Claims

[Claim 1] A sealed and thermally insulating tank integrated into a supporting structure, the tank including a first tank wall (1) fixed to a first supporting wall (3) and a second tank wall (101) fixed to a second supporting wall (103) joining the first supporting wall at the level of an edge (100) of the supporting structure,

in which each of the first and second tank walls includes at least one sealed membrane (4, 104) and ~~one~~ an insulating barrier (2, 102) arranged between the sealed membrane and the supporting wall,

in which the sealed membrane (4, 104) includes a plurality of strakes made of alloy with a low coefficient of expansion, each of the plurality of ~~a~~ strakes including a plane central portion resting on an upper surface of the insulating barrier and two raised edges projecting toward the interior of the tank relative to the central portion, the strakes being juxtaposed and welded together in sealed manner at the level of the raised edges,

the tank wall including a metal corner beam (10, 30) disposed parallel to the edge (100) and anchored to the first and second supporting walls (3, 103), the corner beam including a first plane flange parallel to the first supporting wall and a second plane flange parallel to the second supporting wall, the two plane flanges being rigidly connected to one another at the level of a sealed connecting zone forming a corner of the sealed membrane, each of the first and second plane flanges having a receiving portion (12, 30) that extends at a distance from the edge from the connecting zone,

in which a first portion of the insulating barrier is situated under a proximal portion of the receiving portions of the plane flanges (12, 30) and includes at least one row of first insulating panels (21, 121, 221), each of the first insulating panels (21, 121, 221) including a cover plate (40), a bottom plate (41) and spacers (42, 87, 88) extending in the direction of thickness of the tank wall between the bottom plate and the cover plate to hold the bottom plate and the cover plate at a distance from one another,

in which a second portion of the insulating barrier farther from the edge than the first portion of the insulating barrier includes at least one row of second insulating panels (22, 122), each of the second insulating panels including a cover plate (24), a bottom plate (23) and a block of insulating foam (25) inserted between the bottom plate and the cover plate so that the cover plate is held at a distance from the bottom plate by the block of insulating foam,

characterized in that an end portion of the strakes (32) of the sealed membrane (4,

104) is welded to a distal portion of the receiving portions (30) of the plane flanges extending over the second portion of the insulating barrier.

[Claim 2] The tank as claimed in claim 1, in which each of the first and second plane flanges further includes an anchoring portion (11, 111) that extends toward the supporting structure relative to the connecting zone, the anchoring portion of the first plane flange and respectively of the second plane flange being connected to the second supporting wall (103) and respectively to the first supporting wall (3).

[Claim 3] The tank as claimed in either one of claims 1 or 2, in which said sealed membrane is a secondary sealed membrane (4, 104) and said insulating barrier is a secondary insulating barrier (2, 102) arranged between the secondary sealed membrane and the supporting wall and in which each of the first and second tank walls further includes a primary sealed membrane (6, 106) intended to be in contact with a product contained in the tank and a primary insulating barrier (5, 105) arranged between the primary sealed membrane and the secondary sealed membrane.

[Claim 4] The tank as claimed in claim 3, in which the primary sealed membrane (6, 106) includes metal plates including parallel first corrugations (56, 156), second corrugations (55, 155) perpendicular to the first corrugations and plane portions situated between the first corrugations and between the second corrugations and resting on an upper surface of the primary insulating barrier,

the tank wall including a row of primary corner pieces (37) disposed parallel to the edge, each primary corner piece including a metal angle iron (39) to which is welded an edge portion of the primary sealed membrane (6, 106) of the first and second tank walls and a rigid insulating piece (38) arranged between the metal angle iron (39) and the corner beam (10, 30),

the primary corner pieces resting on an interior surface of the first and second plane flanges of the corner beam,

and in which ~~the~~ corner retaining members (46, 62) retain said primary corner pieces (37) on the secondary insulating barrier (2, 102) of the first and second tank walls or to the first and second supporting walls (3, 103), the corner retaining members (46, 62) being configured to pass in sealed manner through the receiving portions (30) of the plane flanges of the corner beam.

[Claim 5] The tank as claimed in claim 4, in which the corner retaining members (46) include metal rods (46) fixed to or between the first insulating panels (21, 121, 221) of the secondary insulating barrier in line with the row of primary corner pieces (37) and

projecting through the receiving portions (30) of the plane flanges of the corner beam to cooperate with the primary corner pieces.

[Claim 6] The tank as claimed in claim 5, in which a corner retaining member includes a stirrup (48) fixed under the cover plate of a first insulating panel (21), said stirrup including a central plate parallel to the cover plate and two fixing lugs extending perpendicularly to the central plate and fixed to two spacers (42) of said first insulating panel, and a metal rod (49, 46) fixed to said central plate and passing through the cover plate (40) of the first insulating panel.

[Claim 7] The tank as claimed in claim 4 in which a corner retaining member (62) includes a base fixed to a supporting wall in line with the primary corner piece and a coupler retained by the base and extending through the thickness of the secondary insulating barrier (2, 102) and the receiving portion (30) of a plane flange to cooperate with the rigid insulating piece (38).

[Claim 8] The tank as claimed in claim 7, in which said coupler (62) includes a secondary coupler cooperating with a first insulating panel of the secondary insulating barrier to retain the first insulating panel on the supporting wall and a primary coupler carried by the secondary coupler and cooperating with the rigid insulating piece (38) to retain the rigid insulating piece (38).

[Claim 9] The tank as claimed in any one of claims 4 to 8, in which the second portion of the secondary insulating barrier includes a first row of second insulating panels (22, 122), said first row being adjacent to the first portion of the secondary insulating barrier, in which the primary insulating barrier (5) includes a first row of ~~the~~ primary insulating panels (54, 154) adjacent to the row of primary corner pieces (37), and
in which the first row of the second insulating panels (22, 122) carries a row of primary retaining members (52) for retaining the first row of primary insulating panels (54,154) on the secondary insulating barrier (2, 102) of the first and second tank walls.

[Claim 10] The tank as claimed in claim 9, in which the receiving portions (30) of the plane flanges extend over the first row of the second insulating panels (22) beyond said row of primary retaining members (52) in a direction perpendicular to the edge and have the primary retaining members (52) passed through them in sealed manner.

[Claim 11] The tank as claimed in claim 9, in which said row of primary retaining members (52) is disposed on the first row of the second insulating panels (22, 122) beyond the receiving portions (30) of the plane flanges in a direction perpendicular to the edge and

in which the primary retaining members pass in sealed manner through the strakes (32) of the secondary sealing membrane.

[Claim 12] The tank as claimed in any one of claims 9 to 11, in which a second insulating panel (22) features a relaxation slot (65) extending parallel to the edge (100) and extending within the thickness of the second insulating panel through the cover plate (24) and an upper portion of the block of insulating foam (25), the primary retaining members (52) being carried by the second insulating panel between said relaxation slot (65) and an end of the second insulating panel facing toward the edge (100).

[Claim 13] The tank as claimed in any one of claims 9 to 11, in which the first row of the second insulating panels (22, 122) carries the row of primary retaining members (52) at a position situated at approximately half a dimension of the second insulating panel in a direction perpendicular to the edge (100).

[Claim 14] The tank as claimed in any one of claims 9 to 13, in which the first row of the second insulating panels (122) includes an insulating foam (25) having a first density and in which the second portion of the secondary insulating barrier includes a second row of the second insulating panels (22) farther from the edge (100) than the first row of the second insulating panels, and in which the second row of the second insulating panels includes an insulating foam (25) having a second density lower than the first density.

[Claim 15] The tank as claimed in any one of claims 9 to 14, in which, in a direction perpendicular to the edge, the dimension of the primary corner pieces (37) is greater than the dimension of the first portion of the secondary insulating barrier so that the row of the primary corner pieces (37) straddles the first row of the second insulating panels (22, 122).

[Claim 16] The tank as claimed in any one of claims 9 to 14, in which, in a direction perpendicular to the edge, the dimension of the primary corner pieces (37) is smaller than the dimension of the first portion of the secondary insulating barrier so that the first row of the primary insulating panels (54) straddles the first portion of the secondary insulating barrier.

[Claim 17] The tank as claimed in any one of claims 9 to 16, in which the rigid insulating part (38) of the primary corner pieces (37) includes an insulating foam (63) having a first density and in which a primary insulating panel (54) includes a cover plate, a bottom plate and a block of insulating foam inserted between the bottom plate and the cover plate so that the cover plate is held at a distance from the bottom plate by said

block of insulating foam, said block of insulating foam having a second density lower than the first density.

[Claim 18] The tank as claimed in any one of claims 1 to 17, in which, in at least one tank wall, a longitudinal direction of the strakes is perpendicular to the edge (100), the secondary sealed membrane further including a row of edge strakes (32) having a flat edge (33) forming the end portion of the strakes of the secondary sealed membrane welded to the corner beam (10, 30), the end strakes having raised edges parallel to said longitudinal direction of the strakes and that are progressively reduced in size in the direction of the corner beam (10, 30).

[Claim 19] The tank as claimed in any one of claims 1 to 18, in which the corner beam includes a base cross (10) having a first plane lug (12) parallel to the first supporting wall and a second plane lug (112) parallel to the second supporting wall, said sealed connecting zone being formed between the first plane lug and the second plane lug, the corner beam further including two plane metal strips (30, 130) welded in sealed manner to the first and second plane lugs (12, 112) respectively and extending parallel to the first and second supporting walls respectively to form the receiving portion of the plane flanges.

[Claim 20] A ship (70) for the transport of a fluid, the ship including a double hull (72) forming the supporting structure and a tank (71) as claimed in any one of claims 1 to 19 disposed in the double hull (72).

[Claim 21] A transfer system for a fluid, the system including a ship (70) as claimed in claim 20, insulated pipes (73, 79, 76, 81) arranged in such a manner as to connect the tank (71) ~~installed in the hull~~ of the ship to a floating or terrestrial storage installation (77) and a pump for routing a fluid through the insulated pipes from or to the floating or terrestrial storage installation to or from the tank of the ship.

[Claim 22] A method of loading or offloading a ship (70) as claimed in claim 20, in which a fluid is routed through insulated pipes (73, 79, 76, 81) from or to a floating or terrestrial storage installation (77) to or from the tank (71) of the ship.