

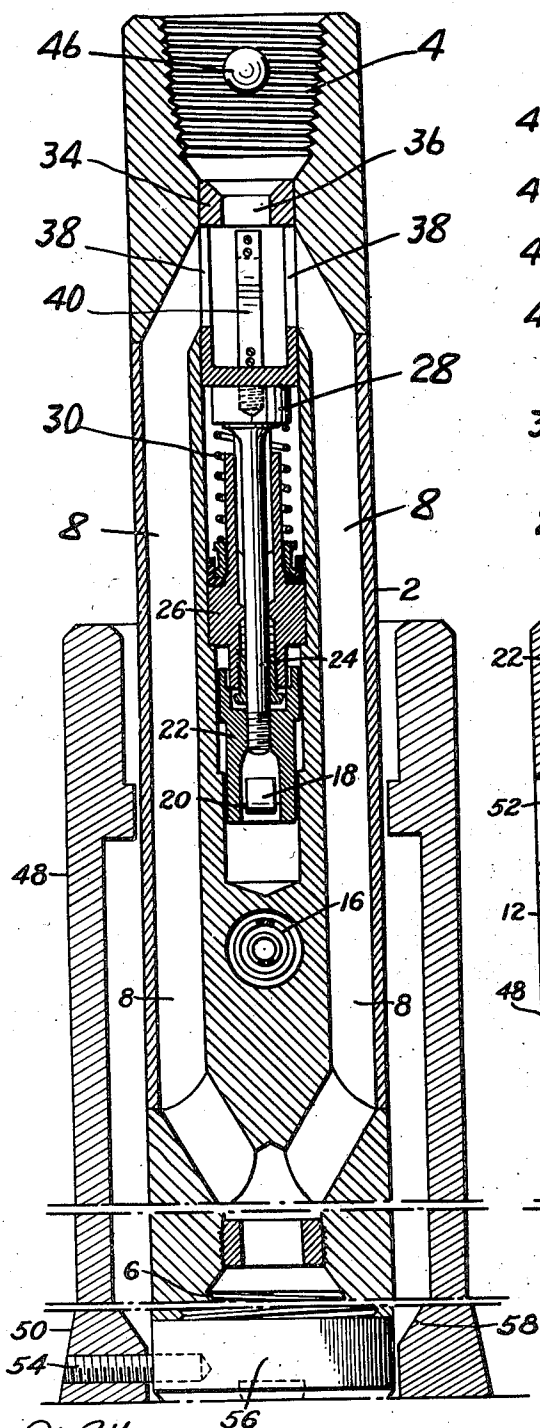
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R. RING

2,454,839

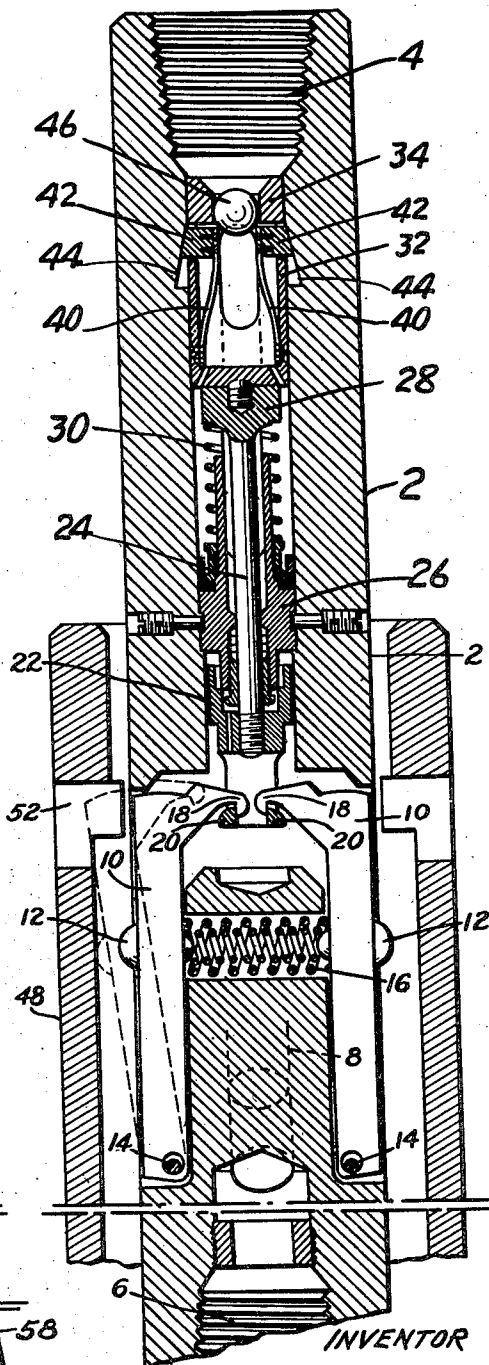
RETRIEVING APPARATUS

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WITNESS

FIG. 1



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RETRIEVING APPARATUS

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2 Claims. (Cl. 294-97)

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This invention relates to a device for removing whipstocks from bore holes by a so-called retrieving operation and relates particularly to a device adapted to be included within a drill string above a bit for effecting such results.

The present invention relates to apparatus of the general type illustrated in Kothny Patents 2,107,420, 2,234,438, 2,261,393, 2,296,706 and 2,302,330. Reference may be made to these patents for more complete discussion of the purpose of devices of this type and their manipulations to affect proper control of a whipstock or the like in a bore hole. In general, such devices comprise members which may occupy alternatively inner or outer positions, in the former of which they are inactive and, being housed within the boundaries of a drill string, do not interfere with its normal operation. In the latter position, however, they are capable of interengaging with a whipstock or the like so as to control it for rotary movement or, in particular, so as to seize it and effect its withdrawal from the hole.

The present invention relates to features of construction and operation of a device of this type which, so far as ultimate results are concerned, functions the same as devices of said patents. The invention in particular relates to means for the hydraulic control of the engaging elements.

The broad object of the present invention is the provision of an apparatus of the type just indicated which has various advantages over devices of the same general type heretofore known and used. In particular, a positive hydraulic control is provided with a possibility of repetition of the controlling operation.

These and other objects of the invention particularly relating to details of construction and operation will become apparent from the following description read in conjunction with the accompanying drawing in which—

Figure 1 is a vertical section through the improved device; and

Figure 2 is a vertical section through the same taken at right angles to the section illustrated in Figure 1.

The retrieving device indicated generally at 2, like those of the patents, is designed to be included as part of the drill string near the lower portion thereof, which drill string carries, for example, a whipstock 50 secured thereto initially by the usual shear pin 54. The whipstock is provided with a collar 48 through which the drill stem may pass during the procedure of drilling off the whipstock and which collar is adapted to

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be engaged by expandible means incorporated in the device.

The device is provided with threaded openings 4 and 6 into which the adjacent drill stem sections are arranged to be secured and which provide passages for the drilling liquid which passes through the device through a pair of channels indicated at 8.

The expandible elements of the device take the form of levers 10 provided as described in the patents mentioned above with soft rivets 12 for conventional purposes and pivoted loosely upon pins 14, the bottoms of the openings containing the levers 10 being adapted to take the strains of whipstock removal rather than the pins. A spring arrangement indicated at 16 urges the levers 10 outwardly but they are at suitable times held inwardly by the engagement of hooks 18 thereof with latching members 20, carried by a plunger 22 which is supported by a rod 24 extending through a suitable stuffing box assembly indicated at 26 and held upwardly by a spring 30 acting beneath a head 28 of the rod 24. As will be noted from Patent 2,302,330 the arrangement so far described is identical with that illustrated in the patent.

In accordance with the present invention the upper end of the rod 24 carries a member 32 which takes the form of a piston slidable in a central bore of the device. The upper end 34 of this piston is provided with a central cylindrical opening 36. The sides of the piston adjacent to the upper ends of the channels 8 are provided with openings 38 so that normally free flow of mud may take place through the opening 36 outwardly through the openings 38 and thence through the channels 8 into the bores of the lower sections of the drill string. The piston 32 carries internally a pair of springs 40 to which are secured blocks 42 which pass through openings in the piston wall and engage, as illustrated particularly in Figure 2, downwardly divergent conical or sloping walls 44 in the upper portion of the bore. When the parts are in the positions illustrated in the drawing, these springs are forced inwardly so as to overlap the peripheral portions of the opening 36, the springs normally tending to move outwardly so as to cause themselves and the blocks to clear that opening.

In the use of this arrangement, the collar 48 of the whipstock 50 extends above the position of the upper ends of the engaging members 10, which occupy the outward positions indicated in chain lines, being received in longitudinal slots 52 in the whipstock collar 48, desirably with close

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clearance so that upon rotation of the whipstock 50 by means of the sub 2, stresses are transferred through the engaging members 10 rather than through a shear pin 54 which, below the level of the sub 2, secures the whipstock 50 to a drill collar or bit 56. Thus assembled, the whipstock, bit 56 and sub 2 and other elements, including for example an orientation sub located above sub 2, are lowered on a sectional drill stem to approximately the depth at which the whipstock will be ultimately fixed. The drill stem and the parts carried thereby may now be rotated while a well surveying instrument is lowered through the same to a position to make a record of orientation, for example, in accordance with Hyer Patent 2,120,670. During such rotation, stresses are taken by the hardened engaging members 10 rather than by the relatively weak shear pin 54, which must ultimately be sheared off. When the surveying instrument reaches its proper level, the drill stem may be moved up and down, i. e., spudded, so that torsional strains are taken out of the assembly and then the entire assembly is held at rest for sufficient time for the surveying instrument to make a record. At this time, the position of the rotary table may be noted at the surface.

As soon as sufficient time has elapsed for the making of the record, the surveying instrument may be withdrawn by its supporting wire line, or retrieved by means of an overshot if it was originally dropped in go-devil fashion, and during such withdrawal the drill stem may be again rotated, at which time the stresses of rotation will again be assumed by the engaging members 10. After the record is analyzed and the proper position of the drill stem ascertained, the rotary table may be turned to a position, as determined by the marks thereon and the record of the surveying instrument, to bring the whipstock 50 to the desired position, whereupon spudding is again effected to insure that stresses in the system are removed and the whipstock 50 properly lined up.

Following this, the weight of the drill stem is caused to rest on the shear pin 54, first driving the whipstock 50 into the earth at the bottom of the bore hole to anchor it, and thereafter shearing off the pin 54 so that drilling may be accomplished.

The whipstock under these circumstances, and as indicated in Patent 2,298,706, desirably has a tapered or conical region shown at 58 at the lower portion of its collar, so that as the sub moves downwardly, the rivets 12 will engage this surface, with the result that the engaging members 10 are cammed inwardly against the pressure of the spring 16. As this inward movement occurs, the rounded ends of the latch extension 18 will ride over the beveled portions of extensions 20, camming the member 24 downwardly until they move inwardly to a sufficient extent to clear these members, whereupon the member 24 will be moved upwardly by the action of spring 30 to latch the engaging members 10 in their inner position. As the sub moves further downwardly, if the most restricted portion of the whipstock collar 48 is too small for the passage of the rivets 12, they will be sheared off. Even if they are not sheared off at this time, however, they will in general be worn or broken away during the subsequent drilling.

Except for the possible continued projection of the rivets 12, the sub now presents a cylindrical aspect, and consequently drilling may occur down the face of the whipstock in usual fashion

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without engagement of any projecting parts with the whipstock or earth.

So long as the members 10 are intended to occupy inner positions the parts occupy the positions illustrated in the drawing, the members 10 then being latched against outward movement. When, however, it is desired to cause said members 10 to move outwardly, a ball 46 of a size closely fitting the cylindrical opening 36 is dropped through the drill stem, being introduced at any suitable point in the mud circulating system. Before it enters the opening 36 the mud flow is unimpeded. When, however, it reaches the position illustrated in Figure 2, it substantially fills the opening 36 while resting on the upper ends of the springs 40. When this occurs the mud flow is interrupted and a rise in pressure at the mud gauge at the surface will then indicate the attainment of this position. As the pump continues to operate, the ball 46 and the head 34 will be subjected to mud pressure as a unitary piston. Consequently, this assembly will be driven downwardly by hydraulic pressure releasing the latches 10 by causing disengagement of the retaining elements 20 from the hooks 18 thereof. The latches or elements 10 will then be forcibly moved outwardly by the spring arrangement 16. As downward movement of the assembly occurs, however, the blocks 42 will become free to move outwardly by reason of their entering the expanding portions of the bore at 44. As a consequence they will open after sufficient downward movement releasing the ball 46 which may then drop between the springs into the lower portion of the cylinder 32. When this occurs the pressure upon the upper end of the movable assembly is relieved, with the result that the spring 30 may again drive it upwardly so that the members 20 are again in position to latch inwardly the members or latches 10 if the same are cammed inwardly by downward movement through the whipstock collar 48 as described above and in the patents referred to. At the same time it will be evident that the device is reset for subsequent operation by another ball. In this fashion a plurality of operations may be secured, the space for receiving the used balls being sufficiently enlarged to accommodate the desired number. It will also be evident that after the operation occurs the mud flow is completely unimpeded. This fact, while highly desirable so that drilling may be resumed without diminution of the mud flow, is also of importance in connection with the signal which is given to the operator of the proper operation of the retrieving apparatus. In other words, he will note at the surface a momentary substantial increase of pressure indicative of the location of the ball at the opening 36 followed by a drop of the pressure to its normal value as soon as the members 10 have been released. Thus he will be advised of the proper and positive operation of the device.

It will be clear that numerous variations may be made in details of the invention without departing from the scope thereof as defined in the following claims.

What I claim and desire to protect by Letters Patent is:

1. Means for retrieving a whipstock from a bore hole comprising a body arranged to be included in a drill string above the bit, means carried by said body and expandible outwardly to engage a whipstock or the like, and means operable by liquid pressure to release said expandible means, said means comprising a member provid-

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ing a piston normally providing free passage of liquid but arranged to be closed by an element lowered through the drill string to restrict flow and provide a closed piston movable under liquid pressure, movement of said member releasing said element so that the passage of liquid is thereafter unimpeded and so that the member may then move to its original position capable of a subsequent operation upon lowering of another element.

2. Means for retrieving a whipstock from a bore hole comprising a body arranged to be included in a drill string above the bit, means carried by said body and expandible outwardly to engage a whipstock or the like, and means operable by liquid pressure to effect outward movement of said expandible means, said means comprising a member providing a piston normally providing free passage of liquid but arranged to

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be closed by an element lowered through the drill string to restrict flow and provide a closed piston movable under liquid pressure, movement of said member releasing said element so that the passage of liquid is thereafter unimpeded and so that the member may then move to its original position capable of a subsequent operation upon lowering of another element.

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REFERENCES CITED

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Number	Name	Date
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