrical surface of a gate 48. One end of this gate is carried between a pair of hinge bosses 50 which are formed integrally with the upper housing H, there being a hinge pin 52 which extends through the bosses, and through a vertical opening in the gate. The interior of the gate is semi-cylindrical as at 56, and it is formed with a tapered ledge 58 of the same design as and which supplements the ledge 46 to complete the circular support of the enlargement 42 on the seal box, when the gate is closed. The gate carries a locking bolt 60 threaded through one end thereof (Figure 2), and this bolt extends into a threaded socket 62 in a flat face on the housing which contacts the end face 64 of the gate. Thus, when the wash pipe assembly is fully inserted into position where the wash pipe is in alignment with the fluidway to the swivel stem, it may be firmly locked in this position, by threading home the bolt 60 into its socket 62.

When the seal box is mounted in the upper support, as described, its upper end may be slightly spaced from the lower end surface of the union collar C (Figure 1), and the upper end of the passage through the seal box is outwardly tapered as at 66, forming an enlarged chamber, an additional quantity of the packing material being molded into this enlarged tapered chamber, and having an upwardly and inwardly presented lip 70, which engages and seals against the lower face of the union collar C.

It will be observed that in our swivel construction the seal box E is positioned below the rigid union collar C, while the flanged lower end 72 of the goose neck G is positioned against the upper end of the fixed and rigid union collar C, making a very rugged and convenient arrangement, as far as assembly and disassembly of the parts is concerned. The upper end of the union collar is provided with a flange 74, similar to the flange 72, and these flanges are drawn together by a pair of semi-circular clamps 76 and 78 which have meeting faces 80 presented toward one another on opposite sides of the goose neck, and enlarged lugs 82 at these points whereby connecting bolts 84 with their nuts 86 may be employed to draw the clamps 76 and 78 toward one another. The clamps are interiorly formed with tapered surfaces 88, which engage similar tapered surfaces 90 and 92 on the flanges 72 and 74, respectively. The faces 80 of the bosses 82 are slightly spaced from one another so that when the nuts 86 are tightened, there is an inward clamping or wedging action between the surfaces 88 and the surfaces 90, 92, whereby to draw the flanges tightly toward one another.

Disposed between the inner faces of the flanges is a sealing ring 94 which is made of metal and has oppositely directed flanges 96 and a relatively thick rib 98. This sealing ring, and the associated parts used therewith, is described in detail in the copending application of Watts and Hill, Serial No. 340,372, filed March 4, 1953. The outer surfaces of the lips 96 are tapered, and there are interior tapered surfaces on the flanges 72 and 74 which contact and flex these lips, in the manner fully described in the copending application referred to, whereby a tight seal is formed when the clamp is set up to a point when the interior flat faces of the flanges engage the rib 98 of the sealing ring 94.

It will be understood that the goose neck G, the union collar C, the wash pipe W, and the swivel stem S are all formed interiorly with passages of substantially the same diameter, for flow of the liquid, such as drilling mud, from the goose neck downwardly into and through the swivel stem.

With the above construction, it will be observed that the wash pipe and associated parts of its assembly, may be conveniently replaced without necessitating any disconnection or adjustment of the union between the goose neck and the union collar C. Similarly, the joint between the union collar and the goose neck may be broken down and re-assembled, without any interference with the mounting of the wash pipe and its assembly, below the union collar C.

It will be further observed that we have provided a simple and rugged arrangement of parts, at the upper end of the swivel, the parts of which are simple in their manufacture, and with the relative arrangement of the parts yielding great convenience in adjustment and replacement. The wash pipe, seal box and drive ring may be installed and replaced as a unit, being conveniently received within the upper housing of the swivel. The goose neck and its associated parts may be similarly assembled and replaced, with respect to the swivel body and its upper housing.

The mounting of the seal box and the wash pipe is simple and rugged, and the seal box is rigidly held against any movements thereof, when it is locked and supported in position between the upper housing and the side door 48.

With reference to the seal box E, it will be understood that we do not apply any mechanical load to the sealing elements thereof. At this position, prior art constructions use a type of packing that is either spring loaded to form an initial compression or is loaded by a gland. Such pre-loaded packings are subject to both overloading or underloading. The packing in our seal box seals only by the action of the fluid applied to the lips of the packing to cause them to move outwardly to engage and seal with the wash pipe.

We claim:

1. In a swivel, the combination comprising: a body having an upper housing terminating in a union collar fixed thereto; a swivel stem mounted in said body and terminating with an upper end in said housing; a wash pipe assembly including a wash pipe having a locking ring flexibly secured to the lower end thereof and lower seal means extending downwardly below said locking ring, and a flanged seal box slidably rotatably mounted on the upper end of said wash pipe having upper seal means extending thereabove; said housing having a side opening therein of a size to receive said wash pipe assembly, and means for removably mounting said wash pipe assembly between the upper end of said stem and said collar releasable to permit quick lateral removal of said wash pipe assembly, said means comprising an annular support on the upper end of said stem having a side opening of a size to receive the locking ring of said wash pipe assembly therethrough and a locking element for rigidly securing said locking ring thereto with said lower seal means in engagement with said stem, a gate hinged to said upper housing, and flange engaging surfaces on said upper housing and said gate for engaging the flanged seal

box to retain the same in alignment with said collar with said upper seal means in engagement with said collar.

2. The combination as defined in claim 1 wherein said locking element is flexibly secured to the lower end of said wash pipe by means of a quantity of plastic molded therebetween, said plastic providing seal means in the form of an annular sealing lip.

3. The combination as defined in claim 1 wherein said seal box comprises a substantially cylindrical shell having a plurality of circular depressions along the length of its interior wall and a quantity of plastic molded to the walls of said depressions and forming yieldable upwardly presented packing lips to seal against said wash pipe.

4. The combination as defined in claim 1 including a gooseneck and means for connecting said gooseneck to the upper end of said union collar, said last named means comprising exterior tapering surfaces adjacent the lower and upper ends of said gooseneck and said collar respectively, clamping members having internal tapering surfaces complementary to said exterior tapering surfaces, and means for drawing said clamping members laterally toward one another to releasably secure said gooseneck to said collar.



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