Dec. 20, 1960 L. H. GALEENER 2,965,182

CIRCULATING WHIPSTOCK

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Fig. 3

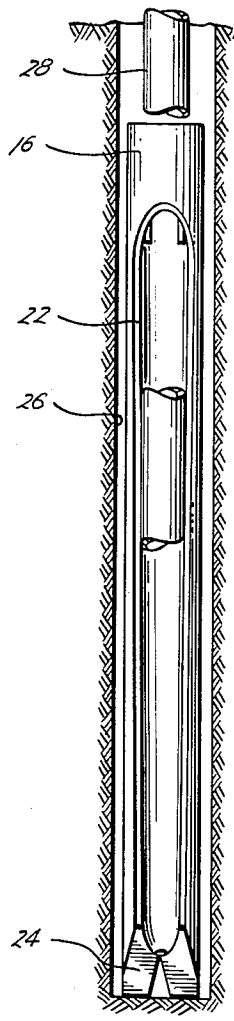

Fig. 2

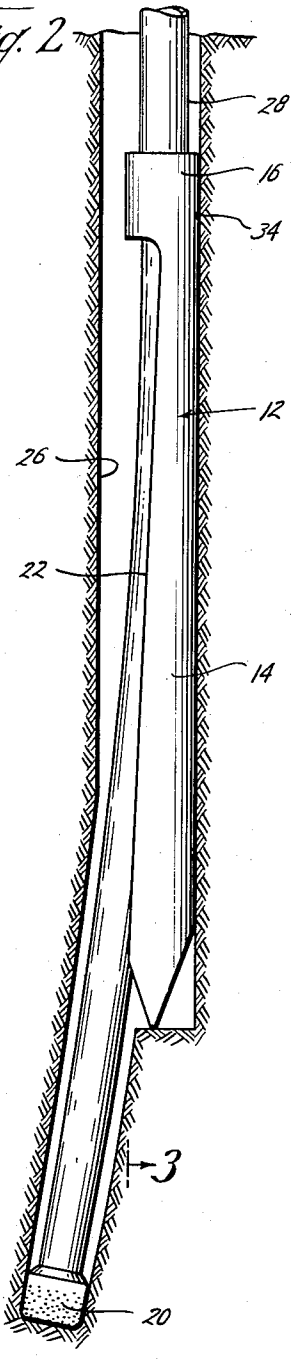

Fig. 1

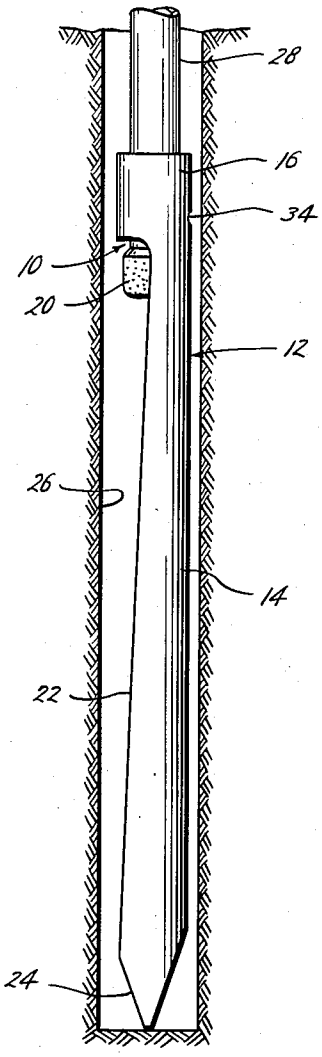

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Fig. 4A

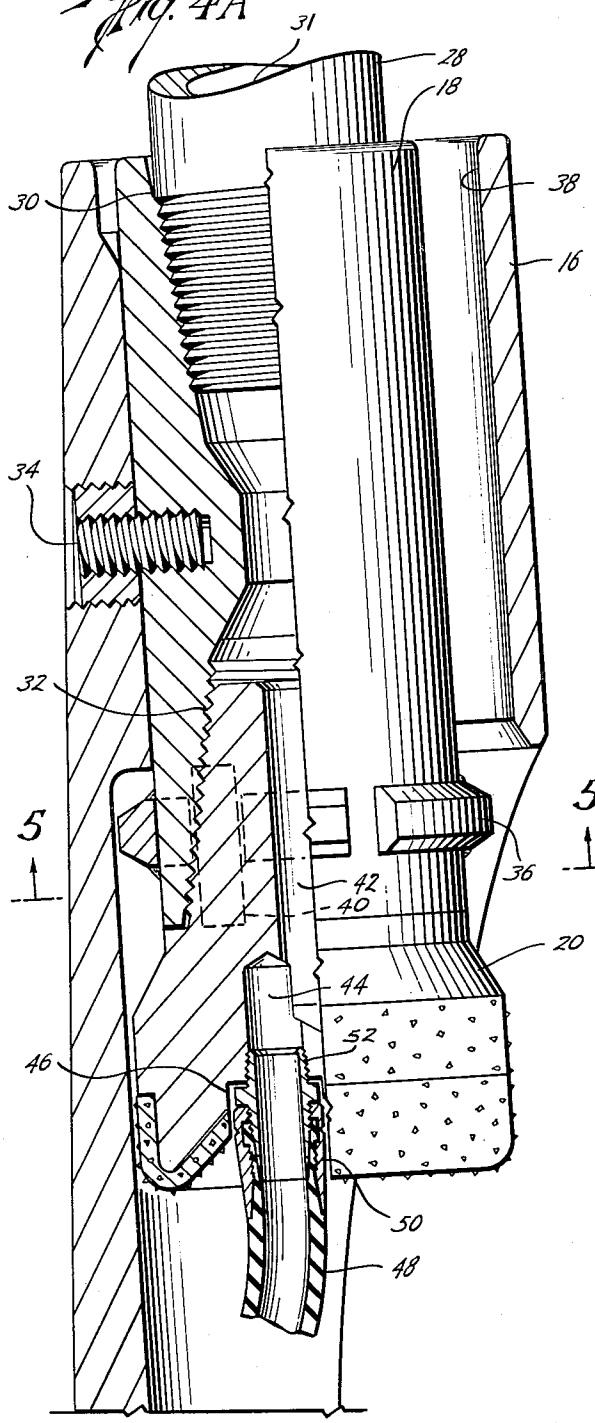

Fig. 4B

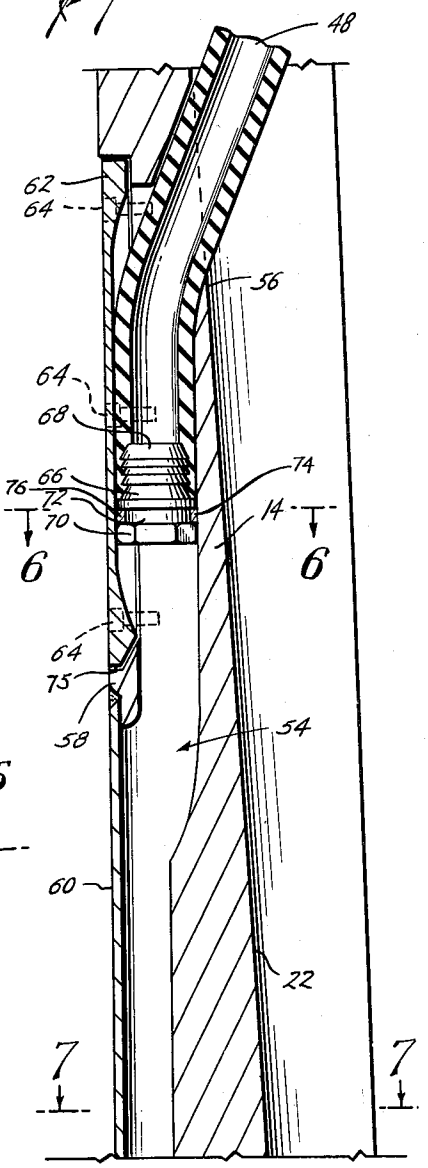

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Fig. 4C

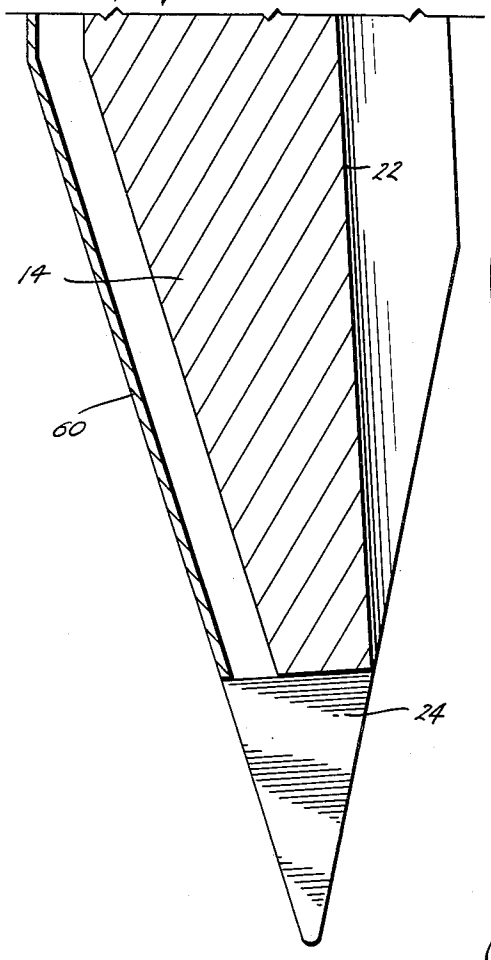


Fig. 5

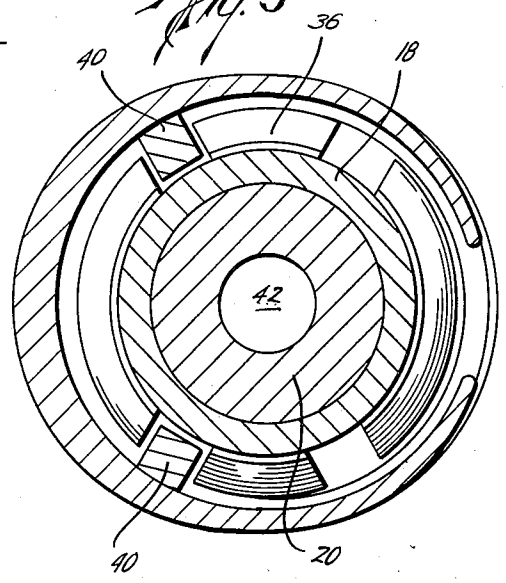


Fig. 6

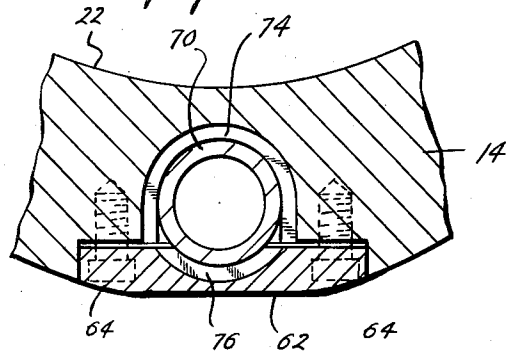
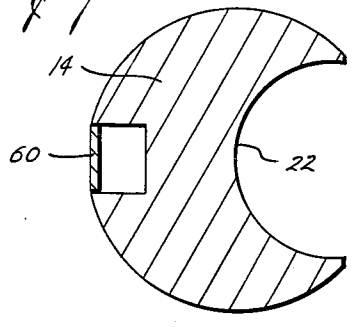


Fig. 7



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CIRCULATING WHIPSTOCK

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2 Claims. (Cl. 175—82)

This invention relates to a circulating whipstock and more particularly to a whipstock providing circulation between the drill bit and the lower end of the whipstock.

In the drilling of oil and gas wells it is oftentimes necessary or desirable to change the direction of the well bore and to do this the path of the drill bit must be deflected. In order to deflect the path of the drill bit a whipstock is normally set in the well bore at the lower end thereof and the path of the drill bit is deflected from the path of the well bore by a slanting or tapered face on the whipstock over which the bit rides in its downward movement.

The whipstock is lowered into the well bore at the lower end of the drill pipe by having a collar at the upper end of the whipstock grip the drill collar located immediately above the bit. The drill bit is normally releasably secured to the collar of the whipstock by a shear pin so that once the whipstock reaches the bottom of the well bore and is properly oriented, downward force on the drill pipe will shear the pin and enable the bit to be moved downwardly to commence drilling.

It has long been recognized that it is advantageous to have circulation out the lower end of the whipstock as the whipstock is lowered into the well bore instead of out the fluid passage in the bit or drill collar located at the upper end of the whipstock. One attempt to provide such a circulating whipstock is illustrated in Patent No. 2,108,419 for a whipstock issued February 15, 1938, to O. B. Trotter which has fluid passages both through the whipstock and through the lower end of the bit but in such construction there is no guarantee that any drilling fluid will pass through the whipstock as it can all leave the lower end of the bit. Another attempt to provide a successful circulating whipstock is by the device illustrated in Patent No. 2,196,517, issued April 9, 1940, to R. F. Bolton for a winged whipstock in which a metal tube has its lower end inserted in a fluid passage in the whipstock and its upper end slipped into a fluid passage in the bit. Because the metal tube of this device is merely inserted in both such passages there is a loose fit of the tube in the bit and drilling fluid often leaks around the upper end of this tube and out the lower end of the bit without passing downwardly through the whipstock. This frequently occurs because when the whipstock is initially lowered into the well bore the drilling fluid rising up through the whipstock and tube into the drill pipe above the bit carries cuttings and other particles which often plug the metal tube either during the lowering operation or when pump pressure is put on the drilling fluid. As the drilling fluid then leaks around the upper end of the plugged metal tube there is no way for the operator to know whether the circulation is through the whipstock or merely out the bit around the upper end of the metal tube. Additionally, because of the loose fit of the metal tube of such a device the lower end of the tube is often forced upwardly and out the whipstock when being lowered in the well bore.

It is therefore a general object of the present invention

to provide a circulating whipstock having a conduit of shearable material connecting the fluid passage in the drill pipe with a fluid passage in the whipstock and which conduit is sealingly secured in the drill bit.

Another object of the present invention is to provide such a circulating whipstock using a flexible conduit having its lower end secured in a fluid passage in the whipstock in such a manner that it is not forced out of the fluid passage in the whipstock by pump pressure or the upward movement of drill fluid through the passage in the whipstock.

A still further object of the present invention is to provide such a circulating whipstock having thread means for sealingly securing the upper end of the conduit to the drill bit and lug means for securing the lower end of the conduit in the whipstock.

A still further object of the present invention is to provide such a circulating whipstock in which the conduit connecting the passage in the drill bit with the passage in the whipstock can easily be replaced after it has been sheared.

Other and further objects, features and advantages of the present invention will appear as the description of the preferred example of the invention proceeds, which is given for the purpose of disclosure and which is taken in conjunction with the accompanying drawings, where like character references designate like parts throughout the several views and where,

Figure 1 is a side elevation of the circulating whipstock of the present invention illustrating it in position for initial setting at the lower end of the well bore,

Figure 2 is a view similar to Figure 1 illustrating the present invention after the drill bit has been released from the collar of the whipstock and has begun cutting a new hole,

Figure 3 is a view along the line 3—3 of Figure 2,

Figure 4A, 4B and 4C are enlarged partially sectional views of the invention shown in the same position as in Figure 1,

Figure 5 is a view along the line 5—5 of Figure 4A,

Figure 6 is a view along the line 6—6 of Figure 4B, and

Figure 7 is a view along the line 7—7 of Figure 4B.

Referring to the drawings, the circulating whipstock, indicated generally by the numeral 10, includes as a whole the whipstock 12 having the elongate body 14 with a collar 16 at its upper end in which collar 16 is releasably secured the drill collar 18 threadedly secured to a drill bit 20.

As seen in Figures 1 and 7, the body 14 of the whipstock 12 has the tapered face 22 which is concave in cross section to deflect and guide the bit 20 after it is released from the whipstock collar 16. The lower end of the body 14, as best seen in Figure 3, has a split chisel point 24 to engage the lower end of the well bore 26 and hold the whipstock 12 in position.

A string of drill pipe 28 is secured such as by complementary threads 30 to the drill collar 18 which in turn is secured such as by the complementary threads 32 to the bit 20. A shear pin 34 through the whipstock collar 16 into the drill collar 18 releasably holds the bit 20 in the whipstock 12 in the position illustrated in Figures 1 and 4A. A plurality of spaced lugs 36 are provided on the drill collar 18 below the whipstock collar 16 which lugs 36 provide an external diameter of the drill collar 18 below the whipstock collar 16 greater than the internal diameter of the bore 38 of the whipstock collar 16 so that when the drill collar 18 is lifted by the drill pipe 28 the whipstock 12 may also be lifted from the well bore 26.

A pair of dogs 40, as best shown in Figure 5, on the whipstock 12, are located between the spaced lugs 36 when the drill collar 18 is in the position illustrated in Figures 1 and 4A to prevent relative rotation between

the drill bit 20 and the whipstock 12 and accidental shearing of pin 34 until the shear pin 34 has been sheared by downward force on the drill pipe 28.

The foregoing construction is conventional in a whipstock, drill pipe, and drill collar and no further description thereof is deemed necessary.

A fluid passage 42 in the drill bit 20 establishes fluid communication through the hollow drill collar 18 with the bore 31 in the drill pipe 28. This fluid passage 42 is provided with an offset portion 44 in communication with the exterior of the lower end of the bit 20 at orifice 46 so that the fluid passage 42 in the drill bit is in communication with the exterior of the lower portion of the drill bit 20 at a point off the axis of rotation of the drill bit. This offset prevents coring of the earth formations when the drill bit 20 is in the position illustrated in Figure 2.

The upper end of a flexible tube or conduit 48 is secured in the orifice 46 by thread means such as the standard male hose connector 50 secured on the upper end of the tube 48 which standard male connection is threadedly and sealingly secured in the orifice 46 by complementary threads 52 on the upper end of the standard male connecter 50 and in the orifice 46. This standard male connector 50 for a hose is a conventional item and need not be further described. The tube 48 is constructed of material which can withstand great pressures in the bottom of deep holes and double braid wire reinforced rubber hose has been found satisfactory.

The lower end of the tube 48 is secured in the fluid passage 54, best seen in Figures 4B and 4C, in the body 14 of the whipstock 12 which fluid passage 54 opens at the lower end of the body 12, preferably between the split chisel point 24, as best seen in Figures 3 and 4C. Thus drill fluid in the bore 31 of the drill pipe 28 passes down through the bit 20 by means of the fluid passage 42, through the flexible conduit 48, through the fluid passage 54 in the whipstock 12, and out the bottom of the whipstock 12 at the chisel point 24.

The fluid passage 54 in the whipstock 12 is preferably formed by milling a groove along the back of the body 14 of the whipstock 12 for the length of the fluid passage 54 and then drilling through the face 22 of the whipstock to form the orifice 56 through which the conduit 48 is inserted. A bridge 58 (see Figure 4B) is welded across this milled groove in its upper portion and a plate 60 is then placed over the milled groove and welded to the bridge 58 and the back of body 14 enclosing the lower portion of the groove and forming the lower portion of the fluid passageway 54. A removable plate 62 is secured over this groove from the bridge 58 to the upper end of the fluid passage 54 by screws 64 through the removable plate 62 into the back of body 14.

The lower end of the flexible conduit 48 is provided with a nipple 66 secured in the tube 48 by the buttress threaded male portion 68 which nipple 66 has the projection 70 extending beyond the lower end of the conduit 48. This projection 70 has an annular groove 72 formed in it into which is fitted the semi-circular lug 74 within the fluid passage 54 and the matching semi-circular lug 76 (best seen in Figure 6) on the inner side of the removable plate 62 thereby holding the nipple 66 and hence the lower end of conduit 48 securely in the fluid passage 54.

The semi-circular lugs 74 and 76 substantially fill the annular groove 72 and prevent appreciable leakage of drill fluid upwardly in fluid passage 54 around the nipple 66. Packing 75 between the lower end of the removable plate 62 and the bridge 58 prevents escape of fluid at that joint.

In operation, the drill collar 18 secured to the bit 20 is inserted in the collar 16 of the whipstock 12 and the shear pin 34 is inserted in a conventional manner. The standard male connector 50 on one end of the conduit 48 is threaded into the orifice 46 and the lower end of the conduit 48 is then inserted through the orifice 56 in the face 22 of the body 14 of the whipstock. At the time of the insertion of this lower end of the conduit 48 the removable plate 62 is off and the annular groove 72 in the nipple 66 is placed over the semi-circular lug 74 within the fluid passage 54. Thereafter the removable plate 62 is secured in the position shown in Figure 4B with the semi-circular lug 76 fitting in the annular groove 72 on the nipple 66 with the semi-circular lugs 74 and 76 nearly meeting. Screws 64 secure the removable plate 62 in position bringing the lugs 74 and 76 closer together and forming a sufficient obstruction around the conduit 48 to prevent a harmful amount of upward flow of drill fluid from the nipple 66 around the exterior of the conduit 48. If desired, a semi-fluid packing material such as Permatex may be applied around the lower end of the tube 48 in the vicinity of the nipple 66 to help seal against fluid leakage.

The entire assembly 10 is then lowered into the well bore 26. During the downward movement of the assembly 10 the drill fluid in the well will initially enter the lower end of the fluid passage 54 in the whipstock 12 and pass upwardly through the conduit 48 into the drill pipe 28. The semi-circular lugs 74 and 76 in the annular groove 72 in nipple 66 prevent such action from forcing the conduit 48 out of the fluid passage 54. When pump pressure is put on so that the drill fluid flows downwardly through the drill pipe 28 the standard male connector 50 holds the tube 48 in position and insures that all drill fluid in the bit 20 enters the tube 48. The lugs 74 and 76 prevent the pressure of the drilling fluid from "kicking" the conduit 48 out of the whipstock and insures that the fluid in the conduit 48 enters the fluid passage 54 in the whipstock so that fluid flows out of the whipstock 12 adjacent its lower end and aids the passage of the assembly 10 downwardly into the well bore.

The circulating whipstock 10 is oriented in a conventional manner and the whipstock 12 spudded in the lower end of the well bore 26 as in the position illustrated in Figure 1. Downward force on the drill pipe 28 shears the shear pin 34 and also the flexible conduit 48 permitting the bit 20 to slide down the face 22 of the whipstock 12 and drill a new hole as illustrated in Figure 2. The whipstock 12 and drill pipe 28 are removed from the well bore 26 when desired by lifting up on the drill pipe 28 whereupon the lugs 36 engage the collar 16 of the whipstock 12 and lift it to the surface. The remnants of the conduit 48 may be removed by unthreading the connector 50 and removing the removable plate 62.

Thus the present invention is well suited to carry out the objects and attain the advantages and ends mentioned as well as others inherent therein. Accordingly the invention is to be limited only by the spirit thereof and the scope of the appended claims.

What is claimed is:

1. In a circulating whipstock including a drill bit releasably secured to the whipstock, said drill bit having a fluid passage throughout opening to the exterior of the bit, the improvement comprising, a fluid passage in the whipstock, a shearable conduit, thread means sealingly securing one end of said conduit in fluid communication with the fluid passage in the bit at the opening of said passage to the exterior of the bit, a removable plate over a portion of the fluid passage in the whipstock, matching lugs and a groove on the other end of the conduit and in the fluid passage in the whipstock under the removable plate whereby such other end of the conduit is insertable in the fluid passage in the whipstock and secured therein.

2. In combination, a whipstock provided with an elongated body and a collar at the upper end of the body, a first fluid passage in the body of the whipstock in fluid communication with the lower end of the body and the exterior of the body approximate the collar, a drill bit releasably held in the collar, a second fluid passage

throughout the drill bit opening to the exterior of the bit, a shearable conduit establishing fluid communication between the fluid passages, thread means sealing'y securing one end of the conduit in said opening of the second passage, a removable plate on the body of the whipstock covering a portion of the fluid passage in the whipstock, coacting lugs and a groove on the other end of the conduit and in the fluid passage in the whipstock under the removable plate whereby said other end of the conduit

may be inserted in the fluid passage in the whipstock and secured therein.

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