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FLUID SWIVEL FOR DRILLING APPARATUS

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Fig. 1.

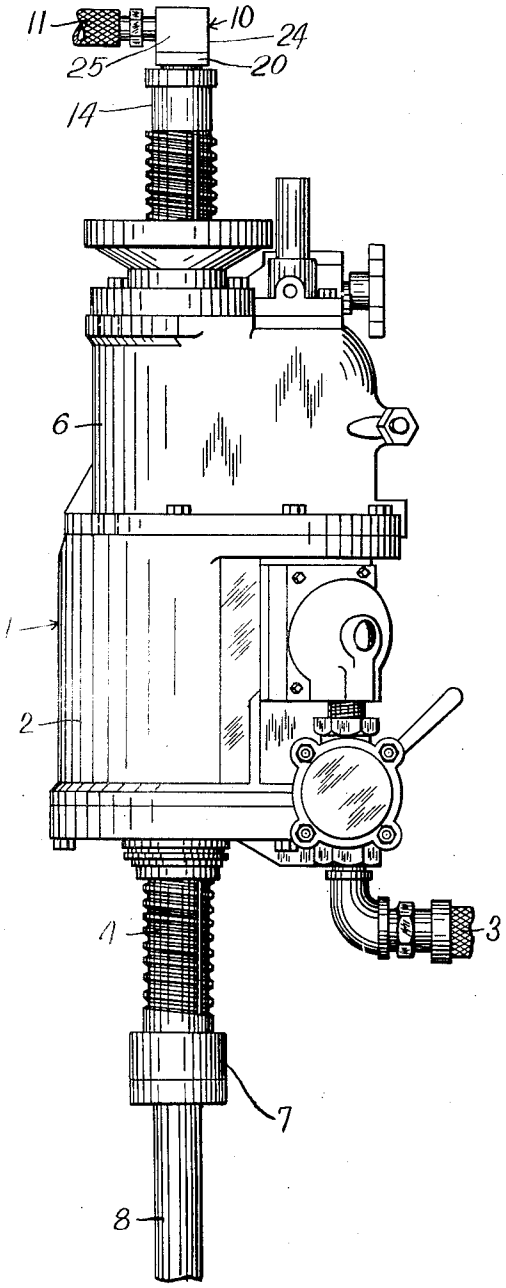
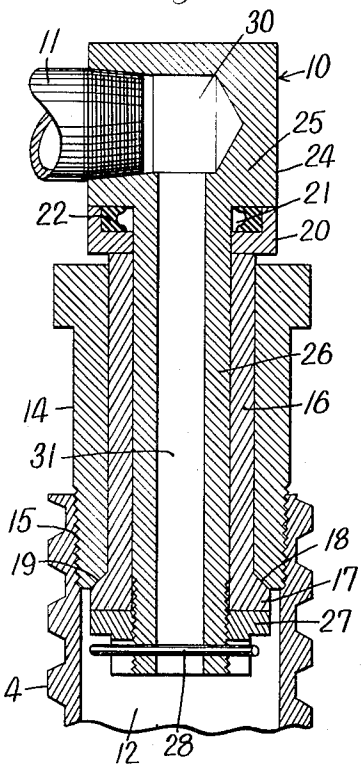


Fig. 2.



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FLUID SWIVEL FOR DRILLING APPARATUS

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8 Claims. (Cl. 285—97.1)

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My invention relates to swivels, and more particularly to water swivels that are adapted especially for use with drilling apparatus of the rotary type.

During the drilling of earth formations with a drill of the rotary type, it is necessary that a liquid be supplied to the bottom of the drill hole for cooling the drill bit and washing away the cuttings formed thereby. It is customary practice to deliver the liquid through passages in the drill rod and bit to the face of the latter, making it necessary that a swivel be provided for delivering the liquid from a non-rotatable supply connection to passage means in the rotatable drill rod.

An object of my invention is to provide an improved swivel for delivering a liquid from a stationary supply connection to passage means in a rotatable element. Another object is to provide an improved water swivel having an improved bearing and sealing means between relatively rotatable parts thereof. Other objects will appear in the course of the following description.

In the drawing in which there is shown for purposes of illustration, one form which my invention may assume in practice:

Fig. 1 is a side elevational view of a drilling apparatus in which my improved water swivel is incorporated.

Fig. 2 is an enlarged longitudinal sectional view showing the water swivel connected to the upper end of the feed screw.

In the illustrative embodiment of the invention there is shown a drilling apparatus, generally designated 1, which may be generally like the drilling apparatus shown and described in my application, Serial No. 558,848, filed October 16, 1944. The drilling apparatus includes a fluid actuated motor 2 having a fluid supply connection 3 and operating to rotate a feed screw 4 which extends through the motor and through a feed control casing 6. Connected to the lower end of the feed screw by an adapter 7 is a conventional drill rod 8 which is adapted to carry a suitable drilling implement, not shown. At the upper end of the feed screw is my improved swivel, generally designated 10, which operates to deliver a liquid, such as water, from a non-rotatable supply connection 11 to the interior 12 of the rotatable feed screw, the latter shown herein as being of tubular shape; and the liquid is conducted from the feed screw through passage means, not shown, in the adapter and drill rod to the bottom of the hole being drilled.

The water swivel 10, as shown, comprises a

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sleeve-shaped member 14 threaded at 15 into the upper end of the rotatable feed screw 4. Extending through the member 14 is a bushing 16 having at its lower end an enlarged portion 17 provided with a beveled surface 18 which is adapted to abut a beveled surface 19 on the lower end of the member 14. When the surfaces 18 and 19 are in engagement with each other, the upper end of the bushing extends somewhat beyond the end of the member 14. Resting upon the upper end of the bushing is a collar 20 having an internal recess 21 which receives a packing 22. This packing prevents leakage between the members 20 and 24 and also exerts a light pressure on the collar 20 holding it in sealing contact with the bushing 16. A member 24 has an enlarged portion 25 arranged above the collar 20 and a non-rotatable elongated cylindrical portion 26 projects through the collar and the bushing in the manner shown. A nut 27 is threaded upon the lower end of the portion 26 and acts against the lower end of the bushing to position the member 24 so that the clearances at the opposite ends of the bushing are only sufficient to permit a free rotation of the bushing and the member 24 relative to each other. A cotter pin 28 extends through openings in the portion 26 and into slots in the nut 27 for holding the latter in its adjusted positions. Formed in the enlarged portion 25 is a chamber 30 to which liquid is delivered by the connection 11, and a passage 31 in the cylindrical portion 26 conducts the liquid from the chamber 30 to the interior of the feed screw.

In order that no liquid may escape between the bushing 16 and the member 14, there is placed between them a sealing material, such as a conventional waterproof cement. The bushing has a close fit in the member 14, and, by reason of its close fit and the presence of sealing material, is caused to rotate with the member 14. The fit of the cylindrical portion 26 within the bushing is such that they are freely rotatable relative to each other and yet there is prevented an escape of liquid between them. The bushing is made of carbon so that the resistance to its rotation relative to the portion 26 is low even with a fairly close fit, and no lubricant needs to be added. The pressure exerted by the packing 22 on the collar 20 to hold the latter in contact with the bushing prevents leakage between the parts and serves to maintain the parts in sealing contact even when the parts are slightly out of alignment and the vibrations set up within the apparatus tends axially to displace slightly the parts 16 and 20. Thus an adequate seal between the parts is main-

tained at all times preventing substantial leakage of liquid from between the relatively rotating parts. The nut 27 may be adjusted to provide clearances at the ends of the bushings sufficiently small to prevent the escape of liquid past them.

While there is in this application specifically described one form which the invention may assume in practice, it will be understood that this form of the same is shown for purposes of illustration and that the invention may be modified and embodied in various other forms without departing from its spirit or the scope of the appended claims.

What I claim as new and desire to secure by Letters Patent is:

1. A fluid swivel for a drilling apparatus of the kind having a rotating tubular drill element and a fluid inlet head connectable to an extraneous source of fluid supply whereby fluid may be supplied through said head to the interior of said rotating drill element, comprising a sleevelike member detachably secured to one end of said rotating drill element, said fluid inlet head having a cylindrical tubular conduit portion, a cylindrical bearing and sealing bushing extending axially through the bore of said sleevelike member and sealingly secured at its exterior periphery to the walls of said bore, said tubular portion rotatably fitting the bore of said bushing and extending axially therethrough, a sealing annulus surrounding said tubular portion at one end thereof between said fluid inlet head and the adjacent end of said bushing and sealingly engaging said end of said bushing, and adjustable means secured to the opposite end of said tubular portion within said tubular drill element and having an end bearing surface engaging the opposite end of said bushing.

2. A fluid swivel for a drilling apparatus of the kind having a rotating tubular drill element and a fluid inlet head connectable to an extraneous source of fluid supply whereby fluid may be supplied through said head to the interior of said rotating drill element, comprising a sleevelike member detachably secured to one end of said rotating drill element, said fluid inlet head having a cylindrical tubular conduit portion, a cylindrical bearing and sealing bushing extending axially through the bore of said sleevelike member and sealingly secured at its exterior periphery to the walls of said bore, said tubular portion rotatably fitting the bore of said bushing and extending axially therethrough, a sealing annulus surrounding said tubular portion at one end thereof between said fluid inlet head and the adjacent end of said bushing and sealingly engaging said end of said bushing, said sealing annulus including a collar sealingly engaging said one end of said bushing and a yieldable member for urging said collar into sealing contact with said end of said bushing, and adjustable means secured to the opposite end of said tubular portion within said tubular drill element and having an end bearing surface engaging the opposite end of said bushing.

3. A fluid swivel for a drilling apparatus of the kind having a rotating tubular drill element and a fluid inlet head connectable to an extraneous source of fluid supply whereby fluid may be supplied through said head to the interior of said rotating drill element, comprising a sleevelike member detachably secured to one end of said rotating drill element, said fluid inlet head having a cylindrical tubular conduit portion, a cylindrical bearing and sealing bushing extending axially through the bore of said sleevelike member and sealingly secured at its exterior periphery to the walls of said bore, said tubular portion rotatably fitting the bore of said bushing and extending axially therethrough, a sealing annulus surrounding said tubular portion at one end thereof between said fluid inlet head and the adjacent end of said bushing and sealingly engaging the surface of said end of said bushing, said fluid inlet head having an inner plane surface with which said end surface of said bushing is parallel, and said sealing annulus including a collar sealingly engaging said end of said bushing and a resilient packing ring sealingly engaging said plane surface on said fluid inlet head and yieldingly urging said collar into sealing contact with said end surface of said bushing, and adjustable means secured to the opposite end of said tubular portion within said tubular drill element and having an end bearing surface engaging the opposite end of said bushing.

4. A fluid swivel for a drilling apparatus of the kind having a rotating tubular drill element and a fluid inlet head connectable to an extraneous source of fluid supply whereby fluid may be supplied through said head to the interior of said rotating drill element, comprising a sleevelike member detachably secured to one end of said rotating drill element, said fluid inlet head having a cylindrical tubular conduit portion, a cylindrical bearing and sealing bushing extending axially through the bore of said sleevelike member and sealingly secured at its exterior periphery to the walls of said bore, said tubular portion rotatably fitting the bore of said bushing and extending axially therethrough, a sealing annulus surrounding said tubular portion at one end thereof between said fluid inlet head and the adjacent end of said bushing and sealingly engaging said end of said bushing, said sleevelike member having a conical recess at one end and said bushing having a conical portion at its opposite end engaging said conical surface, and adjustable means secured to the opposite end of said tubular portion within said tubular drill element and having an end bearing surface engaging said opposite end of said bushing.

5. A fluid swivel for a drilling apparatus of the kind having a rotating tubular drill element and a fluid inlet head connectable to an extraneous source of fluid supply whereby fluid may be supplied through said fluid head to the interior of said rotating drill element, comprising a sleevelike member detachably secured to one end of said rotating drill element, said fluid inlet head having a cylindrical tubular conduit portion, a cylindrical bearing and sealing bushing extending axially through the bore of said sleevelike member and sealingly secured at its exterior periphery to the walls of said bore, said tubular portion rotatably fitting the bore of said bushing and extending axially therethrough, a sealing annulus surrounding said tubular portion at one end thereof between said fluid inlet head and the adjacent end of said bushing and sealingly engaging said end of said bushing, and adjustable means secured to the opposite end of said tubular portion within said tubular drill element and having an end bearing surface engaging the opposite end of said bushing, said adjustable means including a nut threaded on said opposite end of said tubular portion and having a plane bearing surface engaging the end surface of said opposite end of said bushing.

6. A fluid swivel for a drilling apparatus of the kind having a rotating tubular feed screw and a fluid inlet head connectable to an extraneous source of fluid supply whereby fluid may be supplied through said head to the interior of said tubular feed screw, comprising a sleevelike member detachably secured to one end of said tubular feed screw, said fluid inlet head having a non-rotatable cylindrical tubular conduit portion, a rotatable cylindrical bearing and sealing bushing extending axially through the bore of said sleevelike member and sealingly secured at its exterior periphery to the walls of said bore, said non-rotatable tubular portion rotatably fitting the bore of said rotatable bushing and extending axially therethrough, a sealing annulus surrounding said tubular portion at one end thereof between said fluid inlet head and the adjacent end of said bushing and sealingly engaging said end of said bushing, and adjustable means secured to the opposite end of said tubular portion within said tubular feed screw and having an end bearing surface engaging the opposite end of said bushing.

7. A fluid swivel for a drilling apparatus of the kind having a rotating tubular drill element and a fluid inlet head connectable to an extraneous source of fluid supply whereby fluid may be supplied through said head to the interior of said rotating drill element, comprising a sleevelike member detachably secured to one end of said tubular drill element, said fluid inlet head having a cylindrical tubular conduit portion, a cylindrical bearing and sealing bushing extending axially through the bore of said sleevelike member and sealingly received in said bore, said tubular portion rotatively fitting the bore of said bushing and extending axially therethrough, a sealing ring surrounding said tubular portion between said inlet head and the adjacent end of said bushing and yieldable sealing means sealingly engaging an adjacent surface of said inlet head and urging said ring into sealing contact with said adjacent end of said bushing, and a member secured to the opposite end of said tubular portion within said tubular drill element and having a bearing surface engaging the opposite end of said bushing.

8. A fluid swivel for a drilling apparatus of the kind having a rotating tubular drill element and a fluid inlet head connectable to an extraneous source of fluid supply whereby fluid may be supplied through said head to the interior of said rotating drill element, comprising a sleevelike member detachably secured to one end of said tubular drill element, said fluid inlet head having a cylindrical tubular conduit portion, a cylindrical bearing and sealing bushing extending axially through the bore of said sleevelike member and sealingly received in said bore, said bushing having an annular shoulder at one end having bearing contact with a complemental surface on the adjacent end of said sleevelike member, said tubular portion rotatively fitting the bore of said bushing and extending axially therethrough, a sealing ring surrounding said tubular portion between said inlet head and the adjacent end of said bushing, said last mentioned end of said bushing being opposite to said first mentioned end of said bushing, and yieldable sealing means sealingly engaging an adjacent surface of said inlet head and urging said ring into sealing contact with said adjacent end of said bushing, and a member secured to the opposite end of said tubular portion within said tubular drill element and having a bearing surface engaging said opposite end of said bushing.

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