June 13, 1961 M. B. CONRAD 2,988,177

WELL BORE DRAG ASSEMBLY

Filed April 23, 1957

FIG. 1.

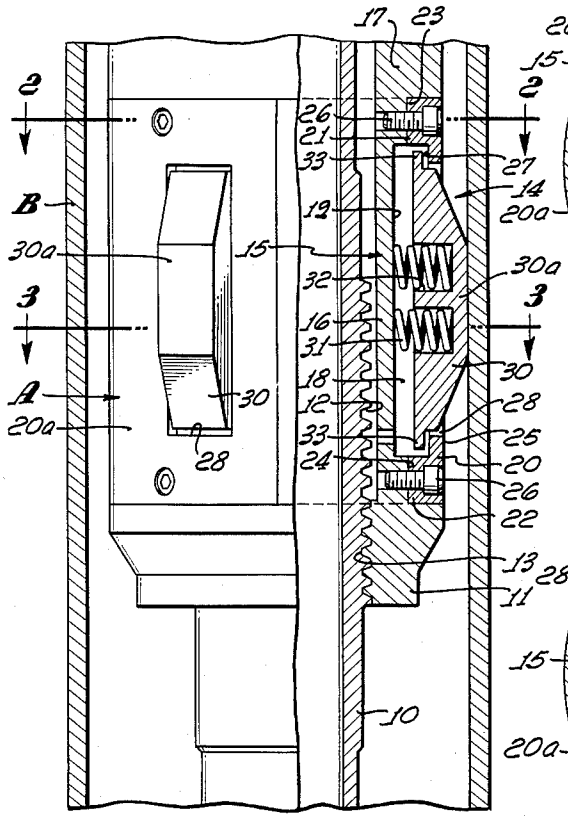


FIG. 2.

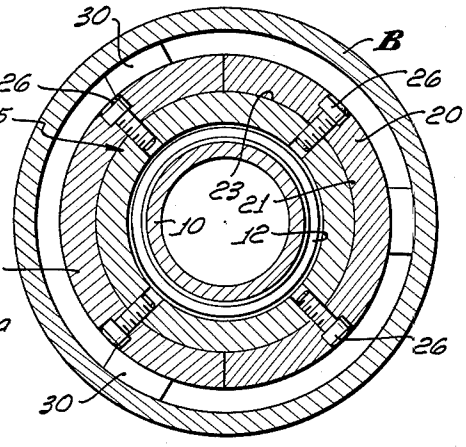
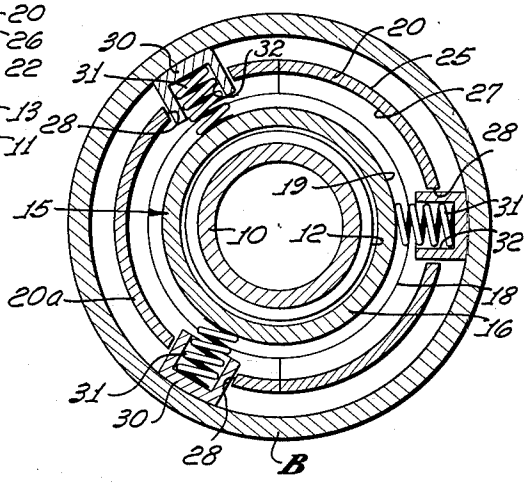


FIG. 3.



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WELL BORE DRAG ASSEMBLY

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The present invention relates to subsurface well devices, and more particularly to devices for securing relative movement between different parts of a well apparatus when disposed in a well bore.

Friction drag devices are used in subsurface well tools to frictionally resist movement of parts of the tools in well casing, or similar well conduits, and thereby allow such parts to partake of movement relative to other parts of the tools. As an example, a friction drag device is sometimes used in setting slips against the well casing and releasing them therefrom, and for operating a subsurface valve device through manipulation of a running-in string secured to the well tool and extending to the top of the well bore. Heretofore, friction drag devices of the type embodying drag blocks have been preferred for certain kinds of tools, but they have been relatively costly to produce, and difficult to assemble and dismantle.

Accordingly, it is an object of the present invention to provide a friction drag device embodying drag blocks, which is relatively economical to manufacture and easy to assemble and disassemble.

Another object of the invention is to provide a drag block device in which the blocks are urged outwardly by springs, and in which the act of assembling the device automatically places the springs under load without the necessity for employing special tools.

This invention possesses many other advantages, and has other objects which may be made more clearly apparent from a consideration of a form in which it may be embodied. This form is shown in the drawings accompanying and forming part of the present specification. It will now be described in detail, for the purpose of illustrating the general principles of the invention; but it is to be understood that such detailed description is not to be taken in a limiting sense, since the scope of the invention is best defined by the appended claims.

Referring to the drawings:

FIGURE 1 is a part side elevation and part longitudinal section through a tool embodying a drag assembly;

FIGURE 2 is a cross-section taken along the line 2—2 on FIG. 1;

FIGURE 3 is a cross-section taken along the line 3—3 on FIG. 1.

As disclosed in the drawings, a well tool A has been lowered within a well casing B, or similar well conduit string, the tool including a tubular central body member 10 which is connectible to a running-in string (not shown), such as a string of tubing or drill pipe, extending to the top of the well bore in which the well casing is disposed. It is desired to relatively move the tubular body member 10 with respect to a nut member 11 threadedly attached thereto, the body member having an external thread 12, which may be of left-hand, meshing with a companion internal thread 13 on the nut member. The tubular body member 10 can be rotated in both directions with respect to the nut member 11 to feed the latter relatively along the body member in either an upward or a downward direction. To resist its movement in the casing B, the nut member 11 is secured to a friction drag assembly 14.

The friction drag assembly includes a body member 15 which may be made integral with the nut member 11. In fact, the nut member 11 may constitute the lower body portion of the drag body member 15, there being an intermediate body portion 16 and an upper body portion 17,

all of such body portions preferably being integral with one another. The intermediate body portion 16 of the drag assembly has a much smaller outside diameter than the upper and lower body portions 17, 11, providing an elongate circumferential groove 18 in the body, the curved or circular base 19 of which is formed by the intermediate body portion. Received within the circumferential groove 18 is a plurality of circumferentially spaced drag blocks 30 adapted to frictionally engage the wall of the well casing B. The circumferential spacing of the drag blocks with respect to each other is secured by a stop sleeve 20, 20*a* that encompasses the drag body member 15. This stop sleeve is made in two halves 20, 20*a*, which fit around the body portion of the drag device, with their upper and lower flanges 21, 22 received within companion circumferential recesses 23, 24 in the upper drag body portion 17 and in the lower drag body portion 11, the flanges and recesses being of such radial distances as to preferably dispose the outer surface 25 of the sleeve substantially flush with the outer surfaces of the upper and lower body portions 17, 11. The two sleeve halves 20, 20*a* are secured to the upper and lower drag body portions of the drag assembly by cap screws 26 extending through the inwardly directed sleeve flanges 21, 22 and threaded into the upper and lower body portions 17, 11.

The part of the sleeve between its upper and lower flanges 21, 22 has its inner wall 27 spaced laterally away from the periphery 19 of the intermediate body portion, providing the annular space or groove 18 in which the inner portions of the drag blocks 30 are located. Each drag block projects through an elongate slot or window 28 in the sleeve which is slightly longer than the drag block 30, the intermediate portion 30*a* of each drag block frictionally engaging the wall of the well casing, the friction force being provided by one or a plurality of helical compression springs 31 disposed in sockets 32 in each drag block and bearing against the intermediate body portion 16 of the drag assembly and the bases of the sockets 32. Outward movement of each drag block 30 under the influence of the springs is limited by engagement of the upper and lower termini 33 of each drag block with the inner surface 27 of the sleeve at the upper and lower ends of the slot 28.

The frictional engagement of the drag blocks 30 against the well casing tends to resist both longitudinal movement and rotation of the drag assembly 14 and the nut 11 in the well casing. Because of such resistance to turning of the nut, the tubular body member 10 can be turned in either direction, which will effect a relative longitudinal shifting of the body 10 with respect to the nut 11, depending upon the direction of rotation of the body. Thus, if the tubular string and the body 10 are turned to the left, the body will move relatively downward along the nut 11, or, conversely, the nut will move upwardly relative to the body. Such movement of the nut 11 may be availed of to effect the setting of slips or to operate a valve device that might be secured to the drag body member 15 (neither the slips nor the valve device being shown). Rotation of the tubular string and the body 10 in a right-hand direction will produce relative upward feeding of the body 10 with respect to the nut 11, or a relative downward movement of the nut along the body. Thus, the nut 11 may be caused to move relative of the body 10 in either an upward or a downward direction, to effect a corresponding desired operation in the well tool. In the absence of rotation of the tubular body member 10 with respect to the nut member 11, the body can be moved by the running-in string in either an upward or a downward direction within the well casing, carrying the nut 11 and the drag assembly 14 along with it, the drag blocks 30 merely frictionally sliding along the inner wall of the well casing B.

The friction drag assembly **14** is comparatively economical to manufacture, since it is a simple matter to turn the circumferential groove **18** in the drag body member **15** in a lathe. It is also a relatively inexpensive and rapid operation to punch, or otherwise cut, the windows or openings **28** in the two parts of the stop sleeve **20**, **20***a*, through which the drag blocks **30** project, the stop sleeve itself being readily turned in a lathe and then severed into the two parts **20**, **20***a* disclosed. In assembling the drag device, the springs **31** need merely be inserted in the drag block sockets **32** and the drag block members **30** then projecting through the window or windows **28** from within each sleeve half **20** or **20***a*, after which the sleeve half is brought laterally around the drag body member **15**, the inwardly directed flanges **21**, **22** being disposed partly within the circumferential recesses **23**, **24**. At this time, the springs **31** need not even be placed under compression. The threading of the cap screws **26** through the flanges and into the companion threaded bores in the upper and lower drag body portions **17**, **11** will shift the sleeve half inwardly, causing the sleeve to engage the block termini **33** and move them inwardly, the inner ends of the springs **31** engaging the intermediate body portion **16** and being compressed thereagainst, upon the continued inward lateral movement of each drag block **30**. The final tightening of the cap screws **26** will place each half of the stop sleeve **20**, **20***a* in the position illustrated in the drawings. Such tightening occurs as a result of applying a suitable wrench or screw driver to each cap screw. Such a simple hand tool is also all that is necessary in dismantling the drag device **14**, once it has been removed from the well casing B.

It is, accordingly, apparent that a friction drag device has been provided that embodies drag blocks, which is relatively economical to manufacture, to assemble, and disassemble. The act of assembling the sleeve halves **20**, **20***a* on the drag body member automatically compresses or stresses the springs **31**, which exert the outward force against the drag blocks **30** to cause them to frictionally engage the inner wall of the well casing B.

Although the invention has been specifically described with respect to securing relative rotation between a threaded tubular body member **10** and a threaded nut or guide member **11**, the drag assembly has general application wherever frictional resistance of a member in a well bore is to be provided.

The inventor claims:

1. In a drag assembly adapted to be lowered in a well bore: a unitary body member having upper and lower cylindrical portions and an intermediate cylindrical portion of substantially less external diameter than said upper and lower portions, said upper and lower portions having circumferential recesses to one side of said intermediate portions; a segmental sleeve surrounding said intermediate portion and disposed in said recesses, the inner wall of said sleeve being spaced laterally outward from said intermediate portion to provide an annular space therebetween; means securing said sleeve to said upper and lower portions; said sleeve having circumferentially spaced openings through its wall between said upper and lower portions; drag blocks in said annular space projecting through said openings; the width and length of each opening being substantially the same as the width and length of that portion of a block extending into said opening, whereby said sleeve guides said blocks in moving laterally inwardly and outwardly through said openings and engages said blocks to move said blocks longitudinally in the well bore; spring means engaging said intermediate portion and blocks to urge said blocks in a lateral outward direction; and means engageable with said blocks to limit the extent of movement of said blocks in said outward direction and to retain said blocks between said sleeve and body member.

2. In a drag assembly adapted to be lowered in a well bore: a unitary body member having upper and lower cylindrical portions and an intermediate cylindrical portion of substantially less external diameter than said upper and lower portions, said upper and lower portions having circumferential recesses to one side of said intermediate portions; a segmental sleeve surrounding said intermediate portion and disposed in said recesses, the inner wall of said sleeve being spaced laterally outward from said intermediate portion to provide an annular space therebetween; means securing said sleeve to said upper and lower portions; said sleeve having circumferentially spaced openings through its wall between said upper and lower portions; drag blocks in said annular space projecting through said openings; the width and length of each opening being substantially the same as the width and length of that portion of a block extending into said opening, whereby said sleeve guides said blocks in moving laterally inwardly and outwardly through said openings and engages said blocks to move said blocks longitudinally in the well bore; spring means engaging said intermediate portion and blocks to urge said blocks in a lateral outward direction; said blocks having upper and lower terminals disposed within said sleeve and engageable with the inner wall of said sleeve to limit lateral outward movement of said blocks.

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