

CLAIMS

1. A ship having a double hull (1) and a sealed, thermally insulating tank (4) carried on the ship, the double hull (1) comprising an inner hull (3) that forms a load-bearing structure for the sealed, thermally insulating tank (4) and an outer hull (2); the double hull (1) having, in the ballast zones (6), ballast compartments (7) that are designed to receive a liquid, such as sea water, and that are delimited between the inner hull (3) and the outer hull (2); the tank (4) having tank walls (8, 9, 10, 11, 12, 13, 14, 15, 16) that are fastened to the inner hull (3); each of the tank walls having, successively in a thickness direction of the tank wall, at least one thermally insulating barrier (17, 19) that comprises insulating panels (21, 28) fastened to the inner hull and a sealing membrane (18, 20) bearing against the insulating panels (21, 28); said tank walls including ballast-zone walls (9, 11, 12, 13, 14) that are fastened to the inner hull (3) level with at least one of the ballast compartments (7) in a thickness direction of said ballast-zone wall, and non-ballast-zone walls (8, 10) that are fastened to the inner hull (3) level with none of the ballast compartments in the thickness direction of said non-ballast-zone wall; at least one of the insulating panels (28) of the ballast-zone walls (9, 11, 12, 13, 14) being anchored directly or indirectly to the inner hull (3) using first anchoring devices (35, 49); at least one of the insulating panels (28) of the non-ballast-zone wall (8, 10, 15, 16) being anchored directly or indirectly to the inner hull (3) using second anchoring devices (52, 53, 89); in which each of the first anchoring devices (35, 49, 60) is provided with n_1 elastic members (44, 66, 88) arranged to exert an elastic force pressing said ballast-zone wall insulating panel (28) towards the inner hull (3) while enabling a relative movement, in the thickness direction of the tank wall, of said insulating panel (28) in relation to the load-bearing structure during deformation of the inner hull (3); n_1 being a whole number equal to or greater than 1; said first anchoring devices having a stiffness K_1 opposing the relative movement of said insulating panel (28) in relation to the load-bearing structure (3) in the thickness direction of the tank wall; and in which each of the second anchoring devices (52, 53, 89) is provided with n_2 elastic members (44, 66, 88) that are arranged to exert an elastic force pressing said non-

ballast-zone wall insulating panel (28) towards the inner hull (3) while enabling a relative movement of said insulating panel (28) in relation to the load-bearing structure during deformation of the inner hull (3); n_2 is a whole number equal to or greater than 0; said second anchoring devices having a stiffness K_2 opposing the relative
 5 movement of said insulating panel (28) in relation to the load-bearing structure (3) in the thickness direction of the tank wall; the stiffness K_2 being greater than K_1 .

2. The ship as claimed in claim 1, in which n_2 is less than n_1 .

3. The ship as claimed in claim 1 or 2, in which each of the tank walls comprises successively, from the outside towards the inside of the tank, a secondary
 10 thermally insulating barrier (17) that includes secondary insulating panels (21) fastened to the inner hull, a secondary sealing membrane (18) that bears against the secondary insulating panels (21), a primary thermally insulating barrier (19) that comprises a plurality of primary insulating panels (28) bearing against the secondary sealing membrane (18) and a primary sealing membrane (20) that bears against the
 15 primary insulating panels (28) and that is designed to come into contact with the liquefied natural gas contained in the tank (4).

4. The ship as claimed in claim 3, in which the first anchoring devices (35, 49) anchor at least one of the primary insulating panels of the ballast-zone walls (9, 11, 12, 13, 14) to at least one of the secondary insulating panels (21) of said
 20 ballast-zone wall (9, 11, 12, 13, 14); and in which the second anchoring devices anchor at least one of the primary insulating panels (28) of the non-ballast-zone walls (8, 10, 15, 16) to at least one of the secondary insulating panels (21) of said non-ballast-zone wall (8, 10, 15, 16).

5. The ship as claimed in claim 3, in which the first anchoring devices
 25 (60) anchor at least one of the secondary insulating panels of the ballast-zone walls (9, 11, 12, 13, 14) to the inner hull (3); and in which the second anchoring devices (89) anchor at least one of the secondary insulating panels of the non-ballast-zone walls (8, 10, 15, 16) to the inner hull (3).

6. The ship as claimed in claim 3 or 5, in which the first anchoring
 30 devices (60) anchor at least one of the primary insulating

panels of the ballast-zone walls (9, 11, 12, 13, 14) to the inner hull (3); and in which the second anchoring devices (89) anchor at least one of the primary insulating panels of the non-ballast-zone walls (8, 10, 15, 16) to the inner hull (3).

7. The ship as claimed in any one of claims 1 to 6, in which each of the first and second anchoring devices (35, 49, 52, 53, 60, 89) has a pin (27, 63, 84) that is anchored directly or indirectly to the inner hull (3) and a retaining member (39, 50, 64, 86) that is mounted on the pin (27, 63, 84); said retaining member (39, 50, 65, 86) being held on the pin (27, 63, 84) and cooperating with a bearing surface (41, 57, 59) of said insulating panel (28) anchored by said first or second anchoring device such as to hold same towards the inner hull (3).

8. The ship as claimed in claim 7, in which the pin (27, 63, 84) has a thread that cooperates with a nut (42, 65, 87) that holds the retaining member (39, 50, 64, 86) towards the inner hull (3).

9. The ship as claimed in claim 8, in which each elastic member is a spring washer (44, 66, 88) that is engaged on the pin (27, 63, 84), between the nut (42, 65, 87) and the retaining member (39, 50, 64, 86), to provide an elastic force pressing the retaining member against the bearing surface (41, 47, 59).

10. The ship as claimed in claim 9, in which the first anchoring devices (35, 49) have a spacer sleeve (45) that is slid onto the respective pin (27) and held towards the inner hull (3) by the nut (42), said spacer sleeve (45) having a cylindrical centering portion (47) that is fitted inside the n1 spring washers (44) to center same and an annular flange (48) that presses the n1 spring washers (44) against the retaining member (39, 50).

11. The ship as claimed in any one of claims 7 to 10, in which n2 is equal to 0 and in which each second anchoring device (52, 53) has a spacer sleeve (45) that is slid onto the respective pin (27) and held towards the secondary thermally insulating barrier (17) by the nut (42), and in which the spacer sleeve (45) has a flange (48) bearing against the retaining member (39, 50).

12. The ship as claimed in claims 10 and 11 taken in combination, in which the spacer sleeve (45) of one of the first anchoring devices (35, 49) and the spacer sleeve (45) of one of the second anchoring devices (52, 53) are identical, the flange (48) of said spacer sleeves being off-center in relation to the middle of the
5 spacer sleeve (45) such as to define a cylindrical centering portion that is longer than one half-length of the spacer sleeve, the spacer sleeve of said first anchoring device and the spacer sleeve of said second anchoring device having an inverted orientation such that the cylindrical centering portion (47) of the first anchoring device (35, 49) passes through the n1 spring washers (44) of said first anchoring device (35, 49) and
10 the cylindrical centering portion (47) of the second anchoring device (52, 53) is arranged between the flange (48) and the nut (42).

13. The ship as claimed in any one of claims 1 to 12, in which said tank walls also have mixed walls (15, 16) that have a portion not level with any of the ballast compartments and a portion level with at least one of the ballast compartments; and
15 in which at least one of the insulating panels of the mixed walls (15, 16) is anchored directly or indirectly to the inner hull by means of second anchoring devices (52, 53, 89).

14. The ship as claimed in any one of claims 1 to 13, in which the tank (4) has an overall polyhedral shape and has an upper wall (8), a lower wall (9), front
20 and rear transverse walls (10) extending transversely to the longitudinal direction of the ship and side walls (11, 12, 13, 14, 15, 16), the upper wall (8), the lower wall (9) and the side walls (11, 12, 13, 14, 15, 16) extending in the longitudinal direction of the ship and linking the front and rear transverse walls (10), and in which the front transverse wall, the rear transverse wall (10) and the upper wall (8) are each one of
25 the non-ballast-zone walls.

15. The ship as claimed in claim 14 taken in combination with claim 13, in which the tank (4) has at least four side walls (11, 12, 13, 14, 15, 16), two of said side walls being vertical side walls (13, 14) and two of said sidewalls being upper oblique side walls (15, 16), each of which links the upper wall (8) to one of said vertical
30 side walls (13, 14); each of said two upper oblique side walls (15, 16) being one of the mixed walls.

16. A transfer system for a fluid, the system including a ship (70) as claimed in any one of claims 1 to 15, insulated pipes (73, 79, 76, 81) arranged to connect the tank (71) installed in the hull of the ship to an onshore or floating storage facility (77) and a pump for driving a fluid through the insulated pipes to or from the
5 onshore or floating storage facility to or from the tank on the ship.

17. A method for loading or offloading a ship (70) comprising:
– providing a ship as claimed in any one of claims 1 to 15,
– routing a fluid through insulated pipes (73, 79, 76, 81) to or from
an onshore or floating storage facility (77) to or from the tank of the ship (71).