May 23, 1972 J. W. E. HANES 3,664,689

SELECTIVELY LOCKABLE CASING HANGER

Filed Aug. 14, 1969

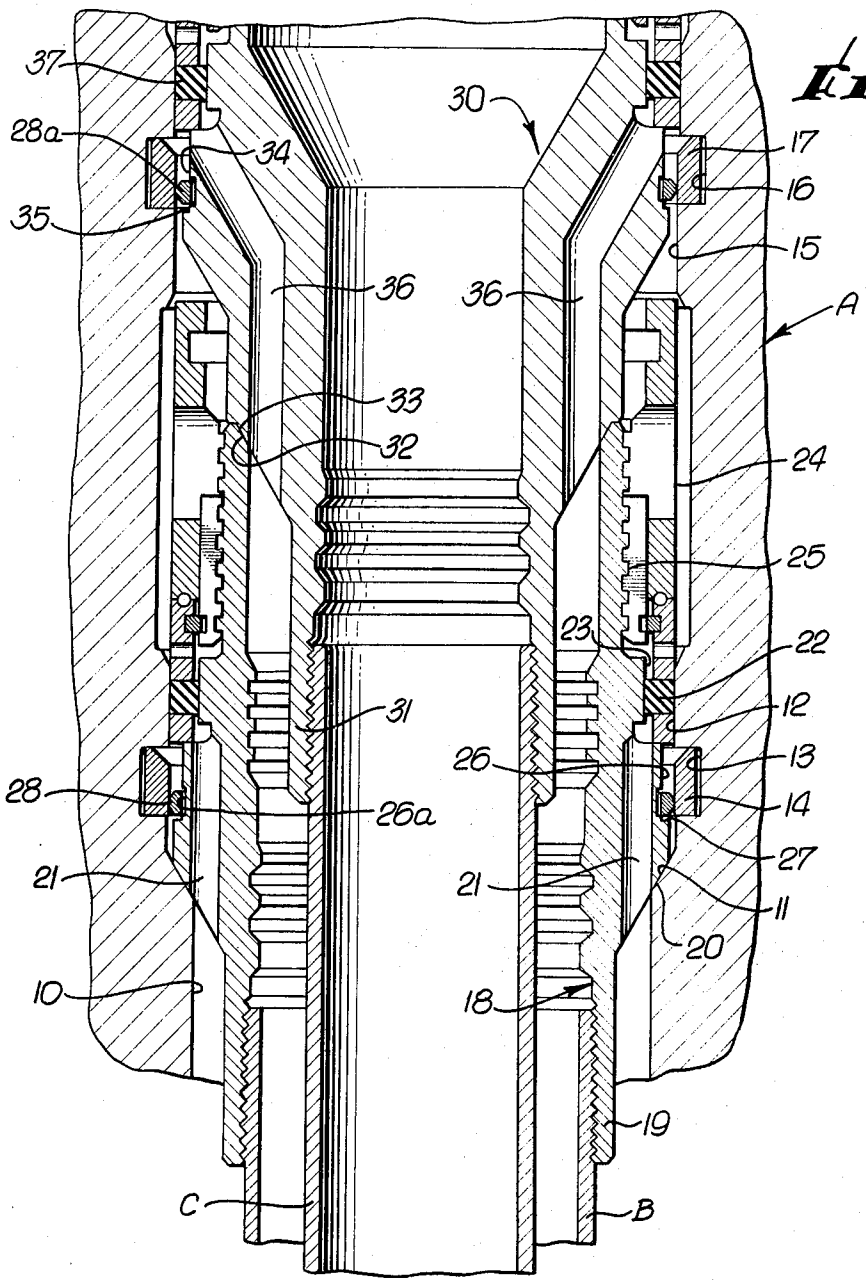


FIG. 1.

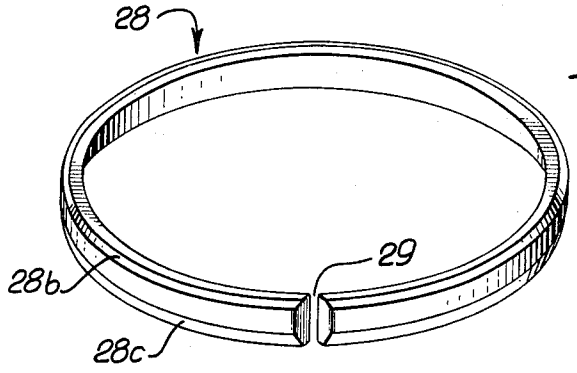


FIG. 2.

INVENTOR.
JAMES W. E. HANES
By Bernard Kriegel
ATTORNEY.

United States Patent Office 3,664,689 Patented May 23, 1972

3,664,689

SELECTIVELY LOCKABLE CASING HANGER

James W. E. Hanes, Ventura, Calif., assignor to Vetco Offshore Industries, Inc., Ventura, Calif.

Filed Aug. 14, 1969, Ser. No. 850,194
Int. Cl. F16l 35/00
U.S. Cl. 285—18 8 Claims

ABSTRACT OF THE DISCLOSURE

Casing hanger apparatus for hanging a well casing string from underwater well head apparatus, in which a lock ring engageable with a shoulder on the casing hanger, to lock the casing hanger in place, can be held from engaging the shoulder by a filler ring which is removably disposed on the casing hanger body. The filler ring is removed if the lock ring is to be permitted to function. Thus, the presence or absence of the filler means renders the lock ring selectively inoperable or operable, permitting easy removal of the casing hanger or its locking in place.

In the drilling of wells, such as oil and gas wells from a platform or vessel, it is sometimes the practice to land a well head housing on the bottom of the body of water and to drill the well through the housing. As the well progresses, a number of strings of well casing may be hung from the well head housing, with the casing strings extending into the well bore. Conventionally, means for locking the respective casing hangers in the well head housing are carried by the well head housing and automatically interlock with the casing hanger to lock the latter down when the casing hanger is landed either in the well head housing or on a previously installed casing hanger.

Under some circumstances, it is desirable that a string of casing not be locked down, but this desirability does not evidence itself until after the housing or previously installed casing hanger has been run and set in place. As a result, if the lock ring is present in previously installed equipment, the next casing hanger will be locked in place, although it is later determined that locking should not occur. Conversely, if the lock ring is omitted, the next casing hanger cannot be locked in place, despite the fact that its locking becomes desirable.

The present invention provides casing hanger means of the type adapted to be locked down when landed in the well head housing, in which the locking device can be rendered ineffective, so that the casing hanger is not locked down. Instead, the casing hanger remains free to be pulled upwardly when desired from its landed position. If desired, the locking device can be permitted to remain effective, capable of functioning in its normal manner.

More particularly, casing hangers of the type herein involved include an upwardly facing annular shoulder adapted to be automatically engaged by a resilient, inherently contractible lock ring carried by the well head housing, or other previously installed hanger device. Since the lock ring for each casing hanger is carried by the well head housing or other hanger device, and the well head housing or other device must be landed at the bottom of the water before drilling commences, there has heretofore been no option respecting the locking of the casing hanger in the well head housing or other device when the casing hanger lands therein. However, in accordance with the present invention, a filler ring, or the like, can be readily mounted on the casing hanger adjacent to its upwardly facing lock down shoulder, to prevent contraction of the lock ring to its locking position over the shoulder, the lock ring being held in an ineffective position by the filler ring. Such filler ring, if initially installed on the casing hanger, may be removed prior to lowering of the casing hanger from the drilling rig, to permit the casing hanger to be locked down, if desired. On the other hand, if the filler ring is not initially mounted on the casing hanger, it may be installed prior to the running of the casing hanger, if it is desired that the casing hanger is not to be locked down. Thus, the present invention provides apparatus comprising a casing hanger which may be optionally locked down or not, as may be required by the prevailing circumstances, despite the presence of a lock ring, or the like, in a previously installed device in which the casing hanger is to be disposed.

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.

Referring to the drawings:

FIG. 1 is a vertical section through well head and casing hanger apparatus embodying the present invention; and

FIG. 2 is an isometric view of a filler ring for use in the apparatus of FIG. 1.

As seen in the drawings, the apparatus includes a well head housing A, which will be understood without need of further illustration to be of the type adapted to be located at the bottom of a body of water and to support a plurality of casing strings B, C which extend downwardly in a well bore (not shown). A more complete illustration and description of this type of equipment will be found in the United States application of Arthur G. Ahlstone, Ser. No. 503,561, filed Oct. 23, 1965, for "Well Bore Casing Hanger Apparatus," now Patent No. 3,492,026.

More particularly, the well head housing A has a lower bore **10**, at the upper end of which is an upwardly and outwardly inclined tapered seat **11**. Above the seat **11**, the housing has a cylindrical bore **12** and a circumferential internal groove **13** opening into such bore and receiving the usual split, inherently contractible lock down ring **14**. The bore **12** continues uwardly from the groove **13** and has an upper portion **15** into which a second annular housing groove **16** opens, adapted to receive a second split, inherently contractible lock down ring **17**. These lock down rings **14** and **17** are expandible fully into their respective grooves and are contractible into locking engagement with casing hangers in the usual casing hanger apparatus, so as to lock the hangers and strings of casing carried thereby, such as casing strings B and C, against upward movement.

In the present invention, the casing string B is supported by a casing hanger body **18**, the body **18** having a depending internally threaded skirt **19** to which the casing string B is threadedly connected. The hanger body **18** has an outwardly and upwardly extended landing surface **20** adapted to seat upon the shoulder **11** of the well head housing A so as to support the casing string B in the well bore.

The casing hanger **18** includes suitable passages **21** through which circulating fluid and cementitious material are adapted to flow prior to expansion of an elastic packing ring or seal **22** into sealing engagement between the wall of the bore **12** of the well head housing A and an outer cylindrical surface **23** of the casing hanger body

18. Such expansion of the packing ring 22 is effected by rotation of an actuator sleeve 24 which threads downwardly along the hanger body 18 by virtue of a threaded interconnection 25. The actuator sleeve 24 and its mode of expansion of the packing ring or sleeve 22 form no part of the invention and need no further description herein, being fully described in the above patent application.

Intermediate the landing surface 20 and the cylindrical sealing surface 23, the casing hanger body 18 is provided with a reduced diameter cylindrical outer wall 26 providing an upwardly facing outwardly extended shoulder 27. Ordinarily, immediately prior to landing of the hanger body in the well head housing A, the tapered seating surface 20 engages and expands the lock ring 14 outwardly in the groove 13 in the housing A. When the landing surface 20 engages the shoulder 11, the shoulder 27 is slightly below the ring 14, the lock ring 14 inherently contracting across the shoulder 27, while remaining partially in its groove to prevent upward movement of the hanger body 18 within the well head housing A. However, in accordance with the present invention, an inherently contractible, split filler ring 28, shown in detail in FIG. 2, may be disposed partially in an external circumferential groove 26*a* extending inwardly from the cylindrical surface 26 of the casing hanger body 18, the ring 28 engaging and holding the lock ring 14 in an expanded condition to prevent its contraction over the hanger body shoulder 27 when the hanger body lands in the shoulder 11. As a result, the hanger body is not locked in place and may be later elevated from the housing A together with the casing string B.

As best illustrated in FIG. 2, the filler ring 28 has a split 29 so as to be an elastic expandible and inherently contractible member, allowing it to be expanded and slipped over the cylindrical surface 26 of the hanger body 18 and its contraction into the shallow groove 26*a*. The filler ring 28 may either be mounted initially in the groove 26*a* of the hanger body 18, under which circumstances the filler ring 28 may be removed therefrom, if it is desired that the casing hanger body 18 is to be locked down in the well head housing A; or alternatively, the filler ring 28 may be separately provided and installed over the cylindrical surface 26 and in the groove 26*a* of the casing hanger 18, if it is desired that the latter is not to be locked down in the well head housing A. In either event, the use of the filler ring 28 is optional, so that the casing hanger body 18 may be rendered free for upward movement following landing of the casing hanger in the well head housing A, if circumstances dictate that the casing hanger not be locked down. Thus, despite the presence of the lock ring 14 in the previously installed hanger housing A, it may be allowed to remain in its effective condition or rendered ineffective through use of the filler ring 28, at the selection of the well operator.

In the illustrative embodiment, the apparatus also includes an upper casing hanger body 30 having a depending skirt 31 threaded connected to the inner casing string C. This inner casing hanger body 30 includes an outwardly tapered seating surface 32 adapted to land on the upper end 33 of the outer casing hanger body 18. Here again, the casing hanger body 30 has a cylindrical surface 34 and a lock shoulder 35, which, in the absence of an optional filler ring 28*a* on the cylindrical body section 34, is adapted to be engaged by the lock ring 17, when the casing hanger body 30 lands upon the casing hanger body 18. Like the casing hanger body 18, the body 30 includes fluid passages 36 and packing means 37 enabling the conducting of cementing operations and sealing of the body 30 against the housing A.

In the illustrative embodiment, the filler rings 28 and 28*a*, of which the ring 28 of FIG. 2 is representative, are provided with outer peripheral surfaces including opposite directed outer beveled walls or corners 28*b* and 28*c* at the juncture of the top and bottom surfaces of the ring with the outer peripheral surface thereof. Thus, the filler rings are reversibly applicable to the casing hanger body and the surfaces 28*b* and 28*c* are adapted to engage the lock ring 14 or 17 to cam the lock ring outwardly as the filler ring moves into the lock ring.

It is apparent that the present invention provides casing hanger apparatus which is selectively lockable in the well head housing structure, requiring simply the application of a filler device or ring or the removal of the filler ring, depending upon whether the casing hanger is to be locked down or is to be allowed to be removed upwardly from the well head housing.

I claim:

1. In casing hanger apparatus for supporting a string of well casing in a well bore, a well head housing having a bore and a landing seat, a casing hanger body adapted to be landed on said seat in said bore, and selectively operable means for locking said hanger body against upward movement in said bore after being landed therein on said seat or for allowing such upward movement from said seat, said selectively operable means including a resilient lock ring carried by said housing and contractible into said bore, means on said housing engaging said lock member to prevent its upward removal from said housing, said hanger body having an upwardly facing shoulder engageable by said lock ring upon movement of said hanger body downwardly through said lock ring and contraction of said lock ring, and means removably carried by said hanger body and engageable with said lock ring to prevent contraction of said lock ring to its locking position as said casing hanger body is landed on said seat.

2. In casing hanger apparatus for supporting a string of well casing in a well bore, a well head housing having a bore, a casing hanger body adapted to be landed in said bore, and selectively operable means for locking said hanger body against upward movement in said bore after being landed therein or for allowing such upward movement, said selectively operable means including a resilient lock ring carried by said housing and contractible into said bore, said hanger body having an upwardly facing shoulder engageable by said lock ring upon movement of said hanger body downwardly through the lock ring and contraction of said lock ring, and a fiiller member carried by said hanger body above said shoulder to engage said lock ring and prevent contraction of said lock ring to its locking position above said shoulder, and means for preventing movement of said filler ring relative to said hanger body out of engagement with said lock ring.

3. In a casing hanger apparatus for supporting a string of well casing in a well bore, a well head housing having a bore, a casing hanger body adapted to be landed in said bore, and selectively operable means for locking said hanger body against upward movement in said bore after being landed therein or for allowing such upward movement, said selectively operable means including a resilient lock ring carried by said housing and contractible into said bore, said hanger body having an upwardly facing shoulder engageable by said lock ring upon movement of said hanger body downwardly through the lock ring and contraction of said lock ring, and a filler ring removably carried by said hanger body above said shoulder to engage said lock ring and prevent contraction of said lock ring to its locking position above said shoulder, said filler ring being split and contractible onto said hanger body above said upwardly facing shoulder, and means for preventing movement of said filler ring relative to said hanger body out of engagement with said lock ring.

4. In a casing hanger apparatus as defined in claim 3, said filler ring having a beveled corner at the juncture of the lower face of the filler ring with its outer peripheral face.

5. In a casing hanger apparatus as defined in claim 3, said filler ring having beveled corners at the juncture of

the upper and lower faces of the filler ring with its outer peripheral face.

6. In selectively lockable casing hanger apparatus, a well head housing having a bore and a resilient lock ring carried by said housing and contractible into said bore, a casing hanger body having means at its lower end for connection to a casing string to depend therefrom, a body portion, a shoulder below said body portion extending laterally outwardly thereof, and a filler ring disposed about and retained on said body portion above said shoulder and engageable with the lock ring to prevent the lock ring from contacting and engaging said shoulder as said hanger body is landed in said well head housing.

7. In selectively lockable casing hanger apparatus as defined in claim 6, said filler ring being split and inherently contractible into tight fitting engagement with said body portion.

8. In selectively lockable casing hanger apparatus as defined in claim 6, said filler ring being split and inherently contractible into tight fitting engagement with said body portion, said filler ring having outer beveled edges at the juncture of the upper and lower faces of the filler ring with its outer peripheral face.

References Cited

UNITED STATES PATENTS

2,035,834	3/1936	Penick et al.	285—141 X
2,520,739	8/1950	Shaw	24—211
2,704,681	3/1955	Fischer	85—8.8
3,273,915	9/1966	Bishop et al.	285—18
3,398,977	8/1968	Yoneda	285—321 X
3,415,322	12/1968	Putch	285—141 X
3,468,558	9/1969	Ahlstone	285—321 X
3,297,344	1/1967	Hanes	285—141
3,405,956	10/1968	Pierce	285—141

DAVE W. AROLA, Primary Examiner

U.S. Cl. X.R.

85—8.8; 285—141, 321