Description

Title of the Invention: Installation for Storing a Liquefied Gas

Technical Field

[0001] The invention relates to the field of storage installations for liquefied gas, which comprise a sealed and thermally insulating tank arranged in a bearing structure.

[0002] In particular, the invention relates to the field of sealed and thermally insulating tanks for storing and/or transporting liquefied gas at low temperature, such as tanks for transporting liquefied petroleum gas (also known as LPG) having, for example, a temperature of between -50°C and 0°C, or for transporting liquefied natural gas (LNG) at about -162°C. These tanks may be installed onshore or on a floating construction. In the case of a floating construction, the tank may be intended for transporting liquefied gas or for receiving liquefied gas which is used as fuel for propulsion of the floating construction.

[0003] The invention more particularly concerns a storage installation of the aforementioned type which comprises a dome structure that protrudes upwards from an upper bearing wall of the bearing structure and is intended to be passed through by at least one pipe intended for loading or unloading the tank.

Technological Background

[0004] Document WO2015155377 discloses an installation for storing a liquefied gas, comprising a bearing structure, consisting of the double hull of a ship, and a sealed and thermally insulating tank arranged in the bearing structure. The installation comprises a dome structure, represented in Figure 4 of the aforementioned document, which serves as a penetration point for various equipment items of the tank, such as pipes intended for loading or unloading the tank. The dome structure protrudes upwards from an upper bearing wall. It comprises a vertical bearing wall which rises above the deck of the ship and a horizontal wall which is positioned at the top of the vertical bearing wall. The horizontal wall supports a cover which essentially consists of a metal cover wall and thermal insulation which is inserted into the top of the dome structure.

[0005] In order to fasten the horizontal wall of the dome structure and the metal cover wall and to ensure sealing of the dome structure, it is known to produce a welding line along the peripheral edge of the metal cover wall. When the pressure prevailing inside the tank is higher than atmospheric pressure, this pressure differential exerts on the cover a force directed towards the outside of the tank, which stresses the metal cover wall in flexion.

Such stresses are capable of degrading the aforementioned welding line and thus leading to sealing problems of the dome structure, particularly when the tank is intended to store the gas at pressures higher than those of conventional tanks with membranes.

[0006] Such a dome structure arrangement is therefore not fully satisfactory.

Summary

[0007] One underlying concept of the invention is therefore to propose an installation for storing liquefied gas which comprises a dome structure that has better pressure resistance.

[0008] For this purpose, according to one embodiment, the invention provides an installation for storing a liquefied gas, comprising a bearing structure and a sealed and thermally insulating tank arranged in the bearing structure, the bearing structure comprising an upper bearing wall and the tank comprising a ceiling wall fastened to the upper bearing wall, the upper bearing wall and the ceiling wall being locally interrupted so as to delimit an opening, the bearing structure comprising a dome structure protruding towards the outside of the tank from the upper bearing wall around the opening and defining a passage intended to be passed through by at least one pipe intended for loading or unloading liquefied gas to or from the tank, the dome structure comprising dome walls protruding from the upper bearing wall and each comprising an upper end, the dome structure comprising a seating wall fastened to the upper ends of the vertical dome walls, the seating wall being continued horizontally and comprising a peripheral border region which borders the passage and which protrudes towards the passage from the vertical dome walls, the dome structure comprising a cover which covers the passage and is welded in a sealed manner to the seating wall, the said cover being welded to at least one intermediate plate, the said intermediate plate being welded to the seating wall in the peripheral border region.

[0009] Thus, since the cover is welded to the peripheral border region, which is the region of the seating wall closest to the centre of the dome structure, the moment exerted on the said welds when the pressure in the tank is higher than the pressure outside the tank is reduced, which makes it possible to limit the flexion of the cover and to improve the pressure resistance of the welds which fasten the cover to the seating wall. Furthermore, the use of an intermediate plate makes it possible to distribute the forces over a larger number of welds. In addition, the intermediate plate constitutes an additional stiffener between the cover and the seating wall, which is capable of absorbing some of the forces by deforming.

[0010] Depending on the embodiments, such an installation may have one or more of the following characteristics.

[0011] According to one embodiment, the intermediate plate is welded to the peripheral border region along an internal edge of the peripheral border region. This makes it possible to fasten the intermediate plate to the seating wall by means of a fillet welding line, which is simple to implement and ensures satisfactory fastening performance.

[0012] According to one embodiment, the cover is welded to a plurality of intermediate plates which are arranged around the passage and which are each welded to the seating wall in the peripheral border region, preferably along the internal edge of the peripheral border region.

[0013] According to one embodiment, the or each intermediate plate protrudes towards the interior of the dome structure. Thus, the intermediate plate extends towards the passage beyond the internal edge of the peripheral border region.

[0014] According to one embodiment, the intermediate plate is welded to the cover by using at least one continuous or discontinuous welding line extending along at least one edge of the intermediate plate.

[0015] According to one embodiment, the intermediate plate is welded to the cover by using at least two welding lines extending respectively along at least two edges of the intermediate plate, which are arranged on either side of the internal edge of the peripheral border region. This makes it possible to distribute the forces over larger welding surfaces and to fasten the intermediate plate to the cover by means of fillet welding lines, which are simple to implement and ensure satisfactory fastening performance.

[0016] According to one embodiment, the cover is welded in a sealed manner to the seating wall by using an intermediate frame which is arranged around the passage and around the at least one intermediate plate.

[0017] According to one embodiment, the intermediate frame is welded to the seating wall by means of at least one sealed welding line extending along an internal or external peripheral edge of the intermediate frame. According to one embodiment, the said sealed welding line is a continuous welding line.

[0018] According to one embodiment, the cover is welded to the intermediate frame by means of at least one sealed welding line. The at least one sealed welding line preferably extends along an external peripheral edge of the cover. Thus, the welding lines which ensure sealing between the cover and the seating wall are arranged outside the region of additional fastening of the cover to the seating wall, so that they are stressed only little by the forces generated by the positive pressure prevailing inside the tank. According to one embodiment, the said sealed welding line is a continuous welding line.

[0019] According to one embodiment, the intermediate frame is welded to the seating wall by using two welding lines extending respectively along the internal peripheral edge of the intermediate frame and along the external peripheral edge of the intermediate frame. According to a first embodiment variant, the welding line extending along the external peripheral edge of the intermediate frame is continuous and sealed, whereas the welding line extending along the internal peripheral edge of the intermediate frame is discontinuous. According to a second embodiment variant, the welding line extending along the internal peripheral edge of the intermediate frame is continuous and sealed, whereas the welding line extending along the external peripheral edge of the intermediate frame is discontinuous. Lastly, according to a third embodiment variant, both welding lines are sealed, which reinforces the reliability of the sealing even more.

[0020] According to one embodiment, the tank comprises a tank wall anchored against each of the dome walls, each tank wall comprising a primary sealing membrane intended to be in contact with the liquefied gas contained in the tank, the dome structure comprising a profiled frame against which the primary sealing membrane is welded, the profiled frame being welded by a sealed welding line to the peripheral border region of the seating wall. Thus, under the effect of its thermal contraction, the primary sealing membrane exerts on the peripheral border region of the seating wall a force directed in an opposite direction to the forces which are exerted on the said peripheral border region because of the pressure exerted on the cover by the vapour phase of the liquefied gas, which makes it possible to limit the flexion of the seating wall and of the cover even more.

[0021] Furthermore, the intermediate plate and the peripheral border region create a region of thermal conduction from the cover towards the profiled frame, which makes it possible to limit the temperature drop of the profiled frame and, consequently, to limit the thermal stresses acting on the profiled frame.

[0022] According to one embodiment, the profiled frame has an L-shaped cross section which comprises a first branch and a second branch that are perpendicular to one another, the first branch being welded to the primary sealing membrane and to the peripheral border region and extending vertically, and the second branch extending horizontally and being fastened to a fastening lug which protrudes towards the ceiling wall, that is to say downwards, from the peripheral border region of the seating wall.

[0023] According to one embodiment, the profiled frame comprises reinforcing gussets which each have a first edge pressing against the first branch and a second edge pressing against the second branch.

[0024] According to one embodiment, the installation comprises a loading/unloading tower which passes through the passage defined by the dome structure, the loading/unloading tower comprising at least two vertical masts which pass through the cover and are fastened to one another by cross-members, the two vertical masts each forming a pipe for loading or unloading the tank.

[0025] According to one embodiment, the ceiling wall as well as each tank wall anchored against one of the dome walls comprises a secondary thermally insulating barrier held against the bearing structure, a secondary sealing membrane resting against the secondary thermally insulating barrier, a primary thermally insulating barrier resting against the secondary sealing membrane and a primary sealing membrane resting against the primary thermally insulating barrier and intended to be in contact with the liquefied gas contained in the tank.

[0026] A tank according to one of the embodiments mentioned above may form part of an onshore storage installation, for example for storing LNG, or it may be installed in a coastal or deep-water floating structure, in particular a methane carrier ship or methane carrier, a floating storage and regasification unit (FSRU), a floating production storage and offloading (FPSO) unit and the like. In the case of a floating structure, the tank may be intended to receive liquefied natural gas which is used as a fuel for propulsion of the floating structure.

[0027] According to one embodiment, the invention relates to a ship for transporting a fluid, which comprises an installation of the aforementioned type.

[0028] According to one embodiment, the ship comprises a double hull, which forms the bearing structure.

[0029] According to one embodiment, the invention also provides a transfer system for a fluid, the system comprising the aforementioned ship, insulated pipelines arranged so as to connect the tank of the ship to a floating or onshore storage installation, and a pump for delivering a flow of fluid through the insulated pipelines from or to the floating or onshore storage installation to or from the tank of the ship.

[0030] According to one embodiment, the invention also provides a method for loading or unloading such a ship, wherein a fluid is conveyed through the insulated pipelines from or to a floating or onshore storage installation to or from the tank of the ship.

Brief Description of the Figures

[0031] The invention will be understood better, and further objects, details, characteristics and advantages thereof will become clearer during the following description of several

particular embodiments of the invention, which are given only by way of illustration and without limitation, with reference to the appended drawings.

[0032] [fig.1] Figure 1 is a schematic perspective view of a bearing structure intended to support a sealed and thermally insulating tank for storing a liquefied gas.

[0033] [fig.2] Figure 2 is a schematic view of the multilayer structure of the walls of the tank.

[0034] [fig.3] Figure 3 is a schematic view in section illustrating the dome structure.

[0035] [fig.4] Figure 4 is a partial view in section illustrating the fastening of the cover of the dome structure on the seating wall.

[0036] [fig.5] Figure 5 is a perspective view from below illustrating the dome structure.

[0037] [fig.6] Figure 6 is a detailed view of the region of Figure 5 illustrating an intermediate piece by which the cover is fastened to the seating walls.

[0038] [fig.7] Figure 7 is a perspective view from above of the dome structure.

[0039] [fig.8] Figure 8 is a partial representation in perspective of a profiled frame forming a holding region for the primary sealing membrane.

[0040] [fig.9] Figure 9 is a partial representation in perspective of a profiled frame according to an embodiment variant of Figure 7.

[0041] [fig.10] Figure 10 is a cutaway schematic representation of a tank of a methane carrier ship and of a terminal for loading/unloading this tank.

Description of the Embodiments

[0042] In connection with Figure 1, a bearing structure 1, against which a sealed and thermally insulating tank for storing a liquefied gas is intended to be fastened, is described. The bearing structure 1 is, for example, formed by the double hull of a ship. The bearing structure 1 has a polyhedral overall shape. It has two bearing walls 2, front and rear, here of octagonal shape, of which only the rear bearing wall is represented in Figure 1. The front and rear walls 2 are, for example, cofferdam walls of the ship which extend transversely with respect to the longitudinal direction of the ship. The bearing structure 1 also comprises an upper bearing wall 3, a lower bearing wall 4 and lateral bearing walls 5, 6, 7, 8, 9, 10.

[0043] The sealed and thermally insulating tank for storing liquefied gas comprises a plurality of tank walls, which are each anchored against one of the bearing walls 2, 3, 5, 6, 7, 8, 9, 10 of the bearing structure 1.

[0044] As represented in Figure 2, each wall of the tank successively has, from the outside inwards along the thickness direction of the wall, a secondary thermally insulating barrier 12 comprising insulating elements 13 fastened to the bearing structure 1, a secondary sealing membrane 14 anchored to the insulating elements 13 of the secondary thermally insulating barrier 12, a primary thermally insulating barrier 15 comprising insulating elements 16 fastened to the insulating elements 13 of the secondary thermally insulating barrier 12 or to the bearing structure 1 and resting against the secondary sealing membrane 14, and a primary sealing membrane 17 anchored to the insulating elements 16 of the primary thermally insulating barrier 15 and intended to be in contact with the liquefied gas contained in the tank.

[0045] As represented in Figures 3 and 7, the upper bearing wall 3 as well as the ceiling wall 11 are locally interrupted so as to delimit an opening 18. The bearing structure 1 comprises a dome structure 19 which protrudes upwards from the upper bearing wall 3 around the opening 18 and which defines a passage 24 intended to be passed through by one or more pipes 20, 21, 47 intended for loading or unloading the tank.

[0046] The dome structure 19 comprises vertical dome walls 22. The number of dome walls 22 is, for example, four when the dome structure 19 has a cross section of square or rectangular shape. The dome walls 22 protrude upwards from the upper bearing wall 3 and rise above the deck of the ship here. The dome structure 19 also comprises, at the top of the dome walls 22, a seating wall 23 which extends horizontally all around the passage 24 formed by the dome walls 22 and thus forms a coaming with the dome walls 22. The seating wall 23 supports a cover 25 through which the pipe or pipes 20, 21 intended for loading or unloading the tank pass. The cover 25 comprises a metal cover plate and thermal insulation (not represented), which is fastened against the lower face of the metal cover plate and is inserted into the dome structure 19. As illustrated in Figures 3 and 7, according to one embodiment, the cover 25 comprises a network of stiffeners 48 which are each formed by metal plates welded against the upper face of the metal cover plate.

[0047] Furthermore, the bearing structure also comprises stiffeners 49 which are fastened under the seating wall 23 and press against the upper bearing wall 3 and against the dome walls 22.

[0048] The multilayer structure of the tank, as described above in connection with Figure 2, is also present against the dome walls 22 but is not present at the level of the cover of the dome structure 19.

[0049] In the embodiment represented in Figure 3, a loading/unloading tower 26 passes through the interior of the passage 24 defined by the dome structure 19. The loading/unloading tower 26 comprises three vertical masts 20, 21, two of which are represented in Figure 3, which are each fastened to one another by cross-members 27. The three vertical masts 20, 21 pass through the cover 25 of the dome structure 19 and extend over substantially the entire height of the tank. The loading/unloading tower 26 comprises a base (not represented) which cooperates with a support foot that is fastened to the lower bearing wall 4 and is thus intended to keep the loading/unloading tower 26 in a vertical position.

[0050] According to one embodiment, each of the masts 20, 21 is hollow, passes through the cover of the dome structure 19 and forms:

- a pipe which is intended for loading the tank with liquefied gas,
- a pipe which is intended for unloading liquefied gas from the tank and which for this purpose is associated with an unloading pump fastened to the lower end of the said pipe, or
- an emergency shaft making it possible to lower an emergency pump and an unloading line in the event of a malfunction of an unloading pump.

[0051] In connection with Figure 4, the fastening of the cover 25, and more particularly of its metal plate, to the seating wall 23 as well as the structure, at their top, of the tank walls that are fastened to the dome walls 22, are described below.

[0052] The cover 25 is fastened in a sealed manner to the seating wall 23. For this purpose, the cover 25 is welded in a sealed manner onto an intermediate metal frame 28 which is itself welded beforehand in a sealed manner to the seating wall 23. Advantageously, the intermediate frame 28 is welded in a sealed manner to the seating wall 23 by using two continuous fillet welding lines 29, 30 which extend respectively along the internal peripheral edge of the intermediate frame 28 and along the external peripheral edge of the intermediate frame 28. Furthermore, the peripheral edge 39 of the cover 25 rests against the upper face of the intermediate frame 28 and is welded in a sealed manner by means of a continuous fillet welding line 31 onto the said upper face of the intermediate frame 28. In the embodiment represented, the intermediate frame 28 rests at least partly against an outer region 32 of the seating wall 23, that is to say a region which is positioned outside the dome walls 22 in relation to the passage 24.

[0053] Furthermore, the seating wall 23 comprises a peripheral border region 33 which borders the passage 24 and which protrudes horizontally towards the passage 24 in relation to the dome walls 22. In addition, the cover 25 is also fastened to the seating wall

23 by means of a plurality of intermediate metal plates 34, which are represented in Figures 4, 5 and 6. The intermediate plates 34 are arranged regularly along the peripheral border region 33 and protrude in the direction of the interior of the dome structure 19 in relation to the internal edge 37 of the peripheral border region 33. According to the exemplary embodiment represented in Figures 5 and 6, the intermediate plates 34 have a narrow elongated shape following the internal edge 37 of the peripheral border region 33 and the form of an L-shaped angle bracket at the corner between two adjacent dome walls 22.

[0054] Each of the intermediate plates 34 is welded beforehand to the cover 25 before being welded to the peripheral border region 33 of the seating wall 23. In the embodiment represented in Figure 4, the intermediate plates 34 are each fillet-welded against the inside face of the cover 25 by at least two welding lines 35, 36. The two welding lines 35, 36 are formed along two edges of the intermediate plate 34 which are arranged on either side of the internal edge 37 of the peripheral border region 33. According to one embodiment variant, the intermediate plates 34 are welded on each of their edges against the inside face of the cover 25.

[0055] Furthermore, the seating wall 23 and each intermediate plate 34 are fastened to one another by using a fillet welding line 38 formed along the internal edge 37 of the peripheral border region 33 and against the lower face of each intermediate plate 34. Fastening of the cover 25 to the peripheral border region 33 by using the said intermediate plates 34 is particularly advantageous insofar as it makes it possible to take up the forces exerted on the cover 25 when the pressure prevailing inside the tank is higher than atmospheric pressure, and thus makes it possible to relieve the welding line 31 which is formed further outside the dome structure 19 and which ensures sealing of the fastening of the cover 25 to the seating wall 23. In addition, the intermediate plates 34 are advantageous insofar as they make it possible to distribute the forces over a larger welding surface. Furthermore, the intermediate plates 34 constitute an intermediate stiffener between the cover 25 and the seating wall 23, which is capable of deforming resiliently when the pressure prevailing inside the tank is higher than atmospheric pressure in order to partly absorb the forces exerted on the cover 25. Lastly, since the welding lines 36, 37, 38 by which the cover 25 is fastened to the peripheral border region of the seating wall 23 are positioned as close as possible to the centre of the dome structure 19, the moment exerted on these welding lines 36, 37, 38 in case of a positive pressure in the tank is reduced.

[0056] Furthermore, as represented in Figure 4, the dome structure 19 comprises a profiled frame 40 against which the primary sealing membrane 17 is welded and which constitutes a holding region for the primary sealing membrane, that is to say a region, located at the

top of the dome structure 19, in which the primary sealing membrane 17 of the tank walls that are mounted against the dome walls 22 is anchored to the bearing structure 1. The profiled frame 40 is welded to the peripheral border region 33 of the seating wall 23, continuously around the latter, in order to ensure sealing of the primary sealing membrane 17.

[0057] Under the effect of its thermal contraction, the primary sealing membrane 17 exerts on the peripheral border region 33 of the seating wall 23 a force directed in an opposite direction to the forces which are exerted on the said peripheral border region 33 because of the pressure forces exerted on the cover 25. Such an arrangement therefore makes it possible to limit the flexion of the seating wall 23 and of the cover 25 even more.

[0058] As represented in Figures 4 and 8, the profiled frame 40 has an L-shaped cross section, that is to say it comprises a first branch 41 and a second branch 42 that are perpendicular to one another. The first branch 41 extends vertically in the plane of the primary sealing membrane 17. The first branch 41 has a free end which is welded onto the peripheral border region 33 of the seating wall 23 by the weld 43. In addition, at the top of the dome structure 19, the primary sealing membrane 17 rests against the first branch 41 and is welded thereto. The second branch 42 extends parallel to the thickness direction of the wall. It is furthermore welded via the weld 45 against a fastening lug 44 which protrudes vertically downwards from the peripheral border region 33 of the seating wall 23.

[0059] According to an embodiment variant represented in Figure 9, the profiled frame 40 comprises reinforcing gussets 46 which each have a first edge pressing against the first branch 41 of the profiled frame 40 and a second edge pressing against the second branch 42 of the profiled frame 40.

[0060] The dome structure 19 also comprises a secondary closure plate 50 (partially illustrated in Figure 4), which is welded to the peripheral border region 33 of the seating wall 23, continuously around the latter, and on which the secondary sealing membrane of the tank walls that are mounted against the dome walls 22 is fastened.

[0061] The liquefied gas intended to be stored in the tank may in particular be a liquefied natural gas (LNG), that is to say a gas mixture comprising mainly methane as well as one or more other hydrocarbons. The liquefied gas may also be ethane or a liquefied petroleum gas (LPG), that is to say a mixture of hydrocarbons which is obtained by refining petroleum and essentially comprises propane and butane.

[0062] Referring to Figure 10, a cutaway view of a methane carrier ship 70 shows a sealed and insulated tank 71 of prismatic overall shape mounted in the double hull 72 of the ship. The wall of the tank 71 comprises a primary sealed barrier intended to be in contact with

the LNG contained in the tank, a secondary sealed barrier arranged between the primary sealed barrier and the double hull 72 of the ship, and two insulating barriers arranged respectively between the primary sealed barrier and the secondary sealed barrier and between the secondary sealed barrier and the double hull 72.

[0063] In a manner known per se, loading/unloading pipelines 73 arranged on the upper deck of the ship may be connected by means of suitable connectors to a maritime or port terminal in order to transfer an LNG cargo from or to the tank 71.

[0064] Figure 10 represents an example of a maritime terminal comprising a loading and unloading station 75, an underwater pipe 76 and an onshore installation 77. The loading and unloading station 75 is a fixed offshore installation comprising a mobile arm 74 and a tower 78 which supports the mobile arm 74. The mobile arm 74 carries a bundle of insulated flexible tubes 79 which can be connected to the loading/unloading pipelines 73. The orientable mobile arm 74 adapts to all the gauges of methane carriers. A connecting pipe (not represented) extends inside the tower 78. The loading and unloading station 75 makes it possible to load and unload the methane carrier 70 from or to the onshore installation 77. The latter comprises liquefied gas storage tanks 80 and connecting pipes 81 connected by the underwater pipe 76 to the loading or unloading station 75. The underwater pipe 76 makes it possible to transfer liquefied gas between the loading or unloading station 75 and the onshore installation 77 over a large distance, for example 5 km, which makes it possible to keep the methane carrier ship 70 at a large distance from the shore during the loading and unloading operations.

[0065] In order to generate the pressure necessary for transferring the liquefied gas, pumps installed on-board the ship 70 and/or pumps fitted in the onshore installation 77 and/or pumps fitted in the loading and unloading station 75 are used.

[0066] Although the invention has been described in connection with several particular embodiments, it is very clear that it is in no way limited thereto and that it comprises all the technical equivalents of the means described as well as their combinations, if these fall within the scope of the invention as claimed.

[0067] The use of the verb “have”, “comprise” or “include” and its conjugated forms does not exclude the presence of elements or steps other than those mentioned in a claim.

[0068] In the claims, any reference in parentheses should not be interpreted as a limitation of the claim.

Claims

[Claim 1] Installation for storing a liquefied gas, comprising a bearing structure (1) and a sealed and thermally insulating tank arranged in the bearing structure (1), the bearing structure (1) comprising an upper bearing wall (3) and the tank comprising a ceiling wall (11) fastened to the upper bearing wall (3), the upper bearing wall (3) and the ceiling wall (11) being locally interrupted so as to delimit an opening (18), the bearing structure (1) comprising a dome structure (19) protruding vertically towards the outside of the tank from the upper bearing wall (3) around the opening and defining a passage (24) intended to be passed through by at least one pipe (20, 21) intended for loading or unloading liquefied gas to or from the tank, the dome structure (19) comprising dome walls (22) protruding from the upper bearing wall (3) and each comprising an upper end, the dome structure (19) comprising a seating wall (23) fastened to the upper ends of the dome walls (22), the seating wall (23) being continued horizontally and comprising a peripheral border region (33) which borders the passage (24) and which protrudes towards the passage (24) from the vertical dome walls (22), the dome structure (19) comprising a cover (25) which covers the passage and is welded in a sealed manner to the seating wall (23), the said cover (25) being welded to at least one intermediate plate (34), the said intermediate plate (34) being welded to the seating wall (23) in the peripheral border region (33).

[Claim 2] Installation according to Claim 1, wherein the intermediate plate (34) is welded to the peripheral border region (33) along an internal edge (37) of the peripheral border region (33).

[Claim 3] Installation according to Claim 2, wherein the cover (25) is welded to a plurality of intermediate plates (34) which are arranged around the passage and which are each welded to the seating wall (23) in the peripheral border region (33), along the internal edge (37) of the peripheral border region (33).

[Claim 4] Installation according to any one of Claims 1 to 3, wherein the or each intermediate plate (34) protrudes towards the interior of the dome structure (19), and wherein the intermediate plate (34) is welded to the cover (25) by using at least one welding line (35, 36) extending along at least one edge of the intermediate plate (34).

[Claim 5] Installation according to Claim 4 taken in combination with Claim 2, wherein the or each intermediate plate (34) is welded to the cover (25) by using at least two welding lines (35, 36) extending along at least two edges of the intermediate plate (34), which are arranged on either side of the internal edge (37) of the peripheral border region (33).

[Claim 6] Installation according to any one of Claims 1 to 5, wherein the cover (25) is welded in a sealed manner to the seating wall (23) by using an intermediate frame (28) which is arranged around the passage (24) and around the at least one intermediate plate (34).

[Claim 7] Installation according to Claim 6, wherein the intermediate frame (28) is welded to the seating wall (23) by means of at least one sealed welding line (29, 30) extending along an internal or external peripheral edge of the intermediate frame (28).

[Claim 8] Installation according to Claim 6 or 7, wherein the cover (25) is welded to the intermediate frame (28) by means of at least one sealed welding line (31), the at least one sealed welding line (31) preferably extending along an external peripheral edge (39) of the cover (25).

[Claim 9] Installation according to any one of Claims 1 to 8, wherein the tank comprises a tank wall anchored against each of the dome walls (22), each tank wall comprising a primary sealing membrane (17) intended to be in contact with the liquefied gas contained in the tank, the dome structure (19) comprising a profiled frame (40) against which the primary sealing membrane (17) is welded and which is welded by a sealed welding line (43) to the peripheral border region (33) of the seating wall (23).

[Claim 10] Installation according to Claim 9, wherein the profiled frame (40) has an L-shaped cross section which comprises a first branch (41) and a second branch (42) that are perpendicular to one another, the first branch (41) being welded to the primary sealing membrane (17) and to the peripheral border region (33) and extending vertically, and the second branch (42) extending horizontally and being fastened to a fastening lug (44) which protrudes towards the ceiling wall (11) from the peripheral border region (33) of the seating wall (23).

[Claim 11] Installation according to Claim 10, wherein the profiled frame (40) comprises reinforcing gussets (46) which each have a first edge pressing against the first branch (41) and a second edge pressing against the second branch (42).

[Claim 12] Installation according to any one of Claims 1 to 11, comprising a loading/unloading tower (26) which passes through the passage (24) defined by the dome structure (19), the loading/unloading tower (26) comprising at least two vertical masts which pass through the cover (25) and are fastened to one another by cross-members (27), the two vertical masts each forming a pipe for loading or unloading the tank.

[Claim 13] Installation according to any one of Claims 1 to 12, wherein the ceiling wall (11) as well as each tank wall anchored against one of the vertical dome walls (22) comprises a secondary thermally insulating barrier (12) held against the bearing structure (1), a secondary sealing membrane (14) resting against the secondary

thermally insulating barrier (12), a primary thermally insulating barrier (15) resting against the secondary sealing membrane (14) and a primary sealing membrane (17) resting against the primary thermally insulating barrier (15) and intended to be in contact with the liquefied gas contained in the tank.

[Claim 14] Ship (70) for transporting a fluid, the ship comprising an installation according to any one of Claims 1 to 13.

[Claim 15] Transfer system for a fluid, the system comprising a ship (70) according to Claim 14, insulated pipelines (73, 79, 76, 81) arranged so as to connect the tank (71) of the ship to a floating or onshore storage installation (77), and a pump for delivering a fluid through the insulated pipelines from or to the floating or onshore storage installation to or from the tank of the ship.

[Claim 16] Method for loading or unloading a ship (70) according to Claim 14, wherein a fluid is conveyed through the insulated pipelines (73, 79, 76, 81) from or to a floating or onshore storage installation (77) to or from the tank (71) of the ship.