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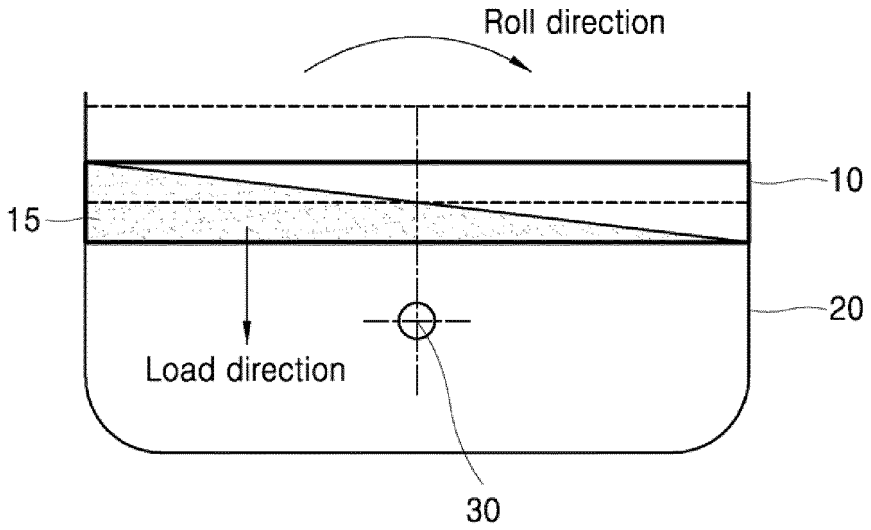
(54) **Passive anti-rolling tank**

(57) A passive anti-rolling tank includes a tank body providing a closed space that accommodates free-surface fluid; and a protruding bottom wall formed on a bottom of the tank body to have a protruding shape, such that a greater amount of fluid can be accommodated in side portions of the tank body.

[Fig.1]



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Description

BACKGROUND

1. Technical Field

[0001] The present disclosure relates to a passive anti-rolling tank, and more particularly, to a passive anti-rolling tank in which a protruding bottom wall is formed, such that an anti-rolling effect of the same level may be achieved with a smaller amount of fluid.

2. Related Art

[0002] In general, anti-rolling tanks may be classified into a passive type, in which power is not transferred from an exterior and separate control is not performed, and an active type, in which power is transferred from an exterior or separate control is performed.

[0003] The passive type anti-rolling tank has been applied to a number of ships since Frahm developed a U-tube type anti-rolling tank in 1911 and Stigter formulated a theory on the U-tube type anti-rolling tank and performed analysis thereof.

[0004] A reference document related with the present disclosure is Korean Unexamined Patent Publication No. 10-2011-0101870 (dated September 16, 2011), in which a rolling-inhibiting type ship and a method for controlling the rolling of a ship are disclosed.

SUMMARY

[0005] Various embodiments are directed to a passive anti-rolling tank which may achieve an anti-rolling effect by using a smaller amount of fluid.

[0006] In an embodiment, a passive anti-rolling tank may include: a tank body providing a closed space that accommodates free-surface fluid; and a protruding bottom wall formed on a bottom of the tank body to have a protruding shape, such that a greater amount of fluid can be accommodated in side portions of the tank body.

[0007] The protruding bottom wall may have a left-right symmetrical shape, and may be formed such that a depth of the fluid accommodated in the tank body increases from a center portion to the side portions of the tank body when the tank body is oriented in a horizontal state.

[0008] The protruding bottom wall may be formed to have inclined surfaces that are inclined downward from the center portion to the side portions, or a curved surface that allows a depth of the fluid to increase from the center portion to the side portions thereof.

[0009] The protruding bottom wall may include a planar protruding wall which is formed on a center portion of the bottom of the tank body such that an amount of the fluid which may be stored in the center portion is decreased.

[0010] The protruding bottom wall may further include inclined walls or curved walls which are formed on both sides of the planar protruding wall.

[0011] The protruding bottom wall may be formed to have a convex curved surface and concave curved surfaces.

[0012] In the passive anti-rolling tank according to the embodiments of the present disclosure, since a load acting point is positioned on a side portion due to the shape of a tank, an improved anti-rolling effect may be achieved from the same weight, or an anti-rolling effect of the same level may be achieved from a smaller weight.

BRIEF DESCRIPTION OF THE DRAWINGS

[0013]

FIG. 1 is a view illustrating a conventional passive anti-rolling tank.

FIG. 2 is a view illustrating a passive anti-rolling tank in accordance with a first embodiment of the present disclosure.

FIG. 3 is a view illustrating a passive anti-rolling tank in accordance with a second embodiment of the present disclosure.

FIG. 4 is a view illustrating a passive anti-rolling tank in accordance with a third embodiment of the present disclosure.

FIG. 5 is a view illustrating a passive anti-rolling tank in accordance with a fourth embodiment of the present disclosure.

FIG. 6 is a view illustrating a passive anti-rolling tank in accordance with a fifth embodiment of the present disclosure.

FIG. 7 is a view illustrating a passive anti-rolling tank in accordance with a sixth embodiment of the present disclosure.

FIG. 8 is a view illustrating a passive anti-rolling tank in accordance with a seventh embodiment of the present disclosure.

DETAILED DESCRIPTION

[0014] Hereinafter, a passive anti-rolling tank will be described in detail with reference to the accompanying drawings through various examples of embodiments.

[0015] In the present disclosure, advantages, features and methods for achieving them will become more apparent after a reading of the following exemplary embodiments taken in conjunction with the drawings. However, the present disclosure should not be construed as being limited to the embodiments set forth herein, and may be embodied in various different forms. Rather, these embodiments are provided so that the present disclosure will be thorough and complete and will fully convey the scope of the present disclosure to those skilled in the art to which the disclosure pertains. Thus, it is intended that the present disclosure cover the modifications and variations of this disclosure, provided they come within the scope of the appended claims and equivalents.

[0016] FIG. 1 is a view illustrating a conventional pas-

sive anti-rolling tank.

[0017] In general, a passive anti-rolling tank 10 is formed in a hull 20 of a floating structure in such a way as to be left-right symmetrical in the port and starboard directions. Also, the passive anti-rolling tank 10 defines a closed space which accommodates fluid 15, and the fluid 15 is stored to have a free surface.

[0018] In relation with the hull 20, the passive anti-rolling tank 10 is disposed in a shape which is left-right symmetrical with respect to a center of rotation 30 of the hull 20. Further, although the passive anti-rolling tank 10 may be positioned above the center of rotation 30 of the hull 20, as shown in the drawing, it is to be noted that the position of the passive anti-rolling tank 10 is not limited to this position, and may be changed according to the shape of the hull 20, and so on.

[0019] FIG. 2 is a view illustrating a passive anti-rolling tank in accordance with a first embodiment of the present disclosure.

[0020] A passive anti-rolling tank 100 in accordance with a first embodiment includes a tank body 110 which provides a closed space for accommodating free-surface fluid 150, and a protruding bottom wall 130 which is formed into a shape which protrudes from the bottom of the tank body 110 such that a larger amount of the fluid 150 is accommodated in the side portions rather than in the center portion of the tank body 110.

[0021] The protruding bottom wall 130 may be fabricated separately from the tank body 110 and be attached to the bottom of the tank body 110, or may be fabricated integrally with the bottom of the tank body 110.

[0022] The tank body 110 provides the closed space which accommodates the fluid 150. The fluid 150 is stored in the tank body 110 to have a free surface, and induces a moment according to rolling.

[0023] The passive anti-rolling tank 100 plays the role of reducing the rolling of a hull, attributable to the phase difference between the rolling moment of the tank body 110 and the moment of the fluid 150 accommodated in the tank body 110 that is induced by the free-surface movement of the fluid 150.

[0024] The embodiment of the present disclosure is to change the shape of the passive anti-rolling tank 100 and thereby induce a larger moment with a smaller amount of the fluid 150. In detail, the embodiment of the present disclosure is to provide the shape of the protruding bottom wall 130 which allows the load acting point of the fluid 150 to move outward.

[0025] The protruding bottom wall 130 has a left-right symmetrical shape. This is to achieve a uniform anti-rolling effect with respect to leftward and rightward rolling.

[0026] Moreover, the protruding bottom wall 130 may be formed in such a manner that the depth of the fluid 150 at the center portion of the tank body 110 is less than the depth of the fluid 150 at the side portions of the tank body 110 in the state in which the tank body 110 is oriented horizontally. That is to say, the protruding bottom wall 130 may have a shape such that its center portion protrudes upward.

[0027] While the protruding bottom wall 130 may have various shapes, FIG. 2 shows that the protruding bottom wall 130 is formed to have inclined surfaces which are inclined downward from the center portion to the side portions.

[0028] In the passive anti-rolling tank 100 in accordance with the embodiment of the present disclosure, the amounts of the fluid 150 which is stored in the center portion and the side portions are different from each other, attributable to the shape of the protruding bottom wall 130. As a consequence, since the load acting point of the fluid 150 moves outward when compared to the conventional passive anti-rolling tank, an anti-rolling effect may be achieved using a smaller amount of the fluid 150.

[0029] FIG. 3 is a view illustrating a passive anti-rolling tank in accordance with a second embodiment of the present disclosure, and FIG. 4 is a view illustrating a passive anti-rolling tank in accordance with a third embodiment of the present disclosure.

[0030] The second embodiment of FIG. 3 shows that a protruding bottom wall 131 is formed into a convex curved surface shape, and the third embodiment of FIG. 4 shows that a protruding bottom wall 132 is formed to have concave curved surface shapes.

[0031] FIG. 5 is a view illustrating a passive anti-rolling tank in accordance with a fourth embodiment of the present disclosure.

[0032] The fourth embodiment of FIG. 5 shows that a planar protruding wall 133 is formed on the center portion of the bottom of a tank body. Attributable to the fact that the planar protruding wall 133 is formed on the center portion of the bottom of the tank body, an amount of fluid which may be stored in the center portion may be decreased, and thus, an effect that the load acting point of the fluid moves outward may be achieved.

[0033] FIG. 6 is a view illustrating a passive anti-rolling tank in accordance with a fifth embodiment of the present disclosure, and FIG. 7 is a view illustrating a passive anti-rolling tank in accordance with a sixth embodiment of the present disclosure.

[0034] The fifth embodiment of FIG. 6 shows that a protruding bottom wall is formed in a shape in which inclined walls 134 are connected to both sides of a planar protruding wall 133, and the sixth embodiment of FIG. 7 shows that a protruding bottom wall is formed in a shape in which curved walls 135 are connected to both sides of a planar protruding wall 133.

[0035] FIG. 8 is a view illustrating a passive anti-rolling tank in accordance with a seventh embodiment of the present disclosure.

[0036] The seventh embodiment shows that a protruding bottom wall is formed to have a convex curved surface shape 136 in the center portion thereof and concave curved surface shapes 137 on both sides of the convex curved surface shape 136.

[0037] As is apparent from the above descriptions, in the passive anti-rolling tank according to the embodi-

ments of the present disclosure, since a relatively greater amount of fluid may be stored in side portions by using a protruding bottom wall which may have various shapes, an effect that a moment acting point moves outward may be achieved.

[0038] As a result, an amount of fluid necessary to achieve a predetermined level of anti-rolling effect may be reduced, whereby the overall weight may be decreased.

[0039] Although various embodiments have been described above with reference to the accompanying drawings, the present disclosure is not limited to the embodiments and may be changed in various different forms, and it will be understood to those skilled in the art that the present disclosure may be worked in other concrete forms without changing the technical spirits and essential features of the present disclosure. Accordingly, it is to be noted that the disclosure described herein is for illustration purposes only, and is not intended to limit the disclosure in any way.

Claims

1. A passive anti-rolling tank comprising:

   a tank body providing a closed space that accommodates free-surface fluid; and
   a protruding bottom wall formed on a bottom of the tank body to have a protruding shape, such that a greater amount of fluid can be accommodated in side portions of the tank body.

2. The passive anti-rolling tank according to claim 1, wherein the protruding bottom wall has a left-right symmetrical shape, and is formed such that a depth of the fluid accommodated in the tank body increases from a center portion to the side portions of the tank body when the tank body is oriented in a horizontal state.

3. The passive anti-rolling tank according to claim 2, wherein the protruding bottom wall is formed to have inclined surfaces that are inclined downward from the center portion to the side portions.

4. The passive anti-rolling tank according to claim 2, wherein the protruding bottom wall is formed to have a curved surface that allows a depth of the fluid to increase from the center portion to the side portions.

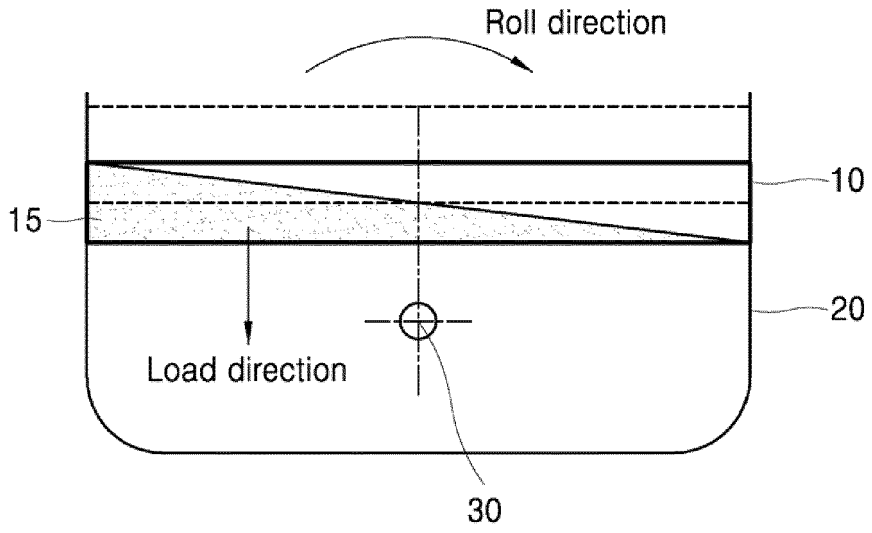
5. The passive anti-rolling tank according to claim 1, wherein the protruding bottom wall comprises a planar protruding wall which is formed on a center portion of the bottom of the tank body such that an amount of the fluid which may be stored in the center portion is decreased.

6. The passive anti-rolling tank according to claim 5, wherein the protruding bottom wall further comprises inclined walls which are formed on both sides of the planar protruding wall.

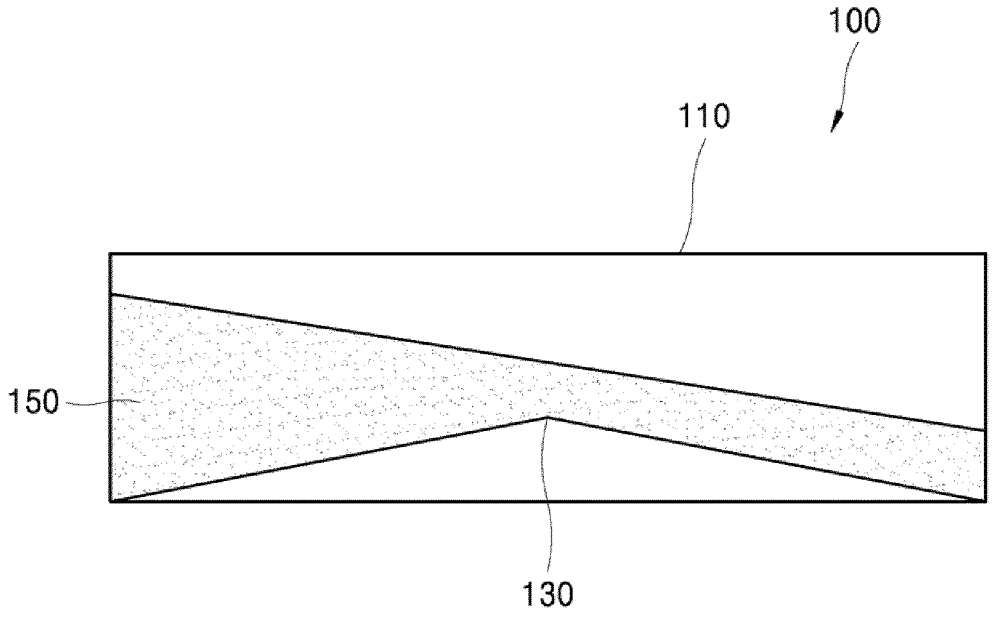
7. The passive anti-rolling tank according to claim 5, wherein the protruding bottom wall further comprises curved walls which are formed on both sides of the planar protruding wall.

8. The passive anti-rolling tank according to claim 2, wherein the protruding bottom wall has a convex curved surface and concave curved surfaces.

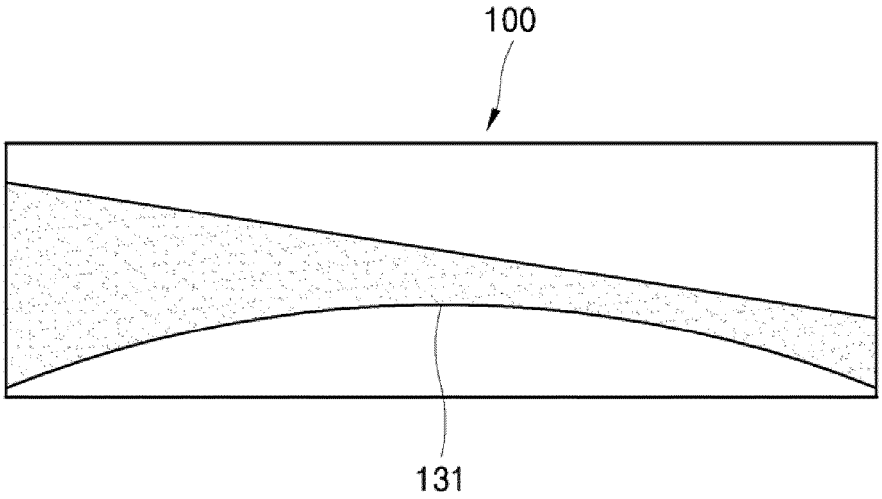
[Fig.1]



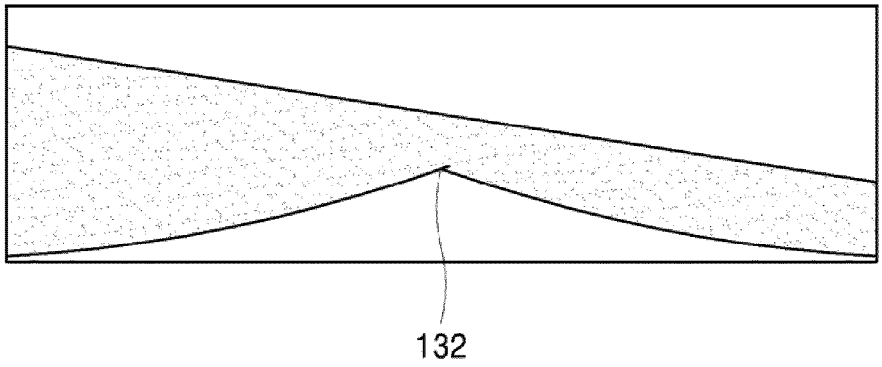
[Fig.2]



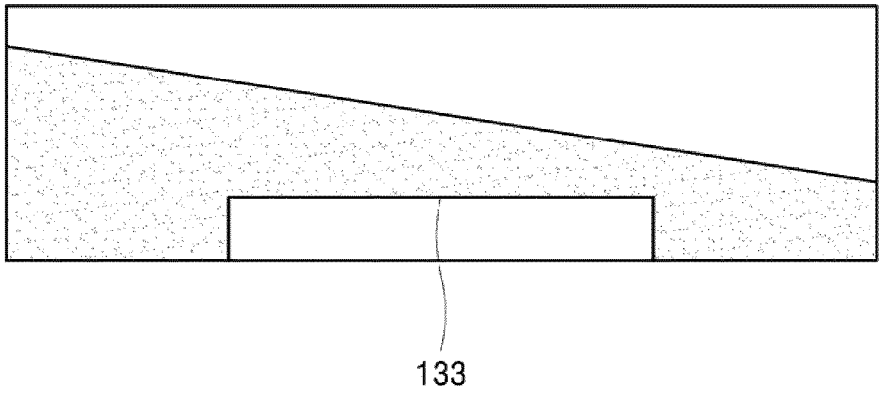
[Fig.3]



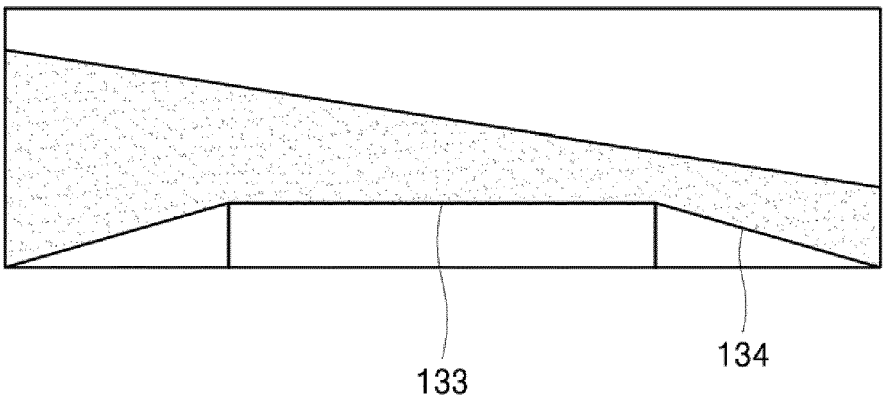
[Fig.4]



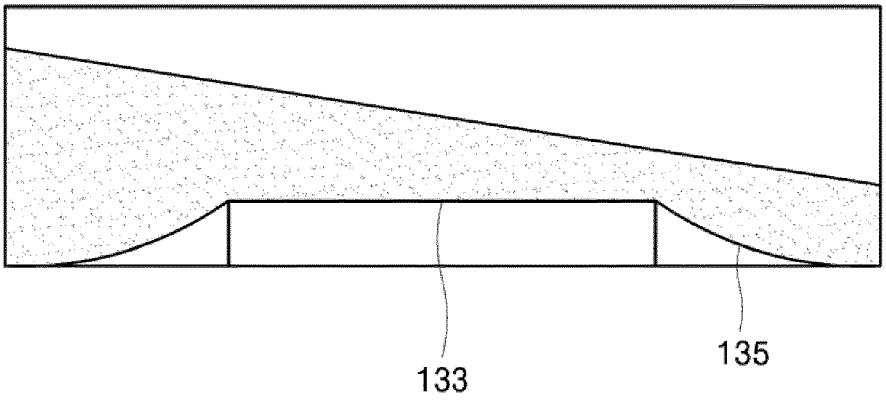
[Fig.5]



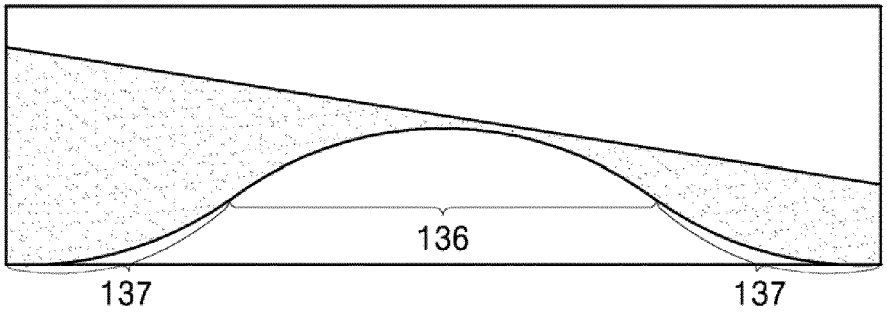
[Fig.6]



[Fig.7]



[Fig.8]



REFERENCES CITED IN THE DESCRIPTION

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