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(54) METHOD FOR LOWERING AND HOISTING OF A LOAD TO OR FROM AN OCEAN FLOOR

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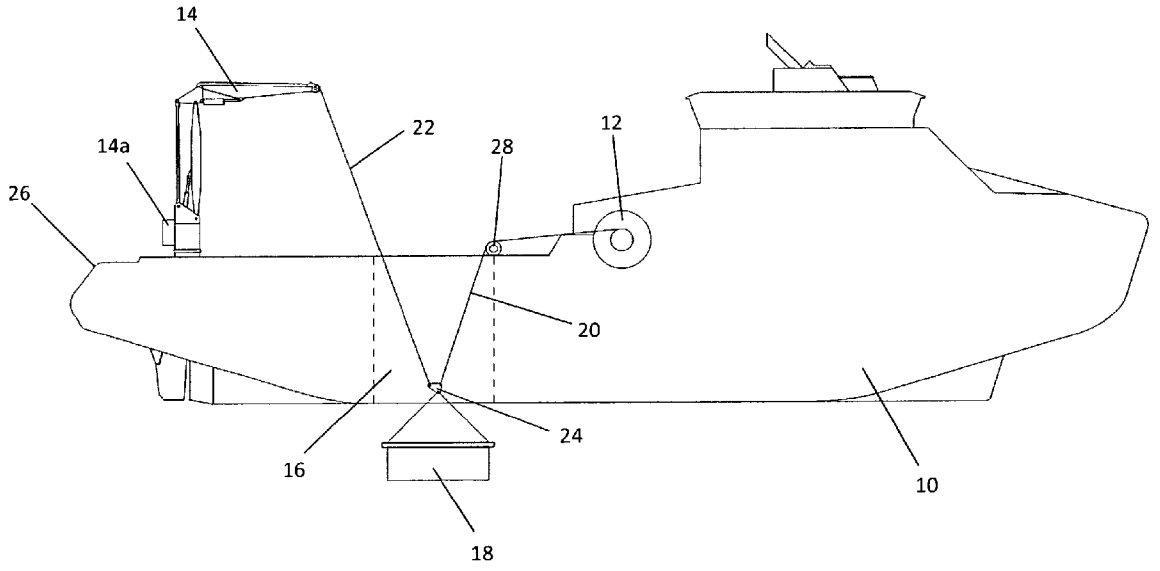
(57) **ABSTRACT**

A method is described for the lowering, of a load (**18**) to the ocean floor from a vessel (**10**) that floats on the ocean surface, comprising the features: to couple a first lifting line (**20**) from a load holding winch (**12**) to the load (**18**), to connect a second lifting line (**22**) from a positioning winch (**14***a*) to the load (**18**) and to adjust the positioning winch (**14***a*) so that a fraction of the weight of the load (**18**) is taken up., to set the load holding inch (**12**) in a constant tension mode and to adjust the load holding winch (**12**) so that a fraction of the weight of the load is compensated, where the fraction of the weight that the load holding winch (**12**) takes up is greater than the fraction of the weight which the positioning winch (**14***a*) takes up, and during lowering of the load (**18**), the positioning winch (**14***a*) lets out the second lifting line (**22**) for lowering of the load (**18**), while the load holding winch (**12**) follows behind with letting out the first lifting line (**20**), A method for hoisting of the load is also described.



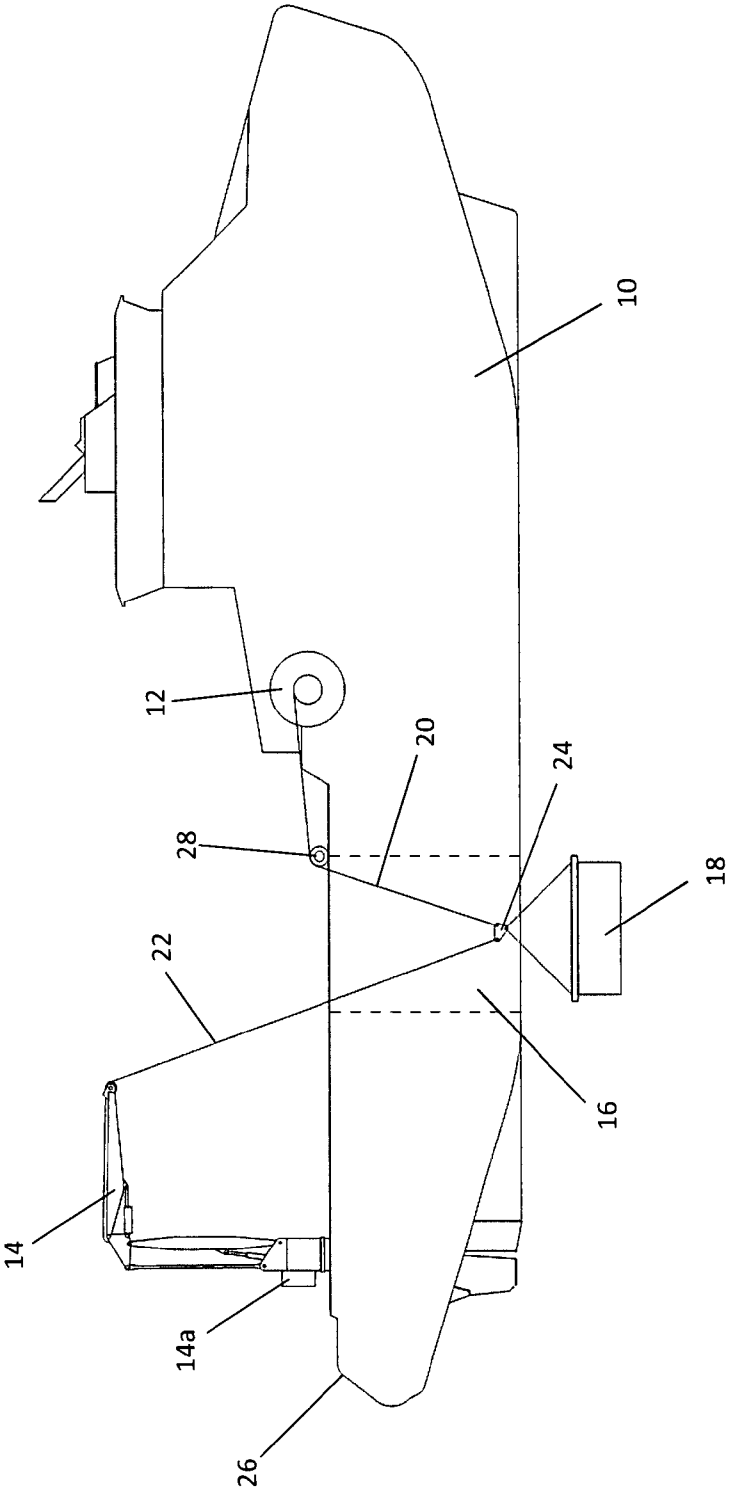


Fig. 1

METHOD FOR LOWERING AND HOISTING OF A LOAD TO OR FROM AN OCEAN FLOOR

[0001] The present invention relates to methods for lowering and hoisting, respectively, of a load to or from the ocean floor from a vessel that floats on the ocean surface, where a first lifting line from a load holding winch is coupled to the load and a second lifting line from a positioning winch is coupled to the load.

[0002] This description has as an aim to describe an invention relating to a concept for installation and lifting that comprises equipment for anchor handling operations, and also a crane or positioning winch for subsea operations.

[0003] The system is initially described installed on an anchor handling vessel, but can also be adapted to other vessels, such as barges, cargo ships, etc. The core of the invention is that one gets a possibility to handle a load, with a crane or the like, that is much bigger than the lifting capacity of the crane by using, for example, an anchor handling winch (load holding winch) in a constant tension mode, while the crane can operate in an active heave mode.

[0004] From prior art, reference is made to US 20120156003 Al. From the US document one can see, in a sense, the use of a heave compensated crane that can cooperate with a winch. However, it is very clear that both shall take up an even load, and there is no mention that the weight of the load shall be adjusted differently between the crane and the winch. Furthermore, a special loading block is apparent, as is the connection with the use of an ROV.

[0005] In contrast to said US document, it is an essential feature of the invention that the winch shall take up the largest part of the weight and the crane is used to position and lower the load. During lowering, the winch is preferably in a constant tension mode. During hoisting, both the crane and the winch are preferably in a constant tension mode.

[0006] The object of the invention comprises use of one of the drums belonging to the anchor handling winch as a load holding winch, while the subsea crane/positioning winch positions the load.

[0007] This is achieved in that the load hangs in the load holding winch either across a stern roller or through an overboard disc arrangement at other places on the vessel, for example, through a moon pool. The crane/positioning winch can be coupled to the main line with the help of, for example, a triangle plate.

[0008] According to the invention a method is provided for the lowering of a load to the ocean floor from a vessel that floats on the ocean surface, comprising the features:

- **[0009]** to couple a first lifting line to the load from a load holding winch,
- **[0010]** to couple a second lifting line to the load from a positioning winch and to adjust the positioning winch so that a fraction of the weight of the load is taken up,
- **[0011]** to set the load holding winch in a constant tension mode and to adjust the load holding winch so that a fraction of the weight of the load is compensated, where the weight fraction that the load holding winch takes up is greater than the weight fraction that the positioning winch takes up, and
- **[0012]** during the lowering of the load the positioning winch lets out the second lifting line for the lowering of the load, while the load holding winch follows behind by releasing the first lifting line.

[0013] According to the invention a method is also provided for the hoisting of a load from the ocean floor by a vessel that floats on the ocean surface, comprising the features:

- **[0014]** to couple a first lifting line to the load from a load holding winch,
- **[0015]** to couple a second lifting line to the load from a positioning winch,
- **[0016]** to set the positioning winch in a constant tension mode and to adjust the positioning winch so that a fraction of the weight of the load is taken up,
- **[0017]** to set the load holding winch in a constant tension mode and also to adjust the load holding winch so that a fraction of the weight of the load is compensated, where the weight fraction that the load holding winch takes up is greater than the weight fraction which the positioning winch takes up, and
- **[0018]** during the hoisting of the load the load holding winch lifts the load in a constant tension mode and the positioning winch lifts the load in a constant tension mode.

[0019] Alternative embodiments are given in the dependent claims.

[0020] During the lowering and hoisting, the fraction of the weight that the load holding winch takes up can be more than 80% of the weight of the load and the fraction of the weight that the positioning winch takes up can be less than 20% of the weight of the load.

[0021] During both lowering and hoisting, the fraction of the weight that the load holding winch takes up can be approximately 90% of the weight of the load and the fraction of the weight that the positioning winch takes up can be approximately 10% of the weight of the load.

[0022] The positioning winch is preferably mounted to a deck crane on the vessel.

[0023] During the placing of the load on the ocean floor the deck crane can be set in an active heave compensation mode.

[0024] During the connection of the second lifting line to the load on the ocean floor the deck crane can be set in an active heave compensation mode.

[0025] The invention shall now be described in more detail with the help of the enclosed FIG. **1**, which shows a diagram of a vessel equipped with a crane and a winch.

[0026] The FIGURE shows a vessel **10**, such as an anchor handling vessel which is equipped with a load handling winch **12**, such as an anchor handling winch. The vessel **10** is further equipped with a deck crane **14** fitted with a heave compensation, and whereupon, or whereto, a positioning winch is mounted, indicated by the reference number **14***a*, such as a winch for subsea operations.

[0027] In one embodiment the heave compensated crane **14** can, for example, comprise a lower vertical boom and an upper horizontal boom that are mutually connected via an articulated piece, and where the vertical boom is connected at the bottom to a base socket which in turn encompasses a slew ring for rotation of the crane about a vertical axis. A tension stay can be arranged between the base socket and the articulated piece at a distance from the vertical boom and on the whole in parallel with this, in a normal position for the crane. The vertical boom can be driven by at least one cylinder and the movement of the upper crane boom with respect to the lower boom can be driven by an intermediate-lying cylinder arrangement, where the cylinder arrangement can comprise at

least one single acting cylinder and at least one double acting cylinder. Other cranes that can be heave compensated can, of course, be used.

[0028] During the hoisting and the lowering of a load **18** the load can be connected to first and second lifting lines **20**, **22**, where the lifting lines can run, for example, over the stern roller of the vessel, indicated by the reference number **26**, or through the ship's moon pool **16**. In the latter case, the lifting line **20** can then run over one or more pulleys **28** or the like mounted on the deck, or in the moon pool.

[0029] The first lifting line **20** runs from the load handling winch **12** and to the load **18** and the second lifting line **22** runs from the positioning winch **14***a*. The first and the second lifting line can be connected to the load **18** with the help of, for example, a triangle plate **24** or the like.

[0030] When the crane/positioning winch is connected, it can lift with about 10% of the weight of the object. Thereafter the load holding winch is set in a constant tension mode and adjusted so that about 90% of the weight is compensated.

[0031] The crane/positioning winch can now be used to guide the load down to the ocean floor, while the load holding winch follows. On placing the load on the ocean floor the crane/positioning winch can be set in an active heave compensation mode and the load can be put down without being influenced by the movements of the ship.

[0032] At the lifting of objects from the ocean floor, the crane/positioning winch is used to hold the lifting appliance at the connection, and if necessary in an active heave compensation mode. After the connection the crane can be set in a constant tension mode, and the load holding winch can lift the load in a constant tension mode free from the ocean floor.

1. Method for lowering of a load (**18**) to the ocean floor from a vessel (**10**) that floats on the ocean surface, comprising the features:

to couple a first lifting line (**20**) from a load holding winch (**12**) to the load (**18**)

to connect a second lifting line (**22**) from a positioning winch (**14***a*) to the load (**18**), wherein

to adjust the positioning winch (**14***a*) so that a fraction of the weight of the load (**18**) is taken up,

to set the load holding winch (**12**) in a constant tension mode and to adjust the load, holding winch (**12**) so that a fraction of the weight of the load is compensated, where the fraction of the weight that the load holding winch (**12**) takes up is greater than the fraction of the weight which the positioning winch (**14***a*) takes up, and

during lowering of the load (**18**), the positioning winch (**14***a*) lets out the second lifting line (**22**) for lowering of the load (**18**), while the load holding, winch (**12**) follows behind, with letting out the first lifting line (**20**).

2. Method according to claim **1**, wherein the fraction of the weight that the load holding winch (**12**) takes up is more than 80% of the weight of the load and that the fraction of the weight that the positioning winch (**14***a*) takes up is less than 20% of the weight of the load.

3. Method according to claim **1**, wherein the fraction of the weight that the load holding winch (**12**) takes up is approximately 90% of the weight of the load and that the fraction of the weight that the positioning the winch (**14***a*) takes up is approximately 10% of the weight of the load.

4. Method according to claim **1**, wherein the positioning winch (**14***a*) is mounted to a deck crane (**14**) on the vessel.

5. Method according to claim **4**, characterised wherein during the landing of the load (**18**) on the ocean floor the deck crane (**14**) is set in an active heave compensation mode.

6. Method for the hoisting of a load (**18**) from the ocean floor from a vessel (**10**) that floats on the ocean surface, comprising the features:

to couple a first lifting line (**20**) from a load holding winch (**12**) to the load (**18**), to connect a second lifting line (**22**) from a positioning winch (**14***a*) to the load (**18**), wherein

to set the positioning winch (**14***a*) in a constant tension mode and to adjust the positioning winch (**14***a*) so that a fraction of the weight of the load (**18**) is taken up,

to set the load holding winch (**12**) in a constant tension mode and also to adjust the load holding winch (**12**) so that a fraction of the weight of the load is compensated, where the fraction of the weight that the load holding winch (**12**) takes up is greater than the fraction of the weight that the positioning winch (**14***a*) takes up, and

during hoisting of the load (**18**) the load holding winch (**12**) lifts the load (**18**) in a constant tension mode and the positioning winch (**14***a*) lifts the load (**18**) in a constant tension mode.

7. Method according to claim **6**, wherein the fraction of the weight that is taken up by the load holding winch (**12**) is more than 80% of the weight of the load and that the fraction of the weight that the positioning winch (**14***a*) takes up is less than 20% of the eight of the load.

8. Method according to claim **6**, wherein the fraction of the weight that the load holding winch (**12**) takes up is approximately 90% of the weight of the load and that the fraction of the weight that the positioning winch (**14***a*) takes up is approximately 10% of the weight of the load.

9. Method according to claim **6**, wherein the positioning winch (**14***a*) is mounted to a deck crane (**14**) on the vessel.

10. Method according to claim **9**, wherein during connection of the second lifting line (**22**) to the load (**18**) on the ocean floor, the deck crane (**14**) is set in an active heave compensation mode.

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