

June 29, 1965

F. C. PITTMAN ETAL

3,191,684

TUBING HOLD-DOWN TOOL

Filed Jan. 8, 1962

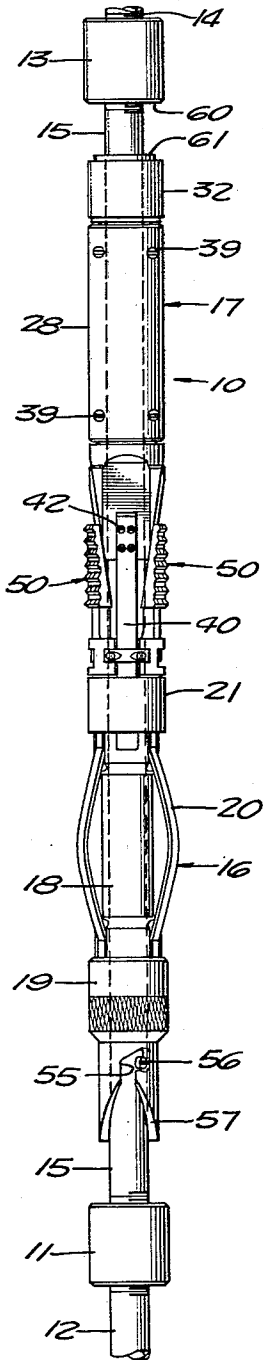


FIG. 1.

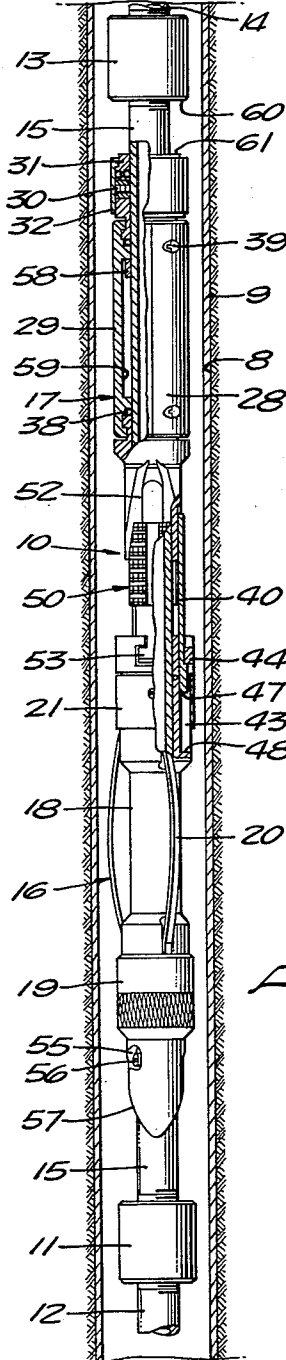


FIG. 2.

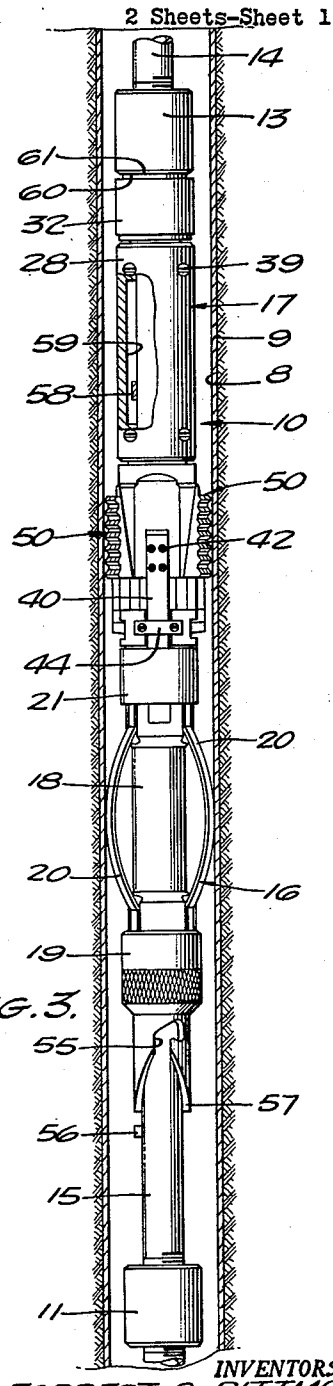


FIG. 3.

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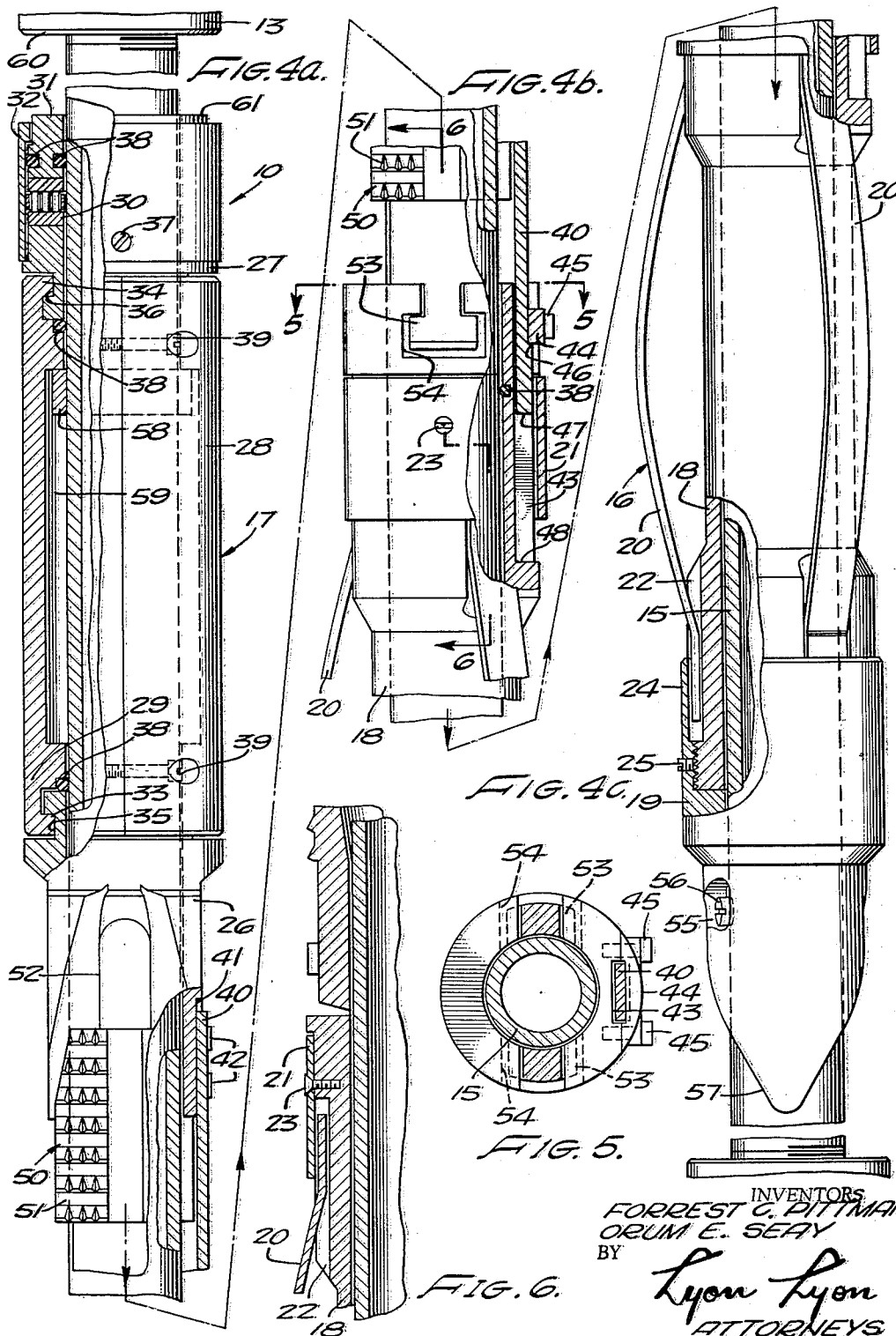
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TUBING HOLD-DOWN TOOL

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9 Claims. (Cl. 166—216)

This invention relates to a tool for releasably holding tubing in a predetermined location in an oil well casing and, in particular, is directed to such a tool wherein the tubing may be rotated while being held in such location.

In the drilling and completion of oil wells, there are certain operations wherein it is desirable to be able to anchor a well pipe, liner or tubing in a particular location in the well casing in such a manner as to permit rotation of the well pipe, liner or tubing. Further, it is desirable in some of these operations to be able to release the anchoring mechanism after completion of the operation so that the well pipe, liner or tubing may be moved vertically within the well casing. For an example, one of such operations is the hydraulic undercutting of the well bore, which operation is used in the completion of some oil wells for increasing the flow of fluid from the well.

In such hydraulic undercutting a tool having one or more horizontally directed jets is attached to the lower end of a string of tubing and lowered into the well bore to the location where the undercutting is desired. Fluid is pumped down through the tubing and passes out the jets and impinges on the well bore wall to effect a horizontal penetration into the formation and to form the desired horizontal cavity. Since it is usually desirable that this cavity extend around the entire circumference of the well bore, the tubing is turned while fluid is flowing from the horizontally directed jets. Thus it becomes apparent that in order to hydraulically undercut a horizontal cavity of relatively narrow vertical thickness, the vertical position of the jets must be maintained relatively constant during the rotation of the tubing and flowing of the fluid. Since the undercutting is performed in the producing zone of the well, the location is generally thousands of feet from ground level and adequate control of the vertical position of the jet cannot be maintained from the drilling rig or other conventional equipment at the surface.

Thus it is desirable to have a tool at or near the hydraulic jet or jets which may be anchored to fix the vertical location and yet permit rotation of the jet. A further difficulty which is inherent in the hydraulic undercutting operation is that the undercutting is usually accomplished in a portion of the well bore which is not provided with well casing. Since it is difficult to releasably anchor a tool in a portion of a well bore not provided with well casing, it has been found advisable to anchor the tubing in the cased portion of the well at a short distance above (or below, though usually above) the location of the jet or jets.

Another inherent requirement of the apparatus used to accomplish the rotatable anchoring of the tubing is that the fluid which is discharged from the jet must pass upward in the annular space between the exterior of the tubing and the interior of the well casing to return to ground level. Thus the fluid must pass downward through the anchoring apparatus and upward past the exterior of the apparatus. If the anchoring apparatus presents a substantial restriction to the flow of fluid in either direction, the effectiveness of the hydraulic undercutting will be reduced due to the loss of fluid pressure caused by such restriction.

Although only the single operation of hydraulically undercutting a well bore with a rotating jet has been

described to illustrate the use to which our invention may be put, it is to be understood from the following description that our apparatus may be used in various other operations performed in the drilling and completion of wells.

Accordingly it is a principal object of this invention to provide a novel form of well tool capable of being releasably anchored in a well casing in a manner whereby the tubing, liner or well pipe supporting the tool may be rotated.

Another object of this invention is to provide a novel form of tubing hold-down tool which may be anchored in a well casing and wherein rotation of the attached tubing above the anchored tool causes rotation of the attached tubing below the tool.

A further object of this invention is to provide a tubing hold-down tool wherein the weight of at least some of the tubing above the anchored tool may be rotatably supported by the tool.

Another and more detailed object of this invention is to provide a novel form of tubing hold-down tool wherein a tubular mandrel extends through the length of the tool for supporting tubing attached therebelow and the tool may be anchored in a well casing in a manner whereby rotation of the tubing above the tool causes rotation of the tubular mandrel and resulting rotation of the tubing below the tool.

A more specific object of this invention is to provide a tubing hold-down tool for rotatably anchoring tubing in a well casing and which can be anchored by slight right-handed turning and downward movement of the tubing and can be released by mere upward movement of the tubing.

Other and more detailed objects and advantages of this invention will appear from the following description and the accompanying drawings.

In the drawings:

FIGURE 1 is an elevation view of the assembled tubing hold-down tool of our invention.

FIGURE 2 is an elevation view of our device being run into a well casing. In FIGURE 2 the entire device is rotated 90° from the elevation view shown in FIGURE 1.

FIGURE 3 is an elevation view showing the tool of our invention in the set position in the well casing.

FIGURE 4a is a fragmentary elevation view of the upper portion of our device similar to FIGURE 2, but on an enlarged scale for clarity.

FIGURE 4b is a fragmentary elevation view of the middle portion of our device and is a continuation of FIGURE 4a with a portion thereof repeated for continuity.

FIGURE 4c is a fragmentary elevation view of the lower portion of our device and is a continuation of FIGURE 4b with a portion thereof repeated for continuity.

FIGURE 5 is a sectional plan view taken substantially on the line 5—5 as shown in FIGURE 4b.

FIGURE 6 is a fragmentary sectional elevation view taken substantially on the line 6—6 as shown in FIGURE 4b.

Referring now to the drawings, the tubing hold-down tool, generally designated 10, is provided with a tubing coupling or collar 11 on its lower end for threadedly attaching the tool to a tubing, liner or well pipe 12 which is suspended from the tool and may carry the desired apparatus for the particular operation to be accomplished. The hold-down tool 10 is also provided with a tubing coupling or collar 13 on its upper end for threadedly attaching the tubing 14 which is used to lower the tool into the well bore. A tubular mandrel 15 of the tool 10 extends through the entire tool and is threadedly connected at its lower end to collar 11 and at its upper end to col-

lar 13. Thus it may be seen that the tubing 12 is supported by the tubing 14 through collars 11 and 13 and mandrel 15.

The tubing hold-down tool 10 is comprised in general of the mandrel 15 with a sleeve assembly, generally designated 16, rotatably and slidably mounted on the outer surface of the lower portion of mandrel 15 and a housing assembly, generally designated 17, rotatably and slidably mounted on the exterior of the upper portion of the tubular mandrel 15. Referring now more particularly to FIGURES 4b and 4c, the sleeve assembly 16 is comprised of a tubular body 18, a collar body 19, three bow springs 20, and a retainer sleeve 21. Although three bow springs 20 are shown which are bowed outwardly to slidably and resiliently engage the well casing, it is to be understood that more or fewer bow springs or other such means could be used in order to obtain the resilient slidable engagement with the well casing.

Each of the bow springs 20 has its ends positioned in slots 22 in the tubular body 18. The retainer sleeve 21 encloses the upper ends of the bows 20 within the slots 22 and is secured to the body 18 by cap screw 23, as best shown in FIGURE 6. The collar body 19 is threadedly mounted on the tubular body 18 and has a skirt portion 24 extending over the lower ends of the bows 20 to retain those ends within the grooves 22 in body 18. A set screw 25 is provided for locking collar body 19 to tubular body 18 to prevent inadvertent disconnection.

Referring now more particularly to FIGURE 4a, the housing assembly 17 is comprised of a lower sleeve 26, an upper sleeve 27, a pair of semi-cylindrical members 28 and 29, a thrust bearing 30, a bushing 31, and a retainer sleeve 32. The lower and upper sleeves 26 and 27 are axially spaced on the mandrel 15 by the semi-cylindrical members 28 and 29. The members 28 and 29 have inwardly directed flanges 33 and 34 on their lower and upper ends, respectively, for mating with the annular grooves 35 and 36 provided in the lower and upper sleeves 26 and 27, respectively. The semi-cylindrical members 28 and 29 are fitted over the grooves 35 and 36 and secured together by means of cap screws 39. The thrust bearing 30 engages the upper annular surface of the sleeve 27 and the lower annular surface of the bushing 31, as best shown in FIGURE 4a. The retainer sleeve 32 encircles the bushing 31, thrust bearing 30 and upper sleeve 27 and is secured to the upper sleeve 27 by set screw 37 for retaining the assembled relationship between the bushing, bearing and upper sleeve.

O-ring seals 38 may be provided in various portions of the housing assembly 17 and sleeve assembly 16 as shown for excluding dirt, drilling fluid or other foreign material from those portions of the assemblies which must rotate or slide relative to one another or relative to the mandrel 15.

In order to prevent relative rotation between the sleeve assembly 16 and housing 17 and further to limit relative axial movement between the two assemblies, a guide bar 40 may be provided. Guide bar 40 is mounted in a milled slot 41 in the lower sleeve 26 by means of cap screws 42 and extends downwardly into a milled slot 43 in the tubular body 18. A retainer bar 44 extends across the slot 43 and is secured to the body 18 by cap screws 45. A shoulder 46 on the outer surface of guide bar 40 is adapted to engage the retainer bar 44 to limit the relative axial movement of the sleeve and housing assemblies 16, 17 away from each other. Further, the relative movement of the sleeve and housing assemblies 16 and 17 toward each other is limited by the engagement of the end 47 of guide bar 40 with the end 48 of the milled slot 43. A second guide bar similar to guide bar 40 could be provided on the opposite side of the sleeve and housing assemblies 16, 17 (180° from guide bar 40) if desired, but it has been found adequate to provide the one guide bar 40 with the slots, etc., as described.

Means are provided for engaging the well casing to anchor the tubing hold-down tool 10 in predetermined location and, as shown in the drawings, these means may include a pair of wedge slips 50. Each wedge slip 50 is provided with an outer serrated or toothed cylindrical surface 51 adapted to engage the inner surface of a well casing in such a manner as to prevent relative movement between the slips 50 and the casing in either an axial or circumferential direction. Each of the slips 50 is provided with a dovetail-shaped slot (not numbered) on its inner surface which inclines upwardly and outwardly relative to the cylindrical surface 51 and which is adapted to mate with a dovetail-shaped way 52 provided on the lower sleeve 26 of the housing assembly 17. The dovetail-shaped way 52 is also inclined upwardly and outwardly from the axis of the tool 10 such that upward movement of the slip 50 relative to the sleeve 26 causes the slip 50 to move outwardly from the mandrel 15 for engaging the internal surface of the well casing.

The lower end of each slip 50 is provided with a T-bar shaped projection 53 for mating with a T-slot 54 provided in the tubular body 18 of the sleeve assembly 16. The T-bar projection 53 and T-slot 54 interlock in the manner shown in FIGURE 4b such that the slip 50 may move radially relative to the mandrel 15, but cannot move axially relative to the tubular body 18. Two dovetail-shaped ways 52 and two T-slots 54 are provided on the sleeve 26 and body 18, respectively, and are spaced 180° from each other on the respective sleeve and body. Thus, diametrically opposed wedge slips 50 are provided which move outwardly (away from each other) into engagement with the internal surface of the well casing when the sleeve 26 and body 18 are moved toward each other. Likewise the slips 50 are retracted from engagement with the well casing upon relative movement of the sleeve 26 and the body 18 away from each other.

The collar body 19 is provided with a J-slot 55 for engaging a pin 56 secured to the outer surface of the tubular mandrel 15. The J-slot 55 is conventional in design in that it includes a circumferential slotted portion connected to an axial slotted portion such that when the pin 56 is positioned in the circumferential slotted portion, the relative movement between the collar body 19 and the mandrel 15 is limited to a small amount, but that when the pin 56 is positioned in the axial slotted portion of the J-slot 55, the collar body 19 and mandrel 15 may move a substantial amount relative to each other in one axial direction. The lower portion of the body 19 has tapering edges 57 to guide the pin 56 back into the J-slot 55 when such is desired.

A stop ring 58 is secured to the outer surface of mandrel 15 and is located in the annular space 59 formed by the semi-cylindrical members 28 and 29. As the tool 10 is being lowered into the well casing, as shown in FIGURE 2, the housing assembly 17 is supported on the mandrel 15 by engagement of the members 28 and 29 with the upper shoulder of the stop ring 58, as shown in FIGURES 2 and 4a. The sleeve assembly 16 is supported on the mandrel 15 by the inner engagement between the J-slot 55 and pin 56. The wedge slips 50 are maintained in a retracted position by reason of the axial separation of the sleeve assembly 16 and housing assembly 17 which is maintained by stop ring 58 and pin 56 during the running in of the tool 10.

In the operation of the tubing hold-down tool 10, the desired tools and joints of tubing are mounted on the tubing 12 which is in turn threadedly secured to the collar 11 of the tool 10. The tubing 14 is then threadedly secured to the collar 13 of the tool 10 and lowered into the well casing 9 previously positioned within the well bore 8. When the desired location for anchoring a tool 10 has been reached, the various components of the tool will be in the respective positions illustrated in FIGURES 2 and 4a, 4b and 4c.

For setting the tool 10 at any location in the well

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casing 9, the tubing 14 is rotated in a right-handed or clockwise direction (as viewed from above) which in turn rotates tubular mandrel 15 in a clockwise direction. Since the bow springs 20 of the sleeve assembly 16 are in resilient engagement with the casing 9, the pin 56 will be moved into the axial slotted portion of the J-slot 55. It can be seen that only a small amount of rotation is necessary although further rotation will have no adverse effect since the pin 56 will merely engage the edge of the axial slotted portion of the J-slot and cause sleeve assembly 16 to rotate. The tubing 14 is then lowered in the well thereby lowering the tubular mandrel 15. As mandrel 15 is lowered the sleeve assembly 16 is retained in the same position relative to the well casing 9 due to the resilient engagement of the bow springs 20 with the well casing. The housing assembly 17, however, is not supported with respect to the well casing 9, and therefore is lowered with the mandrel 15 and thus moves axially downward toward sleeve assembly 16. As previously described, this axial movement of the housing assembly 17 toward the sleeve assembly 16 causes the wedge slips 50 to move upward along the dove-tail way 52 and radially outward toward and into engagement with the internal surface of the well casing 9. As the tubing 14 is lowered further, the lower annular surface 60 of the collar 13 engages the upwardly facing annular surface 61 of bushing 31 such that the weight of the tubing 14 is transferred to the housing 17 and this application of additional weight causes further and tighter setting of the slips 50. The location of the various components of tool 10 in the set condition is shown in FIGURE 3. It will be noted that pin 56 is positioned below the lowermost end of the collar body 19 and thus rotary movement of the mandrel 15 is no longer restricted relative to the collar body 19. Since the weight of the tubing 14 is supported by the thrust bearing 30 through bushing 31 and collar 13, the tubing 14 may be rotated relative to the housing assembly 17 without causing rotation of that assembly. Further such rotation is transmitted through the tubular mandrel 15 to the tubing 12 to rotate whatever tools were provided on the tubing 12 such as the hydraulic jets previously described for hydraulically undercutting the fluid-producing formation. With the weight of the tubing 14 supported in whole or in part by the tool 10, the vertical position of the tubing above and below the tool 10 does not deviate during rotation. Thus if hydraulic undercutting is being performed, a relatively narrow (vertical thickness) plane of undercutting is accomplished.

When it is desired to remove the tubing and the tool from the well or reposition same in another location within the well casing 9, the tubing 14 is raised a sufficient amount to release the wedge slips 50 to cause the pin 56 to enter the J-slot 55. The pin 56 becomes positioned in the circumferential portion of the J-slot 55 by reason of engagement with the inclined edges 57 to the J-slot. The wedge slips 50 are drawn inwardly out of engagement with the internal surface of the casing 9 by reason of the stop ring 58 engaging the upper end of the semi-cylindrical members 28 and 29 and thereby pulling upwardly on the housing assembly 17 relative to the casing 9 and slips 50. With the pin 56 positioned within the J-slots 55 and the housing 17 supported by the stop ring 58, the components of the tool 10 are in their original position shown in FIGURES 1 and 2 so that the tool may be raised or lowered in the well casing as desired. Since there are no shear pins which are sheared during the setting or unsetting of our tool (as is common in similar tools) nor are there any irreversible operations performed in the setting or unsetting, it is obvious that the device of our invention may be set and unset as many times as desired.

The tubing mandrel 15 may be substantially the same size and wall thickness as the tubing 12 and 14 and therefore no obstruction to flow of fluid downwardly through

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the tubing is presented by tool 10. Further, since as shown in FIGURES 2 and 3, the external diameters of the various components of the sleeve and housing assemblies 16 and 17 are substantially less than the internal diameter of the casing 9, and the slips 50 occupy only a portion of the annular space, there is sufficient annular space between the tool 10 and the casing 9 for the upward flow of fluid past the tool.

Having fully described our invention, it is to be understood that we do not wish to be limited to the details herein set forth or to the details illustrated in the drawings, but our invention is of the full scope of the appended claims.

We claim:

1. In a tool for rotatably supporting tubing in a well casing, the combination of: a mandrel having means for attaching to the tubing, first means slidably and rotatably mounted on said mandrel, second means slidably and rotatably mounted on said mandrel, means on said first means for resiliently engaging the casing and frictionally resisting movement of said first means relative to the casing, means on said mandrel and first means for selectively and releasably interconnecting and locking said first means to said mandrel, casing engaging means mounted on said second means for movement toward and away from the casing upon axial movement of said casing engaging means relative to said second means, means interconnecting said casing engaging means and said first means whereby relative axial movement between said first means and said second means causes the said movement of said casing engaging means toward and away from the casing, and said mandrel having means for engaging said second means for rotatably supporting said mandrel.

2. In a tool for rotatably supporting tubing in a well casing, the combination of: a mandrel having means for attaching to the tubing, a sleeve assembly movably mounted on said mandrel, a housing assembly movably mounted on said mandrel, said sleeve assembly including means for resiliently engaging the casing and frictionally resisting movement of said sleeve assembly relative to the casing, means on said mandrel and sleeve assembly for selectively and releasably interconnecting and locking said sleeve assembly to said mandrel, casing engaging means slidably mounted on said housing assembly for movement toward and away from the casing upon axial movement of said casing engaging means relative to said housing assembly, means on said casing engaging means for interconnecting same to said sleeve assembly whereby upon release of said means on the mandrel for releasably lockably engaging said sleeve assembly any relative axial movement between said sleeve assembly and said housing assembly causes the said movement of said casing engaging means toward and away from the casing, a shoulder on said mandrel, and said housing assembly having means for engaging said shoulder for rotatably supporting said mandrel.

3. In a tool for rotatably supporting tubing in a well casing, the combination of: a mandrel having upper and lower ends, means on each end for attaching to the tubing, a sleeve assembly slidably and rotatably mounted on said mandrel, a housing assembly slidably and rotatably mounted on said mandrel, said sleeve assembly including means for resiliently engaging the casing and frictionally resisting movement of said sleeve assembly relative to the casing, means on said mandrel and sleeve assembly for selectively and releasably interconnecting and locking said sleeve assembly to said mandrel, casing engaging means slidably mounted on said housing assembly for movement toward and away from the casing upon axial movement of said casing engaging means relative to said housing assembly, means on said casing engaging means interconnecting same to said sleeve assembly whereby relative axial movement between said sleeve assembly and said housing assembly causes the said movement of said casing engaging means toward and away from the casing, a

shoulder on said mandrel, and said housing assembly having rotatable means for engaging said shoulder for rotatably supporting said mandrel.

4. In a tool for rotatably supporting tubing in a well casing, the combination of: a mandrel having means for attaching to the tubing, a sleeve assembly movably mounted on said mandrel, a housing assembly movably mounted on said mandrel, said sleeve assembly including means for resiliently engaging the casing and frictionally resisting movement of said sleeve assembly relative to the casing, means on said mandrel and sleeve assembly for selectively and releasably interconnecting and locking said sleeve assembly to said mandrel, means extending between said housing assembly and said sleeve assembly for limiting relative rotation between said assemblies, casing engaging means slidably mounted on said housing assembly for movement toward and away from the casing, means on said casing engaging means for interconnecting same to said sleeve assembly whereby relative axial movement between said sleeve assembly and said housing assembly causes the said movement of said casing engaging means, a shoulder on said mandrel, and said housing assembly having means for engaging said shoulder for rotatably supporting said mandrel.

5. In a tool for rotatably supporting tubing in a well casing, the combination of: a mandrel having an upper end and a lower end, a threaded collar on said upper end for threadedly engaging the tubing, means on said lower end for attaching to additional tubing, a sleeve assembly slidably and rotatably mounted on the exterior of and near the lower end of said mandrel, said sleeve assembly including means for resiliently engaging the well casing, said sleeve assembly having a J-slot, a pin mounted on said mandrel for engaging said J-slot to prevent relative axial movement between said mandrel and said sleeve assembly until said mandrel is rotated relative to said sleeve for releasing said pin from said J-slot, a housing assembly slidably and rotatably mounted on the exterior of and near the upper end of said mandrel, at least two wedge slips for engaging the casing, said slips being slidably mounted on said housing assembly whereby axial movement of said slips relative to said housing assembly causes movement of said slips toward and away from the casing, said housing assembly including a thrust bearing positioned in the upper end of said housing assembly for engaging and rotatably supporting the said threaded collar mounted on the upper end of said mandrel, means extending axially between and engaging said sleeve assembly and said housing assembly for limiting relative rotation while permitting relative axial movement between said assemblies, and said wedge slips having means interconnecting with said sleeve assembly whereby axial movement of said sleeve assembly after release of said pin from said J-slot causes axial movement of said slips relative to said housing assembly for moving the slips into engagement with the well casing.

6. In a tool for rotatably supporting tubing in a well casing, the combination of: a mandrel having an upper end and a lower end, a threaded collar on said upper end for threadedly engaging the tubing, means on said lower end for attaching to additional tubing, a sleeve assembly slidably and rotatably mounted on the exterior of and near the lower end of said mandrel, said sleeve assembly including means for resiliently engaging the well casing and frictionally resisting movement of said sleeve assembly relative to the casing, means on said mandrel and sleeve assembly for selectively and releasably interconnecting and locking said sleeve assembly to said mandrel, a housing assembly slidably and rotatably mounted on the exterior of and near the upper end of said mandrel, at least two wedge slips for engaging the casing, said slips being slidably mounted on said housing assembly whereby axial movement of said slips relative to said housing assembly causes movement of said slips toward and away from the casing, upwardly

facing abutting means on said mandrel for engaging and supporting said housing assembly, said housing assembly including a thrust bearing positioned in the upper end of said housing assembly for engaging and rotatably supporting the said threaded collar mounted on the upper end of said mandrel, and means extending axially between and engaging said sleeve assembly and said housing assembly for limiting relative rotation while permitting relative axial movement between said sleeve and housing, and said wedge slips having means interconnecting with said sleeve assembly whereby axial movement of said sleeve assembly after release of said means on the mandrel for releasably lockably engaging said sleeve assembly causes axial movement of said slips relative to said housing assembly for moving the slips into engagement with the well casing.

7. In a tool for rotatably supporting tubing in a well casing, the combination of: a tubular mandrel having an upper end and a lower end, a threaded collar on said upper end for threadedly engaging the tubing, means on said lower end for attaching to additional tubing, a sleeve assembly slidably and rotatably mounted on the exterior of and near the lower end of said mandrel, said sleeve assembly including spring bows for resiliently engaging the well casing, said sleeve assembly having a J-slot, a pin mounted on said mandrel for engaging said J-slot to prevent relative sliding movement between said mandrel and said sleeve assembly until said mandrel is rotated relative to said sleeve assembly for releasing said pin from said J-slot, a housing assembly slidably and rotatably mounted on the exterior of and near the upper end of said mandrel, at least two wedge slips for engaging the casing, said slips being slidably mounted on said housing assembly on an incline to the axis of said mandrel whereby axial movement of said slips relative to said housing assembly causes movement of said slips toward and away from the casing, upwardly facing abutting means on said mandrel for engaging and supporting said housing assembly, said housing assembly including a thrust bearing positioned in the upper end of said housing assembly for engaging and rotatably supporting the said threaded collar mounted on the upper end of said mandrel, means extending axially between and engaging said sleeve assembly and said housing assembly for limiting relative rotation while permitting relative axial movement between said assemblies, and said wedge slips having means interconnecting with said sleeve assembly whereby axial movement of said sleeve assembly after release of said pin from J-slot causes axial movement of said slips relative to said housing assembly for moving the slips into engagement with the well casing.

8. In a tool for rotatably supporting tubing in a well casing, the combination of: a mandrel having upper and lower ends, a sleeve assembly slidably and rotatably mounted on and near the lower end of said mandrel, said sleeve assembly including means for resiliently engaging the well casing, means on said mandrel for releasably engaging said sleeve assembly for limiting the axial movement of said sleeve assembly while so engaged, a housing assembly slidably and rotatably mounted on and near the upper end of said mandrel, upwardly facing abutting means on said mandrel for engaging and limiting the downward movement of said housing assembly relative to said mandrel, casing engaging means slidably mounted on said housing assembly for movement toward and away from the casing upon axial movement of said casing engaging means relative to said housing assembly, means interconnecting said casing engaging means and said sleeve assembly whereby relative axial movement between said sleeve assembly and said housing assembly causes said movement of said casing engaging means toward and away from the casing, a shoulder on said mandrel, and said housing assembly having rotatable means for engaging said shoulder for rotatably supporting said mandrel.

9. In a tool for rotatably supporting tubing in a well casing, the combination of: a mandrel having upper and lower ends, a sleeve assembly slidably and rotatably mounted on and near the lower end of said mandrel, said sleeve assembly including means for resiliently engaging the well casing, means on said mandrel for releasably engaging said sleeve assembly for limiting the axial movement of said sleeve assembly while so engaged, a housing assembly slidably and rotatably mounted on and near the upper end of said mandrel, upwardly facing abutting means on said mandrel for engaging and limiting the downward movement of said housing assembly relative to said mandrel, casing engaging means slidably mounted on said housing assembly for movement toward and away from the casing upon axial movement of said casing engaging means relative to said housing assembly, means interconnecting said casing engaging means and said sleeve assembly whereby relative axial movement be-

tween said sleeve assembly and said housing assembly causes said movement of said casing engaging means toward and away from the casing, means extending between said housing assembly and said sleeve assembly for limiting relative rotation between said assemblies, a shoulder on said mandrel, and said housing assembly having rotatable means for engaging said shoulder for rotatably supporting said mandrel.

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