PATENT COOPERATION TREATY

PCT

INTERNATIONAL PRELIMINARY REPORT ON PATENTABILITY
(Chapter II of the Patent Cooperation Treaty)
(PCT Article 36 and Rule 70)

FOR FURTHER ACTION

See Form PCT/IPEA/416

Applicant’s or agent’s file reference
P27153PC00

FOR FURTHER ACTION

See Form PCT/IPEA/416

International application No.
PCT/NO2015/050222

International filing date (day/month/year)
25/11/2015

INTERNATIONAL PRELIMINARY REPORT ON PATENTABILITY
(Chapter II of the Patent Cooperation Treaty)
(PCT Article 36 and Rule 70)

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P27153PC00

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See Form PCT/IPEA/416

International application No.
PCT/NO2015/050222

International filing date (day/month/year)
25/11/2015

Priority date (day/month/year)
27/11/2014

International Patent Classification (IPC) or national classification and IPC
E21B 33/035 (2006.01), E21B 41/08 (2006.01)

Applicant
NEODRILL AS

1. This report is the international preliminary examination report, established by this International Preliminary Examining Authority under Article 35 and transmitted to the applicant according to Article 36.
2. This REPORT consists of a total of 5 sheets, including this cover sheet.
3. This report is also accompanied by ANNEXES, comprising:
   a. ☑ (sent to the applicant and to the International Bureau) a total of 14 sheets, as follows:
      ☑ sheets of the description, claims and/or drawings which have been amended and/or sheets containing rectifications authorized by this Authority, unless those sheets were superseded or cancelled, and any accompanying letters (see Rules 46.5, 66.8, 70.16, 91.2, and Section 607 of the Administrative Instructions).
      ☑ sheets containing rectifications, where the decision was made by this Authority not to take them into account because they were not authorized by or notified to this Authority at the time when this Authority began to draw up this report, and any accompanying letters (Rules 66.4bis, 70.2(e), 70.16 and 91.2)
      ☑ superseding sheets and any accompanying letters, where this Authority either considers that the superseding sheets contain an amendment that goes beyond the disclosure in the international application as filed, or the superseding sheets were not accompanied by a letter indicating the basis for the amendments in the application as filed, as indicated in item 4 of Box No. 1 and the Supplemental Box (see Rule 70.16(b)).
   b. ☑ (sent to the International Bureau only) a total of (indicate type and number of electronic carrier(s))
      containing a sequence listing, in the form of an Annex C/ST.25 text file, as indicated in the Supplemental Box Relating to Sequence Listing (see paragraph 3ter of Annex C of the Administrative Instructions).

4. This report contains indications relating to the following items:
   ☑ Box No. I  Basis of the report
   ☑ Box No. II Priority
   ☑ Box No. III Non-establishment of opinion with regard to novelty, inventive step and industrial applicability
   ☑ Box No. IV Lack of unity of invention
   ☑ Box No. V Reasoned statement under Article 35(2) with regard to novelty, inventive step and industrial applicability; citations and explanations supporting such statement
   ☑ Box No. VI Certain documents cited
   ☑ Box No. VII Certain defects in the international application
   ☑ Box No. VIII Certain observations on the international application

Date of submission of the demand
13/07/2016

Date of completion of this report
23/01/2017

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Form PCT/IPEA/409 (cover sheet) (January 2015)
INTERNATIONAL PRELIMINARY REPORT ON PATENTABILITY

1. With regard to the **language**, this report is based on:
   - [x] the international application in the language in which it was filed.
   - [ ] a translation of the international application into ____ which is the language of a translation furnished for the purposes of:
     - [ ] international search (Rules 12.3(a) and 23.1(b)).
     - [ ] publication of the international application (Rule 12.4(a)).
     - [ ] international preliminary examination (Rules 55.2(a) and/or 55.3(a) and (b)).

2. With regard to the **elements** of the international application, this report is based on *(replacement sheets which have been furnished to the receiving Office in response to an invitation under Article 14 are referred to in this report as “originally filed” and are not annexed to this report)*:
   - [x] the international application as originally filed/furnished, or
   - [ ] the description:
     - [ ] pages ____ as originally filed/furnished.
     - [ ] pages* 1-6 received by this Authority on 05/12/2016
     - [ ] pages* ____ received by this Authority on ____
   - [x] the claims:
     - [ ] Nos. ____ as originally filed/furnished.
     - [ ] Nos.* ____ as amended (together with any statement) under Article 19
     - [ ] Nos.* 1-11 received by this Authority on 13/07/2016
   - [x] the drawings:
     - [ ] pages ____ as originally filed/furnished.
     - [ ] pages* 1/2-2/2 received by this Authority on 05/12/2016
     - [ ] pages* ____ received by this Authority on ____
   - [ ] a sequence listing - see Supplemental Box Relating to Sequence Listing.

3. [ ] The amendments have resulted in the cancellation of:
   - [ ] the description, pages ____
   - [ ] the claims, Nos. ____
   - [ ] the drawings, sheets/figs ____
   - [ ] the sequence listing (**specify**): ____

4. [ ] This report has been established as if (some of) the amendments annexed to this report and listed below had not been made, since either they are considered to go beyond the disclosure as filed, or they were not accompanied by a letter indicating the basis for the amendments in the application as filed, as indicated in the Supplemental Box (Rule 70.2(c)) and (c-bis)):
   - [ ] the description, pages ____
   - [ ] the claims, Nos. ____
   - [ ] the drawings, sheets/figs ____
   - [ ] the sequence listing (**specify**): ____

5. [ ] This report has been established
   - [ ] taking into account the **rectification of an obvious mistake** authorized by or notified to this Authority under Rule 91 (Rules 66.1(d-bis) and 70.2(c)).
   - [ ] without taking into account the **rectification of an obvious mistake** authorized by or notified to this Authority under Rule 91(Rules 66.4bis and 70.2(c)).

6. With regard to top-up searches (Rules 66.1ter and 70.2(t)):
   - [x] A top-up search was carried out by this Authority on 10/08/2016
   - [ ] Additional relevant documents have been discovered during the top-up search.
   - [ ] No top-up search was carried out by this Authority because it would serve no useful purpose.

7. [ ] Supplementary international search report(s) from Authority(ies) ____ has/have been received and taken into account in establishing this report (Rule 45bis.8(b) and (c)).

* If item 4 applies, some or all of those sheets may be marked "superseded."
INTERNATIONAL PRELIMINARY REPORT ON PATENTABILITY

Box No. V  Reasoned statement under Article 35(2) with regard to novelty, inventive step and industrial applicability; citations and explanations supporting such statement

1. Statement

<table>
<thead>
<tr>
<th>Novelty (N)</th>
<th>Claims</th>
<th>1-11</th>
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<tbody>
<tr>
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<tr>
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<tr>
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<td>Claims</td>
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<td>NO</td>
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</table>

2. Citations and explanations (Rule 70.7)

Reference is made to the following documents:

D1: US 2010/0212916 A1 (RICE, J.) 2010.08.26
D3: US 4260289 A (MOINARD, M.) 1981.04.07

NOVELTY (Article 33(2) PCT):
Claims 1-11 are novel and therefore comply with PCT Article 33(2).

D1 is regarded as being the closest prior art to the subject matter of claims 1-11. D1 discloses a device for reducing the load on a wellhead (12) from a bending moment generated by a horizontal load component from a well element arranged over the wellhead (12). A supporting frame (10) is connected to an upper portion of the wellhead (12), or other suitable parts of the wellhead. The supporting frame (10) projects outwards from the centre axis of the wellhead (12) and is provided with abutments (14) which rest supportingly against a base at a radial distance from the wellhead (12), the supporting frame (6) being arranged to absorb a portion of said bending moment. The connection between the supporting frame and the upper portion of the wellhead is formed as a zero clearance connection and possibly as a sleeve, which encloses a portion of the wellhead with a press fit, see abstract, paragraph [0005]-[0008], [0030]-[0031], [0036], claims 1, 2, 3 and figures 2, 3, 4 and 7.

The subject matter of independent claim 1 differs from what is known from D1 in that the supporting frame is connected to an upper portion of the wellhead casing. The subject matter of independent claim 1 is therefore novel, in light of D1, and does comply with the novelty criteria of Article 33(2) of PCT.

Claims 2-11 depend on claim 1, and as such the subject matter according to said claims is new and it does comply with the requirements of Article 33 (2) PCT.

INVENTIVE STEP (Article 33(3) PCT):
Claims 1-11 involve an inventive step and therefore comply with PCT Article 33(3).

The objective technical problem to be solved by the present invention according to claim 1, in light of D1, may be regarded as to provide an alternative arrangement for protecting the wellhead from lateral forces.

D2 describes a stabilizing device for a wellhead with the upper portion of a wellhead casing projecting up above a seabed, in which a wellhead valve which projects up from the upper portion of the wellhead casing is completely or partially supported on the suction foundation by several supporting elements being arranged between the wellhead valve and the suction foundation, see abstract, page 3 line 21-page 4 line 15, page 5 lines 1-21, page 7 line 11-page 9 line 2 and figures 1 and 2.

To be continued in supplemental box.
<table>
<thead>
<tr>
<th>Box No. VIII</th>
<th>Certain observations on the international application</th>
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<td>The following observations on the clarity of the claims, description, and drawings or on the question whether the claims are fully supported by the description, are made:</td>
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<td>Drawing 1 does not illustrate a support frame (6) connected to an upper part (12a) of a wellhead casing (12), but rather the support frame (6) connected to the conductor casing (121). This does not comply with the description or claims of the application (Article 7 PCT).</td>
</tr>
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In case the space in any of the preceding boxes is not sufficient.

Continuation of Box No. V:

The subject matter according to claim 1 of the present application is considered to involve an inventive step (Article 33(3) PCT). According to D1 paragraph [0031] "the stabilizer (10) may be used to laterally cage various parts of the wellhead, for example connections between wellhead components (as shown), blow-out preventers, spools, and other suitable parts". However, there is no indication in D1 that the supporting frame could, or would be, connect to an upper portion of a wellhead casing. Therefore, in view of what is known from D1 alone, or in combination with D2, the subject matter according to claim 1 is considered to involve an inventive step.

The subject matter according to claims 2-11, dependent on claim 1, does also involve an inventive step and comply with the requirements of Article 33 (3) PCT.

INDUSTRIAL APPLICABILITY (Article 33(4) PCT):

The invention according to claims 1-11 fulfils the industrial applicability requirement set out in Article 33(4) PCT.
ARRANGEMENT FOR SUPPORTING A WELLHEAD

The invention relates to a device for reducing the strain on a wellhead casing from a bending moment generated by a horizontal load component from a well element arranged over a wellhead.

As a rule, installing elements on a wellhead, in particular a blowout preventer (BOP), at the top of a wellhead casing which extends down through unconsolidated masses in the sea floor, usually with an upper wellhead-casing portion surrounded by and fixed to a conductor casing, involves a risk of fatiguing the wellhead casing, by the wellhead being subjected to lateral forces so that the wellhead casing is being bent. The lateral load may arise in consequence of drift of a riser extending through the water masses from the wellhead upwards to a surface installation. When a blowout preventer weighs 250-500 tonnes and has a vertical extent of up to 14-16 metres and a horizontal extent of 5-6 metres, such a bending strain will increase in that the load that is resting on the wellhead casing will have its centre of gravity displaced away from the original, vertical centre axis of the wellhead.

The problem is described among other things by Dahl Lien: "Methods to Improve Subsea Wellhead Fatigue Life", a project assignment at the Faculty for engineering science and technology, the Institute for petroleum technology and applied geophysics, NTNU, Trondheim, Norway, 2009. The situation may lead to deformation of the wellhead casing and, at worst, fatigue and rupturing. The problems intensify as the safety requirements are being increased, for example illustrated by the fact that while pressure barriers were earlier dimensioned to withstand 5000 psi, the requirements have gradually increased to 15000 psi, and associated valves have gone from 4 to 6 levels. The use of deep-water rigs with heavy subsurface safety equipment at moderate water depths has further intensified the problems. It has been recorded that the wellhead has been subjected to strains of up to 90% of the critical limit of the wellhead as regards fatigue.

From the prior art describing solutions to the problem of fatiguing the wellhead casing which forms the foundation for wellhead elements, the inventor's own suction foundation (Conductor Anchor Node = CAN) may be mentioned, disclosed in NO patent No. 313340, included in its entirety herein by reference, in principle providing a larger contact surface between the upper part of the conductor casing and the surrounding seabed mass, the diameter of the suction foundation typically being approximately 6 metres, whereas the diameter of the conductor casing is in the range of 0.75-0.90 m (30-36 inches).

It is also known (Dahl Lien 2009, see above) to use moorings extending at outward and downward
angles from an upper portion of a wellhead installation to the seabed where the moorings are secured to anchors.

From NO 305179, a suction anchor enclosing an upper portion of a conductor casing and parts of a wellhead is known. To the wellhead, a frame is connected, arranged to carry a swivel device for the horizontal connection of a riser et cetera, the frame resting on separate suction anchors placed at a distance from the former suction anchor.

From the applicant's own NO patent 331978 (and the corresponding WO publication 2011162616 A1), a stabilizing device for a wellhead with the upper portion of a wellhead casing projecting up above a seabed is known, in which a wellhead valve which projects up from the upper portion of the wellhead casing is completely or partially supported on the suction foundation by several supporting elements being arranged between the wellhead valve and the suction foundation.

US2006162933A1 discloses a system and a method of establishing a subsea exploration and production system, in which a well casing, projecting up from a seabed where a well is to be established, is provided with a buoyancy body arranged at a distance above the seabed. The buoyancy body is stabilized by means of adjustable stabilizing elements, which are anchored to the seabed at a distance from the well casing.

US2010/0212916 A1 is disclosing a stabilizer for a wellhead, comprising: a ground engaging support structure having lateral dimensions suitable for laterally stabilizing the wellhead; wellhead stabilizer elements disposed within the ground engaging support structure, the wellhead stabilizer elements having wellhead abutting faces spaced to laterally cage the wellhead to restrict lateral movement of the wellhead while permitting the wellhead to move in a vertical direction. The wellhead may include various wellhead components, including for example casing bowls, spools, blowout preventers, and other suitable components. The portion of wellhead that is laterally caged need not be circular in cross-section, but may be a suitable geometry.

To try to meet the constantly increasing challenges when it comes to avoiding fatigue fracturing of the wellhead, the dimension of the wellhead casing has gradually been increased, the diameter having increased from 30 inches to 36 inches and further to 42 inches, with a wall thickness that has increased from 1 inch all the way up to 2 inches.

In the further description, the term "wellhead valve" covers both a blowout preventer (BOP) alone and also a combination of a blowout preventer and other valve types (for example production valves), and other valve types or combinations of valve types alone, said wellhead valve being arranged on a wellhead on an end portion of a wellhead casing projecting above a seabed.

The invention has for its object to remedy or reduce at least one of the drawbacks of the prior art or at least provide a useful alternative to the prior art.
The object is achieved through the features, which are specified in the description below and in the claims that follow.

The invention provides a method and a device for reducing the risk of fatigue in a wellhead without increasing the pipe dimension, that is to say the pipe-wall thickness, the pipe diameter or the material quality, of the wellhead casing projecting up above the seabed and forming the wellhead, and without intervening in valves and so on mounted on the wellhead. The invention involves having a supporting frame, which, at a distance from the well centre, is supported on a foundation that rests on a seabed, rigidly connected to the wellhead casing to absorb a substantial portion of a bending moment applied to the wellhead casing by a horizontal load component. Calculations show that the bending stresses on the wellhead casing can be reduced considerably by the supporting frame absorbing a substantial part of the load caused by horizontal load components affecting the wellhead. Such horizontal load components may, for example, be caused by a connected riser being bent out sideways, for example because of sea currents. Studies have shown that bending stresses on the wellhead casing can be reduced to a range of 5-25 % of the total torque by the supporting frame relieving the wellhead casing. The material stresses in the wellhead casing will thereby be reduced correspondingly and, with a view to fatigue, the lifetime of the wellhead casing will increase. With a conservatively estimated effect by which the load on the wellhead casing is reduced to 10 %, the supporting frame taking 90 % of the load, the stresses in the wellhead casing will be reduced to 10 %, which results in an increase in the estimated lifetime of the wellhead casing by 1000 times seen in relation to fatigue.

The invention is defined by the independent claim. The dependent claims define advantageous embodiments of the invention.

The invention relates, more specifically, to a device for reducing the strain on a wellhead casing from a bending moment generated by a horizontal load component from a well element arranged over a wellhead, characterized by a supporting frame being connected to an upper portion of the wellhead casing and projecting outwards from the centre axis of the wellhead casing and being provided with abutments resting in a supporting manner on a base at a radial distance from the wellhead casing, the supporting frame being arranged to absorb a portion of said bending moment.

The supporting frame may include a well-casing extension adapted for connection to the wellhead casing. The advantage of this is that the wellhead casing can thereby be protected from bending stresses from drilling operations during the establishing of the well, as, in this phase, the bending moment from a blowout valve and other elements temporarily installed over the wellhead subject only the supporting frame and the well-casing extension to strain, and this is removed after the drilling operations have been carried out, and the well casing is possibly provided with a new supporting frame connected directly to the wellhead casing.

The ratio of the maximum bending moment absorbed by the supporting frame to the bending mo-
ment applied to the wellhead casing may be at least 1:2, alternatively at least 3:4, alternatively at least 9:10.

The connection between the supporting frame and the wellhead casing, possibly between the supporting frame and the well-casing extension may be formed as a zero-clearance connection. An advantage of this is that any bending moment applied will, in the main, be absorbed immediately by the supporting frame.

The supporting frame may include a coupling formed as a sleeve enclosing a portion of the wellhead casing or the well-casing extension, by a press fit. The sleeve may have been shrunk around a portion of the wellhead casing or the well-casing extension. An advantage of this is that the connection can be machined with moderate requirements of tolerance, and the shrinking may be provided by heat development during the welding-together of the sleeve and the projecting elements of the supporting frame.

The base may be a seabed or a wellhead foundation. The advantage of this is that the supporting frame may be placed on the type of base that is the most suitable in each situation.

In what follows, an example of preferred embodiments is described, which is visualized in the accompanying drawings, in which:

Figure 1 shows a principle drawing of a wellhead provided with a supporting frame directly connected to an upper portion of a wellhead casing;

Figure 2 shows, in a highly simplified manner, the elements that absorb load when a wellhead is subjected to a bending moment from a horizontal load component; and

Figure 3 shows a principle drawing of a wellhead provided with a supporting frame connected to an upper portion of a wellhead casing via a well-casing extension integrated in the supporting frame.

Reference is first made to figure 1. A subsea well 1 extends downwards in an underground 4 under a water mass 5. A wellhead 11 is arranged immediately above a seabed 41, an upper portion 12a of a wellhead casing 12 projecting up from the seabed and forming the wellhead 11 in which one or more wellhead elements 2 are arranged, at least a Christmas tree including a blowout preventer (also referred to as a BOP), a wellhead connector 21 connecting the wellhead elements 2 to the wellhead casing 12. From the wellhead element 2, at least a marine riser 3 extends up through the water mass 5 to a surface installation (not shown). The riser 3 is shown as being deflected in order to indicate a situation in which the wellhead 11 is subjected to a horizontal load component \( L_h \) which subjects the wellhead casing 12 to a bending moment \( M_w \). The deflection of the riser 3 may be due to currents in the water mass 5 or the position of the surface installation not shown. Currents in the water mass 5 may also subject the wellhead element 2 to a horizontal load component.
L_h, and skewed distribution of the mass of the wellhead element 2 will also subject the wellhead 11 to a horizontal load component L_h.

The wellhead casing 12 is shown here as a casing 122 extending up through a so-called conductor casing 121 which bounds the well 1 in a manner known per se towards the unconsolidated masses in the upper part of the base 4. An upper portion 12a of the wellhead casing 12 is rising from an upper portion 121a of the conductor casing 121.

Connected to the upper portion 12a of the wellhead casing 12, there is a supporting frame 6 which projects radially outwards from the wellhead casing 12 and is provided with several abutments 61 resting in a supporting manner on a base 13 shown schematically here as an element which is partially embedded in the seabed 41. The base 13 may be any wellhead foundation, for example a suction foundation or a well frame which provides a sufficiently large degree of stability and ability to absorb a load L_v which is transmitted through the supporting frame 6.

The wellhead casing 12 and the supporting frame 6 are connected to each other in a way that makes it possible for the supporting frame 6 to absorb a bending moment M_r as a reaction to the horizontal load component L_h from the wellhead element 2 subjecting the wellhead casing 12 to said bending moment M_r. A coupling 62 may be arranged in such a way that the wellhead casing 12 is allowed a certain deflection before hitting the supporting frame 6 and the further load being substantially absorbed by the supporting frame 6. The design of the coupling 62 and the dimensioning of the supporting frame 6 can thereby be used to control how great a load the wellhead casing 12 may be subjected to. Calculations carried out by the applicant and other instances have shown that the supporting frame 6 may absorb 75 to 95 % of the strain caused by said horizontal load component L_h.

To ensure a greatest possible relief of the wellhead casing 12, the coupling 62 is advantageously formed as a sleeve 621 surrounding a portion of the wellhead casing 12 without radial clearance. This is advantageously achieved by shrinking the sleeve 621.

The supporting frame 6 according to figure 1 is suitable for permanent installation on the wellhead 11.

Reference is now made to figure 3, in which the supporting frame 6 is provided with a well-casing extension 63 which is adapted for insertion between the wellhead casing 12 and the wellhead element 2. Thereby the supporting frame 6 can be installed without any intervention into the wellhead casing 12. This embodiment is well suited for temporary installation, for example while drilling is in progress, indicated here by a drill string 7 extending from a surface installation not shown and through the wellhead 11. The well-casing extension 63 also works as a protection of the wellhead 11 during the temporary installation of wellhead elements 2 or the insertion or withdrawal of drilling equipment.
Figure 2 shows the statics of the supporting frame 6 in principle. Solid, oblique connecting lines between horizontal and vertical lines indicate that the connection is rigid. Broken, oblique connecting lines indicate that the connection can allow a restricted relative movement, as is described for the coupling 62 above.

When the supporting frame 6 is mounted on the wellhead 11 and the wellhead 11 is subjected to a bending moment $M_w$ generated by a horizontal load component $L_h$ from above-lying elements 2, 3, the supporting frame 6 is subjected to a vertical load $L_v$ which is transmitted to the seabed 41 at a distance from the centre axis of the wellhead casing 12 through the abutment of the supporting frame 6 against the base. Depending on the amount of play the coupling 62 between the supporting frame 6 and the wellhead casing 12 allows and how great a bending stiffness the wellhead casing 12 and the supporting frame 6 exhibit, the portion of the applied bending moment $M_w$ absorbed by the supporting frame, that is to say $M_r/M_w$, $M_r$ being the bending moment absorbed by the supporting frame 6, will vary. Calculations show that it is quite possible to dimension the supporting frame 6 to enable absorption of at least 9/10 of the bending moment $M_w$ applied.

It should be noted that all the above-mentioned embodiments illustrate the invention, but do not limit it, and persons skilled in the art may construct many alternative embodiments without departing from the scope of the dependent claims. In the claims, reference numbers in brackets should not be regarded as restrictive. The use of the verb “to comprise” and its different forms does not exclude the presence of elements or steps that are not mentioned in the claims. The indefinite article "a" or "an" before an element does not exclude the presence of several such elements.

The fact that some features are stated in mutually different dependent claims does not indicate that a combination of these features cannot be used with advantage.
Regarding: International PCT Application No. PCT/NO2015/050222
Applicant: NeoDrill AS
Title: Arrangement for supporting a wellhead
Our ref.: P27153PC00 - jr

We refer to the Written Opinion of October 20, 2016 in which the examiner maintains his opinion that the invention is lacking inventive step over US2010212916A1 (D1) in the elucidation of WO2011162616A1 (D2).

It is hindsight, when reading section [0031] ("stabilizer 10 may be used to laterally cage various parts of the wellhead, for example connections between wellhead components (as shown), blow-out-preventers, spools, and other suitable parts") to allege that "other suitable parts" should lead the person skilled in the art to provide support at components below the wellhead. Actually, section [0038] of D1 discloses: "Wellhead 12 may include various wellhead components, include for example casing bowls, spools, blowout preventers, and other suitable components. An example of a spool may be an industry standard connection such as a 3000-10000 psi connection. It should be understood that the portion of wellhead 12 that is laterally caged need not be circular in cross-section, but may be a suitable geometry."

From this, and from the specification of the spool that "may be an industry standard connection such as a 3000-10000 psi connection", it should be clear that D1 is teaching of providing support to components installed onto the well casings as this is the earliest possibility to do such a mentioned connection.

D2 is disclosing a stabilization device for a wellhead wherein an upper portion (121) of a wellhead casing (12) extends up above a seabed (4), the upper wellhead casing portion (121) being sideways supported in a suction substructure (5), and wherein a wellhead valve (2) extending up from the upper portion (121) of the wellhead casing (12) is provided with multiple supporting elements (6) abutting supporting an edge portion (54) of an end cover (52) on the suction substructure (5).

Therefore, D2 describes a support of a wellhead valve (2) extending up from the upper portion (121) of the wellhead casing (12). The wellhead valve (2) has to be connected to the upper
portion (121) with a similar industry standard connection as described in D1. D2 further describes that supporting elements (6) are providing support to the wellhead valve (2).

The reality is that while D1 and D2 are disclosing supports being connected directly to one or more of the wellhead elements, the present invention provides a support to the upper portion of the wellhead casing. The confusion occurs in that the same wording (wellhead) is used to address different technical parts of the invention. This is illustrated in the table and figures below, wherein core elements or groups of elements A, B and C are defined.

<table>
<thead>
<tr>
<th>Present Application</th>
<th>US2010212916A1 (D1)</th>
<th>WO2011162616A1 (D2)</th>
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<tr>
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<td>Upper portion of conductor casing (111)</td>
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<td>Wellhead element (2, 3) From description: such as Christmas tree including a blowout preventer</td>
<td>Wellhead (12)</td>
<td>Claim 1: Wellhead valve (2)</td>
</tr>
<tr>
<td></td>
<td>Wellhead 12 may include various wellhead components, include for example casing bowls, spools, blowout preventers, and other suitable components</td>
<td>From description, page 3, line 9-15: [in the further description the term &quot;wellhead valve&quot; comprises both a blowout preventer (BOP) alone and also combination of a blowout preventer and other types of valves for example production valves] Item C in figures below</td>
</tr>
<tr>
<td></td>
<td>Item C in Figures 1 through 4 below</td>
<td></td>
</tr>
<tr>
<td>Base (13)</td>
<td>Ground engaging support structure (14)</td>
<td>Supporting structure (5)</td>
</tr>
<tr>
<td>Supporting elements (6)</td>
<td>Stabilizer (10)</td>
<td>Supporting elements (6)</td>
</tr>
<tr>
<td></td>
<td>Wellhead stabilizer elements (16)</td>
<td></td>
</tr>
<tr>
<td>Not mentioned originally, new reference number 21, see amended description and drawings</td>
<td>Not mentioned</td>
<td>Wellhead connector (21)</td>
</tr>
<tr>
<td></td>
<td>Item B in Figures 1 through 4 below</td>
<td>Item (B) in Figure 5 below</td>
</tr>
<tr>
<td>Invention is claiming: A supporting frame (6) is connected to an upper portion (12a) (= A) of the wellhead casing (12) (= A) and project outwards from the centre axis of the wellhead casing (12) (= A) and is provided with abutments (61) which rest supportingly against a base (13). Therefore the element that is supported is element A.</td>
<td>Referring to FIG. 2, a stabilizer 10 for a wellhead (12) (= C) is illustrated. Stabilizer 10 comprises a ground engaging support structure 14 having lateral dimensions suitable for laterally stabilizing the wellhead (12) (= C). Therefore the element that is supported is element C.</td>
<td>... a wellhead valve (2) (= C) extending up from the upper portion (121 A) of the wellhead casing (12) (= A) is supported fully or partly on the suction substructure (5), multiple supporting elements (6) being arranged between the wellhead valve (2) (= C) and the suction substructure (5). Therefore the element that is supported is element C.</td>
</tr>
</tbody>
</table>
Figure 5 - from D2

With reference to the above presented table and figures:

- D1 does NOT mention any element that is identified as item A clearly supporting elements identified as item C.
- D2 does mention elements that is identified as item A, but clearly states that the supported elements are of type C.

Thus by combining the teaching of D1 with the teaching of D2, the person skilled in the art would not arrive at the wellhead casing support according to the present invention. Thus, it is believed that the claims on file holds inventive step over prior art.

An amended set of drawings is enclosed together with an amended description. In the figures 1 and 3 and in the corresponding embodiment description, a wellhead connector 21 is identified and mentioned, and so is an upper portion 121a of the wellhead casing. As a service, a mark-up copy of the amended description is also enclosed.

Yours sincerely

HÅMSØ PATENTBYrå ANS

Jørgen Risdal

Enclosure: Amended description (inclusive mark-up copy)
Amended set of drawings
Amended claims

1. A device for reducing the load on a wellhead casing (12) from a bending moment ($M_w$) generated by a horizontal load component ($L_h$) from a well element (2, 3) arranged over a wellhead (11), characterized in that a supporting frame (6) is connected to an upper portion (12a) of the wellhead casing (12) and projects outwards from the centre axis of the wellhead casing (12) and is provided with abutments (61) which rest supportingly against a base (13, 41) at a radial distance from the wellhead casing (12), the supporting frame (6) being arranged to absorb a portion of said bending moment ($M_w$).

2. The device according to claim 1, wherein the supporting frame (6) comprises a well-casing extension (63) adapted for connection to the wellhead casing (12).

3. The device according to claim 1, wherein the ratio of the maximum bending moment ($M_t$) absorbed in the supporting frame (6) to the bending moment ($M_w$) applied to the wellhead casing (12) is at least 1:2.

4. The device according to claim 1, wherein the ratio of the maximum bending moment ($M_t$) absorbed by the supporting frame (6) to the bending moment ($M_w$) applied to the wellhead casing (12) is at least 3:4.

5. The device according to claim 1, wherein the ratio of the maximum bending moment ($M_t$) absorbed in the supporting frame (6) to the bending moment ($M_w$) applied to the wellhead casing (12) is at least 9:10.

6. The device according to claim 1 or 2, wherein the connection between the supporting frame (6) and the wellhead casing (12), possibly between the supporting frame (6) and the well-casing extension (63) is formed as a zero-clearance connection.

7. The device according to claim 6, wherein the supporting frame (6) comprises a coupling (62) formed as a sleeve (621) which encloses a portion of the wellhead casing (12) with a press fit.

8. The device according to claim 6, wherein the supporting frame (6) comprises a coupling (62) formed as a sleeve (621) which encloses a portion of the well-casing extension (63) with a press fit.

9. The device according to claim 6, wherein the supporting frame (6) comprises a coupling (62) formed as a sleeve (621) which has been shrunk around a portion of the wellhead casing (12).
10. The device according to claim 6, wherein the supporting frame (5) comprises a coupling (62) formed as a sleeve (621) which has been shrunk around a portion of the well-casing extension (63).

11. The device according to claim 1, wherein the base is a seabed (41) or a wellhead foundation (13).