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DRILL STEM TEST PLUG

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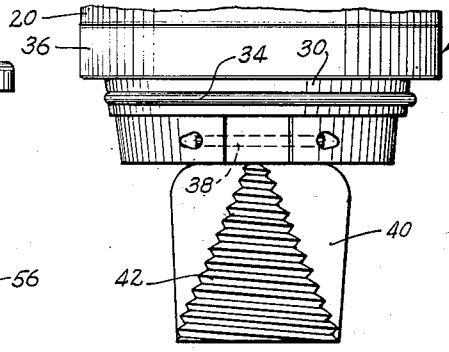
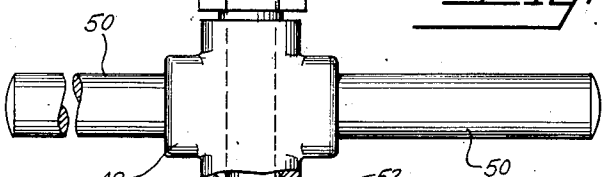


Fig. 3



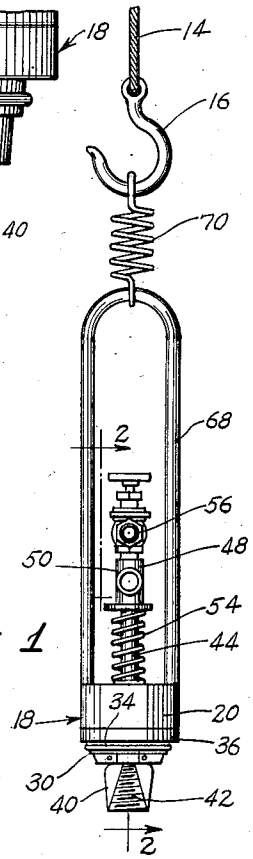


Fig. 1

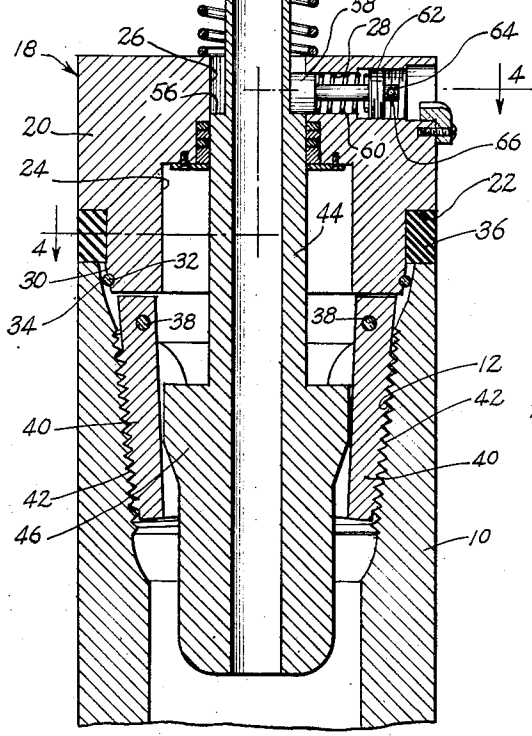


Fig. 2

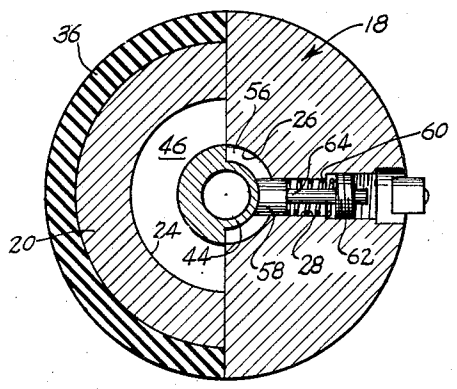


Fig. 4

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DRILL STEM TEST PLUG

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2 Claims. (Cl. 166—75)

This invention relates to a drill stem test plug and more particularly to a means for sealing the open upper end of a drill stem during test operations.

In oil well drilling operations it frequently becomes necessary to test a string of drill pipe or the like to determine the possibility of leakage therein and for other purposes. Heretofore it has been customary to construct test plugs in the field and as a drill stem is being extracted from a well hole, to separate the lengths thereof from one another and screw into the exposed end of the string or drill stem. This is a time consuming and laborious procedure and the primary object of this invention is to provide a test plug which facilitates the rapid sealing and unsealing of the exposed end of the drill stem.

Another object is to utilize certain elements of the drill rig in extracting the test plug from the drill stem.

In the drawings:

Figure 1 is a side view of a drill stem test plug embodying the features of this invention;

Figure 2 is a fragmentary enlarged sectional view taken substantially on the line 2—2 of Figure 1;

Figure 3 is an enlarged fragmentary sectional view of the lower end of the device; and

Figure 4 is a transverse sectional view taken substantially on the line 4—4 of Figure 2.

Referring to the drawings in detail, a drill stem 10 is shown which is provided adjacent its upper end with downwardly tapering internal screw threads 12. The drill stem 10 is conceived as lowered into a well hole above which is supported a conventional drill rig carrying on a suitable cable 14 a drill rig hook 16.

The illustrated test plug designated generally 18 comprises a cylindrical body 20 which is provided intermediate its ends with an external annular shoulder 22. An axial bore 24 opens through the lower end 25 of the body 20 and terminates at its upper end in a shoulder 27 located between the shoulder 22 and the upper end 29 of the body 20. A reduced diameter axial bore 26 extends from the upper end 29 of the body 20 into the bore 24.

A radial bore 28 above the internal shoulder 27 extends through the body 20 into the reduced bore 26.

The exterior of the reduced portion 31 of the body between the shoulder 22 and the lower end 25 of the body 20 is downwardly tapered, as at 30, and formed in the tapered portion 30 is an annular groove 32 containing an O-ring 34 which is preferably formed of a suitable sealing substance. Surrounding the reduced body portion 31 and seated against the shoulder 22 is a gasket 36 preferably of a relatively soft yielding resilient substance. When the device is in place in the drill stem 10, the gasket 36 will engage the upper end of the stem and the O-ring 34 will engage the inside of the stem 10, as will be readily understood upon reference to Figure 2.

Pivotally connected as at 38 to the reduced lower portion 31 of the body 20 for movement adjacent the upper end thereof is a pair of diametrically opposed dogs having downwardly tapering outer surfaces having teeth 42 thereon, which, when the device is in end closing position

in the drill stem 10, engage the threads 12 so as to retain the plug 18 in the drill stem with the gasket 36 and O-ring 34 in sealing relation to the upper open end of said drill stem.

Mounted for sliding movement in the reduced bore 26 is a vertical tubular stem 44 having on its lower end an enlarged cam head 46 which, when the stem 44 is moved downwardly in the bore 24 of the body 20, engages the inner sides of the dogs 40 and causes them to swing outwardly about their pivots 38 and engage their teeth 42 with the teeth 12 of the drill stem 10. Mounted on the upper end of the stem 44 above the body 20 is a fitting 48 from which extend diametrically opposed handles 50, by means of which the stem may be moved through the bore 26 to depress the cam head 46 into operative engagement with the dogs 40. The fitting 48 serves as a stop for a washer 52 which in turn, serves as a seat against which is engaged the upper end of a compression coil spring 54 which is circumposed on the stem 44 and is compressed between the washer 52 and the upper end 29 of the body 20. It will thus be seen that the stem 44 is urged upwardly by the spring 54 so that the cam head 46 will be retracted into the bore 24 and out of operative engagement with the dogs 40 so that the teeth 42 will be disengaged from the threads 12 to permit the plug to be lifted out of the drill stem 10. On the upper end of the stem 44 above the fitting 48 is a hand valve 56 through which pressure within the drill stem 10 may be relieved, or pressure introduced thereinto.

The upper part of the stem 44 is reduced to define an upwardly facing shoulder 56, which, when the stem 44 is depressed against the resistance of the spring 54 so that the cam head 46 moves the dogs 40 outwardly, becomes level with the lower side of the radial bore 28. Slidably mounted in the radial bore 28 is a latch 58 which is yieldably urged toward the stem 44 to engage over the shoulder 56 by a compression coil spring 60, one end of which abuts the latch 58, while its opposite end engages a retainer 62 secured in the bore 28. A stem 64 is carried by the latch 58 and projects through the retainer 62 and is provided with an opening 66 to which a suitable flexible member (not shown), is coupled for retracting the latch 58 from the shoulder 56 against the resistance of the spring 60 when it is desired to release the plug from its position in the drill stem 10.

Secured to the upper end 29 of the body 20 and extending upwardly therefrom and above the valve 56 is a bail 68 carrying a retractile coil spring 70 which, after the plug has been inserted into the drill stem 10 and secured therein by engagement of the teeth 42 of the dogs 40 with the threads 12, is adapted to be coupled to the hook 16 so as to exert lifting effort on the plug 18 and drill stem 10.

With the spring 70 disengaged from the hook 16, the test plug can be lifted by means of the handles 50 to a position above the drill stem 10 and thrust into the upper open end thereof until the gasket 36 engages the upper open end of the drill stem 10. Upon further downward pressure upon the handles 50, the stem 44 will move downwardly relative to the body 20 against the resistance of the spring 54 and cause the cam head 46 to engage the teeth 42 of the dogs 40 with the threads 12 and engage the latch 58 on the shoulder 56, and effectively lock the plug 18 in place in the drill stem 10.

What is claimed is:

1. In a drill stem test plug, a cylindrical body having an upper end and a lower end, an axial bore opening through the lower end of the body and terminating at its upper end in an internal shoulder, a reduced diameter bore opening at its upper end through the upper end of the body and at its lower end into said first mentioned bore, a tubular stem having an intermediate portion sliding in

said reduced bore, said tubular stem having an upper end located above the upper end of the body and a lower end located within said bore, an enlarged cam head on the lower end of the tubular stem, a stop on the stem above the upper end of the body, a helical spring circumposed on the stem and compressed between said stop and the upper end of the body, a latch shoulder on said intermediate portion of the stem, a spring pressed latch on said body engageable with said shoulder when said stem is in depressed position, means for retracting the latch out of engagement with said latch shoulder, and toothed dogs pivoted on said body at the lower end of the body, said dogs having inner sides defining cam surfaces engageable by said cam head in a depressed position of the stem whereby the dogs are moved laterally outwardly and held in operative positions.

2. In a drill stem test plug, a cylindrical body having an upper end and a lower end, an axial bore opening through the lower end of the body and terminating at its upper end in an internal shoulder, a reduced diameter bore opening at its upper end through the upper end of the body and at its lower end into said first mentioned bore, a tubular stem having an intermediate portion sliding in said reduced bore, said tubular stem having an upper end located above the upper end of the body and a lower end located within said bore, an enlarged cam head on the lower end of the tubular stem, a stop on the stem above the upper end of the body, a helical spring circumposed

on the stem and compressed between said stop and the upper end of the body, a latch shoulder on said intermediate portion of the stem, a spring pressed latch on said body engageable with said shoulder when said stem is in depressed position, means for retracting the latch out of engagement with said latch shoulder, and toothed dogs pivoted on said body at the lower end of the body, said dogs having inner sides defining cam surfaces engageable by said cam head in a depressed position of the stem whereby the dogs are moved laterally outwardly and held in operative positions, said body having a radial bore near its upper end, and said latch means comprising a latch slidable in said radial bore, a stem on said latch, a retainer secured in said radial bore through which said stem slidably extends, and a helical spring circumposed on the stem and compressed between said latch and said retainer.

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