Claims

[Claim 1] A sealed and thermally insulating tank (71) for the storage of a liquefied gas, the tank (71) comprising a tank wall (2) fixed to a supporting wall (1), the tank wall comprising a structure with multiple layers superposed in a thicknesswise direction including at least one sealing membrane (3) and at least one thermally insulating barrier (4) arranged between the supporting wall and the sealing member (3),

the sealing membrane (3) comprising a plurality of corrugated metal sheets (8) tightly welded to one another,

the thermally insulating barrier (4) comprising a plurality of juxtaposed insulating panels (11) each having an inner face which forms a support surface (13) for the sealing membrane (3),

the sealing membrane (3) and the thermally insulating barrier (4) being interrupted in a singular zone by a window (7),

metal anchoring plates (14) being fixed onto the inner faces of the insulating panels (11) and the corrugated metal sheets (8) having edges welded to the anchoring plates (14) to retain the sealing membrane (3) against the support surface (13),

the tank comprising a hollow structure (15) inserted into the window (7), the hollow structure (15) being arranged through the thickness of the tank wall (2),

wherein the tank (71) comprises a metal closure plate (23), the metal closure plate (23) comprising an inner edge (24) welded all around the hollow structure (15), the metal closure plate (23) comprising an outer edge (25) placed under the sealing membrane (3) so as to form an overlap zone,

wherein the metal closure plate (23) is tightly welded with the sealing membrane (3) in the overlap zone, and the metal closure plate (23) is left free with respect to the thermally insulating barrier (4).

[Claim 2] The tank as claimed in claim 1, wherein the tank comprises a non-weldable thermal protection coating (27) situated between the metal closure plate (23) and the thermally insulating barrier (4) at least in a zone where the sealing membrane (3) covers the closure plate (23), to avoid degrading the inner face of the insulating panels (11) by making the weld between the metal closure plate (23) and the sealing membrane (3).

[Claim 3] The tank as claimed in claim 1 or claim 2, wherein the hollow structure is a sump structure (15), the sump structure (15) comprising a rigid container (16) comprising a lateral wall (18) and a rim (19) protruding outward from the container (16) all around the lateral wall (18), the inner edge (24) of the metal closure plate (23) being

welded to the rim (19) of the container (16) all around the lateral wall (18) of the container (16).

[Claim 4] The tank as claimed in claim 3, wherein the container (16) has a cylindrical form, the window (7) of the sealing membrane (3) has a square form and wherein the closure plate (23) has a square form with a dimension of a side of the closure plate (23) greater than a dimension of a side of the window (7), the closure plate (23) comprising an orifice formed so as to complement the form of the container (16).

[Claim 5] The tank as claimed in one of claims 1 to 4, wherein, in a zone of the tank away from the singular zone, the sealing membrane (3) has a first series of equidistant parallel rectilinear corrugations (9) extending in a first direction of the plane of the supporting wall and a second series of equidistant parallel rectilinear corrugations (10) extending in a second direction of the plane of the supporting wall, the second direction being at right angles to the first direction, the distance between two adjacent corrugations of the first series (9) and the distance between two adjacent corrugations of the second series (10) being equal to a predetermined corrugation interval io (28).

[Claim 6] The tank as claimed in claim 5, wherein the corrugated metal sheets (8) have rectangular forms whose sides are parallel respectively to the first direction and the second direction of the plane of the supporting wall and whose dimensions are substantially equal to integer multiples of the corrugation interval io, each edge of a corrugated metal sheet (8) being situated between two adjacent corrugations parallel to said edge.

[Claim 7] The tank as claimed in claim 6, wherein the closure plate (23) is oriented so as to have one side parallel to the first direction and another side parallel to the second direction, each side being of a dimension equal to 3io, and wherein the closure plate (23) interrupts two corrugations of the sealing membrane (3) in the first direction and two corrugations of the sealing membrane (3) in the second direction.

[Claim 8] The tank as claimed in one of claims 5 to 7, wherein, in the singular zone, a corrugation directly adjacent to the corrugation interrupted by the closure plate (23) has a singular portion (29) which is offset away from the closure plate (23) with respect to a guideline of said corrugation out of the singular zone, in order not to be interrupted by the closure plate (23).

[Claim 9] The tank as claimed in one of claims 5 to 8, wherein the sealing membrane (3) comprises, on either side of the closure plate (23) in the first direction, two notched rectangular corrugated metal sheets (31) of dimension 1io in the first direction and 7io in the second direction, said notched sheets (31) being symmetrical to one another with respect to an axis of symmetry parallel to the second direction passing through

the center of the window (7), and wherein each notched sheet (31) comprises an inner edge welded to the closure plate (23) and comprising a notching (32) formed to avoid cutting the window (7), said notching (32) having a dimension of 1io in the first direction and a dimension of 3io in the second direction in order for the notched inner edge to run along the window (7).

[Claim 10] The tank as claimed in claim 9, wherein each notched sheet (31) comprises an outer edge opposite the notched inner edge in the first direction, the outer edge being welded to an adjacent corrugated metal sheet (8) by overlap and wherein, at the weld of the outer edge of the notched sheet (31) with the adjacent corrugated metal sheet (8), the tank comprises a non-weldable thermal protection coating (27) on the thermally insulating barrier (4).

[Claim 11] The tank as claimed in claim 2 or claim 10, wherein the thermal protection coating (27) is produced in a composite material comprising at least one layer of glass fiber fixed to an aluminum sheet.

[Claim 12] The tank as claimed in one of claims 1 to 11, wherein the sealing membrane (3) is a primary sealing membrane, the thermally insulating barrier (4) is a primary thermally insulating barrier and the insulating panels (11) are primary insulating panels, wherein the tank wall comprises a secondary thermally insulating barrier (6) situated against the supporting wall and also comprises a secondary sealing membrane (5) situated between the secondary thermally insulating barrier (6) and the primary thermally insulating barrier (4), wherein the secondary sealing membrane (5) and the secondary thermally insulating barrier (6) being interrupted in the singular zone by the window (7).

[Claim 13] The tank as claimed in claims 3 and 12 taken in combination, wherein the container (16) is a primary container, the rim (19) is a first rim, and the sump structure (15) comprises a rigid secondary container (17) surrounding the primary container (16) so that a bottom part of the primary container (16) is situated in the secondary container (17), the secondary container (17) comprising a lateral wall (18) and a second rim (20) protruding outward from the secondary container (16) all around the lateral wall (18) of the secondary container (17),

wherein the second rim (20) of the secondary container (17) extends in a plane coinciding with a plane formed by the secondary sealing membrane (5), the second rim (20) being configured to be tightly fixed to the secondary sealing membrane (5).

[Claim 14] The tank as claimed in claim 13, wherein, in the singular zone, the secondary thermally insulating barrier (6) and the secondary container (16) of the sump structure (15) are spaced apart from one another by an adjustment chimney (34) and wherein

the primary thermally insulating barrier comprises relaxation slits (33), at least some of the relaxation slits (33) of the primary thermally insulating barrier (4) being interrupted in the singular zone in line with the adjustment chimney (34).

[Claim 15] A ship (70) for transporting a cold liquid product, the ship comprising a double hull (72) and a tank as claimed in one of claims 1 to 14 arranged in the double hull (72).

[Claim 16] A transfer system for a cold liquid product, the system comprising a ship (70) as claimed in claim 15, insulated pipelines (73, 79, 76, 81) arranged so as to link the tank (71) installed in the hull of the ship to a floating or onshore storage installation (77) and a pump for driving a flow of cold liquid product through the insulated pipelines from or to the floating or onshore storage installation to or from the tank of the ship.

[Claim 17] Method for loading or offloading a ship (70), wherein a cold liquid product is conveyed through insulated pipelines (73, 79, 76, 81) from or to a floating or onshore storage installation (77) to or from the tank of the ship (70) as claimed in claim 15.