Sept. 12, 1961 W. D. MYERS 2,999,543

PARALLEL TUBULAR STRING APPARATUS FOR WELL BORES

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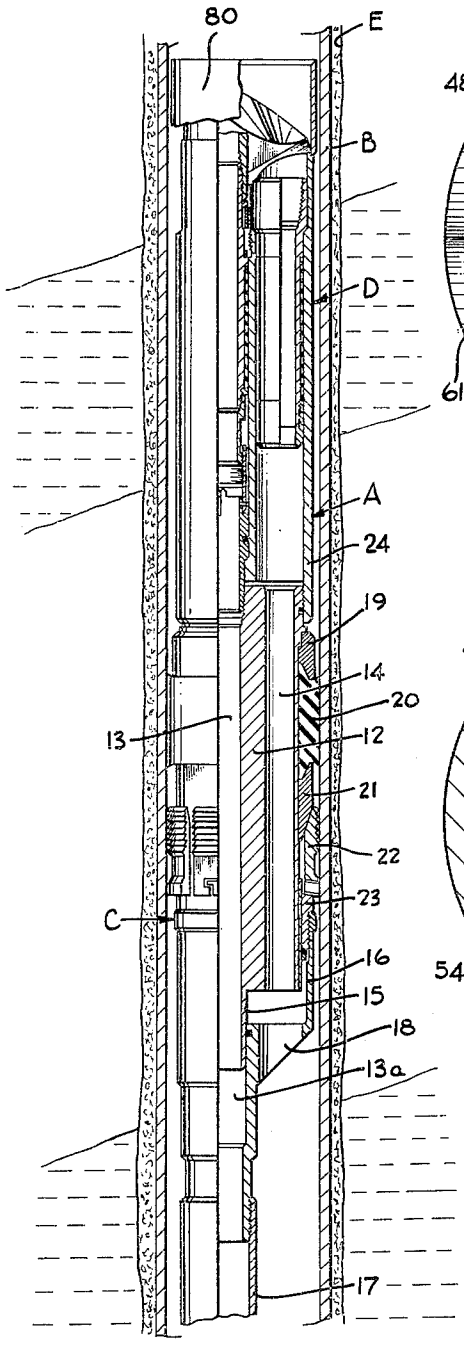

FIG_1

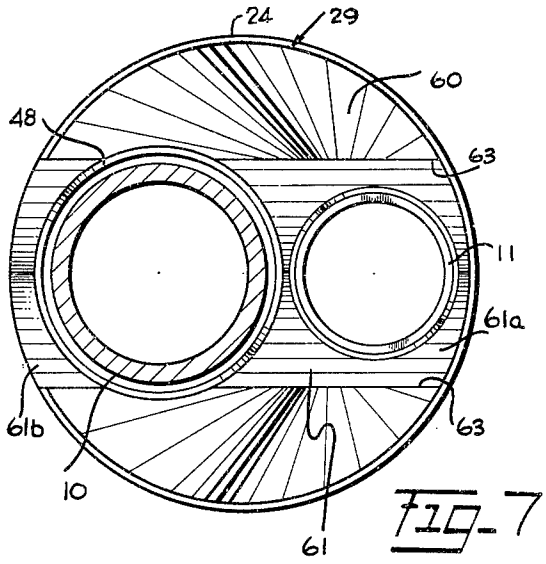

FIG_7

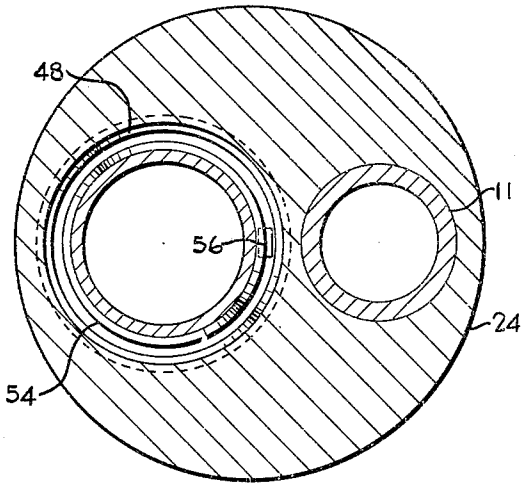

FIG_8

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PARALLEL TUBULAR STRING APPARATUS FOR WELL BORES

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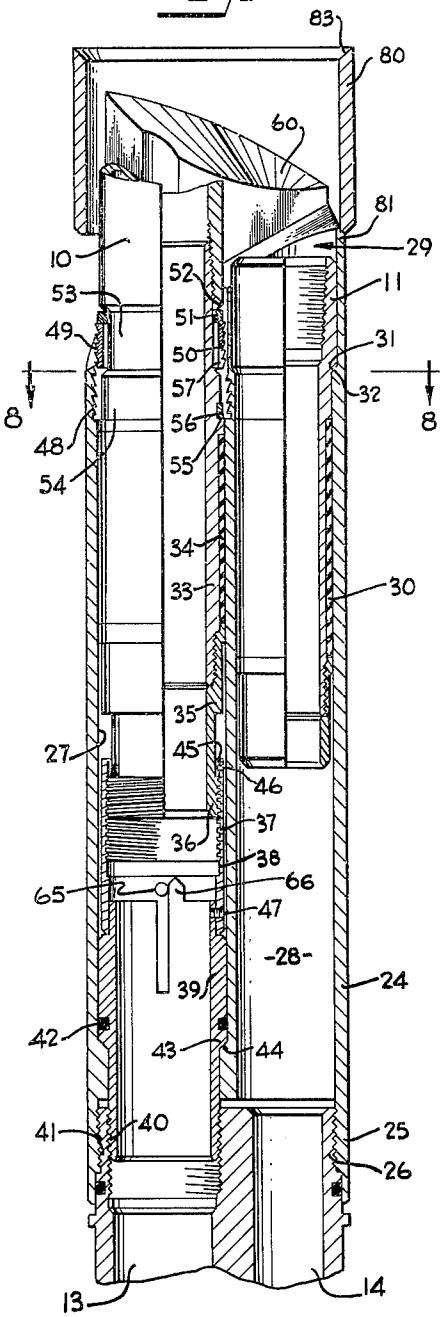
Fig. 2



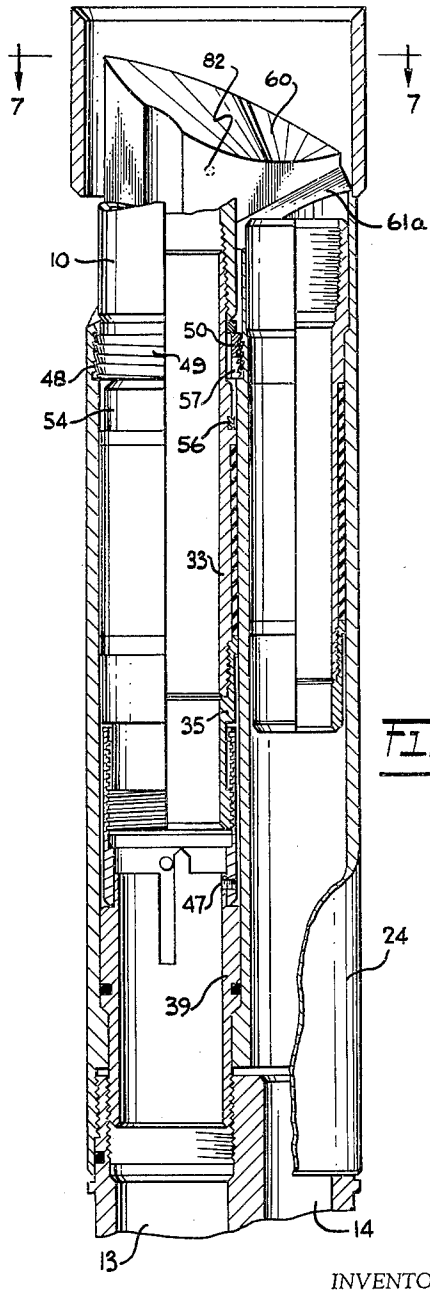


Fig. 3

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PARALLEL TUBULAR STRING APPARATUS FOR WELL BORES

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Fig. 4

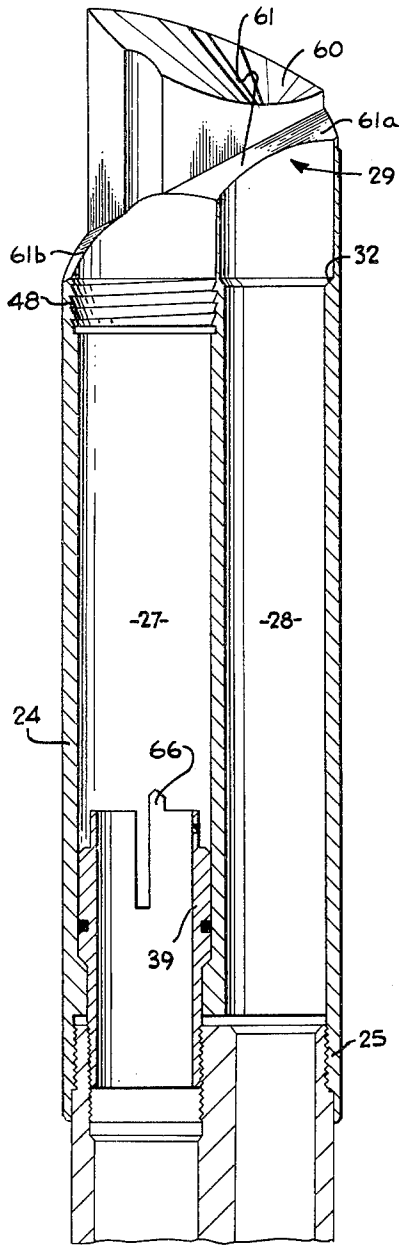
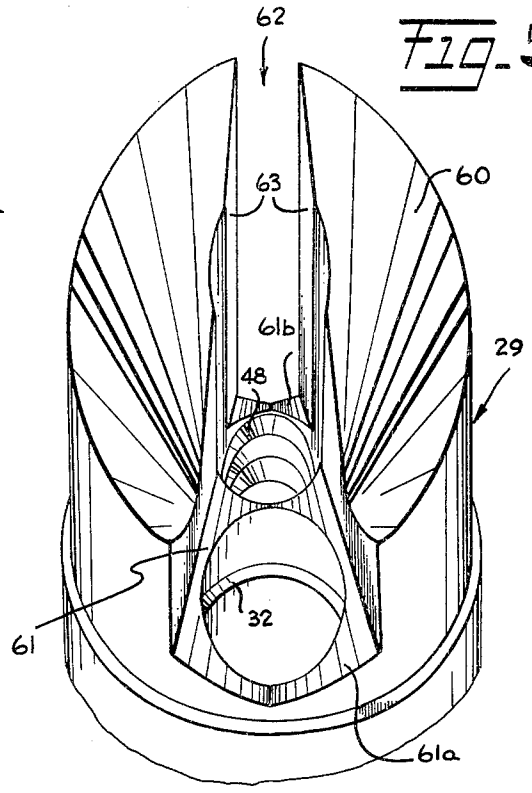


Fig. 5



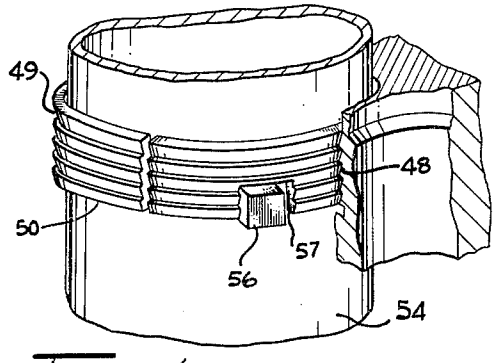


Fig. 6

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2,999,543

PARALLEL TUBULAR STRING APPARATUS FOR WELL BORES

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Filed July 11, 1958, Ser. No. 748,008
18 Claims. (Cl. 166—129)

The present invention relates to subsurface well devices, and more particularly to apparatus for conducting well bore fluids through separate tubular strings disposed in a well bore to the top of the hole.

An object of the present invention is to provide an apparatus to be disposed in a well bore capable of receiving a plurality of generally parallel tubular strings, both of which can be released from the apparatus without removing the latter from the well bore.

Another object of the invention is to provide an apparatus to be disposed in a well bore, in which a plurality of tubular strings can be individually lowered in the well bore and positively guided into properly assembled relation with respect to the apparatus. As an example, all of the tubular strings can be released from the apparatus and removed from the well bore, the strings being individually reinsertable in the well bore and placed in proper operative relation to the apparatus that remains therein.

A further object of the invention is to provide an apparatus to be disposed in a well bore and capable of receiving a plurality of generally parallel tubular strings, all of which can be subsequenty removed from the apparatus without the need for rotating any of the tubular strings in the well bore.

An additional object of the invention is to provide an apparatus to be disposed in a well bore and with which a plurality of generally parallel tubular strings can be properly assembled in the apparatus without the necessity of rotating any of the tubular strings in the well bore.

Yet another object of the invention is to provide a packer apparatus to be run and set in a well bore with a tubular running-in string connected thereto, another tubular string being operatively connected to the apparatus, the running-in string being disconnectible and removable from the apparatus without its rotation in the well bore being required, and then reassembleable within the apparatus without rotation, the running-in string further being adapted for reconnection to the apparatus to enable the latter to be withdrawn from the well bore. If required, the running-in string can again be disconnected from the well packer.

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 combined side elevational view and longitudinal section of an apparatus disposed in a well casing;

FIG. 2 is an enlarged longitudinal section through the upper portion of the apparatus illustrated in FIG. 1;

FIG. 3 is a view similar to FIG. 2 disclosing a portion of the apparatus in another operative position;

FIG. 4 is a view similar to FIG. 2 illustrating both of the tubular strings removed from the apparatus;

FIG. 5 is an isometric projection of the upper head portion of the apparatus, illustrating its guiding surfaces;

FIG. 6 is a fragmentary isometric projection, with parts broken away, through the latch portion of the apparatus;

FIG. 7 is an enlarged cross-section taken along the line 7—7 on FIG. 3;

FIG. 8 is an enlarged cross-section taken along the line 8—8 on FIG. 2.

The apparatus A is illustrated in the drawings as forming part of a well packer of the retrievable type adapted to be anchored in packed-off condition in a well casing B against downward movement therewithin. The lower portion of the apparatus constitutes the set-down type of well packer C, whereas its upper portion D is adapted to receive the lower end portions of first and second tubular strings **10**, **11** extending upwardly therefrom in the well casing to the top of the well bore E.

The specific details of the well packer portion C of the apparatus form no part of the present invention, and are set fourth in my application for "Parallel Tubing String Packer and Anchor," Serial No. 731,770, filed April 29, 1958. Essentially, such packer includes a main body **12** having a pair of passages **13**, **14** therethrough, the first passage extending through an extension **15** piloted within a corresponding passage **13***a* in a lower body member **16** that may be threadedly attached to tubing **17** depending therefrom, and which may engage a lower packer (not shown) disposed in the well casing B. The lower packer body **16** has an inlet **18** which communicates with the second longitudinal passage **14** extending upwardly through the upper packer member **12**. The well packer C includes an upper abutment **19** engaging the upper end of a packing sleeve **20**, made of rubber or rubber-like material. The lower end of the packing sleeve engages a lower expander **21** slidable on the body **12** and adapted to coact with segmental slips **22** disposed around the body, the segmental slips being shiftable radially outwardly into engagement with the wall of the well casing B to prevent downward movement of the well packer therewithin. These slips are suitably coupled to a slip ring **23** secured to the lower packer body **16**.

Inasmuch as details of construction of the packer C portion form no part of the present invention, it is sufficient to state that the packing sleeve **20** and slips **22** may be releasably retained in their retracted positions to facilitate lowering of the apparatus through the well casing. When the lower tubing **17** engages the lower packer (not shown), the imposition of a sufficient downward force on the packer body will cause the packing sleeve **20** and lower expander **21** to shift downwardly, the lower expander moving down and behind the slips **22** to expand the latter outwardly into anchoring engagement with the well casing. After the lower expander has expanded the slips against the casing, a slight continuation of the downward movement of the packer body **12** will move the upper abutment **19** toward the expander **21** to foreshorten the rubber packing sleeve **20** and expand it into sealing engagement with the wall of the well casing.

As described in the above-mentioned patent application, elevation of the packer body **12** will result in shifting of the packing sleeve **20** and the slips **22** to their retracted positions, enabling the apparatus to be elevated in the well casing and removed entirely therefrom, if desired.

The upper portion D of the apparatus includes a receptacle or body **24** having a lower threaded box **25** for threaded attachment to the upper threaded end **26** of the packer body portion **12** of the apparatus. This receptacle has a first passage **27** therethrough in alignment and communicable with the first passage **13** through the packer body, as well as a separate second passage **28** therethrough in alignment and communicable with the second passage **14**. Both of these passages **27**, **28** open upwardly through the upper head end **29** of the recepta-

cle. The second passage 28 is adapted to receive the lower portion of the second tubular string 11 which extends to the top of the well bore. For purposes of illustration, only the lower sub portion of the second tubular string is shown, and this sub portion is insertable within the second passage 28 with a side seal and packing structure 30 thereon adapted to seal against the wall of the second passage. Downward position of the second tubing string 11 is limited by engagement of a stop shoulder 31 thereon with an upwardly facing shoulder 32 on the receptacle body 24 and surrounding the second passage.

The first passage 27 is adapted to receive the lower portion of the first tubular string 10 that extends upwardly through the well casing B to the top of the well bore. This first tubular string is generally parallel to and separate from the second tubular string 11. Its lower portion includes a sub 33 carrying a side seal or packing structure 34 thereon for sealing against the wall of the first passage. This sub is threadedly attached to a connecter sleeve 35 that has a lower male threaded member 36 meshing with a female threaded portion 37 of an expansion sleeve member 38, the lower portion of which telescopes over a rotational lock sleeve 39 having a lower pin 40 threadedly received within a threaded box 41 in the upper portion of the packer body 12 and surrounding its first passage 13. Leakage of fluid between the lock sleeve 39 and the wall of the first passage 13 is prevented by a suitable side seal 42, such as a rubber or rubber-like O ring, carried on the sleeve 39 and sealingly engaging the wall of the first passage 27. Downward movement of the rotational lock sleeve 39 is limited by engagement of a shoulder 43 thereon with a companion shoulder 44 on the receptacle body 24.

Initially, the connector sleeve 35 is threaded upwardly with the expansion sleeve 38 to its fullest extent, determined by engagement of the connector sleeve with a stop segment 45 secured to the upper end of the expansion sleeve by a pin 46. The expansion sleeve 38 is releasably secured to the lock sleeve 39 by a shear screw 47, and is prevented from rotating in a right-hand direction relative to the lock sleeve 39 by a pin 65 secured to the expansion sleeve 38 and engaging an upwardly extending finger 66 on the lock sleeve, for a purpose that will be described hereinbelow.

The first tubular string 10 is initially secured to the lock sleeve 39 and through the latter to the packer body 12 and the receptacle body 24 by means of the shear screw 47. At that time, a releasable latch device carried by the first tubing string 10 is prevented from being latched to the receptacle body 24. As shown most clearly in FIG. 2, the upper portion of the receptacle body 24 surrounding the first passage 27 has a female thread 48 therein, formed as downwardly facing ratchet threads, which are adapted to be engaged by and meshed with companion external or male threads 49, that are also formed as ratchet teeth facing in an upward direction, provided on a split expansible latch ring 50. This latch or ratchet ring 50 surrounds the mandrel 33, its upper end being adapted to be engaged by a back-up ring 51, which, in turn, engages a shoulder 52 provided by the lower end of the tubing string section 10 thereabove. When the ratchet ring 50 engages the back-up ring 51, it is disposed opposite a reduced diameter portion 53 of the mandrel 33, which will enable the split ratchet ring to contract, so that it can ratchet freely in a downward direction over the female ratchet teeth 48 in the receptacle body 24. Below the reduced diameter portion 53 of the mandrel is a large diameter or backing portion 54 which, when fitting within the split latch ring 50, will hold the latter outwardly into full meshing engagement with the female ratchet teeth 48, and thereby lock the mandrel 33 to the receptacle body 24. When such engagement occurs, a shoulder 55 on the mandrel will engage the lower end of the latch ring 50.

The mandrel also has a key 56 suitably secured thereto, which is adapted to fit within a lower recess or pocket 57 in the leading end of the sleeve 50 adjacent its split when the backing portion 54 is disposed within the ratchet ring or sleeve 50. Since the ratchet threads 48, 49 are left-hand threads, rotation of the first tubing string 10 and its mandrel 33 to the right will cause the key 56 to engage the ring 50 and rotate it to the right, or in a clockwise direction, securing its unthreading in an upward direction from the female ratchet teeth 48 in the receptacle 24, as described hereinabove.

The upper head 29 of the receptacle is provided with a plurality of guiding surfaces 60, 61. One of the guiding surfaces 60 is generally frusto-conial, the frusto-conical guide surface having its axis substantially coinciding with the axis of the second passage 28. It is engageable by the tubular strings 10, 11 to shift them towards the second passage 28. The lower portion 38 of the first tubular string 10 has a diameter greater than the diameter of the second passage 28, so that it will not enter such passage. However, the diameter of the second passage 28 is such that when the lower portion of the second tubing string 11 engages the upper guide surface 60 it is shifted toward such passage and will enter the passage 28 to the extent determined by engagement of the stop shoulder 31 with the receptacle body shoulder 32.

In addition to the upper tapered guide surface 60 on the head 29, which has as one of its purposes the guiding of the second tubing string 11 into the second passage 28, the head is provided with the lower tapered guide surface 61, which actually forms the base of a groove 62 cut downwardly from the uppermost end of the head 29. The base of the groove extends across the first and second passages 27, 28 and slopes in a downward direction from the outer end of the receptacle adjacent the second passage 28 to the outer end of the receptacle adjacent the first passage 27. The width of the groove 62 in the head is greater than the diameter of the mandrel 33 or lower portion 39 of the first tubing string 10. Thus, the first tubing string 10 can engage the base 61 of the groove at its upper portion 61*a* and will slide downwardly therealong toward the first passage 27, and will enter such first passage, to insure the appropriate alignment of the axis of the lower mandrel portion 33 of the first tubing string 10 with the axis of the first passage 27 in the receptacle body 24. The bottom or base 61 of the groove is made of V-shape, the base portion tapering from the sides 63 of the groove 62 downwardly toward a central plane passing through the axes of both the first and second passages 27, 28.

Assuming that the second tubing string 11 is not disposed in the well casing or within the second passage 28 in the receptacle body 24, lowering of the first tubing string 10 towards the apparatus may result in its lower end engaging the upper tapered guide surface 60, which will then steer it downwardly toward the upper end of the second passage 28. The lower portion of the first tubing string will drop off the upper tapered guide surface 60 into the transverse groove 62 extending across the head 29 and will engage the base 61 of this groove which is inclined downwardly in the opposite direction from the direction of inclination of the upper tapered surface 60. The first tubing string 10 then slides downwardly along the base 61 of the groove toward the mouth of the first passage 27, dropping thereinto. Of course, by happenstance, the first tubing string 10 could engage the base 61 of the groove without first engaging the upper tapered guide surface 60, in which event it would still be guided downwardly to the upper end of the first passage 27 and will then move downwardly thereinto.

After the first tubing string 10 has been appropriately located in the first passage 27, lowering of the second tubing string 11 in the well casing will cause its lower end to engage the upper tapered guide surface 60, which

will steer it toward the second passage **28**, into which it will shift.

In the use of the apparatus, the slips **22** and packing **20** of the well packer portion C are in their retracted positions, the first tubing string **10** being inserted in the first passage **27** with the shear screw **47** attaching the expansion sleeve **38** to the rotational lock sleeve **39**, and with the connecter sleeve **35** occupying its upward threaded position in the expansion sleeve **38**. At this time, the ratchet ring **50** is disposed in its upper position immediately above the female threaded ratchet portion **48** of the receptacle **24**. The lock sleeve **39** is threaded in the box **41** of the packer body **12**. The first tubing string is thereby connected to the packer portion of the apparatus through the shear screw **47**. The second tubing string **11** has not been disposed in the well bore at this time.

The apparatus is run in the well casing by means of the first tubing string **10**, until the lower tubing **17** appropriately engages a lower member in the well bore, such as a lower well packer (not shown) which precludes further downward movement of the lower packer body **16**. Thereupon, the first tubing string **10** can be lowered additionally, which will shift the receptacle **24** and upper packer body member **12** downwardly to expand the slips **22** against the casing B, as well as the packing sleeve **20** into sealing engagement with the well casing.

The packer is now anchored in packed-off condition in the well casing, with the first tubing string **10** in communication with the first passage **13**, **13***a* through the packer and the tubing **17** therebelow. It can conduct fluid from a lower region in the well bore such as a region below the lower well packer (not shown) to the top of the hole. The second tubing string **11** can now be lowered in the well casing, and upon reaching the upper guide surface **60**, the latter will shift it toward the second receptacle passage **28**, the second tubing string entering such passage and coming to rest therein with its stop shoulder **31** engaging the receptacle stop shoulder **32**. Fluid can now flow upwardly through the second inlet **18**, second packer passage **14** and second receptacle passage **28** into the second tubing string **11**, to be conducted therethrough to the top of the well bore separate and distinct from the fluid flowing upwardly through the first tubing string **10**.

If at any time it is desired to remove the second tubing string **11**, this can be done very simply by taking a straight line pull thereon, the second tubing string merely moving upwardly out of the receptacle **24**. Similarly, first tubing string **10** can be removed from the receptacle **24** by taking a straight line upward pull thereon. Such a straight line pull need only be exerted with a force sufficient to overcome the strength of the shear screw **47** which will be disrupted, allowing the first tubular string **10** to be removed from the first passage **27** and completely from the well bore, if desired. The rotational lock sleeve **39** remains in the first passage **27**, threadedly connected to the upper end of the packer body **12**. If assurance is to be had that the retrievable well packer C will not be released during release of the first tubing string **10** from the apparatus, sufficient downward weight or force may be imposed on the second tubing string **11**, while it is disposed in the receptacle, until the strength of the shear screw **47** has been overcome, whereupon the latter is sheared and the first tubing string **10** removed from the receptacle.

Assuming the second tubing string **11** to be disposed in the second passage **28** and the first tubing string **10** to have been removed from the first passage **27**, the first tubing string can again be disposed in the first passage. Upon its lowering in the well casing, its lower end may engage the upper guide surface **60**, but since the second tubing string **11** is assembled in place it can only move into engagement with said second tubing string, whereupon it will shift downwardly off the guide surface **60** into the transverse groove **62**, engaging the lower tapered guide surface **61**, which will slide the lower end of the first tubing string **10** toward the first passage **27**, into which it will then enter, the first tubing string coming to rest with the expansion sleeve **38** disposed over the upper portion of the rotational lock sleeve **39**, in which the coupling pin **65** on the expansion sleeve is in transverse alignment with the stop finger **66** on the lock sleeve.

Assuming that the first tubing string **10** has been withdrawn from the receptacle **24**, as well as the second tubing string **11**, leaving the apparatus A disposed in the well bore, the first tubing string **10** can be lowered in the well casing and will again be guided into the first receptacle passage **27**. If the lower end of the first tubing string engages the upper guide head surface **60**, it will slide downwardly therealong toward the second passage **28**. However, upon dropping off the lower portion of the upper guide surface, it will engage the upper portion **61***a* of the second guide surface **61**, that tapers or slopes in the opposite direction from the upper surface **60**. Since the diameter of the lower end of the first tubing string **10** is greater than the entrance diameter of the second passage **27**, the first tubing string will slide past such entrance and will move toward the entrance into the first receptacle passage **27**. Upon reaching such passage, the tubing string **10** will slide thereinto and move downwardly in the first passage until it is disposed fully therewithin, such as shown in FIGS. 1 and 2. The second tubing string **11** can then be lowered in the well casing. It will engage the upper guide surface **60** and will be steered thereby toward the second passage **28**, into which it will drop and then move to its final position in the second passage. The second tubing string **11** cannot move into the first passage since such passage is already occupied by the first tubing string **10**.

It is, accordingly, evident that both tubing strings **10**, **11** can be removed from the apparatus without rotation, and that both tubing strings can be reinserted in the apparatus without rotation. This is of importance in connection with the use of gas lift valves and the like in the tubing string, which very often do not permit a tubing string to be rotated.

The tubing strings **10**, **11** can be removed from the receptacle **24** and reinserted therewithin as many times as desired. If the apparatus A is to be retrieved from the well casing B, the first tubing string **10** is connected thereto, assuming that the shear screw **47** has been disrupted. If the shear screw has not been disrupted, in view of the fact that the first tubing string may not have been withdrawn from the first passage **27**, all that is necessary is to first remove the second tubing string **11** from the apparatus and the well casing, whereupon the taking of an upward pull on the first tubing string **10** will exert an upward pull on the packer body **12** allowing the packing **20** to retract, the expander **21** being shifted upwardly to effect retraction of the slips **22** from the well casing. If, however, the shear screw **47** has previously been disrupted, then the first tubing string **10** is connected to the receptacle body **24**, which, in turn, is threadedly attached to the packing body **12**, by means of the threaded latch ring or sleeve **50** engaging the ratchet teeth **48** in the upper portion of the receptacle body **24**.

It is to be noted that the connecter sleeve **35** is initially threaded upwardly in the expansion sleeve **38**, to prevent the latch ring **50** from threadedly engaging the companion left-hand thread **48** in the upper portion of the receptacle body **24**. When such engagement is to occur, the first tubing string **10** is rotated, which will rotate the mandrel **33** and the connecter sleeve **38**. The fact that the packer C is set in the well casing will prevent the rotational lock sleeve **39** from turning. The expansion sleeve **38** can only turn until its stop or coupling pin **65** engages the stop finger **66** on the lock sleeve, whereupon the expansion sleeve can no longer partake

of rotation. Rotation of the mandrel 33 and connecter sleeve 35 will then result in downward threading of the connecter sleeve within the expansion sleeve 38, the back-up ring 51 engaging the latch 50 and shifting it downwardly within the female threads 48 in the upper portion of the receptacle body. When the connecter sleeve 35 has been threaded downwardly to its fullest extent (FIG. 3), the latch 50 will be disposed fully within the threaded box 48, the ratchet teeth 49 on the latch having merely ratcheted downwardly over the box teeth 48. Such downward ratcheting is permitted by allowing the ring 50 to contract as a result of its being disposed opposite the reduced diameter portion 54 of the mandrel. Upon the ring 50 reaching its downward position within the left-hand threaded ratchet box 48, an upward pull can be taken on the first tubing string 10 which will shift the mandrel 33 upwardly and place its enlarged back-up surface 54 within and behind the ratchet ring, preventing the latter from shifting inwardly, which would remove its threads 49 from meshing engagement with the female threads 48 of the receptacle. Upward movement of the first tubing string 10 and mandrel 33 can now take place, the shoulder on the mandrel engaging the lower end of the ratchet ring 50, through which part the upward force of movement is transmitted to the co-engaging threads 49, 48 to the receptacle body 24, and from the latter to the packer body 12, which will be elevated to retract the packing 20 and slips 22 from the well casing, and enable the entire apparatus A to be moved upwardly in the well casing B.

During the upward movement of the mandrel 33 within the ratchet sleeve 50, after the latter has engaged the left-hand threads 48 in the receptacle body 24, the key 56 may not be in alignment with the recess 57 opening through the lower end of the ratchet sleeve 50. If such engagement does not occur, rotation of the tubing string 10 will cause the mandrel 33 to turn within the ratchet sleeve, until the key 56 is disposed under the recess 57, whereupon the key will shift upwardly into the recess and rotationally couple the mandrel 33 to the ratchet or latch ring 50.

Following meshing of the latch ring 50 with the threads 48 of the receptacle body 24, the first tubing string 10 can still be disconnected from the receptacle body 24, if desired. All that need occur is to rotate the first tubing string 10 to the right, which rotation will be transferred through the key 56 to the latch ring 50. Since the threads 48, 49 are left hand, such rotation will result in an upward threading of the latch ring 50 relative to the receptacle box 48 until the latch ring is completely unthreaded therefrom, whereupon the first tubing string 10 can be elevated and its lower portion removed from the first passage 27. If the first tubing string 10 is again to be placed in the recepacle, it will enter the first passage 27, being guided thereinto by the upper tapered guide surface 60 and the lower tapered guide surface 61, in the manner described hereinabove. Since the connecter sleeve 35 has been threaded downwardly to its fullest extent with the expansion sleeve 38, the downward insertion of the first tubing string 10 within the first passage 27 will probably result in a re-latching of the ring 50 with the threads 48 of the receptacle body, requiring rotation of the first tubing string 10 to effect its subsequent release from the receptacle 24 if its removal therefrom is again desired.

It is, accordingly, apparent that an apparatus has been provided in which a plurality of separate tubing strings can be appropriately related to a well packer or other apparatus in the well bore, individually removed from such apparatus, and reassembled with respect to such apparatus while it is in the well bore, all without requiring rotation of either of the tubing strings. If it is desired to remove the apparatus from the well bore, such removal can occur as a result of merely moving the first tubing string 10 upwardly, in the event the shear screw 47 has not been disrupted, or if it has been disrupted, effecting a downward feeding of the ratchet or latch ring 50 until it threadedly meshes with the threads 48 in the receptacle body 24, whereupon the taking of an upward pull will shift the packer body 12 upwardly to enable the packing sleeve 20 and slips 22 to shift to their retracted positions. The entire apparatus can then be removed from the well bore.

In the event the appartus is to be used in a well casing having an inside diameter which is materially greater than the outside diameter of the receptacle body 24, one or both of the tubing strings 10, 11 may tend to hang up on the end of the upper guide head 29. To prevent such action from occurring, an upper guide sleeve 80 is mounted on the head 29, this guide sleeve having an inside diameter sufficient to permit passage of both tubing strings 10, 11 therethrough, with its lower end resting upon a shoulder 81 on the receptacle body. The guide ring 80 may be secured to the body by one or more screws 82. The external diameter of the ring or sleeve 80 is greater than the external diameter of the receptacle body 24, but is substantially less than the inside diameter of the well casing B in which the apparatus is to be used. Its upper end 83 is tapered in a downward and inward direction, forming a guiding surface to direct the first and second tubing strings 10, 11 inwardly of the guide ring 80 and into engagement with the upper tapered guide surface 60 and the lower tapered guide surface 61.

The guide sleeve 80 does not affect nor modify the operation of the apparatus, except that it offers assurance against any of the tubing strings 10, 11 engaging the guide head 29 and remaining on an outer edge thereof, rather than being directed toward one or both of the passages 27, 28 through the receptacle body 24.

The inventor claims:

1. In apparatus to be disposed in a well bore: a body member having first and second passages therein, said first passage having a larger diameter than said second passage; first guide means on said body inclined downwardly toward and extending to said second passage and adapted to be engaged by a second tubular string extending from the top of the well bore to direct said second tubular string to said second passage; and a second guide means on said body inclined downwardly from said second passage toward and extending to said first passage and adapted to be engaged by a first tubular string extending to the top of the well bore to direct said first tubular string to said first passage.

2. In apparatus to be disposed in a well bore: a body member having first and second passages therein, said first passage having a larger diameter than said second passage; said body having an upper generally frusto-conical surface inclined downwardly toward and extending to said second passage and adapted to be engaged by a second tubular string extending to the top of the well bore to direct said second tubular string to said second passage; said body having a transverse groove extending downwardly from said frusto-conical surface and having a base inclined downwardly from said second passage toward and extending to said first passage, said base being engageable by a first tubular string extending to the top of the well bore to direct said first tubular string to said first passage.

3. In apparatus to be disposed in a well bore: a body member having first and second passages therein; said body having an upper generally frusto-conical surface inclined downwardly toward and extending to said second passage and adapted to be engaged by a second tubular string extending to the top of the well bore to direct said second tubular string to said second passage; said body having a transverse groove extending downwardly from said frusto-conical surface and having a base inclined downwardly from said second passage toward and extending to said first passage, said base being engageable by a first tubular string extending to the top of the well bore to direct said first tubular string to said first passage.

4. In apparatus to be disposed in a well bore: a body

member having first and second passages therein, said first first passage having a larger diameter than said second passage; first guide means on said body inclined downwardly toward and extending to said second passage; a second tubular string extending to the top of the well bore and engageable with said first guide means to be directed thereby toward said second passage; second guide means on said body inclined downwardly from said second passage toward and extending to said first passage; and a first tubular string extending to the top of the well bore and engageable with said second guide means to be directed thereby toward said first passage, said first tubular string having a larger diameter than said second passage and adapted to move into said first passage.

5. In apparatus to be disposed in a well bore: a body member having first and second passages therein, said first passage having a larger diameter than said second passage; said body having an upper generally frusto-conical surface inclined downwardly toward and extending to said second passage; a second tubular string extending to the top of the well bore and engageable with said frusto-conical surface to be directed thereby toward said second passage; said body having a transverse groove extending downwardly from said frusto-conical surface and having a base inclined downwardly from said second passage toward and extending to said first passage; and a first tubular string extending to the top of the well bore and engageable with said base to be directed thereby toward said first passage, said first tubular string having a larger diameter than said second passage and adapted to move into said first passage.

6. In apparatus to be disposed in a well bore: a body member having first and second passages therein, said first passage having a larger diameter than said second passage; first guide means on said body inclined downwardly toward and extending to said second passage; a second tubular string extending to the top of the well bore and engageable with said first guide means to be directed thereby toward said second passage; second guide means on said body inclined downwardly from said second passage toward and extending to said first passage; a first tubular string extending to the top of the well bore and engageable with said second guide means to be directed thereby toward said first passage, said first tubing string having a larger diameter than said second passage and adapted to move into said first passage; and means releasably securing said first tubular string to said body member when said first tubular string is in said first passage.

7. In apparatus to be disposed in a well bore: a body member having first and second passages therein, said first passage having a larger diameter than said second passage; first guide means on said body inclined downwardly toward and extending to said second passage; a second tubular string extending to the top of the well bore and engageable with said first guide means to be directed thereby toward said second passage; second guide means on said body inclined downwardly from said second passage toward and extending to said first passage; a first tubular string extending to the top of the well bore and engageable with said second guide means to be directed thereby toward said first passage, said first tubing string having a larger diameter than said second passage and adapted to move into said first passage; and frangible means releasably securing said first tubular string to said body member when said first tubular string is in said first passage.

8. In apparatus to be disposed in a well bore: a body member having first and second passages therein, said first passage having a larger diameter than said second passage; said body having an upper generally frusto-conical surface inclined downwardly toward and extending to said second passage; a second tubular string extending to the top of the well bore and engageable with said frusto-conical surface to be directed thereby toward said second passage, said body having a transverse groove extending downwardly from said frusto-conical surface and having a base inclined downwardly from said second passage toward and extending to said first passage; a first tubular string extending to the top of the well bore and engageable with said base to be directed thereby toward said first passage, said first tubular string having a larger diameter than said second passage and adapted to move into said first passage; and frangible means releasably securing said first tubular string to said body member when said first tubular string is in said first passage.

9. In apparatus to be disposed in a well bore: a body member having first and second passages therein, said first passage having a larger diameter than said second passage; first guide means on said body inclined downwardly toward and extending to said second passage; a second tubular string extending to the top of the well bore and engageable with said first guide means to be directed thereby toward said second passage; second guide means on said body inclined downwardly from said second passage toward and extending to said first passage; a first tubular string extending to the top of the well bore and engageable with said second guide means to be directed thereby toward said first passage, said first tubing string having a larger diameter than said second passage and adapted to move into said first passage; coengageable latch means on said first tubular string and body member for connecting said first tubular string to said body member; means for preventing engagement of said latch means; and means for shifting said preventing means to a position permitting engagement of said latch means.

10. In apparatus to be disposed in a well bore: a body member having first and second passages therein; first guide means on said body inclined downwardly toward and extending to said second passage; a second tubular string extending to the top of the well bore and engageable with said first guide means to be directed thereby toward the second passage; second guide means on said body inclined downwardly from said second passage toward and extending to said first passage; a first tubular string extending to the top of the well bore engageable with said second guide means to be directed thereby toward said first passage; coengageable latch means on said first tubular string and body member for connecting said first tubular string to said body member; means for preventing engagement of said latch means; and means for shifting said preventing means to a position permitting engagement of said latch means.

11. In apparatus to be disposed in a well bore: a body member having first and second passages therein, said first passage having a larger diameter than said second passage; first guide means on said body inclined downwardly toward and extending to said second passage; a second tubular string extending to the top of the well bore and engageable wtih said first guide means to be directed thereby toward said second passage; second guide means on said body inclined downwardly from said second passage toward and extending to said first passage; a first tubular string extending to the top of the well bore and engageable with said second guide means to be directed thereby toward said first passage; said first tubing string having a larger diameter than said second passage and adapted to move into said first passage; latch means on said first tubular string adapted to engage a companion latch member on said body member to connect said first tubular string to said body member; means on said first tubular string holding said latch means above said latch member; and means responsive to rotation of said first tubular string for shifting said first tubular string downwardly of said body member to permit said latch means to engage said latch member.

12. In apparatus to be disposed in a well bore: a body member having first and second passages therein, said first passage having a larger diameter than said second passage; first guide means on said body inclined downwardly toward and extending to said second passage; a second tubular string extending to the top of the well

bore and engageable with said first guide means to be directed thereby toward said second passage; second guide means on said body inclined downwardly from said second passage toward and extending to said first passage; and a first tubular string extending to the top of the well bore and engageable with said second guide means to be directed thereby toward said first passage, said first tubular string having a larger diameter than said second passage and adapted to move into said first passage; latch means on one of said tubular strings adapted to engage a companion latch member on said body member to connect said one tubular string to said body member; means on said one tubular string holding said latch means above said latch member; and means responsive to rotation of said one tubular string for shifting said one tubular string downwardly of said body member to permit said latch means to engage said latch member.

13. In apparatus to be disposed in a well bore: a body member having first and second passages therein; first guide means on said body inclined downwardly toward and extending to said second passage; a second tubular string extending to the top of the well bore and engageable with said first guide means to be directed thereby toward the second passage; second guide means on said body inclined downwardly from said second passage toward and extending to said first passage; a first tubular string extending to the top of the well bore engageable with said second guide means to be directed thereby toward said first passage; coengageable latch means on one of said tubular strings and body member for connecting said one tubular string to said body member; means for preventing engagement of said latch means; and means for shifting said preventing means to a position permitting engagement of said latch means.

14. In apparatus to be disposed in a well bore: a body member having a passage therein; a tubular member disposed in said passage; a latch member on said body member; latch means on said tubular member adapted to engage said latch member to connect said tubular member to said body member; means on said tubular member engaging said body member to hold said tubular member in a position with said latch means above said body member; and means for shifting said tubular member relative to said holding means to a position in which said latch means can engage said latch member.

15. In apparatus to be disposed in a well bore: a body member having a passage therein; a tubular member disposed in said passage; a latch member on said body member; latch means on said tubular member adapted to engage said latch member to connect said tubular member to said body member; means on said tubular member engaging said body member to hold said latch means above said body member; and said last-mentioned means being responsive to rotation of the tubular member for shifting said tubular member downwardly in said body member to a position permitting said latch means to engage said latch member.

16. In apparatus to be disposed in a well bore: a body member having a passage therein; a tubular member disposed in said passage; latch member on said body member; latch means on said tubular member adapted to engaged said latch member to connect said tubular member to said body member; a threaded member engaging said body member and threadedly engaging said tubular member to hold said latch means above said latch member, rotation of said tubular member feeding said tubular member and latch means downwardly to a position permitting said latch means to engage said latch member.

17. In apparatus to be disposed in a well bore: a body member having a passage therein; a tubular member disposed in said passage; a latch member on said body member; latch means on said tubular member adapted to engage said latch member to connect said tubular member to said body member; a threaded member engaging said body member and threadedly engaging said tubular member to hold said latch means above said latch member, rotation of said tubular member feeding said tubular member and latch means downwardly to a position permitting said latch means to engage said latch member; and frangible means releasably connecting said threaded member to said body member.

18. In apparatus to be disposed in a well bore: a body member having a passage therein; a tubular member disposed in said passage; a latch member on said body member; latch means on said tubular member adapted to engage said latch member to connect said tubular member to said body member; a threaded member engaging said body member and threadedly engaging said tubular member to hold said latch means above said latch member, rotation of said tubular member feeding said tubular member and latch means downwardly to a position permitting said latch means to engage said latch member; frangible means releasably connecting said threaded member to said body member; and means on said body member engaging said threaded member to prevent rotation of said threaded member.

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Disclaimer

2,999,543.—*William D. Myers*, Norwalk, Calif. PARALLEL TUBULAR STRING APPARATUS FOR WELL BORES. Patent dated Sept. 12, 1961. Disclaimer filed Jan. 29, 1964, by the assignee, *Baker Oil Tools, Inc.*

Hereby enters this disclaimer to claims 1 and 4 of said patent.

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