March 24, 1953 J. J. FITZPATRICK 2,632,514

TUBING PACKER AND HOLD-DOWN MECHANISM

Filed Sept. 24, 1948 4 Sheets-Sheet 1

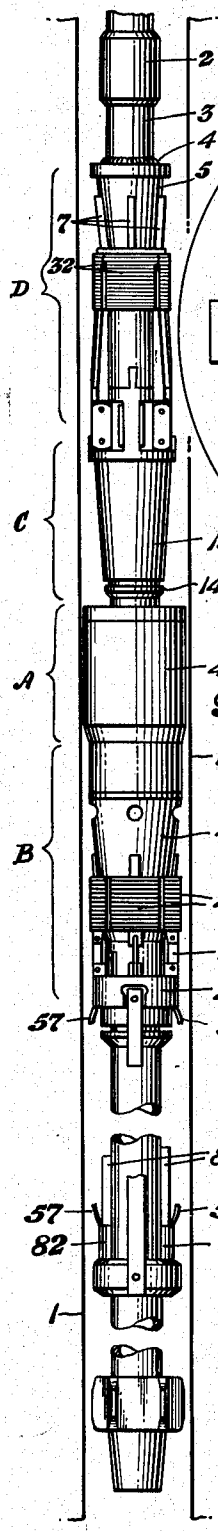


Fig. 1.

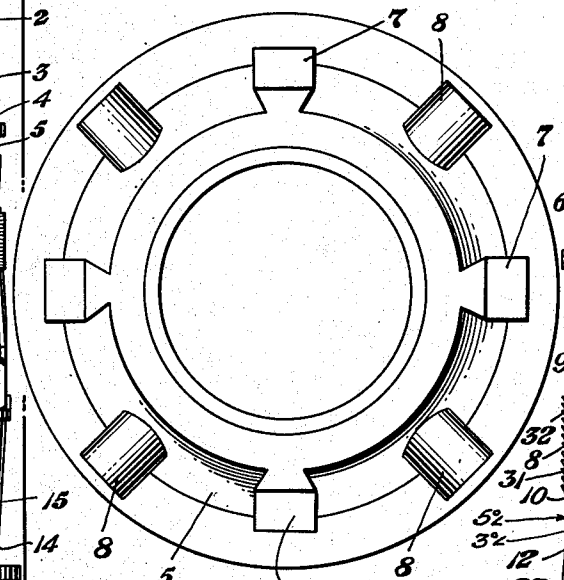


Fig. 3.

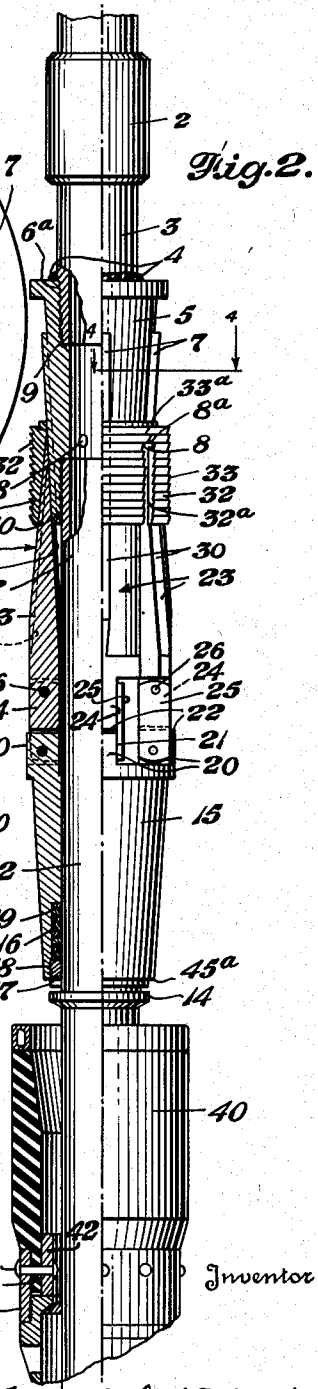


Fig. 2.

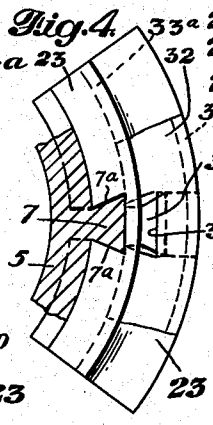


Fig. 4.

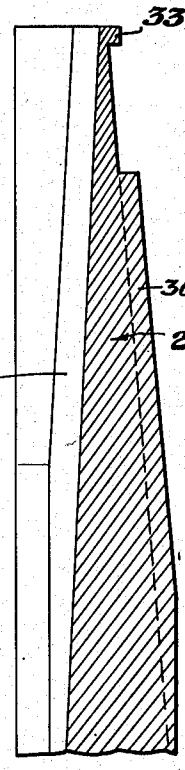


Fig. 5.

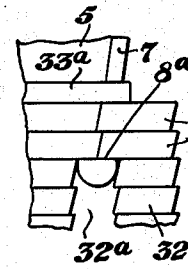


Fig. 6.

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March 24, 1953 J. J. FITZPATRICK 2,632,514

TUBING PACKER AND HOLD-DOWN MECHANISM

Filed Sept. 24, 1948 4 Sheets-Sheet 2

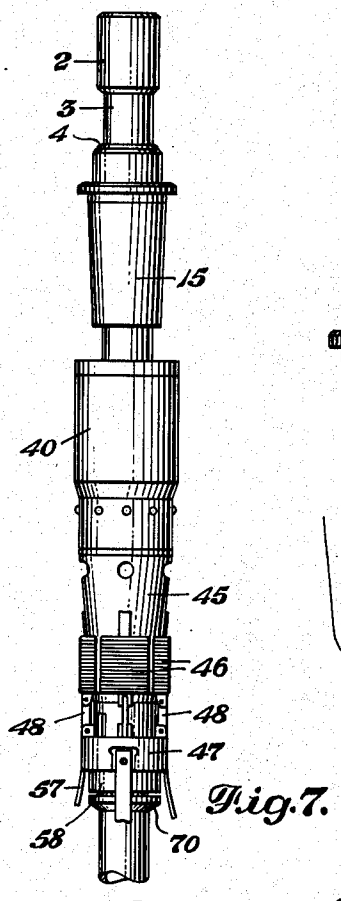


Fig. 7.

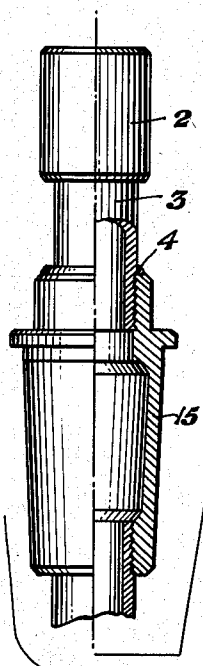
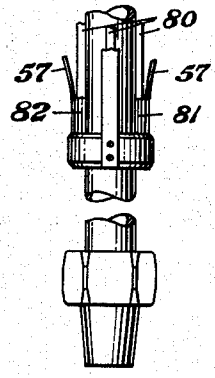


Fig. 8.



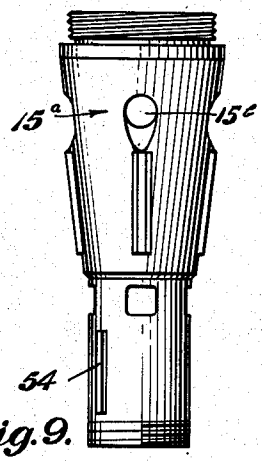
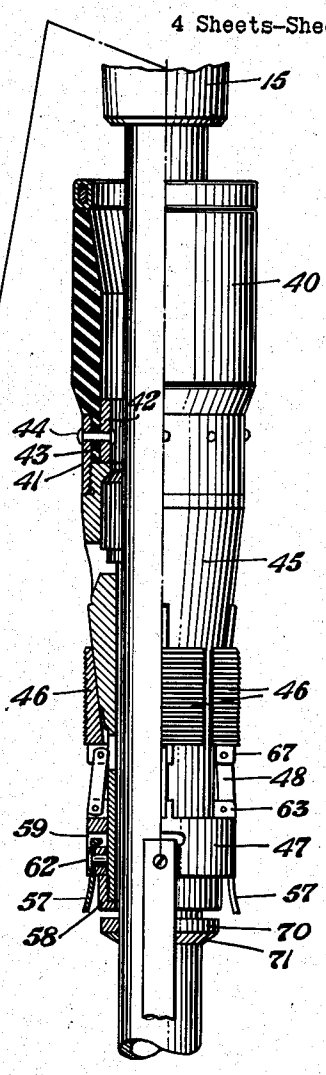
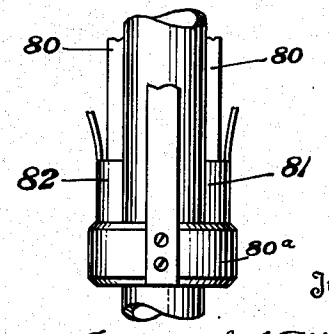


Fig. 9.





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March 24, 1953 J. J. FITZPATRICK 2,632,514

TUBING PACKER AND HOLD-DOWN MECHANISM

Filed Sept. 24, 1948 4 Sheets-Sheet 3

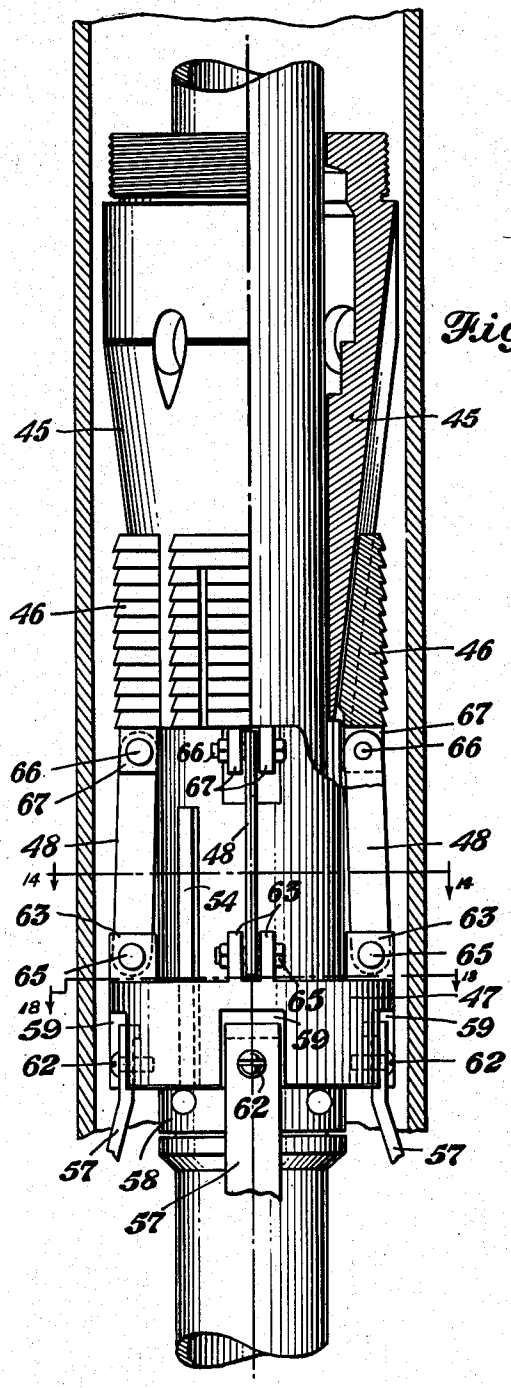


Fig. 10.

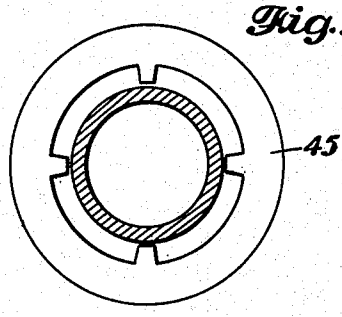


Fig. 11.

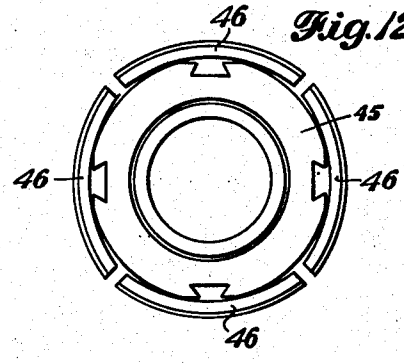


Fig. 12.



Fig. 13.

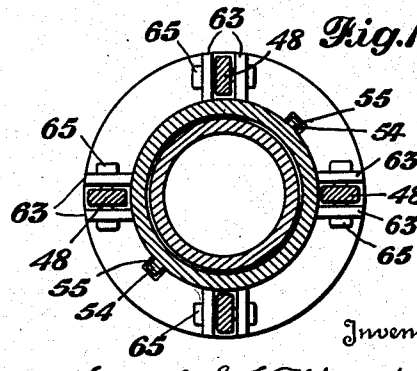


Fig. 14.

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TUBING PACKER AND HOLD-DOWN MECHANISM

Filed Sept. 24, 1948 4 Sheets-Sheet 4

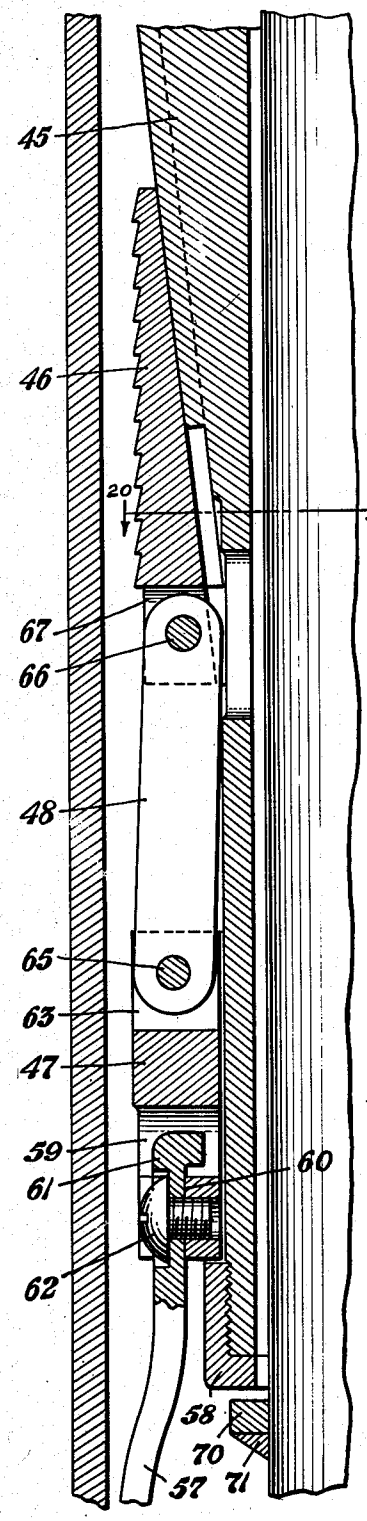


Fig. 15.

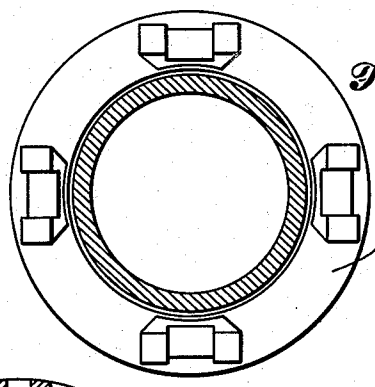


Fig. 20.

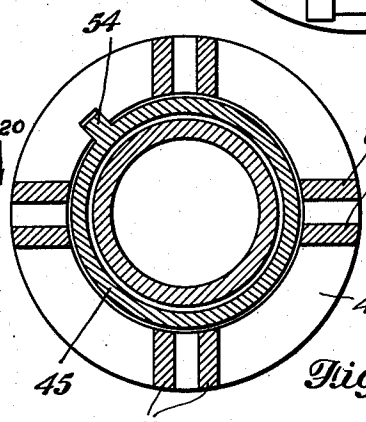


Fig. 18.

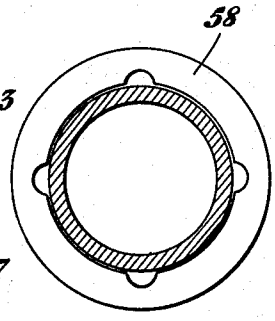


Fig. 19.

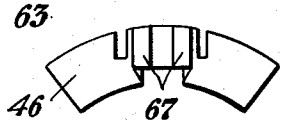


Fig. 17.

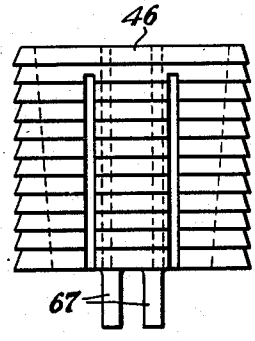


Fig. 16.

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Patented Mar. 24, 1953

2,632,514

UNITED STATES PATENT OFFICE

2,632,514

TUBING PACKER AND HOLD-DOWN MECHANISM

Jeremiah J. Fitzpatrick, Oklahoma City, Okla.

Application September 24, 1948, Serial No. 50,984

12 Claims. (Cl. 166—12)

1

This invention relates to improvements in packer assemblies for oil wells and more particularly to a new type of packer assembly used to flow oil wells or to control high pressure gas wells, where the pressures are excessive and may approximate 7000 lbs. to the cubic inch. In packers of this type, the packer is conventionally run through mud and set about 100 ft. from the bottom of the well, the mud between the casing and tubing above the packer tending to hold the packer in position. In such assemblies the tubing weight on the supporting slip or slip mandrels is often as much as 40,000 lbs. and with such a weight it is obviously important that the slips be so constructed and arranged that they will snugly and accurately conform to the curvature of the casing in order that maximum efficiency be available. In the manufacture of casings the tolerance permitted in the inner diameter is ten thousandths of an inch plus or minus and this variation also tends to defeat the desired efficiency of the engagement between the slip and the casing. Heretofore the supporting slips, which include the dovetail connection riding on a flat surface during the gripping action, maintain their predetermined outer diameter and may not conform to the contour of the casing with which they are to be associated.

The main object of the present invention is to provide an assembly including an expanding packer having a mandrel with novel flexible slips associated therewith for supporting the structure and an expanding mandrel for the packer associated with a tie down structure, which tie down structure includes a telescoping mandrel and associated slips whereby a more positive supporting medium is provided for the weight, and a tie down means is provided against upward shifting of the packer due to excessive pressures which may be developed or which may be present in the well and cause damage to the packer.

One of the objects of this invention is to provide the supporting slips with such a curvature that the slips are capable of flexing to accommodate themselves to the inaccuracies and variations in the inner diameter curvature of the casing with which the slip is associated so as to insure and provide a perfect grip of the slip throughout its full length and width.

Another object of the invention is to provide a suitable connection between the supporting slips and the control ring so that the slips will be capable of flexing in all directions when necessary.

Another object of the invention is to provide means for maintaining the slips and springs in

2

alignment so that there will be no binding between the slips and the dovetail guideways.

A still further object of the invention is the provision of means to facilitate the pulling of the packer, which means comprehend the use of a ring welded to the tubing so that when the cup mandrel is pulled out of the cup by the tubing, the ring will then be available to pull the slip mandrels, clip, springs, and the like.

Associated with the packer and the supporting slips and supporting slip mandrel is the tubing tie down telescoping mandrel structure and associated slip structure. The packer is set in one operation by picking the tubing up when it is located at the desired position in the casing, turning the tubing while the tubing is being lifted approximately 180° and then letting it down, the lifting movement being approximately four feet. This will set the packer and the lower slips on their mandrel, the lower slips being the supporting slips which hold the top weight. When the packer is thus set and the lower slips engage the casing the tie down structure will then start to function by the tie down slips moving into engagement with the casing. If the packer should start to shift or blow up the tie down structure limits this motion to approximately ⅛ of an inch and such slight movement would result in the slips of the tie down structure gripping the casing tight so that the packer cannot blow or move up any further. The slips of the tie down structure are automatically set with the setting of the packer, i. e. the slips will rise to where they contact the casing.

Therefore, another important feature of the present development is a tie down structure for a tubing packer which functions to prevent the tubing packer from being displaced after it is set due to excessive pressures, it being understood that the tie down structure is associated with the tubing packers in instances where pressures may approximate 7000 lbs. to the square inch. The tie down structure, which includes a telescoping mandrel structure and slips, functions in association with the lower mandrel and slip structure to prevent upward movement of the assembly and the parts are so constructed and arranged that the setting of the packer itself and the slips associated with the packer also positions the tie down assembly so that any movement upward of the packer will result in a clamping of the casing by the tie down slips.

A feature of the tie down structure is the provision of packing at the bottom of the packer mandrel which is associated with the tie down

structure so that pressures between the tubing and the inside of the cup mandrel will be held and leakage prevented.

Another object of the invention is the provision of a telescoping mandrel structure cooperating with slips and linked to the packing mandrel so that the parts will be properly associated and function together as a unit in accordance with required practice.

Other objects of this invention will more clearly hereinafter appear by reference to the accompanying drawings and specification wherein like characters of reference designate corresponding parts throughout the several views, in which:

Fig. 1 is a side elevation showing the entire assembly including the supporting structure and the tie down structure associated with the packing element;

Fig. 2 is an enlarged elevation partly in section showing the tie down packer;

Fig. 3 is a bottom plan view of the mandrel forming a part of the tie down assembly;

Fig. 4 is a fragmentary sectional view on line 4—4 of Fig. 2;

Fig. 5 is a vertical sectional view through one of these sectional mandrel elements;

Fig. 6 is an enlarged fragmentary elevation showing the formation of the guide slot between two slip sections;

Fig. 7 is a side elevation of the invention without the tie down packer;

Fig. 8 is an enlarged elevation partly in section of the same structure;

Fig. 9 is a side elevation of the mandrel provided for use in connection with the supporting slips;

Fig. 10 is an enlarged view partly in section showing the supporting structure for the packer with the link arrangement between the slips and the setting collar;

Fig. 11 is a top plan view of the mandrel shown in Fig. 10;

Fig. 12 is a bottom plan view showing the slips in position;

Fig. 13 is a top plan view of one of the slips;

Fig. 14 is a transverse section on line 14—14 of Fig. 10 through the link structures;

Fig. 15 is a vertical sectional view showing the slip structure and the bottom spring connection;

Fig. 16 is a side elevation of one of the slips shown in Fig. 15;

Fig. 17 is a top plan view of one of the slips shown in Fig. 15;

Fig. 18 is a sectional view through the link connection of the slips on line 18—18 of Fig. 10;

Fig. 19 is a bottom plan view of the structure showing the collar 58; and

Fig. 20 is a cross section on line 20—20 of Fig. 15 with the slips removed.

In Fig. 1 the entire assembly is illustrated and includes the packer A, the supporting slip and mandrel structure B at the lower end of the packer, and the expanding packer mandrel C connected to and associated with the tie down slip and mandrel structure at D.

Referring now to Fig. 1 the casing is indicated by the reference character 1. In this casing is arranged the usual tubing which is provided with the standard tubing collar 2 and the nipple 3, this nipple being welded at 4 to the tapered lug mandrel 5, shown more clearly in Fig. 2, this upper tapered mandrel which is associated with the lower sectional mandrel has a taper of 3° and is provided about its circumference with four equally spaced vertical ribs of dovetail design.

Intermediate these ribs are the semi-circular slip stops 8 which have their flat surfaces 8a facing upwardly and extending transversely of the mandrel. The stops 8 are in the form of pins inserted medially between the ribs 7 at a predetermined point in the central portion of the lug mandrel, the pins being sheared to provide the upper flattened faces 8a outward of the mandrel body. The welded joint 4 by which the mandrel 5 is sealed to the tubing nipple insures against leakage which may occur at the threaded joint 6a.

The lug mandrel 5 is provided with internal threads 9 at the upper end of the mandrel body and internal threads 10 at the lower end of the mandrel body to connect with the tubing nipple 3 at its upper threaded end 9 and with the tubing 12 at its lower threaded end 10. A limit collar 14 is provided at a proper distance below the lug mandrel 5, and intermediate the stop 14 and the lug mandrel 5 is arranged the tie down structure for the tubing packer which cooperates with the lug mandrel 5 and its associated parts. The tie down tubing packer includes the conventional packing mandrel 15, this mandrel 15 being sealed at its lower end by packing 16 to which pressure is applied by the annular ring nut 17 which screws into screw threads 18 formed at the inner lower end of the packing element 19 formed at the lower bottom inner portion of the mandrel 15. This structure insures a sealed relation between the mandrel 15 and associated tubing 12. The packer mandrel 15 is formed with a plurality of upwardly extending, equally spaced, annularly arranged projections 20 at its upper end, these projections having flattened side walls 21 and flattened upper faces 22. A plurality of elongated tapered mandrel sections 23, one of which is illustrated in detail in Fig. 5, are linked to the projections 20. These mandrel sections are arcuate in cross-section and are four in number. Each mandrel section has depending projections 24 of the same thickness as the lugs 20 on the packer mandrel 15 and these depending projections 24 are linked to the projections 20 by the side plates 25, these plates being arranged at each side of each pair of projections and having hinge pins 26 extending through the rings and through the projections to permit lateral motion of the mandrel sections. Referring to Figs. 4 and 5 it is seen that each mandrel section is provided on its outer surface with a medially arranged dovetailed guide rib 30, which guide ribs travel in similarly shaped grooves 31 formed longitudinally and medially of the inner surface of the slips 32. Slips 23 have internal dovetailed slots 7a which coact with the ribs 7 of the lug mandrel 5 and travel therealong during operation of the assembly. These slips 32 are generally of conventional construction being provided with the arcuate teeth 33 for engaging the inner face of the casing when the slips are expanded due to longitudinal movement of the structure along the ribs. The abutting side edges of the slip sections are cut away to provide elongated slots indicated by reference character 32a, the upper ends of the slots being defined by a transversely extending shoulder. By this arrangement the abutting side edges of each adjacent pair of slips define elongated slots in which the semi-circular lower slip stops 8 travel, the length of the travel of the stops 8 upwardly being determined by the transverse upper shoulder defining the upper end of the slot. The tapered arcuate mandrel sections 23 form in assembly a truncated cone structure having the four diametrically spaced guide ribs 30 which support and

guide the slips 32, the latter being formed with the longitudinally extending slots or grooves 31 in which the guide ribs 30 seat to retain the parts in proper relative position at all times. The upper ends of each of the mandrel sections 23 of the sectional mandrel are formed with outwardly extending arcuate beads 33a which define the upward movement of the slips 32 on the mandrel sections 23 of the sectional mandrel. Thus the position of the slips are determined by the lower semi-circular stops 8 carried by the mandrel 5 and the upper arcuate stops 33a at the upper end of the mandrel sections 23. However, when the upper tapered mandrel 5 moves downwardly in the setting of the packing in the casing the lower stops 8 carried thereby move downwardly away from the slips 32 giving them a freedom of travel essential to their proper actuation on the surface of the sectional mandrel. The ribs 30 of the mandrel sections 23 have inner and outer faces which extend at an angle of approximately 3° on the inside and 5° on the outside, the inside taper of 3° corresponding to the taper of the face of the lug mandrel 5, while the 5° outer taper of the mandrel sections correspond to the taper of the inner face of slips 32, which is 5° so that the co-acting faces lie parallel during adjustment of the assembly and movement of the slips into engagement with the casing.

Beneath the limit collar 14 I have arranged the packer 40 which is built in accordance with the disclosure of my prior Patent No. 2,356,232, dated August 22, 1944, and is so constructed and arranged that the movement of the packer sleeve against the wall, which movement is normally in a horizontal plane, is transverse to the structure to prevent collapsing of the rubber during the application of the device. The packer sleeve 40 is clamped to the upper end of the packer assembly by the threaded collar 41 and the inner stop collar 42, these collars being at each side of the lower reduced portion 43 of the rubber packer sleeve 40 and clamping this rubber structure to the lower ring elements by rivets 44 which are arranged annularly about the structure to provide a sealed joint at this point. The limit collar 14 cooperates with the lower end portion 45 of the mandrel 15 when the tubing is lowered into the casing, the lower end of the mandrel having a diameter of approximately ⅜ of an inch greater than the diameter of the limit collar 42 so as to engage the limit collar 42 at the inner portion of the packer. The tapered mandrel 45 is provided with the slips 46, these slips being linked to the collar 47 by the links 48 and moving vertically on the mandrel 45 to grip the casing in the usual manner and as shown in Fig. 15. The friction springs 57 are associated with the collar 47 and the usual lock is provided for this collar 47 to release the assembly in the seating of the packers.

The important feature of the present development and one of the main objects of the invention is to provide the supporting slips 46 with a certain amount of flexibility to permit this alignment with the inner contour of the casing so that the threads of the slips will fully and efficiently function in gripping the casing. As previously stated there is a tolerance of approximately ten thousandths of an inch plus or minus permitted in the forming of the inner diameter of the casing structure and this tolerance necessarily results in the variation of the casing inner contour. With a variance in the contour of the casing, it is impossible to cut the teeth of the slips to meet different variable inner diameters unless the slips are made so that they have a certain amount of flexing to permit them to correspond to the inner casing contour. In addition to the foregoing in deep wells the alignment and curvature of the casing may be deflected because of weight and this will add another circumstance preventing maximum results from the engagement of the slip teeth. It will be understood and appreciated that if the slips ride on a surface and thus are held in a predetermined rigid position with respect to the inner casing face, so where a slip rides on a flat surface it cannot flex and when it cannot flex, it will catch the heavier casing on the extreme edge of the slip and lighter casing in the middle of the slip from about ½ to one inch, which lets the tubing drop and unseat the packer, however, the tubing being clamped at the top cannot drop there, but the tubing weight on the packer lets the packer seal give way.

In constructing the supporting slips 46 the medial longitudinal central portion is left with its full thickness and thus is substantially rigid or non-flexible, however, the wings 51 and 52 of the slips are flexible due to the vertical slits or grooves 53 formed therein equidistant from the vertical center line of the slip structure. It will be understood that the amount of flexing of the slip is relatively small with the tolerance of approximately ten thousandths of an inch plus or minus on the tubing or casing, the maximum moving of the wings would approximate $\frac{1}{32}$ of an inch, because the slip will ride higher on the slip mandrel when the tubing weight moves downwardly on the packer to meet the different weight casing.

Reference character 54 indicates a rib extending vertically of the collar 47 of the supporting slip mandrel 45, this rib 54 being associated with a groove 55 formed in the collar 47, this collar 47 providing the upper ring for the springs 57 and functioning to keep the collar and springs in line with the slip and slip mandrel in running and setting the packer. A ring 58 is screwed on the lower threaded end of the mandrel collar 45 to retain the upper spring ring 47 in alignment, this spring ring being notched at 59 to provide an inwardly positioned seat 60 for the upper ends 61 of the springs 57 which latter are fastened to the seat 60 by the screws 62 as is usual in such structures. The upper end of the spring ring 47 is formed with spaced projections 63 to receive the lower ends of the connecting straps 48 which are secured between the tongues by the bolts or pins 65. The upper ends of the connecting straps 48 are fastened by pins 66 between the tongues 67 depending from the individual slips. The tongues 63 on the collar are spaced at 90° so that each of the slips will be properly positioned with respect to the guideways on the cone shaped mandrel 45. The ring 58 threaded on the lower end of the mandrel also acts as a packer guide in the casing and centers the tubing through the packer.

The ring 70 is to facilitate the lifting of the packer after the packer mandrel is pulled and is welded as shown at 71 to the tubing. In Figs. 7 and 8 the disclosure does not include the tie down structure of Figs. 1 and 2 and in this disclosure a packer mandrel 15a such as shown in Fig. 9 may be used. This mandrel is open into the tubing as at 15b to provide an air and gas mixing chamber, the mixture of the air and

gas tending to lighten the load on the column of oil and facilitate the discharge of fluid from the well.

In the use of this device, the assembly is first positioned so that the conventional strainer is immediately above the oil sand and in this position the tubing is moved vertically approximately four feet, the springs 57 normally engaging the casing and providing enough friction to permit the tubing to be turned approximately one-half of a revolution to free the ribs 80 from engagement with the upper faces of the stop elements 81 and 82 arranged diametrically of and projecting upwardly from the collar 80a. This permits lowering of the tubing by virtue of the ribs or splines 80 passing through the slot between the stop elements 81 and 82 on the collar, as shown more clearly in Figs. 7 and 8. As the tubing lowers the packing mandrel 15 moves into the packer 40 until the outer edge portion 45a of the mandrel engages the stop ring 42. When so engaged the tapered lug mandrel 5 and the sectional mandrel 23 telescope, their inclined faces moving together in a parallel plane with the tapered mandrel sections expanding outwardly on the tapered mandrel 5 due to the coacting inclined faces, and as these sections 23 move outwardly and upwardly the slips 32 expand into engagement with the inner face of the casing. The actual relative movement between the tapered lug mandrel 5 and sectional mandrel 23 is approximately four inches after the engagement of the slips with the casing. The movement of the slips in the tie down slip and mandrel structure B follows the seating of the main packer 40 by the movement of the packer mandrel 15 upon the initial lowering of the tubing. The lowering of the tubing obviously carries with it the mandrel 45 to expand the gripping elements 46 into engagement with the casing. The slips 46 engage the casing before the expansion of the packer has reached its maximum and during the movement of the packer mandrel 15 within the packer element while the operation of the tie down slip and mandrel at the upper end of the assembly follows the sealing by the packer element 40.

From the foregoing it will be apparent that a structure has been provided which will not only support a packer in the proper position in the casing but will prevent an unseating of the packer or any undesirable vertical movement due to conditions which may be found in the well. The supporting slips at the bottom of the assembly, as shown in Fig. 1, are caused to engage the casing in the usual manner and by a manipulation of the tubing, i. e. by movement of the tubing approximately four feet and a half turn of the assembly so as to cause a freeing of the assembly at 80—82 which is more or less conventional and forms no part of the present application. The engagement of the tie down slips on the tie down telescoping mandrel is brought about by the lowering of the packer mandrel 15 within the packer structure. The engagement of the packer obviously results in a cooperation of the tie down machanism parts to shift the tie down slips 32 to a position for instant locking engagement with the casing. The movement of the packing mandrel 15 will be limited to approximately ⅛" in the event the packing 40 starts to blow upwardly because of well pressures. It will be noted in the operation of the assembly that the stop ring 14 is of such a diameter as to clear the space between the stop ring 42 and the tubing so as to permit the lower projecting edge of the mandrel 15 to engage and cooperate with the support stop ring 42.

What is claimed is:

1. In a tie down tubing packer assembly for oil wells, a casing, a tubing arranged within the casing and means for sealing the area between the casing and tubing including an expansible packer element enclosing the tubing and having an upwardly and outwardly tapered opening, said packer being normally slidable on said tubing a downwardly tapered mandrel associated therewith for expanding the packer element into engagement with the casing, a supporting structure for the tubing arranged below the packer and including a plurality of slips and a mandrel associated with the slips and movable with said packer element for moving the same into engagement with the casing as the tubing is lowered, means on said tubing for limiting the downward movement of said downwardly tapered packer mandrel, and hold down means for the packer arranged above the same and including a plurality of flexible segmental slip elements for engaging the casing and means for expanding the slip elements into engagement with the casing including telescoping mandrels having coacting angular faces, one of said mandrels being formed of sections, and said sections each being hingedly connected with the packer mandrel, and the other mandrel being rigid with the tubing.

2. In a packer assembly for oil wells, a casing, a tubing arranged within the casing and means for sealing the area between the casing and tubing including an expansible packer element normally slidable on said tubing and a mandrel associated therewith and movable with said tubing for expanding the packer element into engagement with the casing, a supporting structure for the tubing arranged below the packer and including a plurality of slips and a mandrel associated with the slips and movable with said packer for moving the same into engagement with the casing as the tubing is lowered, and hold down means for the packer arranged above the same and including a plurality of slip elements for engaging the casing and means for expanding the slip elements into engagement with the casing including telescoping mandrels having coacting angular faces, said telescoping mandrels being limited in their relative movement one of the telescoping mandrels being formed of a plurality of vertical sections, and said sections being hinged to the packer mandrel.

3. In a packer assembly for oil wells, a casing, a tubing arranged within the casing and means for sealing the area between the casing and tubing including an expansible packer element slidably mounted on said tubing and a mandrel associated therewith and movable with said tubing for expanding the packer element into engagement with the casing, a supporting structure for the tubing arranged below the packer and including a plurality of slips and a mandrel associated with the slips having means for limiting their downward movement, and depending from the packer element for moving the same into engagement with the casing as the tubing is lowered, hold down means for the packer arranged above the same and including inner and outer telescoping mandrels having coacting angular faces, the outer telescoping mandrel being formed of a series of sections which are hingedly connected to the mandrel associated with the expansible packer, a plurality of segmental slips

arranged about said telescoping mandrels, and means carried by the outer telescoping mandrel for limiting the vertical movement of the slips.

4. In a packer assembly for oil wells, a casing, a tubing arranged within the casing and means for sealing the area between the casing and tubing including an expansible packer element and a mandrel associated therewith for expanding the packer element into engagement with the casing, a supporting structure for the tubing arranged below the packer and including a plurality of slips and a mandrel associated with the slips for moving the same into engagement with the casing as the tubing is lowered, hold down means for the packer arranged above the same and including a plurality of slip elements for engaging the casing and means for expanding the slip elements into engagement with the casing including inner and outer telescoping mandrels having coacting angular faces, the outer telescoping mandrel being formed in sections and having arranged thereon said slip elements, and radially projecting means at the upper end portion of the outer mandrel for limiting the movement of the slip elements beyond the upper end portions of said mandrel sections.

5. In a packer assembly for oil wells, a casing, a tubing arranged within the casing and means for sealing the area between the casing and tubing including an expansible packer element and a mandrel associated therewith for expanding the packer element into engagement with the casing, a supporting structure for the tubing arranged below the packer and including a plurality of slips and a mandrel associated with the slips for moving the same into engagement with the casing as the tubing is lowered, hold down means for the packer arranged above the same and including a plurality of slip elements for engaging the casing and means for expanding the slip elements into engagement with the casing including inner and outer telescoping mandrels having coacting angular faces, the outer telescoping mandrel being formed in sections and having arranged thereon said slip elements, radial projections at the upper end portions of said outer mandrel for limiting the movement of the slip elements beyond the upper end portions of said sectional mandrel, and additional means for limiting the downward movement of said slip elements movable with the inner telescoping mandrel.

6. In a packer assembly for oil wells, a casing, a tubing arranged within the casing and means for sealing the area between the casing and tubing including an expansible packing element and a mandrel associated therewith for expanding the packing element into engagement with the casing, a supporting structure for the tubing arranged below the packer and including a plurality of slips and a mandrel associated with the slips for moving the same into engagement with the casing as the tubing is lowered, and hold down means for the packer arranged above the same and including a plurality of slip elements for engaging the casing, and means for expanding the last named slip elements into engagement with the casing including inner and outer telescoping mandrels, the inner telescoping mandrel being fixed to the tubing and the outer telescoping mandrel being hingedly connected to the mandrel associated with the packer element, and directly supporting said last-named slip elements for limited vertical movement.

7. The structure of claim 6 characterized in that the telescoping mandrels are conical in shape, the outer mandrel being formed in sections and having an inner taper corresponding to the taper of the associated mandrel, said sectional mandrel having an outer tapered face varying from the inner taper of the mandrel sections and having slidingly arranged thereon said last-named slips.

8. In a device of the character described, a casing, a sectional tubing arranged within the casing, and means for sealing the area between the casing and tubing, including an expansible packing element and a mandrel associated therewith for expanding the packer element into engagement with the casing, said expansible packing element being arranged on said tubing and permitting a predetermined axial shifting of said tubing, a mandrel on said tubing adapted for movement into said packing element to expand the same to cause its engagement with the casing, packing means between said mandrel and tubing and means for holding the mandrel against vertical movement including a tie-down structure formed of a series of arcuate mandrel sections, said sections being hinged to the packing mandrel and supporting a series of arcuate casing-engaging slip elements, stop means carried by said arcuate mandrel sections for engaging said slip elements to limit their movement on said mandrel sections, and a tapered mandrel forming a tubing section moving relative to said sectional mandrel to expand its sections to move said slips into engagement with said casing.

9. The structure of claim 8 characterized in that the tapered mandrel on the tubing for expanding the sectional mandrel moves in guideways formed on the inner surface of the mandrel sections, which inner surface coincides with the outer surface of the tapered mandrel.

10. In a hold down device for a packing element, in combination, a casing, a tubing, a packing mandrel slidable on said tubing, adjustable means for providing a seal between the packing mandrel and tubing, a sectional conical mandrel arranged above said packing mandrel, means hinging said sectional mandrel to said packing mandrel to permit lateral movement of said sections, said sectional mandrel having its sections formed with outwardly and upwardly tapered inner and outer wall surfaces, lateral extensions forming stops at the upper end portions of said sections, slip members arranged on said sectional mandrel below said stop means, said slip members having their inner faces tapered to correspond to the taper of the outer face of said mandrel sections, a tapered mandrel fixed to said tubing above said sectional mandrel and having its outer surface tapered inwardly and downwardly to correspond to the taper of the inner faces of the said mandrel sections whereby these surfaces lie in telescoping relation, guide means carried by the tapered mandrel and engaging the inner face of the sections of the tapered mandrel to direct the movement of the sections of the tapered mandrel in vertical alignment, and radial stop elements on said tapered mandrel for engaging the under face of portions of said slip members to limit their downward movement.

11. The structure of claim 10 characterized in that the hinge connection between the packing mandrel and the sectional mandrel consists of a series of spaced links which abut sidewall portions of the mandrels.

12. The structure of claim 11 characterized in that the abutting faces of the slip sections are

formed with vertically extending cut out portions defining slots for movement of said stop members carried by the upper tapered mandrel.

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