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Hammer et al.

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(54) **METHOD OF SECURING AND TRANSFERRING A LOAD BETWEEN A VESSEL AND AN OFFSHORE INSTALLATION AND AN APPARATUS THEREFOR**

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B63B 25/18 (2006.01)
(Continued)

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CPC ***B63B 25/18*** (2013.01); ***B63B 25/28*** (2013.01); ***B65G 67/603*** (2013.01);
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CPC B66C 19/002; B66C 13/02; B66C 13/46; B65G 67/603; B65G 2814/0397;
(Continued)

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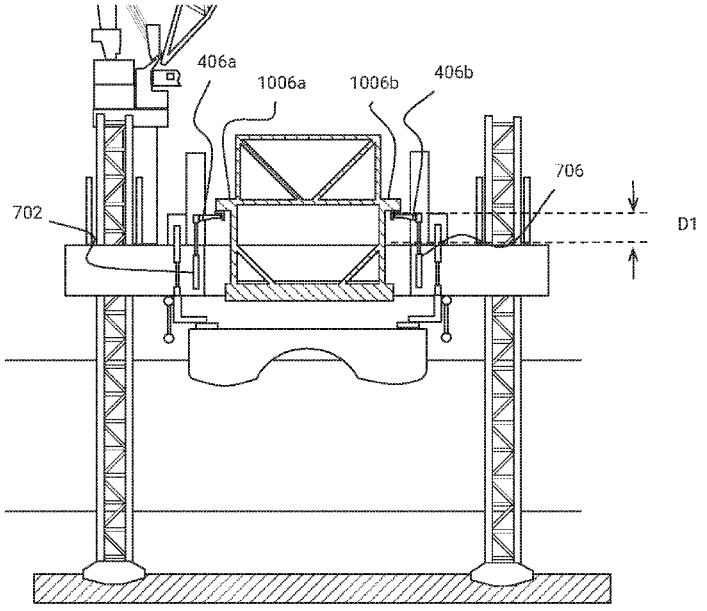
(57) **ABSTRACT**

The offshore jack-up has a hull and a plurality of moveable legs engageable with the seafloor. The offshore jack-up is arranged to move the legs with respect to the hull to position the hull out of the water. The method comprises securing the vessel with respect to the hull of the offshore jack-up when the hull is positioned out of the water and the legs engage the seafloor. A lifting mechanism mounted on the offshore jack-up engages with a cargo carrying platform positioned on the vessel. The platform is lifted with the lifting mechanism between a first position on the vessel and a second position clear of the vessel.

27 Claims, 15 Drawing Sheets



(51) **Int. Cl.**

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B65G 67/60	(2006.01)
F03D 13/40	(2016.01)
B66C 23/18	(2006.01)
B63B 25/22	(2006.01)
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B63B 35/00	(2020.01)

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CPC B63B 27/10; B63B 27/16; B63B 25/004; B63B 27/36; B63B 35/003; B63B 2017/0072; B63B 35/44; B63B 2021/001; B63B 27/30; E02B 3/20; E02B 17/021; E02B 2017/0082; E02B 2017/0091; F05B 2240/95; F03D 13/40; F03D 13/10

See application file for complete search history.

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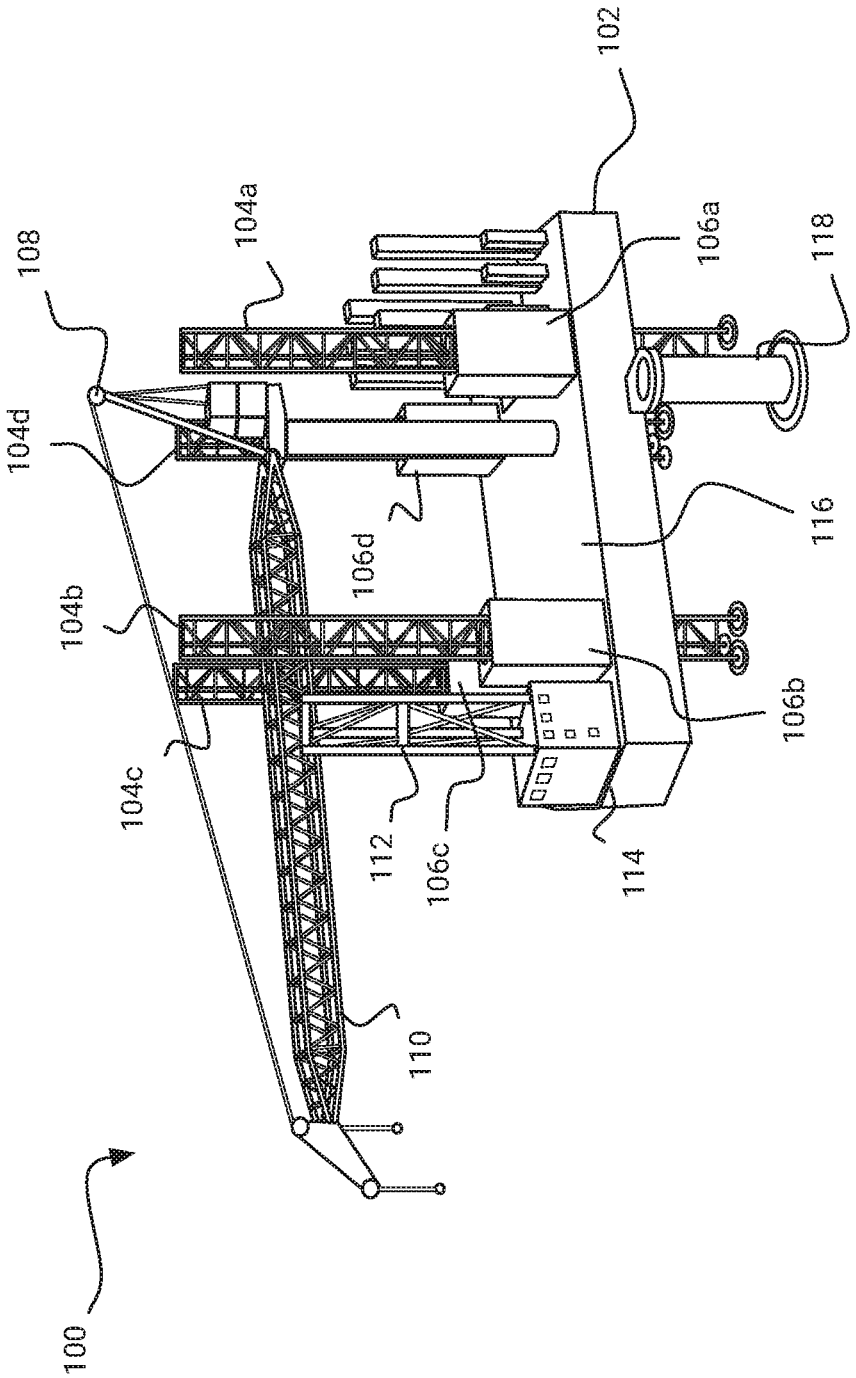
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104d
116
106d
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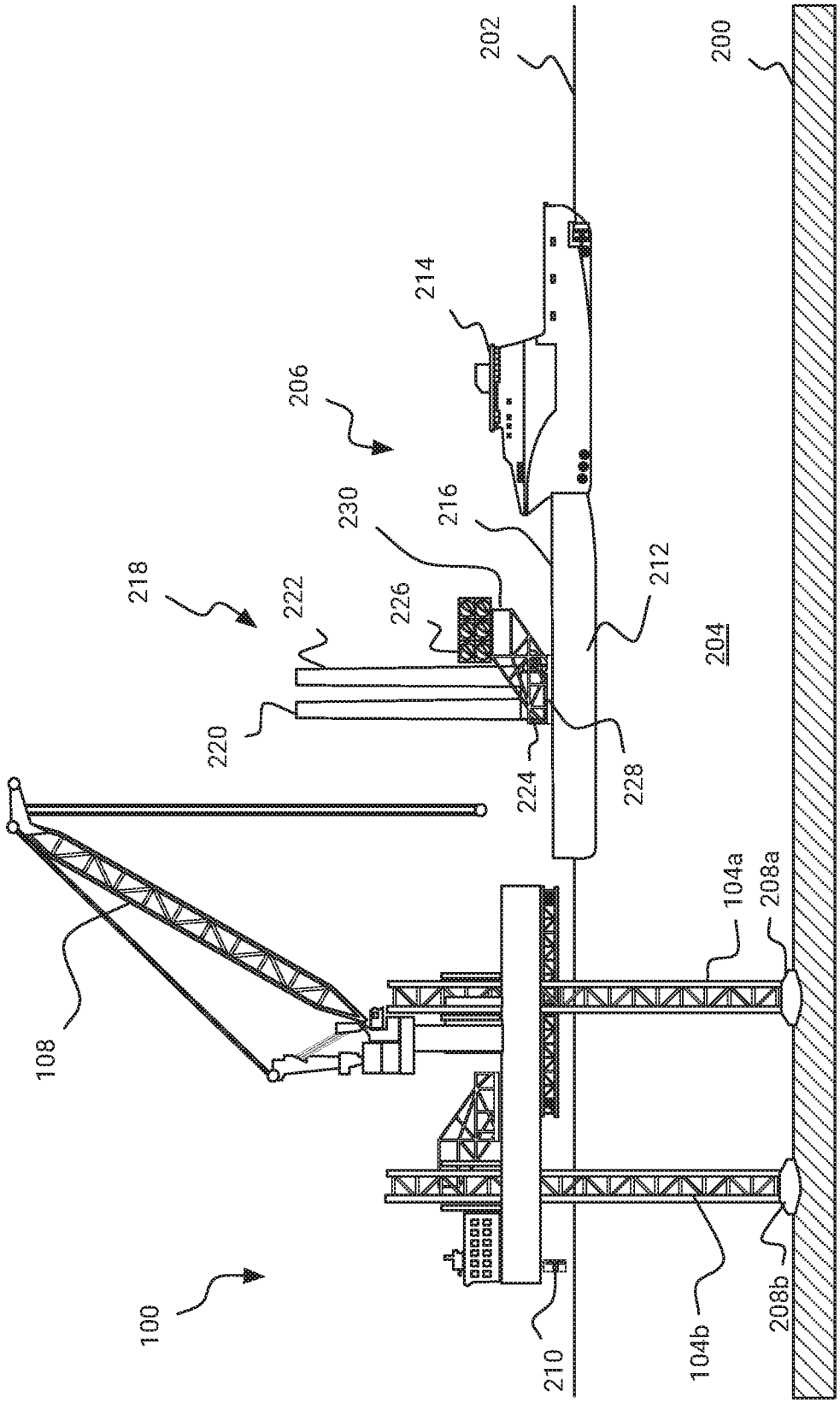
106b
104c
112
106c
114
110
100

Figure 1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208a
108
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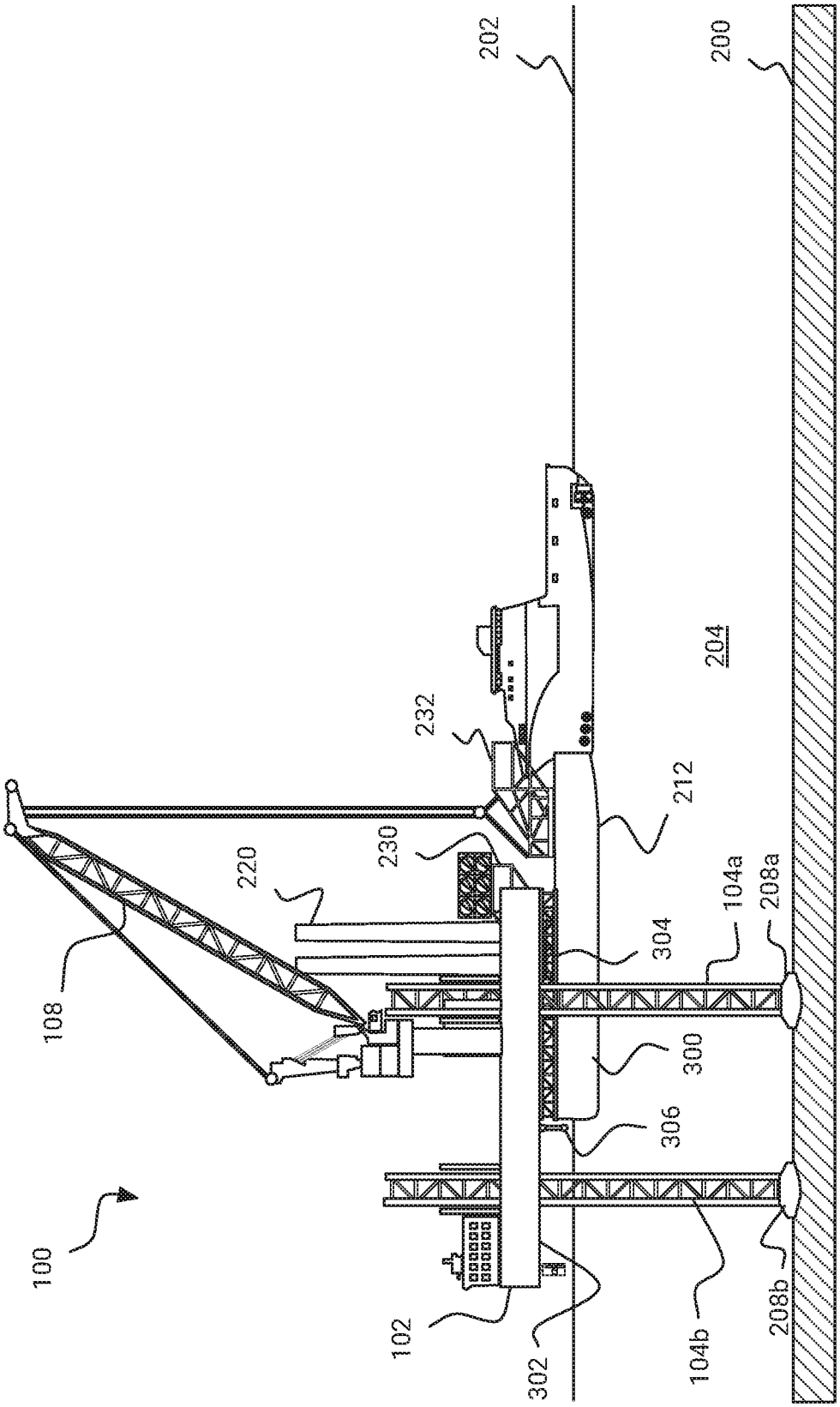
210
104b
208b

Figure 2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104b
208b

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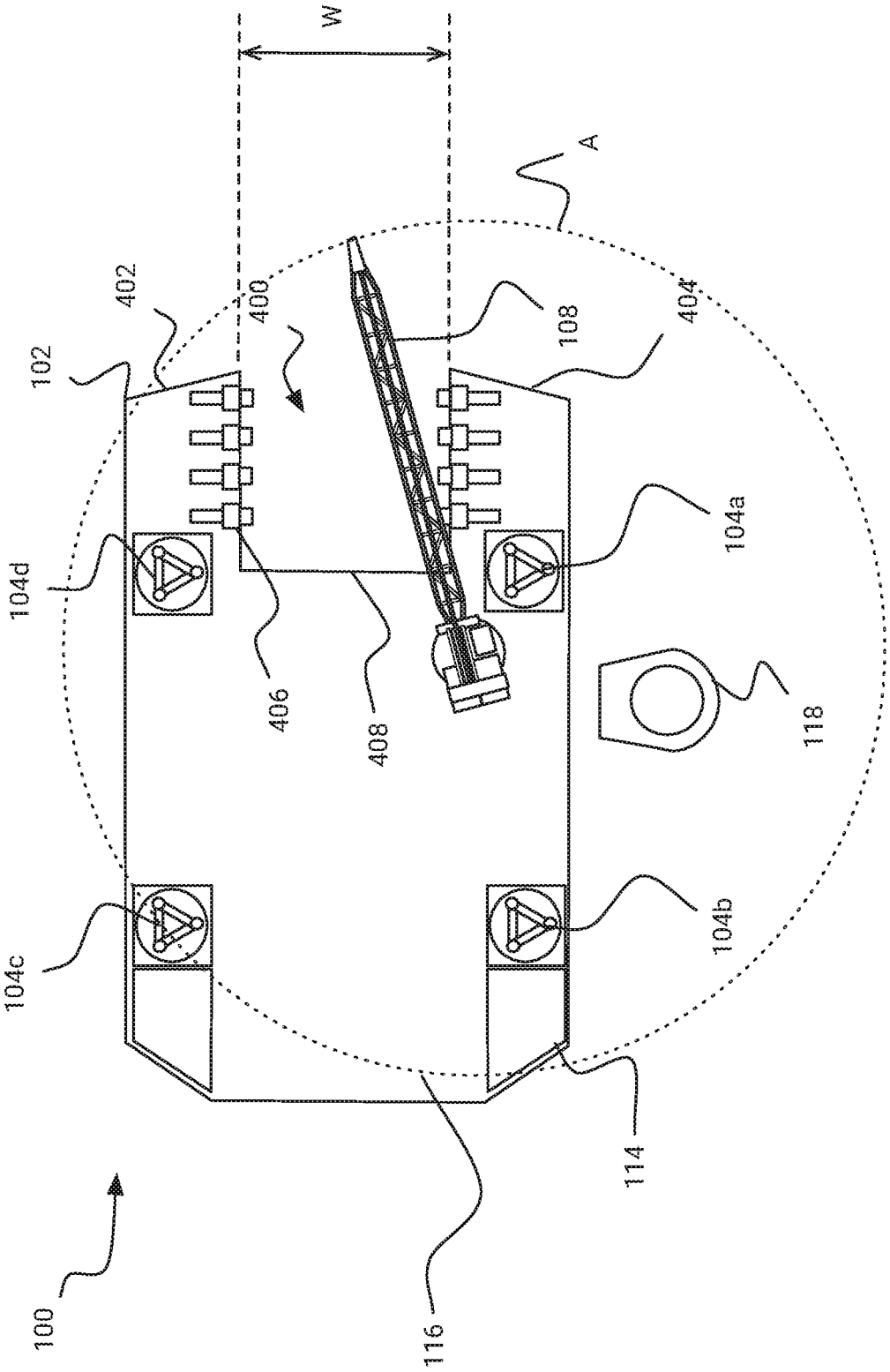
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104b
114
116
100

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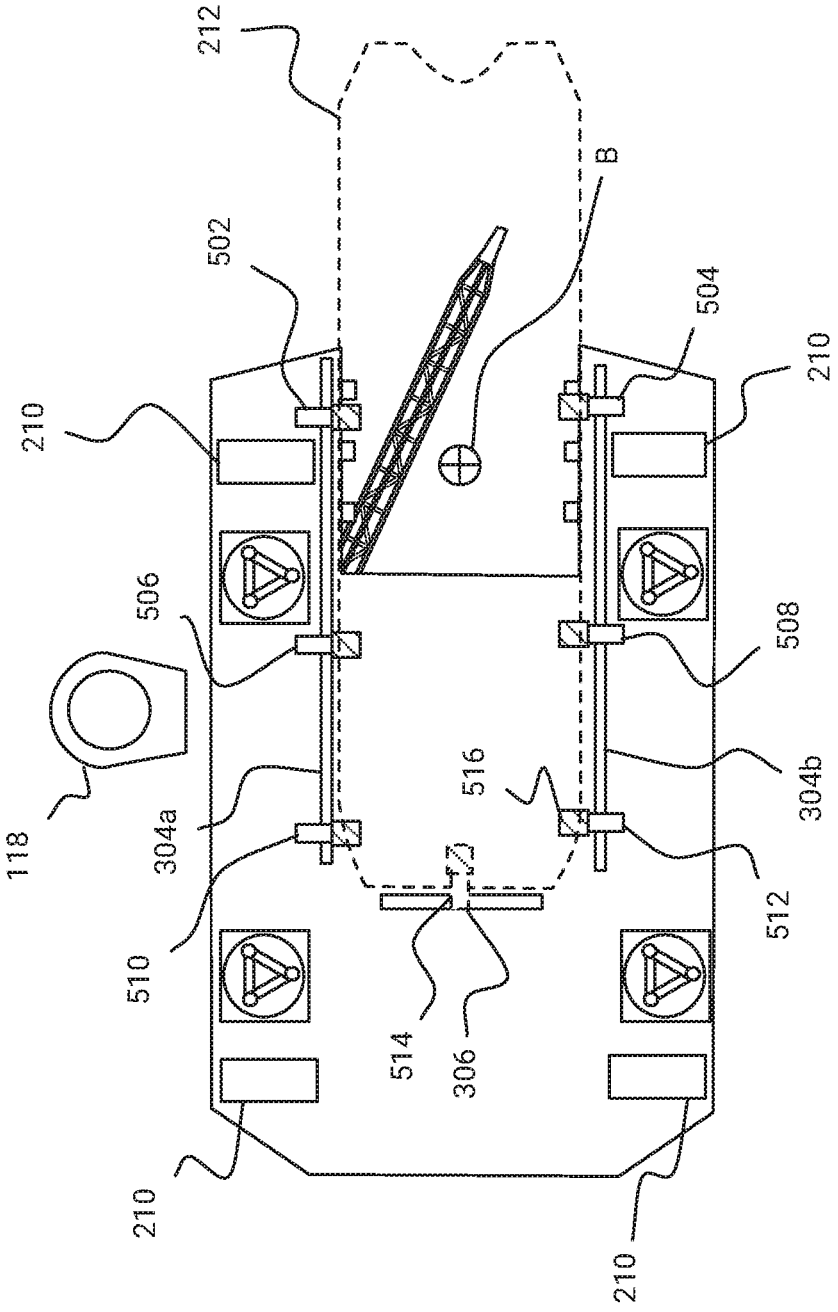
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304b
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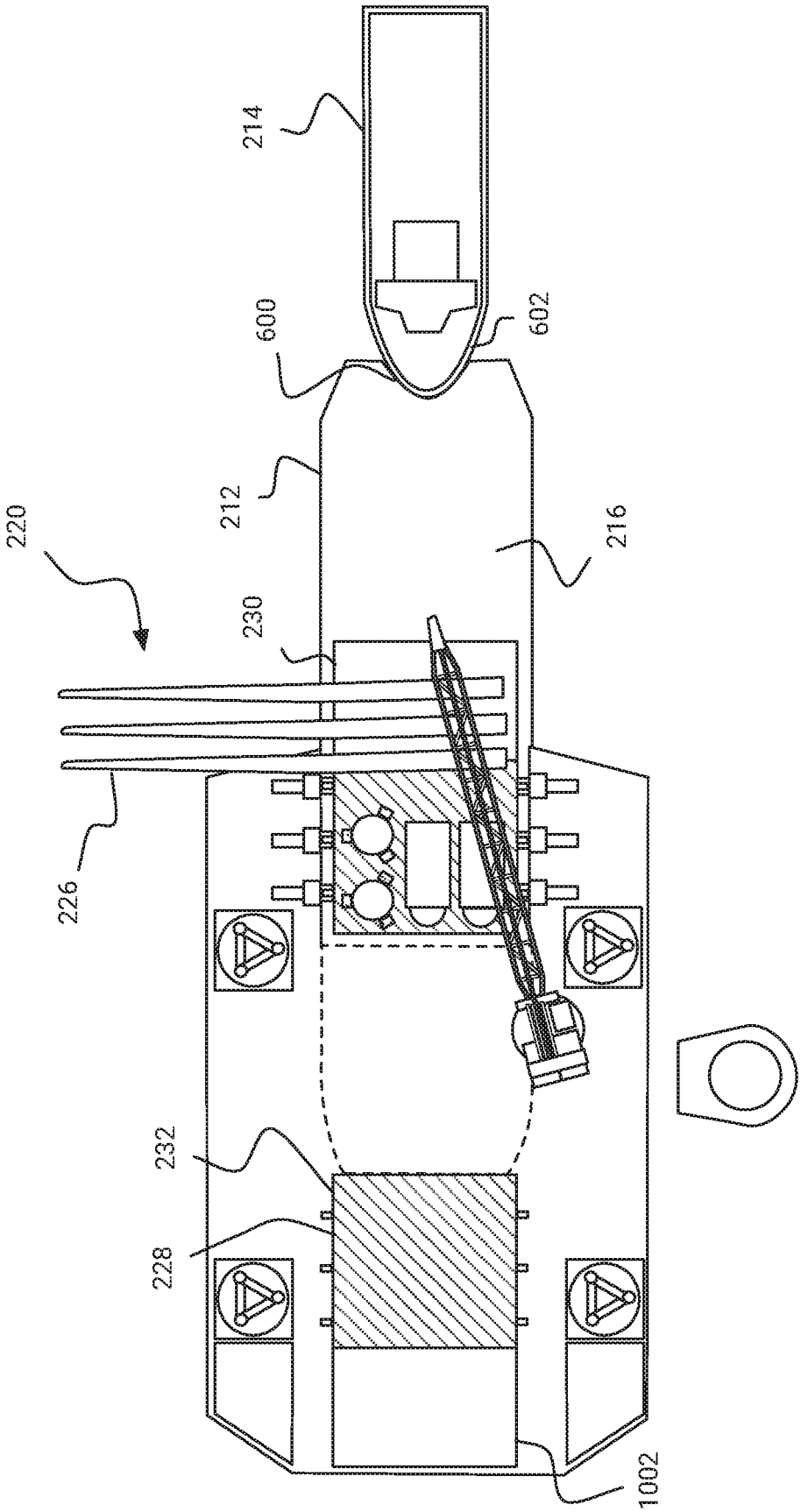
210
210

Figure 5



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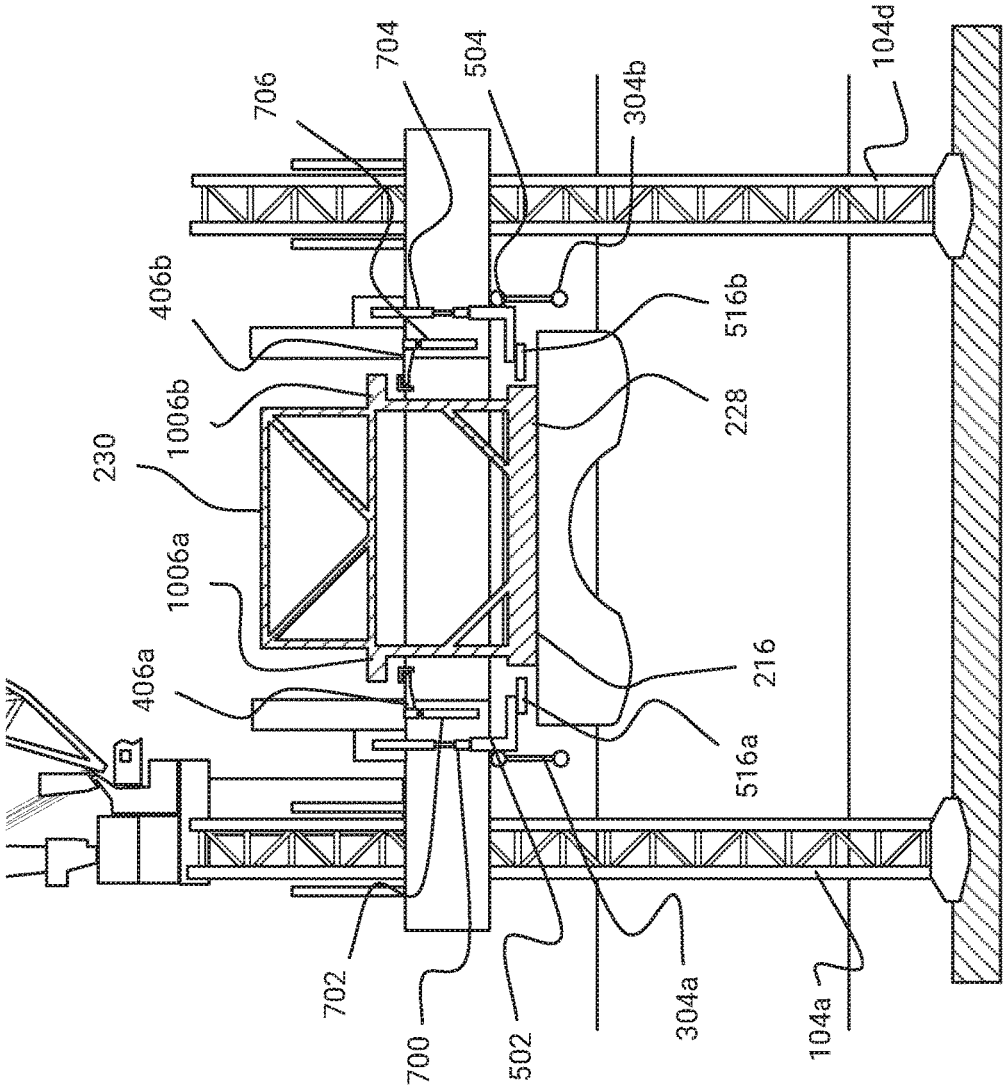
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702
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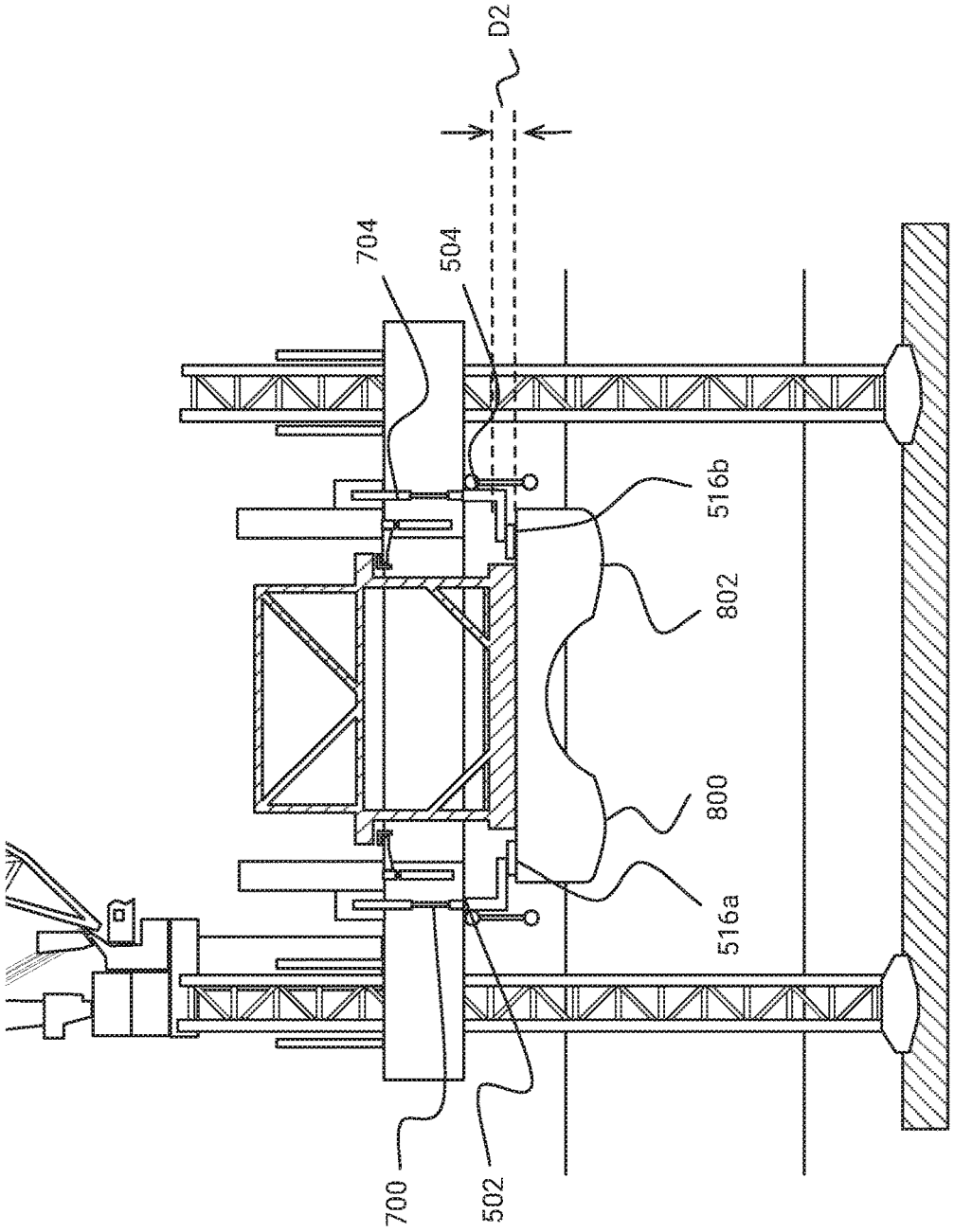
502
304a
104a

Figure 7



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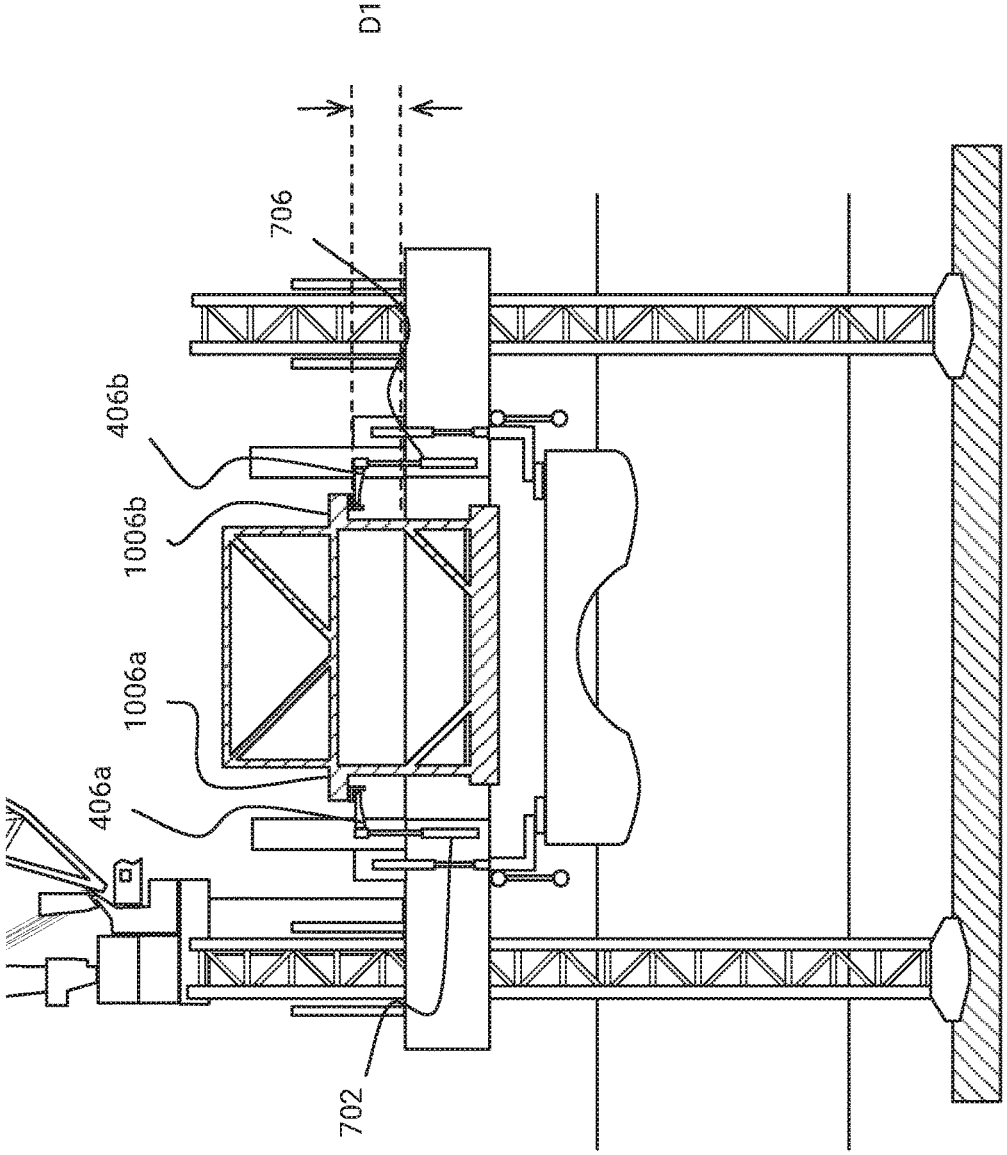

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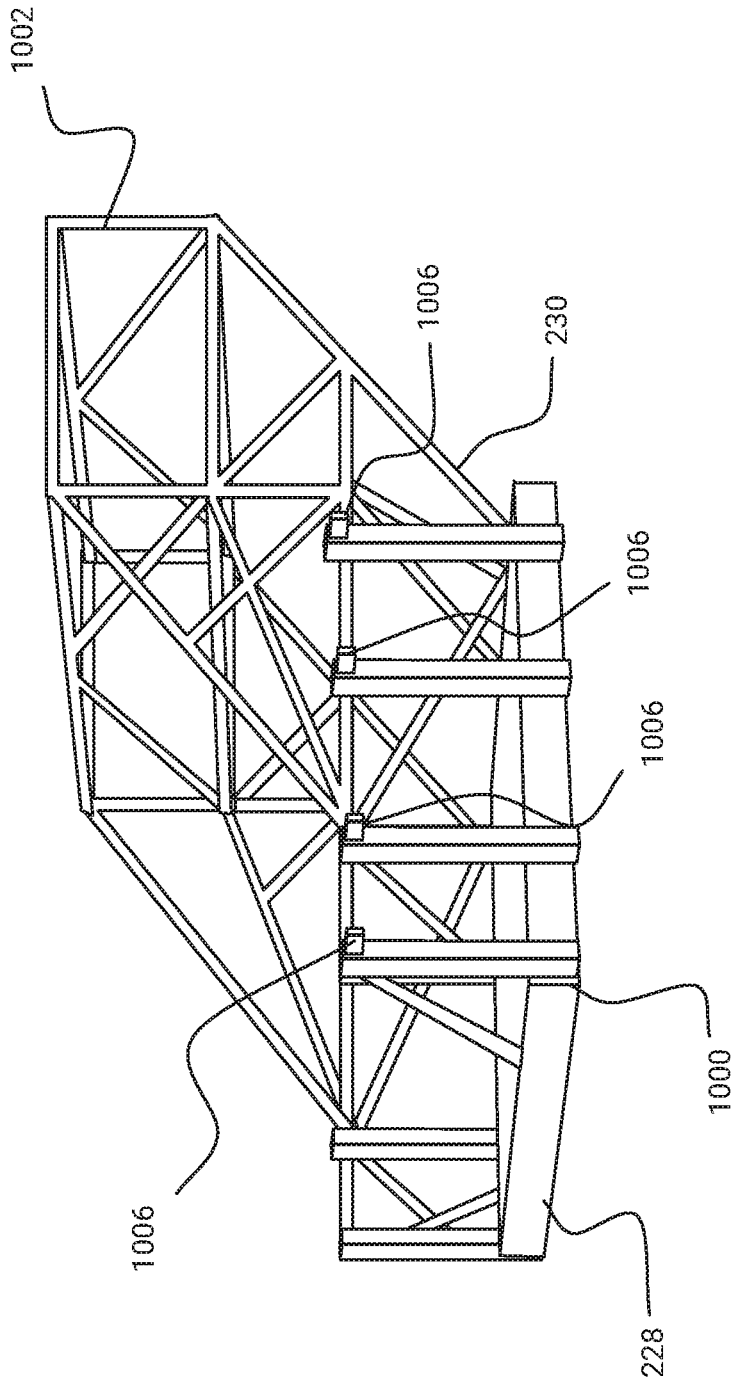

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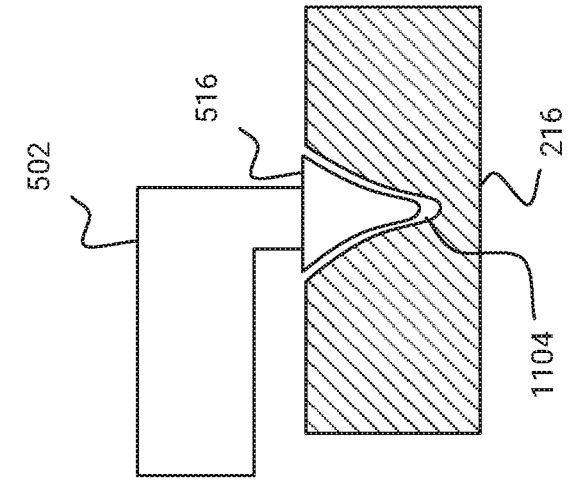

Figure 11c

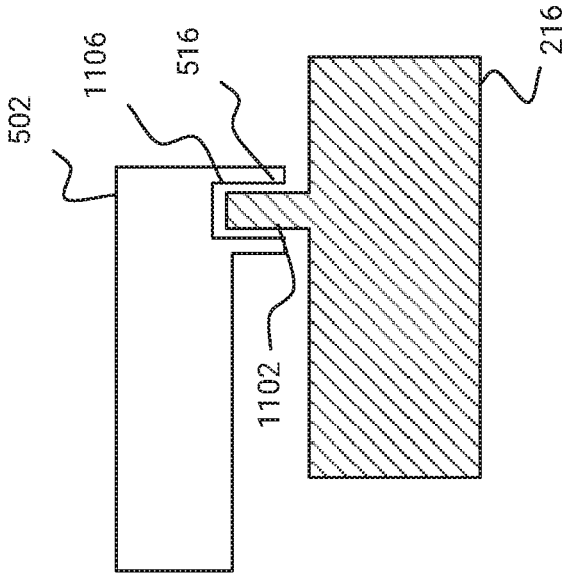

Figure 11b

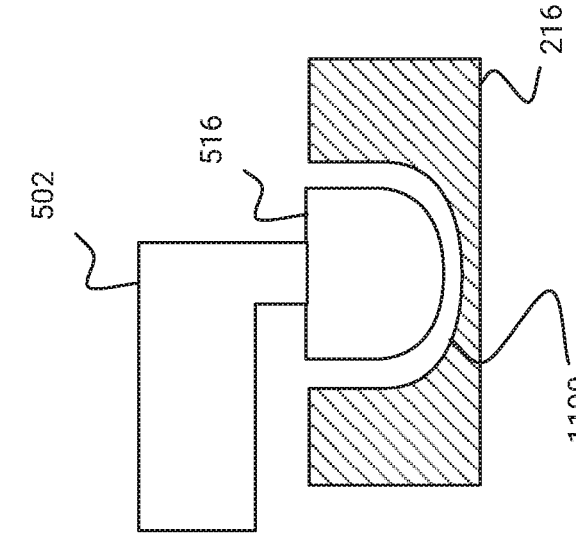

Figure 11a

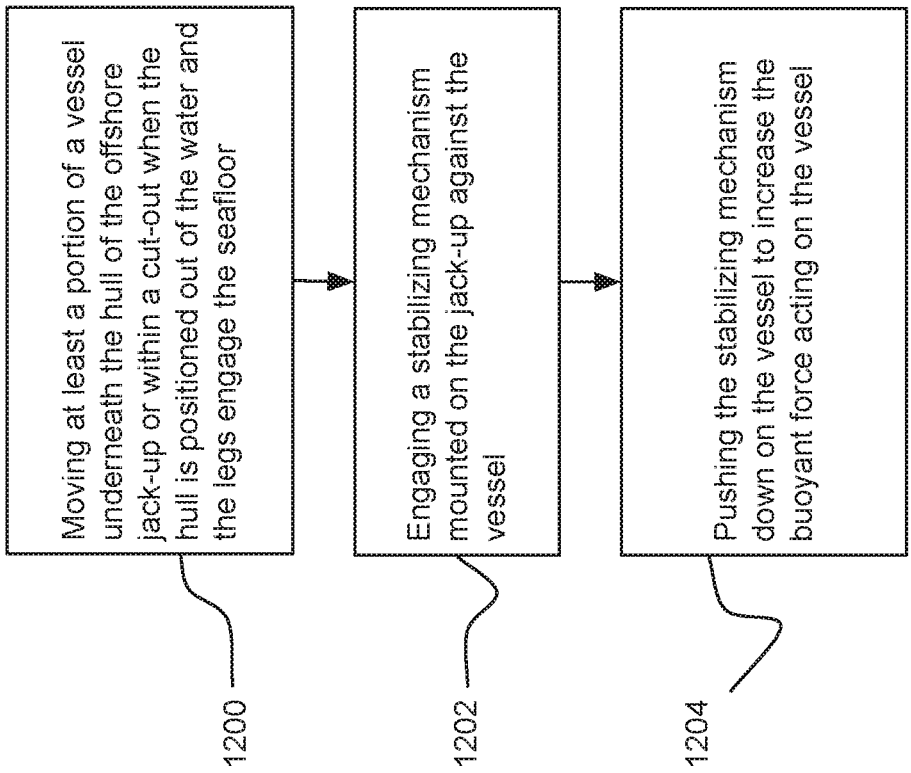
Moving at least a portion of a vessel underneath the hull of the offshore jack-up or within a cut-out when the hull is positioned out of the water and the legs engage the seafloor
Engaging a stabilizing mechanism mounted on the jack-up against the vessel
Pushing the stabilizing mechanism down on the vessel to increase the buoyant force acting on the vessel
1200
1202
1204

Figure 12

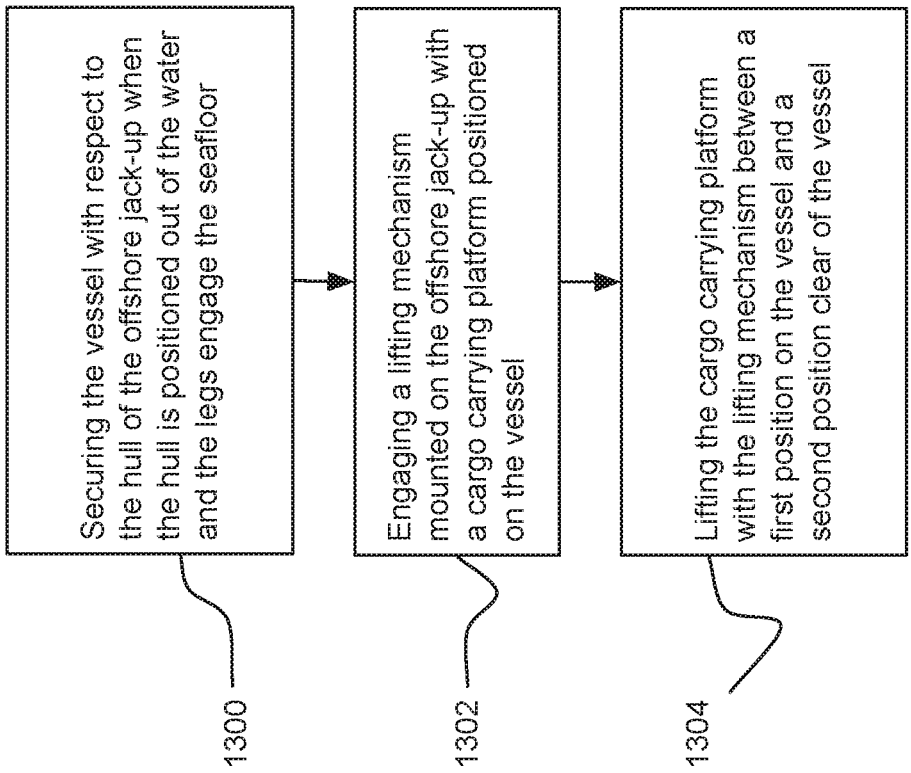
Securing the vessel with respect to the hull of the offshore jack-up when the hull is positioned out of the water and the legs engage the seafloor
Engaging a lifting mechanism mounted on the offshore jack-up with a cargo carrying platform positioned on the vessel
Lifting the cargo carrying platform with the lifting mechanism between a first position on the vessel and a second position clear of the vessel
1300
1302
1304

Figure 13

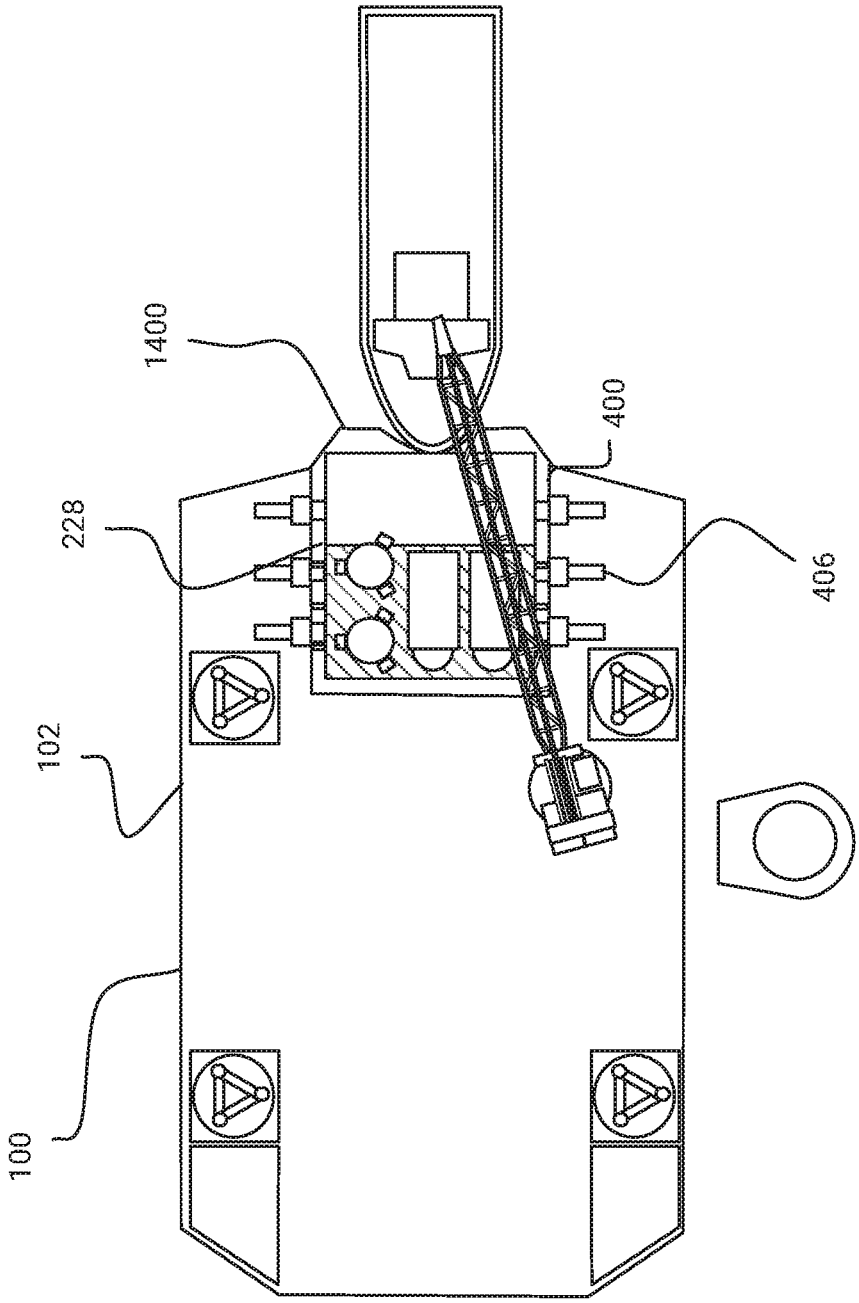

Figure 14

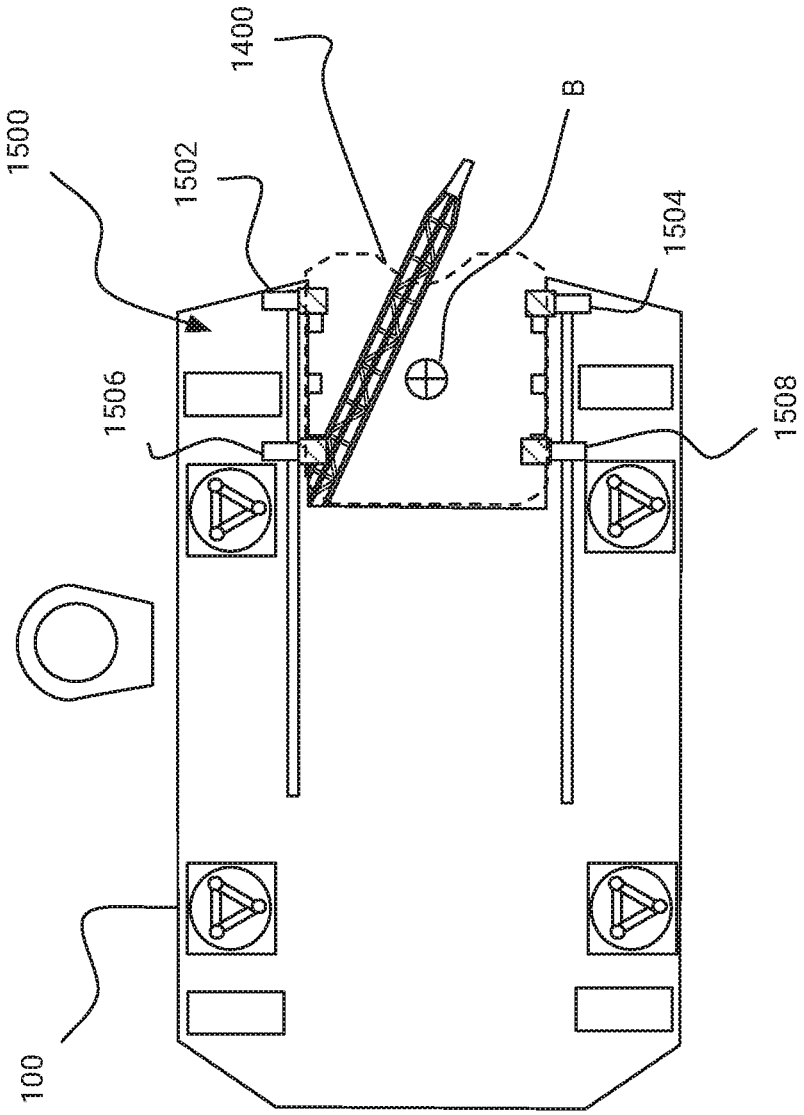

Figure 15

METHOD OF SECURING AND TRANSFERRING A LOAD BETWEEN A VESSEL AND AN OFFSHORE INSTALLATION AND AN APPARATUS THEREFOR

CROSS-REFERENCE TO RELATED APPLICATION(S)

This application claims priority under 35 U.S.C. § 119 to Danish Patent Application No. PA 2019 00391, filed Apr. 1, 2019, the entire contents of which are incorporated herein by reference.

BACKGROUND

Field

The present invention relates to a method of securing and transferring a load between a vessel and an offshore installation and an apparatus therefor. In particular, the present invention relates to transferring a load between a vessel and an offshore jack-up installation.

Description of Related Art

In the offshore industry operations are performed from specialised platforms or vessels, known colloquially as "rigs". Multiple types of rig exist, such as fixed platforms, jack-ups, semi-submersibles, ships, barges and the like. The particular type of rig used can depend on a number of factors, such as water depth, rig availability, operational requirements and the like.

Offshore jack-up rigs can be used for different purposes. Some offshore jack-up rigs are used to drill and extract oil and gas. However, in order to reduce the dependence on limited fossil fuel resources around the world, there has been an increasing demand for renewable energy generation. One such source of renewable energy that has become increasingly reliable is wind energy generation.

Typically, electricity is generated from the wind with wind turbine generators (WTG) installed in locations with a reliable prevailing wind. Some wind turbine generators have been installed on land in windy areas such as on hilltops. Wind turbine generators installed on land are also known as "onshore" wind turbine generators. However, larger wind turbine generators can be installed in coastal waters. Wind turbine generators installed in coastal waters, the sea or deep ocean are also known as "offshore" wind turbine generators.

Accordingly, offshore jack-up rigs can be used for other offshore installations such as offshore WTGs. Offshore wind turbine generator installation is typically carried out in separate stages. One current method of installation is to anchor a foundation to the seabed using a monopile foundation. This is a steel and/or concrete tube which is fixed to and protrudes from the seabed. A transition piece (TP) is fixed to the monopile foundation and the transition piece projects out of the water. The offshore wind turbine generator is then fixed to the transition piece.

One such jack-up rig for installing WTGs is disclosed in EP 2 886 722. This discloses a plurality of WTG components stored on the deck of the jack-up rig ready for installation at a designated offshore area. A problem with the jack-up rig is that the WTG components are loaded on the deck of the jack-up rig in port. When all the WTG components are installed, the jack-up rig must sail back to port to be replenished with more WTG components. This reduces the amount of time that the jack-up rig can be used to install offshore WTGs in the designated offshore area.

KR20170109094 shows a jack-up vessel with a detachable deck comprising the WTG components. Once the jack-up vessel is in the designated offshore area, the legs extend and lift up a platform from the vessel using a rail system. A problem with this is that legs and platform require the jack-up vessel to move the legs and platforms between installation sites. Furthermore, when the vessel sails away from the legs, the vessel requires very calm weather in order not to collide with the legs (e.g. due to heave, roll or sway of the vessel due to the waves.

Alternatively, a jack-up rig can be supplied with WTG components via a supply vessel. One such supply vessel is shown in KR20180003214. A problem with the supply vessel is that the transfer of the WTG components to the jack-up vessel can be difficult especially in bad weather. This means that the jack-up vessel cannot be resupplied until there is a suitably long calm weather window.

SUMMARY

Examples described hereinafter aim to address the aforementioned problems.

According to an aspect of the present invention there is a method of supplying a load between a vessel and an offshore jack-up having a hull and a plurality of moveable legs engageable with the seafloor and the offshore jack-up is arranged to move the legs with respect to the hull to position the hull out of the water, the method comprising: securing the vessel with respect to the hull of the offshore jack-up when the hull is positioned out of the water and the legs engage the seafloor; engaging a lifting mechanism mounted on the offshore jack-up with a cargo carrying platform positioned on the vessel; and lifting the platform with the lifting mechanism between a first position on the vessel and a second position clear of the vessel.

Optionally the cargo carrying platform may comprise a frame for surrounding the cargo.

Optionally the cargo carrying platform may be a removeable deck of the vessel.

Optionally the cargo carrying platform may be fixed with respect to the lifting mechanism after the step of engaging.

Optionally the method may comprise positioning the cargo carrying platform within a cut-out in the hull before the step of engaging.

Optionally the lifting may comprise lifting the load carrying platform through the cut-out in the hull.

Optionally the lifting mechanism may comprise a plurality of lifting mechanisms.

Optionally the lifting mechanism may comprise a plurality of lifting arms mounted on the hull and engageable with the cargo carrying platform.

Optionally the plurality of lifting arms may be spaced on either side of the cargo carrying platform.

Optionally the cargo carrying platform may comprise a plurality of projections each engageable with one of the lifting arms.

Optionally the plurality of lifting arms may be hydraulic.

Optionally the plurality of lifting arms may lift the cargo carrying platform at the same time.

Optionally a crane mounted on the offshore jack-up may hoist the cargo carrying platform after the lifting mechanism has lifted the cargo carrying platform clear of the vessel.

Optionally a crane mounted on the offshore jack-up may hoist another cargo carrying platform from the offshore jack-up to the vessel.

Optionally the method may comprise securing the cargo to the cargo carrying platform with at least one attachment mechanism.

Optionally the cargo may comprise one more of a wind turbine tower, a nacelle, wind turbine blades, a wind turbine component, equipment, personnel, supplies, a transition piece, a monopile, a jacket and/or any other components of an offshore wind turbine generator or wind turbine generator farm.

In another aspect of the invention there is provided an offshore jack-up comprising: a hull; a plurality of moveable legs engageable with the seafloor, wherein the offshore jack-up is arranged to move the legs with respect to the hull to position the hull out of the water when the legs engage the seafloor; and a lifting mechanism mounted on the offshore jack-up configured to engage and lift a cargo carrying platform carrying cargo positioned on a vessel secured to the hull when the hull is positioned out of the water; wherein the lifting mechanism is configured to lift the cargo carrying platform between a first position on the vessel and a second position clear of the vessel.

In yet another aspect of the invention there is provided a cargo carrying platform for carrying one or more wind turbine components and transferring the one or more wind turbine components between a vessel and an offshore jack-up, wherein the cargo carrying platform comprises: a platform base engageable with the one or more wind turbine components and releasably securable to a vessel; a frame mounted to the periphery of the platform base for surrounding at least one of the wind turbine components; and at least one projection extending from the cargo carrying platform, the at least one projection engageable with a lifting mechanism mounted on the offshore jack-up configured to engage and lift the cargo carrying platform between a first position on the vessel and a second position clear of the vessel.

Optionally, the cargo carrying platform comprises: at least one first securing mechanism for releasably securing the platform base to the vessel; and at least one second securing mechanism for releasably securing the one or more wind turbine components to the platform base such that the one or more wind turbine components are secured to the platform base when the cargo carrying platform is lifted from the barge.

In yet another aspect of the invention there is provided a method of loading a plurality wind turbine generator components on a vessel comprising: loading the plurality of wind turbine generator components on a cargo carrying platform; loading the onshore cargo carrying platform on the vessel.

Optionally, the step of loading the plurality of wind turbine components on the cargo carrying platform when the cargo carrying platform is located onshore.

Optionally, the step of loading the onshore cargo carrying platform on the vessel transfers the plurality of wind turbine components to the vessel in a single loading operation.

Optionally, the step of loading the onshore cargo carrying platform on the vessel is before the step of loading the plurality of wind turbine generator components on the cargo carrying platform.

Optionally, the method comprises securing the plurality of wind turbine generator components to the cargo carrying platform.

Optionally, the steps of loading and transferring comprises hoisting the wind turbine components and/or the cargo carrying platform with a crane.

Optionally, the steps of loading and transferring comprises hoisting the wind turbine components and/or the cargo carrying platform with the same crane.

Optionally the method comprises any of steps of the previous aspects.

In yet another aspect there is provided a cargo carrying platform for carrying one or more wind turbine components and transferring the one or more wind turbine components between a vessel and an offshore jack-up, wherein the cargo carrying platform comprises: a platform base engageable with the one or more wind turbine components and releasably securable to a vessel; at least one first securing mechanism for releasably securing the platform base to the vessel; and at least one second securing mechanism for releasably securing the one or more wind turbine components to the platform base such that the one or more wind turbine components are secured to the platform base when the cargo carrying platform is lifted from the barge.

BRIEF DESCRIPTION OF THE DRAWINGS

Various other aspects and further examples are also described in the following detailed description and in the attached claims with reference to the accompanying drawings, in which:

FIG. **1** shows a perspective view of an offshore jack-up according to an example;

FIG. **2** shows a side view of an offshore jack-up with an unsecured vessel according to an example;

FIG. **3** shows a side view of an offshore jack-up with a secured vessel according to an example;

FIG. **4** shows a plan view of an offshore jack-up according to an example;

FIG. **5** shows an underneath plan view of an offshore jack-up according to an example;

FIG. **6** shows a plan view of an offshore jack-up with a secured vessel according to an example;

FIG. **7** shows a front side view of an offshore jack-up with an unsecured vessel adjacent to the offshore jack-up according to an example;

FIG. **8** shows a front side view of an offshore jack-up with a secured vessel according to an example;

FIG. **9** shows another front side view of an offshore jack-up with a secured vessel according to an example;

FIG. **10** shows a perspective view of a load carrying platform according to an example;

FIGS. **11***a*, **11***b* and **11***c* show a schematic side cross sectional view of part of a vessel and an offshore jack-up according to an example;

FIGS. **12** and **13** show a flow diagram of methods according to an example;

FIG. **14** shows an underneath plan view of an offshore jack-up according to an example; and

FIG. **15** shows a plan view of an offshore jack-up with a secured vessel according to an example.

DETAILED DESCRIPTION

Examples of the present disclosure relate to methods and apparatus for securing and transferring a load between a vessel and an offshore jack-up. In some examples, any form of offshore installation and any form of vessel may be utilised. However, for the illustrative purposes only, the following description is provided with reference to an offshore jack-up such as a jack-up rig, a jack-up barge, a lifting vessel or a jack-up vessel.

FIG. **1** shows a perspective view of an offshore jack-up **100** according to an example. The offshore jack-up **100** is a jack-up rig **100** and the term "jack-up" **100** will be used hereinafter. However, the methods and apparatus discussed below can be used with other offshore installations and other forms of jack-up equipment such as jack-up vessels or jack-up barges.

The jack-up **100** comprises a hull **102** and a plurality of moveable legs **104***a*, **104***b*, **104***c*, **104***d*. In the example as shown in FIG. **1**, there are four moveable legs **104***a*, **104***b*, **104***c*, **104***d*, but in other examples there can be three moveable legs or more than four moveable legs. In some examples as shown in FIG. **1**, the moveable legs **104***a*, **104***b*, **104***c*, **104***d*, are open truss legs, but in other examples the moveable legs **104***a*, **104***b*, **104***c*, **104***d*, are solid cylindrical legs.

The moveable legs **104***a*, **104***b*, **104***c*, **104***d* extend downwardly through the hull **102** via respective jacking mechanisms **106***a*, **106***b*, **106***c*, **106***d*. The jacking mechanisms **106***a*, **106***b*, **106***c*, **106***d* comprise a casing for protecting the jacking mechanisms **106***a*, **106***b*, **106***c*, **106***d*. The jacking mechanisms **106***a*, **106***b*, **106***c*, **106***d*, in some examples, are hydraulically operated rack and pinion mechanisms. The operation of a jack-up **100** is known and will not be discussed in further detail.

In FIG. **1** the jack-up **100** is illustrated with the moveable **104***a*, **104***b*, **104***c*, **104***d* **14** in an extended position. When the moveable legs **104***a*, **104***b*, **104***c*, **104***d* are in the extended position, the moveable legs **104***a*, **104***b*, **104***c*, **104***d* extend down to and engage the seafloor **200**. For the purposes of clarity, the seafloor **200** is not shown in FIG. **1** and the moveable legs **104***a*, **104***b*, **104***c*, **104***d* are partially shown. The engagement of the moveable legs **104***a*, **104***b*, **104***c*, **104***d* with the seafloor **200** is better shown in e.g. FIGS. **2** and **3**.

The moveable legs **104***a*, **104***b*, **104***c*, **104***d* are moveable between the extended position and a retracted position, such that the hull **102** may float on the surface **202** of a body of water **204**, and may be transported to a desired location. In some examples, the jack-up **100** comprises one or more propulsors **210** such as an azimuthing thruster (as shown in FIG. **2**) for moving the jack-up **100** between WTG installation sites. In an example, the jack-up **100** comprises four azimuthing thrusters **210** in each corner of the hull **102** as shown in FIG. **5**. Alternatively, in some examples, the jack-up **100** does not comprise propulsors **210** and is towed when the jack-up **100** is moved. In some examples, the jack-up **100** is towed with a vessel between the port and the WTG installation site whether or not the jack-up **100** comprises propulsors **210**.

FIG. **1** shows the jack-up **100** in an operational configuration where the hull **102** has been raised above the surface **202** of the water **204**. During operation of the jack-up **100**, a crane **108** can lift loads for offshore operations. In some examples, the crane **108** is configured to lift one or more components of a wind turbine generator (WTG). The jack-up **100** as shown in FIG. **1** is arranged to install WTGs. In other examples, the jack-up **100** is arranged to install or maintain other offshore structures.

The jack-up **100** as shown in FIG. **1** is positioned adjacent to a (transition piece) TP **118** of a WTG. The TP **118** is ready to receive one or more WTG components **220** such as the WTG tower **222**, the WTG nacelle **224**, and the WTG blades **226**.

The crane **108** comprises a boom **110** which is resting on a boom rest **112**. The boom **110** of the crane **108** is positioned on the boom rest **112** when the jack-up **100** is sailing between locations. The boom rest **112** is mounted on an accommodation block **114**. In examples, there are additional accommodation blocks (not show) arranged on a deck **116** of the hull **102**. The boom **110** is moveable to an operational position as shown in e.g. FIGS. **2** and **3** in order to hoist loads. The crane **108** and the operation thereof is known and will not be described in further detail.

The hull **102** comprises a deck **116** for storing equipment for the offshore installation operation. In some examples, one or more WTG components **220** are stored on the deck **116**. For the purposes of clarity, no WTG components **220** have been shown in FIG. **1**.

A problem with existing jack-up rigs which are used to install multiple WTGs in a designated area is that the jack-up rigs must sail back to port to be resupplied. This means that the jack-up rig spends time sailing to port which could be used installing more WTGs. Examples described in this disclosure provide methods and apparatuses for resupplying the jack-up **100** without requiring the jack-up **100** to sail back to port.

Turning to FIG. **2**, the jack-up **100** will be described in further detail. FIG. **2** shows a side view of the jack-up **100** with an unsecured vessel **206** according to an example.

The jack-up **100** as shown in FIG. **2** is in an operational configuration. The moveable legs **104***a*, **104***b* are extended and feet **208***a*, **208***b* mounted on the moveable legs **104***a*, **104***b* are partially embedded in the soft seafloor **200**. This means that the jack-up **100** is stable and able to lift heavy loads with the crane **108**.

The vessel **206** comprises a barge **212** tethered to an anchor handling vessel **214**. The anchor handling vessel **214** is arranged to transport the barge **212** into the vicinity of the jack-up **100**. In some examples, the vessel **206** is a barge **212** which comprises propulsors (not shown) for moving the barge **212** under its own power and no anchor handling vessel **214** is required. In some examples the anchor handling vessel **214** is instead another powered vessel such as platform supply vessel (PSV), multipurpose support vessel (MSV) tug boats, ice breaker, patrol boat, coast guard vessel, navy vessel, fire-fighting vessel, or any other suitable vessel for managing the movement the barge **212**. The term "vessel" **206** is a powered barge **212**, an unpowered barge **212**, or a combination of a barge **212** and another powered vessel **214** such as an anchor handling vessel **214**.

The barge **212** comprises a deck **216** for securing and transporting loads to the jack-up **100**. As shown in FIG. **2**, a cargo load **218** is positioned on the deck **216**. The cargo load **218** is one or more WTG components **220** for installing on the TP **118**. Specifically, the WTG components **220** comprise one or more towers **222**, one or more nacelles **224** and one or more blades **226**. In other examples, the cargo load **218** can be additionally or alternatively one or more of equipment, personnel, and/or supplies for the jack-up **100**. In other examples, the cargo load **218** can be additionally or alternatively one or more of a transition piece, a monopile, a jacket and/or any other components of an offshore wind turbine generator or wind turbine generator farm.

Optionally, the WTG components **220** are securely mounted to a cargo carrying platform **228** comprises a frame **230** for surrounding the cargo load **218**. The cargo carrying platform **228** and the frame **230** will be discussed in further detail below. FIG. **2** also shows another cargo carrying platform **232** with a similar frame **230** which is empty and positioned on the deck **116** of the jack-up **100**. In some examples, the deck **116** of the jack-up **100** has clear space for receiving one or more full or empty load carrying platforms **228**,**232** on the deck **116** of the jack-up **100**. In some

examples, the load carrying platforms **228**, **232** are received on the deck **116** between two of the moveable legs **104***b*, **104***c*.

In an example (not shown), the WTG components **220** are mounted directly on the barge deck **216**. However, as shown in FIG. **2**, the cargo carrying platform **228** is secured to the deck **216** of the barge **212** with at least one securing mechanism (not shown). In some examples, the at least one securing mechanism can be a twistlock mechanism or a quick release clamp for selectively securing and releasing the cargo carrying platform **228** to the deck **216** of the barge **212**. The at least one securing mechanism in some examples can be mounted on the cargo carrying platform **228**.

As shown in FIG. **2**, the anchor handling vessel **214** is guiding the barge **212** towards the jack-up **100**. In FIG. **2**, the barge **212** is not coupled to the jack-up **100**. This means that the barge **212** and the anchor handling vessel **214** will move relative to the jack-up **100** due to the motion of the sea (e.g. heave, sway, surge, roll, pitch and/or yaw of the barge **212** and/or the anchor handling vessel **214**).

This means that if the weather conditions are too rough, the barge **212** and the anchor handling vessel **214** cannot approach the jack-up **100**. Once there is a suitably calm weather window, the barge **212** and the anchor handling vessel **214** move towards the jack-up **100**.

Turning to FIG. **3**, the method of securing the barge **212** will be described in further detail. FIG. **3** shows a side view of an offshore jack-up **100** with a secured vessel **206** e.g. the barge **212** according to an example.

At least a portion **300** of the barge **212** is moved underneath the hull **102** of the offshore jack-up **100** when the hull **102** is positioned out of the water **204** and the moveable legs **104***a*, **104***b* engage the seafloor **200**. The jack-up **100** is in the operational configuration and the hull **102** is above the surface **202** of the water **204**. In this way, there is clearance between the bottom **302** of the hull **102** and the surface **202** of the water **204** for receiving the portion **300** of the barge **212**.

The hull **102** of the jack-up **100** may comprise at least one guide structure **304** for laterally positioning the portion **300** of the barge **212** underneath the hull **102** or within a cut-out **400** of the hull **102**. The cut-out **400** is described in further detail below. In some examples, there is a first lateral guide structure **304***a* and a second lateral guide structure **304***b* for limiting the lateral movement of the barge **212** with respect to the hull **102** or with respect to the cut-out **400**. The first and second lateral guide structures **304***a*, **304***b* are best shown in FIG. **5**. In other examples, there is a single guide structure **304** mounted on the underside of the hull **102** for guiding the barge **212**.

This means that if the barge **212** is moving sideways with respect to the hull **102**, for example due to currents, the first and second lateral guide structures **304***a*, **304***b* will prevent the barge **212** from colliding with the moveable legs **104***a*, **104***b*, **104***c*, **104***d* when the barge **212** is underneath the hull **102**. In addition, the first and second lateral guide structures **304***a*, **304***b* limit the movement of the barge **212** with respect to the hull **102** and therefore this prevents the frame **230** and the WTG components **220** from colliding with the jack-up **100**. The first and second lateral guide structures **304***a*, **304***b* extend downwardly from the hull **102** and project towards the surface **202** of the water **204**.

In an example, optionally the hull **102** of the jack-up **100** comprises at least one stop structure **306** for limiting the extent the barge **212** moves forward underneath the hull **102**. In another example, there are several stop structures **306** for limiting the extent the barge **212** moves forward underneath the hull **102**. In another example, there is not a stop structure **306** and the anchor handling vessel **214** maintains the position of the barge **212** with respect to the jack-up **100** before the barge **212** is secured to the jack-up **100**. Similarly, in another example, there are no first and second lateral guide structures **304***a*, **304***b* and the anchor handling vessel **214** maintains the position of the barge **212** with respect to the jack-up **100**.

The at least one stop structure **306** extends downwardly from the hull **102** and projects towards the surface **202** of the water **204**. In some examples, the at least one stop structure **306** and the first and second lateral guide structures **304***a*, **304***b* comprise an open lattice structure. This allows the water **204** to flow through the at least one stop structure **306** and the first and second lateral guide structures **304***a*, **304***b* and reduce the drag on the jack-up **100** when the jack-up **100** is being moved.

As shown in FIG. **3**, the crane **108** has hoisted the empty cargo carrying platform **232** and lowered the empty cargo carrying platform **232** on to the deck **216** of the barge **212**. This means that the barge **212** can be used to supply loads **218** and retrieve empty load carrying platform **232**. Accordingly, the jack-up **100** can be replenished more efficiently if the load carrying platforms **228**, **232** are reused.

The jack-up **100** will now be described in further detail with respect to FIGS. **4** and **5**. FIG. **4** shows a plan view of an offshore jack-up **100** according to an example. FIG. **5** shows an underneath plan view of an offshore jack-up **100** according to an example. For the purposes of clarity, FIGS. **4** and **5** are shown without the frame **230** or the WTG components **220**.

The hull **102** comprises a cut-out **400** at one end of the jack-up **100**. In this way, a portion of the hull **102** comprises first arm **402** and a second arm **404** which project out and define the cut-out **400**. The cut-out **400** is arranged to receive a portion of the barge **212** or the cargo carrying platform **228**.

This means the hull **102** comprises a cut-out portion **400** whereby the deck **216** of the barge **212** is accessible from above when at least a portion **300** of the barge **212** is underneath the hull **102** of the offshore jack-up **100**. This means that the cargo load **218**, for example the cargo carrying platform **228** comprising the WTG components **220** can be lifting vertically off the deck **216** of the barge **212**. In some examples, the cargo carrying platform **228** is lifted through the cut-out **400** in the hull **102**.

In the example shown in FIGS. **4** and **5**, the cut-out **400** is in the periphery of the hull **102** of the jack-up **100**. In another example (not shown) which is less preferred, the cut-out **400** is located in the centre of the deck **116** of the jack-up **100**. This means that the deck **116** of the jack-up **100** comprises a hole for receiving the cargo carrying platform **228**.

In an example, the crane **108** comprises a working area A extending over the cut-out **400** of the hull **102**. Accordingly, the crane **108** can hoist objects from the deck **216** of the barge **212** and lower them on to the deck **116** of the jack-up **100**. The working area A covers most of the deck **116** of the jack-up **100** and the location of the TP **118**. In other examples, the working area A of the crane **108** covers the entire deck **116** of the jack-up **100**. This means that the crane **108** can hoist WTG components **220** from the deck **116** of the jack-up **100** and/or the deck **216** of the barge **212**. The crane **108** can then lower the WTG components **220** onto the deck **116** of the jack-up **100** or the TP **118**.

FIG. **4** shows the hull **102** comprising a lifting mechanism **406** mounted on hull **102**. In an example the lifting mecha-

nism **406** is mounted around the periphery **408** of the cut-out **400**. The lifting mechanism **406** is configured to lift the cargo carrying platform **228** between a first position on the deck **216** of the barge **212** and a second position wherein the cargo carrying platform **228** is clear of the deck **216** of the barge **212**. When the lifting mechanism **406** lifts the cargo carrying platform **228** into the second position, the cargo carrying platform **228** is no longer in physical contact with the barge **212**. In this respect, the cargo carrying platform **228** is fixed with respect to the lifting mechanism **406** when in the second position. This means that the movement of the barge **212** due to the water **204** does not move the load carrying platform **406**.

In an example, the lifting mechanism **406** lifts the cargo carrying platform **228** in a vertical distance D**1** (as shown in FIG. **9**). In some examples, the distance D**1** is 3 m. In some examples, the vertical distance D**1** is 1 m to 5 m. In some examples, the lifting mechanism **406** lifts the cargo carrying platform **228** to a height above the deck **216** of the barge **212** where the deck **216** of the barge **212** cannot impact the underside of the cargo carrying platform **228**. The vertical distance D**1** can be varied depending on the weather conditions and the size of the waves. In some examples, the vertical distance D**1** is greater than the vertical displacement of the barge **212** experiences due to the waves e.g. heave. For example, if the barge **212** experiences a heave of plus or minus 2 m, then the lifting mechanism **406** lifts the cargo carrying platform **228** a vertical distance D**1** of greater than 2 m.

Accordingly, as soon as the lifting mechanism **406** lifts the cargo carrying platform **228** off the barge **212**, the barge **212** can be moved out from underneath the hull **102**. This means that there can be a quick transfer of the cargo load **218** and the WTG components **220** to the jack-up **100** from the barge **212**. This means that the barge **212** and the anchor handling vessel **214** can wait near the jack-up **100** and transfer the cargo load **218** to the jack-up **100** in a small calm weather window.

FIG. **4** shows the lifting mechanism **406** is a plurality of lifting arms **406**. For the purposes of clarity only one lifting arm **406** has been labelled in FIG. **4**. In an example, the lifting arms **406** are spaced along the first arm **402** and the second arm **404**. This means that the plurality of lifting arms **406** each lift the cargo carrying platform **228**. FIG. **4** shows that there are eight lifting arms **406**, however, in other examples there can be any other number of suitable lifting arms **406**. In one example, there can be two lifting arms **406** which are positioned either side of the centre of gravity of the cargo carrying platform **228**. In other examples, there can be any other number of lifting arms **406** e.g. three, four, six, ten etc.

Turning to FIG. **5**, the underside of the jack-up **100** will now be described. FIG. **5** shows a dotted outline of the barge **212** position with respect to the jack-up **100**.

In an example, a stabilizing mechanism **502**, **504**, **506**, **508**, **510**, **512** is mounted on the jack-up **100**. In an example, the stabilizing mechanism **502**, **504**, **506**, **508**, **510**, **512** comprises a plurality of stabilizing mechanisms **502**, **504**, **506**, **508**, **510**, **512**. In an example, the stabilizing mechanism **502**, **504**, **506**, **508**, **510**, **512** is a plurality of stabilizing arms **502**, **504**, **506**, **508**, **510**, **512**. In an example, a plurality of stabilizing arms **502**, **504**, **506**, **508**, **510**, **512** are mounted on the hull **102**. The stabilizing arms **502**, **504**, **506**, **508**, **510**, **512** are engageable with the barge **212**. In an example, the stabilizing arms **502**, **504**, **506**, **508**, **510**, **512** are engageable with the structure of the barge **212** such as the deck **216** or any other suitable portion of the barge **212**. The stabilizing arms **502**, **504**, **506**, **508**, **510**, **512** are engageable with the deck **216** of the barge **212** positioned underneath the hull **102** or within the cut-out **400**. The stabilizing arms **502**, **504**, **506**, **508**, **510**, **512** push down on the deck **216** of the barge **212** and this reduces the relative movement of the barge **212** with respect to the jack-up **100**. When the stabilizing arms **502**, **504**, **506**, **508**, **510**, **512** push down on the deck **216** of the barge **212**, the buoyant force acting on the barge **212** increases. This results in the barge **212** being engaged with the jack-up **100** stops or limits the relative movement therebetween. In other words, the waves and current of the water **204** acting on the barge **212** do not cause the barge **212** to move relative to the jack-up **100** when the stabilizing arms **502**, **504**, **506**, **508**, **510**, **512** engage the deck **216** of the barge **212**.

In an example, when the stabilizing arms **502**, **504**, **506**, **508**, **510**, **512** engage with the deck **216**, the stabilizing arms **502**, **504**, **506**, **508**, **510**, **512** dampen the movement of the barge **212**. The stabilizing arms **502**, **504**, **506**, **508**, **510**, **512** comprise a dampener such as a hydraulic piston **700**, **704** (described in further detail below). In some examples, the dampener **700**, **704** is coupled to the stabilizing mechanism and can be one or more of a spring, a resilient material, or an electro-mechanical dampener, cables and a winch or any other suitable means for dampening the movement of the barge **212**.

In an example, the stabilizing mechanism **502** is a single pad (not shown) that engages the deck **216** of the barge **212**. The single pad is a substantially flat planar surface that engages a substantial area of the deck **216**. Since the single pad is of a large area, the pad can push down on the deck **216** of the barge **212** along most of the barge **212**. In this way, the stabilizing mechanism **502** comprises a single engaging element for stabilizing the barge **212**.

In some examples, the stabilizing arms **502**, **504**, **506**, **508**, **510**, **512** are mounted on the underside of the hull **102**. Each of the stabilizing arms **502**, **504**, **506**, **508**, **510**, **512** are extendible underneath the hull **102** towards the surface **202** of the water **204**.

In an example, the stabilizing arms **502**, **504**, **506**, **508**, **510**, **512** are spaced along the hull **102**. The stabilizing arms **502**, **504**, **506**, **508**, **510**, **512** are arranged to engage both sides of the barge **212** along the longitudinal length of the barge **212**. As shown in FIG. **5** there are six stabilizing arms **502**, **504**, **506**, **508**, **510**, **512**. However, in other examples, there can be three or more stabilizing arms **502**, **504**, **506**, **508**, **510**, **512**. In the less preferred example with only three stabilizing arms, there are a first and second stabilising arm **502**, **504** at the sides of the barge **212**. A third stabilizing arm **514** (shown in dotted lines) is positioned at the bow of the barge **212** aligned with the centreline of the barge **212**. In other examples, there can be any number of stabilizing arms **502**, **504**, **506**, **508**, **510**, **512**.

In an example, the jack-up **100** comprises a moveable coupling mechanism (not shown) mounted on cut-out **400**. The moveable coupling mechanism is configured to releasably engage with the bow of the barge **212** when the barge **212** abuts the stop structure **306**. In some examples, the coupling mechanism is mounted to the stop structure **306**. In some examples, a first part of the coupling mechanism is mounted on the stop structure **306** and a second part of the coupling mechanism is mounted on the bow of the barge **212**. In some examples, the first part of the coupling mechanism and the second part of the coupling mechanism are a latch and catch mechanism. In some examples, the barge **212** is pivotable about the moveable coupling mechanism before

the plurality of stabilizing arms **502**, **504**, **506**, **508**, **510**, **512** engage the deck **216** of the barge **212**.

In an example, at least one pair of stabilizing arms **502**, **504**, **506**, **508**, **510**, **512** engages the deck **216** on opposites sides of the centre of buoyancy B of the barge **212**. In an example, there are at least two pairs of stabilizing arms **502**, **504**, **506**, **508**, **510**, **512** engages the deck **216** on opposites sides of the centre of buoyancy B of the barge **212**. In an example, one stabilizing arm **514** can be part of two pairs **514**, **502** and **514**, **504** of stabilizing arms on opposites sides of the centre of buoyancy B of the barge **212**. This means that when the stabilizing arms **502**, **504**, **506**, **508**, **510**, **512** push down on the deck **216** of the barge **212**, the turning moments about the centre of buoyancy B are balanced. Accordingly, the barge **212** is not subjected to a rolling or a pitching motion due to the force of the stabilizing arms **502**, **504**, **506**, **508**, **510**, **512** acting on the deck **216** of the barge **212**.

In an example, the plurality of stabilizing arms **502**, **504**, **506**, **508**, **510**, **512** are mounted adjacent to the first lateral guide structure **304***a* and the second lateral guide structure **304***b*. This means that when the barge **212** is aligned between the first lateral guide structure **304***a* and the second lateral guide structure **304***b*, the stabilizing arms **502**, **504**, **506**, **508**, **510**, **512** are aligned correctly for engaging with the deck **216** of the barge **212**. In some examples, the stabilizing arms **502**, **504**, **506**, **508**, **510**, **512** are mounted to the first lateral guide structure **304***a* and the second lateral guide structure **304***b*. The stabilizing arms **502**, **504**, **506**, **508**, **510**, **512** each comprise an engagement head **516** projecting inwardly towards the barge **212**. For the purposes of clarity only one engagement head **516** has been labelled in FIG. **5**.

As can be seen from FIG. **6**, when the barge **212** is in position, the frame **230** can be lifted off from the deck **216** of the barge **212**. FIG. **6** shows a plan view of an offshore jack-up **100** with the barge **212** secured to the jack-up **100** according to an example.

FIG. **6** shows the anchor handling vessel **214** pushing the barge **212** into position with respect to the jack-up **100**. The barge **212** comprises a stern cut-out **600** for receiving and engaging with the bow **602** of the anchor handling vessel **214**. The stern cut-out **600** engaging with the bow **602** provides for a stable connection between the anchor handling vessel **214** and the barge **212** when the anchor handling vessel **214** pushes the barge **212**.

The barge **212** has been pushed into position and abuts the stop structure **306** (not shown in FIG. **6**) and is aligned between the first lateral guide structure **304***a* and the second lateral guide structure **304***b* (again not shown in FIG. **6**). The frame **230** is ready to be lifted off the deck **216** of the barge **212** once the barge **212** has been secured with respect to the jack-up **100**.

The WTG components **220** are shown mounted on the frame **230**. In particular, the blades **226** may extend out sideways beyond the footprint of the hull **102**. Of course, the WTG components **220** can be orientated in any direction as required. If the WTG components **220** are oversized e.g. wider than the cut-out **400** width W (as shown in FIG. **4**), then the oversized WTG components **220** such as the blades **226** are positioned at a suitable height and orientation. For example, the oversized components e.g. blades **226** are positioned such that the blades **226** do not collide with the first arm **402** and/or the second arm **404** of the hull **102** when the cargo carrying platform **228** is lifted from the first position to the second position.

The steps of the securing and transferring method will now be described in further detail with respect to FIGS. **7** to **9**, **10**, **12** and **13**. FIGS. **7** to **9** show a front side view of an offshore jack-up **100** with the barge **212** at different steps of securing the barge **212** and transferring the load **218**. For the purposes of clarity, only the barge **212** (and not the anchor handling vessel **214**) is shown in FIGS. **7** to **9**.

Turning briefly to FIG. **10**, the cargo carrying platform **228** will be briefly described. FIG. **10** shows a perspective view of a cargo carrying platform **228** according to an example. FIG. **10** shows the cargo carrying platform **228** comprising a frame **230** which surrounds the periphery **1000** of the cargo carrying platform **228**. The frame **230** surrounds the cargo load **218** and protects the supply load from being damaged during lifting and moving operations. This means that the frame **230** can be handled by the lifting mechanism **406** and the crane **108**. In this way, the frame **230** protects the cargo load **218** e.g. WTG components **220** from minor damage such as scratches, dents etc. This means that the WTG components **220** are less likely to need painting or repair after installation.

The cargo carrying platform **228** is substantially planar and comprises a plurality of securing mechanisms **604** or lashing points. FIG. **6** shows clamps **604** for clamping to the bottom of the WTG towers **222** to maintain the WTG towers **222** in an upright position. The securing mechanisms **604** can be clamps or other suitable securing mechanisms **604**. Further securing mechanisms **604** such as clamps can be used with the WTG nacelle **224** and the WTG blades **226**. In some examples, the cargo carrying platform **228** receives WTG components **220** for two WTGs. In other examples, each cargo carrying platform **228** is configured to receive the WTG components **220** for a single WTG. In other examples, each cargo carrying platform **228** is configured to receive the WTG components **220** for any number of WTGs e.g. three, four etc WTGs. In an example there is at least one first securing mechanism for securing the cargo carrying platform **228** to the barge **212** and at least one second securing mechanisms for securing the WTG components **220** to the cargo carrying platform **228**. The at least one first and second securing mechanisms can be a plurality of securing mechanisms. In this way, in some examples there is a first set of securing mechanism for securing the cargo carrying platform **228** to the barge **212** and a second set of securing mechanisms for securing the WTG components **220** to the cargo carrying platform **228**.

The frame **230** comprises an elevated fastening position **1002** for securing the blades **226**. The elevated fastening position **1002** is adjacent to the footprint of the cargo carrying platform **228**. This can be seen in FIG. **6** when viewing the empty load carrying platform **232**. In an example, the frame **230** comprises a plurality of bracing struts for strengthening the frame **230**.

The cargo carrying platform **228** comprises a plurality of vertical posts **1004**. Each of the vertical posts **1004** comprises a lateral projection **1006** each engageable with one of the lifting arms **406**. In some examples, the lateral projections **1006** are optional. Indeed, the lifting arms **406** can lift the cargo carrying platform **228** from underneath the cargo carrying platform **228**. Alternatively in other examples, the cargo carrying platform **228** comprises holes for receiving reciprocal pegs mounted on the lifting arms **406**.

In some examples, the frame **230** is optional. Indeed, the cargo carrying platform **228** is only a flat horizontal platform. In other examples, the cargo carrying platform **228** is a securely removeable top deck **216** of the barge **212**.

Turning back to FIGS. **7** to **9**, the method will now be described. The cargo load **218** e.g. the WTG components **220** are not shown in FIGS. **7** to **9** for the purposes of clarity. The supply carrying platform **228** is mounted on the deck **216** of the barge **212**.

In FIG. **7**, the barge **212** has been moved such that at least a portion **300** of the barge **212** is underneath the hull **102** of the offshore or within a cut-out **400** of the hull **102** jack-up **100** as shown in step **1200** of FIG. **12**. FIGS. **12** and **13** show a flow diagram of methods according to an example. The barge **212** as shown in FIG. **7** is not in engagement with the stabilizing arms **502**, **504**. Furthermore, the lifting arms **406***a* on the port side of the barge **212** and the lifting arms **406***b* on the starboard side of the barge **212** are not in engagement with the lateral projections **1006***a*, **1006***b* on the cargo carrying platform **228**.

This means that the barge **212** can move relative to the jack-up **100**. The position of the cargo carrying platform **228** is the same as shown in FIG. **6**. That is, the cargo carrying platform **228** is within the cut-out **400** of the hull **102**.

In an example, the stabilizing arms **502**, **504** and the lifting arms **406***a*, **406***b* are actuated with hydraulics. Each of the stabilizing arms **502**, **504** and the lifting arms **406***a*, **406***b* are respectively coupled to a hydraulic actuator **700**, **704**, **702**, **706**. The hydraulic actuators **700**, **702**, **704**, **706** are coupled to a hydraulic system (not shown) for controlling and actuating the hydraulic actuators **700**, **702**, **704**, **706**. In an example, each of the stabilizing arms **502**, **504** and the lifting arms **406***a*, **406***b* are coupled to another mechanism for actuating and extending the stabilizing arms **502**, **504** and the lifting arms **406***a*, **406***b*. For example, the mechanism can be a rack and pinion mechanism, mechanical linkage, or any other suitable mechanism for extending and retracting the stabilizing arms **502**, **504** and the lifting arms **406***a*, **406***b*.

Whilst reference in FIGS. **7** to **9** is made to the stabilizing arms **502**, **504** and the lifting arms **406***a*, **406***b*, the same mechanisms and methods of operation are applicable to the other stabilizing arms **502**, **504**, **506**, **508**, **510**, **512**, **514** and the lifting arms **406** discussed in reference to the previous FIGS. **1** to **6**.

Once the barge **212** is in position, the stabilizing arms **502**, **504** are extended to secure the barge **212** as shown in step **1300** in FIG. **13**. The plurality of stabilizing arms **502**, **504** mounted on the hull **102** are extended and engage against the deck **216** of the barge **212** as shown in step **1202** of FIG. **12**. In an example, the stabilizing arms **502**, **504** can dampen the movement of the barge **212** due to the water **204** and this allows for a soft engagement with the deck **216** of the barge **212**.

As can be seen from FIG. **8**, the hydraulic actuators **700**, **704** have been actuated and extend the stabilizing arms **502**, **504** until the engagement heads **516***a*, **516***b* are in physical engagement with the deck **216** of the barge **212**. Once the engagement heads **516***a*, **516***b* are seated correctly on the deck **216**, then the hydraulic actuators **700**, **704** continue to be actuated and extend the stabilizing arms **502**, **504** further. Accordingly, the stabilizing arms **502**, **504** are pushed against the deck **216** of the barge **212** to increase the buoyant force acting on the barge **212** as shown in step **1204** in FIG. **12**. In some examples, the steps **1202** and **1204** can be one continuous movement. Alternatively, there can be a pause between steps **1202** and **1204** in order to check that the engagement heads **516***a*, **516***b* are seated correctly on the deck **216**.

In some examples, the plurality of the stabilizing arms **502**, **504** engage the deck **216** at substantially the same time. This means that the barge **212** does not experience a turning moment about the centre of buoyancy as the stabilizing arms push down on the barge **212**. In other examples, the stabilizing arms **502**, **504** engage the deck **216** at slightly different times in order to accommodate different parts of the barge **212** moving at different rates.

This means that the stabilizing arms **502**, **504** push the barge **212** into the water **204** by a vertical distance D**2**. This prevents the barge **212** from moving with respect to the jack-up **100**. This means that the barge **212** is secured to the jack-up **100**. In some examples, the vertical distance D**2** is between 0.1 to 2 m. In some other examples, the vertical distance D**2** is between 0.3 to 1.5 m. In some other examples, the vertical distance D**2** is between 0.5 to 1 m.

In some examples the barge **212** is a monohulled vessel. In some examples, the barge **212** is a multihull vessel as shown in FIGS. **7** to **9**. FIGS. **7** to **9** show the barge **212** have two hulls **800**, **802**, but in other examples the barge **212** can comprise any number of hulls. This means that the volume of water that is displaced when the stabilizing arms **502**, **504** are pushed down in step **1204** is reduced. Accordingly, the force required to push the barge **212** down with the stabilizing arms **502**, **504** is reduced compared to pushing down on a monohulled barge **212**

After the barge **212** is secured with respect to the jack-up **100**, the FIG. **9** shows that the hydraulic actuators **702**, **706** have been actuated and extend the lifting arms **406***a*, **406***b* so that they engage the lateral projections **1006***a*, **1006***b* of the cargo carrying platform **228**. In this way, the lifting mechanism **406** mounted on the jack-up **100** is engaged with a cargo carrying platform **228** positioned on the barge **212** as shown in step **1302** in FIG. **13**. Once the lifting arms **406***a*, **406***b* have engaged the lateral projections **1006***a*, **1006***b*, the lifting arms **406***a*, **406***b* lift the cargo carrying platform **228** between a first position on the barge **212** and a second position clear of the barge **212** as shown in step **1304** of FIG. **13**.

In some examples, the steps **1302** and **1304** can be one continuous movement. Alternatively, there can be a pause between steps **1302** and **1304** in order to check that the lifting arms **406***a*, **406***b* are engaged correctly with the cargo carrying platform **228**.

In some examples, the plurality of the lifting arms **406***a*, **406***b* engage the lateral projections **1006***a*, **1006***b* at substantially the same time. This means that the cargo carrying platform **228** is lifted in a stable manner. In some examples, the lifting arms **406***a*, **406***b* move at different rates in order ensure that the cargo remains balanced on the cargo carrying platform **228**.

As shown in FIG. **9** and previously discussed above, the lifting arms **406***a*, **406***b* lift the cargo carrying platform **228** by a vertical distance D**1**. Once the cargo carrying platform **228** has disengaged from the barge **212**, the cargo carrying platform **228** is fixed with respect to the lifting arms **406***a*, **406***b*. In other words, the motion of the water **204** will not affect the cargo carrying platform **228** once it is in the second position.

In some examples, once the cargo carrying platform **228** is in the second position, the crane **108** hoists the cargo carrying platform **228**. The crane **108** may hoist the cargo carrying platform **228** to another part of the deck **116** of the jack-up **100** as shown in FIG. **6**. The crane **108** may hoist another cargo carrying platform **232** from the jack-up **100** to the barge **212** at this point as shown in FIG. **3**.

In some examples, when the barge **212** is secured to the jack-up **100** as described in step **1204**, the crane **108** can

place a load on the deck **216** of the barge **212**. The load can be an empty cargo carrying platform **232** as described above.

In some examples, the engagement heads **516** on the stabilizing arms **502**, **504**, **506**, **508**, **510**, **512**, **514** comprise optional self-seating engagement heads. FIGS. **11***a*, **11***b*, **11***c* shown different example couplings between the stabilizing arms **502**, **504**, **506**, **508**, **510**, **512**, **514** and the deck **216** with different shapes of engagement heads **516**. FIG. **11***a* shows a semi-spherical engagement head **516** or elongated curved head configured to seat in a reciprocally curved hole **1100** in the deck **216** of the barge **212**.

FIG. **11***b* shows an upstanding peg **1102** mounted on the deck **216** configured to seat in a reciprocal hole **1106** in the engagement head **516**.

FIG. **11***c* shows a conical engagement head **516** configured to seat in a reciprocally conically curved hole **1104** in the deck **216** of the barge **212**. In other examples, the lifting arms **406** and the lateral projections **1106** comprise similar couplings to those shown in FIGS. **11***a* to **11***c*. In other examples, the surfaces on the engagement heads **516** and the deck **216** are flat.

Another example will now be described with respect to FIGS. **14** and **15**. FIG. **14** shows an underneath plan view of an offshore jack-up **100** according to an example. FIG. **15** shows a plan view of an offshore jack-up **100** with a secured vessel according to an example. FIGS. **14** and **15** show examples which are similar to the examples described in reference to FIGS. **1** to **13**. FIG. **14** shows a barge **1400** which is smaller than the barge **212** described in the previous examples. In particular, the barge **1400** is aligned within the cut-out **400** of the hull **102**. In this way, the barge **1400** does not have a portion of the barge **1400** which is underneath the hull **102**. Instead, at portion of the barge **1400** is wholly contained within the cut-out **400**. Some or all of the length of the barge **1400** can be aligned within the cut-out **400**. In some examples, the barge **1400** can project out from the cut-out **400** away from the jack-up **100**. The cargo carrying platform **228** as shown in FIG. **14** is lifted from the barge **212** by the lifting mechanism **406** in the same way as discussed above with respect to the previous examples.

Similarly, the stabilizing mechanism **1500** operates in the same way at the stabilizing mechanism **502**, **504**, **506**, **508**, **510**, **512** as discussed in reference to the previous examples shown in FIGS. **1** to **13**. However, the placement of the stabilizing arms **1502**, **1504**, **1506**, **1508** has been adapted to the barge **1400**. Since the barge **1400** is smaller, the centre of buoyancy B has moved and the stabilizing arms **1502**, **1504**, **1506**, **1508** are moved accordingly. In this way, there maintained four pairs 1) **1502**, **1506** and 2) **1502**, **1504** and 3) **1506**, **1508** and 4) **1508**, **1504** of stabilizing arms on opposites sides of the centre of buoyancy B of the barge **1400**.

In another example, the shape, size, orientation, extension, and placement of the stabilizing mechanisms **502**, **504**, **506**, **508**, **510**, **512**, **1502**, **1504**, **1506**, **1508** and the lifting mechanism **406** are configurable and adaptable to different vessels **212**. For example, different barges **212** can have different shape, sizes and draft depending on the cargo and other factors.

In another example, the cargo carrying platform **228** comprises the frame **230** for surrounding the cargo load **218**. The cargo carrying platform **228** is identical to the cargo carrying platform **228** previously mentioned in reference to FIGS. **1** to **15** and functions in the same way. As mentioned previously, the cargo load **218** are WTG components **220**. The WTG components **220** comprise one or more towers **222**, one or more pieces of a WTG tower **222**, one or more nacelles **224** and one or more blades **226**. In other examples, the cargo load **218** can be additionally or alternatively one or more of equipment, personnel, and/or supplies for the jack-up **100**. In other examples, the cargo load **218** can be additionally or alternatively one or more of a transition piece, a monopile, a jacket and/or any other components of an offshore wind turbine generator or wind turbine generator farm.

The cargo carrying platform **228** is loaded by an onshore crane (not shown) when the cargo carrying platform **228** is located onshore. In some examples, the onshore crane and the cargo carrying platform **228** are located in the vicinity of a dock or harbour where the barge **212** is moored. In other examples, the cargo carrying platform **228** can be loaded with WTG components **228** at a different location and then transported over land to the harbour. In some examples, an onshore crane located at the harbour is used to load the cargo carrying platform **228** on the barge **212**.

At least the components of one WTG are loaded on to the cargo carrying platform **228**. In other examples, the components for a plurality of WTGs are loaded onto the cargo carrying platform **228**. For example the components for two, three or any number of WTGs are loaded onto the cargo carrying platform **228**.

In this way, the onshore crane loads multiple WTG components **220** on to the cargo carrying platform **228**. Accordingly, a plurality of WTG components **220** are loaded on cargo carrying platform **228** whilst the cargo carrying platform **228** is onshore.

This means that optionally a single crane hoist by the onshore crane can lift and load the cargo carrying platform **228** on to the barge **212**. In other words, a single loading operation such as a crane hoist by the onshore crane can lift and load all the WTG components **220** on to the barge **212** at the same time. In other examples, one or more WTG components **220** are loaded on the cargo carrying platform **228** and then once the cargo carrying platform **228** is loaded on the barge **212**, further WTG components **220** are loaded onto the cargo carrying platform **228**. In yet further alternative examples, the empty cargo carrying platform **228** can be loaded on the barge **212** and then the WTG components **220** are loaded onto the cargo carrying platform **228** mounted on the barge **212**.

In some examples, the loading operation of the cargo carrying platform **228** on to the barge **212** can be carried out without a crane. For example, the cargo carrying platform **228** can be wheeled or towed onto the barge **212** when the deck **216** of the barge **212** is level with the dockside, or the barge **212** is accessible from the dockside with a ramp. In some examples the cargo carrying platform **228** is moved onto the barge **212** with a self-propelled modular transporter (SPMT), which is not shown. The SPMT can drive on the ramp and onto the deck **216** of the barge **212**. Any suitable mechanism can be used for loading the cargo carrying platform **228** on to barge **212**. Similarly, in other examples, the WTG components **220** can be loaded onto the cargo carrying platform **228** without a crane. Any suitable mechanism can be used for loading the WTG components **220** on to the cargo carrying platform **228**.

This means that loading the barge **212** with the cargo carrying platform **228** is quicker than loading each individual WTG component **220** onto the barge **212**. The cargo carrying platform **228** is preloaded with the WTG components **220** and this shortens the turnaround time of the barge **212** in the dock. This means that the barge **212** can make more use of clear weather windows.

Similarly, once the lifting mechanism **406** has lifted the cargo carrying platform **228** from the barge **212** as discussed in reference to the previous examples, the cargo carrying platform **228** is optionally hoisted onto the deck **116** of the jack-up **100** once the cargo carrying platform **228** is empty. This means that a single crane hoist by the crane **108** can lift and unload the cargo carrying platform **228** on to the barge **212**. Once the cargo carrying platform **228** has been lifted by the lifting mechanism **408**, the crane **108** can lift the one or more WTG components **220** in a plurality of crane lifting operations.

Advantageously, this means that the multiple WTGs can be built faster because loading and transit of the WTG components **220** occurs simultaneously with WTG erection and installation. The loading time of the WTG components **220** is faster because the cargo carrying platform **228** allows for a separable preloading operation. Furthermore, the amount of time the barge **212** must be in contact with the jack-up **100** can be reduced because all the WTG components **100** can be unloaded at the same time with the cargo carrying platform **228**. The WTG components **220** are better protected during transit and loading and unloading because the WTG components **220** do not have to be separately loaded and only mounted and dismounted from their securing mechanisms **604** once. For example, the WTG tower **222** can be fixed to the securing mechanisms **604** and constructed in the cargo carrying platform **228** if the WTG tower **222** is formed from multiple pieces. The securing mechanisms **604** are suitable sea fastenings for the WTG components **220** once the barge **212** is sailing. The cargo carrying platform **228** protects the WTG components **220** from any rough handling during loading and unloading.

In another embodiment two or more embodiments are combined. Features of one embodiment can be combined with features of other embodiments.

Embodiments of the present invention have been discussed with particular reference to the examples illustrated. However it will be appreciated that variations and modifications may be made to the examples described within the scope of the invention.

The invention claimed is:

1. A method of supplying a load between a vessel and an offshore jack-up having a hull and a plurality of moveable legs engageable with the seafloor, the offshore jack-up arranged to move the plurality of moveable legs with respect to the hull to position the hull out of water, the method comprising:

pushing down on the vessel to limit movement of the vessel with respect to the hull of the offshore jack-up when the hull is positioned out of the water and the plurality of moveable legs engage the seafloor;

fixing a cargo carrying platform with respect to a lifting mechanism mounted on the offshore jack-up by engaging the lifting mechanism underneath the cargo carrying platform, wherein the cargo carrying platform is positioned on the vessel;

lifting the cargo carrying platform with the lifting mechanism between a first position on the vessel and a second position clear of the vessel; and

releasing the vessel from the offshore jack-up after the cargo carrying platform has been lifted clear of the vessel.

2. The method according to claim **1**, wherein the cargo carrying platform comprises a frame for surrounding the load.

3. The method according to claim **1**, wherein the cargo carrying platform is a removeable deck of the vessel.

4. The method according to claim **1**, further comprising:

positioning the cargo carrying platform within a cut-out in the hull before the fixing.

5. The method according to claim **4**, wherein the lifting comprises:

lifting the cargo carrying platform through the cut-out in the hull.

6. The method according to claim **1**, wherein the lifting mechanism comprises a plurality of lifting mechanisms.

7. The method according to claim **1**, wherein the lifting mechanism comprises a plurality of lifting arms mounted on the hull and engageable with the cargo carrying platform.

8. The method according to claim **7**, wherein the plurality of lifting arms are spaced on either side of the cargo carrying platform.

9. The method according to claim **7**, wherein the cargo carrying platform comprises a plurality of projections, each engageable with one of the plurality of lifting arms.

10. The method according to claim **7**, wherein the plurality of lifting arms are hydraulic.

11. The method according to claim **7**, wherein the plurality of lifting arms lift the cargo carrying platform at the same time.

12. The method according to claim **1**, further comprising:

hoisting, by a crane mounted on the offshore jack-up, the cargo carrying platform after the lifting mechanism has lifted the cargo carrying platform clear of the vessel.

13. The method according to claim **12**, further comprising:

hoisting, by the crane mounted on the offshore jack-up, another cargo carrying platform from the offshore jack-up to the vessel.

14. The method according to claim **1**, further comprising:

securing the load to the cargo carrying platform with at least one attachment mechanism.

15. The method according to claim **1**, wherein the load comprises one or more of a wind turbine tower, a nacelle, wind turbine blades, a wind turbine component, equipment, personnel, supplies, a transition piece, a monopile, a jacket or a component of an offshore wind turbine generator or wind turbine generator farm.

16. The method of claim **1**, wherein

the lifting mechanism includes a plurality of lifting arms;

the cargo carrying platform includes a plurality of lateral projections; and

the engaging the lifting mechanism includes engaging the plurality of lifting arms with corresponding ones of the plurality of lateral projections to fix the cargo carrying platform with respect to the lifting mechanism.

17. The method of claim **1**, wherein the pushing down comprises:

pushing down on the vessel to prevent movement of the vessel with respect to the offshore jack-up.

18. An offshore jack-up comprising:

a hull;

a plurality of moveable legs configured to engage with the seafloor, the offshore jack-up configured to move the plurality of moveable legs with respect to the hull to position the hull out of water when the plurality of moveable legs engage the seafloor;

a lifting mechanism configured to fix a cargo carrying platform with respect to the lifting mechanism by engaging with the cargo carrying platform underneath the cargo carrying platform, the lifting mechanism further configured to lift the cargo carrying platform between a first position on a vessel and a second position clear of the vessel; and

a securing mechanism configured to push down on the vessel to limit movement of the vessel with respect to the hull of the offshore jack-up, and configured to release the vessel from the offshore jack-up after the cargo carrying platform has been lifted clear of the vessel.

19. The offshore jack-up according to claim **18**, wherein the lifting mechanism is configured to lift the cargo carrying platform through a cut-out in the hull.

20. The offshore jack-up according to claim **18**, wherein the lifting mechanism comprises a plurality of lifting mechanisms.

21. The offshore jack-up according to claim **18**, wherein the lifting mechanism comprises a plurality of lifting arms mounted on the hull and engageable with the cargo carrying platform.

22. The offshore jack-up according to claim **21**, wherein the plurality of lifting arms are spaced on either side of the cargo carrying platform.

23. The offshore jack-up according to claim **21**, wherein the cargo carrying platform comprises a plurality of projections, each engageable with one of the plurality of lifting arms.

24. The offshore jack-up according to claim **21**, wherein the plurality of lifting arms configured to lift the cargo carrying platform at the same time.

25. The offshore jack-up according to claim **18**, further comprising:

a crane configured to hoist the cargo carrying platform after the lifting mechanism has lifted the cargo carrying platform clear of the vessel.

26. The offshore jack-up of claim **18**, wherein

the cargo carrying platform includes a plurality of lateral projections; and

the lifting mechanism includes a plurality of lifting arms configured to engage with corresponding ones of the plurality of lateral projections to fix the cargo carrying platform with respect to the lifting mechanism.

27. The offshore jack-up of claim **18**, wherein the securing mechanism is configured to push down on the vessel to prevent movement of the vessel with respect to the offshore jack-up.

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