

Claims

[Claim 1] A connection beam (13) for a thermally insulating sealed tank (71) for storing liquefied gas, wherein the connection beam (13) comprises a first section (14) and a second section (15) which are aligned with each other in a first direction which is intended to extend a tank edge (3), wherein each section (14,15) comprises a central core (17) which comprises a first wall (20) and a second wall (21) which is connected to the first wall (21) along a first edge (24) of the central core (17) and connection wings (28, 29, 30, 31) which are fixed to the central core (17) and which are intended to fix a secondary sealing membrane (7) and a primary sealing membrane (9) of the thermally insulating sealed tank, wherein the first wall (20) and the second wall (21) are intended to extend through a primary insulating space of the tank and wherein the first walls (20) of the first and second sections (14, 15) are parallel and define at the connection between the two sections (14, 15) a first assembly window (16a) and the second walls (21) of the first and second sections (14, 15) are parallel and define at the connection between the two sections (14, 15) a second assembly window (16b), wherein the connection beam (13) comprises a connection assembly (38) which has a shape which complements the assembly windows (16a, 16b) and which is fixed in the region of the assembly windows (16a,16b) to the first section (14) and to the second section (15), the connection assembly (38) comprising a first wing (39) which is parallel with the first wall (20) of the first section (14) and the first wall (20) of the second section (15) and which closes the first assembly window (16a), and a second wing (40) which is connected to the first wing (39) and which is parallel with the second wall (21) of the first section (14) and the second wall (21) of the second section (15) and which closes the second assembly window (16b), and wherein the second wing (40) is lap-welded to the second wall (21) of the first section (14) and to the second wall (21) of the second section (15), and the first wing (39) comprises a main plate (44) which is accommodated in the first assembly window (16a), a first portion (46) which is connected to the main plate (44) and which is lap-welded to the first wall (20) of the first section (14) and a second portion (47) which is connected to the main plate (44) and which is lap-welded to the first wall (20) of the second section (15), the first portion (46) of the first wing (39) being separated in the first direction of the second portion (47) of the first wing (39) by means of a notch (48), the first portion (46) and the second portion (47) of the first wing (39) being welded to the first section (14) and the second section (15), respectively, using a first main bead (50) and a second main bead (51) which extends in the first direction.

[Claim 2] The connection beam as claimed in claim 1, wherein the first portion (46) and the second portion (47) of the first wing (39) are further welded to the first section (14) and the second section (15), respectively, using a first secondary bead (52) and a second secondary bead (53), forming a weld return along an edge of the notch (48).

5 [Claim 3] The connection beam as claimed in claim 1 or claim 2, wherein the central core (17) has a hollow cross-section in the form of a parallelogram and comprises a third wall (22) which is connected to the first wall (20) in the region of a second edge (25), and a fourth wall (23) which is connected to the second wall (21) in the region of a third edge (26), the fourth wall (23) being connected to the third wall (22) in the region of a fourth edge (27), the third and fourth walls (22, 23) being intended to form a secondary sealing membrane (7) along the tank edge (3).

[Claim 4] The connection beam as claimed in claim 3, wherein the connection wings protrude toward the outer side of the central core (12), the connection wings comprising:

- 15 - a first secondary connection wing (28) which is connected to the second edge (25) of the central core (17), the first secondary connection wing (28) being intended to be welded in a sealed manner to the secondary sealing membrane (7) of the tank,
- a second secondary connection wing (29) which is connected to the third edge (26) of the central core (17), the second secondary connection wing (29) being intended to be welded in a sealed manner to the secondary sealing membrane (7) of the tank,
- 20 - a first primary connection wing (30) which is connected to the first edge (24) of the central core (17), the first primary connection wing (30) being intended to be welded in a sealed manner to the primary sealing membrane of the tank,
- a second primary connection wing (31) which is connected to the first edge (24) of the central core (17) and which forms an angle with the first primary connection wing (30), the second primary connection wing (31) being intended to be welded in a sealed manner to the primary sealing membrane (9) of the tank.

[Claim 5] The connection beam as claimed in one of claims 1 to 4, wherein the main plate (44) is located in the same plane as the first wall (20) of the central core (17) of the first and second sections (14, 15), the first portion (46) and the second portion (47) being located at opposite corners of the main plate (44), the first wing (39) comprises an offset portion (45) which is connected to at least one edge of the main plate (44) so as to be formed in a plane remote from the plane of the main plate (44), the first portion (46) and the second portion (47) being located on the offset portion (45), the offset portion (45) partially covering the first wall (20) of the first section (14) and the second section (15), respectively.

[Claim 6] The connection beam as claimed in claim 5, wherein the first wing (39) comprises a notch (54) which extends parallel with the first edge (24) and which is formed on one of the edges of the first wing (39) which is formed in a direction perpendicular to the direction of the first edge (24), the notch (54) being configured to separate the main plate (44) and the offset portion (45) of the first wing (39) which is close to and non-contiguous with the second wing (40).

[Claim 7] The connection beam as claimed in one of claims 1 to 6, wherein the second wing (40) comprises a main plate (42) located in the same plane as the second wall (21) of the central core (17) of the first and second sections (14, 15), and an offset portion (43) which is connected to at least one edge of the main plate (42) so as to be formed in a plane remote from the plane of the main plate (42), the offset portion (43) partially covering the second wall (21) of the first section (14) and the second section (15).

[Claim 8] The connection beam as claimed in claim 7, wherein the second wing (40) comprises a notch (54) which extends parallel with the first edge (24) and which is formed on one of the edges of the second wing (40) which is formed in a direction perpendicular to the direction of the first edge (24), the notch (54) being configured to separate the main plate (42) and the offset portion (43) of the second wing (40) close to and non-contiguous with the first wing (39).

[Claim 9] The connection beam as claimed in one of claims 1 to 8, wherein two adjacent edges of the notch (48) are connected to each other by means of a fillet (49).

[Claim 10] The connection beam as claimed in one of claims 1 to 9, wherein the notch (48) is delimited by an edge of the first portion (46), an edge of the second portion (47) and an edge of the main plate (44).

[Claim 11] The connection beam as claimed in claim 5 or claim 6, wherein the first wing (39) comprises a third portion (55) which connects the first portion (46) and the second portion (47) in line with the notch (48), the third portion (55) being located on the offset portion (45), and the notch (48) being delimited by an edge of the first portion (46), an edge of the second portion (47) and an edge of the third portion (55).

[Claim 12] A thermally insulating sealed tank (71) for storing liquefied gas, the tank (71) comprising at least a first tank wall (1) and a second tank wall (2) each comprising a carrier wall (5), the carrier wall (5) of the first tank wall (1) and the carrier wall (5) of the second tank wall (2) together forming an angle and meeting in the region of a tank edge (3), each tank wall (1, 2) comprising from the carrier wall (5) toward an inner space of the tank a secondary thermally insulating barrier (6) which is supported by the carrier wall (5), a secondary sealing membrane (7) which is supported by the

secondary thermally insulating barrier (6), a primary thermally insulating barrier (8) which is supported by the secondary sealing membrane (7) and a supported primary sealing membrane (9) which is intended to be in contact with the liquefied gas, the tank comprising a connection beam (13) as claimed in one of claims 1 to 11 located in the region of the tank edge (3), the connection beam (13) being fixed to the carrier wall (5) of the first tank wall (1) and to the carrier wall (5) of the second tank wall (2) and the connection beam (13) being configured to connect in a sealed manner the secondary sealing membrane (7) of the first tank wall (1) to the secondary sealing membrane (7) of the second tank wall (2) and to connect in a sealed manner the primary sealing membrane (9) of the first tank wall (1) to the primary sealing membrane (9) of the second tank wall (2).

[Claim 13] The tank as claimed in claim 12, wherein the central core (17) has a cross-section in the form of a parallelogram and the connection wings protrude toward the outer side of the central core (17), the connection wings comprising:

- a first secondary connection wing (28) which is connected to a first edge (24) of the central core (17) and which is located in a plane parallel with the secondary sealing membrane (7) of the first tank wall (1), the first secondary connection wing (28) being welded in a sealed manner to the secondary sealing membrane (7) of the first tank wall (1),
- a second secondary connection wing (29) which is connected to a second edge (25) of the central core (17) and which is located in a plane parallel with the secondary sealing membrane (7) of the second tank wall (2), the second secondary connection wing (29) being welded in a sealed manner to the secondary sealing membrane (7) of the second tank wall (2),
- a first primary connection wing (30) which is connected to a third edge (26) of the central core (17) and which is located in a plane parallel with the primary sealing membrane (9) of the first tank wall (1), the first primary connection wing (30) being welded in a sealed manner to the primary sealing membrane (9) of the first tank wall (1),
- a second primary connection wing (31) which is connected to the third edge (26) of the central core (17) and which is located in a plane parallel with the primary sealing membrane (9) of the second tank wall (2), the second primary connection wing (31) being welded in a sealed manner to the primary sealing membrane (9) of the second tank wall (2).

[Claim 14] A tanker (70) for transporting a cold liquid product, the tanker comprising a double hull (72) and a tank (71) as claimed in claim 12 or claim 13 arranged in the double hull.

[Claim 15] A transfer system for a cold liquid product, the system comprising a tanker (70) as claimed in claim 14, insulated pipes (73, 79, 76, 81) which are arranged in order to connect the tank (71) installed in the hull of the tanker to a floating or ground-based storage installation (77) and a pump for impelling a flow of cold liquid product through the insulated pipes to or from the floating or ground-based storage installation to or from the tank of the tanker.

[Claim 16] A connection assembly (38) which is intended to connect a first section (14) and a second section (15) of a connection beam (13) of a thermally insulating sealed tank, the first section (14) and the second section (15) being aligned with each other along a tank edge (3),

the connection assembly (38) comprising a first wing (39), a second wing (40) forming an angle with the first wing, the first and second wings (39, 40) being connected to each other in the region of an intersection edge (61), the intersection edge extending in a first direction, wherein the first wing (39) comprises a main plate (44) which extends at one side and the other of the intersection edge (61) in a second direction perpendicular to the first direction, a first portion (46) connected to the main plate (44) and a second portion (47) connected to the main plate (44), the first portion (46) of the first wing (39) being separated in the first direction of the second portion (47) of the first wing (39) via a notch (48),_____

wherein the first wing (39) comprises an offset portion which is connected to an edge of the main plate (44) which extends in the first direction and to at least one edge of the main plate (44) which extends in the second direction which is perpendicular to the first direction so as to be formed in a plane different from the plane of the main plate (44), the first portion (46) and the second portion (47) being located on the offset portion, the offset portion being intended to be fixed by means of overlapping on the first section (14) and the second section (15).

[Claim 17] A method for producing a connection beam (13) in a thermally insulating sealed tank, wherein the method comprises the following steps:

- arranging along a tank edge (3) a first section (14) and a second section (15) of the connection beam (13) which are aligned with each other in the direction of the tank edge (3), each section (14, 15) comprising a hollow central core (17) which comprises a first wall (20) and a second wall (21) which is connected to the first wall (20) along a first edge (24) of the central core (17) and connection wings (28, 29, 30, 31) which are fixed to the central core (17) and which are intended to fix a secondary sealing

membrane (7) and a primary sealing membrane (9) of the thermally insulating sealed tank, wherein the first wall (20) and the second wall (21) are intended to extend through a primary insulation space of the tank and wherein the first walls (20) of the first and second sections (14, 15) being parallel and defining at the junction between the two sections (14, 15) a first assembly window (16a), and the second walls (21) of the first section and second section (14, 15) being parallel and defining at the junction between

the two sections (14, 15) a second assembly window (16b),

- providing an insulating element (36) and placing the insulating element (36) in the hollow central core (17),

- providing a connection assembly (38) which has a shape which complements the assembly windows (16a, 16b), the connection assembly (38) comprising a first wing (39) and a second wing (40) connected to the first wing (39), the first wing (39) comprising a main plate (44), a first portion (46) which is connected to the main plate (44) and a second portion (47) which is connected to the main plate (44), the first portion (46) of the first wing (39) being separated from the second portion (47) of the first wing (39) in the direction of the tank edge (3) by a notch (48),

- placing the connection assembly (38) in the region of the assembly windows (16a, 16b) so that the first wing (39) is parallel with the first wall (20) of the first section (14) and the first wall (20) of the second section (15) and closes the first assembly window (16a), the main plate (44) of the first wing (39) being accommodated in the first assembly window (16a), and so that the second wing (40) is parallel with the second wall (21) of the first section (14) and the second wall (21) of the second section (15) and closes the second assembly window (16b),

- lap-welding the second wing (40) to the second wall (21) of the first section (14) and to the second wall (21) of the second section (15), lap-welding using a first main bead (50) which extends in the direction of the tank edge (3) the first portion (46) of the first wing (39) to the first wall (20) of the first section (14), and lap-welding using a second main bead (51) which extends in the direction of the tank edge (3) the second portion (47) of the first wing (39) to the first wall (20) of the second section (15).

[Claim 18] A method for loading or unloading a tanker (70) as claimed in claim 14, wherein a cold liquid product is conveyed through insulated pipes (73, 79, 76, 81) from or to a floating or ground-based storage installation (77) to or from the tank of the tanker (71).