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TITLE OF THE INVENTION

SHIP CONSTRUCTION SYSTEM

BACKGROUND OF THE INVENTION

This invention relates to a ship construction
5 system used for, in particular, construction of ships,
that is, new construction of constructing new ships,
and works and remedies such as repair and maintenance
of existing ships. Further, the present invention
relates to a ship construction system and method of the
10 same, which injects/supplies, or drains sea water into
or from a dock, controls the water level in the dock by
a water injection/drainage device thereof, controls
opening and closing of gates of the dock, and thereby
enables movement of ships from the sea to the ground
15 dock, from the dock to another dock, or from the ground
dock to the sea.

Generally, construction of ships is performed by
using: (1) dry docks; (2) floating docks made of steel;
or (3) a method commonly called a syncrolift system, in
20 which ships are moved by lift devices to a work yard on
the ground to perform work, and lifted down from the
work yard to the sea.

These conventional systems have the following
problems:

25 Dry docks of above item (1) require much
construction costs, since constructing them requires
massive civil works of excavating earth. Further,



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disposition of large amount of earth and sand excavated in construction is perceived as a problem also in respect of environmental protection.

5 Floating docks of item (2) are mainly used for repair. However, because of their properties, floating docks inevitably have a disadvantage in that the size of ships which can enter the dock is limited.

10 Although syncrolift systems of the above item (3) are suitable for construction of a plurality of ships, they not only require a number of large lift devices, but also have limits of lift capacities thereof. Therefore, the size of ships which syncrolift systems can deal with is also limited.

15 Further, there is prior art in which a floating dock is surrounded by surrounding walls standing from the sea floor, a ship is introduced into the floating dock sunk below the surface of water by ballast by opening a water gate provided in the surrounding walls, and the dock is floated up by draining the ballast
20 water and the ship is seated on a seating table in the surrounding walls. This technique controls the water level in the surrounding walls by a water injection/drainage device, and thereby enables accurate seating of the ship onto the seating table of the
25 floating dock regardless of the level of the tide (Jpn. Pat. Appln. KOKAI Pub. No. 11-105785). However, this technique relates to a single dock, and constructing it

requires excavation of a predetermined scale like other docks. Further, the technique can be only used for the dock.

5 In these conventional systems, construction of the facilities requires much cost as described above.

Further, disposition of large amount of earth and sand excavated in construction of the docks is a severe problem. The other conventional systems also have problems such as limitations on the size of ships which
10 the systems can deal with.

BRIEF SUMMARY OF THE INVENTION

The present invention has been made to solve these problems, and provides a system which enables construction of a ship, simultaneous construction of a
15 plurality of ships if necessary, without much limitation of the size and with less construction cost in comparison with prior art, by using a proper site adjacent to the coastal sea.

A system according to claim 1 of the present
20 invention comprises a dock which is surrounded by a peripheral wall supported by ground, has a communicating portion at least part of which communicates with coastal sea, and has a depth that allows a ship to enter and exit from the dock while
25 floating at a water level of the coastal sea. The communicating portion is provided with an entrance/exit openable gate which allows passage of the ship floating

on sea water when the entrance/exit openable gate is opened, and maintains sea water of a water level higher than the water level of the coastal sea in the dock when the entrance/exit openable gate is closed.

5 Further, the system includes a water injection/drainage device which injects water into and drains water from the dock in a state where the entrance/exit openable gate is closed. Further, the dock is provided with a subsequent dock which follows the dock and connects
10 with a part of the peripheral wall through an openable for movement gate allowing passage of the ship. The subsequent dock has a depth less than the depth of the dock, and has a bottom portion on which the ship is placed. Further, the system includes a second water
15 injection/drainage device which injects and drains water into and from the subsequent dock in a state where the openable gate is closed, such that the subsequent dock maintains the same water level as that of the dock. The ship construction system has a
20 structure in which a ship which requires repair and maintenance is allowed to enter the dock through the entrance/exit openable gate opened in the state where the water level in the dock is made to conform to the water level of the coastal sea, and the ship is moved
25 to the subsequent dock connecting with the dock after adjusting the water level in the subsequent dock.
After the water in the subsequent dock is drained, the

ship is fixed and subjected to construction, that is, necessary repair and maintenance.

5 In the case of constructing a new ship, usual construction is finished in the subsequent dock with water drained, and then the subsequent dock and the dock are adjusted to have almost the same water level by opening and closing the openable gate and the entrance/exit openable gate and operating a relevant water injection/drainage device. Then, the newly
10 constructed ship is moved into the dock through the openable gate. Thereafter, in the state where the dock is maintained at almost the same water level as that of the coastal sea, the entrance/exit openable gate is opened, and the newly constructed ship is launched to
15 go out of the dock to the coastal sea.

Further, the invention according to claim 2 has a structure wherein a table dock is provided adjacent to the dock. The table dock has a depth less than the depth of the dock and allows movement of the ship
20 floated by the water level of the dock, and the ship can be placed on a bottom portion of the table dock. Construction of ships can be performed by using the table dock as necessary. Since the table dock has a depth less than the dock, the table dock does not
25 require a special excavation, and can be constructed only by providing peripheral walls on existing ground. Therefore, construction of the table dock can be easily

performed.

Further, the invention according to claim 3 has a structure wherein a movement channel is provided between the dock and the subsequent dock, and the
5 movement channel allows movement of the floating ship between the docks through the gate for movement. The invention enables easier movement of the ship to the subsequent dock.

Further, the invention according to claim 4
10 further comprises one or more subsequent dock having the same structure as that of the subsequent dock. The invention enables selective movement of ships to a desired subsequent dock.

Further, the invention according to claim 5 has a
15 structure wherein the entrance/exit gate and the gate are opened and closed by control in association with each other to allow movement of the ship to a desired dock. The invention enables movement of ships to a desired subsequent dock with efficiency.

Further, the invention according to claim 6 is a
20 ship construction method using a dock which is surrounded by a peripheral wall supported by ground, has a communicating portion at least part of which communicates with coastal sea, and has a depth that
25 allows a ship to enter and exit from the dock while floating at a water level of the coastal sea. The communicating portion is provided with an entrance/exit

openable gate which allows passage of the ship floating on sea water when the entrance/exit openable gate is opened, and maintains sea water of a water level higher than the water level of the coastal sea in the dock

5 when the entrance/exit openable gate is closed.

Further, there is provided a water injection/drainage device which injects water into and drains water from the dock in a state where the entrance/exit openable gate is closed. Further, the dock is provided with a

10 subsequent dock which follows the dock and connects with a part of the peripheral wall through a openable gate allowing passage of the ship. The subsequent dock has a depth less than the depth of the dock, and has a bottom portion on which the ship is placed. Further,

15 there is provided a second water injection/drainage device which injects and drains water into and from the subsequent dock in a state where the openable gate is closed, such that the subsequent dock maintains the same water level as that of the dock and the ship is

20 allowed to move to the subsequent dock. A ship which requires repair and maintenance is allowed to enter the dock through the opened entrance/exit openable gate, in the state where the water level in the dock is made to conform to the water level of the coastal sea.

25 Thereafter, the water level in the subsequent dock connecting to the dock is adjusted, and then the ship is moved to the subsequent dock. After water in the

subsequent dock is drained, the ship is fixed and subjected to construction, that is, necessary repair and maintenance.

Further, the invention according to claim 7 is a
5 ship construction method in which a movement channel is provided between the dock and the subsequent dock, in addition to the dock and the subsequent dock in the construction method of claim 6, and the movement channel allows movement of the floating ship between
10 the docks through the openable gate for movement such that the ship is moved to the desired subsequent dock. A ship which requires repair and maintenance is allowed to enter the dock through the opened entrance/exit openable gate, in the state where the water level in
15 the dock is made to conform to the water level of the coastal sea. Then, the ship is put into the movement channel having the water level adjusted to be the same as the dock. The ship is moved to a desired subsequent dock, which connects with the movement channel and has
20 a water level adjusted, through the openable gate. After water in the subsequent dock is drained, the ship is fixed and subjected to construction, that is, necessary repair and maintenance. Thereafter, the ship is allowed to go out of the dock in reverse order.

25 According to the present invention, the docks other than the entrance dock can be provided at a level almost equal to the ground level, with little

excavation of ground unlike conventional dry docks, and a predetermined water level is maintained by peripheral walls supported by the ground. Further, although the system of the present invention is similar to the above syncrolift system in that installation and construction can be performed at the ground level, the system of the present invention has a simple structure, since it does not move ships on rails between an elevating platform and the ground as performed in the syncrolift system. Further, openable gates of the docks which do not greatly limit the size of ships and are economically provided in connection with each other are opened and closed by control in connection with each other, and thereby ships to be constructed can be smoothly moved to the coastal sea and between the docks as desired.

BRIEF DESCRIPTION OF THE SEVERAL VIEWS OF THE DRAWING

The accompanying drawings, which are incorporated in and constitute a part of the specification, illustrate embodiments of the invention, and together with the general description given above and the detailed description of the embodiments given below, serve to explain the principles of the invention.

FIG. 1 is a perspective view of an embodiment of the present invention.

FIG. 2 is a plan view of a main part of the embodiment of the present invention.

FIG. 3 is a cross-sectional view of the

embodiment, taken along line A-A of FIG. 2.

FIG. 4 is a cross-sectional view of the embodiment, taken along line B-B of FIG. 2.

FIG. 5 is a cross-sectional view of the
5 embodiment, taken along line C-C of FIG. 2.

FIG. 6A is a plan schematic diagram of the embodiment of the present invention.

FIG. 6B is a cross-sectional schematic diagram of the embodiment of the present invention.

10 FIG. 7 is a plan view illustrating another embodiment of the present invention.

FIG. 8 is a cross-sectional view taken along line D-D of FIG. 7.

15 FIG. 9 is a cross-sectional view taken along line E-E of FIG. 7.

FIG. 10 is a plan schematic diagram of said another embodiment of the present invention.

FIG. 11 is a cross-sectional schematic diagram of said another embodiment of the present invention.

20 DETAILED DESCRIPTION OF THE INVENTION

Embodiments of the present invention are explained with reference to drawings.

FIGS. 1 to 6B illustrate an embodiment of the present invention. FIG. 1 is a perspective view
25 illustrating a whole ship construction system denoted by reference number 10. The ship construction system 10 is preferably located in the vicinity of a coastline

CL positioned on the boundary between the coastal sea S and land L. Specifically, as illustrated in plan view of FIG. 2 and cross-sectional views of FIGS. 3 to 5, the construction system 10 is configured to face the coastal sea S, and be surrounded by peripheral walls 12 which stand on land, that is, ground L extending along the coastline CL. The term "coastal sea S" indicates a coastal body of water connecting with the ocean, but is defined as including lakes and rivers. Therefore, the term "sea water" used below may indicate fresh water.

More specifically, in FIGS. 1 and 2, reference number 14 denotes a rectangular dock which includes a communicating portion 16. The communicating portion 16 is located nearly on the boundary between the coastal sea S and the land L, and a part of the communicating portion 16 faces the coastal sea S and can communicate with the coastal sea S. The rectangular dock 14 is surrounded by the peripheral walls 12 such that sea water is maintained at a predetermined level therein. The height of the peripheral wall 12 is determined according to the water level necessary for movement of ships to be constructed or repaired. Although the necessary water level varies according to the type and size of ships, generally it is possible to deal with almost all types of ships with a draft of about 7m. Therefore, in consideration of the height of blocks (about 2m) described below, the sufficient height of

the rear peripheral wall 12 from the ground is about 9 to 10m.

5 The communicating portion 16 is provided with an entrance/exit openable gate 20 for allowing ships to enter and exit from the dock. The openable gate 20 has a height which is almost the same as the peripheral wall 12, and the lower end of the gate 20 is pivotally supported as illustrated in FIG. 5. The gate 20 has sufficient size such that a ship H which requires
10 construction or repairing can enter or exit from the dock between the dock and the coastal sea, when the gate is opened by pivoting the gate to the outside at a right angle. Therefore, the ship floating in the sea water can pass through the gate 20. Further, opening
15 and closing of the gate 20 is controlled to maintain a predetermined water level, that is, the water level of sea water sufficient to support and float ships in the subsequent dock (described below).

20 The dock 14 is divided into two rectangular docks, that is, a front dock and a rear dock. The front dock serves as an entrance dock 14F, and the rear dock serves as a construction dock having the same size as the entrance dock, that is, the subsequent dock 14R. The entrance dock 14F and the subsequent dock 14R
25 connect with each other. Specifically, a partition 15 between the docks is provided with a openable gate 20-R having the same structure as that of the gate 20.

Further, as illustrated in the cross-sectional view of FIG. 5, the dock 14F being an entrance dock directly contacting the coastal sea side is excavated deep toward the coastal sea through the entire length of the rectangle thereof, such that the ships H can easily enter (and exit from) the dock from the coastal sea through the gate 20. Specifically, the dock 14F communicates with the coastal sea and is excavated down by about 7 to 8m through the whole area thereof.

10 Thereby, the dock 14F is formed as a dock having a depth of about 16 to 18m together with the peripheral wall, such that ships can easily enter and exit from the dock through the openable gate 20 from and to the coastal sea.

15 On the other hand, the depth of the subsequent dock 14R is set much less than the depth of the dock 14F. More specifically, the depth of the subsequent dock 14R is set to a depth which does not substantially require excavation of the ground in construction. In

20 other words, a bottom portion having the same level as the ground is formed. Specifically, as described above, the peripheral wall 12 on the rear side is formed to have a height of about 9 to 10m from the ground, and the bottom portion of the dock 14R is

25 formed with the almost same depth as the ground level.

Further, as clearly illustrated in the plan view of FIG. 2 and the cross-sectional view of FIG. 4, a

plurality of blocks 17 are intermittently provided like rail ties on the bottom surface of the subsequent dock 14R in the longitudinal direction thereof. The blocks 17 are arranged such that the bottom portion of the ship H, which enters the dock while floating in sea water and is lowered by discharging water in the subsequent dock 14R as described below, is placed on the blocks 17 and thereby fixed thereon. Each of the blocks 17 is formed by selectively stacking a steel block on a concrete block, and successively stacking a plurality of types of wood blocks thereon and uniting the blocks. The blocks 17 do not float up even when water is injected into the dock. Further, after water in the dock is drained, the blocks 17 stably support the ship H by holding the bottom of the lowered ship H. Further, a water injection/drainage device 18 (a device 18 for the dock 14R may be hereinafter referred to as a second water injection/drainage device) is connected to each of the docks 14F and 14R. Specifically, as illustrated in the schematic diagram of FIG. 6A, as the water injection/drainage devices 18, a water injection/drainage pump 22, valves 24, and a water discharge valve 25 are connected to water injection/drainage ports 26 disposed in the bottoms of the docks 14F and 14R. The pump 22 communicates with the coastal sea S via a sea chest 29 through a strainer 27, and a valve 28. Further, the water discharge valve

25 on the coastal sea S side communicates with the coastal sea S, at a portion lower than the water surface, in the coastal sea communicating portion 16 of the dock 14F, although the location of the water discharge valve 25 is not shown.

Next, as is clear from FIGS. 1 and 2, a rectangular subsequent dock 14S having almost the same depth as that of the subsequent dock 14R is formed on one side of the dock 14F. One side of the subsequent dock 14F connects with the dock 14F through the entire length thereof, and the outer periphery of the dock 14F is surrounded by peripheral walls 12 similar to the peripheral walls 12 surrounding the subsequent dock 14R. Although not shown, blocks similar to those provided in the dock 14R are arranged on a bottom portion of the dock 14S. If necessary, a low standing wall 12A having about the same height (about 2m) as that of the blocks is formed on the boundary with the dock 14F. The standing wall 12A is provided to prevent unnecessary flow of sea water into the dock 14S, when the dock 14F has sea water having the same water level as the coastal sea. The dock 14S is configured such that the water level in the dock 14F is kept equal to or higher than the water level of the coastal sea S and a sufficient water level is secured in the region of the dock 14S by the water injection/drainage device 18, in the state where the ship H floats in the dock 14F at

the same water level as the coastal sea S and the openable gate 20 is closed.

Further, a water drainage valve (not shown) is provided in the bottom portion of the dock 14S. The
5 water drainage valve drains sea water remaining in the dock S by the standing wall 12A, interlocking with water drainage of the dock 14F. Further, the dock 14S can be provided in two or more positions, although it is shown in one position in FIGS. 1 and 2.

10 Although the dock 14S is provided adjacent to one side of the dock 14F in the above embodiment, the dock 14S can be provided adjacent to the longitudinal rear side of the dock 14F, instead of the subsequent dock 14R.

15 Operation of the construction system 10 having the above structure is explained below. In this explanation, among construction of ship H, an example where ship H is repaired is described.

First, ship H to be repaired is positioned in the
20 vicinity of the construction system 10 in the coastal sea S. Further, sea water is injected by the water injection/drainage device 18 into the dock 14F closed by the entrance/exit gate 20, to increase the water level in the dock 14F to be the same as the coastal sea
25 S. In this state, the entrance/exit gate 20 is opened, and the ship H is moved into the dock 14F. After the ship H enters the dock 14F, the gate 20 of the entrance

dock 14F is closed, and the water injection/drainage device 18 injects water into the subsequent dock 14R in the state where the openable gate 20-R of the subsequent dock 14R is opened (or closed). By this water injection, the water level in the dock 14R is increased to a level necessary for putting the ship H into the dock 14R. Then, the ship H in the dock 14F can be moved into the subsequent dock 14R through the gate 20-R (or after opening the gate 20-R) in the state of floating in the sea water.

Thereafter, the gate 20-R is closed, and the second water injection/drainage device 18 is driven to drain sea water in the subsequent dock 14R. Thereby, the ship H is lowered with reduction in the water level, and the bottom of the ship H is stably placed on the blocks 17.

In this state, a predetermined repair process is performed for the ship H in the subsequent dock 14R. After the repair process is finished, water is injected into the dock 14R to the same water level as that used when the ship H is put into the dock 14R, and thereby the ship H is floated up. Further, the water level of the dock 14F is also increased to the same water level with the gate 20 closed. In this state, the gate 20-R is opened, and thereby the docks 14F and 14R communicate with each other with the same water level. Therefore, the ship H in the subsequent dock 14R can

move to the dock 14F through the gate 20-R.

5 Thereafter, the water in the dock 14F is drained
by the water injection/drainage device 18, and the gate
20 is opened in the state where the water level of the
dock 14F is almost equal to the water level of the
coastal sea S. Thereby, the dock 14F communicates with
the coastal sea S with the same water level, and thus
the repaired ship H is allowed to go out of the dock
14F to the coastal sea S. Further, the water drainage
10 operation is performed by gravity by using the water
discharge valve 25 of the coastal sea communicating
portion 16, which is provided in a position lower than
the water surface of the coastal sea S, and thereby oil
from the ship which may float on the sea water surface
15 is not drained to the coastal sea. This structure
eliminates the possibility of sea contamination.

Further, in the case of newly constructing a ship
H, component materials necessary for construction are
supplied onto the blocks 17 in the state where there is
20 no sea water in the subsequent dock 14R, and assembly
steps are performed and the ship H is finished. Next,
water level adjusting operation is performed as
described above by opening and closing the gates 20-R
and 20 of the subsequent dock 14R and the entrance dock
25 14F and by the water injection/drainage devices 18.

Thereby, the ship H is allowed to move from the
subsequent dock 14R to the dock 14F through the gate

20-R, and smoothly go out of the dock 14F to the coastal sea through the entrance/exit openable gate 20. Further, when construction is performed by using the dock 14S in the illustrated embodiment, the water level of the dock 14F is increased by the water injection/drainage device 18 to be equal to or higher than the water level of the coastal sea, in the state where the ship H is located in the dock 14F. Thereafter, sea water is further injected, and thereby a sufficient water level is secured in the dock 14S. In this state, the ship H floating in the dock 14F can be moved to the dock 14S. Conversely, when the ship H is located in the dock 14S, the ship H can be moved to the dock 14F.

Therefore, according to the dock 14S having the above structure, it is unnecessary to provide a special openable gate such as in the dock 14R, and thus it is unnecessary to operate the openable gate. Further, the water level of the dock 14F can be equalized with the water level of the dock 14S, by increasing the water level of the dock 14F to be higher than the bottom portion of the dock 14S by the water injection/drainage device 18. Therefore, the ship H can be moved between the docks, by only increasing and reducing the water level of the dock 14F.

In the above embodiment, appropriate means such as self-propelling and towage by a winch and a boat can

be adopted as the power for moving the ship H, and equipment necessary for them can be provided on a platform provided on the peripheral walls 12.

Although it is explained in the above embodiment
5 that the dock 14F is provided for allowing the ship H to enter or exit from the dock, blocks as used in the other docks can be provided in the bottom portion of the dock 14F. Thereby, a space for construction or repair can be formed by discharging water from the dock
10 14F by the water injection/drainage device 18 in the same manner as in the dock 14R, in the state where the gates 20 and 20-R are closed.

The following is explanation of a method of constructing ships, which enables movement of ships
15 with respect to the subsequent dock, by using the constituent elements in the above embodiment of the construction system, that is, the dock 14F of the above structure, the entrance/exit gate 20, the water injection/drainage device 18 for the dock, the openable
20 gate 20-R, the subsequent dock 14R, and the second water injection/drainage device 18 which injects and drains water with respect to the subsequent dock.

This method is a ship construction method in which a ship H which requires repairing and maintenance is
25 put into the dock 14F through the entrance/exit gate 20 opened in the state where the water level in the dock 14F is made to conform to the water level of the

coastal sea. Then, the water level in the subsequent dock 14R communicating with the dock 14F is adjusted, and thereby the ship H is moved into the subsequent dock 14R. Then, after the water in the subsequent dock 14R is drained, the ship H is fixed and subjected to construction, that is, necessary repair and maintenance.

Next, a second embodiment of the present invention illustrated in FIGS. 7 to 11 is explained. In the second embodiment, the same constituent elements as those in the first embodiment are denoted by the same reference numbers, and explanation thereof is omitted.

The construction system 10 is provided in the vicinity of the coastline CL located on the boundary of the coastal sea S and the land L, in the same manner as the first embodiment. As illustrated in FIG. 7, the construction system 10 is surrounded by standing peripheral walls 12 which are supported by the land, that is, the ground L.

Specifically, in FIG. 7, the dock 14 has a rectangular shape and includes a communicating portion 16. The communicating portion 16 is located nearly in the boundary between the coastal sea S and the land L, and a part of the communicating portion 16 faces the coastal sea S, and can communicate with the coastal sea S. The height of the peripheral walls 12 is about 10m as in the first embodiment, such that the sea water in

the dock 14 is maintained at a predetermined level.

A part of the communicating portion 16 is provided with an entrance/exit openable gate 20 which is opened and closed by control, and thereby an entrance dock 14F
5 for ship H is formed.

A plurality of construction docks having the same shape, that is, subsequent docks 14-1, 14-2, 14-3, 14-4 and 14-5 are formed parallel on the side and at the rear of the dock 14F. The subsequent docks 14-1 to 15-
10 5 communicate with each other through a movement channel 30 through which the ship H is moved. The channel 30 is formed to have almost the same depth as that of the construction subsequent dock 14 of the first embodiment, to substantially eliminate the need
15 for excavation of the ground. The subsequent docks 14-1 and 14-2 have almost the same depth as that of the channel 30, and are successively provided adjacent to the side of the entrance dock 14F. The subsequent docks 14-3, 14-4, and 14-5 also have the same depth as
20 that of the channel 30, and are positioned distant from the entrance dock 14F toward the land side, with the channel 30 interposed therebetween, and positioned adjacent to each other. Therefore, a part of the peripheral walls 12 surrounding the subsequent docks
25 are used in common.

Among the peripheral walls 12, peripheral walls of the respective docks facing the channel 30, that is,

partition walls 32 are provided with movement openable gates 20-R, 20-1, ..., 20-5, respectively, having the same structure as that of the openable gate 20.

FIG. 8 is a cross-sectional view illustrating cross sections of the entrance dock 14F and the subsequent docks 14-1 and 14-2 in the above construction system 10. FIG. 9 is a cross-sectional view illustrating cross sections of the subsequent docks 14-3, 14-4 and 14-5. Specifically, the entrance dock 14F serves as an entrance directly contacting the coastal sea, and thus is deeply excavated through the entire length of the rectangular shape toward the coastal sea S, in the same manner as in the first embodiment, such that ship H can easily enter and exit from the dock from and to the coastal sea S through the openable gate 20.

Further, each subsequent dock has a bottom portion having almost the same depth as, or a depth less than, that of the channel 30 which is formed shallower than the entrance dock 14F. The entrance dock 14F and the docks 14-1, ..., 14-5 being the subsequent docks R are connected with a water injection/drainage device 18 and second water injection/drainage devices 18-1, ..., 18-5, respectively. FIG. 10 and 11 are schematic diagrams illustrating the piping system thereof. Specifically, the water injection/drainage device 18 and the second water injection/drainage devices 18-1 to 18-5 have a

structure in which a water injection/drainage pump 22 and respective valves 24 are connected to the respective docks through respective water injection/drainage ports 26. The pump 22 also
5 communicates with the coastal sea S through a strainer 27 and a valve 28 via a sea chest 29.

The water levels in the entrance dock 14F, the channel 30, and the subsequent docks 14-1 to 14-5 are adjusted by operation of the pump 22 and
10 opening/closing operation of the valves 24 of the respective docks and the valve 28, and set to the same water level through the openable gates. Thereby, the ship H can move between the docks, between one of the docks and the channel 30, and between the entrance dock
15 14F and the coastal sea, through the openable gates 20, 20-R, and 20-1 to 20-5.

Operation of the construction system 10 of the second embodiment having the above structure is explained below. In this explanation, among
20 construction of ship H, an example where ship H is repaired is described. First, a ship H to be repaired is positioned in the vicinity of the construction system 10 in the coastal sea S. Then, the ship H is moved into the dock 14F through the entrance/exit
25 openable gate 20, in the state where the dock 14F is set to the same water level as that of the coastal sea. Thereafter, the gate 20 is closed, the water levels of

the entrance dock 14F and the channel 30 are increased by the water injection/drainage device 18, and the ship H is moved into the channel 30 through the openable gate 20-R between the dock 14F and the channel 30.

5 Therafter, for example, the openable gate 20-3 of the dock 14-3 being the subsequent dock, to which the ship H has been moved, is closed, and the water level in the dock 14-3 is increased to the same level as that of the channel 30 by the water injection/drainage device 18 of
10 the dock 14-3. Then, the openable gate 20-3 is opened, and the ship H positioned in the channel 30 is moved into the dock 14-3 in the state of floating on the sea water through the openable gate 20-3. Next, the openable gate 20-3 is closed, and the water
15 injection/drainage device 18 is driven to drain the sea water in the subsequent dock 14-3. Thereby, the ship H is stably placed with its bottom placed on the blocks 17, and subjected to repair.

After a necessary repair process is finished in
20 the subsequent dock 14-3, water is injected into the dock 14-3 by the water injection/drainage device 18 with the openable gate 20-3 closed, and the ship H is floated up from the blocks 17. Thereby, the repaired ship H is floated on the sea water. In this state, the
25 water levels of the channel 30 and the dock 14F are increased to be the same as the water level of the subsequent dock 14-3 by operating the water

injection/drainage devices 18. Then, the openable gates 20-3 and 20-R are opened, and the ship H is moved from the dock 14-3 to the channel 30, and further to the entrance dock 14F. Thereafter, the operable gate
5 20-R is closed, and the water in the dock 14F is drained to lower the water level in the dock 14F to the water level of the coastal sea. Thereby, the ship H is allowed to go out of the dock to the coastal sea S through the opened entrance/exit gate 20.

10 Further, the same operation is performed also in the case of constructing a new ship. For example, after a newly constructed ship is finished in the subsequent dock 14-3, the ship H is successively moved between the subsequent dock 14-3, the channel 30 and
15 the entrance dock 14F at the same water level, by controlling openable gates 20-3 and 20-R, the entrance/exit gate 20 and the respective water injection devices 18 in association with each other. Thereby, the ship H is allowed to smoothly go to the
20 coastal sea S.

Although a ship is constructed by using a single construction dock in the above embodiments, a plurality of ships can be simultaneously repaired in a plurality of docks, for example, in the subsequent docks 14-1,
25 14-2. Further, new ships can be simultaneously constructed in the subsequent docks 14-3 and 14-5. In each construction, each ship can be moved and allowed

to enter and exit from the dock by the same process as described above.

Further, although each construction dock has almost the same planar shape as that of the entrance dock in the above embodiments, a dock having a
5 different size, that is, having a different length, width, or depth can be prepared, if necessary.

Although operation of moving the ship between the docks and the coastal sea having the same water level is explained in the above embodiments, movement of
10 ships can be performed even when there is a certain difference in the water level between them. A transient difference in water level does not cause a substantial problem, as long as it does not impede
15 moving operation between the moving regions.

The following is explanation of constituent elements of the construction system according to the second embodiment. In other words, the following is explanation of a method of constructing ships using the
20 dock 14F of the above structure, the subsequent docks, and the channel 30 provided therebetween. The method enables movement of a ship H with respect to the desired subsequent dock through the channel 30, by using the entrance/exit gate 20, the water
25 injection/drainage device 18 for the dock 14F, the openable gates 20-R and 20-1 to 20-5, the subsequent docks 14-1 to 14-5, and the second water

injection/drainage devices 18 which inject and drain water with respect to the respective subsequent docks.

5 This method is a ship construction method in which a ship H which requires repairing and maintenance is put into the dock 14F through the entrance/exit gate 20 opened in a state where the water level in the dock 14F is made to conform to the water level of the coastal sea. Then, the water level in the subsequent dock 14-1 communicating with the dock 14F through the channel 30
10 is adjusted, and thereby the ship H is moved to the subsequent dock 14-1. Then, after the water in the subsequent dock 14-1 is drained, the ship H is fixed and subjected to construction, that is, necessary repair and maintenance.

15 As described above, in the above embodiments, the entrance/exit gate and the movement gates are opened and closed by control in association with each other, and water injection/drainage operation of the water injection/drainage devices is controlled in association
20 with the gates. Thereby, ships can be moved to and from the desired dock as required.

Advantages of the invention will be set forth in the description which follows, and in part will be obvious from the description, or may be learned by
25 practice of the invention. Advantages of the invention may be realized and obtained by means of the instrumentalities and combinations particularly pointed

out hereinafter.

Additional advantages and modifications will readily occur to those skilled in the art. Therefore, the invention in its broader aspects is not limited to
5 the specific details and representative embodiments shown and described herein. Accordingly, various modifications may be made without departing from the spirit or scope of the general inventive concept as defined by the appended claims and their equivalents.

WHAT IS CLAIMED IS:

1. A ship construction system comprising:

a dock which is surrounded by a peripheral wall supported by ground, has a communicating portion at least part of which communicates with coastal sea, and has a depth that allows a ship to enter and exit from the dock while floating at a water level of the coastal sea;

an entrance/exit openable gate provided on the communicating portion, the entrance/exit openable gate allowing passage of the ship floating on sea water when the entrance/exit openable gate is opened, and maintaining sea water of a water level higher than the water level of the coastal sea in the dock when the entrance/exit openable gate is closed;

a water injection/drainage device which injects water into and drains water from the dock in a state where the entrance/exit openable gate is closed;

a subsequent dock provided on the dock, the subsequent dock following the dock and connecting with a part of the peripheral wall through a openable gate for movement which allows passage of the ship, the subsequent dock having a depth less than the depth of the dock, and having a bottom portion on which the ship is placed; and

a second water injection/drainage device which injects and drains water into and from the subsequent

dock in a state where the openable gate for movement is closed, such that the subsequent dock maintains the same water level as that of the dock.

2. A ship construction system according to
5 claim 1, wherein a table dock is provided adjacent to the dock, the table dock has a depth less than the depth of the dock and allowing movement of the ship floated by the water level of the dock, and the ship can be placed on a bottom portion of the table dock.

10 3. A ship construction system according to claim 1, wherein a movement channel is provided between the dock and the subsequent dock, and the movement channel allows movement of the floating ship between the docks through the gate for movement.

15 4. A ship construction system according to claim 1, further comprising one or more subsequent dock having the same structure as that of the subsequent dock.

20 5. A ship construction system according to any one of claims 1, 3 and 4, wherein the entrance/exit gate and the gate for movement are opened and closed by control in association with each other to allow movement of the ship to a desired dock.

25 6. A ship construction method using a system comprising:

a dock which is surrounded by a peripheral wall supported by ground, has a communicating portion at

least part of which communicates with coastal sea, and has a depth that allows a ship to enter and exit from the dock while floating at a water level of the coastal sea;

5 an entrance/exit openable gate provided on the communicating portion, the entrance/exit openable gate allowing passage of the ship floating on sea water when the entrance/exit openable gate is opened, and maintaining sea water of a water level higher than the
10 water level of the coastal sea in the dock when the entrance/exit openable gate is closed;

 a water injection/drainage device which injects water into and drains water from the dock in a state where the entrance/exit openable gate is closed;

15 a subsequent dock provided on the dock, the subsequent dock following the dock and connecting with a part of the peripheral wall through a openable gate for movement which allows passage of the ship, the subsequent dock having a depth less than the depth of
20 the dock, and having a bottom portion on which the ship is placed; and

 a second water injection/drainage device which injects and drains water into and from the subsequent dock in a state where the openable gate is closed, such
25 that the subsequent dock maintains the same water level as that of the dock and the ship is allowed to move into the subsequent dock.

7. A ship construction method according to
claim 6, wherein a movement channel is provided between
the dock and the subsequent dock, and the movement
channel allows movement of the floating ship between
5 the docks through the openable gate such that the ship
is moved to the desired subsequent dock.