

Description

This invention relates to the formation of oil and gas wells.

In well drilling operations, during completion of a wellhead system lengths of casing are run through a casing or tubing spool. In order to protect the seal bore of the casing or tubing spool, it is known to provide a wear bushing which is located in a bowl formed on the wall of the spool bore in order to protect that well from damage which can be caused during drilling operations. The wear bushing normally has to be removed before a casing run is started. This means that the bore will be unprotected while lengths of casing are run through it.

U. S. Patent No. 4,340,259 discloses a wear and guide bushing used to protect the casing head or tubing head bowl during drilling and includes an inner tapered ring to guide the casing sections and a plurality of outer lugs to support the ring in the bowl. This structure is to eliminate abrasion of the bowl by return flow of drilling fluid.

U. S. Patent No. 3,247,914 discloses a protector which is run on the drill bit and landed in the casing head bowl. It is picked up by the bit for retrieval. The structure is provided to avoid tilting and jamming of the protector during removal.

U. S. Patent No. 4,362,210 discloses a wear bushing which is landed within a wellhead on the casing which is supported by slips whose bowl are landed on the wellhead landing seat. The wear bushing includes annular packing for sealing between its exterior and the interior of the bushing and also a semicircular flange structure for engagement by a running and retrieving tool.

U.S. Patent No. 4,715,445 discloses a latching and retrieving assembly for use with various well tools. This assembly is adapted for connection in a well pipe string.

According to a first aspect of the present invention there is provided a wear bushing retrieval tool comprising:

- a generally annular body;
- means for supporting the tool body relative to a well string;

- latching means carried by the body portion, the latching means being so shaped and arranged that it can engage a correspondingly shaped portion on the wear bushing;

- means for actuating the latching means to move it into engagement with the wear bushing, characterised in that

- the supporting means is so arranged that it can support the tool body on the exterior surface of a casing string when the supporting means is placed in surrounding relationship thereto.

According to a second aspect of the present invention there is provided a method of retrieving a wear bushing from a well immediately subsequent to drilling a bore in that well, the method comprising the steps of:

- removing the drill equipment from the well;
- and characterised by:

- lowering a casing string through the wear bushing into the bore until it has almost reached the total depth of that bore;

- securing the annular body of a retrieval tool according to said first aspect in surrounding relationship to the casing string at a position close to its uppermost end;

- further lowering the casing string and attached tool to a position where the retrieval tool is arrested by contact with the wear bushing;

- raising or lowering the casing string to activate the actuating means, so that the actuating means coacts with the latching means to move it into engagement with the wear bushing; and

- removing the wear bushing from the well.

A feature of the present invention is that it permits removal of the wear bushing at a relatively late stage in the completion of a wellhead system.

The invention will be described now by way of example only, with particular reference to the accompanying drawings wherein:

Figure 1 is a partial sectional view of the improved wear bushing in position within the drilling riser for engagement therewith.

Figure 2 is a similar view illustrating the first step in preparing for securing the wear bushing within the drilling riser.

Figure 3 is another similar view illustrating the latching of the wear bushing within the drilling riser.

Figure 4 is a partial sectional view of a modified form of wear bushing being positioned within the drilling riser.

Figure 4A is a detail sectional view illustrating the structure to the latching means.

Figure 5 is a partial sectional view of the wear bushing of Figure 4 with the latching dogs positioned within the latching recess.

Figure 6 is a similar view illustrating further lowering of the latching ring so that its bent portion engages below the lower end of the tool body.

Figure 6A is a detail sectional view to show the latching of the latching dogs within the latching recess.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

Referring to Figure 1, there is shown a part of a wellhead system which includes a drilling riser

through which lengths of casing 12 are run in order to complete the wellhead system. The drilling riser 10 is formed with a bowl into which fits wear bushing 14 in a manner which will be apparent to those skilled in the art. The wear bushing acts as a protector sleeve to protect the bore of the drilling riser from damage which could otherwise be caused as the lengths of casing are run through it.

The present arrangement is concerned particularly with a tool which allows retrieval of the wear bushing 14 towards the end of the completion of the wellhead system. In this embodiment of the invention, the tool comprises an upper split ring 16 which can be attached to a casing length by means of screws 18. An outer sleeve 20 is coupled to the upper split ring 18 by means of shear pins 22. The upper part 21 of the sleeve has a relatively thick wall while the lower part 23 has a relatively thin wall. A shoulder 25 is defined between the parts 21 and 23. A segmented latching ring 24 is carried by the outer sleeve 20 within the annular space between that outer sleeve and the casing length. The segmented latching ring comprises an upper body part which is secured to the outer sleeve by means of shear pins 26 and downwardly depending legs 28 which carry at their lower end enlarged feet portions 30. The tool also includes an energizing split ring 32 which can locate on a casing coupling 34 below the latching ring 24 as shown in Figure 1 of the drawings. The inner surface of the energizing ring is tubular and generally of the same diameter as the outer surface of the casing portion 12 while the outer surface of the energizing ring is generally frusto-conical, the arrangement being such that the wall thickness of the split ring increases gradually towards its lower portion. It will be seen from Figure 1 that the wear bushing 14 has a recess 36 and the foot 30 of the segmented latch ring is shaped to conform with the shape of the recess 36.

In operation, a hole is drilled in a conventional manner through the wear bushing located in the bore defined through the drilling riser. The wear bushing remains in position as the casing lengths are run into the hole as will be apparent to those skilled in the art.

At approximately 6 casing lengths from the required tube diameter, centralizers are not fitted to the casing lengths. The actual number of joints can vary depending upon the length of the blowout preventer stack and the drilling riser. At approximately three casing lengths from the required tube diameter, the tool of the present embodiment is secured to the outer surface of the casing length 12 as shown in Figure 1 of the drawings. Initially, the energizing ring is located above the casing collar 34 as shown in Figure 1, and then the remaining elements of the tool are secured to the outer surface of the casing length 12 by means of

the screws 18. This casing length 12 is then lowered in a conventional manner until the downwardly facing shoulder 25 on the outer sleeve 20 lands on top of the upwardly facing upper surface of the wear bushing 14. This position is illustrated in Figure 1 of the drawings. In this position, the feet 30 are held away from the wear bushing by the sleeve part 28.

Continued lowering of the casing from the position shown in Figure 1 initially causes the pins 22 to shear. This means that the upper ring 16 can move axially downwardly relative to the outer sleeve 22 as illustrated by Figure 2 of the drawings. This further lowering causes the pins 26 to shear, and the result is that the segmented latch ring moves downwardly so that the elements 30 can move below the sleeve part 28 and outwardly into engagement with the recess 36 in the wear bushing.

To retrieve the wear bushing from the position shown in Figure 3, the casing is pulled back to the surface to a position where access can be gained in order to retrieve the wear bushing. As shown in Figure 3 of the drawings, the outer surface of the energizing split ring 32 engages the elements 30 and causes them to positively engage in the recess 36 of the wear bushing. Although not necessarily required, continued lowering of the casing does not transmit the weight of the casing through the wear bushing as the upper split ring strips over the casing at the screws 18. As will be apparent, raising of the casing will pull the wear bushing upwardly by virtue of the engagement of the elements 30 within the recess 36 of the bushing.

It will be appreciated that on land wellhead applications, the length of the blowout preventer stack and the drilling riser do not exceed the length of casing which can be handled in a rig derrick. It should therefore not be necessary to break out casing joints when retrieving the wear bushing.

Once retrieved, the tool shown in Figures 1 to 3 is removed, and further stands of casing are lowered through the wear bushing. The wear bushing is removed over the exposed casing connector prior to attachment of the casing hanger to complete the wellhead operations in a conventional manner.

A second embodiment of the invention is shown in Figures 3 to 6. In this embodiment of the invention, the casing is run through a drilling riser 110 in a manner similar to that described for the first embodiment. The drilling riser 110 supports a wear bushing 114 as described also for the first embodiment. The wear bushing has a similar shaped recess 136.

The wear bushing retrieval tool of the second embodiment comprises a generally annular body portion 120 to the upper portion of which are con-

nected upwardly extending lines 122. The tool body 120 has a first upper relatively thick body portion 121, an intermediate thinner body portion 124 and a lower relatively thin body portion 126. A downwardly facing shoulder 128 is formed at the junction of the upper and intermediate portions, and a second downwardly facing shoulder 130 is formed at the junction of the intermediate and lower portions. The intermediate body portion has radial through bores 132, only one of which is shown in Figure 4. The radial through bore is in communication with an upwardly extending closed bore 134. The radial through bores accommodate latching dogs 138. The outwardly facing surface 133 of each latching dog is shaped to conform generally to the shape of the recess 136 formed in the wear bushing. The inwardly facing surface 135 of the latching dog is generally frusto-conical. The upper surface of each latching dog is stepped at 139. The upwardly extending closed bore 134 accommodates a pin 140 which is biased downwardly by means of a spring 142. In the position shown in Figure 4A the pin 140 is in contact with the raised part of the stepped upper surface of the latching dog. As shown in Figure 4(A) the lower surface of each latching dog 138 has a cut-away portion which accommodates an upwardly projecting pin 144.

The lower section 126 of the body portion has a through bore 150 which can receive screws 152 to enable the tool body to be secured to a casing collar 156.

The tool also includes an energizing and latching ring 160 which can be located between the tool body 120 and the outer surface of the casing portion 112. The energizing and latching ring is generally annular, but has a lower chamfered portion 162 on its outer surface. The energizing and latching ring can be secured to the outer surface of the casing length 112. The energizing and latching ring has an upwardly extending portion 164 which is inclined slightly outwardly and upwardly.

In operation casing lengths are run through the drilling riser in the conventional manner with the wear bushing 114 in place. This is carried out until approximately five joints from the required total depth. It should be noted that centralizers are not fitted to the last run of casing. At approximately three casing lengths from the required tube diameter the tool, shown in Figure 4, is fitted to the outer diameter of a casing collar 156 by the means of screws, as shown in Figure 4. The energizing and latching ring 160 is located in the annular space between the tool body 120 and the outer surface of the casing length 112. It will be noted that in this position the latching dogs 138 do not protrude beyond the outer surface of the intermediate body portion 124 and are held by pins 144.

Figure 4 shows one length of line 122 attached to the body portion 120, but it should be appreciated that there are three such lengths spaced angularly around the body. The casing is then run into the hole in a conventional manner, care being taken to monitor the feed of the lines 122. The length of line is monitored as the casing is lowered and when the shoulder 130 lands on the wear bushing 114, the line ceases to travel, thereby indicating that the tool has correctly landed on the wear bushing. This position is illustrated in Figure 4 of the drawings. Continued lowering of the casing causes the screws coupling the tool body to the casing coupling to be stepped through so that the casing can then pass axially downwardly relative to the tool body. Continued downward movement of the casing causes the energizing and latching ring to engage the frusto-conical surface 138 on the latching dogs 130, thereby forcing the latching dogs radially outwardly into the recess 136 formed in the wear bushing. This is illustrated in Figure 5 of the drawings. It should be noted that there are approximately eight latching dogs spaced equally angularly around the body of the retrieval tool. As the dogs are displaced radially outwardly, the upper portions of the pins 144 are sheared and the retaining pins 132 move axially downwardly to engage the lower part of the stepped surface of the latching dogs under the action of the spring 134 and thereby retain the latching dogs in their outer position. This is illustrated best in the enlarged view shown in Figure 6A of the drawings.

The tool and wear bushing can then be retrieved to the surface by pulling on the lines 122. The wear bushing is removed over any exposed casing connector prior to attachment of a casing/tubing hanger for completion of the operations in a conventional manner.

It will be apparent that the second embodiment of the invention has a significant advantage over the first embodiment in that it does not require the casing to be pulled in order to retrieve the wear bushing. The wear bushing can be retrieved to the surface without the need to pull back the casing.

It will be appreciated that the present tool can be adapted for use with a bowl protector in any size of casing or tubing.

Claims

1. A wear bushing retrieval tool (10) comprising:
 - a generally annular body (16, 20, 120);
 - means (18, 152) for supporting the tool body (16, 20, 120) relative to a well string (12, 112);
 - latching means (24, 130) carried by the body portion (16, 20, 120), the latching means (24) being so shaped and arranged that it can



5 nected upwardly extending lines 122. The tool
body 120 has a first upper relatively thick body
portion 121, an intermediate thinner body portion
124 and a lower relatively thin body portion 126. A
downwardly facing shoulder 128 is formed at the
junction of the upper and intermediate portions,
and a second downwardly facing shoulder 130 is
formed at the junction of the intermediate and
lower portions. The intermediate body portion has
radial through bores 132, only one of which is
shown in Figure 4. The radial through bore is in
communication with an upwardly extending closed
bore 134. The radial through bores accommodate
latching dogs 138. The outwardly facing surface
133 of each latching dog is shaped to conform
generally to the shape of the recess 136 formed in
the wear bushing. The inwardly facing surface 135
of the latching dog is generally frusto-conical. The
upper surface of each latching dog is stepped at
139. The upwardly extending closed bore 134 ac-
commodates a pin 140 which is biased downwardly
by means of a spring 142. In the position shown in
Figure 4A the pin 140 is in contact with the raised
part of the stepped upper surface of the latching
dog. As shown in Figure 4(A) the lower surface of
each latching dog 138 has a cut-away portion
which accommodates an upwardly projecting pin
144.

The lower section 126 of the body portion has
a through bore 150 which can receive screws 152
to enable the tool body to be secured to a casing
collar 156.

The tool also includes an energizing and latch-
ing ring 160 which can be located between the tool
body 120 and the outer surface of the casing
portion 112. The energizing and latching ring is
generally annular, but has a lower chamfered por-
tion 162 on its outer surface. The energizing and
latching ring can be secured to the outer surface of
the casing length 112. The energizing and latching
ring has an upwardly extending portion 164 which
is inclined slightly outwardly and upwardly.

In operation casing lengths are run through the
drilling riser in the conventional manner with the
wear bushing 114 in place. This is carried out until
approximately five joints from the required total
depth. It should be noted that centralizers are not
fitted to the last run of casing. At approximately
three casing lengths from the required tube diam-
eter the tool, shown in Figure 4, is fitted to the
outer diameter of a casing collar 156 by the means
of screws, as shown in Figure 4. The energizing
and latching ring 160 is located in the annular
space between the tool body 120 and the outer
surface of the casing length 112. It will be noted
that in this position the latching dogs 138 do not
protrude beyond the outer surface of the intermedi-
ate body portion 124 and are held by pins 144.

Figure 4 shows one length of line 122 attached to
the body portion 120, but it should be appreciated
that there are three such lengths spaced angularly
around the body. The casing is then run into the
hole in a conventional manner, care being taken to
monitor the feed of the lines 122. The length of line
is monitored as the casing is lowered and when the
shoulder 130 lands on the wear bushing 114, the
line ceases to travel, thereby indicating that the tool
has correctly landed on the wear bushing. This
position is illustrated in Figure 4 of the drawings.
Continued lowering of the casing causes the
screws coupling the tool body to the casing cou-
pling to be stepped through so that the casing can
then pass axially downwardly relative to the tool
body. Continued downward movement of the cas-
ing causes the energizing and latching ring to
engage the frusto-conical surface 138 on the latch-
ing dogs 130, thereby forcing the latching dogs
radially outwardly into the recess 136 formed in the
wear bushing. This is illustrated in Figure 5 of the
drawings. It should be noted that there are approxi-
mately eight latching dogs spaced equally angu-
larly around the body of the retrieval tool. As the
dogs are displaced radially outwardly, the upper
portions of the pins 144 are sheared and the retain-
ing pins 132 move axially downwardly to engage
the lower part of the stepped surface of the latch-
ing dogs under the action of the spring 134 and
thereby retain the latching dogs in their outer posi-
tion. This is illustrated best in the enlarged view
shown in Figure 6A of the drawings.

The tool and wear bushing can then be re-
trieved to the surface by pulling on the lines 122.
The wear bushing is removed over any exposed
casing connector prior to attachment of a cas-
ing/tubing hanger for completion of the operations
in a conventional manner.

It will be apparent that the second embodiment
of the invention has a significant advantage over
the first embodiment in that it does not require the
casing to be pulled in order to retrieve the wear
bushing. The wear bushing can be retrieved to the
surface without the need to pull back the casing.

It will be appreciated that the present tool can
be adapted for use with a bowl protector in any
size of casing or tubing.

Claims

1. A wear bushing retrieval tool (10) comprising:
a generally annular body (16, 20, 120);
means (18, 152) for supporting the tool
body (16, 20, 120) relative to a well string (12,
112);
latching means (24, 130) carried by the
body portion (16, 20, 120), the latching means
(24) being so shaped and arranged that it can



engage a correspondingly shaped portion (36, 136) on the wear bushing (14, 114), and

means (32, 160) for actuating the latching means (24, 130) to move it into engagement with the wear bushing (14, 114), characterised in that

the supporting means (18, 152) is so arranged that it can support the tool body (16, 20, 120) on the exterior surface of a casing string (12, 112) when the supporting means is placed in surrounding relationship thereto.

2. A wear bushing retrieval tool (10) according to claim 1, wherein said body portion (16, 20) comprises a ring-like part (16) securable to a length of casing by a frangible means (22) and an outer sleeve (20) carried by said ring-like part (16) and connected thereto by frangible means (22) said outer sleeve (20) incorporating means (25) for engaging the wear bushing to correctly position the tool (10) relative to the wear bushing (14).
3. A wear bushing retrieval tool (10) according to claim 2, wherein said engaging means comprises a shoulder (25) formed on the outer surface of the sleeve (20).
4. A wear bushing retrieval tool (10) according to claim 2, wherein said latching means (24) comprises segmented latch ring (24) disposed intermediate said casing (12) and said sleeve (20) and having a plurality of downwardly depending legs (28) which have latching heads (20) for engaging the wear bushing (14).
5. A wear bushing retrieval tool (10) according to claim 3, wherein said latching means (24) comprises segmented latch ring (24) disposed intermediate said casing (12) and said sleeve (20) having a plurality of downwardly depending legs (28) which have latching heads (20) for engaging the wear bushing (14).
6. A wear bushing retrieval tool (10) according to claim 4, wherein said actuating means (32) comprises a ring shaped member (32) locatable around said casing (12) such that it can be supported by a casing coupling element (34) beneath said body portion (20), said ring shaped member (32) having a generally frusto-conical outer surface arranged to engage said legs (28) of said latching means and urge said latching heads (30) into engagement with the wear bushing (14) by a wedging action.
7. A wear bushing retrieval tool (10) according to claim 1, wherein said body portion (120) is

suspended from one or more lines or cables (122) and said body portion (120) includes means (130) for engaging the wear bushing (114) to correctly position the tool relative to the wear bushing (114).

8. A wear bushing retrieval tool (10) according to claim 7, wherein said engaging means (130) comprises a shoulder (130) formed on the outer surface of the body.
9. A wear bushing retrieval tool (10) according to claim 7, wherein said latching means (130) comprise a plurality of latching dogs (130) carried by said body portion (120), said latching dogs (130) being movable radially outwardly to engage a recess in said wear bushing.
10. A wear bushing retrieval tool (10) according to claim 8, wherein said latching means comprise a plurality of latching dogs carried by said body portion, said latching dogs being movable radially outwardly to engage a recess (136) in said wear bushing (114).
11. A wear bushing retrieval tool (10) according to claim 9, wherein said actuating means (160) comprises an energizing ring (160) movable axially relative to the body portion (120) so that it can contact said latching dogs (130) to move them to their radially outward position.
12. A wear bushing retrieval tool (10) according to claim 11, wherein said body portion (120) includes retaining means (140, 142) operable to retain the latching dogs (130) in their radially outward position.
13. A method of retrieving a wear bushing (14, 114) from a well subsequent to drilling a bore in that well, the method comprising the steps of:
 - removing the drill equipment from the well; and characterised by:
 - lowering a casing string (12, 112) through the wear bushing (14, 114) into the bore until it has almost reached the total depth of that bore;
 - securing the annular body (16, 20, 120) of the retrieval tool (10) of claim 1 in surrounding relationship to the casing string (12, 112) at a position close to its uppermost end;
 - further lowering the casing string (12, 112) and attached tool (10) to a position where the retrieval tool (10) is arrested by contact with the wear bushing (14, 114);
 - raising or lowering the casing string (12,



112) to activate the actuating means (32, 160), so that the actuating means (32, 160) coacts with the latching means (24, 130) to move it into engagement with the wear bushing (14, 114); and

removing the wear bushing (14, 114) from the well.

14. A method according to claim 13, wherein:

the retrieval tool (10) is in accordance with claim 2,

the annular body (16, 20) is secured in surrounding relationship to the casing string (12) by securing the ring-like part (16) to that casing string (12);

prior to the step of raising or lowering the casing string (12), the casing string (12) is lowered still further to break the frangible means (22); and

the actuating means (32, 160) are actuated by raising the casing string (12) to bring the means (32) for actuating the latching means into contact with that latching means (24).

15. A method according to claim 13, wherein:

the retrieval tool (114) is in accordance with claim 7,

the step of raising or lowering the casing string (112) yet further to bring the actuating means (160) into contact with the latching means (130), and

the step of removing the wear bushing (114) is achieved by raising the one or more lines or cables (122) from which the body portion (120) of the retrieval tool (114) is suspended.

Patentansprüche

1. Ausbauwerkzeug für Verschleißschutzhülsen (10) mit:

einem im allgemeinen ringförmigen Körper (16, 20, 120);

einer Einrichtung (18, 152) zum Abstützen des Werkzeugkörpers (16, 20, 120) gegenüber einer Futterrohrkolonne (12, 112);

einer Verriegelungseinrichtung (24, 130), die von dem Körperteil (16, 20, 120) getragen wird, wobei die Verriegelungseinrichtung (24) so geformt und angeordnet ist, daß sie mit einem entsprechend geformten Teil (36, 136) auf der Verschleißschutzhülse (14, 114) zusammenwirken kann, und

einer Einrichtung (32, 160) zur Betätigung der Verriegelungseinrichtung (24, 130), um diese in Eingriff mit der Verschleißschutzhülse (14, 114) zu bringen, **dadurch gekennzeichnet**, daß die Abstützeinrichtung (18, 152) so angeordnet

ist, daß sie den Werkzeugkörper (16, 20, 120) auf der äußeren Fläche einer Futterrohrkolonne (12, 112) abstützen kann, wenn die Abstützeinrichtung in umschließender Verbindung zu dieser angeordnet ist.

2. Ausbauwerkzeug für Verschleißschutzhülsen (10) nach Anspruch 1, **dadurch gekennzeichnet**, daß das Körperteil (16, 20) ein ringförmiges Teil (16) enthält, das an einem Futterrohrabschnitt durch eine Trenneinrichtung (22) und eine äußere Muffe (20), die durch das ringartige Teil (16) gehalten und durch die Trenneinrichtung (22) daran befestigt ist, wobei die äußere Muffe (20) eine Vorrichtung (25) zum Erfassen der Verschleißschutzhülse enthält, um das Ausbauwerkzeug (10) gegenüber der Verschleißschutzhülse (14) ordnungsgemäß anzuordnen.

3. Ausbauwerkzeug für Verschleißschutzhülsen (10) nach Anspruch 2, **dadurch gekennzeichnet**, daß die Erfassungseinrichtung einen Ansatz (25) aufweist, der an der äußeren Fläche der Muffe (20) angeformt ist.

4. Ausbauwerkzeug für Verschleißschutzhülsen (10) nach Anspruch 2, **dadurch gekennzeichnet**, daß die Verriegelungseinrichtung (24) aus einem in Segmente unterteilten Verriegelungsring (24), der zwischen dem Futterrohr (12) und der Buchse (20) angeordnet ist und eine Vielzahl von sich nach unten erstreckenden Beinen (28) besitzt, die Verriegelungsköpfe (20) zur Erfassung der Verschleißschutzhülse (14) aufweist.

5. Ausbauwerkzeug für Verschleißschutzhülsen (10) nach Anspruch 3, **dadurch gekennzeichnet**, daß die Verriegelungseinrichtung (24) aus dem in Segmente unterteilten Verriegelungsring (24), der zwischen dem Futterrohr (12) und der Buchse (20) angeordnet ist, die eine Vielzahl sich nach unten erstreckender Beine (28) besitzt, welche zum Erfassen der Verschleißschutzhülse (14) vorgesehene Verriegelungsköpfe (20) enthält, besteht.

6. Ausbauwerkzeug für Verschleißschutzhülsen (10) nach Anspruch 4, **dadurch gekennzeichnet**, daß die Antriebseinrichtung (32) aus einem ringförmigen Teil (32) besteht, das um das Futterrohr (12) in der Weise anordenbar ist, daß es von einem Futterrohr-Verbindungselement (34) unterhalb des Körperteiles (20) abgestützt werden kann, wobei das ringförmige Teil (32) eine im allgemeinen kegelförmige Oberfläche aufweist, um die Beine



(28) der Verriegelungseinrichtung in Eingriff zu bringen und die Verriegelungsköpfe (30) durch einen Klemmvorgang in Eingriff mit der Verschleißschutzhülse zu drücken.

7. Ausbauwerkzeug für Verschleißschutzhülsen (10) nach Anspruch 1, **dadurch gekennzeichnet**, daß das Körperteil (120) an einem oder mehreren Draht/Drähten oder Seil/Seilen (122) abgehängt ist und daß das Körperteil (120) eine Vorrichtung zum Eingriff in die Verschleißschutzhülse (114) enthält, um das Werkzeug in Bezug zur Verschleißschutzhülse (114) ordnungsgemäß anzuordnen.
8. Ausbauwerkzeug für Verschleißschutzhülsen (10) nach Anspruch 7, **dadurch gekennzeichnet**, daß die Eingriffseinrichtung (130) aus einer Schulter (130) besteht, die an der äußeren Oberfläche des Körpers angeformt ist.
9. Ausbauwerkzeug für Verschleißschutzhülsen (10) nach Anspruch 7, **dadurch gekennzeichnet**, daß die Eingriffseinrichtung (130) aus einer Vielzahl von Mitnehmern (130) besteht, die von dem Körperteil (120) getragen werden, wobei die Mitnehmer (130) radial nach außen beweglich sind, um in eine Ausnehmung in der Verschleißschutzhülse einzugreifen.
10. Ausbauwerkzeug für Verschleißschutzhülsen (10) nach Anspruch 8, **dadurch gekennzeichnet**, daß die Eingriffseinrichtung aus einer Vielzahl von Mitnehmern besteht, die von dem Körperteil getragen werden, wobei die Mitnehmer radial nach außen beweglich sind, um in eine Ausnehmung (136) in der Verschleißschutzhülse (114) einzugreifen.
11. Ausbauwerkzeug für Verschleißschutzhülsen (10) nach Anspruch 9, **dadurch gekennzeichnet**, daß die Antriebseinrichtung (160) aus einem kraftübertragenden Ring (160) besteht, der zum Körperteil (120) axial bewegbar ist, so daß er die Mitnehmer (130) berühren kann, um diese in ihre radial nach außen vorstehende Lage zu bewegen.
12. Ausbauwerkzeug für Verschleißschutzhülsen (10) nach Anspruch 11, **dadurch gekennzeichnet**, daß das Körperteil (120) eine Halteeinrichtung (140, 142) enthält, die die Mitnehmer (130) in deren radial nach außen vorstehender Lage festhält.
13. Verfahren zum Ausbauen einer Verschleißschutzhülse (14, 114) aus einem Bohrschacht nach dem Einbringen der Bohrung in diesen

Bohrschacht, wobei das Verfahren aus folgenden Schritten besteht:

zunächst wird das Bohrwerkzeug aus dem Bohrschacht entfernt und die weiteren Schritte sind **gekennzeichnet durch**:

Absenkung der Futterrohrkolonne (12, 112) durch die Verschleißschutzhülsen (14, 114) in den Bohrschacht, bis sie die größte Tiefe des Bohrschachtes nahezu erreicht hat;

Befestigung des ringförmigen Körpers (16, 20, 120) des Ausbauwerkzeuges (10) nach Anspruch 1 in umschließender Verbindung mit der Futterrohrkolonne (12, 112) in einer Lage nahe ihrem oberen Ende;

weiteres Absenken der Futterrohrkolonne (12, 112) und des befestigten Werkzeuges (10) bis zu einer Lage, in der das Ausbauwerkzeug (10) durch Berührung mit der Verschleißschutzhülse (14, 114) festgesetzt ist;

Anheben oder Absenken der Futterrohrkolonne (12, 112), um die Antriebseinrichtung (32, 160) in Gang zu setzen, so daß die Antriebseinrichtung (32, 160) mit der Verriegelungseinrichtung (24, 130) zusammenwirkt, um diese in Eingriff mit der Verschleißschutzhülse (14, 114) zu bringen; und

Entfernen der Verschleißschutzhülse (14, 114) aus dem Bohrschacht.

14. Verfahren nach Anspruch 13, **dadurch gekennzeichnet**, daß

das Ausbauwerkzeug entsprechend Anspruch 2 gestaltet ist,

der ringförmige Körper (16, 20) in umschließender Verbindung an der Futterrohrkolonne (12) durch Anbringung des ringartigen Teiles (16) an der Futterrohrkolonne (12) befestigt ist; vor dem Schritt des Anhebens oder Absenkens der Futterrohrkolonne (12) die Futterrohrkolonne (12) noch weiter abgesenkt wird, um die Trenneinrichtung (22) zu zertrennen; und die Antriebseinrichtung (32, 160) durch Anheben der Futterrohrkolonne (12) anzutreiben, um die Einrichtung (32) zum Antrieb der Verriegelungseinrichtung in Berührung mit dieser Verriegelungseinrichtung (24) zu bringen.

15. Verfahren nach Anspruch 13, **dadurch gekennzeichnet**, daß:

das Ausbauwerkzeug (114) entsprechend Anspruch 7 gestaltet ist,

der Schritt zum noch weiteren Anheben oder Absenken der Futterrohrkolonne (112), um die Antriebsmittel (160) in Berührung mit der Verriegelungseinrichtung (130) zu bringen, und der Schritt zum Entfernen der Verschleißschutzhülsen (114) durch Anheben eines oder mehrerer Drahtes/Drähte oder Seiles/Seile



(122) der/das/die vom Körperteil (120) des Ausbauwerkzeuges (114) ausgeht/ausgehen, ausgeführt wird.

Revendications

1. Outil (10) de récupération de garniture d'usure, comprenant :
un corps de forme générale annulaire (16, 20, 120),

un dispositif (18, 152) destiné à supporter le corps de l'outil (16, 20, 120) par rapport à un train de tiges (12, 112) de puits,

un dispositif de verrouillage (24, 130) porté par la partie de corps (16, 20, 120), le dispositif de verrouillage (24) ayant une configuration et une disposition telles qu'il peut venir en prise avec une partie (36, 136) de configuration correspondante de la garniture d'usure (14, 114), et

un dispositif (32, 160) de manoeuvre du dispositif de verrouillage (24, 130) afin qu'il vienne en prise avec la garniture d'usure (14, 114), caractérisé en ce que

le dispositif de support (18, 152) est réalisé afin qu'il puisse supporter le corps de l'outil (16, 20, 120) à la surface externe d'un train de tiges de tubage (12, 112) lorsque le dispositif de support est disposé autour de lui.

2. Outil (10) de récupération de garniture d'usure selon la revendication 1, dans lequel la partie de corps (16, 120) comprend une partie annulaire (16) pouvant être fixée à un tronçon de train de tiges par un dispositif cassable (22) et un manchon externe (20) porté par la partie annulaire (16) et raccordé à celle-ci par un dispositif cassable (22), le manchon externe (20) comportant un dispositif (25) destiné à coopérer avec la garniture d'usure afin que l'outil (10) soit positionné convenablement par rapport à la garniture d'usure (14).

3. Outil (10) de récupération de garniture d'usure selon la revendication 2, dans lequel le dispositif de coopération comporte un épaulement (25) formé à la surface externe du manchon (20).

4. Outil (10) de récupération de garniture d'usure selon la revendication 2, dans lequel le dispositif de verrouillage (24) comporte un anneau segmenté (24) de verrouillage disposé entre le train de tiges (12) et le manchon (20) et ayant plusieurs branches (28) qui dépassent vers le bas et qui ont des têtes de verrouillage (20) destinées à coopérer avec la garniture d'usure (14).

5. Outil (10) de récupération de garniture d'usure selon la revendication 3, dans lequel le dispositif de verrouillage (24) comporte un anneau segmenté (24) de verrouillage disposé entre le train de tiges (12) et le manchon (20) et ayant plusieurs branches (28) qui dépassent vers le bas et qui ont des têtes de verrouillage (20) destinées à coopérer avec la garniture d'usure (14).

6. Outil (10) de récupération de garniture d'usure selon la revendication 4, dans lequel le dispositif de manoeuvre (32) comporte un organe de forme annulaire (32) pouvant être disposé autour du train de tiges (12) afin qu'il puisse être supporté par un élément (34) de raccordement de train de tiges au-dessous de la partie de corps (20), l'organe de forme annulaire (32) ayant une surface externe de forme générale tronconique agencée pour coopérer avec les branches (28) du dispositif de verrouillage et à repousser les têtes de verrouillage (30) au contact de la garniture d'usure (14) par un effet de coin.

7. Outil (10) de récupération de garniture d'usure selon la revendication 1, dans lequel la partie de corps (120) est suspendue à un ou plusieurs câbles ou lignes (122), et la partie de corps (120) comporte un dispositif (130) destiné à coopérer avec la garniture d'usure (114) afin que l'outil soit positionné convenablement par rapport à la garniture d'usure (114).

8. Outil (10) de récupération de garniture d'usure selon la revendication 7, dans lequel le dispositif de coopération (130) a un épaulement (130) formé à la surface externe du corps.

9. Outil (10) de récupération de garniture d'usure selon la revendication 7, dans lequel le dispositif de verrouillage (130) possède plusieurs taquets de verrouillage (130) portés par la partie de corps (120), les taquets de verrouillage (130) étant mobiles radialement vers l'extérieur afin de venir en prise avec une cavité formée dans la garniture d'usure.

10. Outil (10) de récupération de garniture d'usure selon la revendication 8, dans lequel le dispositif de verrouillage comprend plusieurs taquets de verrouillage portés par la partie de corps, les taquets de verrouillage étant mobiles radialement vers l'extérieur afin qu'ils pénètrent dans une cavité (136) formée dans la garniture d'usure (114).



11. Outil (10) de récupération de garniture d'usure selon la revendication 9, dans lequel le dispositif de manoeuvre (160) comporte un anneau d'activation (160) mobile axialement par rapport à la partie de corps (120) afin qu'il puisse venir au contact des taquets de verrouillage (130) pour déplacer ceux-ci vers leur position radialement extérieure.

12. Outil (10) de récupération de garniture d'usure selon la revendication 11, dans lequel la partie de corps (120) comporte un dispositif de retenue (140, 142) pouvant être actionné pour retenir les taquets de verrouillage (130) dans leur position radialement extérieure.

13. Procédé de récupération d'une garniture d'usure (14, 114) d'un puits après forage d'un trou dans ce puits, le procédé comprenant l'étape suivante :

l'extraction du puits de l'appareillage de forage, et étant caractérisé par

la descente d'un train de tiges de tubage (12, 112) à travers la garniture d'usure (14, 114), dans le trou jusqu'à ce qu'il ait presque atteint la profondeur totale de ce trou,

la fixation du corps annulaire (16, 20, 120) de l'outil de récupération (10) selon la revendication 1 autour du train de tiges (12, 112) en position proche de son extrémité la plus haute,

la descente supplémentaire du train de tiges (12, 112) et de l'outil (10) qui lui est fixé en un emplacement auquel l'outil de récupération (10) est arrêté par contact avec la garniture d'usure (14, 114),

le soulèvement ou l'abaissement du train de tiges (12, 112) pour l'activation du dispositif de manoeuvre (32, 160), afin que le dispositif de manoeuvre (32, 160) coopère avec le dispositif de verrouillage (24, 130) et amène celui-ci en prise avec la garniture d'usure (14, 114), et

l'extraction de la garniture d'usure (14, 114) du puits.

14. Procédé selon la revendication 13, dans lequel

l'outil de récupération (10) est un outil selon la revendication 2,

le corps annulaire (16, 20) est fixé afin qu'il entoure le train de tiges (12) par fixation de la partie annulaire (16) au train de tiges (12),

avant le soulèvement ou l'abaissement du train de tiges (12), le train de tiges (12) est descendu de façon encore plus importante afin que le dispositif cassable (22) soit rompu, et

le dispositif de manoeuvre (32, 160) est

manoeuvré par soulèvement du train de tiges (12) afin d'amener le dispositif (32) de manoeuvre du dispositif de verrouillage au contact du dispositif de verrouillage (24).

15. Procédé selon la revendication 13, dans lequel

l'outil de récupération (114) est un outil selon la revendication 7,

l'étape de soulèvement ou d'abaissement du train de tiges (112) est réalisée de façon encore plus importante afin d'amener le dispositif de manoeuvre (160) soit mis au contact du dispositif de verrouillage (130), et

l'étape d'extraction de la garniture d'usure (114) est exécutée par soulèvement du câble ou de la ligne ou des câbles ou des lignes (122) auxquels est suspendue la partie de corps (120) de l'outil de récupération (114).