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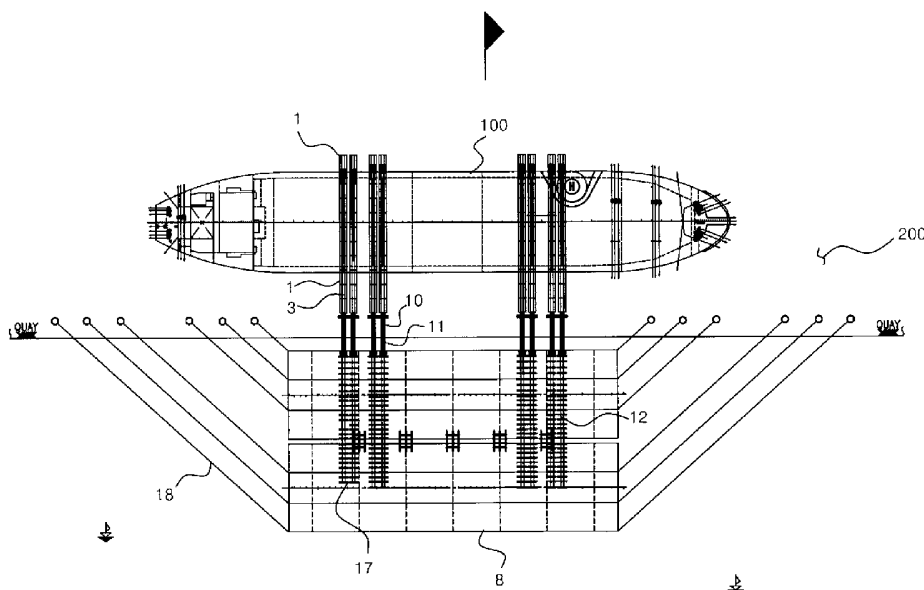
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(54) Title: METHOD AND EQUIPMENT FOR TRANSVERSELY LAUNCHING SHIP BUILT ON THE GROUND



(57) Abstract: A method and the equipment for transversely launching a ship built on the ground are disclosed. The method comprises a ship building step for building a ship on the ground; a preliminary Jacking-Up step for lifting up the built ship by means of a plurality of skid shoes and hydraulic jacks; a ship moving step for skidding the skid shoes and hydraulic jacks which support the ship on skid beams using traction devices, thereby transversely moving the ship toward a barge; a ship loading step for loading the moved ship onto the barge; and a ship launching step for floating the ship by submerging the barge on which the ship is loaded.

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Description

METHOD AND EQUIPMENT FOR TRANSVERSELY LAUNCHING SHIP BUILT ON THE GROUND

Technical Field

- [1] The present invention relates, in general, to a method and the equipment for transversely launching a ship built on the ground, and more particularly, to a method and the equipment for transversely launching a ship built on the ground, without using a dock and transversely loaded-out onto a barge and then the barge is submerged to launch the ship.

[2]

Background Art

- [3] Generally, in the conventional ship building method, several unit blocks constituting a ship are fabricated, and assembled with one another in a dry dock using a gantry crane. Then, sea water is allowed into the dry dock to longitudinally launch the ship. Due to the limitation in the size of the gate and longitudinal movement of the gantry crane, all dry docks distributed throughout the world are formed to extend in a longitudinal direction, whereby it is only possible to launch a ship in a longitudinal direction (in the case of transversely launching a ship, it is necessary to install a gate of a huge scale). At present, while the number of dry docks distributed all over the world is limited to meet the demand for ships, in order to construct a dry dock, enormous construction cost and maintenance and repair fee are incurred. For this reason, it is difficult to construct a dry dock. Therefore, due to a limited number rate of dry docks, a restriction necessarily exists in receiving an order for a ship.

[4]

Disclosure of Invention

Technical Problem

- [5] Accordingly, the present invention has been made keeping in mind the above problems occurring in the prior art, and an object of the present invention is to provide a method and the equipment for transversely launching a ship built on the ground, in which a ship built on the ground can be launched into the sea so that a dock shortage phenomenon due to the demand for ships does not occur, a dock construction cost and a maintenance and repair fee are saved, and space utilization efficiency is maximized through reducing the space required for constructing docks.

- [6] Another object of the present invention is to improve ship building productivity by building a ship on the ground.

[7]

Technical Solution

- [8] In order to achieve the above objects, according to one aspect of the present invention, there is provided a method for transversely launching a ship built on the ground, comprising: a ship building step for building a ship on the ground; a preliminary Jacking-Up step for lifting up the built ship by means of a plurality of skid shoes and hydraulic jacks; a ship moving step for skidding the skid shoes and hydraulic jacks which support the ship on skid beams by traction devices, thereby transversely moving the ship toward barge; a ship loading step for loading the moved ship onto the barge; and a ship launching step for floating the ship by submerging the barge on which the ship is loaded.

- [9] According to another aspect of the present invention, there is provided the equipment for transversely launching a ship built on the ground, comprising: a plurality of concrete mats installed to extend from a lower surface of the ship built on the ground to a position where pile caps are installed; skid beams installed on upper end surfaces of the concrete mats; a plurality of skid shoes brought into contact with upper surface of the skid beams and the lower surface of the ship; hydraulic jacks placed under lower surface of the skid shoes to be skidded along the skid beams; connection bridges continuously connected at the same height as the skid beams which are installed on the upper end surfaces of the concrete mats, between the pile caps and a quay; and link beams having the same height as the connection bridges and coupled at both ends thereof to the quay and a barge by pins.

[10]

Brief Description of the Drawings

- [11] FIG. 1 is a plan view illustrating a state before a ship is loaded on to the barge after it is built on the ground;

- [12] FIG. 2 is a side view illustrating a state before a ship is loaded on to the barge after it is built on the ground;

- [13] FIG. 3 is an enlarged view of the part 'A' of FIG. 2;

- [14] FIG. 4 is a front view illustrating a state before a ship is loaded on to the barge after it is built on the ground;

- [15] FIG. 5 is a plan view illustrating a ship after being loaded on to the barge;

- [16] FIG. 6 is an enlarged view of the part 'B' of FIG. 5;
- [17] FIG. 7 is a side view illustrating a ship after being loaded on to the barge;
- [18] FIG. 8 is a front view illustrating a ship after being loaded on to the barge;
- [19] FIG. 9 is a side view illustrating a ship after being launched using the barge;
- [20] FIG. 10 is an enlarged view of the part 'C' of FIG. 9;
- [21] FIG. 11 is a detailed view illustrating a skid shoe and a traction device according to the present invention;
- [22] FIG. 12 is a view illustrating the construction of the upper end of the barge according to the present invention;
- [23] FIG. 13 is a detailed view illustrating the quay section for transversely launching a ship, according to the present invention; and
- [24] FIG. 14 is a block diagram according to the present invention.
- [25]

Best Mode for Carrying Out the Invention

- [26] Reference should now be made to the drawings, in which the same reference numerals are used throughout the different drawings to designate the same or similar components.
- [27] FIG. 1 is a plan view illustrating a state before a ship is loaded on to the barge after it is built on the ground; FIG. 2 is a side view illustrating a state before the ship is loaded on to the barge after it is built on the ground; FIG. 3 is an enlarged view of the part 'A' of FIG. 2; FIG. 4 is a front view illustrating a state before the ship is loaded on to the barge after it is built on the ground; FIG. 5 is a plan view illustrating the ship after being loaded on to the barge; FIG. 6 is an enlarged view of the part 'B' of FIG. 5; FIG. 7 is a side view illustrating a ship after being loaded on to the barge; FIG. 8 is a front view illustrating the ship after being loaded on to the barge; FIG. 9 is a side view illustrating the ship after being launched using a barge; FIG. 10 is an enlarged view of the part 'C' of FIG. 9; FIG. 11 is a detailed view illustrating the skid shoe and the traction device according to the present invention; FIG. 12 is a view illustrating the construction of an upper end of the barge according to the present invention; FIG. 13 is a detailed view illustrating the quay section for transversely launching a ship, according to the present invention; and FIG. 14 is a block diagram according to the present invention.
- [28] A method for transversely launching a ship built on the ground in accordance with an embodiment of the present invention comprises a ship building step (S100) for building a ship on the ground; a preliminary Jacking-Up step (S200) for lifting up the

built ship by means of a plurality of skid shoes and hydraulic jacks; a ship moving step (S300) for skidding the skid shoes and hydraulic jacks which support the ship on skid beams using traction devices, thereby transversely moving the ship toward a barge; a ship loading step (S400) for loading the moved ship onto the barge; and a ship launching step (S500) for floating the ship by submerging the barge on which the ship is loaded, whereby the ship built on the ground is transversely moved and launched into the sea.

[29] The ship building step (S100) is implemented to build the ship on the ground. In this step, concrete mats 1 are installed, and the ship 100 is built on the concrete mats 1. At this time, the built ship is supported by blocks, and skid beams 3 are installed on the upper surface of the concrete mats 1 which extend from the ship to the upper ends of pile caps 2.

[30] The concrete mats 1 are installed to disperse the concentrated load which is applied to the ground while moving the ship. When the ship is built on the ground, and also while moving, since the number of blocks arranged for supporting the load of the ship at the width of stern portion of the ship is limited to some extent, the loads are applied over a small area to the ground. Therefore, the concrete mats 1 are installed to disperse the concentrated load applied to the portions of the ground which are not reinforced by piles and the like.

[31] The skid beams 3 are installed on the upper surface of the concrete mats 1, which are installed to disperse the applied load of the ship to the ground. Hydraulic jacks 6 connected with the skid shoes 4 which are brought into contact with the lower surface of the ship are installed to be capable of sliding on the skid beams 3. The positions and the number of skid beams 3 are appropriately determined so that the ship can be safely and easily loaded onto the barge.

[32] The preliminary Jacking-Up step (S200) is implemented to move the ship built on the ground and supported by the blocks to a launching position. The preliminary Jacking-Up step (S200) comprises the sub-steps of positioning the skid shoes 4 and the hydraulic jacks 6 between the upper surface of the skid beams 3 and the lower surface of the built ship and actuating the hydraulic jacks 6 to support the ship by the skid shoes 4 and thereby releasing the ship 100 from the blocks. By performing these operations, as the ship is released from the blocks which support the ship, the traction of the ship is possible. The ship 100 is placed on the skid shoes 4 and the hydraulic jacks 6 are positioned on the lower surface of the skid shoes 4. The hydraulic jacks 6 are placed on the upper surface of the skid beams 3.

- [33] Due to the presence of the skid shoes 4 and hydraulic jacks 6 which are installed below the ship as described above, the concentrated load generated by uneven settlement of the ground and rolling and pitching of the barge while the ship is moving also during intermittent stops can be uniformly dispersed and it is possible to reliably support the ship.
- [34] Also, in a state in which the ship is lifted up by the hydraulic jacks 6, the stem and stern portions of the ship may not be detached from the blocks due to natural sagging of the ship. In order to avoid this situation, skid shoes and hydraulic jacks 6 are additionally installed at the stem and stern portions of the ship to control the sag of the stem and stern portions when lifting up the ship.
- [35] The skid shoes 4 are brought into direct contact with the lower surface of the ship and are installed on cradles 5. The hydraulic jacks 6 are connected to the lower surface of the cradles 5. That is to say, the ship which rests on the plurality of skid shoes 4, and the hydraulic jacks 6 that are positioned below the skid shoes 4, are moved along the skid beams 3. The plurality of skid shoes 4 are connected integrally with one another, and the plurality of cradles 5 on which the hydraulic jacks 6 are installed are connected integrally with one another.
- [36] The ship moving step (S300) is implemented to move the ship which is supported by the skid shoes 4 and lifted up by the hydraulic jacks 6, to the barge 8. The ship moving step (S300) comprises the sub-steps of connecting the skid shoes 4 to traction devices 9; moving the skid shoes 4, the cradles 5 and the hydraulic jacks 6 along the skid beams 3 by the traction devices 9 and thereby moving the ship to connection bridges 10; moving the skid shoes 4, the cradles 5 and the hydraulic jacks 6 along the connection bridges 10 using the traction devices 9 and thereby moving the ship to link beam sections 11; and moving the ship to skid beams 12 installed on the upper surface of the barge 8, along the link beam sections 11 using the traction devices 9, and ballasting the barge 8.
- [37] The traction device 9 generally adopts a pushing method or a pulling method and uses elements such as strand jack, push-pull unit, winch, etc.
- [38] The important factor to be considered when loading the ship onto the barge is the identical level of skid ways on quay and on barge in order to ensure that the ship is horizontally loaded onto the barge without tilting. In other words, ballasting should be implemented in consideration of pitching and rolling of the barge due to the tide.
- [39] The ballasting of the barge 8 is performed as described below. The weight of the ship to be loaded onto the barge and the load per unit length of the ship to be

transmitted to the skid shoes are calculated, and a ballasting amount per unit moving distance of the ship is determined. If the weight of the ship, the load to be transmitted to the skid shoes and the amount of ballasting are determined, depending upon determined values, the ship is moved onto the barge, such that a gradually increasing load is transmitted to the barge from the moving ship. At this time, the ballasting is maintained by discharging an amount of sea water corresponding to the weight of a loaded portion of the ship from the barge by using onboard pumps of the barge. This task for maintaining the ballast of the barge is repeatedly conducted until the center of the ship reaches the center of the barge.

[40] Also, when the ship is moved, skid shoes 13 are additionally installed on the upper surface of the barge to disperse a load generated upon loading the ship onto the additional area of barge.

[41] The connection bridge 10 is installed between the pile cap 2 and the quay 14 and connects them with each other, to prevent the quay from being damaged by ground pressure transmitted to the quay in the course of skidding the ship on the ground. A shear key 15 is secured to the lower surface of the connection bridge 10. The end of the connection bridge 10 which is placed on the quay 14 comes into contact with the link beam 11. The compression force from the link beam 11 (corresponding to an inertia force of the barge which is generated by winds or waves to be transmitted to the ground) is transmitted through the shear key secured to the lower surface of the connection bridge 10, to the pile installed on the ground, thus receiving large horizontal load directly applied to quay.

[42] The link beam 12 connects the ground and the barge 8 with each other. One end of the link beam 12 is coupled to the quay by a pin, and the other end of the link beam 12 is coupled to the barge by a pin to absorb the motions of the barge. The link beam 12 transmits an inertia force generated due to the motions of the barge and a compressive force to the ground. By the fact that both ends of the link beam 11 are connected to the quay and the barge by pins, it is possible to compensate the difference in height between the ground and the barge.

[43] The barge 8 is used in a manner such that, when the ship is loaded-out from ground to barge 8 and safely launched in the sea. A plurality of grillage beams 17 having supports 16 are transversely installed at regular intervals on the upper surface of the barge 8, and skid beams 12 are installed on the upper ends of the grillage beams 17 to be positioned between the supports 16 of the grillage beams 17. The skid beams 12 and the grillage beams 17 are installed perpendicularly to each other. Namely, the plurality

of grillage beams 17 are transversely positioned on the lower ends of the skid beams 12 which are installed in the longitudinal direction. The skid beams 12 and the grillage beams 17 installed in this way in order to disperse the applied load while the ship is moved onto the barge.

[44] The barge 8 is further installed with a plurality of mooring elements 18 such as mooring ropes, winches, etc., for maintaining the barge at a predetermined location.

[45] The possibility of a concentrated load that can act on the barge increases, due to winds and waves, during moving the barge having the ship loaded thereon to the launching position and launching the ship into the sea, rather than during loading the ship onto the barge from the ground. Thus, in order to disperse the concentrated load, a plurality of skid shoes and hydraulic jacks are additionally installed on the barge. Through height adjustment by the hydraulic jacks installed in this way, it is possible to more efficiently disperse the load that occurs after the loaded-out and limit the ship sagging phenomenon within the allowable values.

[46] The quay 14 is designed to secure support stability while moving and launching the ship and withstand the concentrated load transmitted through the link beams 11 and the connection bridges 10.

[47] The ship loading step (S400) is implemented to load the ship onto the barge 8 using traction devices 9. The ship loading step (S400) comprises the sub-steps of separating the traction devices 9 and the skid shoes 4 from each other and removing the traction devices 9; de-actuating the hydraulic jacks 6 and resting the skid shoes 4 positioned under the ship onto the supports 16 of the grillage beams 17 of the barge 8; welding the skid shoes 4 positioned under the ship to the supports 16 of the grillage beams 17; moving the separated hydraulic jacks 6 onto the ground by using the rollers 19 installed on the cradles 5. The rollers 19 of the cradles 5 are not brought into contact with the skid beams when lifting up the ship, and are brought into contact with the skid beams when the ship resting on the skid shoes by actuating the hydraulic jacks 6.

[48] The ship launching step (S500) is implemented to launch the ship that was loaded onto the barge, into the sea. In the ship launching step (S500), the barge 8 having the ship loaded thereon is moved to the launching position, the barge is submerged into the sea by continuous ballasting of the barge and thereby, the ship is floated. The submerged barge is recovered and towed by tugboats. A brief ballasting procedure for launching the ship can be sequentially described as below.

[49] 1. After the barge having the ship loaded thereon is moved to the launching position, the barge is horizontally submerged into the sea to the depth of 11.5 m.

- [50] 2. An upper deck of the barge corresponds to 12 m, and a distance between the upper deck of barge and the bottom of the ship is about 2.6~2.8m in which only four buoyancy tanks exist. For this reason, the water plane area of the barge abruptly decreases from 12 m.
- [51] 3. The phenomenon as described just above adversely influences the stability of the barge. Therefore, in order to cope with this problem, the stern portion of the barge is mainly ballasted to incline the stern portion of the barge and allow the ship loaded on the barge to come into contact with sea water before the barge is fully submerged.
- [52] 4. The center portion of the barge is ballasted while maintaining the inclined state of the barge by continuously ballasting the stern portion of the barge, to submerge the barge as a whole into the sea.
- [53] 5. At a level where a weight and a buoyant force of the ship are equal, the ship starts floating from the barge.
- [54] 6. After the ship is floated, the barge is further ballasted by 1 m to prevent collision between the barge and the ship when is towed using the tugboat.
- [55] Moreover, in the case of transversely loading the ship built on the ground onto the barge, the existing barge stability caissons may interfere with ship. In order to avoid this situation, two barges may be firmly connected with each other to be used like an integrated barge having larger capacity, and the control rooms are moved not to interfere with the ship.
- [56] In the case of loading the ship using two barges as described above, because the entire load of the ship is applied to the first barge at the initial stage of loaded-out, it is necessary to compensate this load through ballasting. By connecting ballasting heads of two barges with each other so that the respective pumps of one barge can be used to increase ballasting capacity of the other barge, the ballasting time can be shortened.
- [57] Generally, in order to load the ship on to a single barge, the ship is simplified as one dimensional beam model, longitudinal weight distribution and buoyancy distribution from the stem to the stern are calculated, a difference between the two distribution values is calculated as a shearing force, and an integrated value of the shearing force as a longitudinal strength is calculated and monitored. However, in the case of transversely connected two barges and transversely loading the ship on the resultant integrated barge as described above, longitudinal strength as well as transverse strength must be calculated and monitored.
- [58] Important monitoring factors related with the longitudinal and transverse strengths are as described below.

[59] - A global transverse strength

[60] The barge is represented into one dimensional beam model, transverse weight distribution and buoyancy distribution are calculated, a difference between the two distribution values is calculated as a shearing force, and an integrated value of the shearing force is calculated as a bending moment.

[61] - Local transverse strengths (strengths applied to respective connectors)

[62] In order to conduct a local check, a three dimensional frame model representing the respective barges with five connectors is introduced into a loading computer, and the sum of moment of the respective beam elements representing the connectors is calculated.

[63] - Deformation Checking

[64] 16 target points are set on the barge, and values of deformation are read from the target points while loading the ship on the barge. A loading computer calculates the deformation values at the connectors to check whether or not the values are within an allowable range.

[65] While it was described in the above embodiment that the Push-Pull Units are installed on the lower ends of the skid shoes to move the ship built on the ground to the barge. It is to be readily understood that the ship can be moved through other methods. For example, it can be envisaged that, after lifting up the ship using the hydraulic jacks, the skid shoes are inserted between the skid beams and the ship, the hydraulic jacks are de-actuated to rest the ship on the skid shoes, and then the skid shoes are slid along the skid beams to move the ship to the barge.

[66]

Industrial Applicability

[67] As apparent from the above description, the method and the equipment for transversely launching a ship built on the ground according to the present invention provides advantages in that it is possible to build a ship irrespective of a availability rate and a size of a dock, a dock construction cost and maintenance and repair fees are saved, and the transverse launch of a ship is made possible.

[68] Although the preferred embodiment of the present invention has been disclosed for illustrative purposes, those skilled in the art will appreciate that various modifications, additions and substitutions are possible, without departing from the scope and spirit of the invention as disclosed in the accompanying claims.

Claims

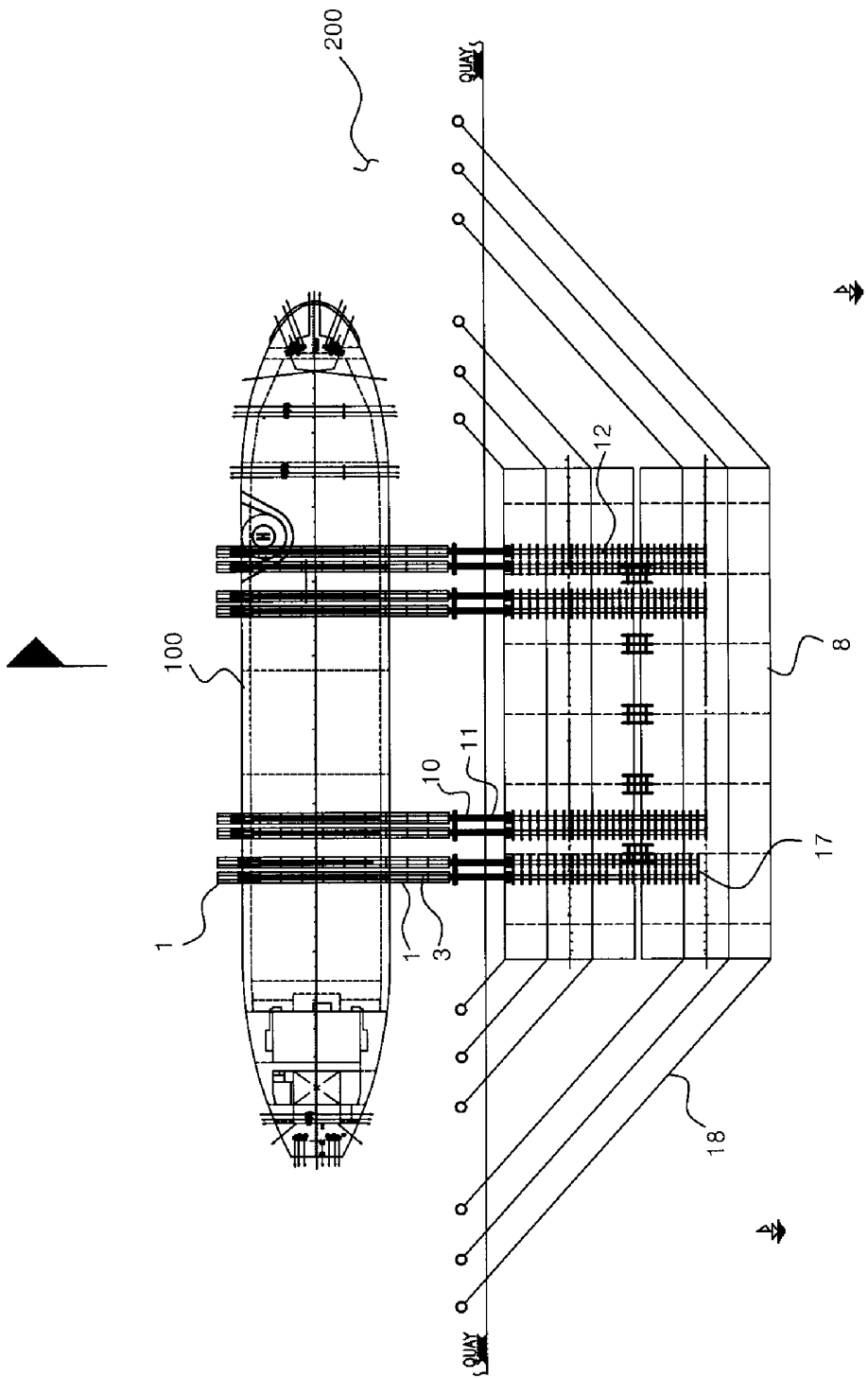
- [1] A method for transversely launching a ship built on the ground, comprising:
a ship building step for building a ship on the ground;
a preliminary Jacking-Up step for lifting up the built ship by means of a plurality of skid shoes and hydraulic jacks;
a ship moving step for skidding the skid shoes and hydraulic jacks which support the ship on skid beams using traction devices, thereby transversely moving the ship toward a barge;
a ship loading step for loading the moved ship onto the barge; and
a ship launching step for floating the ship by submerging the barge on which the ship is loaded.
- [2] The method according to claim 1, wherein the preliminary moving step comprises the sub-steps of:
positioning the skid shoes and the hydraulic jacks on the skid beams below the built ship; and
actuating the hydraulic jacks to support the ship by the skid shoes, thereby releasing the ship from blocks.
- [3] The method according to claim 2, wherein hydraulic jacks are additionally provided below the stem and stern of the built ship to control sag of the stem and the stern when lifting up the ship.
- [4] The method according to claim 1, wherein the ship moving step comprises the sub-steps of:
connecting the skid shoes to the traction devices;
moving the skid shoes, cradles and hydraulic jacks along the skid beams using the traction devices, thereby moving the ship to connection bridges;
moving the skid shoes, the cradles and the hydraulic jacks along the connection bridges by the traction devices and thereby moving the ship to link beam sections; and
moving the ship to skid beams installed on an upper surface of the barge, along the link beam sections by the traction devices, and adjusting ballasting of the barge depending upon a degree to which the ship is moved onto the barge.
- [5] The method according to claim 4, wherein, when the ship is moved, skid shoes are additionally installed on the upper surface of the barge to disperse the load from the ship onto more area of the barge.

- [6] The method according to claim 4, wherein the ballasting of the barge is implemented by the steps of:
calculating a weight of the ship to be loaded onto the barge and a load per unit length of the ship to be transmitted to the skid shoes, and determining a ballasting amount per unit moving distance of the ship;
maintaining the ballasting in conformity with the determined ballasting amount by discharging from the barge an amount of sea water corresponding to a weight of a loaded portion of ship by using onboard pumps of the barge while loading the ship onto the barge; and
conducting repeatedly a task for maintaining ballasting of the barge until the center of the ship reaches the center of the barge.
- [7] The method according to claim 1, wherein the ship loading step comprises the sub-steps of:
de-actuating the hydraulic jacks moved onto the upper surface of the barge and resting the skid shoes supporting the ship onto supports of grillage beams of the barge;
welding the skid shoes positioned under the ship to the supports of the grillage beams;
separating the hydraulic jacks and the skid shoes from each other; and
moving the separated hydraulic jacks onto the ground by the traction devices.
- [8] The method according to claim 1, wherein the ship launching step comprises the sub-steps of:
moving the barge having the ship loaded thereon to a launching location;
submerging the barge moved to the launching position by continuously ballasting the barge;
floating the ship by submerging the barge; and
further submerging the barge by further ballasting the barge after the ship is floated, and recovering and towing the barge using a tugboat.
- [9] The method according to claim 8, wherein launching of the ship is implemented in a manner such that a stern of the barge is ballasted to incline the barge, and a center portion of the barge is ballasted while maintaining an inclined state of the barge by continuously ballasting the stern of the barge, whereby the barge having the ship loaded thereon is submerged.
- [10] The method according to any one of claims 1 and 4 to 9, wherein the barge on which the ship is loaded is formed by integrally connecting two barges with each

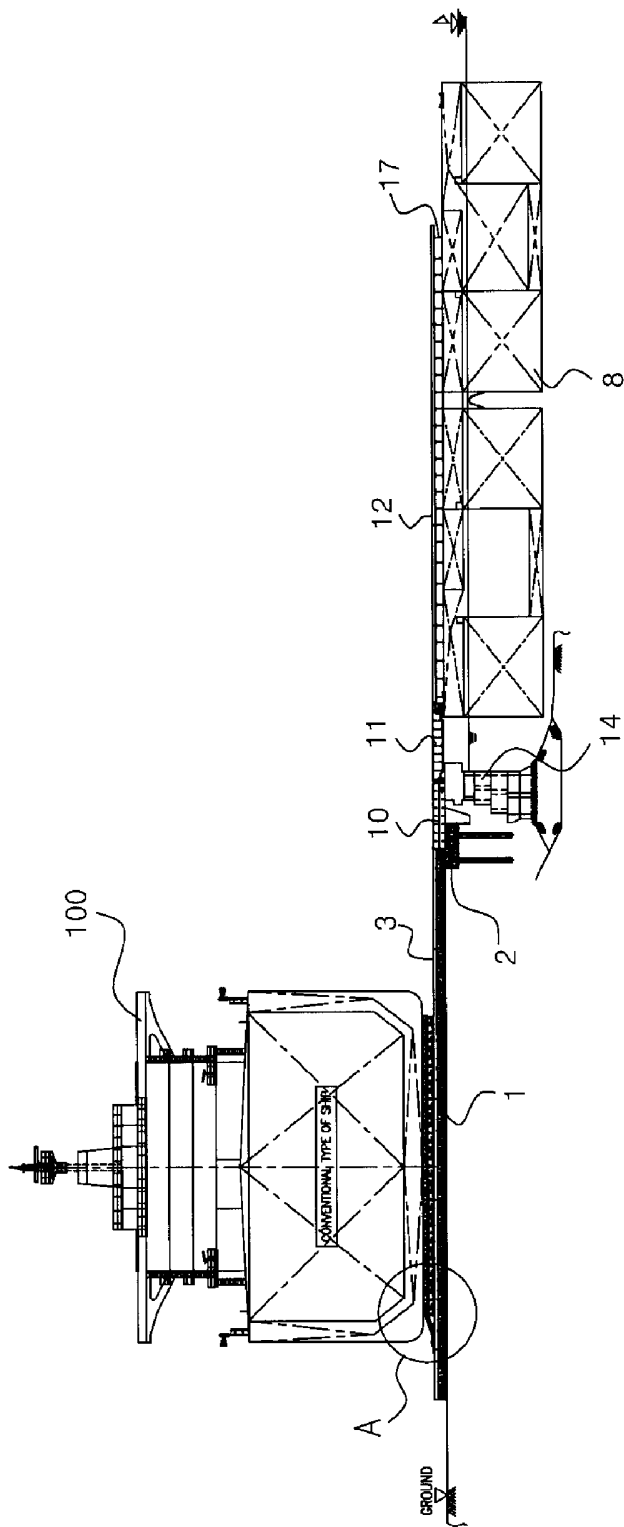
other in a transverse direction.

- [11] An apparatus for transversely launching a ship built on the ground, comprising:
a plurality of concrete mats installed to extend from a lower end of the ship built on the ground to a position where pile caps are installed;
skid beams installed on upper end surfaces of the concrete mats;
a plurality of skid shoes brought into contact with upper surface of the skid beams and the lower surface of the ship;
hydraulic jacks placed under lower surface of the skid shoes to be skidded along the skid beams;
connection bridges continuously connected at the same height as the skid beams which are installed on the upper end surfaces of the concrete mats, between the pile caps and a quay; and
link beams having the same height as the connection bridges and coupled at both ends thereof to the quay and a barge by pins.
- [12] The apparatus according to claim 11, wherein a plurality of grillage beams are transversely installed at regular intervals on an upper surface of the barge, and skid beams are longitudinally installed to be positioned on the grillage beams.
- [13] The equipment according to claim 11, wherein the quay is reinforced by foundation type piles or mats.

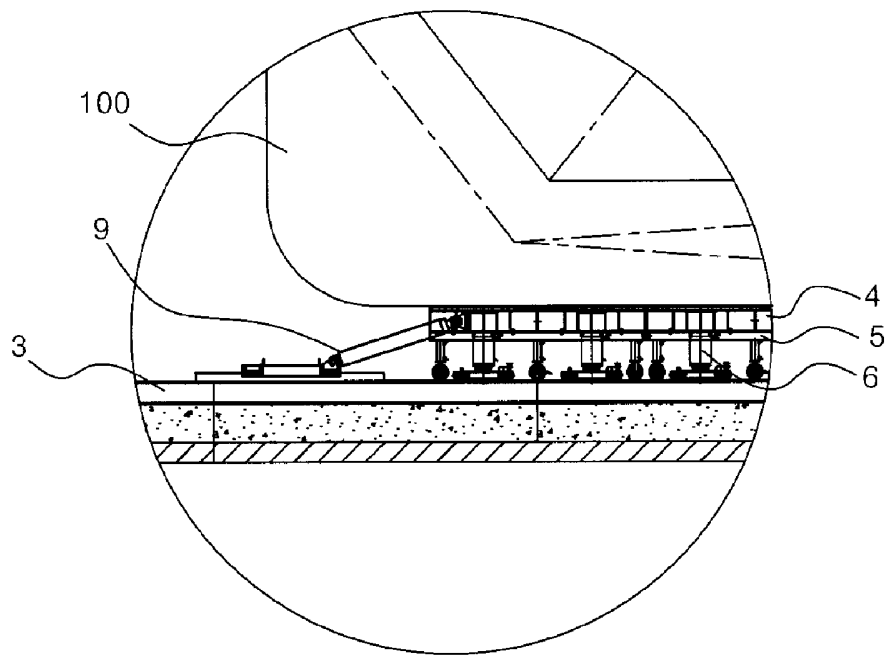
[Fig. 1]



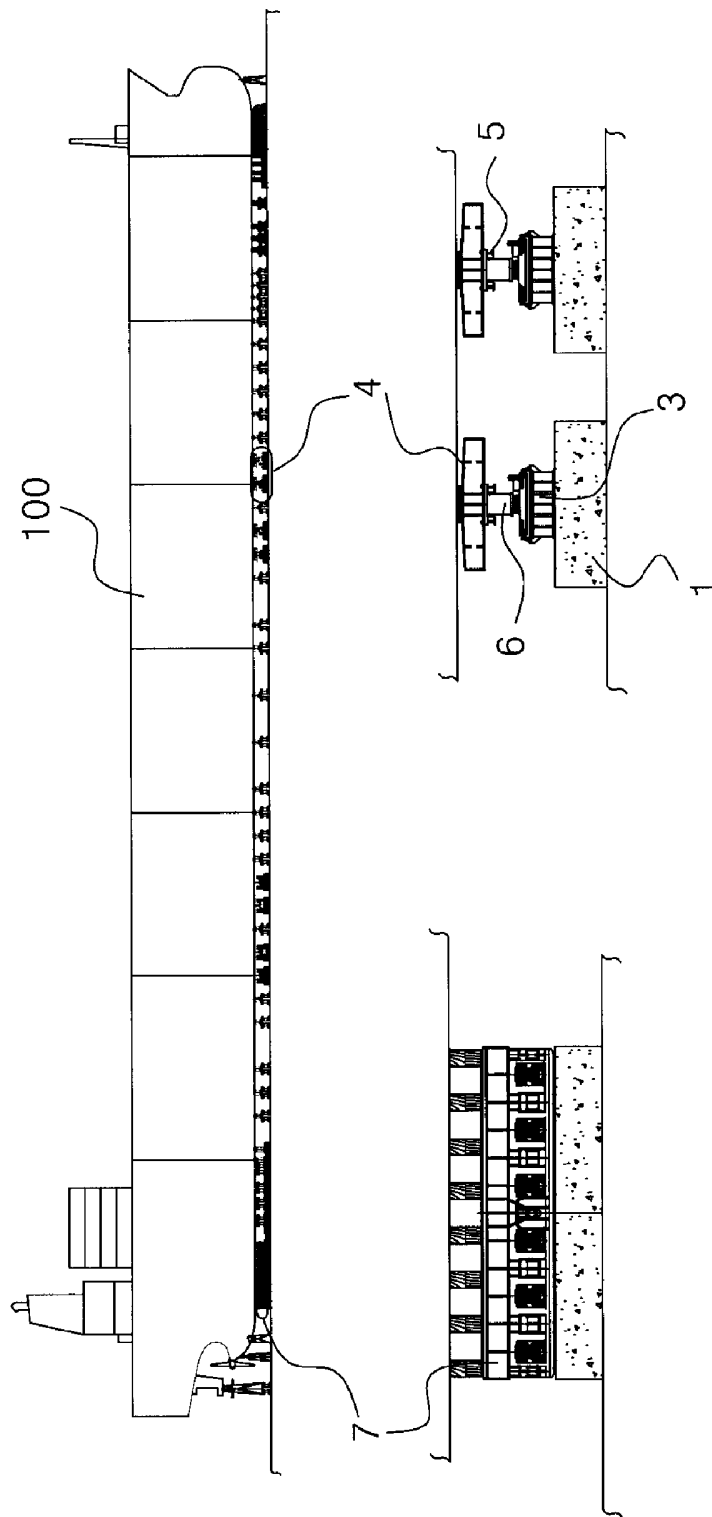
[Fig. 2]



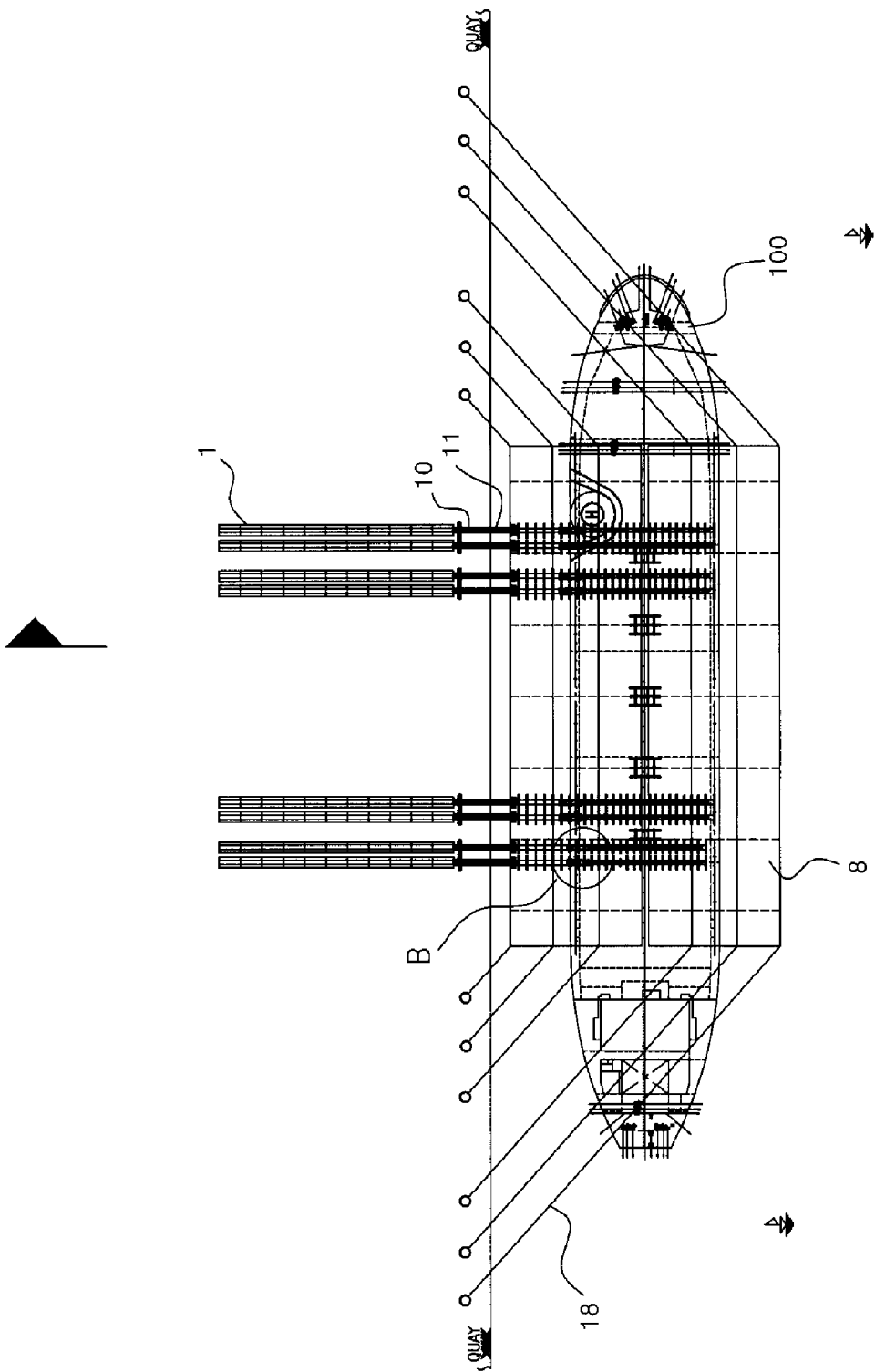
[Fig. 3]



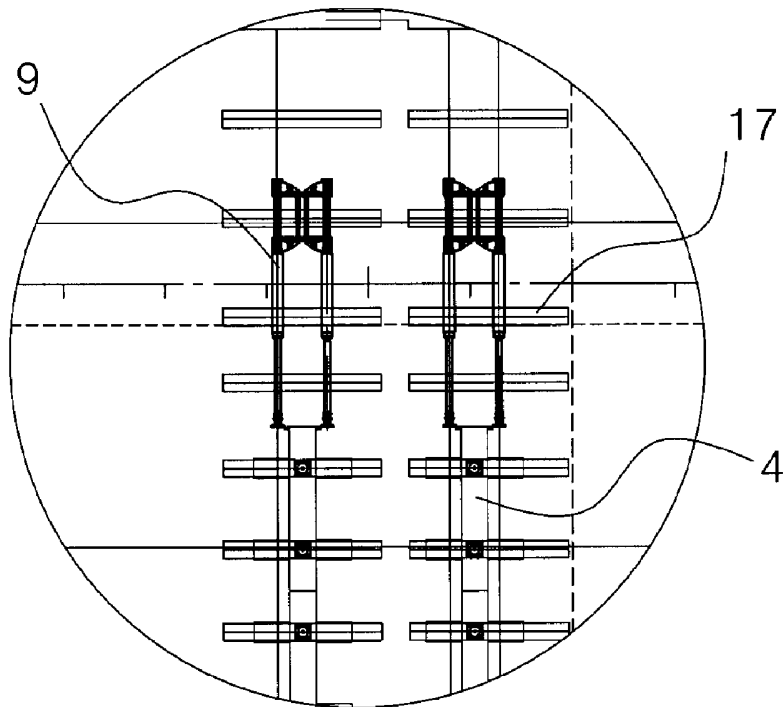
[Fig. 4]



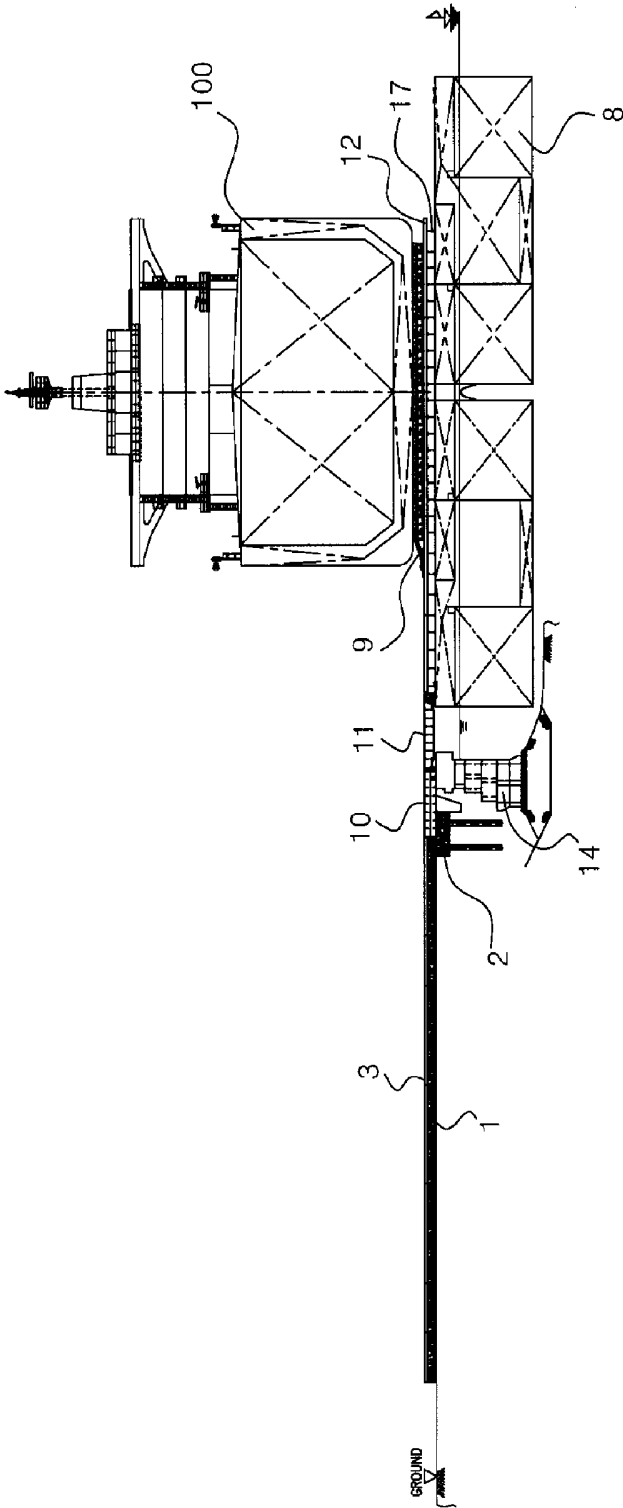
[Fig. 5]



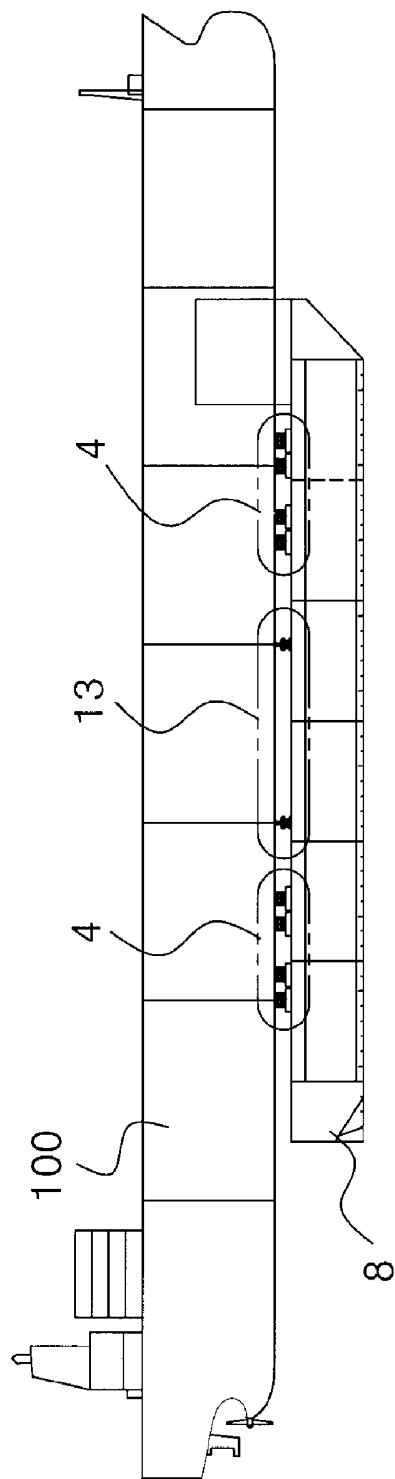
[Fig. 6]



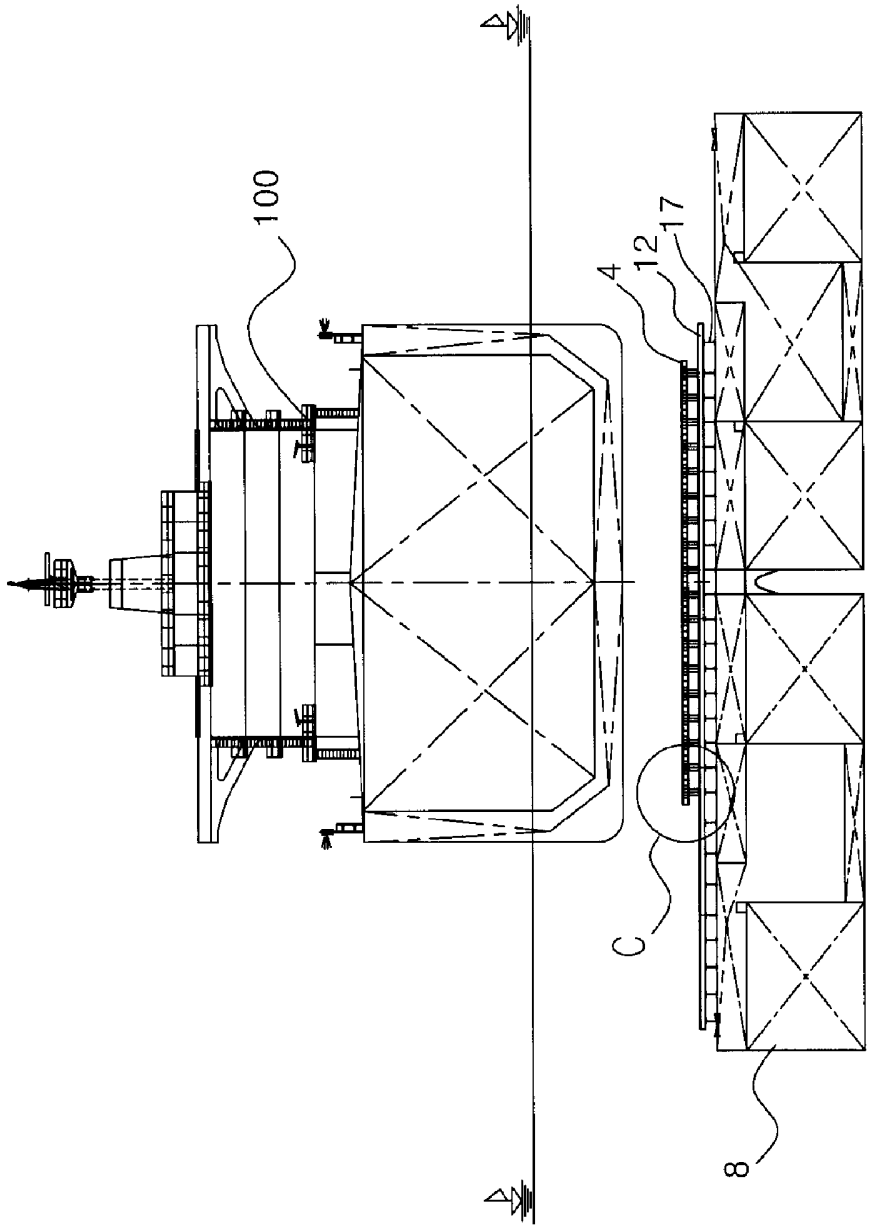
[Fig. 7]



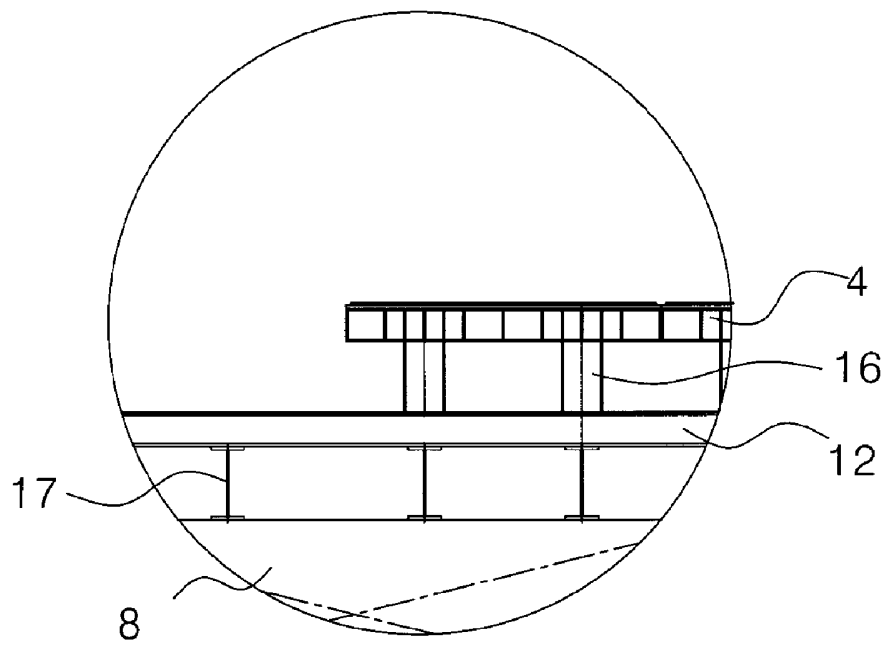
[Fig. 8]



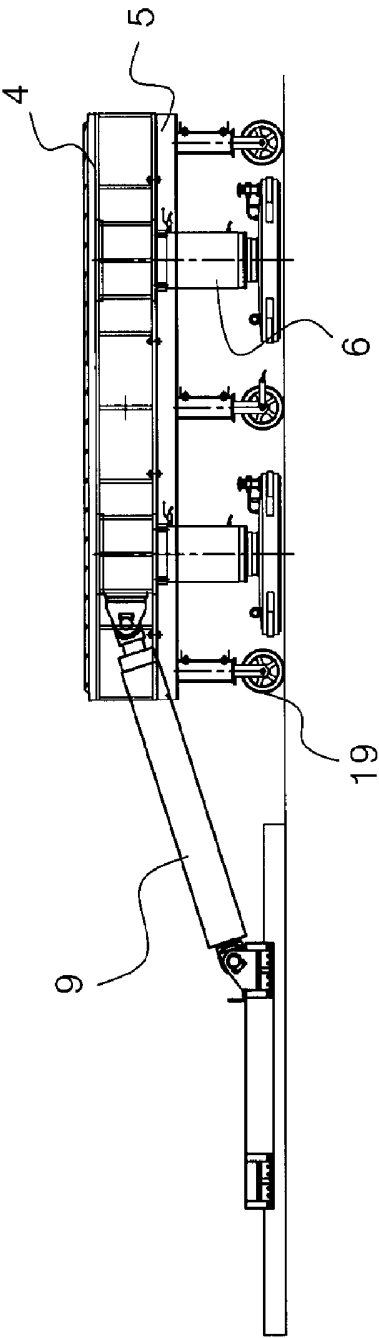
[Fig. 9]



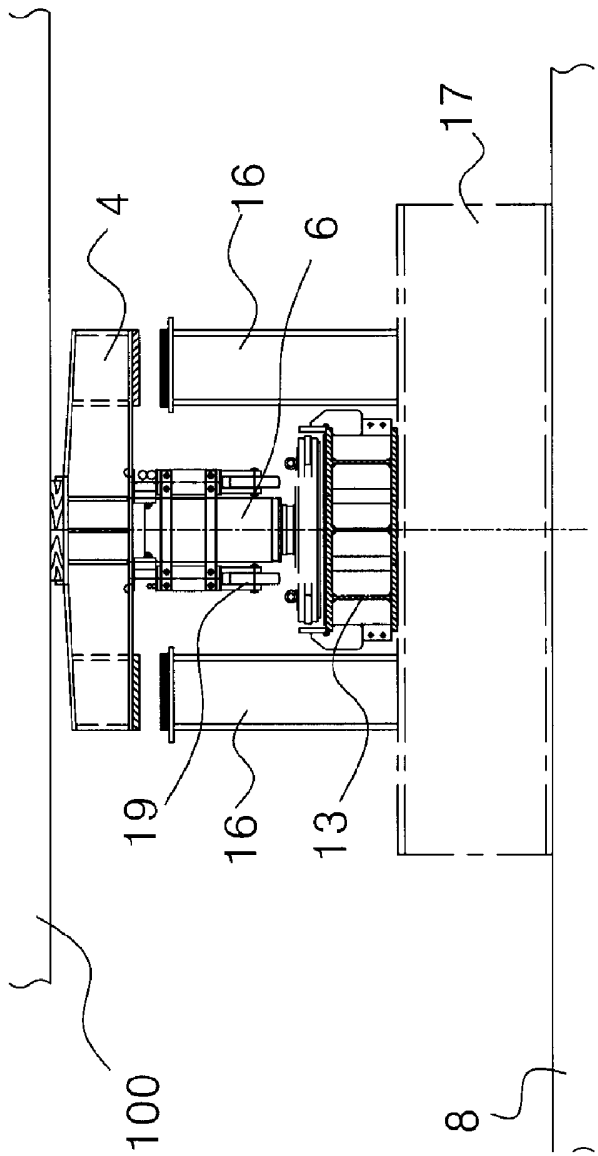
[Fig. 10]



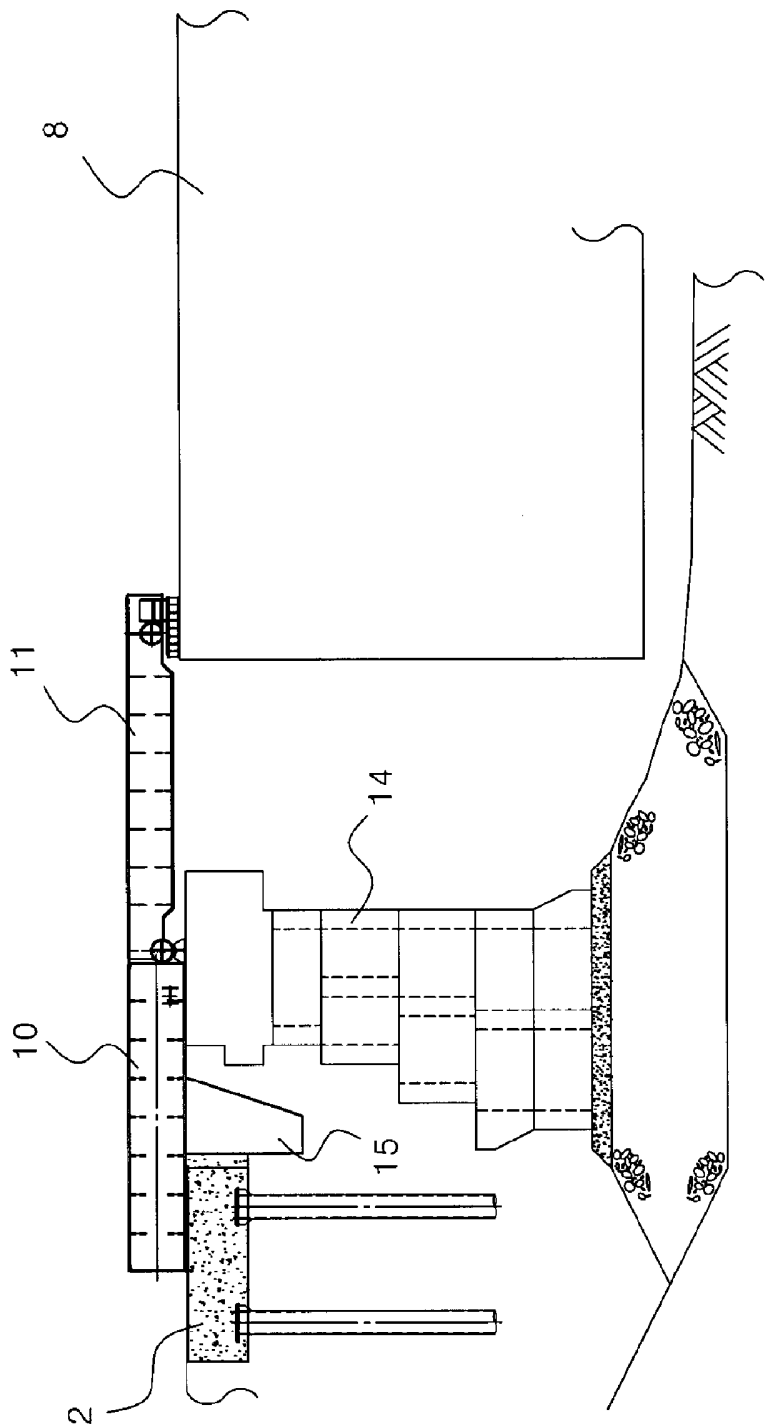
[Fig. 11]



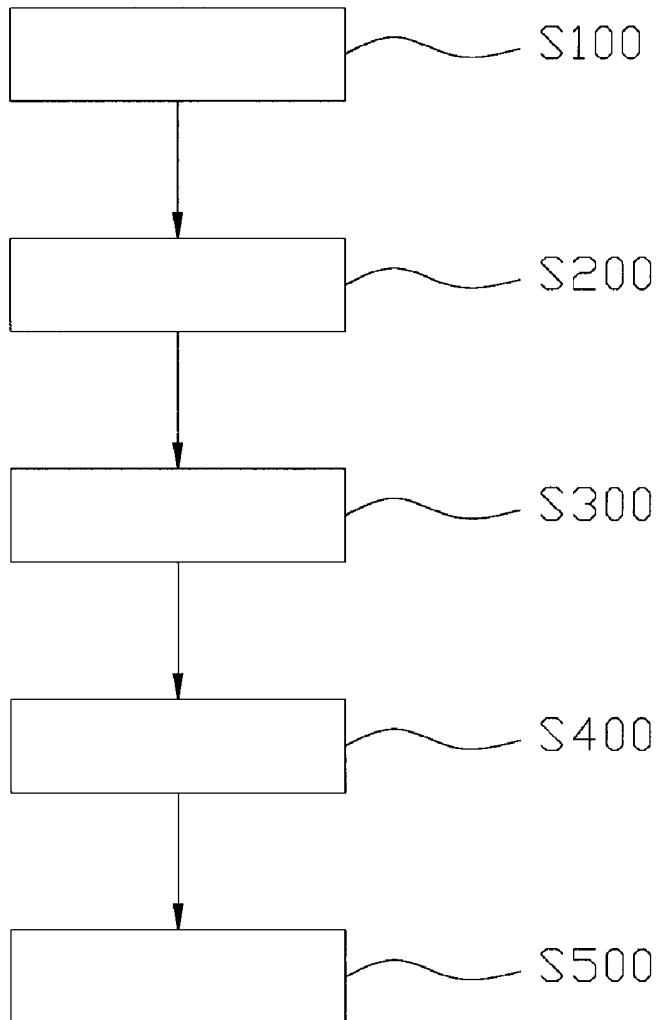
[Fig. 12]



[Fig. 13]



[Fig. 14]



INTERNATIONAL SEARCH REPORT

International application No.
PCT/KR2005/000001

A. CLASSIFICATION OF SUBJECT MATTER**IPC7 B63C 3/04**

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)

B63C 3/04

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched
KR.JP : classes as above

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

KIPO NPS System : "launch*", "load out", "skid*", "barge", "jack", "ship", "trans*", "rail" & "roll"

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	JP 59 - 145688 A (MITSUI ENG & SHIPBUILDING CO LTD) 21 AUGUST 1984 See the whole document	1, 11
A	US 4,243,344 A (DELATTRE-LEVIVIER) 06 JANUARY 1981 See the whole document	11
A	JP 09 - 076993 A (TOYO CONSTRUCTION) 25 MARCH 1997 See the whole document	11

☐ Further documents are listed in the continuation of Box C.

☐ See patent family annex.

* Special categories of cited documents:

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"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

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"&" document member of the same patent family

Date of the actual completion of the international search

27 JUNE 2005 (27.06.2005)

Date of mailing of the international search report

28 JUNE 2005 (28.06.2005)

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