

Sept. 28, 1954

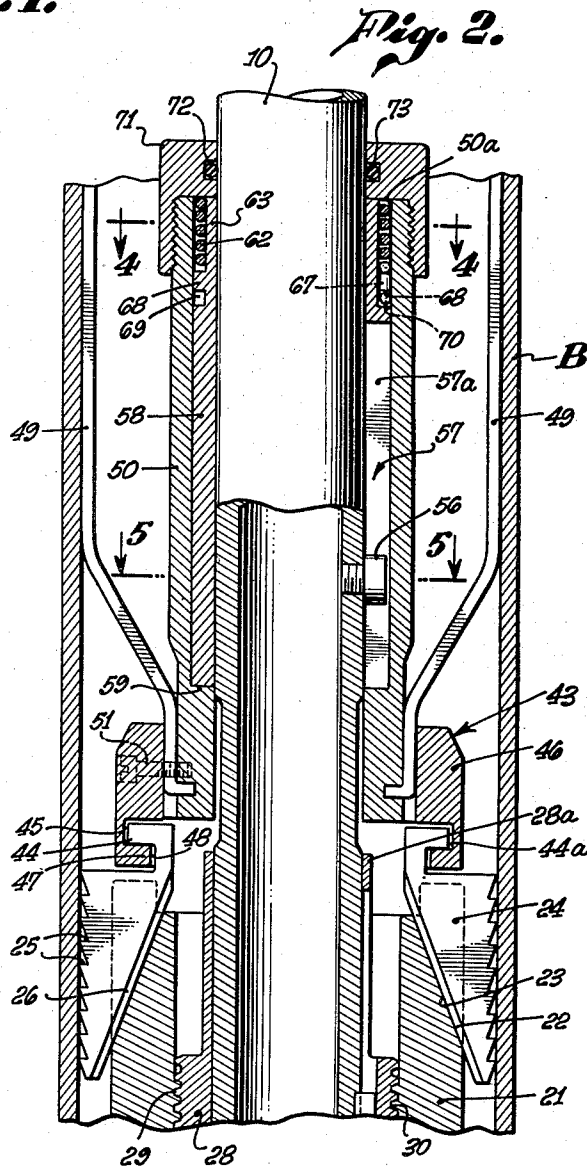
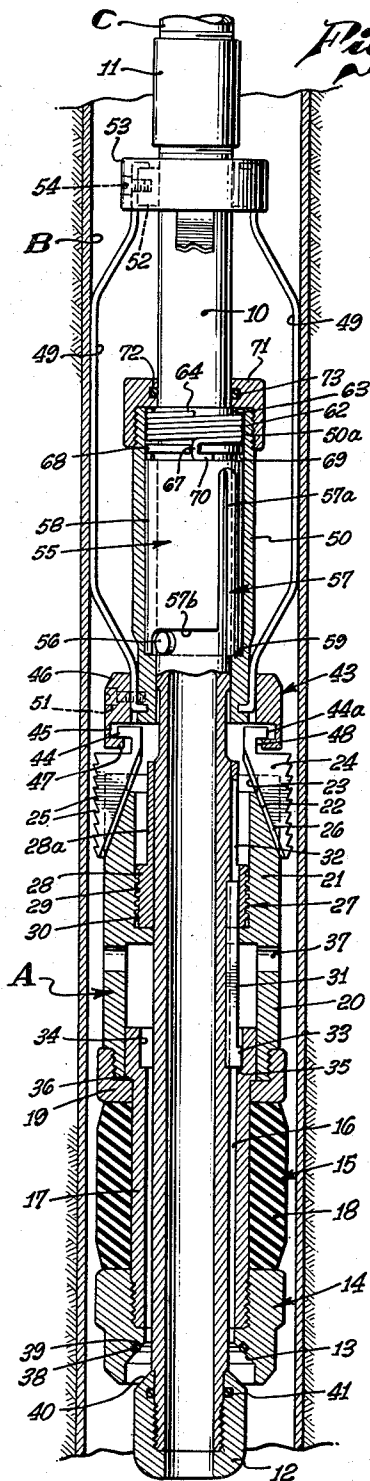
R. C. BAKER ET AL

2,690,225

SUBSURFACE WELL TOOL

Filed Aug. 6, 1951

2 Sheets-Sheet 1



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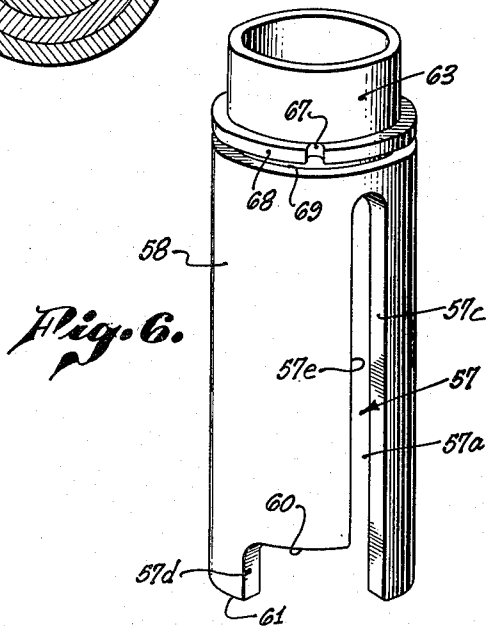
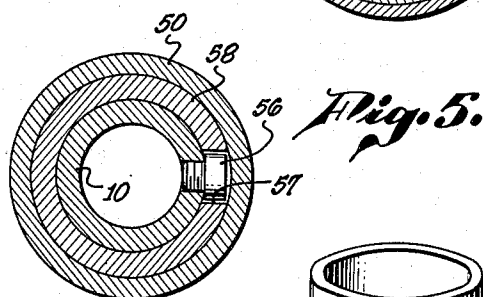
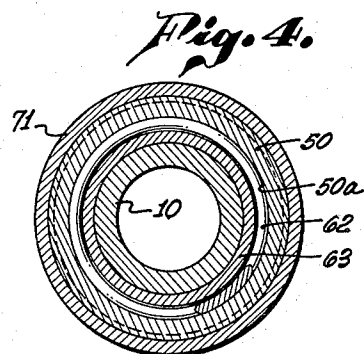
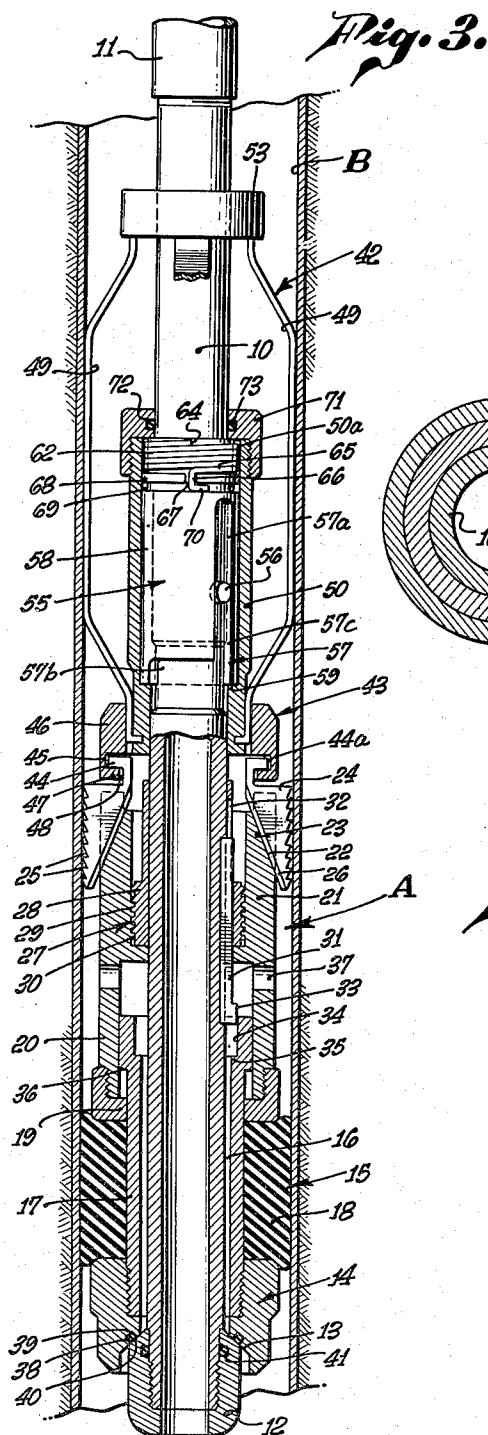
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2 Sheets-Sheet 2



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2,690,225

SUBSURFACE WELL TOOL

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Application August 6, 1951, Serial No. 240,474

14 Claims. (Cl. 166—140)

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The present invention relates to well apparatus, and more particularly to tools to be lowered and operated in bore holes.

Casing or wall engaging elements, such as friction drag springs, are relied upon in bore holes to resist movement of well tool parts, in order that movement of other parts relative thereto can be obtained. The wall engaging elements are effective in holding their companion parts relatively stationary in the bore hole, but in doing so, they tend to prevent rotation of a tubular string to which the well tool may be secured. When it is desired to remove the tool from the bore hole, extensive economies in time and money can be obtained if the tubular string portion in the hole can be rotated by the rotary table at the top of the bore, for the purpose of disconnecting the tubing sections as they are removed from the latter. With drag springs, or equivalent elements, engaging the wall of the bore hole, or a tubular well conduit therein, rotation of the tubular string rotates such springs or elements around with it, causing damage to them and possibly to other well tool parts.

Accordingly, an object of the present invention is to enable a tubing string to be rotated through a plurality of revolutions in the well bore without correspondingly rotating the friction drag springs, or other wall engaging elements, forming part of the well tool.

Another object of the invention is to provide a releasable lock device in a subsurface well tool which utilizes friction drag elements, or the like, engaging the wall of a well conduit or well bore, for the purpose of shifting the lock device between locked and released positions, but in which the drag elements, or the like, are rendered ineffective to prevent or resist rotation of a tubular string to which the tool is secured. In a more limited sense, the drag elements are uncoupled from the tubular string in one direction of rotation of the latter, but can be coupled to the tubular string when it is rotated in the opposite direction.

A further object of the invention is to provide a subsurface well tool incorporating an improved swivel connection between casing engaging slips or a packing structure and a friction drag or similar casing engaging device, to enable the slips or packing structure, or both, to be rotated without rotating the friction drag or similar device.

Yet another object of the invention is to provide an improved safety releasing connection operable upon a set of casing engageable slips

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and a cooperable expander, in order to forcibly release the slips from the casing whenever necessary.

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 longitudinal section, parts being disclosed in elevation, through a well tool disclosed in a well casing and with certain of its parts in retracted position;

Fig. 2 is an enlarged longitudinal section through a portion of the tool disclosed in Fig. 1, disclosing the slips expanded against the well casing and the lock portion of the tool in released position;

Fig. 3 is a view similar to Fig. 1, disclosing the tool anchored in packed-off condition within the well casing;

Fig. 4 is a cross-section taken along the line 4—4 on Fig. 2;

Fig. 5 is a cross-section taken along the line 5—5 on Fig. 2;

Fig. 6 is an isometric projection of the lock sleeve embodied in the well tool.

The well tool disclosed in the drawings is in the form of a packer A adapted to be run in a well casing B by means of a tubular string C, and to be anchored in packed-off condition therewithin. The well tool is of the retrievable type, which enables it to be withdrawn from the well casing B, or well bore, after it has served its desired purposes therewithin.

The well tool A includes a central tubular mandrel 10 having its upper end threaded into a collar 11 which is, in turn, threaded onto the lower end of the tubular running-in string C. This mandrel extends throughout the length of the well tool, having a valve head 12 threaded on its lower end. This valve head is movable upwardly into engagement with the valve seat portion 13 of a lower abutment 14 forming part of a packing structure 15 disposed around the mandrel 10 and spaced therefrom to form an annular passage 16 through which fluids can flow. As specifically disclosed in the drawings, the

packing structure 15 includes the abutment 14, which is threaded onto the lower end of a tubular body 17 spaced outwardly from the exterior of the mandrel 10 to form the aforementioned annular by-pass passage 16. A packing element 18, which may be in the form of a rubber, or rubber-like, sleeve, surrounds the body 17, with its lower end resting upon the lower abutment 14. The upper end of the sleeve 18 engages an upper abutment 19 threaded on the lower end of the skirt portion 20 of a tapered expander 21 having a plurality of circumferentially spaced tapered surfaces 22 thereon that converge in an upward and inward direction. These surfaces are engaged by companion inner surfaces 23 on a plurality of slips 24 having upwardly facing wickers or teeth 25 for embedding in the wall of the well casing B, or similar well conduit. The slips 24 preferably have a slidable dove-tailed connection 26 with the expander 21; so as to be positively moved both to and from engagement with the well casing B.

The tapered expander 21 is rotatably connected to the mandrel 10 by a safety device 27, which operates to forcibly retract the slips 24 from engagement with the casing B, in the event the slips are not retractable merely as a result of lowering the expander 21 with respect thereto. This safety device includes a sleeve 28 slidable on the mandrel 10, its lower portion being provided with an external thread 29 engaging a companion internal thread 30 formed in the expander 21. The threaded connection 29, 30 is preferably left-hand; so that right-hand rotation of the threaded sleeve 28 will effect its upward movement with respect to the expander 21. The rotatable connection between the mandrel 10 and the threaded sleeve 28 is provided by one or more longitudinally extending keys 31 in the mandrel 10 slidable within one or more longitudinally extending keyways 32 in the threaded sleeve 28. The keys 31 are relatively long, being provided with foot portions 33 receivable within a counterbore 34 in the upper portion of the packer body 17, and adapted to engage a body shoulder 35 formed by the lower end of such counterbore 34.

The upper portion of the body 17 is also formed with an outwardly extending shoulder 36 adapted to rest upon the upper abutment 19 when the packing sleeve 18 is in retracted position. As stated above, the body 17 is spaced from the mandrel 10 to provide the by-pass passage 16, which extends from a point below the packing structure 15, and which also extends into the skirt portion 20 of the expander 21, opening outwardly of the latter through the side outlet ports 37 to a point or location above the packing structure 15. It is apparent that when the valve head 12 is in a lower position, spaced from its companion valve seat 13, as disclosed in Fig. 1, the by-pass passage 16 is open, whereas movement of the valve head 12 upwardly into engagement with the valve seat 13 will close the by-pass passage 16. In order to prevent leakage through the valve device, a suitable seal ring 38 may be disposed in a ring groove 39 in the seat 13 for engagement with the upper tapered portion 40 of the valve head 12. A seal ring 41 may also be embodied in the valve head 12, engaging the mandrel 10 to prevent fluid leakage through the threaded connection between the valve head 12 and mandrel 10.

Longitudinal movement of the slips 24 is resisted by a drag device 42 connected thereto through a swivel 43, which permits the slips 24

to be rotated without correspondingly rotating the drag device. The swivel 43 includes an upper lateral, outwardly extending lug or flange 44 on each slip 24 slidable within an internal circumferential groove 45 formed in a tie ring 46. This tie ring has a lower inwardly directed circumferential flange 47 forming its lower end, which extends within grooves or slots 48 in the slips provided between the slip lugs 44 and the main body of the slips therebelow. The lugs 44 and tie ring flange 47, in effect, form interlocking elements causing the slips 24 to move with the tie ring 46 when the latter is shifted upwardly, whereas the main body of the tie ring 46 above the groove 45 engages the upper surfaces of the slip lugs 44 to move the slips downwardly with the tie ring 46. The outer ends 44a of the slip lugs 44 are initially spaced inwardly to a substantial extent from the base of the circumferential groove 45, in order to allow radial outward movement of the slips 24 when they are to be shifted into engagement with the casing wall.

The tie ring 46 forms part of the friction drag device 42 tending to resist longitudinal movement of the slips 24. The lower ends of outwardly bowed springs 49 are suitably secured to the lower portion of a drag and cover sleeve 50, the tie ring 46 encompassing such lower ends to prevent the springs from becoming disconnected from the sleeve 50. Screws 51 extend through the tie ring 46, and are threaded into the drag sleeve 50 to hold the ring in assembled position on the latter. The upper ends of the springs 49 are suitably attached to an upper drag collar 52 slidable on the mandrel 10, the ends of the springs being prevented from becoming disconnected from the upper drag collar by an encompassing ring 53 and screws 54 passing therethrough and threaded into the upper drag collar 52.

The well packer A is actuated mechanically by moving the tubular mandrel 10 to effect expansion and retraction of the slips 24 and packing element 18 to and from engagement with the wall of the well casing B. The ability of the mandrel 10 to so move the expansible and retractable elements 24, 18 is dependent upon the locked or unlocked position of a lock device 55 provided between the mandrel 10 and the drag device 42. This lock device 55 may include a lock pin 56 threaded, or otherwise suitably secured, to the mandrel 10 and extending into a J slot 57 formed in a lock sleeve 58, and also between the latter and the lower portion of the drag sleeve 50. The lock sleeve 58 is rotatable on the mandrel 10 and may also rotate with respect to the drag sleeve 50 in one direction, but is prevented from rotating when moved in the opposite direction, as explained hereinafter.

The lock sleeve slot 57 is composed of a longitudinal or vertical leg portion 57a that terminates at the end of the sleeve 58, which is in abutting relation to a shoulder 59 formed in the lower portion of the drag sleeve 50. The longitudinal leg portion 57a merges into a horizontal or transverse foot locking portion 57b extending circumferentially part way around the sleeve 58. This locking portion 57b of the J slot 57 is defined between a transverse surface 60 of the lock sleeve 58, which is spaced upwardly from its lower terminus 61, and the shoulder 59. The longitudinal and transverse portions 57a, 57b of the slot are sufficient in width to allow movement of the mandrel lock pin 56 therein.

As stated above, the lock sleeve 58 can rotate within the drag sleeve 50 in one direction, but is precluded from rotating therein in the other

direction. Since the lock portion 57b of the J slot 57 extends in a right-hand or clockwise rotary direction from the longitudinal leg 57a of the slot, it is preferred to allow the lock sleeve 58 to rotate in a clockwise or right-hand direction, as viewed when looking downwardly from the top of the well bore. In order to operate the lock device 55, the sleeve 58 is to be prevented from rotating when urged in the opposite or counter-clockwise direction.

To so control the operation of the lock sleeve 58, a one-way coupling or brake device is provided between the lock sleeve 58 and the drag or cover sleeve 50. This one-way brake, as disclosed in the drawings, consists of a helical spring 62 disposed around the reduced diameter upper portion 63 of the lock sleeve 58, with its upper end 64 free from attachment to any part. The spring 62 is wound around the lock sleeve portion 63 in the manner of a right-hand thread, with its lower end 65 being secured to the sleeve 58, as by forming it of generally U-shape, with the base portion 66 of the U extending through a longitudinal slot 67 in a sleeve flange 68, which merges into a circumferential groove 69 in the lock sleeve 58 provided immediately below the flange 68. One leg 70 of the U-shaped portion 65 of the spring is disposed in the circumferential groove 69.

In order to prevent any harmful foreign substances for entering the drag sleeve 50, its upper end may be closed by a suitable cover or cap 71 threaded thereon and having a groove 72 containing an elastic seal or wiper ring 73 slidably engageable with the periphery of the mandrel 10.

The exterior portions of the spring 62 frictionally engage the inner wall 50a of the drag sleeve 50 relatively lightly. When the lock sleeve 58 is turned in a clockwise or right-hand direction, the spring 62 is moved out of engagement with the inner wall 50a of the drag sleeve 50, thereby uncoupling the lock sleeve 58 from the latter. However, any tendency to rotate the lock sleeve 58 in the opposite direction tends to expand the spring 62 and urges it with substantial friction force against the drag sleeve 50, effectively locking the lock sleeve 58 to the drag sleeve 50, and preventing reverse or counter-clockwise rotation of the lock sleeve 58, because of the frictional restraint imposed by the drag springs 49 as a result of their frictional engagement with the wall of the well casing B.

In operating the apparatus A, it is lowered in the well casing with the parts occupying the positions illustrated in Fig. 1. When in this position, the mandrel 10 is disposed in a lower position relative to the other parts, because of the disposition of its pin 56 within the transverse foot portion 57b of the J slot 57. This pin engages the shoulder portion 59 of the drag sleeve 58 to urge the drag device 42 downwardly through the well casing B. At the same time, the lower ends 33 of the keys 31 are engaging the body shoulder 35, to shift the body 17 downwardly, and, because of the engagement of the external body shoulder 36 with the upper abutment 19, the tapered expander 21 and the slips 24 are also urged downwardly in the well casing. At this time, also, the valve head 12 is spaced downwardly from its companion seat 13 to open the by-pass passage 16 and allow fluid to flow upwardly therethrough, passing through the valve seat 13 and annular passage 16 and out through the outlet ports 37. At the same time, fluid is also flowing around the exterior of the packing

element 18 and the other parts of the packer apparatus.

When the location in the well casing B is reached at which the packer A is to be anchored in packed-off condition, the tubular string C is rotated in a counter-clockwise direction, or to the left, shifting the pin 56 within the foot portion 57b of the slot 57 toward the longitudinal slot leg 57a until the pin engages the right wall 57c of the slot, as seen in the drawings. Any tendency for the lock sleeve 58 to move in a counter-clockwise direction is prevented by the expanding and braking action of the one-way brake or clutch spring 62 against the inner wall 50a of the drag sleeve 50. Thus, the lock sleeve 58 is coupled to the drag sleeve 50 and is prevented from moving in a counter-clockwise or left-hand direction by the engagement of the friction drag springs 49 against the wall of the well casing B.

In the event the turning force of the mandrel 10 exceeds the friction force of the springs against the casing the springs and drag sleeve will be rotated, but such turning force need not be exerted merely to locate the pin 56 in the longitudinal leg 57a of the slot.

When the lock pin 56 engages the right wall 57c of the longitudinal slot leg 57a, the tubular mandrel 10 can be elevated to set the packer parts against the well casing. During the first portion of the elevating movement, the valve head 12 engages the valve seat 13, to close the by-pass passage 16. Continued elevation of the mandrel 10 then moves the packing structure 15 upwardly with it, and also the tapered expander 21 upwardly within the slips 24, which are prevented from moving upwardly by the engagement of the drag springs 49 against the well casing B. Such upward movement is permitted, because of the upward shifting of the mandrel lock pin 56 within the longitudinal leg 57a of the J slot 57. The upward movement of the expander 21 within the slips 24 urges the latter outwardly into anchoring engagement with the wall of the well casing B. As a result of such engagement, the expander 21 cannot be shifted upwardly to any further extent by the packing structure 15. Accordingly, continuation of the upward movement of the mandrel 10 then moves the lower abutment 14 toward the upper abutment 19, fore-shortening the rubber packing sleeve 18 and expanding it outwardly into firm sealing engagement with the wall of the well casing B. During this continued upward movement, the lock pin 56 can continue to move upwardly within the lock sleeve 58, in view of the length of the longitudinal leg portion 57a of the J slot 57. When the pin 56 is located in the leg portion 57a of the J slot, the lock device 55 is, in effect, in unlocked condition.

The necessary operation may now be performed with the well packer A in the well casing B. Fluid under pressure may be pumped down through the tubular string C and through the tubular mandrel 10, in order to test the casing; or cement slurry, synthetic resin or a suitable acid may be pumped through the apparatus for displacement through the casing, or for disposition in the casing below the tool. After the operation in the well casing has been performed, the tool A may be cleaned by lowering the mandrel 10; to shift the valve head 12 downwardly from its companion seat 13, opening the by-pass 16 and allowing fluid to be pumped the long way down through the tubular string C and mandrel 10, the fluid then flowing upwardly through the by-pass 16 and the annular space between the tubular string C and well

casing B. If desired, the fluid may be pumped the "short" way down through the last-mentioned annular space, the fluid passing through the ports 37 into the by-pass passage 16, and around the head 12, flowing upwardly through the tubular mandrel 10 and tubular string C to the top of the well bore.

A continuation of the lowering movement of the tubular mandrel 10 will cause the lower ends 33 of the keys 31 to engage the body shoulder 35, shifting the lower abutment 14 further away from the upper abutment 19 and allowing the rubber packing sleeve 18 to retract from the well casing B. When the external body shoulder 36 engages the upper abutment 19, it will shift the tapered expander 21 downwardly with respect to the slips 24, retracting the latter from the well casing B, because of the dovetailed interconnection 25 between the slips and expander. When the slips 24 have been fully retracted, the mandrel pin 56 is at the lower end of the longitudinal portion 57a of the J slot 57, whereupon the tubular string C and mandrel 10 can be rotated to the right, to reposition the pin in the transverse foot portion 57b of the slot, thereby locking all of the parts in retracted position.

The tool A may now be elevated in the well casing. If it is desired to rotate the running-in string C to disconnect the tubing sections above the rotary table at the top of the well bore, the table can be rotated in a right-hand or clockwise direction, to correspondingly rotate the running-in string C and the tubular mandrel 10. The pin 56 will engage the end 57d of the horizontal slot portion 57b, to rotate the lock sleeve 58 in a right-hand direction around with the mandrel 10. Such rotation, however, does not rotate the drag sleeve 50 and the drag device 42 since the brake or coupling spring 62 is wound slightly inwardly to retract it from having any material friction engagement with the drag sleeve 50. Accordingly, the latter and the drag springs 49 attached thereto remain stationary, and do not interfere with the rotation of the tubular mandrel 10 and the tubular string C attached thereto. Because of the key and slot connection 31, 32 between the mandrel 10 and the threaded sleeve 28, the tapered expander 21, packing structure 15 and slips 24 are also rotated around with the mandrel 10. However, the swivel connection 43 between the slips 24 and the drag device 42 allows rotation of the slips 24 without rotating the drag device, and, since the slips have been retracted from the well casing B, they do not offer any resistance to rotation of the parts referred to.

Accordingly, it is evident that the lock device 55 holds the slips 24 and packing structure 15 in retracted positions, and that it also allows the tubular mandrel 10 and other well tool parts to be rotated in a right-hand or clockwise direction without correspondingly rotating the drag device 42. Because of the ability to rotate the tubular string C through a plurality of revolutions, removal of the tool A from the well bore is expedited, with consequent extensive savings in time and money.

In the event the action of lowering the tubular mandrel 10 is incapable of shifting the tapered expander 21 downwardly to retract the slips 24 from the casing B, the mandrel 10 can be rotated in a clockwise direction, or to the right, to forcibly secure retraction of the slips. Since the slips 24 are firmly anchored to the casing B, the expander 21 is prevented from rotating. Rotation of the mandrel 10, therefore, rotates the safety sleeve

28, because of the key and slot interconnection 31, 32. Since the safety sleeve 28 is secured to the expander 21 by means of a left-hand threaded connection 29, 30, rotation of the safety sleeve 28 to the right causes it to unscrew upwardly from the expander 21, until the upper end 28a of the sleeve engages the lower end of the drag sleeve 50, which is firmly attached to the tie ring 46. Continued rotation of the mandrel 10 then exerts an upward force on the tie ring 46, because of the abutting of the upper end 28a of the safety sleeve 28 with the lower end of the drag sleeve 50. At the same time, the safety sleeve 28 is exerting a downward force on the expander 21, because of their threaded interconnection 29, 30. Accordingly, the exertion of sufficient torque on the tubular running-in string C and mandrel 10 will, in effect, eventually jack the expander 21 and slips 24 in directions away from each other, to forcibly retract the slips 24 from the well casing B.

During such rotation of the safety sleeve 28, the lock pin 56 is disposed in the longitudinal leg portion 57a of the J slot 57. However, such rotation will still fail to rotate the drag springs 49 around the wall of the casing B, since the pin 56 will engage the left wall 57e of the longitudinal slot 57 and rotate the lock sleeve 58 around with the mandrel 10. During such rotation, the one-way brake spring 62 is retracted from the drag sleeve 50, to effect an uncoupling of the lock sleeve 58 from the latter.

It is, accordingly, apparent that a well tool apparatus A has been provided that enables the tubular string C to be rotated through a plurality of revolutions without correspondingly rotating the drag device 42. The one-way brake 62 locks the lock sleeve 58 to the drag device 50 whenever the lock pin 56 on the mandrel 10 is to be moved arcuately with respect to the lock sleeve toward a releasing direction. Movement of the mandrel 10 and lock pin 56 in the opposite rotary direction, however, automatically uncouples the lock sleeve 58 from the drag device 42. When it is necessary to rotate the slips 24, such rotation can occur without interference from the drag device 42, because of the swivel connection 43 therebetween. Moreover, in the event the tool becomes stuck in the well bore, the slips 24 can be forcibly released, merely by rotating the mandrel portion 10 of the tool, and such release can occur without rotating the drag device 42 around the wall of the well casing B.

We claim:

1. A well tool including a first member connectible to a running-in string, a second member, said members being rotatable with respect to each other, releasable lock means operatively connected between said members to selectively couple said members for longitudinal movement together or uncouple said members from each other to allow relative longitudinal movement therebetween, and one-way coupling means operatively connected between said lock means and one of said members to connect said lock means and said one of said members together to prevent their relative rotation in one direction and to disconnect said lock means and said one of said members from each other to permit their relative rotation through a plurality of revolutions in the opposite direction.

2. A well tool including a first member connectible to a running-in string, a second member, said members being rotatable with respect to each other, releasable lock means operatively connected between said members to selectively couple said members for longitudinal movement

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together or uncouple said members from each other to allow relative longitudinal movement therebetween, and one-way coupling means operatively connected between said lock means and said second member to connect said lock means and said second member together to prevent their relative rotation in one direction and to disconnect said lock means and said second member from each other to permit their relative rotation through a plurality of revolutions in the opposite direction.

3. A well tool including a first member connectible to a running-in string, a second member, said members being rotatable with respect to each other, releasable lock means operatively connected between said members to selectively couple said members for longitudinal movement together or uncouple said members from each other to allow relative longitudinal movement therebetween, means on said second member engageable with a well casing to resist rotation of said second member therewithin, and one-way coupling means operatively connected between said lock means and one of said members to connect said lock means and said one of said members together to prevent their relative rotation in one direction and to disconnect said lock means and said one of said members from each other to permit their relative rotation through a plurality of revolutions in the opposite direction.

4. A well tool including a first member connectible to a running-in string, a second member, said members being rotatable with respect to each other, releasable lock means operatively connected between said members to selectively couple said members for longitudinal movement together or uncouple said members from each other to allow relative longitudinal movement therebetween, means on said second member engageable with a well casing to resist rotation of said second member therewithin, and one-way coupling means operatively connected between said lock means and said second member to connect said lock means and said second member together to prevent their relative rotation in one direction and to disconnect said lock means and said second member from each other to permit their relative rotation through a plurality of revolutions in the opposite direction.

5. A well tool including a first member connectible to a running-in string, a second member surrounding said first member, said first and second members being rotatable with respect to each other, a third member between said first and second members, releasable lock means operatively connected between said third member and one of said other two members to selectively couple said first and second members for longitudinal movement together or uncouple said first and second members from each other to allow relative longitudinal movement therebetween, and one-way coupling means operatively connected between said third member and the other of said two members to connect said third member and said other of said two members together to prevent their relative rotation in one direction and to disconnect said third member and said other of said two members from each other to permit their relative rotation through a plurality of revolutions in the opposite direction.

6. A well tool including a first member connectible to a running-in string, a second member surrounding said first member, said first and second members being rotatable with respect to each other, a third member between said first and second members, releasable lock means op-

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eratively connected between said first and third members to selectively couple said first and second members for longitudinal movement together or uncouple said first and second members from each other to allow relative longitudinal movement therebetween, means on said second member engageable with a well casing to resist rotation of said second member therewithin, and one-way coupling means operatively connected between said third member and second member to connect said third member and second member together to prevent their relative rotation in one direction and to disconnect said third member and said second member from each other to permit their relative rotation through a plurality of revolutions in the opposite direction.

7. A well tool including an inner member connectible to a running-in string, an outer annular member surrounding said inner member, said inner and outer members being rotatable with respect to each other, an annular lock member between said inner and outer members, releasable lock means operatively connected between said inner member and lock member to selectively couple said inner and outer members for longitudinal movement together or uncouple said inner and outer members from each other to allow relative longitudinal movement therebetween, and a one-way coupling element engageable with said lock member and outer member to connect said lock member and outer member together to prevent their relative rotation in one direction and to disconnect said outer member and lock member from each other to permit their relative rotation through a plurality of revolutions in the opposite direction.

8. A well tool including a tubular mandrel connectible to a running-in string, an outer sleeve surrounding said mandrel, said mandrel and outer sleeve being rotatable with respect to each other, an inner sleeve surrounding said mandrel within said outer sleeve, releasable lock means operatively connected between said inner sleeve and mandrel to selectively couple said mandrel and inner sleeve for longitudinal movement together or uncouple said mandrel and inner sleeve from each other to allow relative longitudinal movement therebetween, and a one-way coupling element operatively connected between said inner sleeve and outer sleeve to connect said inner and outer sleeves together to prevent their relative rotation in one direction and to disconnect said inner sleeve and said outer sleeve from each other to permit their relative rotation through a plurality of revolutions in the opposite direction.

9. A well tool including a tubular mandrel connectible to a running-in string, an outer sleeve surrounding said mandrel, said mandrel and outer sleeve being rotatable with respect to each other, an inner sleeve surrounding said mandrel within said outer sleeve, releasable lock means operatively connected between said inner sleeve and mandrel to selectively couple said mandrel and inner sleeve for longitudinal movement together or uncouple said mandrel and inner sleeve from each other to allow relative longitudinal movement therebetween, means on said outer sleeve engageable with a well casing to resist rotation of said outer sleeve therewithin, and a one-way coupling element operatively connected between said inner sleeve and outer sleeve to connect said inner and outer sleeves together to prevent their relative rotation in one direction and to disconnect said inner sleeve and said outer sleeve from each other to permit their relative

rotation through a plurality of revolutions in the opposite direction.

10. A well device, including a rotatable mandrel, an expander surrounding said mandrel, means cooperable with said expander for anchoring said device in a well casing, a sleeve within said expander, means for transmitting the rotary motion of said mandrel to said sleeve, and means connecting said sleeve to said expander whereby rotation of said sleeve by said mandrel with respect to said expander is adapted to effect relative longitudinal movement between said sleeve and expander, and means on said sleeve for transmitting such longitudinal movement to said anchoring means to forcibly move said anchoring means and expander relative to each other in longitudinal directions away from each other to retract said anchoring means from anchoring engagement with the well casing.

11. A well device, including a rotatable mandrel, an expander surrounding said mandrel, means cooperable with said expander for anchoring said device in a well casing, a sleeve threadedly secured to said expander to rotate within said expander into engagement with said anchoring means to forcibly move said anchoring means and expander relative to each other in longitudinal directions away from each other to retract said anchoring means from anchoring engagement with the well casing, and means for transmitting the rotary motion of said mandrel to said sleeve.

12. A well tool having relatively movable parts, means for controlling longitudinal movement of said parts with respect to one another, including a first member connectible to a running-in string and attached to one of said parts, a second member attached to another of said parts, releasable lock means operatively connected between said members to selectively couple said members for longitudinal movement together or

uncouple said members from each other to allow relative longitudinal movement therebetween and one-way coupling means between said lock means and one of said members to connect said lock means and said one of said members together to prevent their relative rotation in one direction and to disconnect said lock means and said one of said members from each other to permit their relative rotation through a plurality of revolutions in opposite directions, wherein said one-way coupling means comprises a helical spring engageable with said lock means and one of said members.

13. A well tool as defined in claim 7, wherein said one-way coupling means comprises a helical spring connected to said lock member and frictionally engageable with said outer member.

14. A well device, including a rotatable mandrel, an expander surrounding said mandrel, means cooperable with said expander for anchoring said device in a well casing, a sleeve threadedly secured to said expander to rotate within said expander into engagement with said anchoring means to forcibly move said anchoring means and expander relative to each other in longitudinal directions away from each other to retract said anchoring means from anchoring engagement with the well casing, and means for transmitting the rotary motion of said mandrel to said sleeve, comprising a key on said mandrel slidable in a keyway in said sleeve.

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Number	Name	Date
2,248,211	Young	July 8, 1941
2,323,989	Fulkerson	July 13, 1943
2,368,400	Baker	Jan. 30, 1945
2,368,401	Baker	Jan. 30, 1945
2,442,121	Earley	May 25, 1948