

[54] **WELL PACKER APPARATUS**
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[52] U.S. Cl. **166/120, 166/129**
[51] Int. Cl. **E21b 33/129**
[58] Field of Search **166/120, 129, 134**

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[57] **ABSTRACT**
A well packer apparatus having a mandrel movable between extended and contracted positions within an anchor body that carries holddown slips, an internal bypass passage that is opened and closed by a balanced valve sleeve movable longitudinally relative to the mandrel and the anchor body, first coengageable elements to prevent operation of said slips when the mandrel is extended, second coengageable means to move said valve sleeve to closed condition as the mandrel is moved to contracted position, and a mechanical interlock to releasably secure the mandrel in contracted position.

20 Claims, 10 Drawing Figures

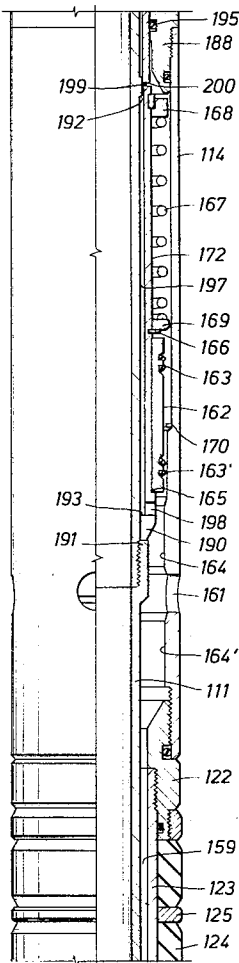
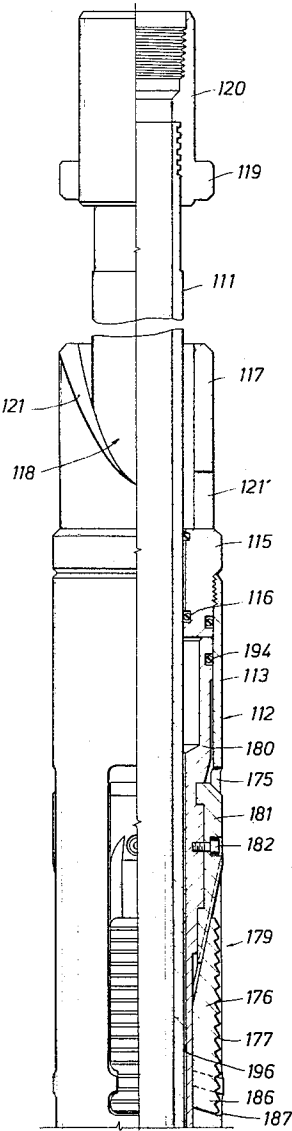


FIG. 1A

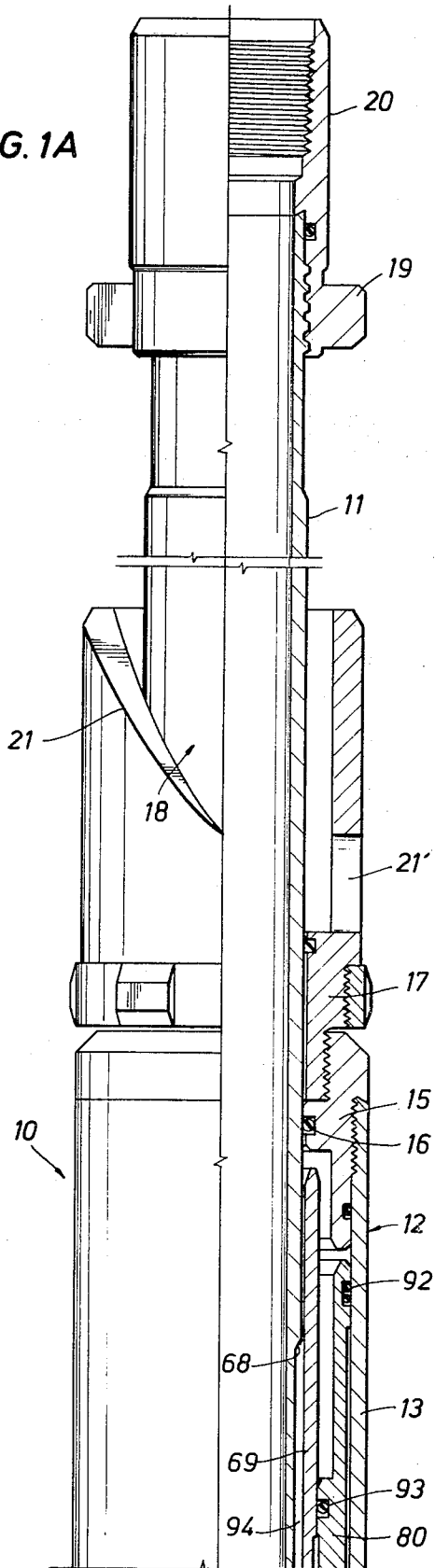
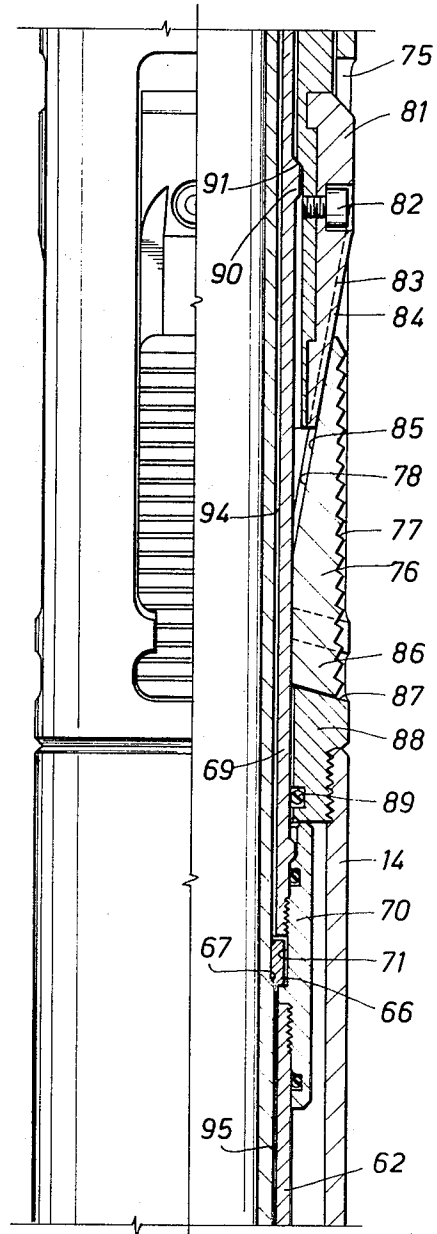


FIG. 1B



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FIG. 1C

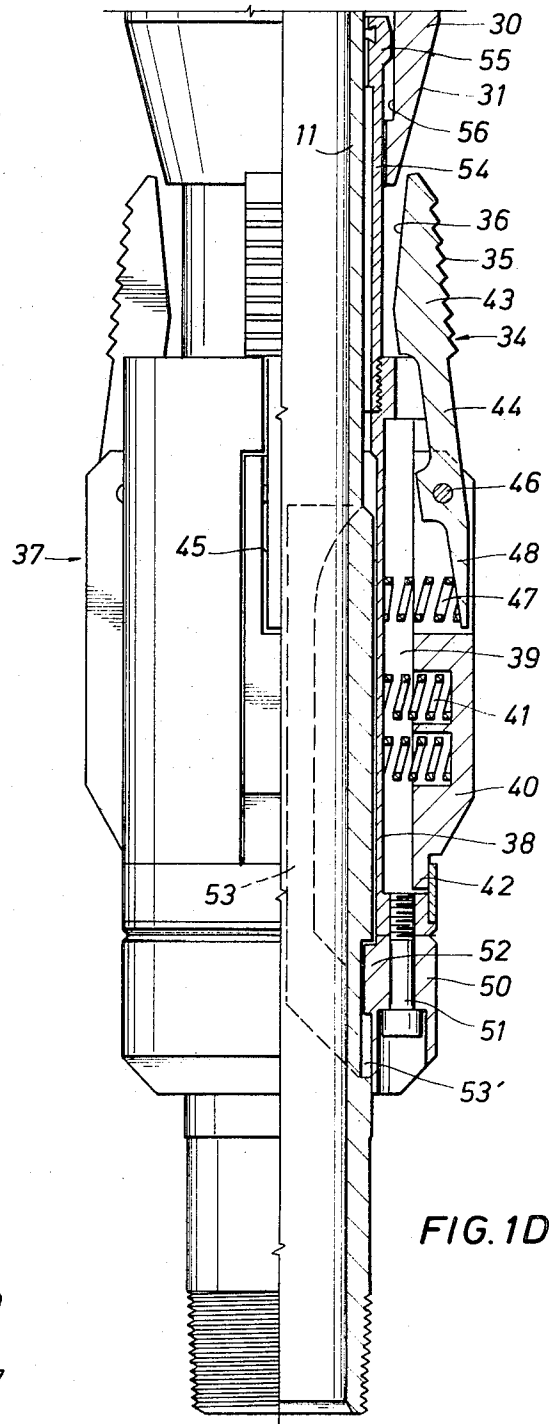
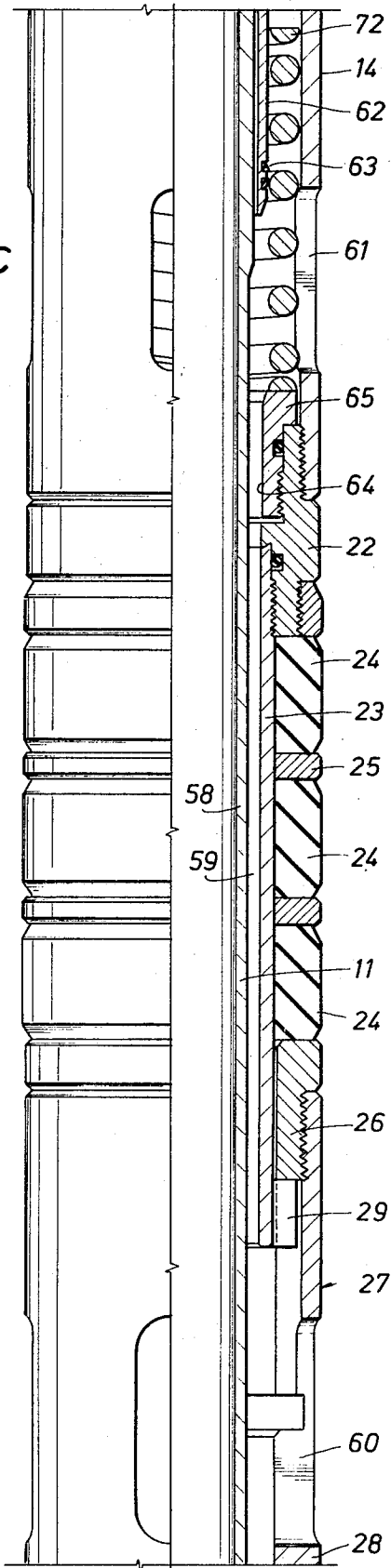


FIG. 1D

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FIG. 2A

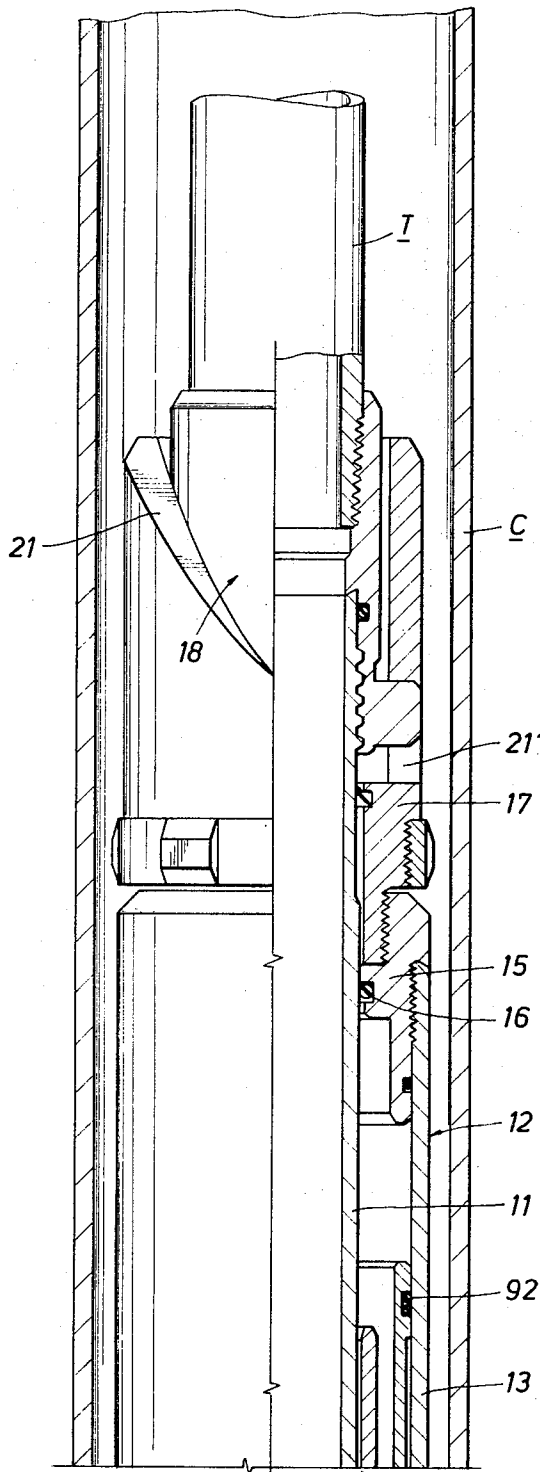
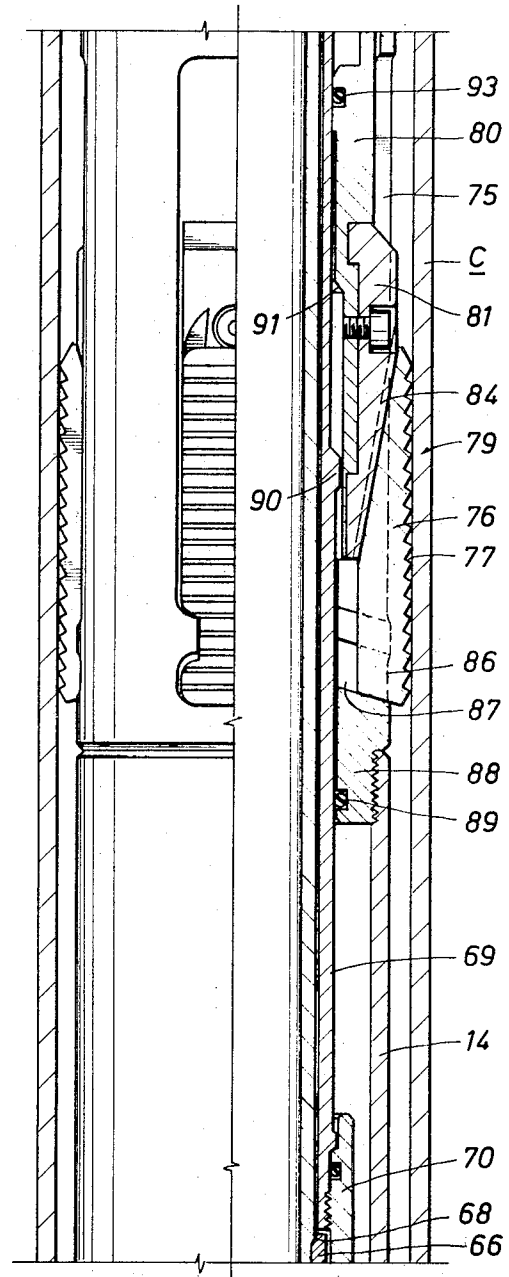


FIG. 2B



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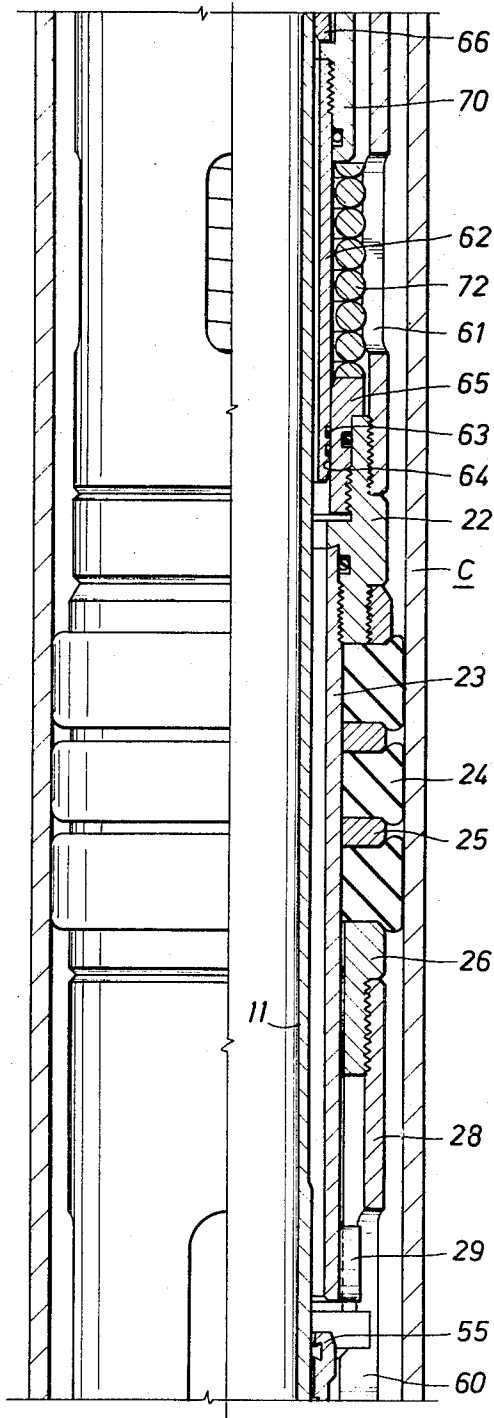


FIG. 2C

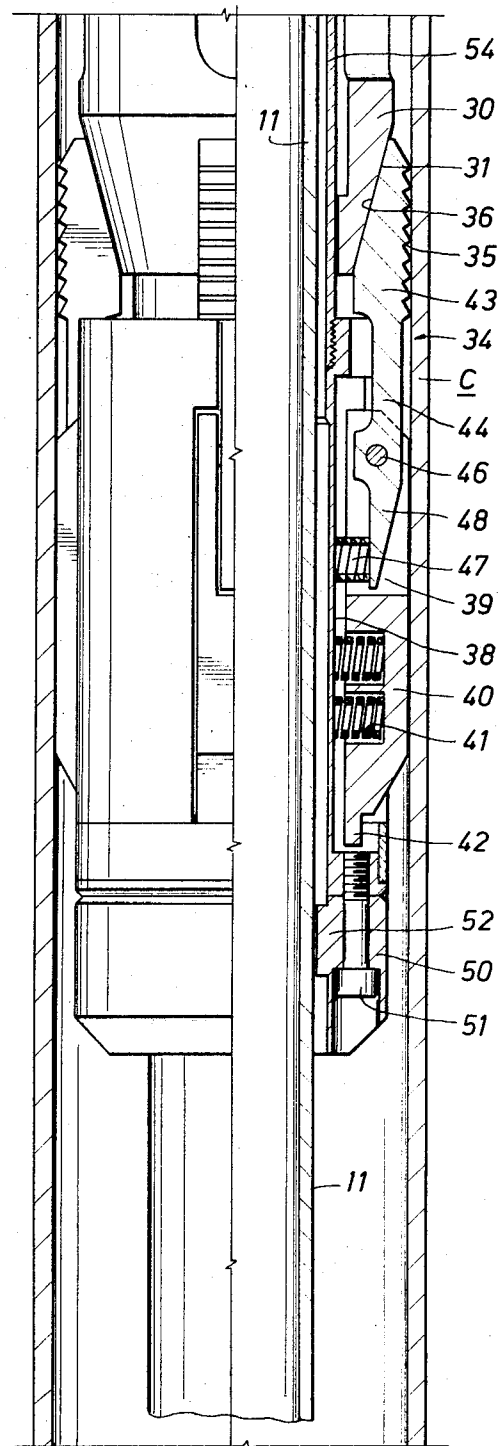


FIG. 2D

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FIG. 3A

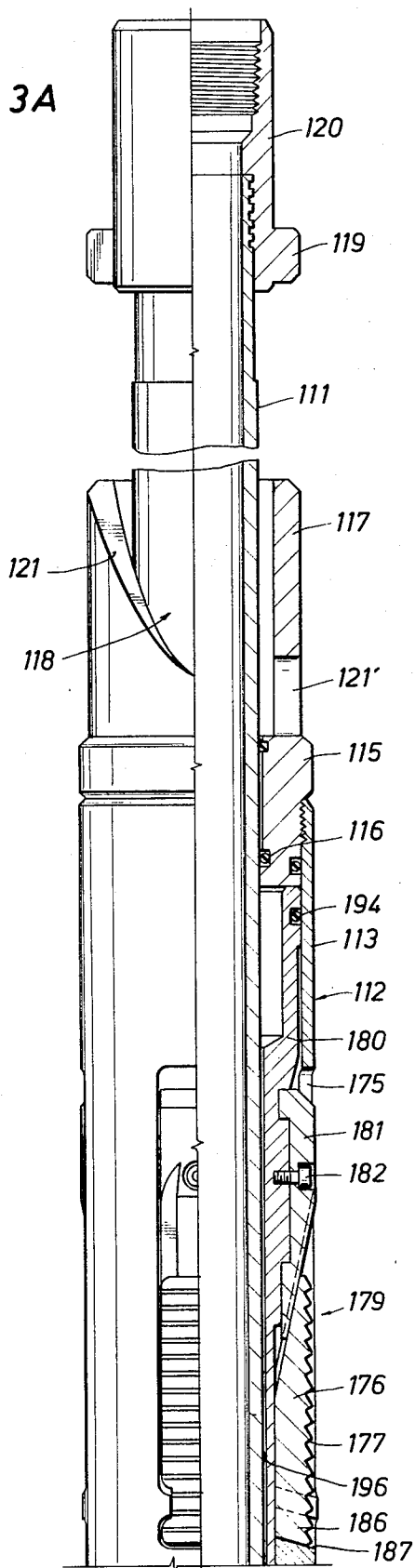
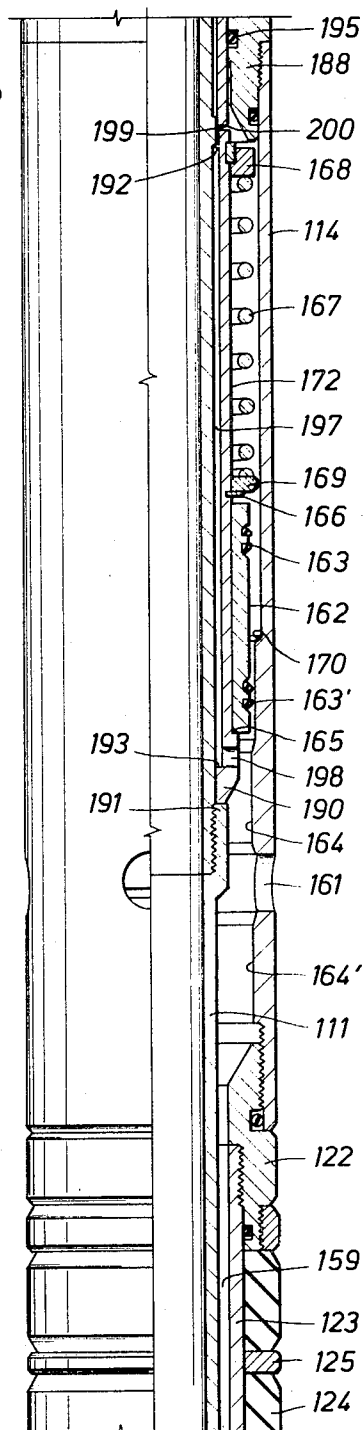


FIG. 3B



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WELL PACKER APPARATUS

This invention relates generally to well packers used in well bores, and more specifically to a new and improved retrievable packer that is adapted to be installed in a producing well and anchored against movement due to fluid pressure in either longitudinal direction.

In well production operations where a packer that isolates the producing interval may be subjected to pressure differentials acting in either direction, it is fairly common practice to anchor the packer against downward movement by a slip and expander combination that is set by the weight of the production string that extends from the packer to the top of the well. An anchor system that responds to greater fluid pressure below the packer is used to anchor the packer against upward movement. The packer may also employ an internal bypass passage that is closed off when the tool is set by a valve that is actuated by downward movement of the packer mandrel. A well packer having a particularly successful anchor and bypass arrangement of this type is shown in my U.S. Pat. No. 3,399,729, issued Sept. 3, 1968. However, the packer shown in this patent is primarily adapted for well service operations such as squeeze cementing, hydraulic fracturing and acidizing.

In production operations, it is considered to be desirable to provide a relatively long travel or stroke mandrel to expedite spacing out procedures during installation of the production string of tubing. More particularly, the packer is run in and set at a precise location above the production interval, and the elevation of the packer should not be disturbed during installation of surface flow control equipment such as a Christmas tree. Since the installation of such equipment may require a substantial amount of vertical pipe movement in order to set the pipe in hangers or to secure bolted flanges, a relatively long mandrel travel may be necessary to insure that the location of the packer anchor is not moved during surface manipulations of the pipe string.

Moreover, after a production packer has been in service over an extended period of time and it is necessary to remove it from the well for workover operations or the like, difficulty can be encountered in unseating the packing elements. When this occurs, a long stroke mandrel enables a jarring action to be applied by working the production string upwardly and downwardly, similar in nature to the use of a bumper sub.

In situations where a greater pressure exists below the packer than in the annulus above it, the pressure acts in opposition to the weight of the production string which supplies the setting force for the packer. The greater pressure is used to actuate the holddown slips to prevent upward movement of the packing elements, however upward movement of the mandrel is undesirable because such movement may open the bypass valve and equalize pressures. Accordingly it has become common practice to employ a hydraulic balance piston arrangement to counterbalance the upward force on the mandrel due to greater pressure below the packer. Such balancing features can tend to unduly complicate the structure of the packer, and in production packers that normally remain in a well for an extended period of time, seal deterioration can occur and cause leakage. Thus it is considered to be desirable to provide a mechanical interlock that functions to prevent upward movement of the mandrel, a mechanical arrangement being more reliable under adverse conditions and affording in general a more simplified structural arrangement than a hydraulic system. As a further feature of the present invention, the valve that closes the internal bypass passage is hydraulically balanced to reduce the unbalanced areas that are available for the greater pressure below the packer to act upon, thereby reducing to a minimum the upward force on the mandrel that is produced by such greater pressure. The mandrel is movable longitudinally within limits with respect to the valve in accordance with the long stroke capability of the mandrel.

It is accordingly an object of the present invention to provide a new and improved well packer apparatus that can be

anchored against movement in either direction, and which employs a long stroke mandrel to compensate for spacing procedures during installation in a well.

Another object of the present invention is to provide a new and improved well packer apparatus having a bypass valve that is closed by downward movement of the packer mandrel, together with a mechanical interlock to absolutely prevent upward movement of the mandrel due to pressure from below.

Yet another object of the present invention is to provide a new and improved well packer apparatus having an internal bypass passage that is closed when the packer is set by a balanced valve.

These and other objects are attained in accordance with the concepts of this invention by a well packer apparatus comprising a mandrel that is telescopically disposed within an anchor body having packing means to seal off a well bore. A lower slip and expander combination is used to anchor against downward movement, and an upper slip and expander combination carried by the anchor body is responsive to greater fluid pressure below the packer to anchor against upward movement. A bypass passage extends along the mandrel inside the packing and terminates above the packing in side ports below the upper slips. The passage is opened and closed by a valve sleeve that is movable longitudinally relative to the mandrel between limit positions defined by oppositely disposed shoulders on the mandrel.

The longitudinal movement enables a long stroke mandrel, and when the mandrel is in its upper or running position, coengageable means including one of the mandrel shoulders is provided to positively retain the holddown slips in retracted positions. Downward movement of the mandrel as the packer is set releases the coengageable means, and causes the other of the mandrel shoulders to engage the valve sleeve and move it to closed position with respect to the bypass passage. The valve sleeve has equal and oppositely disposed transverse areas exposed to fluid pressure to balance the valve sleeve. A mechanism is provided to lock the mandrel to the anchor body in its lower position, in order to prevent fluid pressure below the packer from lifting the mandrel and accidentally opening the bypass.

The present invention has other features, objects and advantages which will become more readily apparent in connection with the following detailed description of several embodiments, taken in conjunction with the accompanying drawing, in which:

FIGS. 1A-1D are longitudinal sectional views with portions in side elevation, of one embodiment of a well packer in accordance with this invention with parts in running-in positions;

FIGS. 2A-2D are views similar to FIGS. 1A-1D except showing the packer parts in their relative positions when set in a well casing; and

FIGS. 3A and 3B are longitudinal sectional views with portions in side elevation of a modified form of the present invention, again with parts in running-in positions.

Referring initially to FIGS. 1A-1D, one embodiment of a well packer 10 in accordance with the concepts of the present invention includes a mandrel 11 that is telescopically disposed within an anchor body 12 having an upper section 13 and a lower section 14. The upper end of the upper section 13 is closed by an annular cap 15 that is sealed with respect to the mandrel 11 by a seal ring 16. The mandrel 11 is shown foreshortened for convenience of illustration, and is actually elongated so that a substantial amount of telescoping movement is available for purposes to be described hereinafter. A locking sub 17 is threadedly connected to the cap 15 and has diagonally opposed jay-slots 18 that are adapted to receive opposed lugs 19 on the mandrel collar 20 in order to lock the mandrel 11 in its lowermost position. The slots 17 have inclined wall surfaces 21 to automatically guide the lugs 19 into the closed portions 21' of the slots.

The lower end of the anchor body 12 is connected to an upper abutment ring 22 (FIG. 1C) that is in turn connected to an annular compression sleeve 23. The compression sleeve 23

carries a plurality of annular elastic packing elements 24 which may be separated by metallic spacer rings 25. A lower abutment 26 is slidable on the compression sleeve 23, and constitutes the upper end portion of a slip expander 27. The sleeve portion 28 of the expander 27 is corotatively secured to the compression sleeve 23 by a typical spline connection 29, and has a cone portion 30 with downwardly and inwardly inclined outer surfaces 31.

A plurality of normally retracted slips 34 (FIG. 1D) having toothed outer surfaces 35 and inclined inner surfaces 36 are pivotally attached to a drag assembly indicated generally at 37. The slip and drag assembly to be described immediately hereafter is only to be considered as illustrative and not in a limiting sense, since other well known anchor assemblies could be used. The drag assembly 37 includes an annular cage or housing 38 having circumferentially spaced, longitudinal slots 39 which receive rectangularly shaped friction drag blocks 40. Between each drag block 40 and the cage 38 are coil springs 41 that urge the blocks radially outwardly into friction engagement with a well casing. Each block 40 has end portions or flanges 42 (only one end shown) to retain the block in the cage 38. Associated with each drag block 40 is a respective slip element 34 having a head 43 and a stem 44. Each drag block 40 has a slot 45 which receives the stem 44, and a pin 46 pivotally interconnects the stem to the drag block. A coil spring 47 is positioned between the cage 38 and a tang 48 on each stem 44 to urge the tang outwardly and thereby pivot the slip head 43 inwardly toward the mandrel 11.

A gauge ring 50 is secured to the lower end of the cage 38 by studs 51 or the like, and has an inwardly projecting lug 52 that coacts with a typical jay-slot 53 formed on the exterior of the mandrel 11 in order to couple the drag assembly 37 to the mandrel during running and retrieving. The mandrel 11 can be manipulated in a conventional manner, for example by elevating the mandrel and then lowering it while applying right-hand torque, to release the lug 52 from the jay-slot 53 so that the mandrel can be moved downwardly relative to the drag assembly to set the packer 10. Of course it will be appreciated that these parts could be reversed so that the lug is on the mandrel 11 and the jay-slot is in the cage or housing 38. A tie sleeve 54 connected to the cage 38 extends upwardly within the expander cone 30 and has an enlarged shoulder portion 55 engaging in an internal annular recess 56 to limit upward movement of the slip expander 27 relative to the drag assembly 37.

Referring again to FIG. 1C, the compression sleeve 23 has a larger inner diameter than the outer diameter of the adjacent mandrel portion 58 to provide an annular fluid bypass passage 59 that extends from lateral ports 60 in the sleeve portion 28 of the expander 27 to lateral ports 61 through the wall of the lower section 14 of the anchor body 12. The bypass passage 59 is open during running and retrieving but is adapted to be closed off by an annular valve sleeve 62 having a seal assembly 63 that is engageable with a seal surface 64 on a seat ring 65 when the valve sleeve is shifted downwardly as will subsequently be described. The valve sleeve 62 is coupled for limited longitudinal movement relative to the mandrel 11 through the provision of a split drive ring 66 (FIG. 1B) that is slidable relative to the mandrel between limit positions defined by an upwardly facing shoulder 67 and a downwardly facing shoulder 68. A seal sleeve 69 is connected to the valve sleeve 62 by a collar 70 and extends upwardly along the mandrel 11, the drive ring 66 being confined within an internal recess 71 in the collar and between the opposed end surfaces of the valve and seal sleeves. A substantial coil spring 72 (FIG. 1C) surround the valve sleeve 62 and rests on the upper end surface of the valve seat ring 65. The upper end of the spring is aligned to be engaged by the lower end surface of the collar 70 for purposes to be described hereafter.

The upper section 13 of the anchor body 12 has a plurality of radially disposed windows 75 that carry holddown slips 76 having toothed outer surfaces 77 and inner inclined surfaces

78. The slips 76 are adapted to be shifted outwardly by an expander assembly 79 that includes an expander piston 80 having expander inserts 81 mounted on stepped outer surfaces thereof and attached thereto by screws 82 or the like. The inserts 81 have outer inclined surfaces 83 to wedge the slips 76 outwardly, and a sliding connection is provided by a dovetail spline 84 that fits within a mating groove 85 on a respective slip. The lower end of each slip 76 is provided with a tongue 86 that fits slidably within a companion groove 87 to guide the slip outwardly, the groove being provided in a thickened section 88 of the anchor body 12. The section 88 is sealed with respect to the seal sleeve 69 by a seal ring 89.

Downward movement of the expander assembly 79 will result in outward shifting of the slips 76 into gripping contact with a well casing wall, and upward movement will cause inward retraction. During running and retrieving of the packer 10, the lower shoulder 67 on the mandrel 11 engages the drive ring 66 in order to retain the seal sleeve 69 in its upper position. The seal sleeve 69 also has a shoulder 90 that engages a shoulder 91 on the expander piston 80 to positively retain the expander assembly 79 in its upper position and thus the slips 76 in their retracted positions. When the mandrel 11 is moved downwardly during setting of the packer 10, the parts are no longer retained, and downward movement of the expander assembly 79 will occur when the pressure of fluids below the packer 10 is greater than the pressure of fluids in the annulus above the packer, as follows. The expander piston 80 is sealed with respect to the upper anchor body section 12 by a seal ring 92, and with respect to the seal sleeve 69 by a seal ring 93. The downwardly facing transverse surfaces of the expander piston 80 are subject to the pressure of fluids in the well annulus via the windows 75 in the anchor body 12. The upwardly facing transverse surfaces of the expander piston 80 are subject to the pressure of fluids in the well bore below the packer via annular clearance spaced 94 and 95 inside the seal sleeve 69 and the valve sleeve 62 respectively, and via the bypass passage 59 and the lower bypass ports 60. Accordingly, with the valve sleeve 62 in closed position, a greater fluid pressure below the packer will act downwardly on the difference in transverse areas circumscribed by the seals 92 and 93 to force the expander assembly 79 downwardly and the slips 76 outwardly. Of course a greater fluid pressure in the annulus will retract the slips 76.

One feature of the present invention resides in the fact that the assembly constituted by the valve sleeve 62 and the seal sleeve 69 is balanced with respect to fluid pressure. This is accomplished by sizing the parts such that the seal diameter for the valve seal 63 is equal to the seal diameters for the seals 89 and 93. Thus arranged, fluid pressure acts with equal force on oppositely disposed transverse surfaces of the members, whether the pressure is greater below the packer or in the annulus above the packer. Accordingly, a greater pressure below the packer will not tend to move the valve to open position, nor will a greater pressure in the annulus tend to hold the valve in closed condition.

In operation, the packer 10 is connected to the lower end of a pipe string and run into the well casing with the parts in the relative positions shown in FIGS. 1A-D. The drag assembly 37 and the slips 34 are fixed with respect to the mandrel 11 by engagement of the lug 52 with a closed portion 53' of the jay-slot 53. The drag blocks 40 slide in frictional engagement with the casing, and the slip heads 43 are pivoted inwardly in their normally retracted positions by the coil springs 47. The packing elements 24 are in relaxed condition, and fluids present in the well bore can bypass between the packing and the well casing wall, as well as through the lower ports 60, bypass passage 59 and the upper ports 61. The lower shoulder 67 on the mandrel 11, through the drive ring 66, supports the valve sleeve 62 and the seal sleeve 69 in an upper position, and the upper end of the seal sleeve can engage the cap 15 to hold the anchor body 12 and the compression sleeve 23 in an upper position. The interengaging splines 29 on the compression sleeve 23 and expander sleeve 28 maintain the cone 30 in spaced relation to the slips 34.

The packer 10 is set in the casing C as shown in FIGS. 2A-2D. After the packer is halted, the pipe string T is elevated slightly and then lowered while holding right-hand torque. This will disconnect the lug 52 on the drag assembly 37 from the jay-slot 53 on the mandrel 11. The drag blocks 40 hold the drag assembly 37 motionless in the casing C. As the mandrel 11 is lowered, the expander cone 30 moves downwardly behind the slip heads 43, and the coating inclined surfaces 36 and 31 cause the slips to be shifted outwardly into gripping contact with the well casing C. With the slip set, the packer is in position and the mandrel 11 can be moved upwardly and downwardly during installation of surface equipment without moving the packer in either direction.

When the mandrel 11 has been moved downwardly to a sufficient extent, the upper shoulder 68 will engage the drive ring 66 and force the valve sleeve 62 downwardly until the seals 63 engage the seal surface 64 to close off the bypass ports 60. The upper end of the coil spring 72 is engaged by the collar 70 and the spring is compressed to provide an upward bias force on the valve sleeve 62. As the mandrel slips 19 enter the jay-slots 18, the mandrel 11 is kicked or turned slightly to the left so that the lugs engage in the closed portions 21' of the jay-slots 21 in the locking sleeve 17. As the weight of the pipe string T is applied to the mandrel 11, the upper abutment 22 is advanced relatively downwardly toward the lower abutment 26 to compress and expand the packing elements 24 into sealing contact with the well casing C as shown in FIG. 2C. A sufficient amount of the weight of the pipe string T is slacked off on the mandrel 11 to ensure the retention of a pack-off under expected pressure conditions.

In the event that the pressure of fluids below the packer 10 should exceed the pressure of fluids in the annulus above the packer, the greater pressure is communicated by the bypass passage 59 and the clearance spaces 95 and 94 to the upper face of the expander piston 80 to force the expander assembly 79 downwardly and slips 76 outwardly as shown in FIG. 2D. The slip teeth 77 grip the casing to anchor the anchor body 12 and thus the packing 24 against upward movement. The greater fluid pressure can not move the mandrel 11 upwardly and inadvertently open the bypass passage 59 because of the mechanical interlock provided by the lugs 19 and the jay-slots 18. As previously explained, the valve sleeve 62 is balanced with respect to fluid pressure so that pressure does not tend to move it vertically in either direction.

To unseat the packer 10, the mandrel 11 is torqued by the pipe string T to the right and then lifted. This manipulation will release the lugs 19 from the jay-slots 18 and enable the mandrel 11 to be elevated. As downward force is removed from the valve sleeve 62, the coil spring 72 will force the valve sleeve upwardly to open the bypass passage 59 to the well annulus above the packer to equalize pressures across the packing elements 24. In the event that pressure below the packer is greater at this point, equalization will occur without retracting the holddown slips 76 so that the packer remains firmly anchored. When the mandrel 11 has been elevated sufficiently, the lower shoulder 67 will engage the drive ring 66 and force the seal sleeve 69 upwardly until the seal sleeve shoulder 90 engages the shoulder 91 on the expander piston 80 to lift it and retract the slips 76. As compressive force is relieved on the packing elements 24, they will inherently retract. The jay-slot 53 at the bottom end of the mandrel 11 will automatically interengage with the lug 52 on the drag assembly 37 to lock the packer parts in retracted conditions.

The relatively long travel distance of the mandrel 11 relative to the anchor body 12 and compression sleeve 23 provides a number of advantages. For example, when the packer 10 is used as a production tool, the packer can be properly located and the pipe string T raised and lowered at the surface during installation of a Christmas tree or flow head without disturbing the setting elevation of the packer 10. In this manner, the long stroke of the mandrel 11 compensates for spacing out procedures. Also, the mandrel travel can be used in a manner similar to a bumper sub to provide a jarring action to help free the packer 10 in the event that it should become stuck or lodged in the casing.

A modified form of the present invention is illustrated in FIGS. 3A and 3B, however only the upper portion of the packer 110 is shown to simplify the description, the lower portion being substantially identical to, or an equivalent of, the structural arrangement shown in FIGS. 1C and 1D. In this embodiment, the mandrel 111 is telescopically disposed within an anchor body 112 having its lower end connected to an upper abutment ring 122 and to a compression sleeve 123. The sleeve 123 carries elastomeric packing elements 124 and spacers 125. The upper section 113 of the anchor body 112 is closed by a cap 115 that is sealed with respect to the mandrel 111 by a seal ring 116. In similar manner to the previously disclosed embodiment, a locking sleeve 117 on the anchor body 112 has jay-slots 118 with inclined walls 121 and a closed channel 121', which are cooperable with lugs 119 on the mandrel collar 120 to mechanically lock the mandrel 111 in its lower position with respect to the anchor body.

A holddown slip and expander assembly 179 includes slip elements 176 received in windows 175 in the anchor body 112. The slip elements 176 are adapted to be expanded by a downwardly moveable expander piston 180 having expander inserts 181 secured on to stepped wall surfaces thereof by screws 182. The inserts 181 are slidably coupled to the slips 176 by dovetail spline and groove structures 184. The slip elements 176 are also guided radially outwardly by tongues 186 that fit within grooves 187 in a thickened section 188 of the anchor body section 113. The slip elements 176 have teeth 177 adapted to bite into and grip a well casing wall to anchor against upward movement.

A bypass passage 159 extends along the mandrel 111 and terminates in radial ports 161 in communication with the well annulus above the packing 124. The ports 161 are open during running and retrieving, and are closed off by a valve head 162 carried by a shifting sleeve 172. The valve head 162 has spaced seals 163 and 163' that engage seal surfaces 164 and 164' when the valve head is moved downwardly into spanning relation to the ports 161 as the packer 110 is set. The valve head 162 is fixed on the shifting sleeve 172 by virtue of its mounting between an upwardly facing exterior shoulder 165 and a snap ring 166. A biasing spring 167 surrounds the shifting sleeve 172 above the valve head 162, the upper end of the spring engaging a fixed ring 168, the lower end of the spring engaging a slidable ring 169. The slidable ring 169 is aligned for engagement with a shoulder 170 on the anchor body section 114 when the valve head 162 is moved downwardly to closed position. In such position, the spring 167 is compressed and exerts an upwardly directed bias force on the shifting sleeve 172 and valve head 162 tending to return it to its upper open position.

The valve head 162 and shifting sleeve 172 are held in the upper position as shown in FIG. 3B through engagement of an inwardly thickened section 190 on the shifting sleeve 172 with an outwardly extending shoulder 191 on the mandrel 111. To move the valve head 162 to closed position, a vertically spaced shoulder 192 is provided on the mandrel 111 and is adapted to engage the shoulder 193 on the thickened section 190. Such interengagement will cause the sleeve 172 and head 162 to be carried downwardly with the mandrel 111 until the head spans the ports 161 to block communication between bypass passage 159 and the well annulus.

The holddown slip and expander assembly 179 is hydraulically operated by a greater pressure of fluids either in the well bore below the packer 110 or in the annulus above the packing elements 124 as follows. The expander piston 180 is sealed with respect to the inner wall of the anchor body section 113 by a seal ring 194, and with respect to the inwardly extending portion 188 thereof by a seal ring 195. A pressure communicating path to the upwardly facing transverse surface of the piston 180 is provided by the annular clearance 196 between the piston and the mandrel 111, by the clearance 197 between the shifting sleeve 72 and the mandrel, and by radial ports 198 through the wall of the sleeve 172 below the valve head 162. The ports 198 communicate with the bypass passage 159 which is open to the well bore below the packer

110 as described with reference to FIG. 1C. The downwardly facing transverse surfaces of the expander piston 180 located between the seals 195 and 194 are exposed to the pressure of fluids in the well annulus via the windows 175 in the anchor body 112. Accordingly, when the valve head 162 is in closed position, a greater fluid pressure below the packer 110 will act downwardly on an area equal to the difference in transverse areas circumscribed by the seals 194 and 195 to force the expander piston 180 downwardly and the slip elements 176 outwardly. Conversely, a greater fluid pressure in the annulus will retract the slip elements 176.

During running and retrieving, the slip elements 176 are positively held retracted because the upper end surface 199 of the shifting sleeve 172 engages the lower end surface 200 of the expander piston 180 to prevent downward movement of the expander piston. When the mandrel 111 is moved downwardly, however, to close the valve head 162 and set the packing elements 124, ample clearance is provided between the end surfaces 199 and 200 to enable operation of the expander piston 180.

It should be noted that when the valve head 162 is in closed position, fluid pressure forces thereon are balanced because the seal surfaces 164 and 164' circumscribe equal transverse areas. Thus fluid pressures cannot act to move the valve head 162 or the shifting sleeve 172 vertically. To open the valve head 162, the mandrel 111 is lifted upwardly. Normally the coil spring 167 will force the valve head 162 upwardly and enable equalization of pressures above and below the packing elements 124 before the holddown slips 176 are retracted. In any event, sufficient upward movement of the mandrel 111 will bring the shoulder 191 against the shifting sleeve shoulder 190 to elevate the sleeve and the expander piston 180 and return the parts to running-in positions.

As with the case of the embodiment disclosed in FIGS. 1 and 2, the packer shown in FIG. 3 has a long stroke mandrel, a balanced valve, and a mechanical interlock to lock the mandrel in its lower position where the bypass passage 159 is closed. Since various changes or modifications may be made in the disclosed embodiments without departing from the inventive concepts involved, it is the aim of the appended claims to cover all such changes or modifications falling within the true spirit and scope of the present invention.

I claim:

1. A well packer apparatus comprising: an anchor body; a mandrel movable within said anchor body between an upper position and a lower position relative thereto; normally retracted slip means mounted on said anchor body and adapted to be shifted to expanded position; hydraulically operable means movable between an upper position for retracting said slip means and a lower position for expanding said slip means; packing means surrounding said mandrel and including packing elements for sealing off a well bore; a fluid passage space extending between said packing means and said mandrel and between locations in communication with the well bore above and below said packing means; valve means on said mandrel movable longitudinally relative to said mandrel and to said anchor body and between an upper open position and a lower closed position with respect to said fluid passage space; first means coacting in the upper position of said mandrel for preventing downward movement of said hydraulically operable means to retain said slip means in retracted positions; and second means coacting in the lower position of said mandrel for moving said valve means to said closed position.

2. The well packer apparatus of claim 1 further including means for providing an upwardly directed bias force on said valve means in said closed position.

3. The well packer apparatus of claim 1 wherein said first means includes a shoulder on said mandrel engageable with said valve means to hold said valve means in its upper position, said valve means having a shoulder engaging said hydraulically operable means to hold said hydraulically operable means in its upper position.

4. The well packer apparatus of claim 1 wherein said second means includes a shoulder on said mandrel engageable with said valve means to force said valve means downwardly.

5. A well packer apparatus comprising: an anchor body; a mandrel movable within said anchor body between an upper position and a lower position relative thereto; packing means surrounding said mandrel and adapted to seal off a well bore; normally retracted slip means mounted on said anchor body and adapted for outward movement relative to said anchor body between extended and retracted positions; hydraulically operable means for moving said slip means outwardly; a fluid passage space extending longitudinally between said packing means and said mandrel between locations in communication with the well bore above and below said packing means; valve means on said mandrel and movable within said anchor body between an upper open position and a lower closed position with respect to said fluid passage space; and oppositely disposed shoulders on said mandrel in spaced relation to one another and adapted for alternate engagement with said valve means, one of said shoulders positioning said valve means in open position in the upper position of said mandrel and the other of said shoulders positioning said valve means in closed position in the lower position of said mandrel.

6. The well packer apparatus of claim 6 further including coengageable means coacting at the upper position of said mandrel for preventing operation of said hydraulic means to retain said slip means in retracted positions.

7. The well packer apparatus of claim 7 wherein said coengageable means includes a shoulder surface on said valve means engageable with a shoulder surface on said hydraulically operable means.

8. The well packer apparatus of claim 6 wherein said hydraulically operable means includes expander means movable between an upper position for retracting said slip means and a lower position for expanding said slip means, and further including coengageable means coacting at the upper position of said mandrel for holding said expander means in its upper position to positively retain said slip means in retracted position.

9. The well packer apparatus of claim 9 wherein said coengageable means includes an upwardly facing shoulder surface on said valve means engageable with a downwardly facing surface on said expander means.

10. A well packer apparatus comprising: an anchor body; a mandrel movable within said anchor body between an upper position and a lower position relative thereto; packing means surrounding said mandrel and adapted for sealing off a well bore; bypass means for bypassing fluid through said packing means; sleeve valve means movable relative to said anchor body and said mandrel and between an upper open position and a lower closed position with respect to said bypass means, said mandrel having longitudinally spaced, oppositely disposed shoulder surfaces alternately engageable with said sleeve valve means for positioning said sleeve valve means in open or closed position; slip means mounted on said anchor body and movable between an inner retracted position and an outer extended position; hydraulic means in said anchor body movable between an upper position for retracting said slip means and a lower position for extending said slip means; a seal sleeve extending along said mandrel and connected to said sleeve valve means, said hydraulic means including an expander piston sealingly slidable on said anchor body and said seal sleeve; means for feeding the pressure of fluids in said bypass means along a path interiorly of said valve sleeve means and said seal sleeve to a location above said expander piston to force said expander piston downwardly; and means coacting in the upper position of said mandrel for holding said expander piston in its upper position to selectively prevent outward movement of said slip means, said holding means being released by downward movement of said mandrel.

11. The well packer apparatus of claim 10 wherein said bypass means terminates at a location above said packing means in port means extending laterally through the wall of

said anchor body, said sleeve valve means and anchor body having seal means coengageable below said port in the closed position of said sleeve valve means.

12. The well packer apparatus of claim 10 further including bias means for providing an upward force on said sleeve valve means at the closed position of said sleeve valve means.

13. The well packer apparatus of claim 10 further including locking means for securing said mandrel to said anchor body in said lower position.

14. The well packer apparatus of claim 13 wherein said locking means includes lug means on said mandrel cooperable with channel means on said anchor body in the lower position of said mandrel.

15. A well packer apparatus comprising: an anchor body; a mandrel movable within said anchor body between an upper position and a lower position relative thereto; packing means surrounding said mandrel and adapted to seal off a well bore; by pass means for bypassing fluid through said packing means between locations above and below said packing means, said bypass means terminating at the location above said packing means in laterally extending port means through the wall of said anchor body; valve means including an annular member adapted for movement between an upper open position and a lower closed position with respect to said port means, said annular member in said lower position spanning and closing off said port means; longitudinally spaced and oppositely disposed shoulder surfaces on said mandrel alternately engageable with said valve means for moving said annular member between open and closed positions; slip means on said anchor body movable between inner retracted positions and outer extended positions; hydraulically operable means

movable between an upper position for retracting said slip means and a lower position for extending said slip means; and coengageable means coacting in the upper position of said mandrel for holding said hydraulically operable means in its upper position to prevent outward movement of said slip means.

16. The well packer apparatus of claim 15 further including releasable means on said mandrel and anchor body for securing said mandrel to said anchor body in said lower position where said valve means is in closed position.

17. The well packer apparatus of claim 16 wherein said hydraulically operable means includes a piston member sealingly slidable in cylinder means in said anchor body, said coengageable means including opposed shoulder surfaces on said piston member and said valve means.

18. The well packer apparatus of claim 17 further including means for feeding the pressure of fluids in said bypass means along said mandrel interiorly of said valve means and piston member to a location in said cylinder means above said piston member.

19. The well packer apparatus of claim 16 further including bias means for applying an upward force to said valve means in its closed position to assist in moving it to open position.

20. The well packer apparatus of claim 19 wherein said bias means comprises a spring surrounding said valve means above said annular member, the upper end of said spring being fixed to said valve means, the lower end of said spring being adapted to engage a shoulder on said anchor body to compress said spring during movement of said valve means to closed position.

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