

Description

Title of Invention: ANTI-FLOATING DEVICE

Technical Field

5 **[0001]** The present disclosure relates to anti-floating devices preventing tanks disposed on a ship from floating.

[0002]

Background Art

[0003] A ship is used to transport gas. The gas being
10 transported may be liquefied gas. The gas is filled in a tank, and the tank is accommodated inside the hull of the ship. During the transport process, there are cases where the ship may sink due to an unexpected accident.

[0004] When a ship sinks, the gravity acting on the ship is
15 greater than the buoyancy acting on the ship, so the combined force of gravity and buoyancy acting on the ship is directed downwards on the water surface. However, the density of the tank accommodated inside the hull of the ship is less than the density of water, so the combined
20 force of gravity and buoyancy acting on the tank in the sinking situation of the ship is directed upwards on the water surface. Therefore, when the ship sinks, the tank floats up, and the tank and the inner surface of the hull may collide, causing the hull and the tank to be damaged.

25 **[0005]** To prevent damage to the hull and the tank, anti-floating chocks were installed on the outer surface of the tank and inside the hull in the related art. However, the anti-floating chocks should be installed on all the inner

surfaces of the hull that may come into contact with the tank. In addition, the anti-floating chocks should also be installed on the tank that may come into contact with the inner surface of the hull. The construction of anti-floating
5 chocks requires a large amount of materials and also has the problem of requiring a lot of man-hours due to complex construction thereof.

[0006] In addition, in the related art, reinforcement was constructed on the inner surface of the hull to construct
10 the anti-floating chock. The reinforcement is intended to secure structural safety for the hull and the tank itself when in contact with the anti-floating chock, and is constructed in the same position as the anti-floating chock, and the construction direction thereof is directed toward
15 the inside of the hull, that is, it is designed to be disposed on the surface facing the inside of the hull so that it has sufficient strength in preparation for contact with the anti-floating chock. In this manner, when the reinforcement is disposed toward the inside of the hull
20 where the tank is accommodated, there is a problem that the size of the space where the tank may be disposed and the capacity of the tank are reduced by the space occupied by the reinforcement.

[0007]

25 Disclosure of Invention
Technical Problem

[0008] An aspect of the present disclosure is to provide an anti-floating device that stably supports a tank while

having a simple structure to solve such a problem.

[0009]

Solution to Problem

[0010] According to an aspect of the present disclosure, an
5 anti-floating device includes a first connection part
coupled to a hull; a second connection part coupled to a
tank; and a floating capture connecting the first connection
part and the second connection part. The floating capture
has a belt structure.

10 **[0011]** The anti-floating device may include a first pin
disposed on the first connection part; and the floating
capture may be disposed such that at least a portion of an
inner peripheral surface is spaced apart from at least a
portion of an outer peripheral surface of the first pin in
15 a longitudinal direction of the floating capture.

[0012] The anti-floating device may include a second pin
disposed on the second connection part; and the floating
capture may be disposed to surround the first pin and the
second pin.

20 **[0013]** The floating capture may be disposed as a plurality
of floating captures, and the plurality of floating captures
may be disposed to be spaced apart from each other in a
longitudinal direction of the first connection part.

[0014] A material of the floating capture may be an elastic
25 body or steel.

[0015] The floating capture may be provided with a cap
fitted and coupled to one end thereof.

[0016] The first connection part may be provided with a

first pin disposed thereon; the second connection part may be provided with a second pin disposed thereon; and the floating capture may be disposed to surround the first pin and the second pin, wherein one end of the second pin is
5 fitted and coupled to the cap.

[0017]

Advantageous Effects of Invention

[0018] According to the present disclosure, when a ship sinks, the tank may be prevented from floating inside the
10 hull. Furthermore, in the event of a ship sinking, the tank and the hull may be prevented from colliding and being damaged.

[0019] In addition, the pipe support structure may be optimized by horizontalizing the upper deck of the hull
15 through disposing of the reinforcing member, and the space for disposing the tank inside the hull may be secured greatly, so that the capacity of the tank may be increased.

[0020] In addition, the construction of the anti-floating device may be facilitated by using the cap, and the
20 insulation performance of the tank may be improved.

[0021]

Brief Description of Drawings

[0022] FIG. 1 is a cross-sectional view of a hull of a ship and a tank disposed inside the hull according to an
25 embodiment of the present disclosure.

[0023] FIG. 2 is an enlarged view of a portion of the ship and a floating holding device illustrated in FIG. 1.

[0024] FIG. 3 is a cross-sectional view taken along line A-

A' of FIG. 2.

[0025] FIG. 4 is a drawing illustrating a floating capture according to an embodiment of the present disclosure.

[0026] FIG. 5 is a drawing illustrating the upper portion
5 of a ship hull according to an embodiment of the present disclosure.

[0027] FIG. 6 is a cross-sectional view illustrating a ship hull and a tank disposed inside the hull according to the related art.

10 **[0028]** FIG. 7 is a drawing comparing a tank of a ship according to the related art with a tank of a ship according to an embodiment of the present disclosure.

[0029] FIG. 8 and FIG. 9 are drawings illustrating a coupled structure of an anti-floating device and a cap.

15 **[0030]** FIG. 10 is a perspective view of a cap according to the present disclosure.

[0031] FIG. 11 is a plan view of a cap according to the present disclosure.

[0032] FIG. 12 is a flow chart illustrating a method for
20 constructing insulation on a tank of a ship according to the present disclosure.

[0033]

Best Mode for the Invention

[0034] Before going into the detailed description of
25 embodiments of the present disclosure, the terms or words used in the this specification and claims should not be interpreted as limited to their usual or dictionary meanings, but should be interpreted as meanings and concepts that

conform to the technical idea of the present disclosure based on the principle that the inventor may appropriately define the concept of the term to explain his or her own invention in the best way. Therefore, the embodiments
5 described in this specification and the configurations illustrated in the drawings are only the preferred embodiments of the present disclosure, and do not represent all of the technical ideas of the present disclosure, so it should be understood that there may be various equivalents
10 and modified examples that may replace the same at the time of this application.

[0035] In the following description, the singular expression includes the plural expression unless the context clearly indicates otherwise. It should be
15 understood that the terms "include," "configure," or the like are intended to specify the presence of a feature, number, step, operation, component, part, or combination thereof described in the specification, but do not preclude the possibility of the presence or addition of one or more
20 other features, numbers, steps, operations, components, parts, or combinations thereof.

[0036] In addition, in the following description, the expressions such as upper side, upper, lower side, lower, below, side, front, rear, and the like are expressed based
25 on the direction depicted in the drawings, and it should be noted in advance that they may be expressed differently if the direction of the corresponding object changes.

[0037] In addition, in this specification and claims, terms

including ordinal numbers such as "first", "second", or the like may be used to distinguish between components. These ordinals are used to distinguish between identical or similar components, and the meaning of the terms should not be limited due to the use of these ordinals. For example, components combined with these ordinals should not be limited in their use order, location order, or the like by their numbers. If necessary, respective ordinal numbers may be used interchangeably.

10 **[0038]** Hereinafter, embodiments of the present disclosure will be described with reference to the attached drawings. However, the idea of the present disclosure is not limited to the presented embodiments. For example, a person skilled in the art who understands the idea of the present disclosure may suggest other embodiments included within the scope of the idea of the present disclosure by adding, changing, deleting components, or the like, but this will also be included within the scope of the idea of the present disclosure. The shape, size and the like of elements in the drawing may be exaggerated for clearer explanation.

[0039]

[0040] FIG. 1 is a drawing illustrating a cross-section of a hull of a ship and a tank disposed inside the hull according to an embodiment of the present disclosure.

25 **[0041]** Referring to FIG. 1, a ship (100) according to an embodiment of the present disclosure may include a hull (110), a tank (120), a reinforcing member (130), and an anti-floating device (140).

[0042] The hull (110) forms at least a portion of the appearance of the ship (100) and may be provided to accommodate the tank (120) therein. For example, an accommodation space (115) in which the tank (120) may be disposed may be provided inside the hull (110). The anti-floating device (140) may be provided between the hull (110) and the tank (120).

[0043] The accommodation space (115) of the hull (110) may be provided as a space surrounded by an upper plate (111), a lower plate (112) and side plates (113, 114) of the hull (110). The upper plate (111) and the lower plate (112) may be disposed to face each other while being spaced apart from each other, and the two side plates (113, 114) may connect both ends of the upper plate (111) and the lower plate (112), respectively. For example, the upper plate (111), the lower plate (112), and the inner side surfaces (for example, the surfaces facing the inside of the hull (110)) of the side plates (113, 114) may form the upper surface, the lower surface and the side surface of the accommodation space (115), respectively. The upper plate (111) and the tank (120) of the hull (110) may be disposed to be spaced apart from each other at a specified interval without a separate structure connecting the same.

[0044] The upper plate (111) of the hull (110) may be inclined at a predetermined incline. The upper plate (111) may be inclined to form a predetermined angle with a virtual extension line extended in a direction parallel to the lower plate (112). For example, the upper plate (111) may be

formed such that the left and right portions are inclined downward, respectively, based on a center line (C) extended in a height direction (H) while passing through the center of the width direction (W) of the hull (110). In this case, the virtual extension line may be parallel to the width direction (W) of the hull (110) and perpendicular to the center line (C). In detail, the left portion of the upper plate (111) based on the center line (C) of the hull (110) may be connected to the first side plate (113) while being inclined at a predetermined angle toward the lower plate (112), and the right portion of the upper plate (111) may be connected to the second side plate (114) while being inclined at a predetermined angle toward the lower plate (112).

[0045] The height direction (H) of the hull (110) may mean the up-down direction of the hull (110), that is, both directions in which the upper plate (111) and the lower plate (112) face, and the width direction (W) of the hull (110) may mean the left-right direction, that is, the direction in which the two side plates (113, 114) face. The longitudinal direction of the hull (110) may mean the forward-backward direction of the hull (110) and refer to a direction in which the ship (100) moves when the ship (100) is operating and a direction opposite thereto. For example, FIG. 1 illustrates a cross-section of the ship (100) cut in the width direction (W).

[0046] The hull (110) may be symmetrical about the center line (C), but is not limited thereto. A reinforcing member

(130) may be disposed on the upper plate (111) of the hull (110). For example, the reinforcing member (130) may be disposed on a surface of the upper plate (111) of the hull (110) facing the outside of the hull (110).

5 **[0047]** The tank (120) may be disposed in the accommodation space (115) of the hull (110). A storage space for storing or accommodating cargo may be provided inside the tank (120). The tank (120) may be provided to accommodate liquefied gas. For example, the material loaded or stored in the tank (120)
10 may be LNG or LPG. However, the material stored in the tank (120) is not limited to liquefied gas, and various materials may be stored. The storage space of the tank (120) may be provided as a plurality of spaces separated from each other, but is not limited thereto.

15 **[0048]** The tank (120) may be disposed in the accommodation space (115) of the hull (110), but may be spaced apart from the inner surface of the accommodation space (115). For example, the outer surface of the tank (120) may be spaced apart from the inner surface of the accommodation space
20 (115) by a predetermined distance. The tank (120) may include an upper surface (121), side surfaces (123, 124), and a lower surface (122), forming the appearance of the tank (120). The upper surface (121) of the tank (120) may face the upper plate (111) of the hull (110) while being
25 spaced apart therefrom, the lower surface (122) of the tank (120) may face the lower plate (112) of the hull (110) while being spaced apart therefrom, and the two side surfaces (123, 124) of the tank (120) may face the two side plates

(113, 114) of the hull (110) while being spaced apart therefrom, respectively.

[0049] The reinforcing member (130) may be disposed on the upper plate (111) of the hull (110) to be located outside
5 the hull (110). For example, the reinforcing member (130) may be disposed on the upper portion or upper surface of the upper plate (111). The reinforcing member (130) may be referred to as a structure for preventing bending or buckling of the upper plate (111) by being fixed to the
10 upper plate (111). For example, the reinforcing member (130) may be installed on the upper portion of the upper plate (111) by various coupling methods or fixing methods.

[0050] The reinforcing member (130) may be provided so that an upper edge portion (133) is horizontal. The upper edge
15 portion (133) of the reinforcing member (130) may be perpendicular to the center line (C) of the hull (110). In addition, the upper edge portion (133) of the reinforcing member (130) may extend parallel to the width direction (W) and/or the longitudinal direction. For example, the upper
20 edge portion (133) of the reinforcing member (130) may form a predetermined angle with the upper plate (111) of the hull (110) inclined at a predetermined incline, and simultaneously therewith, may be parallel to the lower plate (112) of the hull (110). In detail, the reinforcing member
25 (130) may be provided such that the upper edge portion (133) is parallel to a virtual extension line that extends in a direction parallel to the lower plate (112). That is, the upper plate (111) is formed to be inclined to form a

predetermined angle with the virtual extension line, and the reinforcing member (130) is formed such that the upper edge portion (133) is parallel to the virtual extension line.

5 **[0051]** The reinforcing member (130) may be provided in a shape in which the height gradually increases and/or decreases. The reinforcing member (130) may be formed in a shape in which the height varies along the width direction (W) based on the center line (C) of the hull (110). For
10 example, when looking at the cross section of FIG. 1, the reinforcing member (130) may be provided in a shape in which the height of a portion thereof located on the left side of the center line (C) gradually increases toward the first side plate (113) and the height of a portion thereof located
15 on the right side gradually increases toward the second side plate (114). The detailed structure and arrangement structure of the reinforcing member (130) will be described later with reference to FIG. 5.

[0052] The anti-floating device (140) may connect a portion
20 of the hull (110) and a portion of the tank (120). The anti-floating device (140) may be disposed between the lower surface (122) of the tank (120) and the lower plate (112) of the hull (110) to connect the lower surface (122) and the lower plate (112). The anti-floating device (140) may
25 be provided in plural. For example, the plurality of anti-floating devices (140) may be disposed spaced apart from each other to connect the hull (110) and the tank (120).

[0053] The anti-floating device (140) may prevent the tank

(120) from colliding with the hull (110) by restricting the floating and movement of the tank (120) when a buoyancy force is applied to the tank (120) due to a situation in which a ship in which the tank (120) is installed sinks, or
5 the like, by connecting the tank (120) to the hull (110) with a predetermined strength. The detailed structure and connection structure of the anti-floating device (140) are described in detail below with reference to FIG. 2.

[0054] In a ship (100) according to an embodiment of the
10 present disclosure, an anti-floating device (140) is provided between the lower surface (122) of the tank (120) and the hull (110) to connect and support the tank (120) and the hull (110), so that a separate connection structure, fixed structure, or support structure is unnecessary
15 between the hull (110) and an outer surface of the tank (120) other than the lower surface (122). In detail, floating of the tank (120) may be prevented even without a separate device (for example, anti-floating chock) for spacing the upper plate (111) of the hull (110) and the
20 upper surface (121) of the tank (120) apart from each other by a certain distance.

[0055] In addition, since in the ship (100) according to an embodiment of the present disclosure, a connecting structure, a fixed structure, or a supporting structure
25 between the upper surface (121) of the tank (120) and the upper plate (111) of the hull (110) may be omitted, a reinforcing material for installing these structures also does not need to be provided between the upper plate (111)

and the tank (120), and thus the reinforcing member (130) may be installed on the outside of the hull (110), not on the inside of the accommodation space (115), in detail, on the upper portion of the upper plate (111) (for example, on
5 the upper portion of the hull deck).

[0056] In addition, the ship (100) according to an embodiment of the present disclosure may secure a relatively wide accommodation space (115) by disposing the reinforcing member (130) outside the upper plate (111) of the hull (110)
10 instead of disposing the same on the accommodation space (115) side of the hull (110), and accordingly, the capacity of the tank (120) may be increased.

[0057]

[0058] FIG. 2 is an enlarged drawing of a portion of the ship and the floating anchorage device illustrated in FIG.
15 1.

[0059] FIG. 2 is an enlarged drawing of the left portion of the ship (100) based on the center line (C) in the cross-sectional view illustrated in FIG. 1, and is a drawing
20 illustrating the detailed configuration of the anti-floating device (140). FIG. 3 is a drawing illustrating the A-A' cross-section of FIG. 2.

[0060] Referring to FIGS. 2 and 3, the anti-floating device (140) may connect the lower surface (122) of the tank (120)
25 to the hull (110). Accordingly, the anti-floating device (140) may perform the function of supporting the load (for example, vertical load) of the tank (120) and, at the same time, prevent the tank (120) from rising due to buoyancy in

a specific situation (for example, sinking of the ship).

[0061] The anti-floating device (140) may include a first connection part (141), a first pin (142), a first reinforcing portion (143), a second connection part (144),
5 a second pin (145), a second reinforcing portion (146), and a floating capture (147).

[0062] The first connection part (141) may be disposed on the lower plate (112) of the hull (110). The first connection part (141) may be connected to the second
10 connection part (144) disposed on the tank (120). For example, the first connection part (141) may be connected to the second connection part (144) via the floating capture (147). The first connection part (141) may be coupled to a surface facing the tank (120) in the lower plate (112) of
15 the hull (110). The first connection part (141) may protrude from the lower plate (112) of the hull (110) toward the tank (120). A longitudinal direction of the first connection part (141) may be a direction parallel to the lower plate (112) of the hull (110). The tank (120) may be disposed on
20 the upper portion of the first connection part (141), and the first connection part (141) may support the load of the tank (120). The first pin (142) may be inserted into the first connection part (141). For example, a hole (not illustrated) into which the first pin (142) is to be
25 inserted may be formed in the first connection part (141). A floating capture (147) may be connected to the first pin (142).

[0063] The first reinforcing portion (143) may be a flat

plate having a hole in the center. The first reinforcing portion (143) may be a flat plate having a constant thickness. The first reinforcing portion (143) may be in contact with the first connection part (141). The hole of the first reinforcing portion (143) may be aligned with the hole of the first connection part (141). The first pin (142) may be inserted into the hole of the first reinforcing portion (143) and the hole of the first connection part (141). The first reinforcing portion (143) may be disposed between the first connection part (141) and the first pin (142) to reduce the bending moment acting therebetween. In addition, the first reinforcing portion (143) may be disposed between the first connection part (141) and the floating capture (147).

[0064] The second connection part (144) may be disposed on the lower surface (122) of the tank (120). The second connection part (144) may be connected to the first connection part (141) disposed on the hull (110). For example, the second connection part (144) may be connected to the first connection part (141) via a floating capture (147). The second connection part (144) may be coupled to the lower surface (122) of the tank (120) facing the hull (110). The second connection part (144) may protrude from the lower surface (122) of the tank (120) toward the lower plate (112) of the hull (110). The second connection part (144) may be symmetrical with the first connection part (141). The tank (120) may be disposed on the upper portion of the second connection part (144). The second connection

part (144) may be in contact with the first connection part (141) and may support the load of the tank (120) together with the first connection part (141). A second pin (145) may be inserted into the second connection part (144). For
5 example, a hole (not illustrated) into which the second pin (145) is to be inserted may be formed in the second connection part (144). A floating capture (147) may be connected to the second pin (145).

[0065] The second reinforcing portion (146) may be a flat
10 plate having a hole in the center. The second reinforcing portion (146) may be a flat plate having a constant thickness. The second reinforcing portion (146) may be in contact with the second connection part (144). The hole of the second reinforcing portion (146) may be aligned with
15 the hole of the second connection part (144). The second pin (145) may be inserted into the hole of the second reinforcing portion (146) and the hole of the second connection part (144). The second reinforcing portion (146) may be disposed between the second connection part (144)
20 and the second pin (145) to reduce the bending moment acting therebetween. In addition, the second reinforcing portion (146) may be disposed between the second connection part (144) and the floating capture (147).

[0066] The floating capture (147) may connect the first
25 connection part (141) and the second connection part (144). For example, the floating capture (147) may connect the first connection part (141) and the first connection part (141) by being connected to the first pin (142) inserted

into the first connection part (141) and the second pin (145) inserted into the second connection part (144). The floating capture (147) may be a belt. For example, the floating capture (147) may surround the first pin (142) and the second pin (145) and be connected to the first pin (142) and the second pin (145). In detail, a portion of the floating capture (147) may contact the first pin (142), and another portion facing the portion contacting the first pin (142) may contact the second pin (145).

10 **[0067]** The floating capture (147) may limit the movement and/or separation between the first connection part (141) and the second connection part (144) to a predetermined range by connecting the first pin (142) (for example, the first connection part (141)) and the second pin (145) (for example, the second connection part (144)). That is, by preventing the second connection part (144) from being separated from the first connection part (141) by a predetermined distance or more by the floating capture (147), the tank (120) may be prevented from floating from the lower plate (112) of the hull (110) and colliding with the inner surface of the accommodation space (115).

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[0068] The floating capture (147) may be provided in plural. For example, the first connection part (141) and the second connection part (144) may be connected through the plurality of floating captures (147). According to the embodiment illustrated in FIG. 2, the first connection part (141) and the second connection part (144) may be connected by four floating captures (147) that are spaced apart from each

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other. When the floating captures (147) are provided in plural, the first pins (142) and the second pins (145) are also provided in multiple numbers accordingly, and the first connection part (141) and the second connection part (144) may be provided with multiple holes for inserting the multiple first pins (142) and the multiple second pins (145) thereinto.

[0069] FIG. 4 is a perspective view of a floating capture according to an embodiment of the present disclosure.

10 **[0070]** The floating capture (147) may be a belt. The floating capture (147) may include a hole (361). The floating capture (147) may include a first inner surface (362), a second inner surface (363), a third inner surface (364), and a fourth inner surface (365).

15 **[0071]** The second inner surface (363) may face the first inner surface (362). The third inner surface (364) may be a surface connecting the first inner surface (362) and the second inner surface (363). The fourth inner surface (365) may be a surface connecting the first inner surface (362) and the second inner surface (363) and facing the third inner surface (364). The third inner surface (364) may include a curved surface. The third inner surface (364) may contact the first pin (142). The curvature of the third inner surface (364) may correspond to the curvature of the body (311) of the first pin (142). The fourth inner surface (365) may include a curved surface. The fourth inner surface (365) may contact the second pin (145). The curvature of the fourth inner surface (365) may correspond to the

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curvature of the body (341) of the second pin (145).

[0072]

[0073] The material of the floating capture (147) may be a composite material having strong tensile strength. For example, the floating capture (147) may be a CFRP (carbon fiber reinforced plastics) material. However, it is not limited to CFRP, and any material having a tensile strength that may prevent the tank (120) from floating when the ship sinks is sufficient. The floating capture (147) may have elasticity. The material of the floating capture (147) may be steel. In this case, the floating capture (147) may have a tensile strength that may prevent the tank (120) from rising when the ship sinks.

[0074]

[0075] FIG. 5 is a drawing illustrating the upper portion of the hull of a ship according to an embodiment of the present disclosure.

[0076] For example, FIG. 3 may be a perspective view of the upper plate (111) of the hull (110) in the ship (100) illustrated in FIG. 1, viewed from above.

[0077] Referring to FIG. 5, the ship (100) according to an embodiment of the present disclosure may be provided such that a reinforcing member (130) is disposed on the upper plate (111) of the hull (110).

[0078] The reinforcing member (130) may be disposed on the upper portion (for example, upper surface or outer surface) of the upper plate (111) to be located outside the hull (110). In this case, the upper plate (111) may be referred

to as a deck or upper deck of the hull (110).

[0079] The reinforcing member (130) may include a first reinforcing member (131) extending in the width direction (W) on the upper plate (111) of the hull (110) and a second reinforcing member (132) extending in the longitudinal direction (L) to be perpendicular to the first reinforcing member (131) and connected to the first reinforcing member (131). For example, the first reinforcing member (131) may be referred to as a main reinforcing member, and the second reinforcing member (132) may be referred to as a sub reinforcing member. Since FIGS. 1 and 2 illustrate cross-sections in the width direction (W), the reinforcing member (130) of FIGS. 1 and 2 may be referred to as the first reinforcing member (131).

[0080] The first reinforcing member (131) may have a shape having different heights along the width direction (W). The first reinforcing member (131) may be installed on an upper plate (111) that is inclined at a predetermined incline. The first reinforcing member (131) may include a first upper edge portion (133) that extends horizontally. The first upper edge portion (133) of the first reinforcing member (131) may be parallel to the width direction (W) of the hull (110). For example, the first reinforcing member (131) may be provided in a shape with different heights in the width direction (W) on the inclined upper plate (111), thereby implementing horizontal arrangement of the first upper edge portion (133).

[0081] The first reinforcing member (131) may be provided

in plural. For example, the plurality of first reinforcing members (131) may be disposed while being spaced apart from each other by a specified interval in the longitudinal direction (L). The plurality of first reinforcing members
5 (131) may be formed in a shape in which the first upper edge portion (133) may be horizontally disposed in response to the inclination of the upper plates (111) disposed respectively.

[0082] The second reinforcing member (132) may be connected
10 and fixed to the first reinforcing member (131) while at least partially penetrating the first reinforcing member (131). The second reinforcing member (132) may extend in the longitudinal direction (L) to penetrate the plurality of first reinforcing members (131), respectively. The
15 second reinforcing member (132) may include a second upper edge portion (134) connected to the first upper edge portion (133). The second upper edge portion (134) may also be horizontally disposed like the first upper edge portion (133). The second upper edge portion (134) of the second
20 reinforcing member (132) may be parallel to the longitudinal direction (L) of the hull (110).

[0083] The first reinforcing member (131) and the second reinforcing member (132) are disposed on the upper plate (111) of the hull (110), and may thus support at least a
25 portion of a plurality of pipes (not illustrated) installed on the upper plate (111). Accordingly, the length and size of the structure supporting the plurality of pipes on the upper plate (111) may be reduced, thereby reducing the

weight. In addition, since the upper edge portions (133, 134) of the first reinforcing member (131) and the second reinforcing member (132) are horizontalized, a plurality of pipes may be installed and supported in the horizontal portion. Accordingly, a support structure in which the installation of the plurality of pipes is easy and stable may be implemented.

[0084]

[0085] FIG. 6 is a drawing illustrating a cross-section of a ship hull according to the related art and a tank disposed inside the hull. FIG. 7 is a drawing comparing a tank of a ship according to the related art with a tank of a ship according to an embodiment of the present disclosure.

[0086] FIG. 6 and FIG. 7 are drawings for comparing a ship (100) according to an embodiment of the present disclosure with a ship (10) according to the related art, and in detail, may be drawings for illustrating that the effect of increasing the capacity of the tanks (13, 120) may be provided by a changed structure unlike the ship (10) of the related art.

[0087] Referring to FIG. 6, the ship (10) according to the related art may include a hull (11), a tank (13), a reinforcing member (14), and an anti-floating choke (15).

[0088] Compared with the ship (10) according to an embodiment of the present disclosure, the ship (10) according to the related art is provided with an anti-floating chock (15) between the upper surface of the tank (13) and the hull (11), and a reinforcing member (14) is

disposed on the upper plate (12) of the hull (11) to prepare against contact with the anti-floating chock (15) according to the installation of the anti-floating chock (15). At this time, the reinforcing member (14) should be disposed
5 in a position facing the anti-floating chock (15), and is thus disposed inside the hull (11), that is, in the space where the tank (13) is accommodated. In detail, the reinforcing member (14) is installed on a surface facing the inside of the hull (11) or a surface facing the tank
10 (13) in the upper plate (12) of the hull (11), and the anti-floating chock (15) is disposed between the reinforcing member (14) and the tank (13).

[0089] In the ship (10) according to the related art, as the reinforcing member (14) is disposed inside the hull
15 (11), the size of the space in which the tank (13) may be disposed is reduced by the space occupied by the reinforcing member (14), and the tank (13) is formed to a size corresponding to the accommodation space. That is, in the related art, the capacity of the tank (13) is limited as
20 the reinforcing member (14) is installed on the inner-side surface of the upper plate (12) corresponding to the installation position of the anti-floating choke (15).

[0090] In contrast, in the ship (100) according to an embodiment of the present disclosure, the support and
25 floating prevention of the tank (120) may be performed by the anti-floating device (140) disposed between the bottom surface of the tank (120) and the hull (110) as described above, so that by disposing the reinforcing member (130) on

the upper portion of the deck (for example, the upper plate (111)) of the hull (110), the size of the space in which the tank (120) may be disposed may be increased.

[0091] According to an embodiment of the present disclosure, the space occupied by the reinforcing member (14) in the related art may be utilized as the arrangement space of the tank (13, 120), so that the capacity and volume of the tank (13, 120) may be expanded as illustrated in FIG. 5. That is, the ship (100) in the present disclosure may load a tank (120) having a larger capacity and volume than the tank (13) of the ship (10) of the related art, depending on the arrangement of the reinforcing member (130) on the deck. For example, the tank (120) equipped in the ship (100) of the present disclosure may have a volume expanded by about 6 to 7% compared to that of the tank (13) equipped in the ship (10) of the related art, but the above numerical values are illustrative and are not limited thereto.

[0092]

[0093] FIG. 8 and FIG. 9 are drawings illustrating a coupling structure of an anti-floating device and a cap, FIG. 10 is a perspective view of a cap according to the present disclosure, and FIG. 11 is a plan view of a cap according to the present disclosure.

[0094] The cap (400) may include a body portion (410) and a grip portion (420).

[0095] The body portion (410) and the grip portion (420) may be coupled. The body portion (410) and the grip portion (420) may be formed integrally. One surface of the body

portion (410) and one surface of the grip portion (420) may be coupled by contact.

[0096] The body portion (410) and the grip portion (420) may have a cylindrical shape. The body portion (410) and
5 the grip portion (420) may have a shape similar to a disc shape having an approximate thickness. The body portion (410) may include a groove portion (415).

[0097] The radius of the grip portion (420) may be larger than the radius of the body portion (410). Therefore, the
10 outer peripheral surface of the grip portion (420) and the outer peripheral surface of the body portion (410) may form a step.

[0098] The body portion (410) may include the groove portion (415). The groove portion (415) may be disposed on one
15 surface of the body portion (410). One surface of the body portion (410) on which the groove portion (415) is disposed may be a surface disposed on the opposite side to one surface of the body portion (410) on which the grip portion (420) is disposed.

[0099] The groove portion (415) may be formed by recessing
20 in the axial direction of the body portion (410) on one surface of the body portion (410). A first pin (142) or a second pin (145) and a floating capture (147) may be fitted and coupled to the groove portion (415).

[00100] A cap (400) may be used to couple the floating
25 capture (147) to the first pin (142) and the second pin (145). The worker may couple the floating capture (147) fitted and coupled with the cap (400) to the first pin (142)

and the second pin (145).

[00101] A cap (400) may be coupled to one side of the floating capture (147). When the worker couples the floating capture (147) to the first pin (142) or the second pin (145),
5 the worker may grip the grip portion (420) of the cap (400) and couple the floating capture (147) to the first pin (142) or the second pin (145). Therefore, the worker may easily perform the task of coupling the floating capture (147) to the first pin (142) or the second pin (145) using the cap
10 (400).

[00102] In addition, the floating capture (147) and the first pin (142) may be disposed while being spaced apart from each other by a predetermined range. At least a portion of the inner surface of the floating capture (147) and at
15 least a portion of the outer peripheral surface of the first pin (142) may be disposed while being spaced apart from each other. At least a portion of the inner surface of the floating capture (147) and at least a portion of the outer peripheral surface of the first pin (142) may be disposed
20 while being spaced apart from each other in the longitudinal direction of the floating capture (147).

[00103] In other words, based on a state in which the floating capture (147) is coupled to the first pin (142) and the second pin (145), when a maximum distance between
25 the outer peripheral surface of the first pin (142) and the outer peripheral surface of the second pin (145) is referred to as a first separation distance, and a maximum width of the inner peripheral surface of the floating capture (147)

is referred to as a second separation distance, the second separation distance is greater than the first separation distance.

[00104] That is, the floating capture is disposed to
5 surround the first pin and the second pin, which are spaced
apart from each other, and since a gap (150) may be disposed
between a portion of the outer peripheral surface of the
first pin (142) and a portion of the inner peripheral
surface of the floating capture (147), the worker may easily
10 couple the floating capture (147) to the first pin (142)
and the second pin (145). In addition, during the process
of disposing the tank (120) inside the hull (110), a change
in the arrangement position of the tank (120) may occur.
That is, the alignment of the first pin (142) and the second
15 pin (145) may be misaligned due to a change in the
arrangement position of the tank (120), but since there is
a gap (150) between the first pin (142) and the floating
capture (147), even if the alignment of the first pin (142)
and the second pin (145) is misaligned, there is an effect
20 of facilitating the installation or removal of the floating
capture (147).

[00105] Hereinafter, a method of insulating a tank will be
described with reference to FIG. 12. FIG. 12 is a flow chart
for explaining a method of insulating a tank.

25 **[00106]** As described above, liquefied gas is filled inside
the tank (120). Since the gas filled in the tank (120) is
a gas in a gaseous state at room temperature, the
temperature of the liquefied gas inside the tank (120) is

lower than room temperature. Therefore, when the surface of the tank (120) is exposed externally, condensation and freezing may occur on the surface of the tank (120) due to the temperature difference between the outside of the tank (120) and the inside of the tank (120). Therefore, it is desirable to apply insulating material to the surface of the tank (120).

[00107] It is desirable to apply the insulating material before disposing the tank (120) inside the hull of the ship, to facilitate work and minimize the area where the insulation is not applied.

[00108] As described above, the connection parts (141, 144) are disposed below the tank (120). Pins (142, 145) are inserted into the connection parts (141, 144), and the floating capture (147) described above may be coupled to the pins (142, 145).

[00109] Before applying the insulating material, the pins (142, 145) are coupled to the connection parts (141, 144). In this case, the connection parts (141, 144) may refer to the first connection part (141, 144) and the second connection part (141, 144) described above, and the pins (142, 145) may refer to the first pin (142) and the second pin (145) described above.

[00110] One ends and the other ends of the pins (142, 145) are exposed externally. That is, the one ends and the other ends of the pins (142, 145) are disposed by protruding outwardly of the connection parts (141, 144).

[00111] The worker constructs a masking member at one ends

and the other ends of the pins (142, 145). The masking member is sufficient if it is a member that wraps around one ends and the other ends of the pins (142, 145), and is not limited to a specific material. However, it is preferable that the masking member is a member that may be easily removed from the pins (142, 145).

[00112] It is preferable that the masking member is constructed to wrap around one ends and the other ends of the pins (142, 145) along the outer peripheral surfaces of the pins (142, 145). That is, when viewed in the axial direction of the pins (142, 145), it is preferable that the masking member is constructed to wrap one ends and the other ends of the pins (142, 145) in a circular shape. In more detail, when viewed in the axial direction of the pins (142, 145), it is preferable that the masking member is constructed to have a shape and size that is approximately similar to the cap (400).

[00113] When the masking member is constructed on the pins (142, 145), an insulating material is applied to the surface of the tank (120). In this case, the insulating material is preferably a material with low thermal conductivity. For example, the insulating material may be urethane foam. The insulating material is preferably applied along the surface of the tank (120). If the insulating material is not applied to a portion of the surface of the tank (120), condensation and freezing may occur on the surface of the tank (120) where insulation is not applied. Therefore, unless other devices or the like are attached to the surface of the tank

(120), it is preferable to apply an insulating material to all surfaces of the tank (120) as much as possible.

[00114] The insulating material is applied to all surfaces of the tank (120), and therefore, may also be applied to the connection parts (141, 144) disposed below the tank (120) and around the connection parts (141, 144). At this time, the insulating material may also be applied to the masking member constructed on one ends and the other ends of the pins (142, 145).

[00115] When the application of the insulating material is completed, the masking member constructed on one ends and the other ends of the pins (142, 145) may be removed. When viewed from the axial direction of the pins (142, 145), the masking member is constructed to have the size and shape similar to those of the cap (400) and then removed, and thus the space from which the masking member is removed may also have the size and shape similar to those of the cap (400).

[00116] When the masking member is removed, the cap (400) may be inserted into the space from which the masking member has been removed. In this case, the floating capture (147) may be installed on the pins (142, 145) first and the cap (400) may be coupled to the pins (142, 145), or alternatively, the floating capture (147) may be coupled to the cap (400) first and then the cap (400) may be coupled to the pins (142, 145), thereby simultaneously coupling the floating capture (147) and the cap (400) to the pins (142, 145).

[00117]

[00118] According to the above description, since the anti-floating device is installed below the tank, there is an advantage in that the tank may be prevented from floating without installing a floating chock at the upper portion of the tank. In addition, there is an advantage in that the upper volume of the tank may be increased by using the anti-floating device. In addition, there is an advantage in that the upper deck of the hull may be leveled to optimize the structure of the pipes constructed at the upper deck.

[00119]

[00120] Although various embodiments of the present disclosure have been described in detail above, the scope of the rights of the present disclosure is not limited thereto, and it will be obvious to those with average knowledge in the relevant technical field that various modifications and variations are possible within a range that does not depart from the technical idea of the present disclosure described in the claims. In addition, some components of the above-described embodiments may be deleted and implemented, and respective embodiments may be implemented in combination with each other.

Claims

[Claim 1]

An anti-floating device comprising:

- 5 a first connection part coupled to a hull;
 a second connection part coupled to a tank; and
 a floating capture connecting the first connection
part and the second connection part,
 wherein the floating capture is a belt structure.

10

[Claim 2]

The anti-floating device of claim 1, wherein the anti-floating device includes a first pin disposed on the first connection part; and

- 15 the floating capture is disposed such that at least a
portion of an inner peripheral surface is spaced apart from
at least a portion of an outer peripheral surface of the
first pin in a longitudinal direction of the floating
capture.

20

[Claim 3]

The anti-floating device of claim 2, wherein the anti-floating device includes a second pin disposed on the second connection part; and

- 25 the floating capture is disposed to surround the first
pin and the second pin.

[Claim 4]

The anti-floating device of claim 1, wherein the floating capture is disposed as a plurality of floating captures,

wherein the plurality of floating captures are
5 disposed to be spaced apart from each other in a longitudinal direction of the first connection part.

[Claim 5]

The anti-floating device of claim 1, wherein a
10 material of the floating capture is an elastic body or steel.

[Claim 6]

The anti-floating device of claim 1, wherein the floating capture is provided with a cap fitted and coupled
15 to one end thereof.

[Claim 7]

The anti-floating device of claim 6, wherein the first connection part is provided with a first pin disposed
20 thereon;

the second connection part is provided with a second pin disposed thereon; and

the floating capture is disposed to surround the first pin and the second pin,

25 wherein one end of the second pin is fitted and coupled to the cap.