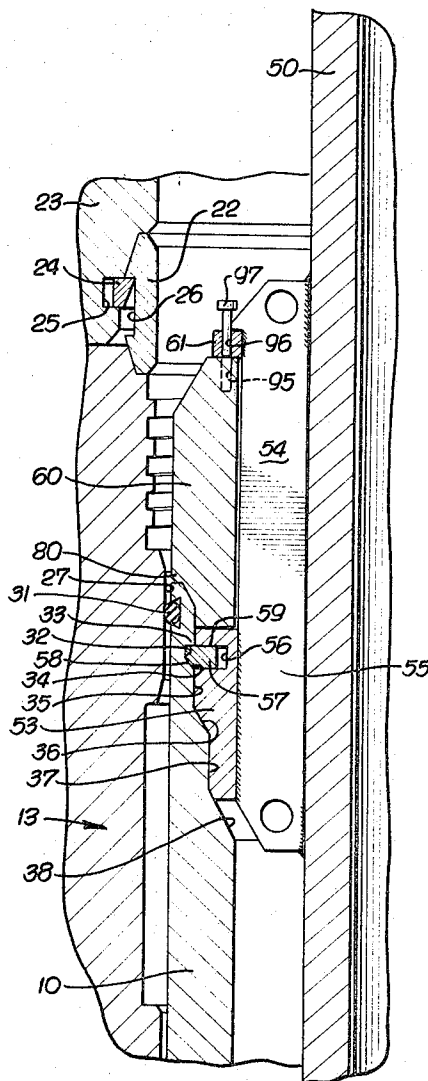


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WELL BORE RUNNING-IN AND RETRIEVING TOOL

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1

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WELL BORE RUNNING-IN AND RETRIEVING TOOL

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The present invention relates to oil and gas well apparatus, and more particularly to tools used in conjunction with well head devices.

In the drilling of oil and gas wells at an underwater site, a seat protector is installed in the well head housing located on or near the ocean floor. The drilling rig is above water, being mounted on a fixed platform arrangement or on a floating structure. A fixed platform can easily shift, due to settling of one or more of its supporting legs, while an anchored floating structure can still move up and down, from side to side, and in other lateral directions. Shifting or moving of the drilling rig, and running of the drill pipe in and out of the hole, can cause the drill string to rub on one side or another of the well head. To protect the seat and sealing surfaces inside the well head, a seat protector is used, which is also called a wear bushing or bowl protector. The seat protector remains in the well head housing or body as long as drilling is going on or tools are being run in and out of the well. It must be removed before the next casing and casing hanger are installed in the well bore and well head.

At the present time, most seat protectors are retrieved by use of a fishing spear, which usually has a shoulder limiting the engagement of the spear into the seat protector. The portion of the spear that projects inside the seat protector has teeth, either spring actuated, rotationally actuated, or hydraulically actuated, to grip the seat protector, which is retrieved by pulling up on the drill pipe running string.

In order to use a fishing spear, all drill pipe, drill collars, drill bits, etc. must first be removed from the well. The handling tools, etc. at the drilling rig are required to be changed from handling drill pipe to the handling of drill collars and to drill bits, after which the drill pipe handling equipment must be reinstalled to lower the fishing spear into the well head on drill pipe. When the fishing spear lands in the seat protector, it is necessary to manipulate its teeth, then pull the drill pipe, fishing spear and seat protector back to the rig, manipulate the fishing spear to release the seat protector, and remove the fishing spear from the drill pipe string. The time required to rig up to run drill pipe to manipulate the fishing spear, to latch on to the seat protector, and to release the seat protector from the spear is substantial and requires reduction or elimination, because of the large cost of operating an offshore rig, which presently is of the order of about \$10,000 to \$15,000 a day. Accordingly, a savings of even one hour of time on an offshore rig represents a saving of about \$500. In addition, the reduction of the time required to remove the seat protector also reduces the time for the casing to be lowered to the bottom of the hole, which minimizes the danger of sticking the casing in the well bore.

The main purpose or objective of the present invention is to reduce considerably the time for retrieving seat protectors from well heads, and to also provide equipment that allows protectors to be installed in well heads. The equipment can also effect a retrieving and running-in of a packer assembly used to provide a seal between a casing hanger and the surrounding well head housing or body. A changeover at the drilling rig from handling drill pipe to drill collars, and then back to handling drill pipe, is not required in connection with the use of the retrieving tool to remove the seat protector. Accordingly, substan-

2

tial savings in rig time are effected. The running-in and retrieving tool of the present invention can readily retrieve the seat protector and without requiring any significant rotation of the drill pipe string. When withdrawn to the top of the well bore, the seat protector, or the like, is easily released from the retrieving apparatus. The retrieving tool exerts no outward swedging force on the seat protector, or other devices retrieved from the well head, when coupled to the seat protector or other device, so as to avoid damage to the latter.

This invention possesses many other advantages, and has other purposes which may be made more clearly apparent from a consideration of a form in which it may be embodied. This form is shown in the drawings accompanying and forming part of the present specification. It will now be described in detail, for the purpose of illustrating the general principles of the invention; but it is to be understood that such detailed description is not to be taken in a limiting sense, since the scope of the invention is best defined by the appended claims.

Referring to the drawings:

FIGURE 1 is a longitudinal section through a casing hanger portion of a well head, with a running-in and retrieving tool connected to a seat protector, shown in side elevation;

FIG. 2 is an enlarged quarter longitudinal section through a portion of the running-in and retrieving tool latched to the seat protector;

FIG. 3 is a view similar to FIG. 1 illustrating the use of the running-in and retrieving tool in connection with a pack-off assembly or structure that effects a seal between inner and outer casing hanger bodies;

FIG. 4 is an enlarged partial fragmentary section through the torque pin and latch portions of the running-in and retrieving tool;

FIG. 5 is a cross-section taken along the line 5—5 on FIG. 3;

FIG. 6 is a cross-section taken along the line 6—6 on FIG. 3;

The well bore running-in and retrieving tool A is illustrated in the drawings in connection with a seat protector 10 and an actuating sleeve 11 of a pack-off assembly 12 used in connection with well head equipment that includes an outer housing or body 13 supporting an inner hanger body 14 on its seat 15 to support a string of casing B suspended therefrom and extending downwardly into a well bore (not shown). A lower lock ring 16 locks the inner hanger body 14 to the outer body 13 against upward movement. The actuator sleeve 11 is threadably mounted on the inner body 14 so that its rotation will have shortened and compressed a packing ring or sleeve 17 between inner and outer seal surfaces 18, 19 on the outer and inner bodies. An upper split lock ring 20 is mounted in an internal groove 21 in the outer body for locking a hanger body (not shown) to the body 13 when subsequently lowered into the latter. The upper end of the outer housing 13 is engaged by a seal ring 22 held downwardly in place by an adapter portion 23 of a suitable coupling device, the seal ring being supported in the adapter by a split retainer ring 24 mounted in an internal groove 25 in the adapter and extending into an external groove 26 in the seal ring.

The seat protector 10 extends across the upper lock ring 20 and across seal surfaces 27 in the outer body or housing and is releasably secured to the actuator sleeve 11 by radial lock or torque pins 28 on the lower portion of the seat protector or bushing extending into inverted T-slots 29 in the upper portion of the actuator sleeve, the vertical legs of the T-slots opening through the upper end 30 of the actuator sleeve. The upper portion of the seat protector 10 carries a suitable seal ring 31 sealing against a companion internal surface 27 in the outer

housing 13. This seat protector also has an internal groove 32, the upper side 33 of which is normal or at right angles to the axis of the protector, its lower side 34 tapering downwardly and inwardly to an inner cylindrical wall 35, which, in turn, terminates at a second tapered surface 36 that extends downwardly and inwardly into another internal cylindrical surface 37 of the seat protector, terminating at a lower surface 38 tapering downwardly and inwardly to an elongate cylindrical surface 39 of the seat protector. The seat protector has J-slots 40 therein opening through its cylindrical surface 37 above the lower tapered wall 38, the legs 41 of the J-slots opening through the intermediate tapered seat protector surface 36.

The running-in and retrieving tool A is used for retrieving the seat protector 10 or for running it to its position within the housing 13, for releasing the actuator sleeve 11 by rotating it to the left, so as to release the pack-off assembly 12 and remove it from the well head, or for running the same or another actuator sleeve and pack-off assembly into the well head to effect a pack-off between the internal and external well head surfaces 18, 19. As shown, it includes a central mandrel 50, which may actually be a short section of drill pipe, having an upper threaded box 51 for threaded attachment to drill pipe C thereabove and a lower threaded pin 52 for threaded attachment to drill pipe C therebelow. This last-mentioned drill pipe will normally have drill collars and a drill bit extending therebelow. To the mandrel 50 is secured a lower ring or sleeve 53 by means of intervening elongate radially arranged spokes or ribs 54, which are welded to the exterior of the mandrel and to the interior of the ring, and which project a substantial distance above the upper end of the ring 53. The radial ribs 54 extending between the mandrel and ring provide large by-pass fluid passages 55 therebetween to avoid a swabbing action from occurring during removal of the seat protector 10, or other device, from the well head 13.

The sleeve has a peripheral groove 56 therein in which a split inherently expansible latch ring 57 is mounted. This ring has an outer lower beveled corner 58, its upper surface 59 being normal to the axis of the mandrel, the ring being so dimensioned as to be expandable outwardly into the groove 32 of the seat protector for the purpose of coupling the retrieving apparatus A to the seat protector when lowered thereinto.

At the drilling rig, the ring 57 can be contracted from the internal seat protector groove 32 to effect its release from the protector 10 through use of a turnable sleeve 60 that surrounds the ribs 54 above the lower sleeve 53 and which is confined against substantial longitudinal movement thereon by an upper stop ring 61 welded or otherwise suitably secured to the outer portions of the ribs or spokes 54. This sleeve has a key 62 welded or otherwise suitably secured to its lower end, projecting downwardly into a space 63 in the ring 53 opening into its external groove 56. One end 62a of the key 62 engages a pin 64 secured to and projecting upwardly from the expansible ring 57 at one end of its split, the ring 57 having another pin 65 secured thereto at the opposite end of its split and projecting downwardly into an inclined groove 66 in the sleeve 53 opening into the lower side of the peripheral groove 56 containing the latch ring. The end 62a of the key engaging the pin 64 is inclined to form a cam surface; whereas, the groove 66 is also inclined to form a cam device, such that turning of the ring or sleeve 60 will cause the key 62 to engage the pin 64 and shift it toward the other pin 65 and cause the pin 65 to ride inwardly within its inclined slot or groove 66, so as to contract the ring 57 fully within its peripheral groove 56 in the ring 53, the latch ring no longer projecting outwardly of the ring 53. To facilitate turning of the sleeve 60, it may be provided with a suitable slot 68 for reception of a lever bar or other tool (not shown).

The fixed sleeve 53 carries torque pins 69 below the latch ring 57, which can yieldably shift radially of the mandrel 50 and sleeve 53. As disclosed, a plurality of circumferentially spaced radial shields or housings 70 extend inwardly from the exterior of a reduced diameter portion 71 of the sleeve to the mandrel 50, these housings being suitably secured to the ring 53, as by use of welding material 72. A torque pin 69 projects from each shield or housing, being urged outwardly by a helical compression spring 73 in the shield, with its inner end bearing against the mandrel 50 and its outer end bearing against a pin flange 74, the extent of outward shifting of each torque pin being limited by engagement of the flange with a shield shoulder 75. The torque pins 69 can shift inwardly of their shields 70 against the force of the springs 73 so as to be movable past certain portions of the seat protector 10 when the tool is used in connection therewith. However, they are spaced below the latch ring 57 a distance corresponding to the distance between the internal groove 32 and horizontal portions of the J-slots 40 in the seat protector, which enables the pins 69 to fit in the J-slots simultaneously with the reception of the latch ring 57 in the seat protector groove 32.

When the tool A is used in connection with the actuator sleeve 11, the spring-pressed pins 69 will be located in alignment with the horizontal portions of the inverted T-slots 29, by virtue of being spaced the appropriate distance below a shoulder 78 on the sleeve 53, which corresponds to the distance between the upper end of the actuator sleeve 11 and the horizontal portions of the T-slots 29. Thus, engagement of this shoulder 78 with the upper end of the actuator sleeve will align the pins 69 with the horizontal portions of the inverted T-slots.

Assuming it is desired to retrieve a seat protector 10 from the well head housing 13, the running-in and retrieving tool A need merely be secured to the drill pipe C, or other running string, and lowered through the equipment extending between the well head adapter 23 and the drilling rig. The yieldable torque pins 69 do not project outwardly sufficiently to engage the upper end of the seat protector, and when they engage the intermediate tapered surface 36 of the seat protector, they will be cammed inwardly. The lower beveled or tapered corner 58 of the latch ring will engage the upper end of the seat protector and be contracted automatically inwardly within its peripheral groove 56, allowing the tool to move down into the seat protector 10 until a shoulder 80 on the turnable sleeve 60 engages the upper end of the seat protector, or the sleeve 53 rests on the shoulder 36 of the seat protector, at which time the inherently expandable latch ring 57 will be opposite its companion internal groove 32 in the seat protector and will snap outwardly into the latter. The torque pins 69 will be in circumferential alignment with the horizontal portions of the J-slots 40, so that turning of the drilling string C and the mandrel 50 will turn the entire tool A with respect to the protector 10 until the pins 69 snap into the horizontal portions of the J-slots. The tool has now been fully coupled to the seat protector 10, but the latter cannot be removed until the torque pins 28 connecting it to the actuator sleeve 11 are aligned with the vertical leg portions of the inverted T-slots 29. Accordingly, a turning effort is imposed on the string of drill pipe C and the tool A, such turning effort being transmitted from the yieldable torque pins 69, which are now disposed in the J-slots 40, to the seat protector 10, shifting the seat protector to a position relative to the actuator sleeve 11 in which the torque pins 28 are aligned with the vertical legs of the T-slots, whereupon a straight-line pull taken on the string of drill pipe C will elevate the tool A, with the seat protector 10 connected thereto, from the housing 13, and through the apparatus connected to the adapter 23, to the drilling rig.

Upon arrival at the drilling rig, the lower section of drill pipe C below the tool A can be supported in the usual equipment in the table at the rig floor and the mandrel 50

unscrewed therefrom. A bar or other suitable tool can now be inserted in the slot 68 of the sleeve 60, which is then turned to cause its key 62 to engage the pin 64 at one end of the latch ring 57, shifting it circumferentially and causing the other pin 65 to ride inwardly within its inclined groove 66 to contract the latch ring 57 fully within the peripheral groove 56 and completely out of the internal groove 32 of the seat protector. The seat protector 10 can be turned in the appropriate direction to align the vertical legs 41 of the J-slots 40 with the torque pins 69, whereupon the seat protector 10 is easily moved downwardly completely free of the retrieving tool A.

The mandrel 50 can be disconnected from the drill pipe section C thereabove and this section can then be reconnected to the drill pipe section C previously attached to the lower end of the mandrel, and elevation of the drill pipe, drill collars, and drilling bit continued in the usual manner.

If desired, a seat protector 10 can be installed through use of the running-in and retrieving tool A. It is necessary to retract the latch ring 57 and retain it in such retracted condition. This is readily accomplished by turning the sleeve 60 to retract the ring 57 and by then locking the sleeve 60 with respect to the mandrel 50. When the sleeve is turned, a vertical bore 95 therein will be aligned with a hole 96 in the upper stop ring 61. A lock pin 97 can then be inserted through the aligned hole 96 and bore 95 to prevent return rotation of the sleeve 60 relative to the stop ring 61 and the mandrel 50. As a result, the ring 57 will be retained in its retracted position, disposed fully within the peripheral groove 56 in the lower ring 53.

The running-in tool A is then lowered, its yieldable pins 69 shifting inwardly as they move within the seat protector 10. When the tool shoulder 80 engages the upper end of the seat protector, the yieldable torque pins 69 are aligned with the horizontal portions of the J-slots 40, whereupon a relative turning of the tool with respect to the seat protector will cause the pins 69 to slide around the surface 37 and snap outwardly into the horizontal portions of the J-slots. The seat protector 10 can now be lowered from the drilling rig and through the marine conductor pipe, blowout preventers, and the like, usually connected between the drilling rig and the well head, and into its position within the outer housing or body 13. The seat protector 10 is turned to align its pins 28 with the vertical legs of the T-slots 29 in the actuator sleeve 11, whereupon it is lowered a slight distance to shift into such legs, the turning of the drill pipe string C, the tool A, and seat protector then placing the pins 28 in a locked position within the horizontal portions of the T-slots. The continued application of torque to the drill pipe C and the tool A will cause the yieldable pins 69 to engage the ends of the horizontal J-slot in alignment with the vertical slot portions 41, whereupon a straight upward pull taken on the drill pipe elevates the tool A out of and from the seat protector 10, the tool then being withdrawn by the drill pipe C to the drilling rig.

The tool can be used, if desired, to tighten the pack-off assembly 12, or to remove the pack-off assembly or structure from the well head. As disclosed in FIG. 3, the seat protector 10 is assumed to be out of the well head 13. The tool A is lowered by means of the drill pipe C into the well head and its pins 69 shifted in through the vertical legs of the inverted T-slots 29 and into the horizontal portions of the T-slots. Additional torque can then be transmitted from the drilling rig to the mandrel 50, spokes 54 and ring 53 to the pins 69, which will shift to one end of the T-slots and allow the actuating sleeve 11 to rotate and be threaded downwardly along the inner hanger body 14, further compressing the elastic packing ring 17 more fully against the inner and outer sealing surfaces 18, 19. The tool A can be disconnected from the actuating sleeve 11 by turning the drill pipe and the tool toward the vertical legs of the T-slots 29, while taking a slight upward pull on the tool. When the vertical legs are reached, the

pins 69 snap through such slot portions, whereupon the tool can be elevated to the drilling rig.

The tool A can also be used in connection with removing the packer assembly 12 in the event it leaks so as to permit another packing assembly to be substituted in its place. As shown in FIG. 3, the drill string C will be lowered, preferably with its joints strapped together to prevent their inadvertent unthreading from one another, and the tool A connected to the sleeve 11. The drill string and tool are turned to the left which will cause the torque pins 69 in the T-slots to transmit left-hand rotation to the actuating sleeve 11 and unthreaded upwardly from the inner hanger body 14, carrying the packing structure or assembly 12 upwardly with it. The upper end 99 of the actuator sleeve 11 can be beveled to allow it to ride past the upper lock ring 20.

The above-noted removal of the packing structure 12 can occur with the seat protector 10 coupled to the actuating sleeve 11 merely by coupling the tool A to the seat protector 10 and with its pins 69 disposed in the J-slots 40, whereupon left-hand rotation of the drill pipe C and tool A will effect left-hand rotation of the seat protector 10 and of the actuating sleeve 11 to unthread the latter from the inner body member 14.

The tool A can be used for running-in a new packer assembly mounted on the actuator sleeve 11, which can be connected to a seat protector 10, the seat protector being coupled to the tool A, which is then lowered by means of the drill pipe C from the drilling rig into the well head 13. The actuating sleeve 11 will engage the upper end of the inner hanger body 14, whereupon right-hand rotation of the drill pipe and tool will effect right-hand rotation of the seat protector 10 and actuating sleeve 11 to thread the latter downwardly of the body 14 and again compress a packing structure or sleeve 17 in sealed relation against the inner and outer sealing surfaces 18, 19 of the inner and outer hanger bodies 14, 13. When used in this manner, the expansible latch ring 57 will have been locked in retracted position as by use of the pin 97, which will then allow the tool pins 69 to be readily released from the J-slots 40 and the tool A removed from the well head.

If desired, the actuating sleeve 11 and packing assembly 12 itself can be connected directly to the tool A and lowered on the drill pipe C into the well head. When the actuating sleeve 11 engages the upper end of the inner hanger body 14, the drill string C, tool A, and actuating sleeve 11 are rotated to the right to thread the actuating sleeve downwardly along the body 14 and again compress the packing sleeve 17 into sealing relation against the inner and outer sealing surfaces 18, 19. The tool C is again released from the T-slots 29 and elevated to the drilling rig.

It is, accordingly, apparent that the seat protector or wear bushing 10 can be retrieved whenever desired with a substantial savings in time, since it is unnecessary to first pull all of the equipment, including the drill collars and drill bit, out of the well bore and up to the drilling rig. Before any drill collars reach the rig floor, a section of drill pipe thereabove can be suitably supported at the drilling rig and the tool A threaded thereto, whereupon additional drill pipe C can be connected to the upper end of the mandrel 50, and the combination lowered toward the well head 13 to place the tool into latching and coupling relation to the seat protector, as disclosed in FIG. 1. There is no necessity for making any changeovers at the drilling rig for the purpose of handling and removing the drill collars and the drill bit, and then changing back to the handling of drill pipe, for the purpose of lowering a retrieving tool into the well bore by means of drill pipe.

The seat protector 10 can be removed without any significant rotation since the latch ring 57 automatically becomes coupled thereto, and it is only necessary to turn the drill string and tool a slight distance to align the seat protector pins 28 with the legs of the inverted T-slots 29 provided in the actuator sleeve 11. After the seat pro-

ector 10 has been lifted to the drilling rig, it is easily released from the tool by turning the sleeve 60 and causing the key 62 and cam slot or groove 66 to contract the expandable ring 57 to a smaller diameter in which it is completely removed from the internal groove 32 in the seat protector. In coupling the tool A to the seat protector 10, there are no outward swedging forces imposed on the latter, since the ring 57 readily contracts and then expands outwardly into the groove 32. Similarly, the spring-pressed pins 69 shift readily inwardly and will then expand outwardly into the J-slots 40. As a result, no damage is imposed upon the seat protector 10. The tool A can be used in connection with other devices, such as the packing structure 12 illustrated in the drawings, both for retrieving such devices and for running them in and placing them in their appropriate positions in the well head.

I claim:

1. In apparatus for retrieving or running-in a well bore device: a supporting structure having connecting means thereon for connecting said structure to a running string; expandable and contractable latch means on said supporting structure adapted for coupling to the well bore device upon lowering of said supporting structure on the running string to the well bore device; and means disposed on said supporting structure during lowering of said supporting structure on the running string and engageable with said latch means to retract and release said latch means from the well bore device, said retracting and releasing means being rotatably mounted on said supporting structure and rotated thereon to retract said latch means from the well bore device.

2. In apparatus for retrieving or running-in a well bore device: a supporting structure adapted for connection to a running string; expandable and contractable latch means on said supporting structure adapted for coupling to the well bore device; means on said supporting structure for releasing said latch means from the well bore device; wherein said latch means comprises an inherently expandable split ring expandable outwardly into coupling relation to the well bore device; and said means on said supporting structure comprises means rotatable on said structure for contracting said ring to release said ring from coupling relation to the well bore device.

3. In apparatus for retrieving or running-in a well bore device: a supporting structure adapted for connection to a running string; expandable and contractable latch means on said supporting structure adapted for coupling to the well bore device; means on said supporting structure for releasing said latch means from the well bore device; wherein said latch means comprises an inherently expandable split ring expandable outwardly into coupling relation to the well bore device; and said releasing means comprises a sleeve turnable on said structure, and means on opposite end portions of said ring at opposite ends of its split engaging said sleeve and said supporting structure for contracting said ring upon turning of said sleeve on said structure to release said ring from coupling relation to the well bore device.

4. In apparatus for retrieving or running-in a well bore device: a supporting structure adapted for connection to a running string; expandable and contractable latch means on said supporting structure adapted for coupling to the well bore device; means on said supporting structure for releasing said latch means from the well bore device; wherein said latch means comprises an inherently expandable split ring expandable outwardly into coupling relation to the well bore device; and said releasing means comprises pins on said ring at opposite ends of its split, a cam groove in said structure receiving one of said pins, and a sleeve turnable on said structure and having means engaging the other of said pins, whereby turning of said sleeve on said structure contracts said ring and releases said ring from coupling relation to the well bore device.

5. In apparatus for retrieving or running-in a well bore device: a supporting structure adapted for connection

to a running string; expandable and contractable latch means on said supporting structure adapted for coupling to the well bore device; means on said supporting structure for releasing said latch means from the well bore device; wherein said latch means comprises an inherently expandable split ring expandable outwardly into coupling relation to the well bore device; and said releasing means comprises pins on said ring at opposite ends of its split, a cam groove in said structure receiving one of said pins, and a sleeve turnable on said structure and having means engaging the other of said pins, whereby turning of said sleeve on said structure contracts said ring and releases said ring from coupling relation to the well bore device; and means for locking said sleeve to said structure in a position retaining said ring contracted.

6. In apparatus for retrieving or running-in a well bore device: a supporting structure adapted for connection to a running string; expandable and contractable latch means on said supporting structure adapted for coupling to the well bore device; means on said supporting structure for releasing said latch means from the well bore device; wherein said latch means comprises an inherently expandable split ring expandable outwardly into coupling relation to the well bore device; means rotatable on said structure; and means on opposite ends of said ring at opposite ends of its split engaging said rotatable means and said supporting structure for contracting said ring upon rotation of said rotatable means on said structure to release said ring from coupling relation to the well bore device.

7. In apparatus for retrieving or running-in a well bore device: a supporting structure adapted for connection to a running string; expandable and contractable latch means on said supporting structure adapted for coupling to the well bore device; means on said supporting structure for releasing said latch means from the well bore device; wherein said latch means comprises an inherently expandable split ring expandable outwardly into coupling relation to the well bore device; and said releasing means comprises pins on said ring at opposite ends of its split, a cam groove in said structure receiving one of said pins, and means shiftable on said structure and having means engaging the other of said pins, whereby shifting of said shiftable means on said structure contracts said ring and releases said ring from coupling relation to the well bore device.

8. In apparatus for retrieving or running-in a well bore device: a mandrel adapted for connection to a tubular running string; an annular member secured to said mandrel and having a peripheral groove; an inherently expandable split ring in said groove expandable partially outwardly thereof into coupling relation to the well bore device when inserted therewithin; pins on said ring at opposite ends of its split; said annular member having a cam groove receiving one of said pins; means shiftable with respect to said mandrel and engaging the other of said pins, whereby shifting of said shiftable means relative to said mandrel contracts said ring and releases said ring from coupling relation to the well bore device.

9. In apparatus as defined in claim 8; wherein said shiftable means comprises a sleeve turnable on said mandrel.

10. In apparatus as defined in claim 8; and pins projecting from said annular member and adapted for reception in companion slots in the well bore device.

11. In apparatus as defined in claim 8; radial pins slidable in said annular member; and yieldable means urging said radial pins partially outwardly of the periphery of said annular member.

12. In apparatus as defined in claim 1; and pins separate from said latch means projecting from said supporting structure and adapted for reception in companion slots in the well bore device.

13. In apparatus as defined in claim 1; radial pins separate from said latch means slidable in said supporting structure; and yieldable means urging said radial pins

partially outwardly of said supporting structure for reception in companion slots in the well bore device.

14. In apparatus for retrieving or running-in a well bore device: a supporting structure adapted for connection to a running string; expansible and contractable latch means on said supporting structure adapted for coupling to the well bore device; means on said supporting structure for releasing said latch means from the well bore device; wherein said latch means comprises an inherently expansible split ring expandable outwardly into coupling relation to the well bore device; and said releasing means comprises pins on said ring at opposite ends of its split, a cam groove in said structure receiving one of said pins, and a sleeve turnable on said structure and having means engaging the other of said pins, whereby turning of said sleeve on said structure contracts said ring and releases said ring from coupling relation to the well bore device; radial pins slidable in said supporting structure; and yieldable means urging said radial pins partially outwardly of said supporting structure for reception in companion slots in the well bore device.

15. In apparatus for retrieving or running-in a well bore device: a supporting structure adapted for connection to a running string; expansible and contractable latch means on said supporting structure adapted for coupling

to the well bore device; means on said supporting structure for releasing said latch means from the well bore device; wherein said latch means comprises an inherently expansible split ring expandable outwardly into coupling relation to the well bore device; and said releasing means comprises pins on said ring at opposite ends of its split, a cam groove in said structure receiving one of said pins, and means shiftable on said structure and having means engaging the other of said pins, whereby shifting of said shiftable means on said structure contracts said ring and releases said ring from coupling relation to the well bore device; radial pins slidable in said supporting structure; and yieldable means urging said radial pins partially outwardly of said supporting structure for reception in companion slots in the well bore device.

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