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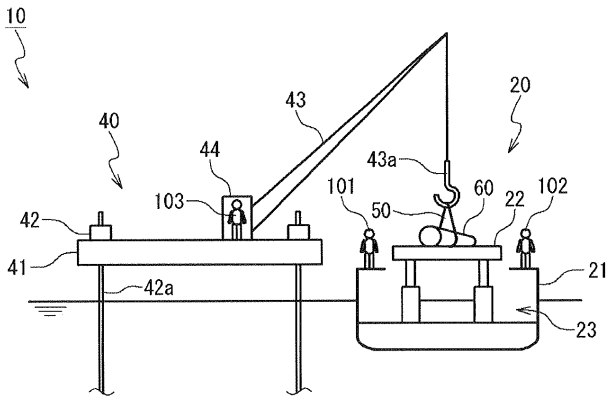
(54) **TRANSPORTING BARGE, FLOATING STRUCTURE INSTALLATION SYSTEM, AND FLOATING STRUCTURE INSTALLATION METHOD**

(57) A transportation barge is provided with a load table and an actuator group which drives the load table to move up and down. It is possible to move down the load table when hoisting the transportation freight from the load table. Therefore, the influence of heaving of the transportation barge due to waves can be eased without jacking up the transportation barge to the sea bottom. Therefore, a collision of the transportation freight and the load table can be prevented when hoisting the transportation freight, and the time of jacking-up and the use cost of the transportation barge provided with the expensive jack-up unit can be reduced.

Fig. 1



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Description

Technical Field

[0001] The present invention is related to a transportation barge, an offshore structure installation system and a method of installing an offshore structure, and especially, to a transportation barge, an offshore structure installation system and a method of installing an offshore structure, which are suitable to install a structure such as a wind turbine offshore.

Background Art

[0002] Generally, when transporting and installing a structure such as a wind turbine offshore, parts of the structure, a basis structure to install the wind turbine offshore and so on are loaded on a transportation barge which is provided with a jack-up unit, and a deck crane, and the transportation barge moves to an installation area of sea through navigation or tow.

[0003] After the movement, in the condition which jack-up legs are lowered to a sea bottom to raise the hull of the barge above the sea surface, an installation work of hoisting each part from the transportation barge by using the deck crane is carried out.

[0004] Also, when a working barge is resident in the installation area of sea, the transportation barge is jacked up in the neighborhood of the working barge, and then the parts of the wind turbine loaded on the transportation barge are hoisted by a deck crane of the working barge and are used for installation.

[0005] Patent Literature 1 (Japanese Utility Model Publication JP H07-11033Y2) discloses a motion reducing unit for reducing pitching and rolling operations of the structure in a ship.

Citation List

[0006]

[Patent Literature 1] JP H07-11033Y2

Summary of the Invention

[0007] However, in a conventional technique, an operation is required in which the transportation barge is moved to an installation area of sea, and then is jacked up to unload the transportation freight to fix the transportation barge.

[0008] Also, the installation area of sea for the wind turbine is far from the shore and is deep in water depth in many cases, and the wind turbine itself tends to have a larger size. For these reasons, an installation time is elongated and an installation cost is increased.

[0009] The present invention is made in view of such circumstances, and has as an object, to provide a transportation barge, and an offshore structure installation system, in which the installation time and cost can be reduced and transportation freight can be unloaded without damaging the transportation freight.

[0010] In order to achieve the above object, the transportation barge in the first viewpoint of the present invention is used to install a structure offshore. The transportation barge is provided with a load table for loading the structure. The load table is allowed to move up and down in the barge.

[0011] Conventionally, because the heaving of a hull of the transportation barge occurs due to waves when unloading the transportation freight from the transportation barge, the transportation barge is jacked up to the sea bottom previously and the work is carried out in a stationary condition in which the transportation barge is fixed.

[0012] Therefore, the load table of the transportation barge is configured to be moved up-and-down and the load table is moved down when hoisting the transportation freight from the load table.

[0013] Therefore, the influence of the heaving of the transportation barge due to waves can be eased without jacking up the transportation barge to the sea bottom. In this way, a collision of the transportation freight and the load table can be prevented when the transportation freight is hoisted. Also, the time for the jacking-up and the use cost of the transportation barge provided with an expensive jack-up unit can be reduced.

[0014] The transportation barge in the first viewpoint of the present invention is desirably provided with an actuator group which drives the load table to move up and down. The actuator group moves the load table down based on a first manual operation. It is easy to control the timing of moving the load table down because the load table is moved down based on the manual operation.

[0015] It is desirable that the actuator group moves the load table down at timing of an upper limit of the heaving of the transportation barge. By moving the transportation barge down at the timing of the upper limit of the heaving of the transportation barge, the movement down of the transportation barge and the movement down of the load table by the actuator group overlap to leave the load table from the hoisted transportation freight promptly. Thus, the collision of the transportation freight and the load table can be more surely prevented.

[0016] Moreover, in the first viewpoint of the present invention, it is desirable that the transportation barge is further provided with an actuator control unit which automatically controls the actuator group based on the pitching or rolling operation of the transportation barge so that the motion of the load table can be reduced.

[0017] The pitching or rolling motion in addition to the heaving due to waves can be reduced by providing the actuator control unit for the transportation barge, and an unloading work of the transportation freight can be easily carried out.

[0018] Moreover, in the first viewpoint of the present invention, it is desirable that the transportation barge is

provided with motion reducing boards which reduces the pitching and rolling motions of the transportation barge.

[0019] By providing the motion reducing boards for the transportation barge to reduce the pitching or rolling operation of the transportation barge, it is possible to ease the influence of the pitching and rolling operations in addition to the heaving due to the waves, and the unloading work of the transportation freight can be carried out easily.

[0020] The offshore structure installation system in a second viewpoint of the present invention is provided with the above transportation barge and a crane ship. The transportation barge is provided with the actuator group which drives the load table to move up and down. The crane ship is provided with a deck crane, an actuator operation unit which generates a first operation signal through a first manual operation and a crane operation unit which generates a second operation signal through a second manual operation. The actuator group moves the load table down based on the first operation signal. The deck crane hoists the transportation freight loaded on the load table based on the second operation signal.

[0021] Because the system is provided with the crane operation unit which generates the operation signal for the actuator group to move down the load table of the transportation barge and the actuator operation unit which generates the operation signal for a deck crane of the crane ship to hoist the transportation freight, the timing of moving down the load table and the timing of hoisting the transportation freight can be correctly adjusted, and the unloading work of the transportation freight can be carried out without damaging the transportation freight.

[0022] In the offshore structure installation system in the second viewpoint of the present invention, the transportation barge is further provided with a heaving sensor which detects the heaving of the transportation barge to output a heaving detection signal. It is desirable that the crane ship is provided with a display unit which displays the heaving of the transportation barge based on the heaving detection signal.

[0023] The heaving of the transportation barge due to the waves is detected and displayed on the display unit of the crane ship. Therefore, it is easy that the deck crane hoists the transportation freight loaded on the load table at the timing of the upper limit of the heaving of the transportation barge, and the actuator group moves down the load table at the timing of the upper limit. Accordingly, by easing the influence of the heaving of the transportation barge due to the waves, and by hoisting the transportation freight and moving down the load table at the timing of the upper limit, the collision of the transportation freight and the load table when hoisting the transportation freight can be avoided and the transportation freight can be easily unloaded.

[0024] Moreover, it is desirable that the crane ship includes a hull provided with the deck crane and a jack-up unit to support the hull on the sea bottom.

[0025] By supporting the crane ship provided with the deck crane to hoist the transportation freight to the sea bottom by the jack-up unit, the motion of the crane ship due to the waves can be eliminated and the transportation freight can be easily unloaded.

[0026] A method of installing an offshore structure in the third viewpoint of the present invention is provided with hoisting the transportation freight loaded on the load table of the transportation barge offshore, and moving down the load table when hoisting the transportation freight.

[0027] Therefore, the influence of the heaving of the transportation barge due to the waves can be eased without jacking up the transportation barge to the sea bottom. Therefore, the collision of the transportation freight and the load table can be prevented when hoisting the transportation freight, and the time of jacking up the transportation barge and the use cost of the transportation barge provided with the expensive jack-up unit can be reduced.

[0028] Desirably, the method of installing an offshore structure is further provided with the actuator operation unit outputting a first operation signal based on a first manual operation and the crane operation unit outputting a second operation signal based on a second manual operation. The actuator group of the transportation barge moves down the load table based on the first operation signal in the moving down the load table. The deck crane of the crane ship hoists the transportation freight based on the second operation signal in the hoisting of the transportation freight. The actuator operation unit and the crane operation unit are provided for one of the transportation barge and the crane ship.

[0029] Because the actuator operation unit and the crane operation unit are provided for one of the transportation barge and the crane ship, the timing of moving down the load table and the timing of hoisting the transportation freight can be correctly adjusted, and the unloading work of the transportation freight can be carried out without damaging the transportation freight.

[0030] When the actuator operation unit and the crane operation unit are provided for the crane ship, it is desirable that the method of installing an offshore structure in the third viewpoint is further provided with detecting the heaving of the transportation barge and displaying the heaving of the transportation barge on a display unit of the crane ship.

[0031] It is desirable that the hoisting of the transportation freight and the moving down of the load table are carried out at the timing of the upper limit of the heaving of the transportation barge.

[0032] It is desirable that that the crane ship supported on the sea bottom by jack-up legs hoists the transportation freight in the hoisting of the transportation freight.

[0033] According to the present invention, the transportation barge, the offshore structure installation system and the method of installing an offshore structure are provided to prevent the collision of the transportation barge and the transportation freight when hoisting the

transportation freight from the transportation barge moving up and down due to the waves.

Brief Description of the Drawings

[0034] The above object, other objects, effects and features of the present invention would be made clear from the following description of embodiments in conjunction with the following drawings:

FIG. 1 is a diagram showing an offshore structure installation system according to a first embodiment of the present invention;
FIG. 2 is a conceptual diagram showing a control system of the offshore structure installation system according to the first embodiment;
FIG. 3A is a diagram showing a procedure of a method of installing an offshore structure according to the first embodiment;
FIG. 3B is a diagram showing a procedure of a method of installing an offshore structure according to the first embodiment;
FIG. 3C is a diagram showing a procedure of a method of installing an offshore structure according to the first embodiment;
FIG. 3D is a diagram showing a procedure of a method of installing an offshore structure according to the first embodiment;
FIG. 4 is a conceptual diagram showing a control system of the offshore structure installation system according to a second embodiment of the present invention;
FIG. 5 is a conceptual diagram showing the control system of the offshore structure installation system according to a third embodiment of the present invention;
FIG. 6 is a diagram showing a transportation barge according to a fourth embodiment of the present invention;
FIG. 7 is a diagram showing the transportation barge according to a fifth embodiment of the present invention;
FIG. 8 is a diagram showing the transportation barge according to a sixth embodiment of the present invention; and
FIG. 9 is a diagram showing the transportation barge according to a seventh embodiment of the present invention.

Description of Embodiments

[0035] A transportation barge, an offshore structure installation system and a method of installing an offshore structure according to embodiments of the present invention will be described below with reference to the attached drawings.

[First Embodiment]

[0036] A first embodiment of the present invention will be described with reference to FIG. 1. The offshore structure installation system 10 is provided with a transportation barge 20 and a crane ship 40. The transportation barge 20 is provided with a hull 21, a load table 22 and an actuator group 23. The crane ship 40 is provided with a hull 41, a jack-up unit 42, a deck crane 43, and a crane operator room 44. The deck crane 43 and the crane operator room 44 are provided on the hull 41. The jack-up unit 42 is provided with jack-up legs 42a. The deck crane 43 is provided with a hook 43a which hoists transportation freight. The transportation barge 20 and the crane ship 40 are possible to self-navigate or be towed.

[0037] FIG. 2 is a diagram schematically showing a mechanism which hoists the transportation freight loaded on the load table 22 of the transportation barge 20. The transportation barge 20 is provided with an actuator control unit 24 and an actuator operation unit 25. The actuator group 23 is provided with a plurality of actuators 23A to 23D. The actuators 23A to 23D are connected with the load table 22 and support the load table 22 in a position above the hull 21. The actuator group 23 can drive the load table 22 to move up and down. The actuator operation unit 25 outputs an operation signal through a manual operation. The actuator control unit 24 controls the actuators 23A to 23D based on the operation signal outputted from the actuator operation unit 25. The crane ship 40 is provided with a crane operation unit 45 in the crane operator room 44. The crane operation unit 45 outputs an operation signal through a manual operation. The deck crane 43 operates based on the operation signal outputted from the crane operation unit 45.

[0038] Hereinafter, in the present embodiment, a case that a structure installed offshore by the offshore structure installation system 10 is a wind turbine will be described. However, the structure installed offshore may be a petroleum platform, a bridge pier and so on.

[0039] Referring to FIG. 1, the crane ship 40 is used for a crane work for the installation of the wind turbine. If the crane ship 40 is arranged in a desired place on a sea area for wind turbine installation, the jack-up legs 42a of the jack-up unit 42 are downed to the sea bottom to lift the hull 41 above the sea surface. In this way, the crane ship 40 is supported on the sea bottom through the jack-up legs 42a. The transportation barge 20 is used for the transportation of parts and fundamental structures of the wind turbine. The transportation freight 60 such as the parts and fundamental structures of the wind turbine is loaded on the load table 22. The transportation barge 20 transports the transportation freight 60 from a harbor to the sea area for wind turbine installation, and lies around the crane ship 40, desirably in a place neighboring the crane ship 40.

[0040] After that, the transportation freight is unloaded by the crane. The crane work contains a hoisting work of hoisting the transportation freight 60 from the trans-

portation barge 20. When carrying out the hoisting work, a hoisting worker 101 and an actuator operator 102 work on the transportation barge 20 and a crane operator 103 operates the deck crane 43 in the crane operator room 44.

[0041] In the hoisting work, a slinging worker hangs the transportation freight 60 from a wire 50 with the hook 43a. Here, the slinging worker hands the transportation freight 60 from the wire 50 such that the transportation freight 60 does not rise from the load table 22 when the transportation barge 20 comes to a lower limit of the heaving and that the wire 50 sags when the transportation barge 20 comes to the upper limit of the heaving. The slinging worker may be the hoisting worker 101 or the actuator operator 102.

[0042] FIG. 3A is a diagram showing the transportation freight 60 and the wire 50 when the transportation barge 20 came to the lower limit of the heaving. FIG. 3B is a diagram showing the transportation freight 60 and the wire 50 when the transportation barge 20 came to the upper limit of the heaving. Because the crane ship 40 is supported to the sea bottom through the jack-up legs 42a, the hook 43a does not move up and down due to waves. When the transportation barge 20 comes to the lower limit of the heaving, the wire 50 stretches such that the transportation freight 60 does not rise from the load table 22. When the transportation barge 20 comes to the upper limit of the heaving, the wire 50 sags.

[0043] The hoisting worker 101 gives a sign by using an instruction tool such as a flag, a whistle or a transceiver at the timing when the transportation barge 20 comes to the upper limit of the heaving. The crane operator 103 carries out the manual operation to the crane operation unit 45 according to the sign from the hoisting worker 101. The crane operation unit 45 outputs the operation signal based on the manual operation of the crane operator 103. The deck crane 43 hoists or lifts the transportation freight 60 based on the operation signal outputted from the crane operation unit 45. The actuator operator 102 carries out the manual operation to the actuator operation unit 25 according to the sign of the hoisting worker 101. The actuator operation unit 25 outputs the operation signal based on the manual operation of the actuator operator 102. The actuator control unit 24 controls the actuator group 23 such that the actuator group 23 lowers the load table 22 based on the operation signal outputted from the actuator operation unit 25.

[0044] Therefore, as shown in FIG. 3C, at the timing when the transportation barge 20 comes to the upper limit of the heaving, the transportation freight 60 is hoisted up, and the load table 22 is lowered or moved down. As a result, as shown in FIG. 3D, the heaving of the hull 21 due to the waves is eased and a sufficient distance is promptly kept between the transportation freight 60 and the load table 22. Thus, when the transportation freight 60 is hoisted, the collision of the transportation freight 60 and the load table 22 due to the heaving can be prevented. Moreover, it is possible to prevent that the transportation freight 60 and the load table 22 collide at the timing of the upper limit of the next heaving after the transportation freight 60 is hoisted.

[0045] According to the transportation barge 20, the offshore structure installation system 10 and a method of installing an offshore structure in the present embodiment, the collision of the transportation freight 60 and the transportation barge 20 can be prevented when the transportation freight 60 is hoisted from the transportation barge 20 which moves up and down due to the waves. The work steps can be reduced in the transportation barge 20, the offshore structure installation system 10 and the method of installing a offshore structure according to the present embodiment, compared with a case where the transportation freight 60 is lifted in the condition which the transportation barge 20 has been jacked up and a case where the transportation barge 20 is used for both of the transportation of the transportation freight 60 and the crane work. Because the work steps for raising and falling the jack-up legs of the jack-up unit can be reduced, the transportation barge 20, the offshore structure installation system 10, and the method of installing an offshore structure according to the present embodiment are favorable especially when the structure such as the wind turbine is installed in the sea area with deep water depth. Moreover, because the transportation barge 20 is not required to be provided with the expensive jack-up unit, the chartered vessel cost of the transportation barge 20 can be reduced.

[Second Embodiment]

[0046] The offshore structure installation system 10 and the method of installing an offshore structure according to a second embodiment of the present invention will be described with reference to FIG. 4. The offshore structure installation system 10 and the method of installing an offshore structure according to the present embodiment are different from those of the first embodiment in the following point, and are the same as those of in the other points.

[0047] The transportation barge 20 is provided with a pitching sensor 27 and a rolling sensor 28. Each of the pitching sensor 27 and the rolling sensor 28 is provided with an accelerometer or a draft gauge. The pitching sensor 27 detects a pitching operation of the hull 21 and outputs a pitching detection signal. The rolling sensor 28 detects a rolling operation of the hull 21 and outputs a rolling detection signal. The actuator control unit 24 automatically controls the actuator group 23 to reduce the motion of the load table 22 based on the pitching detection signal and the rolling detection signal. When receiving the operation signal outputted from the actuator operation unit 25, the actuator control unit 24 controls the actuator group 23 to stop the automatic control for reducing the motion of the load table 22, and to lower the load table 22. Or, the actuator control unit 24 may carry out both of the automatic control for reducing the motion of

the load table 22 and the lowering control of the load table 22 in response to the operation signal outputted from the actuator operation unit 25.

[0048] According to the present embodiment, because the pitching operation and rolling operation of the load table 22 are reduced, it is possible to carry out the hoisting operation more easily.

[Third Embodiment]

[0049] The offshore structure installation system 10 and the method of installing an offshore structure according to a third embodiment of the present invention will be described with reference to FIG. 5. The offshore structure installation system 10 and the method of installing an offshore structure according to the present embodiment are different from those of the first embodiment in the following points, and are the same as those of the first embodiment in the other points.

[0050] The transportation barge 20 is provided with a heaving sensor 26 which outputs a heaving detection signal, when detecting the heaving of the transportation barge 20 (e.g. the hull 21). The heaving sensor 26 is provided with an accelerometer or a draft gauge. The crane ship 40 is provided with an actuator operation unit 46 and a display unit 47. The actuator operation unit 46 and the display unit 47 are provided in the crane operator room 44. The display unit 47 receives the heaving detection signal outputted from the heaving sensor 26 in wired or wireless communication, and displays the heaving of the transportation barge 20 (e.g. the hull 21) to the crane operator 103 based on the heaving detection signal. For example, the display unit 47 is an oscilloscope. The actuator operation unit 46 outputs the operation signal through the manual operation. The actuator control unit 24 receives the operation signal outputted from the actuator operation unit 46 in the wired or wireless communication.

[0051] The crane operator 103 determines the timing of the upper limit of the heaving of the transportation barge 20 based on the heaving of the transportation barge 20 displayed on the display unit 47, and carries out a manual operation to the crane operation unit 45 and the actuator operation unit 46 at the determined timing. The operation of crane operation unit 45 based on the manual operation of the crane operator 103 and the working of the deck crane 43 are same as described in the first embodiment. The actuator operation unit 46 outputs the operation signal based on the manual operation of the crane operator 103. The actuator control unit 24 controls the actuator group 23 to move down the load table 22 based on the output operation signal outputted from the actuator operation unit 46.

[0052] According to the present embodiment, because the hoisting operation of the transportation freight 60 and the lowering operation of the load table 22 are carried out with the manual operations in the same crane operator room 44, it is easy to adjust the timing of the lifting operation of the transportation freight 60 and the timing of the lowering operation of the load table 22.

[0053] It should be noted that another crane operation unit (not shown) different from the crane operation unit 45 may be provided near the actuator operation unit 25, and the hoisting operation of the transportation freight 60 and the lowering operation of the load table 22 may be carried out based on the manual operation of the actuator operator 102. Moreover, the actuator control unit 24 may execute the same control as the second embodiment.

[Fourth Embodiment]

[0054] The transportation barge 20 according to a fourth embodiment of the present invention will be described with reference to FIG. 6. The transportation barge 20 according to the present embodiment, another load table 22 and another actuator group 23 are added to the transportation barge 20 according to either of the first to third embodiments. The other load table 22 and the other actuator group 23 are configured and work in the same manner as the load table 22 and the actuator group 23. Other transportation freight 60 is loaded on the other load table 22.

[0055] According to the present embodiment, because the load table 22 is provided for each of transportation freights 60, the hoisting operation becomes easy.

[Fifth Embodiment]

[0056] The transportation barge 20 according to a fifth embodiment of the present invention will be described with reference to FIG. 7. The transportation barge 20 according to the present embodiment is provided with swinging motion reducing plates 29 to the transportation barge 20 according to either of the first to fourth embodiments. The swinging motion reducing plates 29 project from the hull 21 in front and back directions to reduce the pitching operation of the transportation barge 20 or project from the hull 21 to left and right directions to reduce the rolling operation of the transportation barge 20. According to the present embodiment, because the pitching operation or rolling operation of the transportation barge 20 is reduced, the hoisting work becomes easy. It should be noted that the swinging motion reducing plates 29 may be provided to reduce both the pitching operation and the rolling operation.

[Sixth Embodiment]

[0057] The transportation barge 20 according to a sixth embodiment of the present invention will be described with reference to FIG. 8. The transportation barge 20 according to the present embodiment has a ship shape different from that of the transportation barge 20 according to either of the first to fifth embodiments. The transportation barge 20 according to the present embodiment has a hull 21 of a SWATH (Small Waterplane Area Twin

Hull) type. According to the present embodiment, because the amplitude of the heaving of the transportation barge 20 becomes small, the hoisting work becomes easy.

[Seventh Embodiment]

[0058] The transportation barge 20 according to a seventh embodiment of the present invention will be described with reference to FIG. 9. The transportation barge 20 according to the present embodiment has a ship shape different from that of the transportation barge 20 according to either of the first to fifth embodiments. The transportation barge 20 according to the present embodiment has a hull 21 of a semi-sub (Semi-Submersible) type. According to the present embodiment, because the amplitude of the heaving of the transportation barge 20 becomes small, the hoisting work becomes easy.

[0059] In the above, the transportation barge, the offshore structure installation system and the method of installing an offshore structure according to the embodiments of the present invention have been described. However, the present invention is not limited to the above embodiments. The above embodiments may be changed in a range of the objects of the present invention and may be combined.

Claims

1. A transportation barge which is used to install a structure offshore, wherein a load table on which the structure is loaded in said transportation barge is allowed to move up and down.

2. The transportation barge according to claim 1, wherein said transportation barge comprises an actuator group which drives said load table to move up and down,
wherein said actuator group moves down said load table based on a first manual operation.

3. The transportation barge according to claim 2, wherein said actuator group moves down said load table at a timing of an upper limit of a heaving operation of said transportation barge.

4. The transportation barge according to claim 2 or 3, further comprising:

    an actuator control unit configured to automatically control said actuator group based on a pitching operation or a rolling operation of said transportation barge such that the pitching operation or the rolling operation of said load table is reduced.

5. The transportation barge according to any of claims 1 to 4, further comprising:

    swinging motion reducing plates provided to reduce a pitching operation or a rolling operation of said transportation barge.

6. An offshore structure installation system comprising:

    said transportation barge according to claim 1; and
    a crane ship,
    wherein said transportation barge comprises an actuator group which drives said load table to move up and down,
    wherein said crane ship comprises:

        a deck crane;
        an actuator operation unit configured to generate a first operation signal through a first manual operation; and
        a crane operation unit configured to generate a second operation signal through a second manual operation,
        wherein said actuator group moves down said load table based on the first operation signal, and
        wherein said deck crane hoists the transportation freight loaded on said load table based on the second operation signal.

7. The offshore structure installation system according to claim 6, wherein said transportation barge comprises a heaving sensor configured to detect a heaving operation of said transportation barge to output a heaving detection signal, and
wherein said crane ship comprises a display unit configured to display the heaving operation of said transportation barge based on the heaving detection signal.

8. The offshore structure installation system according to claim 6, wherein said deck crane hoists the transportation freight loaded on said load table at timing of an upper limit of the heaving operation of said transportation barge, and
wherein said actuator group moves down said load table at the timing of the upper limit.

9. The offshore structure installation system according to any of claims 6 to 8, wherein said crane ship comprises:

    a hull on which said deck crane is provided; and
    a jack-up unit which supports said hull on a sea bottom.

10. A method of installing an offshore structure, comprising:

hoisting a transportation freight loaded on a load table of a transportation barge offshore; and
moving down said load table when hoisting the transportation freight.

11. The method according to claim 10, further comprising:

outputting a first operation signal from an actuator operation unit based on a first manual operation; and
outputting a second operation signal from a crane operation unit based on a second manual operation,
wherein said moving down comprises moving down said load table by an actuator group of said transportation barge based on the first operation signal,
wherein said hoisting comprises hoisting the transportation freight by a deck crane of a crane ship based on the second operation signal, and
wherein said actuator operation unit and said crane operation unit are provided for one of said transportation barge and said crane ship.

12. The method according to claim 11, wherein said actuator operation unit and said crane operation unit are provided for said crane ship, and
wherein said method further comprises:

detecting a heaving operation of said transportation barge; and
displaying the heaving operation of said transportation barge on a display unit of said crane ship.

13. The method according to any of claims 10 to 12, wherein said hoisting and said moving down are carried out at a timing of an upper limit of the heaving operation of said transportation barge.

14. The method according to claim 10, wherein said hoisting comprises hoisting the transportation freight by a crane ship supported on a sea bottom through jack-up legs.

Fig. 1

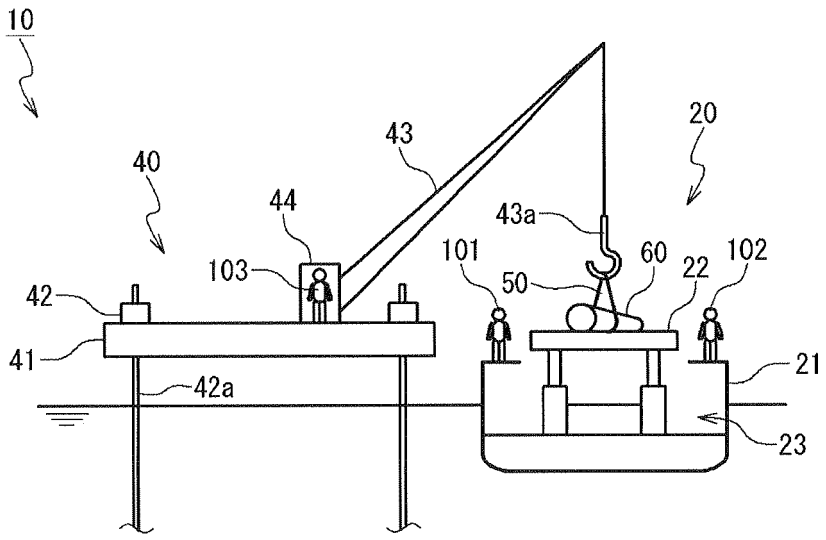


Fig. 2

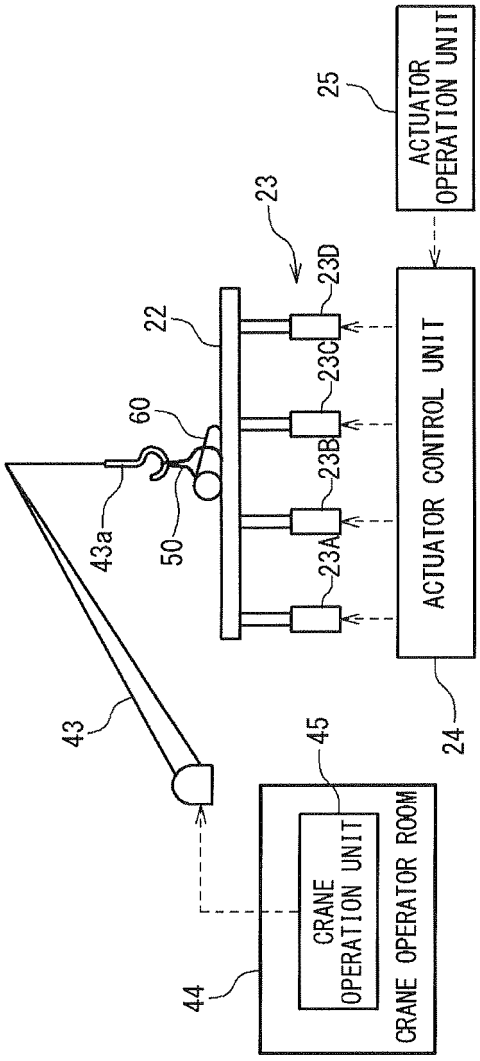

ACTUATOR OPERATION UNIT
25
23
23D
23C
23B
23A
22
60
43a
50
ACTUATOR CONTROL UNIT
24
43
45
CRANE OPERATION UNIT
CRANE OPERATOR ROOM
44

Fig. 3A

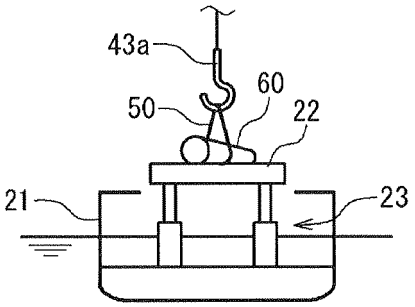


Fig. 3B

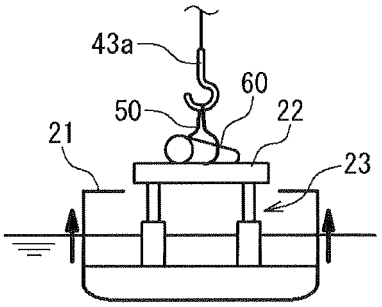


Fig. 3C

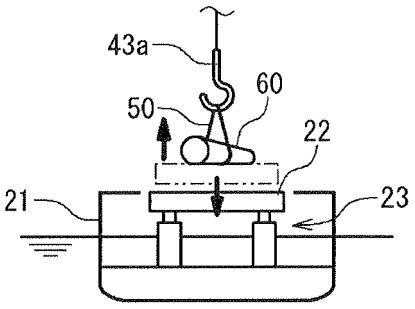


Fig. 3D

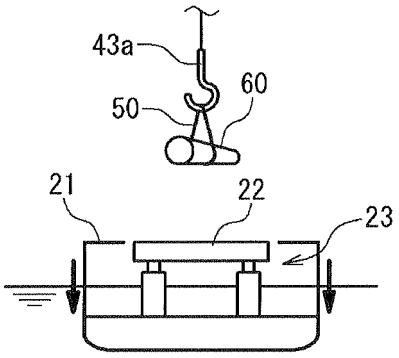


Fig. 4

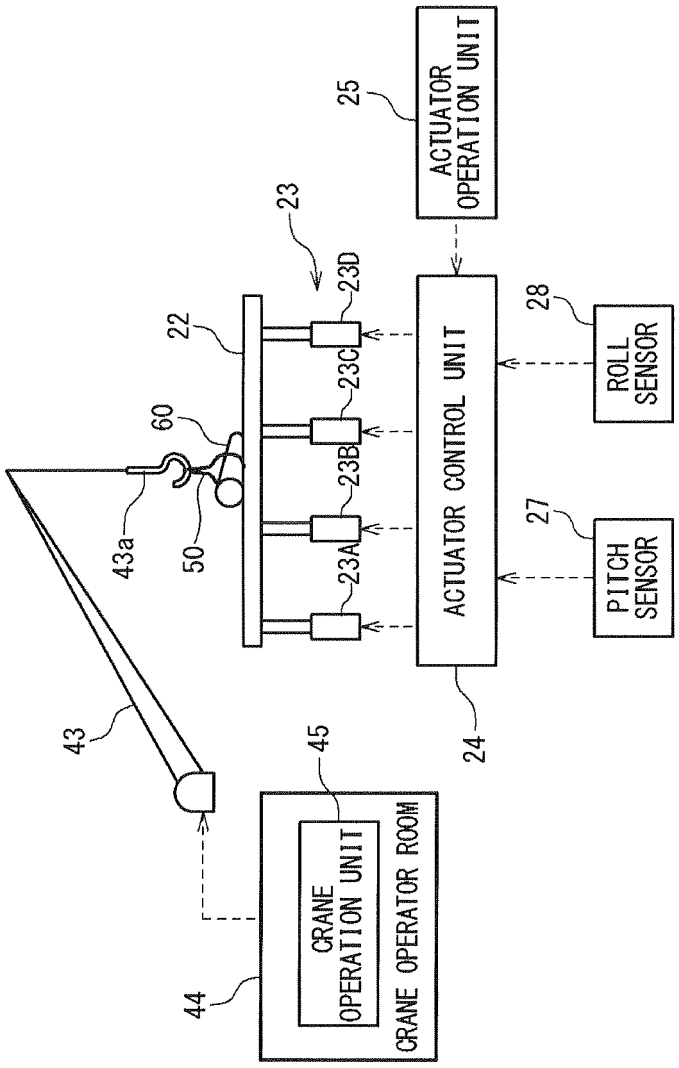

ACTUATOR OPERATION UNIT
25
23
23D
23C
23B
23A
22
60
43a
50
ACTUATOR CONTROL UNIT
28
ROLL SENSOR
27
PITCH SENSOR
24
43
45
CRANE OPERATION UNIT
CRANE OPERATOR ROOM
44

Fig. 5

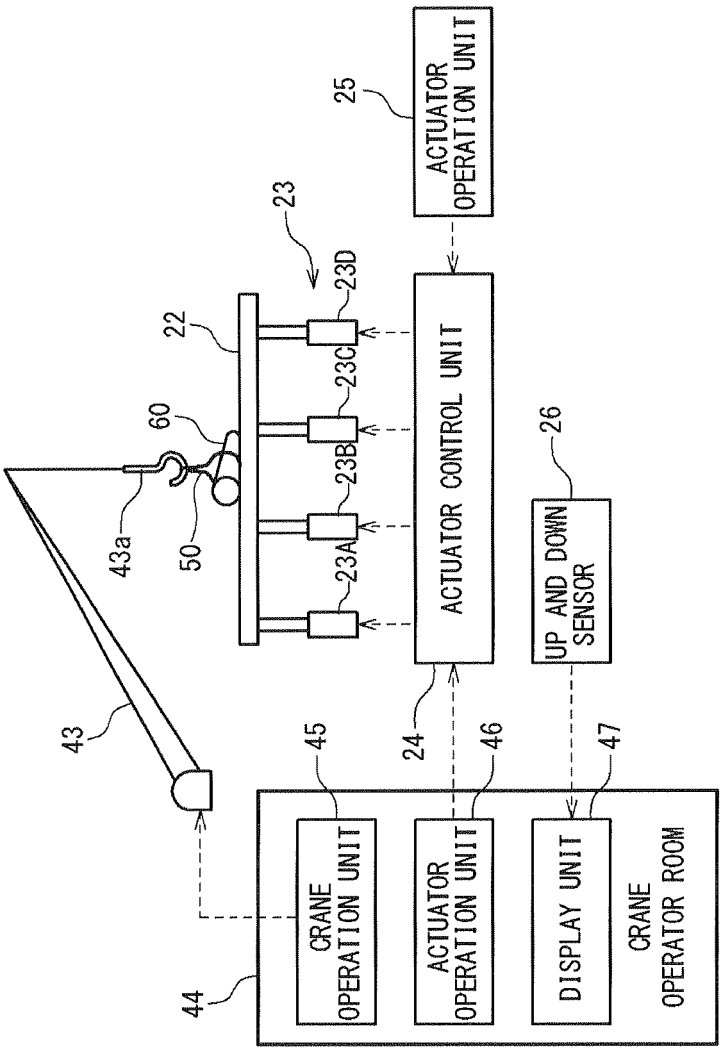

ACTUATOR OPERATION UNIT
25
23
23D
23C
23B
23A
22
60
43a
50
ACTUATOR CONTROL UNIT
UP AND DOWN SENSOR
26
43
24
45
46
47
CRANE OPERATION UNIT
ACTUATOR OPERATION UNIT
DISPLAY UNIT
CRANE OPERATOR ROOM
44

Fig. 6

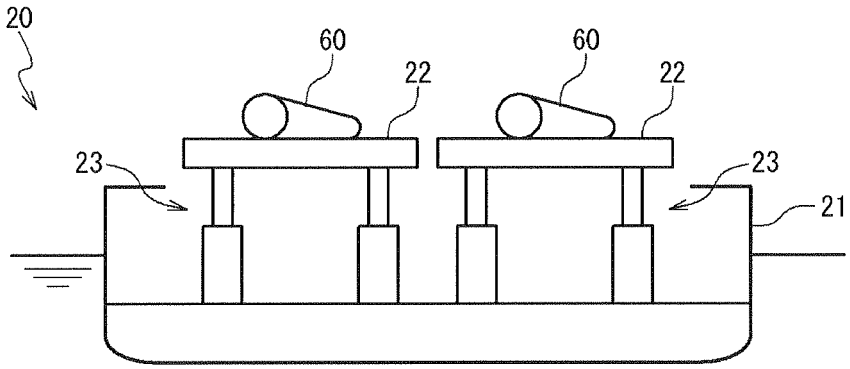


Fig. 7

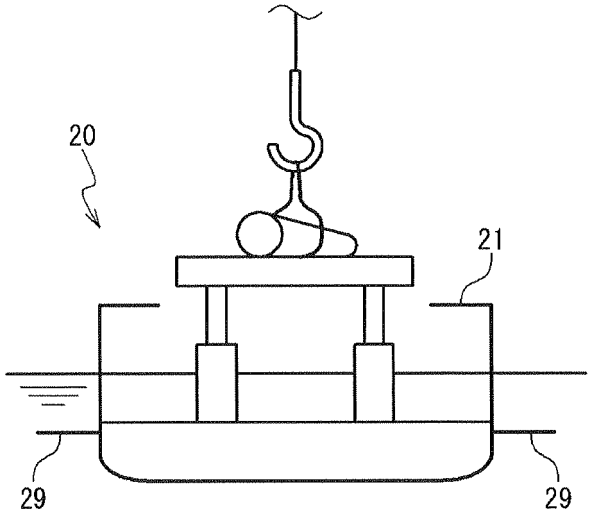


Fig. 8

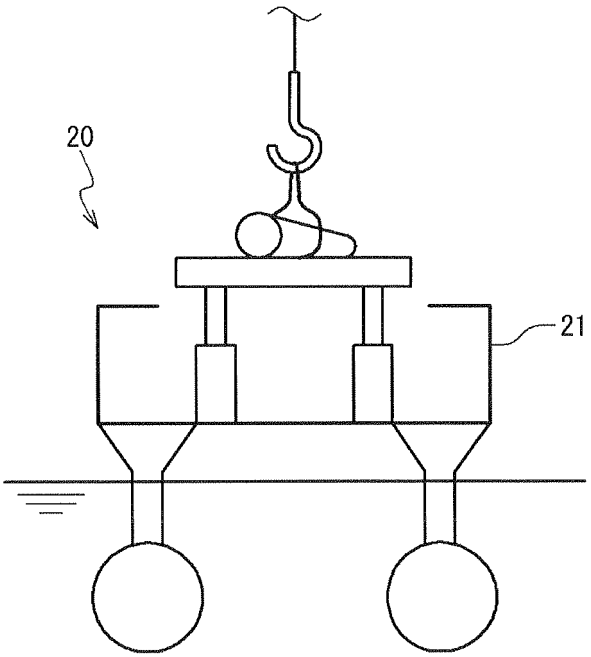
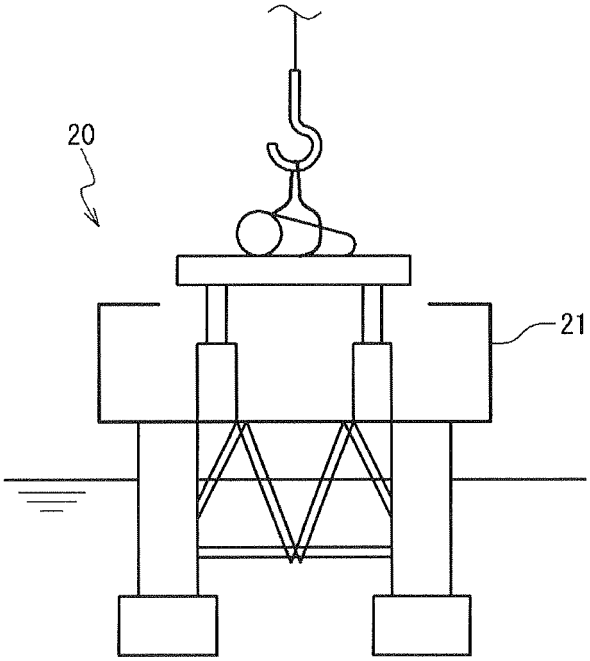


Fig. 9



INTERNATIONAL SEARCH REPORT

International application No.
PCT/JP2011/061445

A. CLASSIFICATION OF SUBJECT MATTER
B63B27/16(2006.01)i, *B63B27/10*(2006.01)i, *B63B35/44*(2006.01)i, *B63B39/06*(2006.01)i, *B63B39/14*(2006.01)i

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
B63B27/16, B63B27/10, B63B35/44, B63B39/06, B63B39/14

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched
Jitsuyo Shinan Koho 1922-1996 Jitsuyo Shinan Toroku Koho 1996-2011
Kokai Jitsuyo Shinan Koho 1971-2011 Toroku Jitsuyo Shinan Koho 1994-2011

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

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X Y A	JP 2005-132130 A (Taisei Corp.), 26 May 2005 (26.05.2005), page 3, line 40 to page 4, line 40; page 5, lines 26 to 43; fig. 1 to 6 (Family: none)	1,5 2-3,10,13-14 4,6-9,11-12
X Y A	Microfilm of the specification and drawings annexed to the request of Japanese Utility Model Application No. 47292/1985(Laid-open No. 163793/1986) (Mitsui Engineering & Shipbuilding Co., Ltd.), 11 October 1986 (11.10.1986), specification, page 4, line 1 to page 5, line 15; fig. 1 to 5 (Family: none)	1,5 2-3,10,13-14 4,6-9,11-12

☒ Further documents are listed in the continuation of Box C. ☐ See patent family annex.

* Special categories of cited documents:
"A" document defining the general state of the art which is not considered to be of particular relevance
"E" earlier application or patent but published on or after the international filing date
"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)
"O" document referring to an oral disclosure, use, exhibition or other means
"P" document published prior to the international filing date but later than the priority date claimed
"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention
"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone
"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art
"&" document member of the same patent family

Date of the actual completion of the international search	Date of mailing of the international search report
15 August, 2011 (15.08.11)	23 August, 2011 (23.08.11)
Name and mailing address of the ISA/ Japanese Patent Office Facsimile No.	Authorized officer Telephone No.

Form PCT/ISA/210 (second sheet) (July 2009)

INTERNATIONAL SEARCH REPORT

International application No.
PCT/JP2011/061445

C (Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y A	JP 60-195215 A (Hitachi Zosen Corp.), 03 October 1985 (03.10.1985), page 3, lower left column, line 8 to lower right column, line 7; fig. 1 to 2 (Family: none)	2-3 4,6-9,11-12
Y A	JP 1-17992 B2 (Mitsui Engineering & Shipbuilding Co., Ltd.), 03 April 1989 (03.04.1989), column 4, 3rd line from the bottom to column 5, line 24; fig. 1 to 5 (Family: none)	3,10,13-14 4,6-9,11-12
Y A	JP 3206248 B2 (Ishikawajima-Harima Heavy Industries Co., Ltd.), 10 September 2001 (10.09.2001), column 2, lines 5 to 12; fig. 1 (Family: none)	10,13-14 6-9,11-12
Y A	JP 57-130888 A (Mitsui Engineering & Shipbuilding Co., Ltd.), 13 August 1982 (13.08.1982), page 1, lower right column, 5th line from the bottom to page 2, upper right column, 3rd line from the bottom; page 2, lower left column, lines 10 to 14; fig. 1 to 5 (Family: none)	14 6-9,11-12

Form PCT/ISA/210 (continuation of second sheet) (July 2009)

INTERNATIONAL SEARCH REPORT

International application No.
PCT/JP2011/061445

Box No. II Observations where certain claims were found unsearchable (Continuation of item 2 of first sheet)

This international search report has not been established in respect of certain claims under Article 17(2)(a) for the following reasons:

1. ☐ Claims Nos.:
because they relate to subject matter not required to be searched by this Authority, namely:

2. ☐ Claims Nos.:
because they relate to parts of the international application that do not comply with the prescribed requirements to such an extent that no meaningful international search can be carried out, specifically:

3. ☐ Claims Nos.:
because they are dependent claims and are not drafted in accordance with the second and third sentences of Rule 6.4(a).

Box No. III Observations where unity of invention is lacking (Continuation of item 3 of first sheet)

This International Searching Authority found multiple inventions in this international application, as follows:

(Invention 1)
The inventions in claims 1-9 relate to barge-type transportation platform wherein a load carriage can be vertically moved.
(Invention 2)
The inventions in claims 10-14 relate to method for setting a floating structure which lowers a load carriage when a load is lifted.

The above-said two invention groups cannot be considered to be a group of inventions which are so linked as to form a single general inventive concept.

1. ☐ As all required additional search fees were timely paid by the applicant, this international search report covers all searchable claims.
2. ☒ As all searchable claims could be searched without effort justifying additional fees, this Authority did not invite payment of additional fees.
3. ☐ As only some of the required additional search fees were timely paid by the applicant, this international search report covers only those claims for which fees were paid, specifically claims Nos.:

4. ☐ No required additional search fees were timely paid by the applicant. Consequently, this international search report is restricted to the invention first mentioned in the claims; it is covered by claims Nos.:

Remark on Protest

☐ The additional search fees were accompanied by the applicant's protest and, where applicable, the payment of a protest fee.

☐ The additional search fees were accompanied by the applicant's protest but the applicable protest fee was not paid within the time limit specified in the invitation.

☐ No protest accompanied the payment of additional search fees.

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REFERENCES CITED IN THE DESCRIPTION

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Patent documents cited in the description

- JP H0711033 Y **[0005] [0006]**