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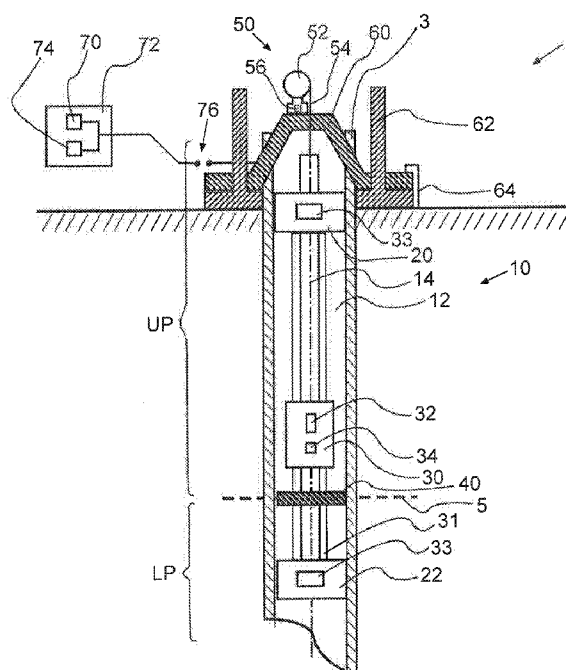


Fig. 1

(57) Abstract: An arrangement (1) and a device (10) for providing a separating cut in a material of a wellhead of a hydrocarbon well. The device (10) comprises a support structure (14), an attachment arrangement and a cutting device (40). The attachment arrangement comprises a first attachment unit (20) and a first attachment unit (20) adapted to form an attachment to an upper portion (UP) respectively a lower portion (LP) of the wellhead (3) and the cutting device is arranged between the upper portion (UP) and the lower portion (LP). The device comprises a displacement unit (30) adapted to generate a force acting to separate the first attachment unit (20) and the second attachment unit (22) from each other so that the upper portion (UP) and the lower portion (LP) of the wellhead (3) are pulled away from each other during the cutting device (40) establishing said separating cut.



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A DEVICE FOR PROVIDING A SEPARATING CUT IN A MATERIAL OF A WELLHEAD OF A HYDROCARBON WELL

Introduction

The present invention relates to a device for providing a separating cut in a material of a wellhead
5 of a hydrocarbon well. The device comprises a support structure, an attachment arrangement at the support structure adapted to attach the device to the wellhead, and a cutting device arranged at the support structure, which cutting device is adapted to provide the separating cut to the wellhead. The device is arranged so that at least a portion of the device is adapted to be inserted in an opening of the wellhead to be provided with the separating cut.

10 The present invention also relates to an arrangement and a method for providing a separating cut in a material of a wellhead of a hydrocarbon well.

Prior art

Wellheads are arranged at the surface of an oil or gas well, such at the seabed of the sea for a
15 subsea wellhead. The function of the wellhead is to provide a structural and pressure-containing interface for the drilling and production equipment. After the operation and as the well has been terminated, it is required that the well is plugged and the wellhead is removed. In regards of a sub-sea wellhead, it is a requirement from the authorities that the wellhead is removed at a certain depth below the seabed.

Prior art devices for removing subsea wellheads rely on methods involving cutting using high pres-
20 sure water and sand, blasting, or drilling down into the wellhead. While generating a separating cut by means of a cutting device, the weight of the wellhead acts to close the gap, which may result in that the cutting device becomes wedged in the gap. It may be necessary to remove the cutting device from the opening and thereafter reintroduce the cutting device again and restart the cutting operation. Such interruption of the cutting process may be time consuming and accordingly costly.
25 In particular, in the event of damaged to the cutting device, a significant interruption of the cutting process may be the result. It may also be difficult to find the exact position of the previous cut again when restarting the cutting process. A further disadvantage of prior art devices for removing sub-sea wellheads is that the separating cut can not be verified.

EP2281998A2 disclosed an apparatus for a subsea intervention on a wellhead. The apparatus comprises a grip member adapted engage with the wellhead and a rotary cutting assembly for generating a separating cut.

Summary of the invention

5 The invention has for its object to remedy or to reduce at least one of the drawbacks of the prior art, or at least provide a useful alternative to prior art. A first object of the invention is to provide an improved device for providing a separating cut in a material of a wellhead of a hydrocarbon well. A second object of the invention is to provide a device for providing a separating cut in a material of a wellhead of a hydrocarbon well that enables verification of the separating cut. A third object of the invention is to provide a device for providing a separating cut in a material of a wellhead of a hydrocarbon well that requires less equipment arranged on a rig or a vessel. A fourth object of the invention is to provide a device for providing a separating cut in a material of a wellhead of a hydrocarbon well that can be operated with less personnel than prior art devices.

15 These objects are achieved by means of a device for providing a separating cut in a material of a wellhead of a hydrocarbon well, the device comprises

- a support structure,
- an attachment arrangement at the support structure adapted to attach the device to the wellhead, and
- a cutting device arranged at the support structure, which cutting device is adapted to provide said

20 separating cut to the wellhead, wherein at least a portion of the device is adapted to be inserted in an opening of the wellhead to be provided with the separating cut.

The device is characterised in that the attachment arrangement comprises a first attachment unit adapted to form a first attachment to an upper portion of the wellhead and second attachment unit adapted to form a second attachment to a lower portion of the wellhead, and the cutting device is arranged between the upper portion and the lower portion of the wellhead, wherein the device further comprises a displacement unit adapted to generate a force acting to separate the first attachment unit and the second attachment unit from each other so that the upper portion and the lower portion of the wellhead are pulled away from each other during the cutting device establishing said

30 separating cut in the material of the well head.

The device facilitates the establishment of the separating cut by means that the first and second attachment unit form attachment to the respective upper and lower portion of the wellhead, and during the cutting device establishing the separating cut in the material of the well head, the displacement unit pulls the upper and lower portion of the wellhead away from each other. Thereby,

35 the risk of the cutting device being wedged between the upper and lower portion of the wellhead is reduced.

According to an embodiment of the invention, said force is arranged with a magnitude corresponding to at least the weight of the upper portion of the wellhead.

According to an embodiment of the invention, the device comprises means for measuring the displacement of the first attachment unit and second attachment unit in respect to each other. The means for measuring the displacement is for example an encoder. If the first and second attachment unit are displaced away from each other to certain extent, it can be concluded that a sufficient separating cut is present to enable the wellhead to be lifted away from its installed position. On the other hand, if the first and second attachment units are prevented from being further separated from each other when subjected to the separating force, it can be concluded that the separating cut has not fully been established to enable the removal of the wellhead from its position of installation.

According to an embodiment of the invention, the first attachment unit and the second attachment unit comprise a respective disengaged state in which at least a portion of the device is movable within the opening of the wellhead and a respective engaged state in which the first attachment unit and the second attachment unit engage with the respective upper portion and the lower portion of the wellhead.

According to an embodiment of the invention, the second attachment unit comprises an expandable engagement member adapted to engage with an inner envelope surface of the opening at the lower portion of the wellhead when the second attachment unit is in the engaged state. The second attachment is formed by means of expanding the second attachment unit to contact with the inner envelope surface at the lower portion of the wellhead.

In the disengaged state, the first and the second attachment unit lack essentially engagement with the opening of the wellhead. Accordingly, the device is movable within the opening of the wellhead when the first and the second attachment unit are in the disengaged state. Contrary, in the engaged state, the second attachment unit is in engagement with the opening of the wellhead. Accordingly, the device is restricted from movement within the opening of the wellhead when the first and the second attachment unit are in the engaged state.

According to an embodiment of the invention, the first attachment unit comprises an expandable engagement member adapted to engage with an inner envelope surface of the opening at the upper portion of the wellhead when the first attachment unit is in the engaged state. The first attachment is formed by means of expanding the first attachment unit to contact with the inner envelope surface at the upper portion of the wellhead.

According to an embodiment of the invention, the first attachment unit comprises an engagement member adapted to engage with a structure of the wellhead outside the opening at the upper portion of the wellhead when the first attachment unit is in the engaged state.

According to an embodiment of the invention, the support structure is elongated and the first at-

attachment unit and the second attachment unit are spaced apart along a longitudinal axis of the support structure.

According to an embodiment of the invention, the displacement unit comprises a motor unit acting on the first attachment unit and the second attachment unit so that the first attachment unit and the second attachment unit are adapted to be displaced in respect to each other between a first spacing and a second spacing, wherein the second spacing is larger than the first spacing. The motor unit is for example an electric motor, a hydraulic cylinder, etcetera, generating the force that acts to separate the first attachment unit and the second attachment unit from each other.

According to an embodiment of the invention, the first attachment unit and second attachment unit comprise a respective further motor unit, a wedge shaped engagement member and a contact member in contact with the engagement member, wherein the further motor unit is adapted to displace the engagement member between a first position corresponding to the disengaged state of the attachments units and a second position corresponding to the engaged state of the attachment units.

According to an embodiment of the invention, the support structure is elongated and the first attachment unit and the second attachment unit are spaced apart along a longitudinal axis of the support structure.

According to an embodiment of the invention, the cutting device comprises a rotary arranged cutting member comprising a compressed state in which the device is movable within the opening of the wellhead and an extended state in which cutting device is brought into contact with the wellhead for providing the separating cut.

According to an embodiment of the invention, the arrangement comprises the device according to any of claim 1-9 and a further displacement unit for displacing at least a portion of the device within the opening of the wellhead.

The further displacement unit is used for arranging the device in certain position in the opening of the wellhead so that the first attachment unit is positioned at the upper portion of the wellhead and the second attachment unit is positioned at the lower portion of the wellhead.

According to an embodiment of the invention, the further displacement unit comprises a winch comprising a wire connected to the device.

According to an embodiment of the invention, the further displacement unit comprises means for determining the displacement of at least a portion of the device within the opening of the wellhead. The means for determining the displacement of the devices is for example an encoder.

By means of the means for determining the displacement of the device within the opening of the

wellhead, the device can be arranged to its desired position within the opening of the wellhead.

According to an embodiment of the invention, the arrangement further comprises a guide arrangement for positioning the arrangement in a predetermined position in respect to the wellhead. The guide arrangement comprises preferably a guide funnel adapted to be guided to the predetermined position in respect to the wellhead by means of a guide post arranged at the wellhead.

According to an embodiment of the invention, the arrangement comprises a locking device for locking the position of the arrangement to the predetermined position in respect to the wellhead. The locking device assures a firm attachment of the arrangement in respect of the wellhead so that the device can be positioned accurately in the opening of the wellhead.

According to an embodiment of the invention, arrangement comprises means for control and power supply of the device and the further displacement unit. The control means is for example a control unit comprises a logic unit, such as a CPU. The power supply may be in form of connection of electric power, hydraulic pumps, etcetera.

According to an embodiment of the invention, the arrangement comprises a remotely operated vehicle and said means for control and power supply are provided in the remotely operated vehicle connected to the device and the further displacement unit.

The object of the invention is furthermore achieved by means of a method for providing a separating cut in a material of a wellhead a hydrocarbon well by means of a device according to any of above embodiments. The method comprises the steps of

- setting the first attachment unit and the second attachment unit to the disengaged state,
- arranging the device in the opening of the wellhead so that the first attachment unit is positioned at an upper portion of the wellhead and the second attachment unit is positioned at a lower portion of the wellhead,
- setting the first attachment unit and the second attachment unit to the engaged state, and
- establishing a separating cut in the well head between the upper portion and lower portion of the wellhead while generating a force by means of the displacement unit that acts to separate the first attachment unit and the second attachment unit from each other.

According to an embodiment of the invention, the method comprises

- measuring a displacement of the first attachment unit and the second attachment unit in respect to each other, and
- determining that a sufficient separating cut exists if the displacement is equal or exceeding a predetermined distance.

According to an embodiment of the invention, the method comprises

- if a sufficient separating cut has been determined, interrupting the cutting operation of the wellhead.

According to an embodiment of the invention, the method comprises

- determining that an insufficient separating cut exists if the measured displacement of the first attachment unit and the second attachment unit in respect to each other is less than a predetermined distance.

§ According to an embodiment of the invention, the method comprises

- if an insufficient separating cut has been determined, continue cutting the wellhead at the position of the insufficient separating cut.

Brief description of the drawings

10 In the following is described examples of preferred embodiments illustrated in the accompanying drawings, wherein:

Fig. 1 discloses an arrangement for providing a separating cut in a material of a wellhead of a hydrocarbon well according to an embodiment of the invention;

15 Fig. 2 discloses an arrangement an arrangement for providing a separating cut in a material of a wellhead of a hydrocarbon well according to a further embodiment of the invention;

Fig. 3 discloses a flow chart of a method for operation on a wellhead of a hydrocarbon well according to an embodiment of the invention; and

Fig. 4 discloses a flow chart of a method for operation on a wellhead of a hydrocarbon well according to a further embodiment of the invention.

25 Detail description

In fig. 1, an arrangement 1 for operation on a wellhead 3 of a hydrocarbon well according to a first embodiment of the invention is disclosed. In particular the arrangement 1 is adapted for forming and verifying a separating cut 5 to be formed in a material of the wellhead 3.

25 The arrangement 1 comprises a device 10 for operating on the wellhead 3. In fig. 1, the device 10 is inserted into an opening 12 in the wellhead 3. In the following the device 10 will be explained in details.

30 The device 10 comprises an elongated support structure 14 and an attachment arrangement for controllably attaching the device 10 to the wellhead 3. The attachment arrangement comprises a first attachment unit 20, a second attachment unit 22 and a cutting device 40 adapted to generate the separating cut 5 in the material of the of the wellhead 3, in particular the tubing and surrounding casing of the wellhead 3. The tubing normally mainly comprises a metallic material, such as steel or stainless steel. The casing surrounding the tubing normally mainly comprises a concrete materi-

ai. Accordingly, the cutting device 40 is adapted to generate the separating cut 5 through material with different properties.

The device 10 is adapted to be positioned in the opening 12 of the wellhead 3 so that the first attachment unit 20 is arranged at an upper portion UP of the wellhead 3 and so that the second attachment unit 22 is arranged at a lower portion LP of the wellhead 3. The cutting device 40 is arranged between the upper portion UP and the lower portion LP of the wellhead 3. Accordingly, the upper portion UP of the wellhead 3 is located at an upper side in respect to a separating cut 5 to be formed and the lower portion LP of the wellhead 3 is located at a lower side in respect to the separating cut 5 to be formed.

The first attachment unit 20 is adapted to form a first attachment to the upper portion UP of the wellhead 3. Correspondingly, the second attachment unit 22 is adapted to form a second attachment to the lower portion LP of the wellhead 3. The first attachment unit 20 and the second attachment unit 22 comprise a respective disengaged state in which the device 10 is movable within the opening 12 of the wellhead 3 and a respective engaged state in which the first attachment unit 20 and the second attachment unit 22 engage with the respective upper portion UP and the lower portion LP of the wellhead 3, and thereby forming a firm attachment with the respective parts of the wellhead 3.

In the disclosed embodiment, both the first attachment unit 20 and the second attachment units 22 are adapted to form the respective first and second attachment with an inner envelope surface of the opening 12 of the wellhead 3.

The device 10 further comprises a displacement unit 30 connected to the first attachment unit 20 and the second attachment unit 22 by means of a connection element 31. The displacement unit 30 is adapted to generate a force acting to separate the first attachment unit 20 and the second attachment unit 22 from each other while the cutting device 40 establishing the separating cut in the material of the well head 3. Accordingly, the upper portion UP and the lower portion LP of the wellhead 3 are pulled away from each other during the cutting device 40 establishing the separating cut 5.

In the disclosed embodiment, the cutting device 40 is arranged between the displacement unit 30 and the second attachment unit 22. However, it shall be understood that a different location of the cutting device 40 is possible. For example, the cutting device 40 could be positioned between the first attachment unit 20 and the displacement unit 30, which is preferable in that interaction of cutting material from the cutting operation with the displacement unit 30 is avoided.

In an embodiment of the invention, the displacement unit 30 comprises a motor unit 32 acting on the first attachment unit 20 and the second attachment unit 22. The motor unit 32 is for example an electric motor, a hydraulic cylinder, etcetera.

According to an embodiment of the invention, the first attachment unit 20 and second attachment unit 22 comprise a respective further motor unit 33, a wedge shaped engagement member and a contact member in contact with the engagement member. The further motor unit 33 is adapted to displace the engagement member between a first position corresponding to the disengaged state of the attachments units 20, 22 and a second position corresponding to the engaged state of the attachment units 20, 22. The further motor unit 33 is for example an electric motor, a hydraulic cylinder, etcetera.

Preferably, the force has a magnitude that exceeds the weight of the upper portion UP of the wellhead 3. Thereby it can be assured that the cutting device 40 is not being wedged between the upper portion UP and lower portion LP of the wellhead. Furthermore, after that a sufficient separating cut 5 is assumed to have been produced, the assumed separation cut 5 in the wellhead 3 can be verified by means of the combined operation of the first attachment unit 20, the second attachment unit 22 and the displacement unit 30. Preferably, the cutting device 40 is withdrawn from contact with the wellhead before verifying the separating cut 5.

According to an preferred embodiment, the device 10 further comprises means 34 for measuring the displacement of the first attachment unit 20 and second attachment unit 22 in respect to each other. Thereby, the displacement of the attachment units 20, 22 induced by the displacement unit 30 is measured. The means 34 for measuring the displacement of the first attachment unit 20 and second attachment unit 22 is for example an encoder.

If the measured displacement of the first attachment unit 20 and second attachment unit 22 is equal to or larger than a certain distance, it can be concluded that a sufficient separating cut 5 is present. Contrary, if the measured displacement of the first attachment unit 20 and second attachment unit 22 is less than the certain distance, it can be concluded that an insufficient separating cut 5 is present and the cutting operation on the wellhead 3 needs to be continued before the wellhead 3 can be lifted away from its installed location.

The cutting device 40 arranged at the support structure 14 and is adapted to provide the separating cut 5 in the material of the wellhead 3. The cutting device 40 is for example rotary cutting blade comprising a compressed state and an extended state. In the compressed state, the cutting device 40 lacks essential contact with the envelope surface of the opening 12 of the wellhead 3 and the device 10 is freely movable within the opening 12 of the wellhead 3. In the extended state, the cutting device 40 is in contact with the wellhead 3 for providing the separating cut 5 in the wellhead 3.

The arrangement 1 further comprises a further displacement unit 50, such as a winch 52 and cable 54 connected to the device 10. The further displacement unit 50 is adapted to displace the device 10 in the opening of the wellhead 3 to a desired position for the separating cut 5.

The further displacement unit 50 comprises means 56 for determining the displacement of the de-

vice 10 within the opening of the wellhead 3. Preferably, the means 56 for determining the displacement of the device 10 is an encoder.

The arrangement 1 further comprises a guide arrangement 60 for positioning the arrangement 10 in a predetermined position in respect to the wellhead 3. In the disclosed embodiment, the guide arrangement 60 is adapted to be guided by a guide element 62, such as a plurality of guide posts, arranged at the wellhead 3. The arrangement 1 further comprises a locking device 64 for locking the position of the arrangement 1 to the predetermined position. Thereby, it is assured that the arrangement is maintained in a set position in respect to the wellhead 3 during operation of the arrangement 1.

10 The arrangement 1 further comprises means 70 for control and power supply of the device 10 and the further displacement unit 50. In the disclosed embodiment, the arrangement comprises a Remotely operated vehicle (ROV) 72 comprising the means 70 for control and power supply. The ROV 72 is further provided with a control unit 74 for controlling the operation of the arrangement 1. The control unit 74 further comprises a logic unit adapted to receive information from the first encoder 34 and determine if a sufficient separating cut 5 is present on basis of the information from
15 the means 34 for measuring the displacement of attachment units 20, 22.

The arrangement further comprises connection device 76 adapted to enable the ROV 72 to be connected and disconnected from the device 10. Thereby, a single ROV 72 can be used to power and control a plurality of devices 10 at different wellheads 3.

20 Fig. 2 discloses a further embodiment of the invention. The further embodiment of the invention differs from the embodiment in fig. 1 in that the engagement member of the first attachment unit 20 is adapted to engage with a structure of the wellhead 3 outside the opening 12 at the upper portion UP of the wellhead 3 when the first attachment unit 20 is in the engaged state.

Fig. 3 discloses a flow chart of a method for providing a separating cut in a material of a wellhead
25 of a hydrocarbon well according to an embodiment of the invention.

In a step 110, the method comprises setting the first attachment unit 20 and the second attachment unit 22 to the disengaged state. Thereby, insertion of the device 10 in the opening 12 of the wellhead 3 is enabled. Furthermore, the device 10 is displaceable between different positions within the opening 12 of the wellhead 3.

30 In a step 120, the method comprises arranging the device 10 in the opening 12 of the wellhead 3 so that the first attachment unit 20 is positioned at an upper portion UP of the wellhead 3 and the second attachment unit 22 is positioned at a lower portion LP of the wellhead 3. Accordingly, the cutting device is arranged between the upper portion UP and lower portion LP of the wellhead 3. The cutting device lacks essentially contact when the device 10 is inserted in the opening 12 of the
35 wellhead 3 and arranged to the desired position for establishing the separating cut 5.

In a step 130, the method comprises setting the first attachment unit 20 and the second attachment unit 22 to the engaged state. Thereby, the first attachment unit 20 is firmly attached to the upper portion UP of the wellhead 3 and the second attachment unit 22 is firmly attached to the lower portion LP of the wellhead 3.

8 In a step 140, the method comprises establishing the separating cut 5 in the wellhead 3 between the upper portion UP and the lower portion LP of the wellhead 3 while generating a force by means of the displacement unit 30 that acts to separate the first attachment unit 20 and the second attachment unit 22 from each other. The separating cut 5 is established by means of that the cutting device 40 is brought into engagement with the material of the wellhead 3. While the cutting device 40 is cutting into the material, the upper portion UP and lower portion LP of the wellhead are pulled
10 away from each other by means of the force generated by the displacement unit 30. Accordingly, the pressure towards the cutting device 40 from the upper portion UP of the wellhead 3 is reduced and the risk of the cutting device 40 being wedged between the upper portion UP and the lower portion LP of the wellhead 3 is reduced.

15 Fig. 4 discloses a flow chart of a method for providing a separating cut 5 in a material of a wellhead 3 of a hydrocarbon well according to a further embodiment of the invention. The method in fig. 4 differs from the embodiment in fig. 3 in that the method further comprises the steps of verifying the separating cut 5 in the wellhead 3.

In a step 150, the method comprises measuring a displacement of the first attachment unit 20 and the second attachment unit 22 in respect to each other. Subsequently, in a step 160, the method
20 comprises determining that a sufficient separating cut 5 exists if the displacement is equal or exceeding a predetermined distance.

If an insufficient separating cut 5 has been determined, the method comprises continuing step 140 of establishing the separating cut in the wellhead 3.

25 If a sufficient separating cut 5 has been determined, the method comprises in a step 170, interrupting the cutting operation by the cutting device 40. Accordingly, the contact between the cutting device 40 and the wellhead 3 is disestablished and the device 10 is removed from the opening of the wellhead 3. Thereafter, the wellhead 3 can be lifted away from its installed position.

It should be noted that the above-mentioned embodiments illustrate rather than limit the invention,
30 and that those skilled in the art will be able to design many alternative embodiments without departing from the scope of the appended claims. In the claims, any reference signs placed between parentheses shall not be construed as limiting the claim. Use of the verb "comprise" and its conjugations does not exclude the presence of elements or steps other than those stated in a claim. The article "a" or "an" preceding an element does not exclude the presence of a plurality of such elements. The mere fact that certain measures are recited in mutually different dependent claims does
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not indicate that a combination of these measures cannot be used to advantage.

C l a i m s

1. A device (10) for providing a separating cut in a material of a wellhead (3) of a hydrocarbon well, the device (10) comprises:
- a support structure (14),
 - 5 - an attachment arrangement at the support structure (14) adapted to attach the device (10) to the wellhead (3), and
 - a cutting device (40) arranged at the support structure (14), which cutting device (40) is adapted to provide said separating cut (5) to the wellhead (3).
- wherein at least a portion of the device (10) is adapted to be inserted in an opening (12) of the wellhead (3) to be provided with the separating cut (5),
- 10 c h a r a c t e r i s e d i n t h a t
- the attachment arrangement comprises a first attachment unit (20) adapted to form a first attachment to an upper portion (UP) of the wellhead (3) and second attachment unit (22) adapted to form a second attachment to a lower portion (LP) of the wellhead (3), and the
- 15 cutting device (40) is arranged between the upper portion (UP) and the lower portion (LP) of the wellhead (3), wherein the device (10) further comprises a displacement unit (30) adapted to generate a force acting to separate the first attachment unit (20) and the second attachment unit (22) from each other so that the upper portion (UP) and the lower portion (LP) of the wellhead (3) are pulled away from each other during the cutting device
- 20 (40) establishing said separating cut in the material of the well head (3).
2. The device (10) according to claim 1, wherein said force is arranged with a magnitude corresponding to at least the weight of the upper portion (UP) of the wellhead (3).
3. The device (10) according to any of claim 1 and 2, wherein the device (10) comprises means for measuring the displacement of the first attachment unit (20) and second attachment unit (22) in respect to each other.
- 25
4. The device (10) according to any of the previous claims, wherein the first attachment unit (20) and the second attachment unit (22) comprise a respective disengaged state in which at least a portion of the device (10) is movable within the opening (12) of the wellhead (3) and a respective engaged state in which the first attachment unit (20) and the
- 30 second attachment unit (22) engage with the respective upper portion (UP) and the lower portion (LP) of the wellhead (3).
5. The device (10) according to any of the previous claims, wherein the second attachment unit (22) comprises an expandable engagement member adapted to engage with an inner envelope surface of the opening (12) at the lower portion of the wellhead (3) when the second attachment unit (22) is in the engaged state.
- 35

6. The device (10) according to any of the previous claims, wherein the first attachment unit (20) comprises an expandable engagement member adapted to engage with an inner envelope surface of the opening (12) at the upper portion (UP) of the wellhead (3) when the first attachment unit (20) is in the engaged state.
7. The device (10) according to any of the previous claims, wherein the first attachment unit (20) comprises an engagement member adapted to engage with a structure of the well head (3) outside the opening (12) at the upper portion (UP) of the wellhead (3) when the first attachment unit (20) is in the engaged state.
8. The device (10) according to any of the previous claims, wherein the support structure (14) is elongated and the first attachment unit (20) and the second attachment unit (22) are spaced apart along a longitudinal axis of the support structure (14).
9. The device (10) according to any of the previous claims, wherein the displacement unit (30) comprises a motor unit (32) acting on the first attachment unit (20) and the second attachment unit (22) so that the first attachment unit (20) and the second attachment unit (22) are adapted to be displaced in respect to each other between a first spacing and a second spacing, wherein the second spacing is larger than the first spacing.
10. An arrangement (1) for providing a separating cut in a material of a wellhead (3) of a hydrocarbon well, the arrangement (1) comprises the device (10) according to any of claim 1-9 and a further displacement unit (50) for displacing at least a portion of the device (10) within the opening (12) of the wellhead (3).
11. The arrangement (1) according to claim 10, wherein the further displacement unit (50) comprises means (34) for determining the displacement of at least a portion of the device (10) within the opening (12) of the wellhead (3).
12. The arrangement (1) according to any of claim 10-11, wherein the arrangement (1) further comprises a guide arrangement (60) for positioning the arrangement (1) in a predetermined position in respect to the wellhead (3).
13. The arrangement (1) according to claim 12, wherein the arrangement (1) comprises a locking device (64) for locking the position of the arrangement (1) to the predetermined position in respect to the wellhead (3).
14. The arrangement (1) according to any of claim 10-13, wherein the arrangement (1) comprises means (70) for control and power supply of the device (10) and the further displacement unit (50).

15. The arrangement (1) according to any of claim 10-14, wherein the arrangement (1) comprises a remotely operated vehicle (72) and said means (70) for control and power supply are provided in the remotely operated vehicle (72) connected to the device (10) and the further displacement unit (50).
- 5 16. A method for providing a separating cut (5) in a material of a wellhead (3) of a hydrocarbon well by means of a device (10) according to claim 1-9, the method comprises the steps of
- setting the first attachment unit (20) and the second attachment unit (22) to the disengaged state,
 - 10 - arranging the device (10) in the opening (12) of the wellhead (3) so that the first attachment unit (20) is positioned at an upper portion (UP) of the wellhead (3), the second attachment unit (22) is positioned at a lower portion (LP) of the wellhead (3),
 - setting the first attachment unit (20) and the second attachment unit (22) to the engaged state, and
 - 15 - establishing a separating cut (5) in the wellhead (3) between the upper portion (UP) and the lower portion (LP) of the wellhead (3) while generating a force by means of the displacement unit (30) that acts to separate the first attachment unit (20) and the second attachment unit (22) from each other.
17. The method according to claim 16, wherein the method comprises
- 20 - measuring a displacement of the first attachment unit (20) and the second attachment unit (22) in respect to each other, and
 - determining that a sufficient separating cut (5) exists if the displacement is equal or exceeding a predetermined distance.
18. The method according to any of claim 17, wherein the method comprises
- 25 - if a sufficient separating cut (5) has been determined, interrupting the cutting operation of the wellhead (3).
19. The method according to any of claim 16-18, wherein the method comprises
- determining that an insufficient separating cut (5) exists if the measured displacement of the first attachment unit (20) and the second attachment unit (22) in respect to each other
 - 30 is less than a predetermined distance.
20. The method according to any of claim 19, wherein the method comprises
- if an insufficient separating cut (5) has been determined, continue cutting the wellhead (3) at the position of the insufficient separating cut (5).

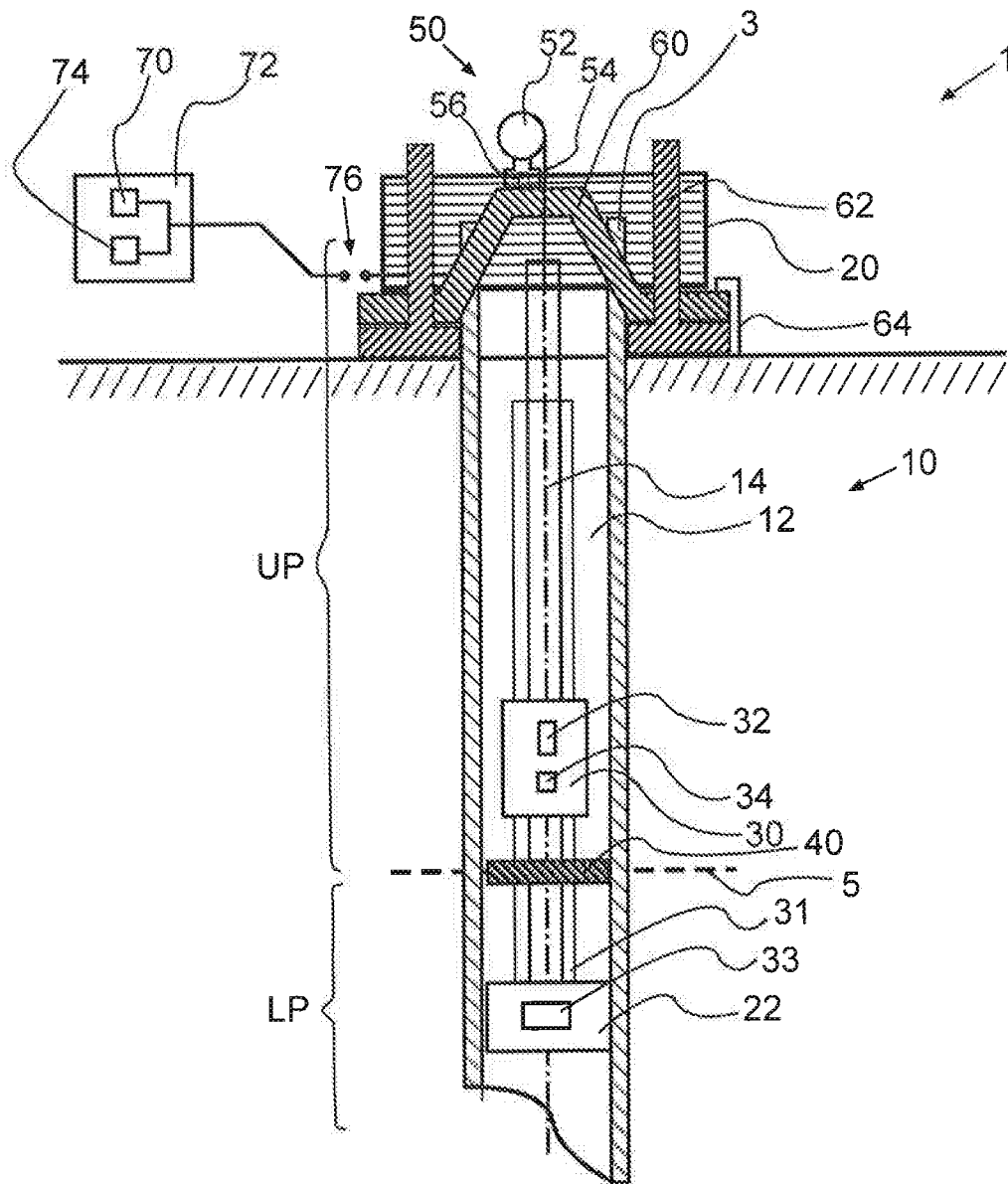


Fig. 2

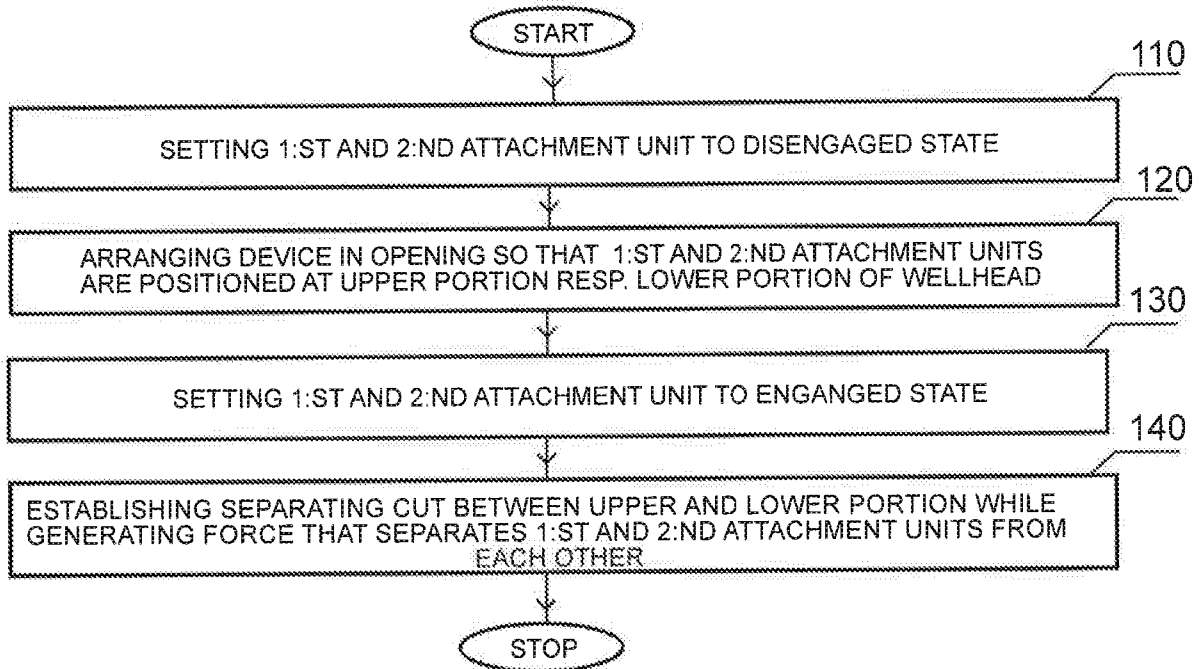


Fig. 3

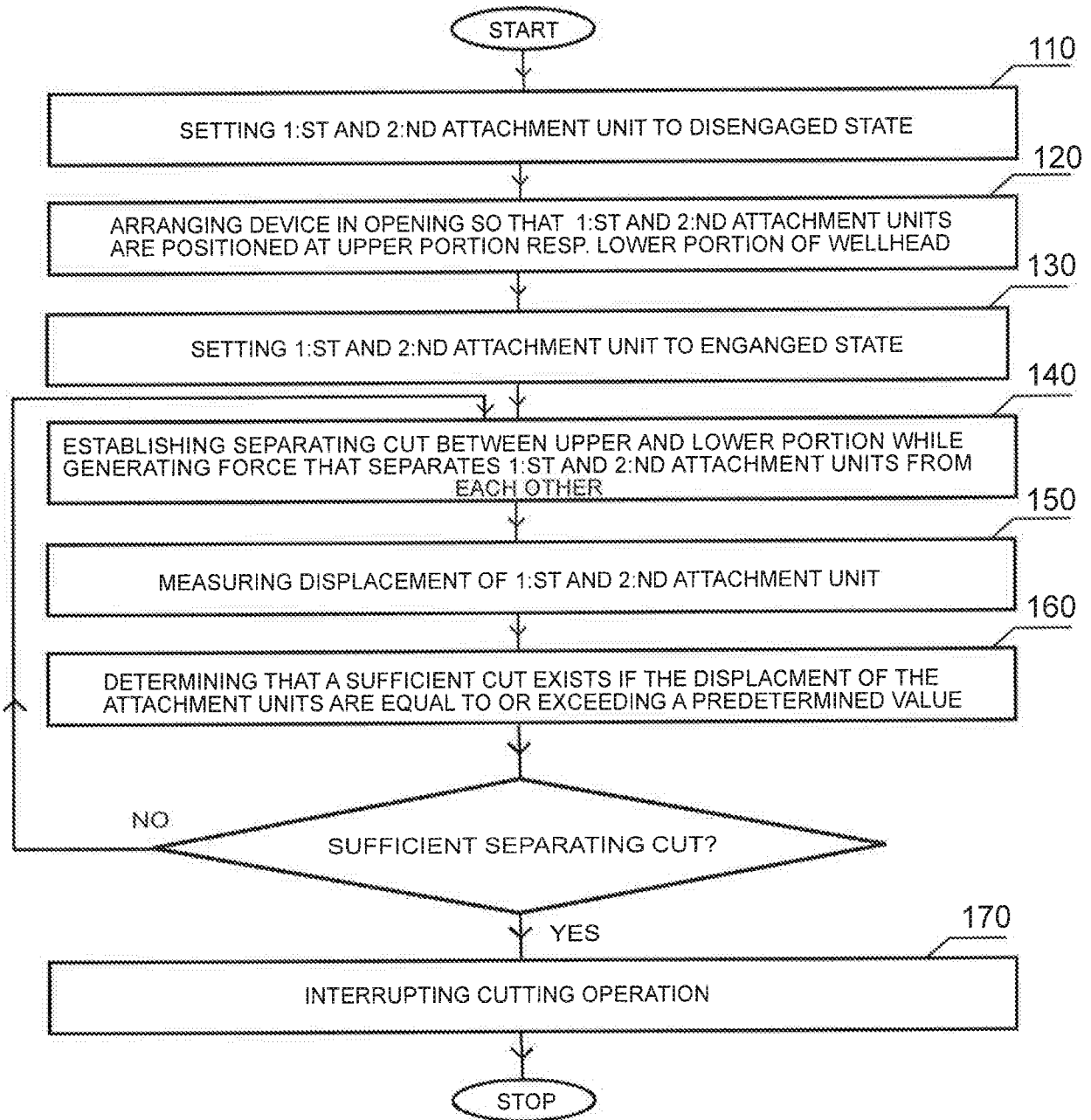


Fig. 4

INTERNATIONAL SEARCH REPORT

International application No.

PCT/NO2017/050105

A. CLASSIFICATION OF SUBJECT MATTER E21B 29/00 (2006.01), E21B 29/08 (2006.01), E21B 29/12 (2006.01), E21B 23/00 (2006.01), E21B 31/16 (2006.01), E21B 31/20 (2006.01) According to International Patent Classification (IPC) or to both national classification and IPC		
B. FIELDS SEARCHED		
Minimum documentation searched (classification system followed by classification symbols) E21B		
Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched DK, NO, SE, FE: Classes as above.		
Electronic data base consulted during the international search (name of data base and, where practicable, search terms used) EPODOC, WPI, FULL TEXT: ENGLISH, GERMAN, FRENCH		
C. DOCUMENTS CONSIDERED TO BE RELEVANT		
Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	US 6357528 B1 (DAVIS, J. P. ET AL.) 2002.03.19 Figs. 1-8.	1-20
A	US 2002/0060076 A1 (HARRELL, D. H.) 2002.05.23 Abstract, figs. 1-3, 9, paragraphs 0010-0014, 0026-0033, 0039, 0040.	1-20
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A	US 4703802 A (BRYAN, L. B. ET AL.) 1987.11.03 Figs. 1-3	1-20
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A	US 2014/0027117 A1 (HEKELAAR, S.) 2014.01.30 Figs. 1-16.	1-20
A	EP 2740885 A2 (SCHLUMBERGER TECHNOLOGY BV ET AL.) 2014.06.11 Paragraphs 0059, 0076, figs. 2-4 and 6-17.	1-20
<input checked="" type="checkbox"/> Further documents are listed in the continuation of Box C. <input checked="" type="checkbox"/> See patent family annex.		
* Special categories of cited documents:		
"A"	document defining the general state of the art which is not considered to be of particular relevance	"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention
"E"	earlier application or patent but published on or after the international filing date	"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone
"L"	document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)	"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art
"O"	document referring to an oral disclosure, use, exhibition or other means	"&" document member of the same patent family
"P"	document published prior to the international filing date but later than the priority date claimed	
Date of the actual completion of the international search	Date of mailing of the international search report	
10/07/2017	14/07/2017	
Name and mailing address of the ISA Nordic Patent Institute Helgeshøj Allé 81 DK - 2630 Taastrup, Denmark. Facsimile No. + 45 43 50 80 08	Authorized officer Al-Amiri, Thamir Jassim Telephone No. +47 22 38 75 37	

INTERNATIONAL SEARCH REPORT

International application No.

PCT/NO2017/050105

C (Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT		
Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	US 5146989 A (ROUSE, G. O.) 1992.09.15 Figs. 5 and 7.	1-20
X, P	US 2016/0215580 A1 (LEHR, D. J.) 2016.07.28 Figs. 1-4, paragraphs 0016-0020, claims 1-3.	1, 10, 16

INTERNATIONAL SEARCH REPORT
Information on patent family members

International application No.

PCT/NO2017/050105

Patent document cited in search report / Publication date	Patent family member(s) / Publication date
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