

STORAGE TANK STRUCTURE

CROSS-REFERENCE TO RELATED APPLICATION

5 1. Technical Field

[0001] Embodiments of the present invention relate to a storage tank structure, and more particularly, to a storage tank structure that can prevent leakage that may occur along a side surface of a support portion of a liquefied natural gas storage tank.

2. Discussion of Related Art

10 **[0002]** Floating structures such as LNG carriers, LNG RV, LNG FPSO, and LNG FSRU, which transport or store liquid cargoes, e.g., LNG, are equipped therein with storage tanks for storing LNG in cryogenic conditions.

[0003] LNG storage tanks may be largely classified into independent type and membrane type. Representatively, the membrane type storage tanks are classified into GTT NO 96, Mark III and
15 CS1, and the independent type storage tanks are classified into MOSS type and SPB type. In addition, such an independent type LNG storage tank requires a support structure that structurally allows the LNG storage tank to be placed at the bottom of a ship or the structure.

[0004] A cryogenic liquefied natural gas leaked from the independent storage tank directly damages surrounding members such as an inner hull of the ship. Accordingly, a structure capable
20 of preventing leakage of the cryogenic liquefied natural gas stored in the tank and a collecting unit for collecting leaked cryogenic liquefied natural gas are provided.

[0005] [Prior Art Document]

[0006] [Patent Literature]

[0007] (Patent Document 0001) Korean Patent Laid-Open No. 10-2009-013225 (December

30, 2009)

[0008] It is to be understood that this background of the technology section is intended to provide useful background for understanding the technology and as such disclosed herein, the technology background section may include ideas, concepts or recognitions that were not part of what was known or appreciated by those skilled in the pertinent art prior to a corresponding effective filing date of subject matter disclosed herein.

SUMMARY

[0009] Embodiments of the present invention may be directed to a storage tank structure that defines a groove at a support portion of the storage tank and secures an angle plate so as to substantially prevent leakage of cryogenic liquefied natural gas that may occur along a side surface of the support portion of the storage tank.

[0010] According to an embodiment, a storage tank structure includes: a support portion provided at a bottom surface of a hull to support a storage tank; a heat insulating member provided at opposite side surfaces of the support portion; a groove portion provided at a predetermined height of the support portion and defined perpendicular to a height direction of the support portion; and a plate portion extending to a predetermined length in a longitudinal direction of the groove portion. Inside of the groove is filled with an adhesive portion.

[0011] The plate portion may have an “L”-like cross-sectional shape, and an end portion of the plate portion may be secured at an inner surface of the groove portion.

[0012] An insulating member may be provided between a side surface of the support portion and the heat insulating member, and an end portion of the insulating member may contact the plate portion.

[0013] The insulating member may extend from an upper portion of the support portion to a portion between the support portion and another neighboring support portion, and collect a

liquefied natural gas leaked through a drain hole.

[0014] An auxiliary plate may be provided under the heat insulating member.

[0015] The groove portion may have a predetermined length and a predetermined height so that an “└”-like shaped jig for transporting the support portion is inserted and secured thereto.

5 **[0016]** The foregoing is illustrative only and is not intended to be in any way limiting. In addition to the illustrative aspects, embodiments and features described above, further aspects, embodiments and features will become apparent by reference to the drawings and the following detailed description.

10 BRIEF DESCRIPTION OF THE DRAWINGS

[0017] A more complete appreciation of the present invention will become more apparent by describing in detail embodiments thereof with reference to the accompanying drawings, wherein:

[0018] FIG. 1 is a cross-sectional view illustrating an embodiment of a storage tank structure;

[0019] FIG. 2 is an enlarged cross-sectional view illustrating portion "A" of FIG. 1;

15 **[0020]** FIG. 3 is a cross-sectional view illustrating another embodiment of the storage tank structure; and

[0021] FIG. 4 is a schematic view illustrating a support portion of a storage tank structure.

DETAILED DESCRIPTION

20 **[0022]** Embodiments will now be described more fully hereinafter with reference to the accompanying drawings. Although the invention may be modified in various manners and have several embodiments, embodiments are illustrated in the accompanying drawings and will be mainly described in the specification. However, the scope of the present invention is not limited to the embodiments and should be construed as including all the changes, equivalents and substitutions included in the spirit and scope of the present invention. Some of the parts which

are not associated with the description may not be provided in order to specifically describe embodiments of the present invention and like reference numerals refer to like elements throughout the specification.

[0023] Hereinafter, detailed embodiments of the present invention will be described with reference to the accompanying drawings.

[0024] FIG. 1 is a cross-sectional view illustrating an embodiment of a storage tank structure, FIG. 2 is an enlarged cross-sectional view illustrating portion "A" of FIG. 1, FIG. 3 is a cross-sectional view illustrating another embodiment of the storage tank structure, and FIG. 4 is a schematic view illustrating a support portion of a storage tank structure.

[0025] Referring to FIGS. 1, 2, and 4, a storage tank structure according to an embodiment includes a support portion 110, a heat insulating member 120, an insulating member 130, a plate portion 140, and an auxiliary plate 150.

[0026] The support portion 110 is provided at a bottom surface of a hull 20, and supports a storage tank 10. The support portion 110 is provided between the storage tank 10 and a base portion 30 that contacts a bottom surface of the hull 20, and transmits the load of the storage tank 10 to the bottom surface of the hull 20 while supporting the load of the storage tank 10.

[0027] The support portion 110 may include a wood material, but a material of the support portion 110 is not limited to wood. The support portion 110 may be provided in a rectangular parallelepiped shape, but may be provided in a circular column shape.

[0028] The heat insulating member 120 closely contacts opposite sides of the support portion 110, and the heat insulating member 120 may include a material such as polyurethane foam. A groove portion 111 is defined at the support portion 110 at a predetermined height, and an end portion of the plate portion 140 is secured to the groove portion 111.

[0029] The groove portion 111 may be provided at the support portion 110 at a predetermined

height, e.g., at an intermediate portion of the height of the support portion 110. However, in order to prevent leakage of the liquefied natural gas, the groove portion 111 may be provided at a portion other than the intermediate portion.

[0030] In a case where the groove portion 111 is located at an upper portion of the support portion 110, a flow path of the leaked liquefied natural gas may be shortened.

[0031] Referring to FIG. 4, it is exemplified that the groove portion 111 is defined at the intermediate height of the support portion 110, and when the groove portion 111 is defined at the intermediate height of the support portion 110, a jig 180 having an “└”-like shape or a shape other than the “└”-like shape to be inserted and secured to the groove portion 111 is secured to the groove portion 111 in an insertion manner. Accordingly, the support portion 110 may be stably transported by a lifting rope 190 that is connected to the jig 180. Although the jig 180 is exemplified as having an “└”-like shape in the present embodiment, the jig 180 may have an inverted “└”-like shape or a T-like shape, and the shape thereof is not limited to the “└”-like shape.

[0032] In such a case, the groove portion 111 is cut to have a predetermined length perpendicular to a height direction of the support portion 110 and a predetermined height so that the jig 180 may be inserted and secured thereto.

[0033] Referring to FIG. 2, the plate portion 140 extends to a predetermined length in a longitudinal direction of the groove portion 111, and is provided to prevent leakage and further advancement of the liquefied natural gas.

[0034] One end portion of the plate portion 140 is inserted into the groove portion 111, and is secured to an inner surface of the groove portion 111 by a securing unit 143. The plate portion 140 may be provided having a straight or T-like cross-sectional shape, but may have an “└”-like cross-sectional shape as shown in FIG. 2. However, the cross-section of the plate portion 140 is

not limited to the T-like cross-sectional shape or the “└”-like cross-sectional shape.

[0035] The meaning of having an “└”-like cross-sectional shape is that one end portion of the plate portion 140 has a shape bent at 90 degrees, and another end portion of the plate portion 140 has a predetermined length and maintains a straight shape.

5 **[0036]** As the plate portion 140 has an “└”-like shape, a coupling strength increases when it is coupled to the groove portion 111. Thus, the plate portion 140 is stably secured at the inner surface of the groove portion 111, and another end portion maintains a straight line shape. Accordingly, it is possible to reduce a thickness thereof, and the liquefied natural gas may be substantially prevented from being leaked or further advance.

10 **[0037]** The inside of the groove portion 111 is filled with an adhesive portion 145. That is, a part of the inside of the groove portion 111, except the plate portion 140, may be filled with the adhesive portion 145. The adhesive portion 145 may include a material such as a low temperature adhesive.

[0038] The insulating member 130 is provided between a side surface of the support portion 15 110 and the heat insulating member 120, and serves as a flow path for a cryogenic cargo (liquefied natural gas) when the cryogenic cargo stored in the storage tank 10 is leaked.

[0039] The insulating member 130 is porous, and one end portion of the insulating member 130 contacts a plate 141 of the plate portion 140.

[0040] An auxiliary plate 150 is provided under the heat insulating member 120, and the 20 auxiliary plate 150 is secured to a predetermined position of the support portion 110 by a securing member 151.

[0041] The auxiliary plate 150 stably supports a lower portion of the heat insulating member 120 and prevents leakage of the liquefied natural gas leaked along another path.

[0042] The auxiliary plate 150 may be provided to be longer than the plate portion 140.

[0043] In a conventional case, a part of the heat insulating member is formed corresponding to a thickness of the groove portion, and additional works is required to seal a side surface of the support portion, the heat insulating member and the insulating member.

[0044] According to an embodiment of the present invention, since the plate portion is provided at the groove portion, the installation work becomes simple, and additional works for sealing between the support portion, the heat insulating member and the insulating member is unnecessary, and leakage of the liquefied natural gas may be stably prevented.

[0045] FIG. 3 is a cross-sectional view illustrating another embodiment of the storage tank structure.

[0046] A storage tank structure according to another embodiment has configurations most of which are substantially the same as those according to an embodiment, and it will be described below focusing on differences.

[0047] According to another embodiment, the insulating member 130 extends from an upper portion of one support portion 110 to a portion between the support portion 110 and another neighboring support portion 110. A liquefied natural gas leaked through a drain hole 160 is collected by a collecting unit 170. The drain hole 160 includes a porous material. One end portion of the drain hole 160 may be connected to at least one side of the insulating member 130. That is, in the present embodiment, the drain hole 160 may mean a member for discharging the leaked liquefied natural gas, flowing along the insulating member 130, to the collecting unit 170.

[0048] The leaked liquefied natural gas that has not passed through the plate portion 140 may flow along the insulating member 130 that extends between the support portions 110 and is collected by the collecting portion 170 provided between the support portions 110.

[0049] The drain hole 160 and the collecting unit 170 may be provided in singular at a center portion between each of the support portions 110, but may be provided in plural adjacent to a

portion corresponding to a horizontal extension length of the plate portion 140 or the auxiliary plate 150.

[0050] The collecting unit 170 may be provided at a bottom portion of the hull 20, but may be disposed adjacent to a lower portion of the heat insulating member 120.

5 **[0051]** As set forth hereinabove, according to one or more embodiments of the present invention, as the plate portion is provided at the groove portion, the installation work becomes simple, and the support portion may be easily moved and handled through the jig that may be set and secured at the groove portion. In addition, an additional work for sealing between the support portion, the thermal insulating member, and the insulating member is not necessary,
10 leakage of the liquefied natural gas may be stably prevented, and thermal penetration of heat from the outside may be prevented.

[0052] It will be understood by those skilled in the art that the foregoing description of the present invention is for illustrative purposes only and that those of ordinary skill in the art can readily understand that various changes and modifications may be made without departing from
15 the spirit or essential characteristics of the present invention. It is therefore to be understood that the above-described embodiments are illustrative in all aspects and not restrictive. For example, each component described as a single entity may be distributed and implemented, and components described as being distributed may also be implemented in a combined form.

[0053] While the present invention has been illustrated and described with reference to the
20 embodiments thereof, it will be apparent to those of ordinary skill in the art that various changes in form and detail may be made thereto without departing from the spirit and scope of the present invention.

WHAT IS CLAIMED IS:

1. A storage tank structure, comprising:
 - a support portion provided at a bottom surface of a hull to support a storage tank;
 - 5 a heat insulating member provided at opposite side surfaces of the support portion;
 - a groove portion provided at a predetermined height of the support portion and defined perpendicular to a height direction of the support portion; and
 - a plate portion extending to a predetermined length in a longitudinal direction of the groove portion,
 - 10 wherein inside of the groove is filled with an adhesive portion.
2. The storage tank structure of claim 1, wherein the plate portion has an “└”-like cross-sectional shape, and
 - an end portion of the plate portion is secured at an inner surface of the groove portion.
 - 15
3. The storage tank structure of claim 1, wherein an insulating member is provided between a side surface of the support portion and the heat insulating member, and
 - an end portion of the insulating member contacts the plate portion.
- 20 4. The storage tank structure of claim 3, wherein the insulating member extends from an upper portion of the support portion to a portion between the support portion and another neighboring support portion, and collects a liquefied natural gas leaked through a drain hole.
5. The storage tank structure of claim 1, wherein an auxiliary plate is provided under the

heat insulating member.

6. The storage tank structure of claim 1, wherein the groove portion has a predetermined length and a predetermined height so that an “└”-like shaped jig for transporting the support
5 portion is inserted and secured thereto.