

Description

Title of the invention: Connection beam for a thermally insulating sealed tank for storing liquefied gas

Technical field

5 [0001] The invention relates to the field of connection beams for thermally insulating sealed tanks having membranes. In particular, the invention relates to the field of connection beams for thermally insulating sealed tanks for the storage and/or transport of liquefied gas at low temperature, such as tanks for transporting liquefied petroleum gas (also referred to as LPG), for example, at a temperature between -50°C and 0°C, or for
10 transporting liquefied natural gas (LNG) at approximately -162°C at atmospheric pressure. These tanks may be installed onshore or on a floating structure. In the case of a floating structure, the tank may be intended for the transport of liquefied gas or to receive liquefied gas which is used as fuel for propelling the floating structure.

Technical background

15 [0002] Connection beams for a thermally insulating sealed tank having membranes for storing LNG are known, for example, from the publication KR200473167. Such a tank comprises a plurality of longitudinal tank walls and a plurality of transverse tanks walls. The tank walls comprise a dual sealing membrane which is interposed with a dual insulating barrier. Such a tank is integrated in a carrier structure formed, for example, by the hull of a vessel.

20 [0003] During loading and unloading operations of LNG, the change in temperature and the filling state of the tanks impose significant stresses on the membranes of the tank. In order to prevent deterioration of the sealing and insulation characteristics of the tank, the primary and secondary sealing membranes are anchored to the carrier structure using a connection beam, in particular in the region of an edge formed between a transverse wall
25 and a longitudinal wall of the tank. The connection beam also serves to connect the primary and secondary sealing membranes of the transverse wall to the sealing membranes of the longitudinal wall in a sealed manner.

[0004] The anchoring of the connection beams to the carrier structure, on the one hand, and, on the other hand, their connection to the sealing membranes enables the transfer of
30 forces between the membranes and the hull of the vessel, thus strengthening the overall structure of the tank.

[0005] In KR200473167, the connection beam is formed by sections which are aligned with each other in the direction of the edge and which define at the connection between two sections an assembly window.

[0006] In order to assemble two adjacent sections, a connection assembly having a shape which complements the assembly window is fixed in the region of the assembly window.

Summary

[0007] It has been found by the Applicant that during the use of such beams significant stresses are applied in the region of the connection assembly. Furthermore, it has been found that excessively great rigidity in the assembly between the sections of the beam and the connection assembly could reduce the service-life of the assembly.

[0008] A notion on which the invention is based is to improve the flexibility of the connection beam in particular in the region of the connection assembly.

[0009] Another notion on which the invention is based is to avoid concentrations of stresses in order to increase the service-life of the connection beam.

[0010] According to an embodiment, the invention provides a connection beam for a thermally insulating sealed tank for storing liquefied gas, wherein the connection beam comprises a first section and a second section which are aligned with each other in a first direction which is intended to extend a tank edge, wherein each section comprises a central core which comprises a first wall and a second wall which is connected to the first wall along a first edge of the central core and connection wings which are fixed to the central core and which are intended to fix a secondary sealing membrane and a primary sealing membrane of the thermally insulating sealed tank, wherein the first wall and the second wall are intended to extend through a primary insulating space of the tank and wherein the first walls of the first and second sections are parallel and define at the connection between the two sections a first assembly window and the second walls of the first and second sections are parallel and define at the connection between the two sections a second assembly window, wherein the connection beam comprises a connection assembly which has a shape which complements the assembly windows and which is fixed in the region of the assembly windows to the first section and to the second section, the connection assembly comprising a first wing which is parallel with the first wall of the first section and the first wall of the second section and which closes the first assembly window, and a second wing which is connected to the first wing and which is parallel with the second wall of the first section and the second wall of the second section and which closes the second assembly window,

and wherein the second wing is lap-welded to the second wall of the first section and to the second wall of the second section, and the first wing comprises a main plate which is accommodated in the first assembly window, a first portion which is connected to the main plate and which is lap-welded to the first wall of the first section and a second portion which is connected to the main plate and which is lap-welded to the first wall of the second section, the first portion of the first wing being separated in the first direction of the second portion of the first wing by means of a notch, the first portion and the second portion of the first wing being welded to the first section and the second section, respectively, using a first main bead and a second main bead which extends in the first direction.

[0011] As a result of these features, the connection beam is sufficiently flexible, in particular in the region of the connection assembly, and enables any concentration of stress in the region of the connection assembly to be prevented. This is because the design of the first wing, in particular with the notch thereof, and with the first portion and the second portion spaced apart from each other by the notch, enables the behavior of the first portion which is fixed to the first section and the second portion which is fixed to the second section to be dissociated in order to gain flexibility.

[0012] According to embodiments, such a connection beam may comprise one or more of the following features.

[0013] According to an embodiment, the first main bead of the first portion and the second main bead of the second portion are separated from each other in the first direction by the notch.

[0014] According to an embodiment, the first portion and the second portion of the first wing are further welded to the first section and the second section, respectively, using a first secondary bead and a second secondary bead, forming a weld return along an edge of the notch.

[0015] According to an embodiment, the first main bead and the first secondary bead form a continuous weld bead.

[0016] According to an embodiment, the second main bead and the second secondary bead form a continuous weld bead.

[0017] According to an embodiment, the central core has a hollow cross-section in the form of a parallelogram and comprises a third wall which is connected to the first wall in the region of a second edge, and a fourth wall which is connected to the second wall in the region of a third edge, the fourth wall being connected to the third wall in the region of a

fourth edge, the third and fourth walls being intended to form a secondary sealing membrane along the tank edge.

[0018] According to an embodiment, the connection wings protrude toward the outer side of the central core, the connection wings comprising:

- 5 - a first secondary connection wing which is connected to the second edge of the central core, the first secondary connection wing being intended to be welded in a sealed manner to the secondary sealing membrane of the tank,
- a second secondary connection wing which is connected to the third edge of the central core, the second secondary connection wing being intended to be welded in a sealed
- 10 manner to the secondary sealing membrane of the tank,
- a first primary connection wing which is connected to the first edge of the central core, the first primary connection wing being intended to be welded in a sealed manner to the primary sealing membrane of the tank,
- a second primary connection wing which is connected to the first edge of the central core
- 15 and which forms an angle with the first primary connection wing, the second primary connection wing being intended to be welded in a sealed manner to the primary sealing membrane of the tank.

[0019] According to an embodiment, each section comprises anchoring wings which protrude toward the outer side of the central core, the anchoring wings comprising:

- 20 - a first secondary anchoring wing which is connected to the fourth edge of the central core and which is located in the same plane as the second secondary connection wing, the first secondary anchoring wing being intended to be fixed to the carrier wall of the tank,
- a second secondary anchoring wing which is connected to the fourth edge of the central core and which is located in the same plane as the first secondary connection wing, the
- 25 second secondary anchoring wing being intended to be fixed to the carrier wall of the tank,
- a first primary anchoring wing which is connected to the third edge of the central core and which is located in the same plane as the second primary connection wing, the first primary anchoring wing being intended to be fixed to the carrier wall of the tank,
- a second primary anchoring wing which is connected to the second edge of the central
- 30 core and which is located in the same plane as the first primary connection wing, the second primary anchoring wing being intended to be fixed to the carrier wall of the tank.

[0020] According to an embodiment, the main plate is located in the same plane as the first wall of the central core of the first and second sections, the first portion and the second portion being located at opposite corners of the main plate, the first wing comprises an

35 offset portion which is connected to at least one edge of the main plate so as to be formed

in a plane remote from the plane of the main plate, the first portion and the second portion being located on the offset portion, the offset portion partially covering the first wall of the first section and the second section, respectively.

5 [0021] According to an embodiment, the first wing comprises a notch which extends parallel with the first edge and which is formed on one of the edges of the first wing which is formed in a direction perpendicular to the direction of the first edge, the notch being configured to separate the main plate and the offset portion of the first wing which is close to and non-contiguous with the second wing.

10 [0022] According to an embodiment, the first wing comprises a cut-out which is formed on each of the edges of the first wing formed in a direction perpendicular to the first direction.

[0023] According to an embodiment, the offset portion of the first wing comprises a main portion which extends in the direction of the first edge, a first branch and a second branch which are formed at one side and the other of the main portion and which extend in a direction perpendicular to the first edge so that the offset portion is in the form of a U-shape
15 around the main plate of the first wing, the width of the first and second branches being less than the width of the main portion.

[0024] According to an embodiment, the second wing comprises a notch which extends parallel with the first edge and which is formed on one of the edges of the second wing which is formed in a direction perpendicular to the direction of the first edge, the notch
20 being configured to separate the main plate and the offset portion of the second wing close to and non-contiguous with the first wing.

[0025] According to an embodiment, the second wing comprises a cut-out which is formed on each of the edges of the second wing formed in a direction perpendicular to the first direction.

25 [0026] According to an embodiment, each cut-out base is produced in a rounded form.

[0027] According to an embodiment, the second wing comprises a main plate located in the same plane as the second wall of the central core of the first and second sections, and an offset portion which is connected to at least one edge of the main plate so as to be formed in a plane remote from the plane of the main plate, the offset portion partially covering the
30 second wall of the first section and the second section.

[0028] According to an embodiment, the offset portion of the first wing and the second wing is produced around the main plate.

[0029] According to an embodiment, the first portion of the first wing and the second portion of the first wing extend along an edge of the main plate orientated in the first direction and along an edge of the main plate orientated in a second direction perpendicular to the first direction.

5 [0030] According to an embodiment, the first main bead and the second main bead extend in the first direction and in the second direction. In this manner, the main bead has a portion which extends opposite the edge of the main plate orientated in the first direction and a portion which extends opposite the edge of the main plate orientated in the second direction.

10 [0031] According to an embodiment, two adjacent edges of the notch are connected to each other using a fillet.

[0032] In this manner, the fillets enable concentrations of stresses to be prevented at the intersection between two edges of the notch, which would risk forming the beginnings of cracks.

15 [0033] According to an embodiment, the connection between the edge of the first portion in line with the opening and the edge of the main plate in line with the opening is produced using a fillet.

[0034] According to an embodiment, the connection between the edge of the second portion in line with the opening and the edge of the main plate in line with the opening is produced
20 using a fillet.

[0035] According to an embodiment, the notch is delimited by an edge of the first portion, an edge of the second portion and an edge of the main plate.

[0036] According to an embodiment, the first wing comprises a third portion which connects the first portion and the second portion in line with the notch, and the notch is delimited by
25 an edge of the first portion, an edge of the second portion and an edge of the third portion.

[0037] According to an embodiment, the third portion is located on the offset portion.

[0038] According to an embodiment, the invention also provides for a thermally insulating sealed tank for storing liquefied gas, the tank comprising at least a first tank wall and a second tank wall each comprising a carrier wall, the carrier wall of the first tank wall and
30 the carrier wall of the second tank wall together forming an angle and meeting in the region of a tank edge, each tank wall comprising from the carrier wall toward an inner space of the tank a secondary thermally insulating barrier which is supported by the carrier wall, a secondary sealing membrane which is supported by the secondary thermally insulating

barrier, a primary thermally insulating barrier which is supported by the secondary sealing membrane and a supported primary sealing membrane which is intended to be in contact with the liquefied gas, the tank comprising an above-mentioned connection beam located in the region of the tank edge, the connection beam being fixed to the carrier wall of the first tank wall and to the carrier wall of the second tank wall and the connection beam being configured to connect in a sealed manner the secondary sealing membrane of the first tank wall to the secondary sealing membrane of the second tank wall and to connect in a sealed manner the primary sealing membrane of the first tank wall to the primary sealing membrane of the second tank wall.

- 10 [0039] According to an embodiment, the central core has a cross-section in the form of a parallelogram and the connection wings protrude toward the outer side of the central core, the connection wings comprising:
- a first secondary connection wing which is connected to a first edge of the central core and which is located in a plane parallel with the secondary sealing membrane of the first tank wall, the first secondary connection wing being welded in a sealed manner to the secondary sealing membrane of the first tank wall,
 - a second secondary connection wing which is connected to a second edge of the central core and which is located in a plane parallel with the secondary sealing membrane of the second tank wall, the second secondary connection wing being welded in a sealed manner to the secondary sealing membrane of the second tank wall,
 - a first primary connection wing which is connected to a third edge of the central core and which is located in a plane parallel with the primary sealing membrane of the first tank wall, the first primary connection wing being welded in a sealed manner to the primary sealing membrane of the first tank wall,
 - a second primary connection wing which is connected to the third edge of the central core and which is located in a plane parallel with the primary sealing membrane of the second tank wall, the second primary connection wing being welded in a sealed manner to the primary sealing membrane of the second tank wall.

- 30 [0040] According to an embodiment, each section comprises anchoring wings which protrude toward the outer side of the central core, the anchoring wings comprising:
- a first secondary anchoring wing which is connected to the fourth edge of the central core and which is located in the same plane as the second secondary connection wing, the first secondary anchoring wing being fixed to the carrier wall of the first tank wall,
 - a second secondary anchoring wing which is connected to the fourth edge of the central core and which is located in the same plane as the first secondary connection wing, the second secondary anchoring wing being fixed to the carrier wall of the second tank wall,

- a first primary anchoring wing which is connected to the third edge of the central core and which is located in the same plane as the second primary connection wing, the first primary anchoring wing being fixed to the carrier wall of the first tank wall,
- a second primary anchoring wing which is connected to the second edge of the central core and which is located in the same plane as the first primary connection wing, the second primary anchoring wing being fixed to the carrier wall of the second tank wall.

[0041] Such a tank may be part of a ground storage installation, for example, for storing liquefied natural gas, or may be installed in a floating structure, which is coastal or in deep water, in particular a liquid natural gas tanker, a floating storage and regasification unit (FSRU), a floating production, storage and offloading installation (FPSO) and the like. Such a tank may also be used as a fuel store in any type of tanker.

[0042] According to an embodiment, a tanker for transporting a cold liquid product comprises a double hull and an above-mentioned tank arranged in the double hull.

[0043] According to an embodiment, the invention also provides a transfer system for a cold liquid product, the system comprising the above-mentioned tanker, insulated pipes which are arranged in order to connect the tank installed in the hull of the tanker to a floating or ground-based storage installation 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.

[0044] According to an embodiment, the invention also provides a connection assembly which is intended to connect a first section and a second section of a connection beam of a thermally insulating sealed tank, the first section and the second section being aligned with each other along a tank edge, the connection assembly comprising a first wing, a second wing forming an angle with the first wing, the first and second wings being connected to each other in the region of an intersection edge, the intersection edge extending in a first direction, wherein the first wing comprises a main plate which extends at one side and the other of the intersection edge in a second direction perpendicular to the first direction, a first portion connected to the main plate and a second portion connected to the main plate, the first portion of the first wing being separated in the first direction of the second portion of the first wing via a notch.

[0045] According to an embodiment, the first wing comprises an offset portion which is connected to an edge of the main plate which extends in the first direction and to at least one edge of the main plate 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, the first portion and the second portion being located on the offset portion, the offset portion

being intended to be fixed by means of overlapping on the first section and the second section.

[0046] According to an embodiment, the second wing comprises a main plate which is located at one side and the other of the intersection edge,

5 and wherein the second wing comprises an offset portion which is connected to an edge of the main plate which extends in the first direction and to at least one edge of the main plate which extends in a third direction perpendicular to the first direction so as to be formed in a plane different from the plane of the main plate, the offset portion being intended to be fixed by means of overlapping on the first section and the second section.

10 [0047] According to an embodiment, the offset portion is connected to an edge of the main plate which extends in the first direction and to two opposing edges of the main plate which extend in the second direction or in the third direction.

[0048] According to an embodiment, the portion of the first wing which comprises the offset portion and which is located at one side of the intersection edge has a larger dimension in
15 the second direction than the other portion of the first wing located at the other side of the intersection edge. The other portion of the first wing thus forms a first connection portion of the first wing which is intended to be fixed to the first primary connection wing and to the primary sealing membrane.

[0049] According to an embodiment, the portion of the second wing which comprises the
20 offset portion and which is located at one side of the intersection edge has a greater dimension in the third direction than the other portion of the second wing located at the other side of the intersection edge. The other portion of the second wing thus forms a second connection portion of the first wing which is intended to be fixed to the second primary connection wing and to the primary sealing membrane.

25 [0050] According to an embodiment, the invention also provides a method for producing a connection beam in a thermally insulating sealed tank, wherein the method comprises the following steps:

- arranging along a tank edge a first section and a second section of the connection beam which are aligned with each other in the direction of the tank edge, each section comprising
30 a hollow central core which comprises a first wall and a second wall which is connected to the first wall along a first edge of the central core and connection wings which are fixed to the central core and which are intended to fix a secondary sealing membrane and a primary sealing membrane of the thermally insulating sealed tank, wherein the first wall and the second wall are intended to extend through a primary insulation space of the tank
35 and wherein the first walls of the first and second sections being parallel and defining at

the junction between the two sections a first assembly window, and the second walls of the first section and second section being parallel and defining at the junction between the two sections a second assembly window,

- providing an insulating element and placing the insulating element in the hollow central core,

- providing a connection assembly which has a shape which complements the assembly windows, the connection assembly comprising a first wing and a second wing connected to the first wing, the first wing comprising a main plate, a first portion which is connected to the main plate and a second portion which is connected to the main plate, the first portion of the first wing being separated from the second portion of the first wing in the direction of the tank edge by a notch,

- placing the connection assembly in the region of the assembly windows so that the first wing is parallel with the first wall of the first section and the first wall of the second section and closing the first assembly window, the main plate of the first wing being accommodated in the first assembly window, and so that the second wing is parallel with the second wall of the first section and the second wall of the second section and closing the second assembly window,

- lap-welding the second wing to the second wall of the first section and to the second wall of the second section, lap-welding using a first main bead which extends in the direction of the tank edge the first portion of the first wing to the first wall of the first section, and lap-welding using a second main bead which extends in the direction of the tank edge the second portion of the first wing to the first wall of the second section.

[0051] According to an embodiment, the step of welding the first portion and the second portion of the first wing to the first section and to the second section, respectively, is also carried out using a first secondary bead and a second secondary bead forming a weld return along an edge of the notch.

[0052] According to an embodiment, the invention also provides a method for loading or unloading such a tanker, wherein a cold liquid product is conveyed through insulated pipes from or to a floating or ground-based storage installation to or from the tank of the tanker.

Brief description of the Figures

[0053] The invention will be better understood and other objectives, details, features and advantages thereof will be appreciated more clearly from the following description of a number of specific embodiments of the invention, given purely by way of non-limiting example with reference to the appended drawings, in which.

[0054] [Fig. 1] Figure 1 is a partial, perspective cut-away view of a thermally insulating sealed tank in the region of a junction between two walls.

[0055] [Fig. 2] Figure 2 is a partial, perspective view of a connection beam positioned in the region of the edge of a tank.

5 [0056] [Fig. 3] Figure 3 is an exploded perspective view of the connection beam illustrated in Figure 2.

[0057] [Fig. 4] Figure 4 is a perspective view of a connection assembly according to an embodiment.

10 [0058] [Fig. 5] Figure 5 is a front view of the first wing of the connection assembly according to a first embodiment.

[0059] [Fig. 6] Figure 6 is a front view of the first wing of the connection assembly according to a second embodiment.

[0060] [Fig. 7] Figure 7 is a cut-away schematic illustration of a tank of a liquid natural gas tanker comprising a connection beam and a terminal for loading/unloading this tank.

15 **Description of the embodiments**

[0061] Conventionally, the terms "on" or "above" will refer to a position located closer to the interior of the tank and the terms "under" or "below" will refer to a position located closer to the carrier structure, regardless of the orientation of the tank wall relative to the earth's gravitational field. In the same manner, the term "upper" or "internal" will refer to an element
20 located closer to the interior of the tank and "lower" or "external" will refer to an element located closer to the carrier structure.

[0062] A thermally insulating sealed tank 71 and in particular a connection beam for such a tank 71 will be described below.

25 [0063] The tank 71 which is integrated in a hull of a tanker, for example, is polyhedral. For example, the tank 71 may comprise a longitudinal base wall, a longitudinal roof wall, two longitudinal flank walls and lower and upper longitudinal chamfered walls.

[0064] The general structure of such a tank 71 is well known. Therefore, only one wall zone of the tank will be described, given that all the walls of the tank may have a similar general structure.

30 [0065] In relation to Figure 1, the multi-layer structure of a tank wall 1 according to an embodiment will now be described. The tank wall 1 comprises, in the direction of the thickness of the tank, from the outer side to the inner side, a secondary thermally insulating barrier 6 which rests against a carrier wall 5, a sealed secondary membrane 7, a primary

thermally insulating barrier 8 and a primary sealing membrane 9 which is intended to be in contact with the fluid stored in the tank.

[0066] The primary thermally insulating barrier 8 and the secondary thermally insulating barrier 6 are each constituted by heat-insulating elements and more specifically parallelepipedal heat-insulating boxes 10 which are juxtaposed in accordance with a regular pattern. Different techniques are known for making such heat-insulating elements. For example, each heat-insulating box 10 is formed as described in the publication FR2877638. Each heat-insulating box 10 is retained on the carrier wall 5 by means of anchoring members which may be produced in numerous manners in accordance with the known technique and, for example, as described in the publication FR2973098. The heat-insulating boxes 10 of the primary thermally insulating barrier 8 and the secondary thermally insulating barrier 6 carry the primary membrane 9 and the secondary membrane 7, respectively.

[0067] The secondary membrane 7 and primary membrane 9 are, for example, constituted by a series of metal plates called strakes 11 which are parallel and have folded edges and which are arranged alternately with elongate weld supports 12. The strakes 11 and the weld supports 12 are produced from an alloy with a low expansion coefficient. The strakes 11 and the weld supports 12 are, for example, produced from Invar ®, that is to say, an iron and nickel alloy whose expansion coefficient is typically between 1.2×10^{-6} and 2×10^{-6} K⁻¹, or from an iron alloy with a high content of manganese whose expansion coefficient is typically in the order of 7×10^{-6} K⁻¹. The secondary membrane 7 and primary membrane 9 typically have a thickness between 0.5 and 1.5 mm, and preferably of 0.7 mm.

[0068] The strakes 11 comprise, in the direction of the width, a planar central strip which rests against the heat-insulating boxes 10 and the folded lateral edges. The folded edges extend substantially perpendicularly to the planar central strip. The folded edges of the strakes 11 are welded in a sealed manner to the weld supports 12. More details on the production of such a membrane can be found in the publication FR2968284.

[0069] An angle zone of the tank will now be described more specifically. Figure 1 is a perspective view of an edge zone between a first tank wall 1 and a second tank wall 2.

[0070] In the region of this zone, the carrier wall 5 of the first wall 1 and the carrier wall 5 of the second wall 2 meet in the region of a tank edge 3, and the secondary membrane 7 and primary membrane 9 of the two tank walls 1, 2 are connected by means of an anchoring device which enables the secondary sealing membrane 7 and primary sealing membrane 9 to be anchored, on the one hand, on the carrier wall 5 of the first wall 1 and, on the other hand, on the carrier wall 5 of the second wall 2.

[0071] More specifically, the secondary membrane 7 and primary membrane 9 of the first wall 1 are anchored perpendicularly on the carrier wall 5 of the second wall 2. In the same manner, the secondary membrane 7 and primary membrane 9 of the second wall 2 are anchored perpendicularly on the carrier wall 5 of the first wall 1.

5 [0072] The anchoring device enables the tension forces resulting from the thermal contraction of the secondary membrane 7 and primary membrane 9 to be absorbed. The anchoring device also enables the forces resulting from the deformation of the hull and in particular the flexion of the longitudinal wall of a tanker to be absorbed, corresponding to the beam effect of the tanker.

10 [0073] The anchoring device is formed by a connection beam 13 with an elongate form. The connection beam 13 comprises at least a first section 14 and a second section 15 which are aligned with each other in the direction of the tank edge 3 and which define at the connection between the two sections 14, 15 an assembly window which is formed by a first assembly window 16a and a second assembly window 16b.

15 [0074] Each section 14, 15 comprises a hollow central core 17 which has a cross-section in the form of a parallelogram, in this instance a rectangular one, since, in the example illustrated in Figures 1 to 3, the two carrier walls 5 form a right angle. Similarly to all sealing membranes, the connection beam 13 may in particular be produced from an alloy with a low expansion coefficient, for example, with metal sheets whose thickness is between 0.5
20 and 1.5 mm.

[0075] In order to hold the connection beam 13 at each side of the edge 3, each of the carrier walls 5 comprises a primary flat anchoring portion 18 and a secondary flat anchoring portion 19, The distance from the secondary flat anchoring portions 19 to the edge 3 corresponds to the thickness of the secondary thermally insulating barrier 6. The distance
25 between the flat anchoring portions 18 and 19 corresponds to the thickness of the primary thermally insulating barrier 8.

[0076] As can be better seen in Figures 2 and 3, the connection beam 13 is constituted by planar metal sheets which are welded together to form:

- a hollow central core 17 which has a rectangular or square cross-section (in the case of
30 an edge zone with a right angle) whose length of the sides is equal to the distance between the primary flat anchoring portion 18 and the secondary flat anchoring portion 19 of the carrier wall with which each side is parallel, the hollow central core comprising 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, a third wall 22 which is connected to the first wall 20 in the region of a
35 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;

- connection wings 28, 29, 30, 31 which protrude toward the outer side of the central core in the direction of the primary sealing membrane 9 and secondary sealing membrane 7 of the first and second tank walls 1, 2, the connection wings 28, 29, 30, 31 enabling the secondary sealing membranes 7 of the tank walls 1, 2 to be connected in a sealed manner and the primary sealing membranes 9 of the tank walls 1, 2 to be connected in a sealed manner;

- anchoring wings 32, 33, 34, 35 which protrude toward the outer side of the central core 17 in the direction of the carrier walls 5 of the tank walls 1, 2, the anchoring wings being fixed to the carrier walls 5.

[0077] The first walls 20 of the first and second sections 14, 15 are parallel and define the first assembly window 16a at the junction between the two sections 14, 15 and the second walls 21 of the first and second sections 14, 15 are parallel and define the second assembly window 16b at the junction between the two sections 14, 15.

[0078] The connection wings comprise:

- a first secondary connection wing 28 which is connected to the 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 the 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 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 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.

[0079] The anchoring wings comprise:

- a first secondary anchoring wing 32 which is connected to the fourth edge 27 of the

central core 17 and which is located in the same plane as the second secondary connection wing 29, the first secondary anchoring wing 32 being fixed to the secondary flat anchoring portion 18 of the first tank wall 1,

- a second secondary anchoring wing 33 which is connected to the fourth edge 27 of the central core 17 and which is located in the same plane as the first secondary connection wing 28, the second secondary anchoring wing 33 being fixed to the secondary flat anchoring portion 18 of the second tank wall 2,

- a first primary anchoring wing 34 which is connected to the third edge 26 of the central core 17 and which is located in the same plane as the second primary connection wing 31, the first primary anchoring wing 34 being fixed to the primary flat anchoring portion 19 of the first tank wall 1,

- a second primary anchoring wing 35 which is connected to the second edge 25 of the central core 17 and which is located in the same plane as the first primary connection wing 30, the second primary anchoring wing 35 being fixed to the primary flat anchoring portion 19 of the second tank wall 2.

[0080] In order to ensure the continuity of the insulation in the region of the connection beam 17, insulating elements 36 are positioned inside the hollow central core 17 and between the anchoring wings 32-35 in order to form the secondary thermally insulating barrier 6 and the primary thermally insulating barrier 8 in the region of the tank edge 3. The insulating elements 36 may be in the form of boxes which are filled with insulating materials such as, for example, glass wool or perlite or blocks of insulating foam.

[0081] As described above and as can be seen in particular in Figure 3, the connection beam 13 has at the junction between two adjacent sections 14, 15 a first assembly window 16a and a second assembly window 16b. The assembly windows 16a, 16b are formed by cut-outs in the first wall 20 and in the second wall 21 of the central core 17, respectively. These assembly windows 16a, 16b, using a metal joint 37, in particular enable the third wall 22 of the first section 14 to be welded to the third wall 22 of the second section 15, the fourth wall 23 of the first section 14 to be welded to the fourth wall 23 of the second section 15 and the secondary connection wings 28, 29 of the first section 14 to be welded to those of the second section 15 in a sealed manner. This is because the third wall 22, the fourth wall 23 and the secondary connection wings 28, 29 enable the continuity of the secondary sealing membrane 7 between the first tank wall 1 and the second tank wall 2 in the region of the connection beam 13. Furthermore, the assembly windows 16a, 16b enable the insertion of the insulating elements 36 inside the hollow central core 17.

[0082] The connection beam 13 comprises a connection assembly 38 having a shape which complements the assembly window 16 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 insulating elements 36 are thus placed in the hollow central core 17 before the connection assembly is fixed in the region of the assembly windows 16a, 16b since the connection assembly 38 blocks the windows 16a, 16b.

[0083] The connection assembly 38 comprises a first wing 39 which is parallel with the first wall 20 of the central core 17 and a second wing 40 which is parallel with the second wall 21 of the central core 17 and which intersects with the first wing 39 in order to form a cross-shaped cross-section. The first wing 39 therefore extends at one side and the other of the second wing 40 in the region of an intersection edge 61 and vice versa for the second wing 40. In this manner, on the one hand, the first wing 39 is aligned with the first wall 20 of the central core 17 of each section 14, 15 and, on the other hand, the first wing 39 is aligned with the first primary connection wing 30 of each section 14, 15. In the same manner, on the one hand, the second wing 40 is aligned with the second wall 21 of the central core 17 of each section 14, 15 and, on the other hand, the second wing 40 is aligned with the second primary connection wing 29 of each section 14, 15.

[0084] The continuity of the primary sealing membrane 9 between the first tank wall 1 and the second tank wall 2 is produced by the primary connection wings 30, 31. In order also to ensure this continuity in the region of the assembly window 16, however, the connection assembly 38 comprises curved metal joints 41 at one side and the other of the wings 39, 40 which are welded in a sealed manner both to the first wing 39 and to the second wing 40 and to the primary connection wings 30, 31.

[0085] In order to fixedly join the first section 14 to the second section 15, as illustrated in Figure 2, the first wing 39 is lap-welded to the first wall 20 of the first section 14 and to the first wall 20 of the second section 15. 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.

[0086] Figures 4 to 6 illustrate in a more detailed manner the connection assembly 38 and in particular the first wing 39 and the second wing 40.

[0087] As can be seen in Figure 4, 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 each section 14, 15, and an offset portion 43 connected to the edges of the main plate 42 located below the first wing 39 in order to be formed in a plane remote from the plane of the main plate 42. The offset portion 43 thus covers the second wall 21 of the first section 14 and the second wall 21 of the second section 15. It is thus the offset portion 43 of the second wing 40 which is

welded to the sections 14, 15. The portion of the main plate 42 located above the first wing 39 and the intersection edge 61 forms a second connection portion 60 of the second wing 40 which, during assembly, is aligned with the second primary connection wings 31 of the first section 14 and the second section 15 in order to be welded at that location.

5 [0088] The first wing 39 is configured differently from the second wing 40 since it requires more flexibility in order to limit the concentrations of stress which are greater on this wing. This is why Figures 5 and 6 illustrate in detail the first wing 39 of the connection assembly 38.

10 [0089] Figure 5 shows a first embodiment of the first wing 39. In this embodiment, the first wing 39 comprises a main plate 44 located in the same plane as the first wall 20 of the central core 17 of each section 14,15 and an offset portion 45 which is connected to the edges of the main plate 44 located below the second wing 40 in order to be formed in a plane remote from the plane of the main plate 44.

15 [0090] The offset portion 45 of the first wing 39 comprises a first portion 46 which is lap-welded to the first wall 20 of the first section 14 and a second portion 47 which is lap-welded to the first wall 20 of the second section 15. The first portion 46 and the second portion 47 are separated from each other in the direction of the tank edge 3 by a notch 48.

[0091] In order to prevent concentrations of stress in the region of the notch 48, two adjacent edges of the notch 48 are connected to each other using a fillet 49.

20 [0092] In the same manner as the second wing 40, the first wing 39 extends at one side and the other of the intersection edge 61. At one side, the first wing 39 comprises the offset portion 45 in order to be fixed by means of overlapping in the region of the assembly window 16A to the first and second sections 14,15. The portion of the first wing 39 located at the other side of the intersection edge 61 forms a first connection portion 59 of the first wing 39 which, during assembly, is aligned with the first primary connection wings 30 of the first section 14 and the second section 15 in order to be welded at that location.

30 [0093] As can be seen schematically in Figure 5, the first portion 46 is welded to the first wall 20 of the first section 14 by a first main bead 50 formed on the circumference of the first portion 46 and by a weld return formed by a first secondary bead 52 along an edge of the notch 48. The second portion 47 is welded to the first wall 20 of the second section 15 by a second main bead 51 formed on the circumference of the second portion 47 and by a weld return formed by a second secondary bead 53 along an edge of the notch 48.

[0094] Furthermore, as illustrated in Figure 4, the first wing 39 and the second wing 40 comprise a notch 54 which is formed on each of the edges of the first wing 39 and the

second wing 40, respectively, and which extend in a direction perpendicular to the first direction. The notch 54 enables the main plate 42, 44 and the offset portion 43, 45 to be separated.

[0095] Figure 6 shows a second embodiment of the first wing 39. This embodiment differs from the first embodiment of Figure 5 as a result of the size of the notch 48. This is because, in the first embodiment, the notch 48 extends as far as the main plate 44, whilst, in the second embodiment, the notch 48 is located only on the offset portion 45. In this manner, in this embodiment, the offset portion 45 comprises a third portion 55 which connects the first portion 46 and the second portion 47 in line with the notch 48. The notch 48 is thus formed by an edge of the first portion 46, an edge of the second portion 46 and an edge of the third portion 55. Furthermore, in this embodiment, the offset portion 45 of the first wing 39 comprises a main portion 56 which extends in the direction of the first edge 24, a first branch 57 and a second branch 58 which are formed at one side and the other of the main portion 56 and which extend in a direction perpendicular to the first edge so that the offset portion 45 forms a U-shape around the main plate 56 of the first wing, the width of the first and second branches 57, 58 being less than the width of the main portion 56.

[0096] With reference to Figure 7, a cut-away view of a liquid natural gas tanker 70 shows a sealed and insulated tank 71 which is of generally prismatic form and which is mounted in the double hull 72 of the tanker. The wall of the tank 71 comprises a primary sealed barrier which is intended to be in contact with the liquid natural gas contained in the tank, a secondary sealed barrier which is arranged between the primary sealed barrier and the double hull 72 of the tanker and two insulating barriers which are arranged between the primary sealed barrier and the secondary sealed barrier and between the secondary sealed barrier and the double hull 72, respectively.

[0097] In a manner known per se, charging/discharging pipes 73 arranged on the upper bridge of the tanker can be connected, using appropriate connectors, to a sea or port terminal in order to transfer a load of LNG to or from the tank 71.

[0098] Figure 7 shows an example of a sea terminal comprising a loading and unloading station 75, an underwater pipe 76 and a ground-based installation 77. The loading and unloading station 75 is a fixed off-shore installation comprising a movable arm 74 and a tower 78 which supports the movable arm 74. The movable arm 74 carries a bundle of insulated flexible pipes 79 which can be connected to the loading/unloading pipes 73. The orientable movable arm 74 adapts to all the gauges of tankers. A connection pipe which is not illustrated extends inside the tower 78. The loading and unloading station 75 enables the liquid natural gas tanker 70 to be loaded and unloaded from/to the ground-based

installation 77. This installation comprises liquefied gas storage tanks 80 and connection pipes 81 which are connected via the underwater pipe 76 to the loading or unloading station 75. The underwater pipe 76 enables the liquefied gas to be transferred between the loading or unloading station 75 and the ground-based installation 77 over a large distance, for example, 5 km, which enables the liquid natural gas tanker 70 to be kept at a great distance from the coast during the loading and unloading operations.

[0099] In order to produce the pressure required to transfer the liquefied gas, on-board pumps are used in the tanker 70 and/or pumps with which the ground-based installation 77 is equipped and/or pumps with which the loading and unloading station 75 is equipped.

[0100] Although the invention has been described in connection with several specific embodiments, it is self-evident that it is by no means limited thereto and that it comprises all the technical equivalents of the means described and the combinations thereof if they fall within the scope of the invention.

[0101] The use of the verb "have", "comprise" or "include" and the conjugated forms thereof does not exclude the presence of elements or steps other than those set out in a claim.

[0102] In the claims, any reference numeral in brackets should not be interpreted to be a limitation of the claim.

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

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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).