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DRILL COLLAR FLOAT VALVE FOR WELL DRILLING STRINGS

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Fig. 1.

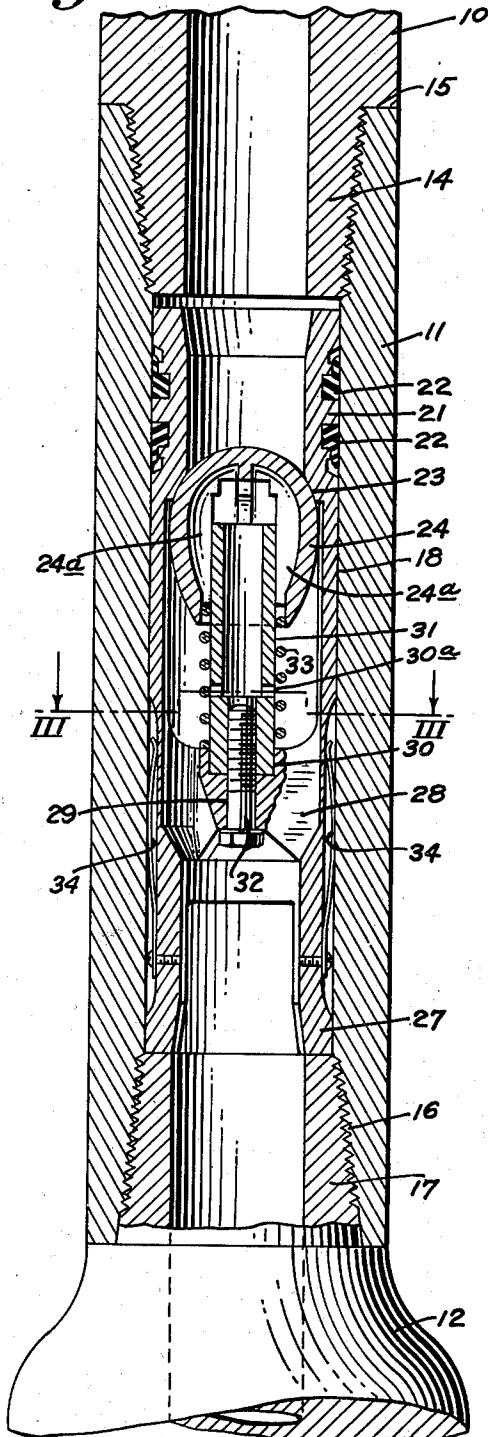


Fig. 2.

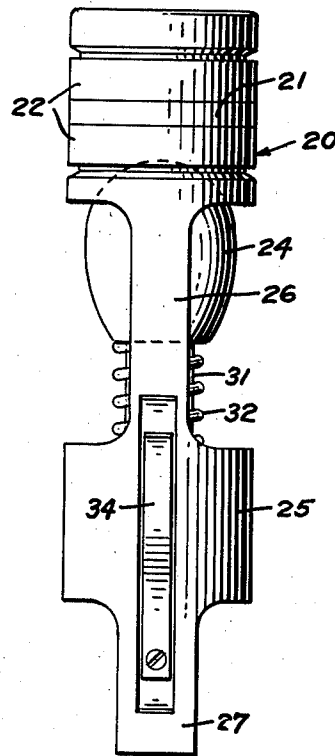
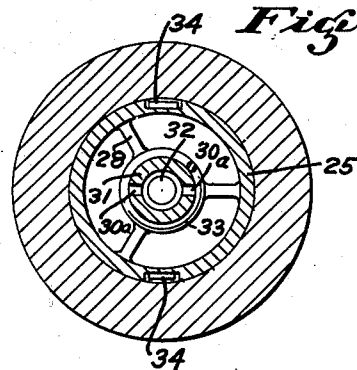


Fig. 3.



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DRILL COLLAR FLOAT VALVE FOR WELL
DRILLING STRINGS

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a corporation of California

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1 Claim. (Cl. 137—69)

This invention relates to well drilling equipment and particularly pertains to a drill collar float valve structure.

It is the principal object of my present invention to provide an improved float valve mechanism which may be incorporated in a drill collar of a well drilling string.

In practicing my invention, I provide a drill collar having a straight bore formed therein. A hollow cylindrical valve body is provided and which reciprocably fits said bore, and which is provided with suitable sealing means preventing the flow of fluid between the said body and said bore. The body is formed with a valve seat intermediate its ends and is fitted with a spring-pressed valve for cooperation with said seat to enable fluid to be pumped downwardly through the drill collar, but to prevent the flow of fluid upwardly therethrough. The valve body is retained in the bore between the pin of the bit fitting in the lower end of the collar and between a shoulder formed at the upper end of the bore in the collar.

One form which the invention may assume is exemplified in the following description and illustrated by way of example in the accompanying drawing, in which:

Fig. 1 is a central vertical sectional view through a drill collar float valve structure embodying the preferred form of my invention.

Fig. 2 is a perspective view of the valve body assembly.

Fig. 3 is a transverse sectional view taken on line III—III of Fig. 1.

Referring more particularly to the accompanying drawing, 10 indicates a well drilling string, 11 the drill collar, which connects the well drilling string 10 to the bit 12. The upper end of the drill collar 11 is formed with a box 14 adapted to be threadedly engaged with the pin of a tool joint 15 directly thereabove, and the lower end of the drill collar 11 is formed with a box 16 to receive the pin 17 of the bit 12. The drill collar member 11 is formed with a straight bore 18 which commences at the inner end of the box 16 and extends to the box 14. The diameter of the bore is less than the smallest diameter of the thread formed in the box 16.

Adapted to be reciprocably received in the bore 18 is a valve body 20. This valve body 20 is formed at its upper end with a cylinder 21, the exterior diameter of which is just slightly less than the bore 18, and which is fitted with opposed cup rings 22 to prevent the passage of fluid in either direction between the exterior of the cyl-

inder 21 and the bore 18. At its lower end this cylinder 21 is formed with an interior valve seat 23 with which an upwardly seating valve 24 co-operates. At a spaced distance from the cylinder 21 the valve body is formed with a second cylindrical section 25 connected by integral and diametrically opposed legs 26 with the cylinder 21. From the lower end of the portion 25 of the valve body project opposed legs 27.

Within the cylindrical portion 25 of the valve body is a spider 28 having a bore 29 formed longitudinally therethrough and concentrically with respect to the cylindrical portion 25. The upper end of this bore is counterbored as at 30 to receive the lower end of the fixed valve stem 31. A cap screw 32 is provided which projects upwardly through the bore 29 in the spider 28 and is threaded into the lower end of the valve stem 31 to secure the same in position. The valve member 24 is hollow and is provided interiorly with radial ribs 24a which slidably engage the valve stem 31 and guide the valve member 24 in its vertical movement. A spring 33 is provided which tends to constantly maintain the valve member 24 seated on its seat 23. At the sides of the cylindrical portion 25 of the valve body are springs 34 for holding weight of assembly until bit pin is screwed in box 16.

It should be said that the overall distance between the ends of the legs 27 and the upper end of the cylinder 21 is less than the distance between the upper end of the pin 17 of the bit and the lower end of the pin of the tool joint 15. Ordinarily this distance is considerable in order to permit recuts of the threads in the box 16. Obviously, each time these threads are recut, the pin 17 of the bit 12 will project further upwardly into the drill collar. Consequently, by providing the valve body of an overall length less than the distance between the upper end of the pin 17 and the lower end of the pin of the tool joint 15, the valve body will fit and function properly in the drill collar regardless of recutting.

In operation of the device the valve body 20 is placed in the bore of the drill collar and the latter is then made up on the bit 12. The remainder of the drilling string is then made up on the drill collar. When the bit is lowered into the well bore, the force of the fluid in the bore will immediately attempt to pass through the cylinder 21, but due to the fact that this is closed by the valve 24 the fluid pressure will cause the entire valve body to move upwardly in the bore 18 until the upper end of the valve body engages the pin of the joint 15, and thereafter a floating

action will result to float the drill string into the hole.

5 When the circulating fluid is pumped downwardly through the drill string, it will impinge against the valve 24 and unseat the same and at the same time cause the entire valve body to lower until the lower ends of the legs 27 engage the pin 17, and thereby the drilling fluid may be pumped downwardly through the valve body. It 10 will be seen, of course, that the opposed rubber packing or sealing rings 22 will prevent the passage of fluid between the exterior of the cylinder 21 and the bore 18.

15 When the bit is removed from the hole and disconnected from the drill collar, the entire valve assembly may be merely pulled from the bore, and if the valve, or seat, or its stem, needs repair, it is only necessary to remove the one cap screw 32 and insert a pin or other tool through 20 the openings 30a and remove the entire valve stem and valve from the valve body through the spaces between the legs 26.

25 From the foregoing it is obvious that I have provided a very simple and very efficient drill collar float for use in connection with well drill-

ing strings, and while I have shown the preferred form of my invention, it is to be understood that various changes may be made in its construction by those skilled in the art without departing from the spirit of the invention as defined in the appended claim. 5

Having thus described my invention, what I claim and desire to secure by Letters Patent is:

In combination, a drill collar having a straight bore formed therein, a valve body reciprocably 10 mounted in said bore, said body including a hollow cylindrical portion, sealing means on the exterior of the cylindrical portion to prevent passage of fluid between it and the bore, a valve seat on the cylinder circumscribing its interior, 15 said body including a spider rigidly suspended from said cylindrical portion, an upwardly projecting valve stem rigidly held in coaxial relation to said cylinder by said spider, an upwardly seating hollow valve member fitting over the upper 20 end of said stem and axially movable with respect thereto, and spring means constantly tending to seat said valve on said seat.

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