

DESCRIPTION

Title of Invention

SHIP

Technical Field

[0001]

The present disclosure relates to a ship.

This application claims the priority of Japanese Patent Application No. 2020-140909 filed in Japan on August 24, 2020, the content of which is incorporated herein by reference.

Background Art

[0002]

A ship carrying a liquefied gas such as a liquefied natural gas and an offshore facility or a ground base for producing or storing the liquefied gas include a cargo tank for accommodating the liquefied gas. For example, PTL 1 discloses a configuration in which the cargo tank is supported by a hull via a cylindrical skirt.

Citation List

Patent Literature

[0003]

[PTL 1] Japanese Patent No. 5403900

Summary of Invention

Technical Problem

[0004]

However, in the configuration disclosed in PTL 1, when a size of the cargo tank is increased to increase capacity, in some cases, a shaking amount of the cargo tank may increase due to oscillation of the ship in a shape of the cargo tank. In addition, the cargo tank is thermally shrunk since the cargo tank accommodates the liquefied gas. A total shrinkage amount thereof increases due to an increase in the size of the cargo tank, and depends on the shape of the cargo tank. For example, the cargo tank is thermally shrunk when the cargo tank accommodates a low-temperature liquefied gas. Even in this case, it is desirable that the cargo tank is stably supported to safely store the accommodated liquefied gas.

[0005]

The present disclosure is made to solve the above-described problems, and an object of the present disclosure is to provide a ship which can more stably support a tank.

Solution to Problem

[0006]

According to the present disclosure, in order to solve the above-described problems, there is provided a ship including a hull, a tank, a lower support section, and an elastic support section. The tank is installed on the hull,

and is filled with a liquefied gas. The tank has a cross-sectional shape perpendicular to a bow-stern direction, in which an upward-downward direction is set as a longitudinal direction, and the lower support section supports the tank on the hull from below. The elastic support section elastically supports the tank with respect to the hull above the lower support section.

Advantageous Effects of Invention

[0007]

According to the ship of the present disclosure, the tank can be supported more stably.

Brief Description of Drawings

[0008]

Fig. 1 is a plan view illustrating an overall configuration of a ship according to a first embodiment of the present disclosure.

Fig. 2 is a sectional view perpendicular to a bow-stern direction of the ship according to the first embodiment of the present disclosure, and is a sectional view taken along line A-A in Fig. 1.

Fig. 3 is a view illustrating a tank provided in a ship according to an embodiment of the present disclosure, and is a sectional view taken along line B-B in Fig. 2.

Fig. 4 is a view illustrating a specific example of an elastic support section provided in the ship according to the embodiment of the present disclosure.

Fig. 5 is a view illustrating a specific example of the elastic support section provided in the ship according to the embodiment of the present disclosure.

Fig. 6 is a view illustrating a specific example of the elastic support section provided in the ship according to the embodiment of the present disclosure.

Fig. 7 is a view illustrating a specific example of the elastic support section provided in the ship according to the embodiment of the present disclosure.

Fig. 8 is a view illustrating a specific example of the elastic support section provided in the ship according to the embodiment of the present disclosure.

Fig. 9 is a sectional view illustrating a modification example of the elastic support section provided in the ship according to the embodiment of the present disclosure.

Fig. 10 is a sectional view illustrating another modification example of the elastic support section provided in the ship according to the embodiment of the present disclosure.

Fig. 11 is a sectional view illustrating still another modification example of the elastic support section provided

in the ship according to the embodiment of the present disclosure.

Fig. 12 is a sectional view illustrating a modification example in which an upper section of a tank according to the embodiment of the present disclosure is protruded upward from an upper deck.

Fig. 13 is a sectional view illustrating a modification example in which the ship according to the embodiment of the present disclosure includes a tank cover.

Fig. 14 is a plan view illustrating an overall configuration of a ship according to a second embodiment of the present disclosure.

Fig. 15 is a side view of the ship according to the second embodiment of the present disclosure.

Fig. 16 is a sectional view perpendicular to the bow-stern direction of the ship according to the embodiment of the present disclosure.

Fig. 17 is a sectional view illustrating a modification example of the elastic support section provided in the ship according to the embodiment of the present disclosure.

Fig. 18 is a sectional view illustrating another modification example of the elastic support section provided in the ship according to the embodiment of the present disclosure.

Fig. 19 is a sectional view illustrating still another modification example of the elastic support section provided in the ship according to the embodiment of the present disclosure.

Fig. 20 is a plan view of Fig. 19.

Fig. 21 is a sectional view illustrating still another modification example of the elastic support section provided in the ship according to the embodiment of the present disclosure.

Fig. 22 is a sectional view illustrating still another modification example of the elastic support section provided in the ship according to the embodiment of the present disclosure.

Fig. 23 is a plan view illustrating another disposition example of the tank in the ship according to the embodiment of the present disclosure.

Fig. 24 is a plan view illustrating still another disposition example of the tank in the ship according to the embodiment of the present disclosure.

Description of Embodiments

[0009]

Hereinafter, a ship according to embodiments of the present disclosure will be described with reference to Figs. 1 to 24.

<First Embodiment>

As illustrated in Figs. 1 and 2, a ship 1A of the present embodiment carries a liquefied gas such as a liquefied natural gas, a liquefied petroleum gas, and liquefied carbon dioxide. The ship 1A includes at least a hull 2, a tank 10A, a lower support section 20A, and an elastic support section 30A.

[0010]

The hull 2 has a pair of broadsides 3A and 3B, a ship bottom 4, and an upper deck (deck) 5, which form an outer shell of the hull 2. The broadsides 3A and 3B include a pair of broadside outer plates respectively forming right and left broadsides. The ship bottom 4 includes a ship bottom outer plate connecting the broadsides 3A and 3B. The pair of broadsides 3A and 3B and the ship bottom 4 cause the outer shell of the hull 2 to have a U-shape in a cross section perpendicular to a bow-stern direction Da. The upper deck 5 is a completely open deck exposed outward. In the hull 2, a superstructure 7 having an accommodation space is formed on the upper deck 5 on a stern 2b side.

[0011]

The hull 2 has a cargo tank storage compartment (hold) 8 on a bow 2a side of the superstructure 7. The cargo tank storage compartment 8 is recessed toward the ship bottom 4 below the upper deck 5, and is open upward.

[0012]

A plurality of tanks 10A are disposed inside the cargo tank storage compartment 8 along the bow-stern direction Da. Each of the tanks 10A internally accommodates a liquefied gas. In the present embodiment, the tanks 10A are provided in two rows at an interval in a ship width direction Dw, except for the tank 10A disposed closest to the bow 2a. A case where only one tank 10A disposed closest to the bow 2a is disposed at a center in the ship width direction Dw will be described as an example.

[0013]

In the present embodiment, each of the tanks 10A has a cylindrical shape extending in the bow-stern direction Da. As illustrated in Figs. 2 and 3, the tank 10A is a so-called Bilobe type, and includes a first body section 11 and a second body section 12.

[0014]

The first body section 11 is provided in a lower section of the tank 10A. An accommodating space S1 is formed inside the first body section 11. The first body section 11 has a shape similar to a cylindrical shape, and extends in the bow-stern direction Da. The first body section 11 includes an intermediate cylindrical section 11a and an end spherical section 11b. The intermediate cylindrical section 11a is provided in an intermediate section of the first body section 11 in the bow-stern

direction Da, and is formed in a shape similar to a cylindrical shape continuous along the bow-stern direction Da. The intermediate cylindrical section 11a has a constant radius of curvature in the bow-stern direction Da. The end spherical sections 11b are respectively provided in both end sections of the intermediate cylindrical section 11a in the bow-stern direction Da. Each of the end spherical sections 11b has a hemispherical shape, and closes openings in both ends of the intermediate cylindrical section 11a in the bow-stern direction Da. A diameter dimension of each of the end spherical sections 11b gradually increases from one toward the other. Each of the end spherical sections 11b has a hemispherical shape having a constant radius of curvature, and the hemispherical shape is partially illustrated.

[0015]

The second body section 12 is provided in an upper section of the tank 10A. An accommodating space S2 is formed inside the second body section 12. The second body section 12 is provided above the first body section 11. The second body section 12 has a cylindrical shape, and extends in the bow-stern direction Da. The second body section 12 includes an intermediate cylindrical section 12a and an end spherical section 12b. The intermediate cylindrical section 12a is provided in an intermediate section of the second

body section 12 in the bow-stern direction Da, and is formed in a shape similar to a cylindrical shape continuous along the bow-stern direction Da. The intermediate cylindrical section 12a has a constant radius of curvature in the bow-stern direction Da. The end spherical sections 12b are respectively provided in both end sections of the intermediate cylindrical section 12a in the bow-stern direction Da. Each of the end spherical sections 12b has a hemispherical shape, and closes openings in both ends of the intermediate cylindrical section 12a in the bow-stern direction Da. A diameter dimension of each of the end spherical sections 12b gradually increases from one toward the other. Each of the end spherical sections 12b has a hemispherical shape having a constant radius of curvature, and the hemispherical shape is partially illustrated.

[0016]

A lower end section of the second body section 12 is connected to an upper end section of the first body section 11. In the present embodiment, the lower end section of the second body section 12 and the upper end section of the first body section 11 are open in sections connected to each other. in this manner, an accommodating space S1 inside the first body section 11 and an accommodating space S2 inside the second body section 12 communicate with each other (communication section). The tank 10A may be provided

with a bulkhead (not illustrated) between the first body section 11 and the second body section 12, and the accommodating space S1 inside the first body section 11 and the accommodating space S2 inside the second body section 12 may be partitioned.

[0017]

As illustrated in Fig. 2, a cross-sectional shape of the tank 10A perpendicular to the bow-stern direction Da is a vertically long shape in which an upward-downward direction Dv of the hull 2 is set as a longitudinal direction. More specifically, in the tank 10A, the second body section 12 is provided on the first body section 11. In this manner, in the cross section perpendicular to the bow-stern direction Da, the tank 10A has a vertically long cross-sectional shape in which the upward-downward direction Dv is set as the longitudinal direction, and the ship width direction Dw is set as a short direction.

[0018]

A lower section of the first body section 11 disposed below a center of the first body section 11 in the upward-downward direction Dv forms a bottom surface 10b of the tank 10A. The lower section (bottom surface 10b) of the first body section 11 of the tank 10A has a convex curved surface shape whose dimension in the ship width direction Dw gradually decreases downward from above. An upper section

of the second body section 12 disposed above a center of the second body section 12 in the upward-downward direction D_v forms an upper surface 12d of the tank 10A. The upper section (upper surface 12d) of the second body section 12 of the tank 10A has a convex curved surface shape whose dimension in the ship width direction D_w gradually decreases upward from below.

[0019]

In addition, in the tank 10A, joint portions 10j between the first body section 11 and the second body section 12 are recessed inward in a width direction of the tank 10A on both sides of the tank 10A in the width direction (in other words, the ship width direction D_w).

[0020]

In the present embodiment, each of the tanks 10A is provided below the upper deck 5. As illustrated in Figs. 1 and 3, transverse bulkheads 6 are provided on both sides in the bow-stern direction D_a with respect to each of the tanks 10A. Each of the transverse bulkheads 6 is provided perpendicular to the bow-stern direction D_a . Each of the transverse bulkheads 6 is formed to rise upward from the bottom deck 8b forming the bottom surface of the cargo tank storage compartment 8 between the pair of broadsides 3A and 3B. In the present invention, each of the transverse

bulkheads 6 is not always required, and can be omitted when emergency measures are taken by separate means.

[0021]

As illustrated in Fig. 2, a bulkhead 9 is provided between the tanks 10A adjacent to each other in the ship width direction Dw. The bulkhead 9 is provided in a central portion in the ship width direction Dw, and is provided perpendicular to the ship width direction Dw. The bulkhead 9 is continuously formed in the bow-stern direction Da between the transverse bulkheads 6 on both sides of each of the tanks 10A in the bow-stern direction Da. Furthermore, the bulkhead 9 is provided between the bottom deck 8b forming the bottom surface of the cargo tank storage compartment 8 and the upper deck 5. The bulkhead 9 has a watertight structure, and partitions the cargo tank storage compartment 8 into two along the ship width direction Dw. As will be described later, one end of the lateral elastic support section 31A is connected to each of the bulkheads 9, but can be omitted when the connection is made by separate means and emergency measures are taken by separate means.

[0022]

The respective tanks 10A are provided at an interval between the broadsides 3A and 3B in the ship width direction Dw. In addition, the tanks 10A adjacent to each other in the ship width direction Dw are provided at an interval

between the tank 10A and the bulkhead 9 in the ship width direction Dw.

[0023]

As illustrated in Fig. 3, the lower support section 20A supports the tank 10A on the hull 2 from below. The lower support section 20A described as an example in the present embodiment includes two saddle type supports 21A for one tank 10A. The saddle type supports 21A are provided at an interval in the bow-stern direction Da for one tank 10A. The saddle type supports 21A are disposed in both end sections of the intermediate cylindrical section 11a of the first body section 11 of the tank 10A in the bow-stern direction Da. Each of the saddle type supports 21A is fixed to the bottom deck 8b of the cargo tank storage compartment 8 of the hull 2.

[0024]

As illustrated in Fig. 2, the saddle type support 21A has rising sections 21a rising upward on both sides in the ship width direction Dw. The saddle type support 21A has a placement surface 21s between the rising sections 21a on both sides in the ship width direction Dw. The placement surface 21s has a concave curved surface shape along the bottom surface 10b of the tank 10A. The first body section 11 of the tank 10A having the bottom surface 10b is placed on the placement surface 21s.

[0025]

The elastic support section 30A elastically supports the tank 10A with respect to the hull 2 above the lower support section 20A.

As illustrated in Fig. 3, the elastic support sections 30A in the present embodiment are provided at an interval in two locations in the bow-stern direction Da. In addition, as illustrated in Fig. 2, the elastic support section 30A in the present embodiment includes a lateral elastic support section 31A and an upper elastic support section 32A in each location. In the present embodiment, the elastic support sections 30A may be provided in two or more locations in the bow-stern direction Da. In addition, when a shape of the tank 10A, for example, a length in the bow-stern direction Da is short, the elastic support section 30A may be provided in one location in the bow-stern direction Da.

[0026]

The lateral elastic support sections 31A are provided on both sides of the second body section 12 provided in the upper section of each of the tanks 10A in the ship width direction Dw. With respect to each of the tanks 10A, the lateral elastic support section 31A disposed outward in the ship width direction Dw is provided between the broadside 3A or the broadside 3B on the hull 2 side and a side surface 12s of the second body section 12, which is a surface Fw

facing the ship width direction Dw in the upper section of the tank 10A. In addition, the lateral elastic support section 31A is also disposed inward in the ship width direction Dw with respect to each of the tanks 10A. The lateral elastic support section 31A disposed inward in the ship width direction Dw is provided between the bulkhead 9 on the hull 2 side and a side surface 12t of the second body section 12, which is the surface Fw facing the ship width direction Dw in the upper section of the tank 10A.

[0027]

The upper elastic support section 32A is provided on an upper side of the second body section 12 of each of the tanks 10A. The upper elastic support sections 32A are respectively provided one by one on both sides in the ship width direction while a top section 12c of the second body section 12 is interposed therebetween. Each of the upper elastic support sections 32A is provided between the upper deck 5 on the hull 2 side and the second body section 12 of the tank 10A.

[0028]

The upper elastic support section 32A disposed outward in the ship width direction Dw with respect to each of the tanks 10A extends to be inclined inward and downward from above in the ship width direction Dw. The tip section 32s of the upper elastic support section 32A disposed outward

in the ship width direction Dw is disposed outward in the ship width direction Dw from the top section 12c with respect to the second body section 12.

In addition, the upper elastic support section 32A disposed inward in the ship width direction Dw with respect to each of the tanks 10A extends to be inclined outward and downward from above in the ship width direction Dw. The tip section 32t of the upper elastic support section 32A disposed inward in the ship width direction Dw is disposed inward in the ship width direction Dw from the top section 12c with respect to the second body section 12.

[0029]

That is, the tip sections 32s and 32t of the upper elastic support section 32A are connected to a portion inclined in both the upward-downward direction Dv and the ship width direction Dw, on the upper surface 12d of the second body section 12. In other words, the tip sections 32s and 32t of the upper elastic support section 32A are connected to a position where the surface Fw facing the ship width direction Dw and the surface Fu facing upward in the upward-downward direction Dv overlap each other, in the upper section of the tank 10A. In this way, the upper elastic support section 32A is disposed across the upper deck 5 on the hull 2 side and the upper section of the tank 10A.

[0030]

As illustrated in Fig. 4, a coil spring 51 is used as the elastic support member 50. In the coil spring 51, the base end section 51a is connected to the hull 2 side (broadside 3A and 3B, bulkhead 9, and upper deck 5) via a fixing member 56A. The tip section 51b of the coil spring 51 is connected to the second body section 12 of the tank 10A via a fixing member 56B. The coil spring 51 is elastically deformable in a direction in which the base end section 51a and the tip section 51b come into contact with and are separated from each other, and is provided in a compressed state between the hull 2 side and the tank 10A.

[0031]

In addition, as illustrated in examples in Figs. 5 to 8, the coil spring 51 can be replaced with another member.

As illustrated in Fig. 5, a leaf spring 52 can be used as the elastic support member 50. A base end section 52a of the leaf spring 52 is connected to the hull 2 side (broadside 3A and 3B, bulkhead 9, and upper deck 5) via the fixing member 56A. A tip section 52b of the leaf spring 52 is connected to the second body section 12 of the tank 10A via the fixing member 56B. The leaf spring 52 has a curved section 52c curved in a U-shape or a V shape between the base end section 52a and the tip section 52b, and is elastically deformable in a direction in which the base end

section 52a and the tip section 52b come into contact with and are separated from each other. The leaf spring 52 is provided in a compressed state between the hull 2 side and the tank 10A.

[0032]

In addition, as illustrated in Fig. 6, as the elastic support member 50, an elastic body 53 formed of rubber or a resin can be used. A base end section 53a of the elastic body 53 is connected to the hull 2 side (broadside 3A and 3B, bulkhead 9, upper deck 5) via a fixing member 57A. A tip section 53b of the elastic body 53 is connected to the second body section 12 of the tank 10A via a fixing member 57B. The elastic body 53 is elastically deformable in a direction in which the base end section 53a and the tip section 53b come into contact with and are separated from each other. The elastic body 53 is provided in a compressed state between the hull 2 side and the tank 10A.

[0033]

In addition, as illustrated in Fig. 7, as the elastic support member 50, an elastic body 54 formed of rubber or a resin can be used. A base end section 54a of the elastic body 54 is connected to the hull 2 side (broadside 3A and 3B, bulkhead 9, upper deck 5) via a fixing member 57A. A tip section 54b of the elastic body 54 abuts against the second body section 12 of the tank 10A. The elastic body

54 is elastically deformable in a direction in which the base end section 54a and the tip section 54b come into contact with and are separated from each other. The elastic body 54 is provided in a compressed state between the hull 2 side and the tank 10A, and even when the tank 10A is thermally shrunk, the elastic body 54 is provided to maintain a state where the tip section 54b abuts against the second body section 12.

[0034]

In addition, as illustrated in Fig. 8, a damper 55 can be used as the elastic support member 50. A base end section 55a of the damper 55 is connected to the hull 2 side (broadside 3A and 3B, bulkhead 9, upper deck 5) via the fixing member 56A. A tip section 55b of the damper 55 is connected to the second body section 12 of the tank 10A via the fixing member 56B. The damper 55 includes a cylinder 55c provided in the base end section 55a and internally filled with a compressible fluid such as air, and a piston 55d provided in the tip section 55b. The piston 55d moves inside the fluid of the cylinder 55c when the base end section 55a and the tip section 55b come into contact with and are separated from each other. When the piston 55d moves inside the fluid of the cylinder 55c, the damper 55 generates a damping force. In addition, the damper 55 generates an elastic force resulting from the compressible

fluid in response to a sudden input. In this manner, the damper 55 elastically supports the upper section of the tank 10A with respect to the hull 2. A damper using an incompressible fluid and an elastic member such as a spring may be used in combination.

[0035]

The ship 1A of the above-described first embodiment includes the tank 10A having a cross-sectional shape perpendicular to the bow-stern direction Da in which the upward-downward direction Dv is set as the longitudinal direction, and the elastic support section 30A that elastically supports the tank 10A with respect to the hull 2 above the lower support section 20A.

In the ship 1A, the upper section of the tank 10A having a so-called vertically long cross-sectional shape, the cross-sectional shape perpendicular to the bow-stern direction Da in which the upward-downward direction Dv is set as the longitudinal direction, is supported by the elastic support section 30A. Therefore, the tank 10A having a so-called vertically long cross-sectional shape can be more stably supported by the elastic support section 30A.

[0036]

In the tank 10A of the ship 1A of the above-described first embodiment, the bottom surface 10b has a convex curved surface shape protruding downward. The lower support

section 20A has a concave curved surface shape along the bottom surface 10b of the tank 10A, and has the placement surface 21s on which the bottom surface 10b of the tank 10A is placed.

In the ship 1A configured in this way, the tank 10A is placed on the placement surface 21s, and the tank 10A is not fixed to the lower support section 20A. However, even when a portion above the lower support section 20A tries to be displaced due to a large vibration of the ship 1A, the elastic support section 30A suppresses a possibility that the portion above the lower support section 20A may be displaced. Therefore, the tank 10A can be stably supported.

[0037]

In the ship 1A of the above-described first embodiment, the elastic support section 30A is provided between the hull 2 side and the surface Fw facing the ship width direction Dw, in the upper section of the tank 10A.

In this manner, it is possible to suppress a possibility that the portion above the lower support section 20A in the tank 10A may be displaced in the ship width direction Dw.

[0038]

In the ship 1A of the above-described first embodiment, the elastic support section 30A is provided between the hull

2 side and the surface F_u facing upward in the upper section of the tank 10A.

In this manner, it is possible to suppress a possibility that the portion above the lower support section 20A in the tank 10A may be displaced in the upward-downward direction D_v .

[0039]

In the ship 1A of the above-described first embodiment, the elastic support section 30A is fixed to the broadsides 3A and 3B of the hull 2, the upper deck 5, and the bulkhead 9.

In this manner, displacement of the tank 10A can be received on the hull 2 side via the elastic support section 30A.

[0040]

In the ship 1A of the above-described first embodiment, the elastic support section 30A is provided in a compressed state between the hull 2 side and the tank 10A.

In this manner, even when a low-temperature liquefied gas is accommodated inside the tank 10A and the tank 10A is thermally shrunk, the elastic support section 30A in the compressed state is stretched, and a state of elastically supporting the tank 10A can be maintained.

[0041]

Hitherto, the first embodiment of the present disclosure has been described in detail with reference to the drawings. However, specific configurations are not limited to the embodiment, and design changes within the scope not departing from the concept of the present disclosure are also included.

In the above-described embodiment, the elastic support sections 30A are provided in two locations at an interval in the bow-stern direction Da. However, the present disclosure is not limited thereto. The elastic support section 30A may be provided only in one location in the bow-stern direction Da. In addition, the elastic support sections 30A may be provided in three or more locations at an interval in the bow-stern direction Da. In addition, as illustrated in Fig. 9, the elastic support sections 30A may be continuously provided along the bow-stern direction Da. In addition, when the shape of the tank 10A, for example, the length in the bow-stern direction Da is relatively short, the elastic support section 30A may be provided at one installation position in the bow-stern direction Da.

[0042]

In addition, in the first embodiment, one end of the lateral elastic support section 31A is connected to the side surface 12s of the second body section 12 which is the surface Fw facing the ship width direction Dw in the upper

section of the tank 10A. However, the present disclosure is not limited thereto. Depending on the shape of the tank 10A, one end of the lateral elastic support section 31A may be connected to a side surface (not illustrated) of the first body section 11 which is a surface (not illustrated) facing the ship width direction Dw in the lower section of the tank 10A. For example, this corresponds to a case where the first body section 11 is larger than the second body section 12, and a case where the center of gravity of the tank 10A is located sufficiently below the position of the second body section 12.

Furthermore, a connection position of the lateral elastic support section 31A with respect to each of the tanks 10A is not limited only to the surface facing the ship width direction Dw in the upper section or the lower section of the tank 10A. The elastic support section 30A may be installed to suppress a possibility that the portion above the lower support section 20A may be displaced due to the vibration in the ship 1A. Therefore, for example, the elastic support section 30A may be installed on a surface facing downward in the upward-downward direction Dv in the upper section of the tank 10A.

[0043]

In addition, in the first embodiment, the upper elastic support sections 32A are respectively provided on

both sides in the ship width direction while the top section 12c of the second body section 12 is interposed therebetween. However, the present disclosure is not limited thereto.

For example, as illustrated in Fig. 10, the upper elastic support section 32A may be provided between the top section 12c of the second body section 12 and the upper deck 5. In this manner, the upper elastic support section 32A is provided between the upper deck 5 on the hull 2 side and the surface F_u (top section 12c of the second body section 12) facing upward in the upper section of the tank 10A.

In addition, as illustrated in Fig. 11, the upper elastic support sections 32A may be provided in three or more locations at an interval in the ship width direction D_w (circumferential direction of the second body section 12).

[0044]

In addition, in the first embodiment, the elastic support section 30A includes the lateral elastic support section 31A and the upper elastic support section 32A. However, the present disclosure is not limited thereto. The elastic support section 30A may include at least one of the lateral elastic support section 31A and the upper elastic support section 32A.

[0045]

In addition, in the first embodiment, the elastic support section 30A is installed in the compressed state. However, the present disclosure is not limited thereto. When the elastic support section 30A acts to suppress a possibility that the portion above the lower support section 20A may be displaced due to the vibration in the ship 1A within a range of elastic deformation of the elastic support section 30A, for example, the elastic support section 30A may be installed in a tensile state.

[0046]

In addition, in the first embodiment, a plurality of members of the elastic support member 50 have been described as an example. However, the present disclosure is not limited thereto. Other members that enables elastic support may be used. In addition, the plurality of elastic support members may be configured in combination.

[0047]

In addition, in the first embodiment, the tank 10A is not fixed to the lower support section 20A. However, the present disclosure is not limited thereto. A disposition status of the tank 10A on the placement surface 21s is not limited to the above-described form. For example, in the plurality of lower support sections 20A, for example, the tank 10A may be fixed to the placement surface 21s in one

location thereof. In this case, various pipes can be stably fixed in the vicinity of the fixed position.

[0048]

In addition, in the first embodiment, the tank 10A is provided on the lower side of the upper deck 5. However, the present disclosure is not limited thereto.

For example, as illustrated in Fig. 12, the upper section of the tank 10A may be provided to protrude upward from the upper deck 5. In this case, the elastic support section 30B may include only the lateral elastic support section 31B. For example, the lateral elastic support section 31B may be provided between an opening 5h formed in the upper deck 5 and the upper section of the tank 10A. The lateral elastic support section 31B has a configuration the same as that of the lateral elastic support section 31A.

[0049]

As illustrated in Fig. 13, a tank cover 15 that covers the upper section of the tank 10A may be provided above the tank 10A protruding upward from the upper deck 5. In this configuration, the upper elastic support section 32C of the elastic support section 30A is provided between the tank cover 15 on the hull 2 side and the second body section 12 of the tank 10A.

[0050]

<Second Embodiment>

Next, a second embodiment of a ship according to the present invention will be described. The second embodiment described below is mainly different from the first embodiment in only a configuration of a tank 10D. Therefore, description will be made by assigning the same reference numerals to elements which are the same as those of the first embodiment, and repeated description will be omitted.

As illustrated in Figs. 14 to 16, a ship 1D of the second embodiment includes at least the hull 2, the tank 10D, a lower support section 20D, and an elastic support section 30D.

[0051]

The tank 10D internally accommodates a liquefied gas. A plurality of the tanks 10D are disposed inside the cargo tank storage compartment 8 along the bow-stern direction Da. In the second embodiment, the tanks 10D are provided in two rows at an interval in the ship width direction Dw, except for the two tanks 10D disposed closest to the bow 2a side.

[0052]

As illustrated in Figs. 15 and 16, in the second embodiment, each of the tanks 10D has a cylindrical shape extending in the upward-downward direction Dv. The tank 10D includes a cylindrical section 10p, a lower hemispherical section 10q, and an upper hemispherical section 10r. The cylindrical section 10p has a cylindrical

shape extending in the upward-downward direction D_v . The lower hemispherical section 10q is continuously provided on the lower side of the cylindrical section 10p. The lower hemispherical section 10q has a convex curved surface shape in which the respective dimensions in the ship width direction D_w and the bow-stern direction D_a gradually decrease downward from above. The upper hemispherical section 10r is continuously provided on the upper side of the cylindrical section 10p. The upper hemispherical section 10r has a convex curved surface shape in which the respective dimensions in the ship width direction D_w and the bow-stern direction D_a gradually decrease upward from below. Each shape of the upper hemispherical section 10r and the lower hemispherical section 10q is a hemispherical shape having a constant radius of curvature, and the hemispherical shape is partially illustrated. Both do not need to have the same shape.

[0053]

In the second embodiment, each of the tanks 10D is provided on the lower side of the upper deck 5. As illustrated in Fig. 15, a plurality of transverse bulkheads 6 are provided inside the cargo tank storage compartment 8 of the hull 2 at an interval in the bow-stern direction D_a . The tanks 10D are aligned two by two, and are disposed in the bow-stern direction D_a between the transverse bulkheads

6 located on the mutually front and rear side in the bow-stern direction Da. As illustrated in Fig. 14, the bulkhead 9 is provided between the tanks 10D adjacent to each other in the ship width direction Dw.

In the present invention, each of the transverse bulkheads 6 is not always required, and can be omitted when emergency measures are taken by separate means. As will be described later, one end of the lateral elastic support section 31D is connected to each of the bulkheads 9, but can be omitted when the connection is made by separate means and emergency measures are taken by separate means.

[0054]

As illustrated in Fig. 16, the respective tanks 10D are provided between the broadsides 3A and 3B at an interval in the ship width direction Dw. In addition, the respective tanks 10D are provided between the tanks 10D and the bulkhead 9 at an interval in the ship width direction Dw.

[0055]

The lower support section 20D supports each of the tanks 10D on the hull 2 from below. The lower support section 20D is fixed to the bottom deck 8b of the cargo tank storage compartment 8 of the hull 2. An outer peripheral section of the lower support section 20D has a rising section 21b that rises upward. The lower support section 20D has a placement surface 21t located inward in the radial

direction of the rising section 21b. The placement surface 21t has a concave curved surface shape along the bottom surface of the tank 10D. The lower hemispherical section 10q having the bottom surface of the tank 10D is placed on the placement surface 21t.

[0056]

The elastic support section 30D elastically supports the tank 10D with respect to the hull 2 above the lower support section 20D. In the second embodiment, the elastic support section 30D includes a lateral elastic support section 31D and an upper elastic support section 32D.

[0057]

The lateral elastic support sections 31D are provided on both sides of the cylindrical section 10p in the upper section of each of the tanks 10D in the ship width direction Dw. With respect to each of the tanks 10D, the lateral elastic support section 31D disposed outward in the ship width direction Dw is provided between the broadside 3A or the broadside 3B on the hull 2 side and the side surface 10s of the cylindrical section 10p which is the surface Fw facing the ship width direction Dw in the upper section of the tank 10D. In addition, the lateral elastic support section 31D is also disposed inward in the ship width direction Dw with respect to each of the tanks 10D. The lateral elastic support section 31D disposed inward in the

ship width direction Dw is provided between the bulkhead 9 on the hull 2 side and the side surface 10t of the cylindrical section 10p which is the surface Fw facing the ship width direction Dw in the upper section of the tank 10D.

[0058]

The upper elastic support section 32D is provided on the upper side of the upper hemispherical section 10r provided in the upper section of each of the tanks 10D. The upper elastic support sections 32D are respectively provided on both sides in the ship width direction while a top section 10 m of the upper hemispherical section 10r is interposed therebetween. Each of the upper elastic support sections 32D is provided between the upper deck 5 on the hull 2 side and the upper hemispherical section 10r of the tank 10D.

[0059]

The upper elastic support section 32D disposed outward in the ship width direction Dw with respect to each of the tanks 10D extends to be inclined inward and downward from above in the ship width direction Dw. The tip section 32s of the upper elastic support section 32D disposed outward in the ship width direction Dw is disposed outward in the ship width direction Dw with respect to the top section 10m of the upper hemispherical section 10r.

In addition, the upper elastic support section 32D disposed inward in the ship width direction Dw with respect to each of the tanks 10D extends to be inclined outward and downward from above in the ship width direction Dw. The tip section 32t of the upper elastic support section 32D disposed inward in the ship width direction Dw is disposed inward in the ship width direction Dw with respect to the top section 10m of the upper hemispherical section 10r.

[0060]

That is, the tip sections 32s and 32t of the upper elastic support section 32D are connected to a portion inclined to both the upward-downward direction Dv and the ship width direction Dw, on the upper surface of the second body section 12. In other words, the tip sections 32s and 32t of the upper elastic support section 32D are connected to a position where the surface Fw facing the ship width direction Dw and the surface Fu facing upward in the upward-downward direction Dv overlap each other, in the upper section of the tank 10D. In this way, the upper elastic support section 32D is disposed across the upper deck on the hull 2 side and the upper section of the tank 10D.

[0061]

The lateral elastic support section 31D and the upper elastic support section 32D which form the elastic support section 30D are respectively formed by using the elastic

support member 50. As in the above-described first embodiment, the elastic support member 50 includes the coil spring 51 (refer to Fig. 4), the leaf spring 52 (refer to Fig. 5), the elastic body 53 formed of rubber or a resin (refer to Fig. 6), the elastic body 54 (refer to Fig. 7), and the damper 55 (refer to Fig. 8). In addition, the elastic support member may be configured to include a plurality of members in combination.

[0062]

The ship 1D of the above-described second embodiment includes the tank 10D having a cross-sectional shape perpendicular to the bow-stern direction Da in which the upward-downward direction Dv is set as the longitudinal direction, and the elastic support section 30D that elastically supports the tank 10D with respect to the hull 2 above the lower support section 20D.

In the ship 1D, the tank 10D supported from below by the lower support section 20D is elastically supported with respect to the hull 2 by the elastic support section 30D above the lower support section 20D. In this manner, the upper section of the tank 10D having a so-called vertically long cross-sectional shape, the cross-sectional shape perpendicular to the bow-stern direction Da in which the upward-downward direction Dv is set as the longitudinal

direction, can be supported by the elastic support section 30D. Therefore, the tank 10D can be more stably supported.

[0063]

In the tank 10D of the ship 1D of the above-described second embodiment, the lower hemispherical section 10q forming the bottom surface has a convex curved surface shape protruding downward. The lower support section 20D has a concave curved surface shape along the bottom surface of the tank 10D, and has the placement surface 21t on which the bottom surface of the tank 10D is placed. In this ship 1D, the tank 10D is placed on the placement surface 21t, and is not fixed to the lower support section 20D. Therefore, in some cases, the portion above the lower support section 20D may try to be displaced due to a large vibration of the ship 1D. However, the elastic support section 30D suppresses a possibility that the portion above the lower support section 20D may be displaced. Therefore, the tank 10D can be stably supported.

[0064]

In the ship 1D of the above-described second embodiment, the elastic support section 30D is provided between the hull 2 side and the surface Fw facing the ship width direction Dw in the upper section of the tank 10D.

In this manner, it is possible to suppress a possibility that the portion above the lower support section

20D in the tank 10D may be displaced in the ship width direction Dw.

[0065]

In the ship 1D of the above-described second embodiment, the elastic support section 30D is provided between the hull 2 side and the surface Fu facing upward in the upper section of the tank 10D.

In this manner, it is possible to suppress a possibility that the portion above the lower support section 20D in the tank 10D may be displaced in the upward-downward direction Dv.

[0066]

In the ship 1D of the above-described second embodiment, the elastic support section 30D is fixed to the broadsides 3A and 3B of the hull 2, the upper deck 5, and the bulkhead 9.

In this manner, displacement of the tank 10D can be received on the hull 2 side via the elastic support section 30D.

[0067]

In the ship 1D of the above-described second embodiment, the elastic support section 30D is provided in a compressed state between the hull 2 side and the tank 10D.

In this manner, even when the low-temperature liquefied gas is accommodated inside the tank 10D and the

tank 10D is thermally shrunk, the elastic support section 30D in the compressed state is stretched, and a state of elastically supporting the tank 10D can be maintained.

[0068]

In the ship 1D of the above-described second embodiment, the tank 10D has a cylindrical shape extending in the upward-downward direction Dv.

In this manner, it is possible to stably support the tank 10D having a vertically long cross-sectional shape, the cross-sectional shape perpendicular to the bow-stern direction Da in which the upward-downward direction Dv is set as the longitudinal direction. Since the tank 10D has a vertical cross-sectional shape in this way, capacity of the tank 10D in the ship 1D can be efficiently increased.

[0069]

Hitherto, the second embodiment of the present disclosure has been described in detail with reference to the drawings. However, specific configurations are not limited to the embodiment, and design changes within the scope not departing from the concept of the present disclosure are also included.

In the above-described embodiment, the upper elastic support sections 32D are respectively provided on both sides in the ship width direction Dw while the top section 10 m of the upper hemispherical section 10r is interposed

therebetween. However, the present disclosure is not limited thereto. For example, as illustrated in Fig. 17, the upper elastic support section 32D may be provided between the top section 10 m of the upper hemispherical section 10r and the upper deck 5. In this manner, the upper elastic support section 32D is provided between the upper deck 5 on the hull 2 side and the surface Fu (top section 10 m of the upper hemispherical section 10r) facing upward in the upper section of the tank 10D.

[0070]

In addition, as illustrated in Fig. 18, the upper elastic support section 32D may be located at a lateral position in the ship width direction Dw with respect to the top section 10 m of the upper hemispherical section 10r, and at a position deviated from the top section 10 m of the upper hemispherical section 10r in the bow-stern direction Da. In this manner, the upper elastic support section 32D is provided among the upper deck 5 on the hull 2 side, the surface Fu facing upward in the upper section of the tank 10D, and the surface Fa facing the bow-stern direction Da in the upper section of the tank 10A.

[0071]

In addition, the upper elastic support sections 32D may be provided in three or more locations at an interval in the circumferential direction of the upper hemispherical

section 10r. For example, as illustrated in Figs. 19 and 20, the upper elastic support sections 32D may be provided in three locations at an equal interval in the circumferential direction of the upper hemispherical section 10r. In this case, the upper elastic support section 32D is provided among the upper deck 5 on the hull 2 side, the surface Fu facing upward in the upper section of the tank 10D, the surface Fw facing the ship width direction Dw in the upper section of the tank 10A, and the surface Fa facing the bow-stern direction Da in the upper section of the tank 10A.

[0072]

In addition, in the second embodiment, the lateral elastic support sections 31D are respectively provided on both sides in the ship width direction Dw while the cylindrical section 10p is interposed therebetween. However, the present disclosure is not limited thereto.

For example, as illustrated in Fig. 21, the lateral elastic support sections 31D may be provided on both sides in the bow-stern direction Da while the cylindrical section 10p is interposed therebetween. In this case, the lateral elastic support section 31D may be disposed to be interposed between the transverse bulkheads 6 adjacent to each other in the bow-stern direction Da and between the tanks 10D adjacent to each other.

In addition, as illustrated in Fig. 22, the support member 16 extending in the ship width direction Dw may be provided between the transverse bulkheads 6 adjacent to each other in the bow-stern direction Da and between the tanks 10D adjacent to each other. The lateral elastic support sections 31D may be respectively provided between the support members 16 facing each other in the bow-stern direction Da and the respective tanks 10D.

[0073]

In addition, in the second embodiment, the elastic support section 30D includes the lateral elastic support section 31D and the upper elastic support section 32D. However, the present disclosure is not limited thereto. The elastic support section 30D may include at least one of the lateral elastic support section 31D and the upper elastic support section 32D.

[0074]

In addition, in the second embodiment, the tank 10D is not fixed to the lower support section 20D. However, the present disclosure is not limited thereto. A disposition status of the tank 10A on the placement surface 21t is not limited to the above-described form. For example, in the plurality of lower support sections 20D, for example, the tank 10A may be fixed to the placement surface 21s in one

location thereof. In this case, various pipes can be stably fixed in the vicinity of the fixed position.

[0075]

In addition, in the second embodiment, the elastic support section 30A is installed in a compressed state. However, the present disclosure is not limited thereto. When the elastic support section 30A acts to suppress a possibility that the portion above the lower support section 20A may be displaced due to the vibration in the ship 1A within a range of elastic deformation of the elastic support section 30A, for example, the elastic support section 30A may be installed in a tensile state.

[0076]

In addition, in the second embodiment, the tank 10D is provided on the lower side of the upper deck 5. However, the present disclosure is not limited thereto.

For example, as in the modification example of the above-described first embodiment illustrated in Fig. 12, the upper section of the tank 10D may be provided to protrude upward from the upper deck 5.

In addition, as in the modification example of the above-described first embodiment illustrated in Fig. 13, the tank cover 15 covering the upper section of the tank 10D may be provided above the tank 10D protruding upward from the upper deck 5.

[0077]

In the above-described second embodiment, the tanks 10D are provided in two rows at an interval in the ship width direction Dw. However, the present disclosure is not limited thereto.

For example, as illustrated in Fig. 23, the tank 10D may be provided in only one row in the center in the ship width direction Dw, for example. In other words, the plurality of tanks 10D may be disposed in series at an interval in the bow-stern direction Da.

[0078]

In addition, as illustrated in Fig. 24, disposition in a so-called staggered pattern may be used as follows. The plurality of tanks 10D are disposed at an interval in the bow-stern direction Da, and the tanks 10D adjacent to each other in the bow-stern direction Da are alternately disposed on the first side in the ship width direction Dw and on the second side in the ship width direction Dw. In a case of the configurations illustrated in Figs. 23 and 24, as in the above-described second embodiment, the elastic support section 30D may be provided with respect to each of the tanks 10D.

[0079]

Alternatively, in the above-described respective embodiments, the lower support sections 20A and 20D that

support the tanks 10A and 10D from below are provided. However, the lower support section may be a deck forming the bottom surface of a skirt or a hold. That is, for example, the present disclosure includes a configuration in which a square tank is simply placed on the deck.

In addition, the tanks 10A and 10D may be provided below the deck other than the upper deck 5.

[0080]

<Appendix>

The ships 1A and 1D described in the respective embodiments can be understood as follows, for example.

[0081]

(1) The ships 1A and 1D according to a first aspect include the hull 2, the tanks 10A and 10D installed on the hull 2, filled with the liquefied gas, and having the cross-sectional shape perpendicular to the bow-stern direction Da in which the upward-downward direction Dv is set as the longitudinal direction, the lower support sections 20A and 20D that support the tanks 10A and 10D on the hull 2 from below, and the elastic support sections 30A, 30B, and 30D that elastically support the tanks 10A and 10D with respect to the hull 2 above the lower support sections 20A and 20D.

Examples of the elastic support sections 30A, 30B, and 30D include the coil spring 51, the leaf spring 52, the

elastic bodies 53 and 54 formed of rubber or a resin, and the damper 55.

[0082]

In the ships 1A and 1D, the tanks 10A and 10D supported from below by the lower support sections 20A and 20D are elastically supported with respect to the hull 2 by the elastic support sections 30A, 30B, and 30D above the lower support sections 20A and 20D. In this manner, the upper section of the tanks 10A and 10D having a so-called vertically long cross-sectional shape having the cross-sectional shape perpendicular to the bow-stern direction Da in which the upward-downward direction Dv is set as the longitudinal direction can be stably supported by the elastic support sections 30A, 30B, and 30D. Therefore, the tanks 10A and 10D can be more stably supported.

[0083]

(2) In the ships 1A and 1D according to a second aspect, which are the ships 1A and 1D according to (1), the tanks 10A and 10D have a convex curved surface shape whose bottom surface 10b protrudes downward. The lower support sections 20A and 20D have a concave curved surface shape along the bottom surface 10b of the tanks 10A and 10D, and have the placement surfaces 21s and 21t on which the bottom surface 10b of the tanks 10A and 10D are placed.

[0084]

The tanks 10A and 10D in which the bottom surface 10b having the convex curved surface shape is placed on the placement surfaces 21s and 21t having the concave curved surface shape are not fixed to the lower support sections 20A and 20D, and the portion above the lower support sections 20A and 20D may try to be displaced due to the large vibration of the ships 1A and 1D, in some cases. The tanks 10A and 10D configured in this way are supported by the elastic support sections 30A, 30B, and 30D above the lower support sections 20A and 20D. In this manner, the tanks 10A and 10D can be stably supported.

[0085]

(3) In the ships 1A and 1D according to a third aspect, which are the ships 1A and 1D according to (1) or (2), the elastic support sections 30A, 30B, and 30D are provided between the hull 2 side and the surface Fa facing the bow-stern direction Da in the upper section of the tanks 10A and 10D.

[0086]

In this manner, in the tanks 10A and 10D, it is possible to suppress a possibility that the portion above the lower support sections 20A and 20D may be displaced in the bow-stern direction Da.

[0087]

(4) In the ships 1A and 1D according to a fourth aspect, which are the ships 1A and 1D according to any one of (1) to (3), the elastic support sections 30A and 30D are provided between the hull 2 side and the surface Fw facing the ship width direction Dw in the upper section of the tanks 10A and 10D.

[0088]

In this manner, it is possible to suppress a possibility that the portion above the lower support sections 20A and 20D in the tanks 10A and 10D may be displaced in the ship width direction Dw.

[0089]

(5) In the ships 1A and 1D according to a fifth aspect, which are the ships 1A and 1D according to any one of (1) to (4), the elastic support sections 30A and 30D are provided between the hull 2 side and the surface Fu facing upward in the upper section of the tanks 10A and 10D.

[0090]

In this manner, it is possible to suppress a possibility that the portion above the lower support sections 20A and 20D in the tanks 10A and 10D may be displaced in the upward-downward direction Dv.

[0091]

(6) In the ships 1A and 1D according to a sixth aspect, which are the ships 1A and 1D according to any one of (1)

to (5), the elastic support sections 30A and 30D are fixed to at least one of the broadsides 3A and 3B of the hull 2, the deck 5 provided on the hull 2 and above the tanks 10A and 10D, the tank cover 15 provided on the hull 2 and covering the section above the tanks 10A and 10D, and the bulkheads 9 provided on the hull 2 and partitioning the inside of the hull 2 in the ship width direction Dw or the bow-stern direction Da.

Examples of the deck provided above the tanks 10A and 10D include the upper deck 5, and decks other than the upper deck 5.

[0092]

In this manner, the elastic support sections 30A, 30B, and 30D are fixed to at least one of the broadsides 3A and 3B, the deck 5, the tank cover 15, and the bulkhead 9. In this manner, displacement of the tanks 10A and 10D can be received on the hull 2 side via the elastic support section 30A, 30B, and 30D.

[0093]

(7) In the ships 1A and 1D according to a seventh aspect, which are the ships 1A and 1D according to any one of (1) to (6), the elastic support sections 30A, 30B, and 30D are provided in a compressed state between the hull 2 side and the tanks 10A and 10D.

[0094]

In this manner, even when the low-temperature liquefied gas is accommodated inside the tanks 10A and 10D and the tanks 10A and 10D are thermally shrunk, the elastic support sections 30A, 30B, and 30D in a compressed state or a tensile state are stretched, and a state of elastically supporting the tanks 10A and 10D can be maintained.

[0095]

(8) In the ships 1A and 1D according to an eighth aspect, which are the ships 1A and 1D according to any one of (1) to (7), the tanks 10A and 10D include the first body section 11 extending in the bow-stern direction D_a , and the second body section 12 provided above the first body section 11, extending in the bow-stern direction D_a , and connected to the first body section 11.

[0096]

In this manner, it is possible to stably support the tanks 10A and 10D having a vertically long cross-sectional shape, the cross-sectional shape perpendicular to the bow-stern direction D_a in which the upward-downward direction D_v is set as the longitudinal direction. Since the tanks 10A and 10D having the vertical cross-sectional shape in this way, capacity of the tanks 10A and 10D in the ships 1A and 1D can be efficiently increased.

[0097]

(9) In the ship 1D according to a ninth aspect, which are the ships 1A and 1D according to any one of (1) to (8), the tank 10D has a cylindrical shape extending in the upward-downward direction Dv.

[0098]

In this manner, since the cylindrical tank 10D extending in the upward-downward direction Dv is provided, capacity of the tank 10D in the ship 1D can be efficiently increased. When the tank 10D having the cross-sectional shape in this way is provided, the tank 10D can be stably supported.

Industrial Applicability

[0099]

According to the ship of the present disclosure, the tank can be supported more stably.

Reference Signs List

[0100]

1A, 1D: Ship

2: Hull

2a: Bow

2b: Stern

3A, 3B: Broadside

4: Ship bottom

5: Upper deck (deck)

5h: Opening

6: Transverse bulkhead

7: Superstructure

8: Cargo tank storage compartment

8b: Bottom section deck

9: Bulkhead

10A, 10D: Tank

10b: Bottom surface

10j: Joint portion

10m: Top section

10p: Cylindrical section

10q: Lower hemispherical section

10r: Upper hemispherical section

10s, 10t: Side surface

11: First body section

11a: Intermediate cylindrical section

11b: End spherical section

12: Second body section

12a: Intermediate cylindrical section

12b: End spherical section

12c: Top section

12s, 12t: Side surface

15: Tank cover

16: Support member

20A, 20D: Lower support section

21A: Saddle type support

21a, 21b: Rising section
21s, 21t: Placement surface
30A, 30B, 30D: Elastic support section
31A, 31B, 31D: Lateral elastic support section
32A, 32C, 32D: Upper elastic support section
32s, 32t: Tip section
50: Elastic support member
51: Coil spring
51a: Base end section
51b: Tip section
52: Leaf spring
52a: Base end section
52b: Tip section
52c: Curved section
53: Elastic body
53a: Base end section
53b: Tip section
54: Elastic body
54a: Base end section
54b: Tip section
55: Damper
55a: Base end section
55b: Tip section
55c: Cylinder
55d: Piston

56A, 56B, 57A, 57B: Fixing member

Da: Bow-stern direction

Dv: Upward-downward direction

Dw: Ship width direction

Fa: Surface facing bow-stern direction

Fu: Surface facing upward

Fw: Surface facing ship width direction

S1, S2: Accommodating space

Claims

[Claim 1]

A ship comprising:

a hull;

a tank installed on the hull, filled with a liquefied gas, and having a cross-sectional shape perpendicular to a bow-stern direction in which an upward-downward direction is set as a longitudinal direction;

a lower support section that supports the tank on the hull from below; and

an elastic support section that elastically supports the tank with respect to the hull above the lower support section,

wherein the tank includes

a first cylindrical section extending in the bow-stern direction,

a second cylindrical section provided above the first cylindrical section, extending in the bow-stern direction, and connected to the first cylindrical section, and

a communication section through which the first cylindrical section and the second cylindrical section communicate with each other.

[Claim 2]

The ship according to Claim 1,

wherein the tank has a convex curved surface shape whose bottom surface protrudes downward, and

the lower support section has a concave curved surface shape along a bottom surface of the tank, and has a placement surface on which the bottom surface of the tank is placed.

[Claim 3]

The ship according to Claim 1 or 2,
wherein the elastic support section is provided between the hull side and a surface facing the bow-stern direction in an upper section of the tank.

[Claim 4]

The ship according to any one of Claims 1 to 3,
wherein the elastic support section is provided between the hull side and a surface facing a ship width direction in an upper section of the tank.

[Claim 5]

The ship according to any one of Claims 1 to 4,
wherein the elastic support section is provided between the hull side and a surface facing upward in an upper section of the tank.

[Claim 6]

The ship according to any one of Claims 1 to 5,
wherein the elastic support section is fixed to at least one of a broadside of the hull, a deck provided on the hull and above the tank, a

tank cover provided on the hull and covering a section above the tank, and a bulkhead provided on the hull and partitioning an inside of the hull in a ship width direction or in the bow-stern direction.

[Claim 7]

The ship according to any one of Claims 1 to 6,
wherein the elastic support section is provided in a compressed state or a tensile state between the hull side and the tank.

[Claim 8]

The ship according to any one of Claims 1 to 7,
wherein the tank has a cylindrical shape extending in the upward-downward direction.