



(51) International Patent Classification:

B63B 35/44 (2006.01) E21B 15/00 (2006.01)

E02B 17/02 (2006.01) E21B 15/02 (2006.01)

(21) International Application Number:

PCT/NL2020/050161

(22) International Filing Date:

11 March 2020 (11.03.2020)

(25) Filing Language:

English

(26) Publication Language:

English

(30) Priority Data:

2022730 12 March 2019 (12.03.2019) NL

(71) Applicant: ITREC B.V. [NL/NL]; 2, Admiraal Trompstraat, 3115 HH SCHIEDAM (NL).

(72) Inventor: WIJNING, Diederick Bernardus; c/o 2, Admiraal Trompstraat, 3115 HH SCHIEDAM (NL).

(74) Agent: VAN DER VELDEN, Marc; EP&C, P.O. Box 3241, 2280 GE Rijswijk (NL).

(81) Designated States (unless otherwise indicated, for every kind of national protection available): AE, AG, AL, AM, AO, AT, AU, AZ, BA, BB, BG, BH, BN, BR, BW, BY, BZ, CA, CH, CL, CN, CO, CR, CU, CZ, DE, DJ, DK, DM, DO, DZ, EC, EE, EG, ES, FI, GB, GD, GE, GH, GM, GT, HN, HR, HU, ID, IL, IN, IR, IS, JO, JP, KE, KG, KH, KN, KP,

KR, KW, KZ, LA, LC, LK, LR, LS, LU, LY, MA, MD, ME, MG, MK, MN, MW, MX, MY, MZ, NA, NG, NI, NO, NZ, OM, PA, PE, PG, PH, PL, PT, QA, RO, RS, RU, RW, SA, SC, SD, SE, SG, SK, SL, ST, SV, SY, TH, TJ, TM, TN, TR, TT, TZ, UA, UG, US, UZ, VC, VN, WS, ZA, ZM, ZW.

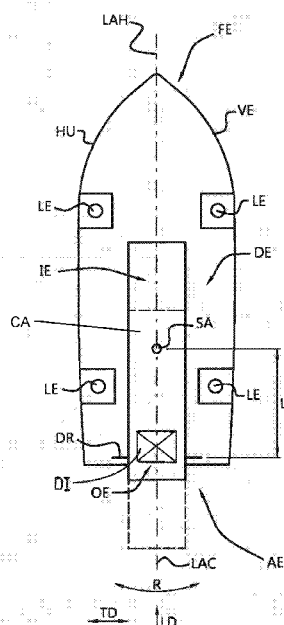
(84) Designated States (unless otherwise indicated, for every kind of regional protection available): ARIPO (BW, GH, GM, KE, LR, LS, MW, MZ, NA, RW, SD, SL, ST, SZ, TZ, UG, ZM, ZW), Eurasian (AM, AZ, BY, KG, KZ, RU, TJ, TM), European (AL, AT, BE, BG, CH, CY, CZ, DE, DK, EE, ES, FI, FR, GB, GR, HR, HU, IE, IS, IT, LT, LU, LV, MC, MK, MT, NL, NO, PL, PT, RO, RS, SE, SI, SK, SM, TR), OAPI (BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, KM, ML, MR, NE, SN, TD, TG).

Published:

— with international search report (Art. 21(3))

(54) Title: OFFSHORE SYSTEM

FIG. 1



(57) Abstract: The invention relates to an offshore system comprising a vessel, a moveable cantilever arranged on the vessel with cantilever rails and a transverse connection at a free end of the cantilever, and a drilling installation with a tower structure including vertically extending support structures arranged on the cantilever above the transverse connection and/or above one of the cantilever rails seen in plan view and supporting a hoisting device and a pipe racker. As a result thereof, the weight of the drilling installation can be transferred via side walls of the cantilever and the cantilever rails to the vessel in an efficient manner without having to add additional strengthening and thus weight to the cantilever.

Title: Offshore system

- 5 The invention relates to an offshore system including a vessel and a drilling installation for drilling a well, for example an oil, gas, or a thermal well, by means of said installation, e.g. a subsea well from said vessel.

An example of such an offshore system can be found in publication WO2014/065655A1 in
10 the name of the applicant. The publication discloses a drilling installation comprising a drilling tower with four vertically extending hollow casings that are interconnected to form a frame supporting storage devices, pipe rackers and hoisting device.

Main advantage of the drilling installation disclosed in WO2014/065655A1 is that the
15 installation has a favourable strength and sufficient strength while at the same time allowing easy handling of drilling tubulars and other accessories.

When drilling and borehole activities need to be performed outside the contours of a deck of the vessel, e.g. when activities need to be performed over an abandoned platform, it is
20 known to use a cantilever that is mounted on the deck and that is at least moveable in a longitudinal direction of the cantilever relative to the deck between a retracted position and an extended position. See for instance publication WO2017/034403 in the name of the applicant. The drilling installation is then mainly arranged at an operational end of the cantilever, which is the distal end of the cantilever extending outside the deck of the vessel
25 when the cantilever is in the extended position.

Although the drilling installation of WO2014/065655A1 has many advantages, among others a favourable weight, the inventors have found it challenging to use such a drilling installation on a cantilever. Practical implementations of the drilling installation were still too heavy, large
30 and/or bulky to be used on the cantilever. In order to support such a drilling installation on the cantilever, the cantilever needs to be strengthened, e.g. by applying a lattice structure to the inside of the cantilever. However, this further increases the weight of the combination of cantilever and drilling installation.

35 Hence, it is an object of the invention to provide an improved offshore system with a favourable weight of the combination of cantilever and drilling installation while at the same time keeping the advantage of easy access to the firing line.

The object of the invention is achieved by providing an offshore system comprising:

- a vessel having a deck; and
- a cantilever which is mounted on the deck and which is at least moveable in a

5 longitudinal direction of the cantilever relative to the deck between a retracted position and an extended position,

wherein the cantilever comprises two cantilever rails extending parallel to each other in the longitudinal direction of the cantilever, which cantilever rails support at least a portion of the weight of the cantilever and transmit said weight to the deck of the vessel, wherein the

10 cantilever comprises a proximal end and a distal end opposite to the proximal end, said distal end extending outside the deck of the vessel when the cantilever is in the extended position, wherein the two cantilever rails at the distal end are connected to each other using a transverse connection, and wherein the offshore system further comprises a drilling installation including:

- 15 ○ a tower structure;
- a hoisting device adapted to manipulate an object in a firing line extending in a longitudinal direction of the tower structure;
- a storage device for vertically storing tubular elements; and
- a pipe racker for moving tubular elements between the storage device and the
- 20 firing line.

and wherein the tower structure comprises a vertically extending first support structure and a vertically extending second support structure to support the hoisting device and the pipe racker, said first support structure being arranged on the cantilever above the transverse connection seen in plan view or above one of the cantilever rails seen in plan view, and said

25 second support structure being arranged on the cantilever above the other one of the cantilever rails seen in plan view.

A main advantage of the offshore system according to the invention is that the support structures are arranged above at least one cantilever rail and/or the transverse connection

30 making it relatively easy to transmit the weight of the drilling installation to the cantilever rails, optionally via the transverse connection, e.g. via side walls of the cantilever, and subsequently to the deck of the vessel. An extensive lattice structure inside the cantilever may thus be omitted or replaced by a lighter structure. An additional advantage may be that the available space inside the cantilever is increased.

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In an embodiment, the storage device is supported by the first and/or second support structure. An advantage there is that also the weight of this component is transmitted via the first and/or second support to the at least one cantilever rail and the transverse connection.

- 5 In an embodiment, the drilling tower structure comprises a third vertically extending support structure, wherein the first support structure is arranged on the cantilever above the transverse connection seen in plan view, the second support structure is arranged on the cantilever above one of the cantilever rails seen in plan view and said third support structure is arranged on the cantilever above the other one of the cantilever rails seen in plan view.
- 10 Preferably, the arrangement of the first, second and third support structures is substantially mirror symmetric about a vertical plane extending parallel to the longitudinal axis of the cantilever through the first support structure.

- An advantage of using three support structures is that bending and torsion loads on the
- 15 support structures may be minimized as it is easier to design and configure the drilling installation such that the centre of gravity stays within the triangular shape formed by the three support structures seen in plan view.

- In an embodiment, the storage device is a first storage device and the pipe racker is a first
- 20 pipe racker, wherein the drilling installation comprises a second storage device for vertically storing tubular elements and a second pipe racker for moving tubular elements between the second storage device and the firing line, and wherein the third support structure supports the second pipe racker. Preferably, the second storage device is supported by the first and/or third support structure.

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- In an embodiment, the drilling tower structure between the second and third support structure comprises an opening to allow tubular elements to be moved in and out of the tower structure. Preferably, the opening has a height which is at least equal to a maximum length of a tubular element in the storage device. Complex motions of the tubular elements,
- 30 such as moving from a vertical state outside the tower structure to an inclined state to pass the opening and back to a vertical state inside the tower structure can thus be avoided/prevented due to the sufficient length of the opening in the tower structure.

- The phrase "inside the tower structure" is meant to be interpreted such that an object is
- 35 substantially inside a vertical projection of the tower structure in plan view. In other words, inside the tower structure means that an object is substantially surrounded by portions of the tower structure, except possibly at the location of the opening in the tower structure. It also

means that portions of the object may extend outside the tower structure as long as the main portion is inside the tower structure. To make a proper distinction with the situation that all portions of an object are inside the tower structure and thus no portions extend outside the tower structure, this situation will be referred to as entirely or completely inside the tower structure. In the remainder of this description, the phrase "inside the tower structure" will be used unless explicitly mentioned otherwise. However, it is envisaged that these phrases can be replaced with the phrase "entirely inside the tower structure" or "completely inside the tower structure" when desired.

10 In an embodiment, the storage device provides a plurality of storage locations arranged around a center seen in plan view, wherein the pipe racker comprises one or more gripping members adapted to grip a tubular element, wherein the one or more gripping members are rotatable about a vertically extending rotation axis, and wherein the pipe racker is arranged such that the rotation axis of the one or more gripping members substantially coincides with
15 the center of the storage device. The same may apply to the first and/or the second storage device.

In an embodiment, the first and second support structure, and the third support structure, if applicable, are interconnected to form a rigid tower structure.

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In an embodiment, the cantilever comprises a box-shaped structure having a top, a bottom and four sidewalls extending between the top and the bottom, wherein the two cantilever rails are arranged at a respective edge between bottom and a corresponding sidewall, and wherein the drilling installation is arranged on the top. In other words, the corresponding side
25 wall is arranged on top of a corresponding cantilever rail. In this way, the sidewall can be used to transmit loads from the top of the cantilever to the cantilever rails.

In an embodiment, the transverse connection is arranged at another respective edge between bottom and a corresponding sidewall.

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In an embodiment, the first and second support structure are integrated with the box-shaped structure, preferably by being integrated with the corresponding sidewall.

In an embodiment, a lattice structure is provided inside the box-shaped structure. This lattice
35 structure may be arranged mainly at the sidewalls and/or the bottom or top of the box-shaped structure to keep the centre of the box-shaped structure clear for other equipment or components.

In an embodiment, the first, second and third, if applicable, support structure include one or more vertical posts, preferably the posts being embodied as box-like elements. The box-like elements may alternatively be referred to as substantially hollow casings.

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In an embodiment, the first support structure is provided with one or more vertical guide elements, e.g. rails, and one or more trolleys that are movable along said guide elements, said one or more trolleys supporting a topdrive for rotary drive of a string of drilling tubulars and/or a travelling block for attaching a string of drilling tubulars to the hoisting device.

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In an embodiment, the tower structure occupies at most 40%, preferably at most 30%, more preferably at most 20% and most preferably at most 10% of the cantilever seen in plan view.

The invention will now be described in a non-limiting way by reference to the accompanying

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drawings in which like parts are indicated using like reference symbols, and in which:

Fig. 1 schematically depicts a plan view of an offshore system according to the invention;

Fig. 2 schematically depicts a side view of a part of the offshore system of Fig. 1;

Fig. 3 schematically depicts a cross-sectional view of the drilling installation of the offshore system of Figs. 1 and 2;

20

Fig. 4 schematically depicts a rear view of the drilling installation of the offshore system of Figs. 1 and 2.

Fig. 1 schematically depicts a top view of an offshore system according to an embodiment of the invention, comprising a vessel VE with a deck DE, and a cantilever CA which is mounted

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The vessel VE in this embodiment is a monohull vessel with an elongated hull HU, but the invention can be applied to any type of vessel, including but not limited to semi-submersibles, jack-up platforms, barges, etc.

30

The vessel VE in this embodiment is equipped with a jack-up system to lift the vessel at least partly out of the water. The jack-up system in this embodiment comprises four legs LE arranged in a rectangular configuration and configured to lift the hull HU of the vessel VE relative to a bottom of a body of water when the legs are moved downwards relative to the

35

hull.

The depicted vessel VE is a mono-hull vessel with two legs LE along the port side of the hull HU and two legs LE along the starboard side of the hull HU, with the cantilever CA being extendable over the stern of the hull and with an accommodation and bridge structure (not shown) raised above the deck at the bow of the vessel.

5

The rectangular configuration results in two legs LE being arranged at the aft end AE, i.e. the stern, of the vessel, and the other two legs LE being arranged at the front end FE, i.e. the bow, of the vessel. Other configurations of the jack-up system, e.g. depending on the vessel, are also possible. An example is a triangular shaped platform having a leg in each

10 corner of the triangular shaped platform.

The elongated hull HU of the vessel has a longitudinal axis LAH and the cantilever CA has a longitudinal axis LAC substantially parallel to the longitudinal axis LAH of the hull HU.

15 The cantilever CA is moveable in a longitudinal direction LD of the cantilever CA, which is parallel to the longitudinal axis LAC of the cantilever, relative to the deck between a retracted position (shown in solid lines in Fig. 1) and an extended position (shown in dashed lines in Fig. 1).

20 Additionally, the cantilever CA may be rotatable relative to the deck DE about a substantially vertical swivel axis SA as indicated by arrow R. To this end, the deck DE may be provided with a deck rail DR at a distance L from the swivel axis SA allowing the cantilever CA to slide in a transverse direction TD resulting in a rotation of the cantilever CA about the swivel axis SA. As rotation of the cantilever CA is not essential to the invention, the deck rail DR, swivel

25 axis SA and any actuators configured for moving the cantilever CA along the deck rail DR have been omitted from the other figures for clarity reasons.

The cantilever CA comprises an inner end IE, which may alternatively be referred to as proximal end of the cantilever CA, and an operational end OE of the cantilever CA, which

30 may alternatively be referred to as distal end of the cantilever. The distal end / operational end OE of the cantilever CA extends outside the deck DE of the vessel VE when the cantilever CA is in the extended position. Although in the embodiment of Fig. 1 the distal end OE also extends outside the deck DE of the vessel VE when the cantilever CA is in the retracted position, it is also envisaged that the cantilever CA in the retracted position is

35 completely above the deck DE, so that neither the proximal end nor the distal end extends beyond the deck DE seen in plan view, or that the cantilever in the retracted position is arranged with the distal end above the deck and the proximal end extends outside the deck.

At the operational end OE, a drilling installation DI is provided for drilling a well, for example an oil, a gas, or thermal well, by means of said installation DI.

- 5 Figs. 2 and 4 schematically depict a side view and a rear view of the cantilever CA, respectively, including the drilling installation DI arranged at the distal end OE of the cantilever CA.

In these Figs. 2 and 4, the cantilever CA comprises a first side wall SW1 and a second side
10 wall SW2 extending parallel to the longitudinal axis LAH and thus also parallel to the longitudinal direction LD, which side walls SW1, SW2 are arranged above respective first cantilever rail CR1 and second cantilever rail CR2. The first and second side wall SW1, SW2, and thus the first and second cantilever rail CR1, CR2, are connected to each other at the operational end OE by a transverse connection, in this embodiment formed by a third
15 side wall SW3 extending parallel to the transverse direction TD. The first, second and third side wall SW1, SW2, SW3, all extend vertically and are configured to transfer loads applied to the side walls directly or indirectly to the first and second cantilever rails CR1, CR2.

In this embodiment, the first and second cantilever rails CR1, CR2 engage with a respective
20 cantilever slide shoe CSS that is mounted to the deck DE. The cantilever slide shoe is configured to slidably support the corresponding cantilever rail so that loads can be transferred from the cantilever rail via the cantilever slide shoe CSS to the deck DE of the vessel VE while at the same time the cantilever CA is able to move and thus slide over the cantilever slide shoe CSS between the retracted position and the extended position. The
25 cantilever slide shoe CSS being mounted to the deck DE may mean a direct mounting, but may also include an indirect mounting to the deck DE, e.g. via a deck slide shoe (not shown), which deck slide shoe engages with the aforementioned deck rail DR for rotational purposes.

30 The cantilever slide shoes CSS provide a first support location along the length of the cantilever CA. A second support location along the length of the cantilever CA, which is advantageous to counteract torques, is provided by a sliding assembly SLA. The sliding assembly SLA comprises a carrier device CD configured to travel over and engage with support rails (not shown) mounted on the deck DE and extending in the longitudinal direction
35 LD. The carrier device CD is connected, preferably pivotably, to the inner end IE of the cantilever CA thereby holding the cantilever inner end IE relative to the deck DE by transferring forces between the inner end IE and the deck DE.

The carrier device CD holds the cantilever inner end IE down when the combination of the weight of the cantilever CA and any forces thereon, e.g. due to drilling activities, tend to tilt the cantilever inner end IE upwards. The forces are then transmitted by the carrier device

5 CD into the support rails. It will be appreciated that the effective moment arm between the carrier device CD and the cantilever slide shoe CSS depends on the actual extension of the cantilever CA as the carrier device CD is fixed to the cantilever CA and thus moves along with the longitudinal extension of the cantilever CA.

10 In an embodiment, the cantilever slide shoe CSS is equipped with actuators to apply forces between the cantilever slide shoe CSS or the deck DE on the one hand and the cantilever CA on the other hand to move the cantilever CA in the longitudinal direction LD. However, alternatively or additionally, a displacement mechanism as shown in Fig. 2 may be provided. The displacement mechanism in this embodiment includes a hydraulic cylinder HC and a
15 gripping unit GU configured to grip the support rails thereby temporarily fixing the position of the gripping unit GU relative to the support rails and allowing the hydraulic cylinder HC to move the carrier device CD and thus the cantilever CA relative to the gripping unit GU and thus the support rails. When the gripping unit GU releases the support rails, operation of the hydraulic cylinder HC will then move the gripping unit GU relative to the support rails,
20 thereby allowing to skid the cantilever CA over the support rails between the retracted position and the extended position.

Although the above displacement mechanism suggests that there is only one hydraulic cylinder HC and one gripping unit GU, it is also possible that each support rail, which may be
25 one, two, three or even more support rails in total is provided with such a displacement mechanism that cooperate with each other in moving the cantilever CA.

In this embodiment, at least a portion of the top of the cantilever CA is closed to form a working platform WP at the distal end OE of the cantilever. The drilling installation DI is
30 arranged above the working platform WP and personnel is able to travel between the deck DE of the vessel VE and the working platform WP via the gangway GW and the stairs ST shown in Fig. 2. The gangway GW and stairs ST may be provided on the outside of the sidewall SW1 which has the advantage that the internal space of the cantilever CA is free for other equipment, but it is also envisaged that the gangway GW and stairs ST are
35 arranged within the cantilever, i.e. in between the sidewalls SW1 and SW2.

The drilling installation DI which can be seen in side view in Fig. 2, in rear view in Fig. 4 and in cross-sectional plan view in Fig. 3, comprises a tower structure TS, a hoisting device HD adapted to manipulate an object in a firing line FL extending in a longitudinal direction Z of the tower structure TS, a first storage device SD1, a second storage device SD2, a third
5 storage device SD3, a first pipe racker PR1 and a second pipe racker PR2.

The storage devices SD1, SD2, SD3 are configured to vertically store tubular elements TE as shown in Fig. 4. The first pipe racker PR1 is configured to move tubular elements TE between the first storage device SD1 and the firing line FL. The second pipe racker PR2 is
10 configured to move tubular elements TE between the second storage device SD2 and the firing line FL and to move tubular elements TE between the third storage device SD3 and the firing line FL.

In this embodiment, the tower structure TS comprises a first vertically extending support
15 structure SS1, a second vertically extending support structure SS2 and a third vertically extending support structure SS3, in this embodiment formed by vertical posts of box-like elements.

The hoisting device HD, the storage devices SD1, SD2, SD3 and the pipe rackers PR1, PR2
20 are all supported by the support structures SS1, SS2, SS3 of the tower structure TS. In order to transfer the weight of all the equipment to the cantilever CA in accordance with the invention, the first support structure SS1 is arranged above the transverse connection formed by the third side wall SW3 seen in plan view, the second support structure SS2 is arranged above the first cantilever rail CR1 seen in plan view, and the third support structure
25 SS3 is arranged above the second cantilever rail CR2 seen in plan view. As a result thereof, the first side wall SW1 can be used to transfer the loads from the second support structure SS2 to the first cantilever rail CR1, the second side wall SW2 can be used to transfer the loads from the third support structure SS3 to the second cantilever rail CR2, and the third
30 side wall SW3 can be used to transfer the loads from the first support structure SS1 to the first and second cantilever rails CR1, CR2 such that additional strengthening constructions inside the cantilever CA can be reduced.

Preferably, as in this embodiment, the support structures SS1, SS2 and SS3 are interconnected at or near their upper parts. Further, any lattice structures LS to reinforce the
35 tower structure, if any, are preferably provided between the first support structure SS1 and the second support structure SS2 and between the first support structure SS1 and the third support structure SS3 as shown in Fig. 3. As a result thereof, there will be an opening

between the second and third support structure allowing tubular elements TE to be moved in and out of the tower structure TS.

When looking at Fig. 3, the fact that the first pipe racker PR1 is only associated with the first
5 storage device SD1 allows to keep an area AR on the working platform WP free for
equipment or objects to be temporarily positioned in said area AR and/or to use the area AR
to easily allow equipment or objects to enter the firing line FL. However, it is of course also
possible that the area AR is occupied by a fourth storage device similar to the third storage
device SD3.

CLAIMS

1. An offshore system comprising:

- a vessel (VE) having a deck (DE);
- a cantilever (CA) which is mounted on the deck and which is at least moveable in a longitudinal direction (LD) of the cantilever relative to the deck

5 between a retracted position and an extended position, wherein the cantilever comprises two cantilever rails (CR1, CR2) extending parallel to each other in the longitudinal direction of the cantilever, which cantilever rails support at least a portion of the weight of the cantilever and transmit said weight to the deck of the vessel, wherein the cantilever comprises a proximal end (IE) and a distal end (OE) opposite to the proximal end, said distal end extending outside the deck of the vessel when the cantilever is in the extended position, wherein the two cantilever rails at the distal end are connected to each other using a transverse connection (SW3), and wherein the offshore system further comprises a drilling installation (DI) including:

- 15 - a tower structure (TS);
- a hoisting device (HD) adapted to manipulate an object in a firing line (FL) extending in a longitudinal direction (Z) of the tower structure;
- a storage device (SD1, SD2) for vertically storing tubular elements;
- a pipe racker (PR1, PR2) for moving tubular elements between the storage

20 device and the firing line, and wherein the tower structure comprises a first vertically extending support structure and a second vertically extending support structure to support the hoisting device and the pipe racker, said first support structure being arranged on the cantilever above the transverse connection seen in plan view or above one of the cantilever rails seen in plan view, and said second support structure being arranged on the cantilever above the other one of the cantilever rails seen in plan view.

25 2. The offshore system according to claim 1, wherein the storage device is supported by the first and/or second support structure.

30 3. The offshore system according to claim 1, wherein the drilling tower structure comprises a third vertically extending support structure, and wherein the first support structure is arranged on the cantilever above the transverse connection seen in plan view, the second support structure is arranged on the cantilever above one of the cantilever rails seen in plan view and said third support structure is arranged on the cantilever above the other one of the cantilever rails seen in

35 plan view.

4. The offshore system according to claim 3, wherein the storage device is a first storage device and the pipe racker is a first pipe racker, wherein the first support structure is configured to support the hoisting device, wherein the second support structure is configured to support the first pipe racker, wherein the drilling installation comprises a second storage device for vertically storing tubular elements and a second pipe racker for moving tubular elements between the second storage device and the firing line, and wherein the third support structure supports the second pipe racker.
5. The offshore system according to claim 4, wherein the second storage device is supported by the first and/or third support structure.
6. The offshore system according to claim 3, wherein the drilling tower structure between the second and third support structure comprises an opening to allow tubular elements to be moved in and out of the tower structure.
7. The offshore system according to claim 6, wherein the opening has a height which is at least equal to a maximum length of a tubular element in the storage device.
8. The offshore system according to claim 1, wherein the storage device provides a plurality of storage locations arranged around a center seen in plan view, wherein the pipe racker comprises one or more gripping members adapted to grip a tubular element, wherein the one or more gripping members are rotatable about a vertically extending rotation axis, and wherein the pipe racker is arranged such that the rotation axis of the one or more gripping members substantially coincides with the center of the storage device.
9. The offshore system according to any of the preceding claims, wherein the first and second support structure, and the third support structure if applicable, are interconnected to form a rigid tower structure.
10. The offshore system according to claim 1, wherein the cantilever comprises a box-shaped structure having a top, a bottom and four sidewalls extending between the top and the bottom, wherein the two cantilever rails are arranged at a respective edge between bottom and a corresponding sidewall, and wherein the drilling installation is arranged on the top.
11. The offshore system according to claim 10, wherein the first and second support structure are integrated with the box-shaped structure.
12. The offshore system according to claim 10, wherein inside the box-shaped structure a lattice structure is provided.
13. The offshore system according to any of the preceding claims, wherein the first, second and third, if applicable, support structure include one or more vertical posts, preferably the posts being embodied as box-like elements.

14. The offshore system according to claim 1, wherein the first support structure is provided with one or more vertical guide elements, e.g. rails, and one or more trolleys that are movable along said guide elements, said one or more trolleys supporting a topdrive for rotary drive of a string of drilling tubulars and/or a travelling block for attaching a string of drilling tubulars to the hoisting device.

15. The offshore system according to claim 1, wherein the tower structure occupies at most 40%, preferably at most 30%, more preferably at most 20% and most preferably at most 10% of the cantilever seen in plan view.

FIG. 1

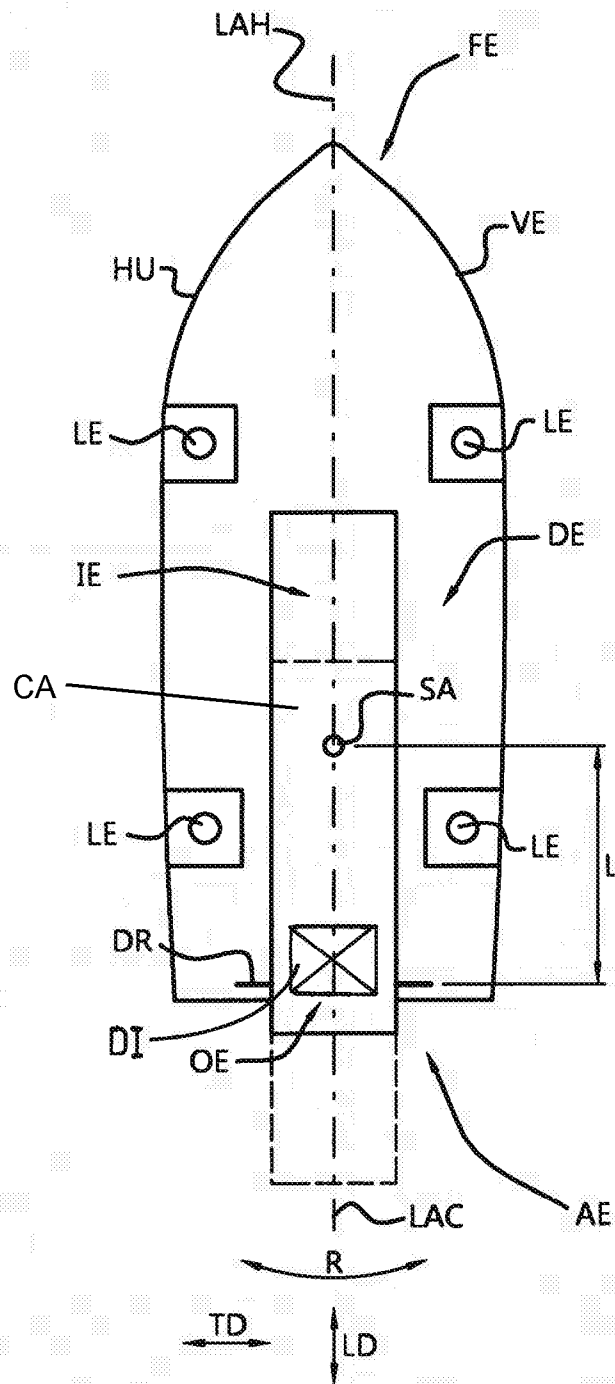


FIG. 2

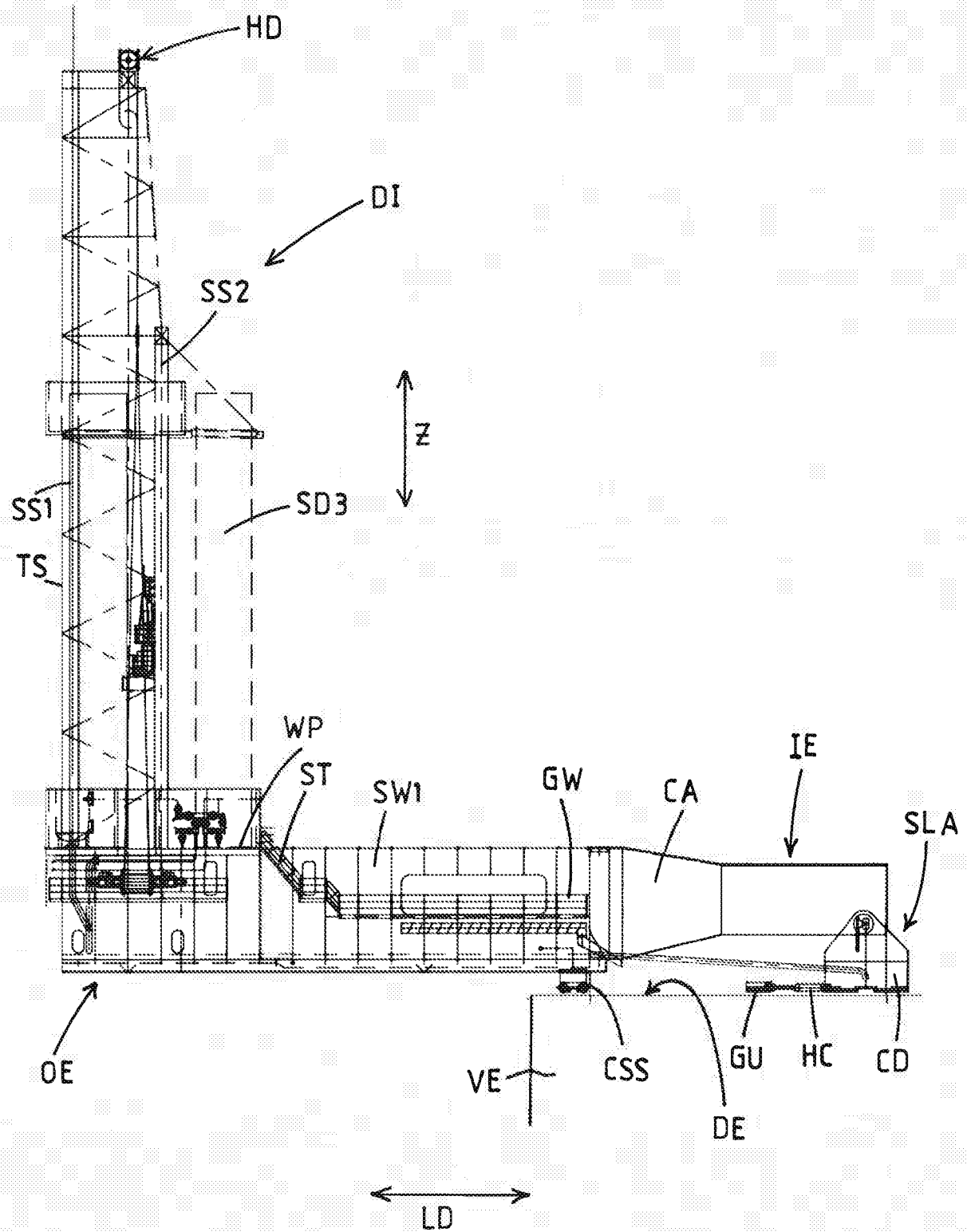


FIG. 3

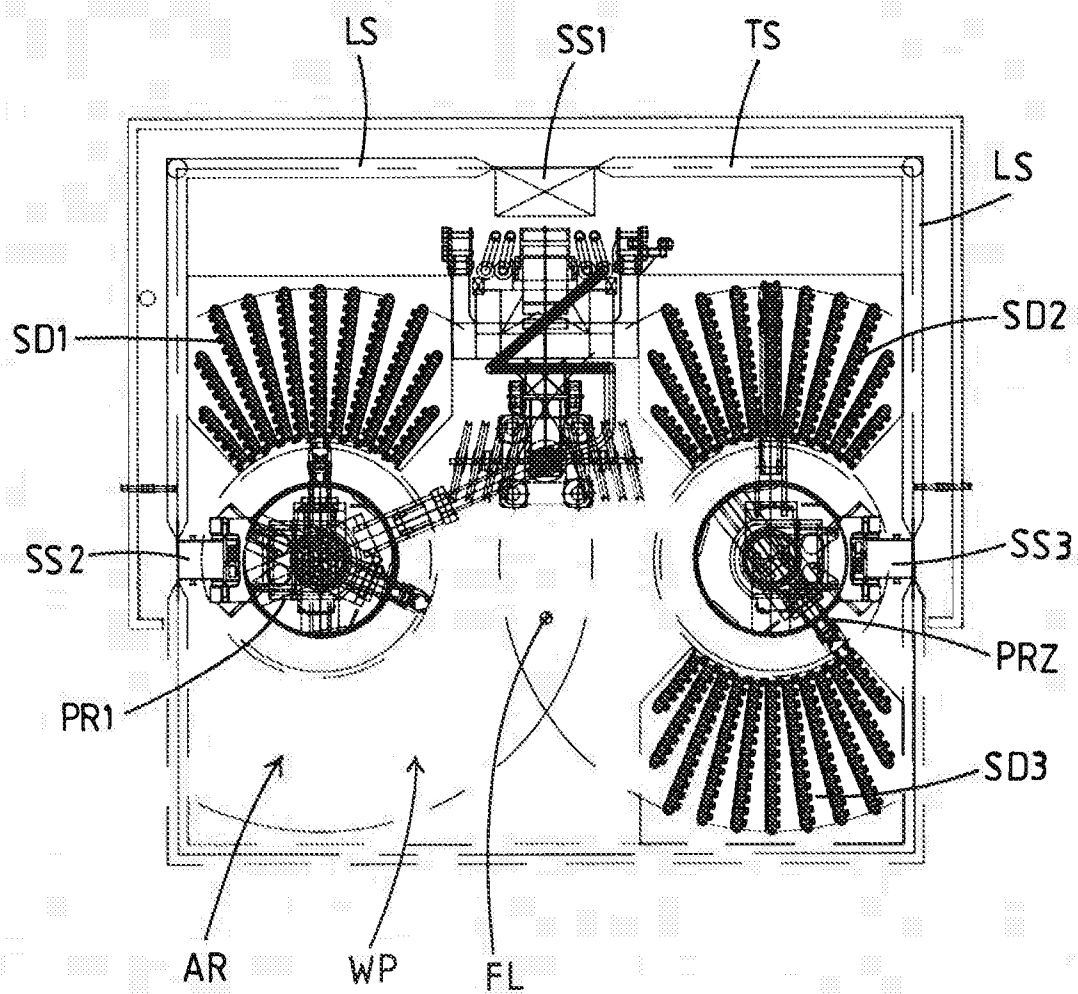
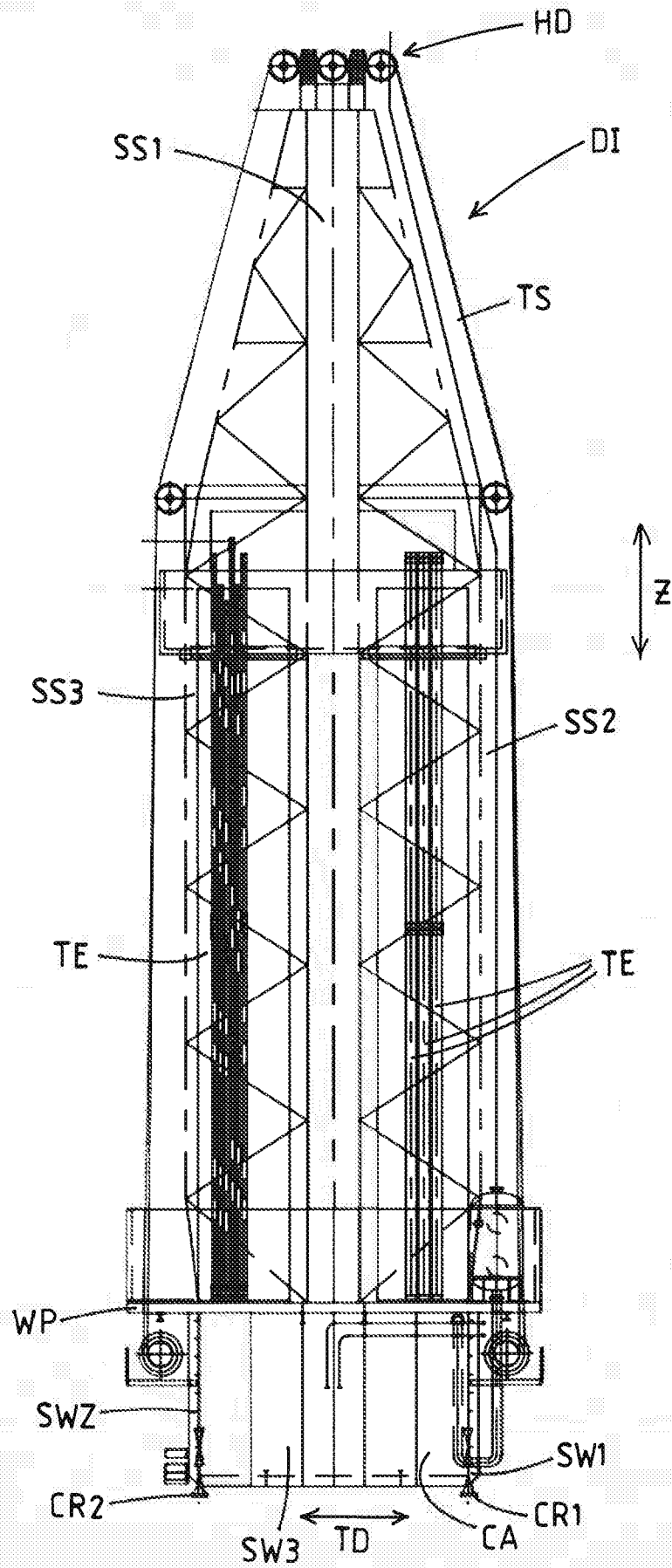


FIG. 4



INTERNATIONAL SEARCH REPORT

International application No
PCT/NL2020/050161

A. CLASSIFICATION OF SUBJECT MATTER

INV. B63B35/44 E02B17/02 E21B15/00 E21B15/02
ADD.

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)

B63B E02C E21B E02B

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

EPO-Internal, WPI Data

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 2004/151549 A1 (ROODENBURG JOOP [NL] ET AL) 5 August 2004 (2004-08-05) paragraphs [0082] - [0086]; figures 1,2,10-23	1-15
A	----- WO 2017/071710 A1 (MAERSK DRILLING AS [DK]) 4 May 2017 (2017-05-04) page 36, line 3 - page 38, line 12; figures 1a-4	1-15
A	----- WO 2018/236214 A1 (GUSTOMSC RESOURCES BV [NL]) 27 December 2018 (2018-12-27) page 5, line 19 - page 6, line 26; figures 1-4	1-15



Further documents are listed in the continuation of Box C.



See patent family annex.

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Date of the actual completion of the international search

9 June 2020

Date of mailing of the international search report

19/06/2020

Name and mailing address of the ISA/

European Patent Office, P.B. 5818 Patentlaan 2
NL - 2280 HV Rijswijk
Tel. (+31-70) 340-2040,
Fax: (+31-70) 340-3016

Authorized officer

Mauriès, Laurent

INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No

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