

Description

Title of the invention: Sealed and thermally insulating tank comprising a hollow rigid sheath for the passage of electric cables

5 Technical field

[0001] The invention relates to the field of the sealed and thermally insulating tanks, with membranes. In particular, the invention relates to the field of the sealed and thermally insulating tanks for storing and/or transporting a liquefied gas at low temperature, such as tanks for transporting Liquefied Petroleum Gas (also called LPG) for example having a
10 temperature of between -50°C and 0°C, or for transporting Liquefied Natural Gas (LNG) at approximately -162°C at atmospheric pressure.

[0002] The invention relates more specifically to the tanks installed on a floating structure. In the case of a floating structure, the tank can be intended to transport liquefied gas or to receive liquefied gas serving as fuel for the propulsion of the floating structure.

15 Technological background

[0003] In the case of a tank installed on a floating structure, it is necessary to provide a pump to load the tank with liquefied gas or offload the tank.

[0004] It is known practice to incorporate the pump in a loading/offloading tower situated in an internal space of the tank, the pump being supplied with electricity from an electrical
20 power source situated outside of the tank. The electric cables used to convey the electrical power to the pump are received in a rigid sheath. The sheath is composed of metal sections of parallelepipedal form, these sections being bolted to one another.

[0005] With this solution, several hundreds of bolts may be necessary to assemble the sheath. The assembling of the sheath is then inefficient, because the bolting necessitates
25 mounting precautions and lengthy and tedious checks. The same issue arises when a sheath maintenance operation is necessary, since such maintenance requires undoing then redoing at least a part of the bolting.

[0006] Another drawback with this solution is that the assembly of the sheath by means of bolts is not very resistant to impacts, and notably to the impacts due to the sloshing of
30 liquefied gas in the tank. In practice, the sheath is often forced to be positioned in the tank in such a way that the sheath is also exposed as little as possible to the impacts due to the sloshing, which is yet another drawback.

Summary

[0007] One idea on which the invention is based is to remedy at least some of the above-mentioned drawbacks.

[0008] According to one embodiment, the invention provides a sealed and thermally insulating tank, the tank being anchored in a bearing structure of a ship, the tank comprising a loading/offloading tower, the loading/offloading tower comprising at least one mast, the at least one mast extending vertically in an internal space of the tank, the tank further comprising at least one pump, the pump being secured to the loading/offloading tower and comprising an electrical power supply housing, and a rigid sheath extending vertically, the rigid sheath being hollow and receiving at least one electric cable connected to the electrical power supply housing, the rigid sheath comprising a plurality of sections that are aligned vertically and fixed to the loading/offloading tower, each said section being tubular and being separated from an adjacent section by a first gap.

[0009] The rigid sheath is thus produced without fixing the sections to one another, and notably without bolting, which very substantially improves the resistance of the sheath to the impacts due to the sloshing. Furthermore, the assembly of the tank is advantageous from the economic and industrial point of view since it does not necessitate fixing sections to one another, by bolting, by welding or by other means.

[0010] "Tubular" is understood to mean that the section has a hollow annular cross-section. Such a section can then be chosen from a standard range of pipes, which facilitates the assembly of the rigid sheath. Furthermore, the outer form of the sections being of circular section, the sections have a hydrodynamic drag coefficient that is lower than that of sections of outer parallelepipedal form. This further enhances the resistance of the rigid sheath to the impacts due to the sloshing, since an identical impact of liquefied gas applies a lesser mechanical force on the rigid sheath.

[0011] The rigid sheath can thus be positioned freely in the tank, because it is no longer necessary for the rigid sheath to be in a position which tends to shelter it from the sloshing. This is why the rigid sheath can for example be disposed above the electrical power supply housing as will be described hereinbelow.

[0012] According to embodiments, such a sealed and thermally insulating tank can comprise one or more of the following features.

[0013] According to one embodiment, the loading/offloading tower comprises a single mast, and each said section is fixed to the mast.

[0014] According to another embodiment, the loading/offloading tower comprises a first, a second and a third masts, spaced apart from one another, and the loading/offloading tower further comprises crossmembers fixing the masts to one another, and each said section is fixed to at least two crossmembers.

5 [0015] According to one embodiment, the metal sections are made of a metal alloy, such as stainless steel.

[0016] According to one embodiment, the rigid sheath extends vertically above the electrical power supply housing. In other words, in a top view parallel to the vertical direction of the masts and of the rigid sheath, the hollow annular cross-section of the sections is at least
10 partly included in the outer contour of the electrical power supply housing. This tends to minimise the length of electric cable necessary to the electrical connection with the electrical power supply housing, and further tends to simplify the assembly of the tank, notably because the rigid sheath can be without bent portions, which otherwise would be necessary to have said at least one electric cable run to the electrical power supply
15 housing through the rigid sheath.

[0017] According to one embodiment, the first mast and the second mast are situated in a first transverse plane, and the third mast is situated in a second transverse plane parallel to the first transverse plane. In other words, the masts define a prism with triangular section.

[0018] According to one embodiment, the first transverse plane and the second transverse
20 plane are orthogonal to a longitudinal direction of the ship.

[0019] According to one embodiment, the second transverse plane is situated more forward than the first transverse plane in the longitudinal direction of the ship.

[0020] According to one embodiment, the rigid sheath is situated between the first transverse plane and the second transverse plane.

25 [0021] As mentioned above, it is no longer necessary for the rigid sheath to be in a position which tends to shelter it from the sloshing. Thus, such a positioning of the rigid sheath can be done without compromising the lifetime of the rigid sheath.

[0022] According to one embodiment, the loading/offloading tower further comprises crossmembers fixing the masts to one another, and each said section is fixed to at least
30 two crossmembers.

[0023] Thus, the rigid sheath contributes to the structural rigidity of the loading/offloading tower, and notably to the resistance thereof to the impacts due to the sloshing.

[0024] According to one embodiment, the first gap is between 5 mm and 50 mm, preferentially between 5 mm and 20 mm when the tank is in thermal equilibrium at 20°C.

[0025] By choosing such a value for the first gap, the sections can together constitute the rigid sheath while leaving uncovered only a very small part of the electric cable.

5 [0026] According to one embodiment, an end of the rigid sheath facing the electrical power supply housing is separated from the electrical power supply housing by a second gap, the second gap being between 20 mm and 200 mm when the tank is in thermal equilibrium at 20°C.

10 [0027] Thus, it is easy to make the electrical connection with the electrical power supply housing, since there remains a free space which allows an operator to manipulate said at least one electric cable.

[0028] According to one embodiment, the rigid sheath passes through a ceiling wall of the bearing structure and emerges in a hollow coupling piece above the ceiling wall, and the rigid sheath further receives:

- 15 - N cable support devices that are spaced apart, said at least one electric cable passing through each of the N cable support devices, and each cable support device having a greater outer dimension which is strictly less than a greater inner diameter of the rigid sheath;
- 20 - N-1 support cables attached between the N cable support devices, in which N is an integer number greater than or equal to 2; and
- a terminal support cable stretched between an attachment point situated in the hollow coupling piece and the cable support device closest to the hollow coupling piece.

25 [0029] According to one embodiment, the hollow coupling piece comprises a T-coupling, the T-coupling comprising a first branch in the extension of the rigid sheath and a second branch oriented at right angles or obliquely to the rigid sheath, the attachment point is situated in the first branch, and said at least one electric cable passes through the hollow coupling piece by exiting through the second branch.

30 [0030] According to one embodiment, the invention also provides an assembly method for assembling a sealed and thermally insulating tank, the assembly method comprising the steps of:

- A) anchoring the tank in a bearing structure which is incorporated in a ship;
- B) in an internal space of the tank, installing:
- 35 - a loading/offloading tower comprising at least one mast, the at least one mast extending vertically in an internal space of the tank, and
- at least one pump, the pump being secured to the loading/offloading tower and

comprising an electrical power supply housing, and a rigid sheath extending vertically, the rigid sheath being hollow and receiving at least one electric cable connected to the electrical power supply housing, the rigid sheath comprising a plurality of sections that are aligned vertically and fixed to the loading/offloading tower, each said section being tubular and being separated from an adjacent section by a first gap;

C) connecting said at least one electric cable to the electrical power supply housing.

[0031] This assembly method makes it possible to obtain the sealed and thermally insulating tank described above, with the same advantages. These advantages are not repeated in the interests of conciseness. It is quite clear that a feature described in relation to the tank is applicable to the assembly method and vice versa.

[0032] According to one embodiment, the loading/offloading tower comprises a single mast, and the step B) comprises fixing each section to the mast.

[0033] According to another embodiment, the loading/offloading tower comprises a first, a second and a third masts, spaced apart from one another, the loading/offloading tower further comprises crossmembers fixing the masts to one another, and the step B) comprises fixing each section to at least two crossmembers.

[0034] According to one embodiment, the step B) comprises making a ceiling wall of the bearing structure pass through the rigid sheath, and making the rigid sheath emerge in a hollow coupling piece above the ceiling wall;

- installing N cable support devices spaced apart on said at least one electric cable, said at least one electric cable passing through each of the N cable support devices, and each cable support device having a greater outer dimension which is strictly less than a greater inner diameter of the rigid sheath, and attaching N-1 support cables between the N cable support devices, in which N is an integer number greater than or equal to 2;

- inserting said at least one electric cable provided with the N cable support devices in the rigid sheath; and

- attaching a terminal support cable to an attachment point situated in the hollow coupling piece and to the cable support device closest to the hollow coupling piece.

[0035] Thus, it is easy to insert said at least one electric cable into the rigid sheath.

Furthermore, the terminal support cable is stretched between the attachment point and the cable support device closest to the hollow coupling piece, under the effect of the force of gravity being applied to this cable support device. This tends to better hold said at least one electric cable in position in the rigid sheath, in particular if the support cables are also stretched between the cable support devices.

[0036] According to one embodiment, the assembly method according to the invention comprises, prior to the step B), a step of installation of the at least one electric cable in the rigid sheath, preferentially when the loading/offloading tower is in a horizontal position.

[0037] In a variant, the step of installation of the at least one electric cable in the rigid sheath comprises:

- inserting the at least one electric cable and N-1 support cables in the rigid sheath, in which N is an integer number greater than or equal to 2;
- inserting, in line with N openings of the rigid sheath, N cable support devices spaced apart on said at least one electric cable, said at least one electric cable passing through each of the N cable support devices, and each cable support device having a greater outer dimension strictly less than a greater inner diameter of the rigid sheath, and attaching the N-1 support cables between the N cable support devices;

and after the step B), the rigid sheath emerging in a hollow coupling piece above a ceiling wall of the bearing structure, a step of attaching a terminal support cable to an attachment point situated in the hollow coupling piece and to the cable support device closest to the hollow coupling piece.

[0038] In a variant, the N openings of the rigid sheath are formed by the first gap between two adjacent sections.

[0039] According to one embodiment, the assembly method comprises:

- prior to the step of inserting, in line with N openings of the rigid sheath, N cable support devices and N-1 support cables, a step of creation of the N openings of the rigid sheath;
- after the step of attaching the N-1 support cables, a step of closure of the N openings of the rigid sheath.

[0040] According to one embodiment, the step of inserting the at least one electric cable and the N-1 support cables in the rigid sheath comprises a step of pulling the at least one electric cable and the N-1 support cables through at least one of the N openings.

[0041] According to one embodiment, the assembly method further comprises, after the step of attaching the N-1 support cables, a step of holding the ends of the at least one electric cable.

[0042] According to one embodiment, the hollow coupling piece comprises a T-coupling, the T-coupling comprising a first branch in the extension of the rigid sheath and a second branch oriented at right angles or obliquely to the rigid sheath, the attachment point is

situated in the first branch, and, in the step B), said at least one electric cable provided with the N cable support devices is inserted in the rigid sheath through the first branch, then an end of the electric cable opposite the electrical power supply housing is extracted from the hollow coupling piece through the second branch.

5 [0043] According to one embodiment, the assembly method further comprises blocking the first branch after having inserted said at least one electric cable provided with the N cable support devices in the rigid sheath.

[0044] This tends to better ensure the seal-tightness of the tank, notably by avoiding leaks of the liquefied gas contained in the tank via the rigid sheath. The stopper employed to block
10 the first branch can be removable so as to allow access to the rigid sheath for the maintenance of the rigid sheath.

[0045] According to one embodiment, at the end of the step B), an end of the rigid sheath facing the electrical power supply housing is separated from the electrical power supply housing by a second gap.

15 [0046] In one embodiment, the liquefied gas is LNG, namely a mixture with high methane content stored at a temperature of approximately -162°C at atmospheric pressure. Other liquefied gases can also be envisaged, notably ethane, propane, butane or ethylene, or even ammonia or hydrogen. Liquefied gases can also be stored under pressure, for example at a relative pressure of between 2 and 20 bar, and in particular a relative
20 pressure of around 2 bar. The tank can be produced according to different techniques, notably in the form of an integrated tank with membrane or a self-supporting tank.

[0047] According to one embodiment, the bearing structure of the ship is formed by a double hull of the ship. The ship can notably be a methane tanker, a floating storage and re-gasification unit (FSRU), a remote floating production and storage offshore (FPSO) unit,
25 and the like. The tank can also serve as fuel tank in any type of ship.

[0048] According to one embodiment, a ship for transporting a liquefied gas comprises a double hull and an above-mentioned tank disposed in the double hull.

[0049] According to one embodiment, the invention also provides a transfer system for a liquefied gas, the system comprising the above-mentioned ship, insulated pipelines
30 arranged so as to link the tank installed in the hull of the ship to a floating or onshore storage installation and a pump for driving a flow of liquefied gas through the insulated pipelines from or to the floating or onshore storage installation to or from the tank of the ship.

[0050] According to one embodiment, the invention also provides a method for loading or offloading such a ship, wherein a liquefied gas 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

5 [0051] The invention will be better understood, and other aims, details, features and advantages thereof will become more clearly apparent from the following description of several particular embodiments of the invention, given solely in an illustrative and nonlimiting manner, with reference to the attached drawings.

10 [0052] [Fig. 1] Figure 1 is a schematic view of a sealed and thermally insulating tank anchored in a bearing structure of a ship, in cross-section on a longitudinal plane of the ship, the tank being equipped with a loading/offloading tower.

[0053] [Fig. 2] Figure 2 is a schematic top view of the loading/offloading tower.

[0054] [Fig. 3] Figure 3 is a partial perspective view of the loading/offloading tower, together with a rigid sheath secured to the loading/offloading tower.

15 [0055] [Fig. 4] Figure 4 is an enlarged view of the detail A of figure 1.

[0056] [Fig. 5] Figure 5 is a perspective view of a cable support device intended to be inserted in the rigid sheath.

[0057] [Fig. 6] Figure 6 is a perspective view of the cable support device of figure 5, passed through by electric cables and linked to support cables.

20 [0058] [Fig. 7] Figure 7 is a flat view of several cable support devices of the type represented in figure 6.

[0059] [Fig. 8] Figure 8 is an enlarged view of the detail B of figure 1, illustrating the insertion of the electric cables in the rigid sheath using the cable support devices.

[0060] [Fig. 9] Figure 9 is an enlarged view of the detail C of figure 8.

25 [0061] [Fig. 10] Figure 10 is a cutaway schematic representation of a methane tanker tank and a terminal for loading/offloading this tank.

Description of the embodiments

30 [0062] In figure 1, a sealed and thermally insulating tank 1 is schematically represented in cross-section. The tank 1 is anchored in a bearing structure of a ship. The bearing structure notably comprises a bottom bearing wall 2 and a ceiling bearing wall 3. For example, the bearing structure is formed by the double hull of the ship.

[0063] According to one embodiment, the tank 1 is a tank with membranes. In such a tank 1, each tank wall has a multilayer structure comprising, from the outside to the inside, a secondary thermally insulating barrier comprising insulating elements resting against the bearing structure, a secondary sealing membrane resting against the secondary thermally insulating barrier, a primary thermally insulating barrier comprising insulating elements, not represented, resting against the secondary sealing membrane and a primary sealing membrane intended to be in contact with the liquefied gas contained in the tank 1. The primary sealing membrane defines an internal space 4 intended to receive a liquefied gas. By way of example, such membrane tanks are notably described in the patent applications WO14057221, FR2691520 and FR2877638 which respectively target the Mark V, Mark III and NO96 technologies developed by the applicant.

[0064] The liquefied gas intended to be stored in the tank 1 can notably be a liquefied natural gas (LNG), that is to say a gaseous mixture mostly comprising methane as well as one or more other hydrocarbons. The liquefied gas can also be ethane or a liquefied petroleum gas (LPG), that is to say a mixture of hydrocarbons derived from the refining of the oil essentially comprising propane and butane. The liquefied gas can also be ammonia or hydrogen.

[0065] The tank 1 is equipped with a loading/offloading tower 10, hereinbelow designated by "tower 10" for convenience. The tower 10 notably makes it possible to load the liquefied gas in the tank 1 or offload it. For that, the tower 10 comprises at least one pump 20. The pump 20 comprises a pump body 21 linked to a duct 22. The duct 22 can for example extend to an upper deck 6 of the ship, the upper deck 6 being situated above the ceiling wall 3. When wanting to offload the tank 1, the pump 20 is set into operation, and the liquefied gas is sucked by the pump body 21 into the duct 22, then transferred via the duct 22 to a liquefied gas loading/offloading equipment item.

[0066] Referring now to figure 1, figure 2 and figure 3, the tower 10 extends in the internal space 4 of the tank 1 over substantially the entire height of the tank 1. The tower 10 comprises a tripod structure, that is to say that the tower 10 comprises masts 11, 12, 13 that are spaced apart, parallel to one another, and extending vertically in the internal space 4. The masts 11, 12, 13 are linked together by crossmembers 19 (see figure 2, figure 3) contributing to the mechanical rigidity of the tower 10. Generally, the invention applies to a loading/offloading tower comprising at least one mast.

[0067] The pump 20 is secured to the tower 10, for example by being secured to a base of the tower 10 that is not represented, the base being situated at the end of the tower 10 which is adjacent to the bottom bearing wall 2. According to embodiments, the pump body

21 is received in a sump formed in the bottom wall of the tank 1 which is supported by the bottom bearing wall 2.

[0068] The pump 20 is electrical and comprises an electrical power supply housing 23 (hereinbelow designated "the housing 23"). In service, the pump 20 is more often than not immersed in the liquefied gas contained in the tank 1. To supply the pump 20 with electricity, it is therefore suitable to convey electrical power from an electrical power source situated outside the tank 1 to the housing 23. For that, the tower 10 comprises a rigid sheath 30 (hereinbelow designated "the sheath 30") which will now be described. The sheath 30 is hollow and receives electric cables 41 connected to the housing 23.

[0069] Referring to figure 3 and figure 4, the sheath 30 comprises a plurality of sections 31. Each section 31 is tubular, that is to say that the section 31 has a hollow annular cross-section. For example, the sections 31 are pipes produced in a metal alloy capable of withstanding the low temperature of the liquefied gas, for example stainless steel.

[0070] The sections 31 have inner diameters D1 (see figure 4) that are identical. The inner diameter D1 is advantageously chosen from a standard range of pipe diameters, for example the ND (nominal diameter) range defined by the ISO 6708 standard. In one example, the sections 31 are chosen with a nominal diameter ND 150.

[0071] In the case where the loading/offloading tower comprises a single mast, each said section 31 is fixed to the mast. In the case where the loading/offloading tower 10 comprises a first, a second and a third masts 11, 12, 13, spaced apart from one another, the loading/offloading tower 10 further comprises crossmembers 19 fixing the masts 11, 12, 13 to one another, and each said section 31 is fixed to at least two crossmembers 19. Hereinbelow, the description of the invention will be based on the case where the tower 10 comprises three masts, but it is of course understood that the invention applies similarly regardless of the number of masts.

[0072] Referring now to figure 3, the sections 31 are aligned vertically, that is to say parallel to the masts 11, 12, 13. In more concrete terms, each end of each section 31 is fixed to a crossmember 19 via a fixing element 39. For example, the fixing element 39 is produced in a metal alloy and is welded to the section 31 and to the crossmember 19. Each section 31 can further be fixed to one or more other crossmembers 19 via fixing elements 38. The fixing elements 38 are similar to the fixing elements 39. For example, the fixing elements 38 are produced in a metal alloy and are each welded to a section 31 and to a crossmember 19. The fixing elements 38, 39 can be curved as represented in figure 3 or else have other geometries.

[0073] The sections 31 are fixed to the crossmembers 19 in such a way that each section 31 is separated from an adjacent section 31 by a non-zero gap C1 (see figure 4). The gap C1 is between 5 mm and 20 mm, for example equal to 10 mm, when the tank 1 is in thermal equilibrium at 20°C. By choosing such a value for the gap C1, the sections 31 can together constitute the sheath 30 by leaving uncovered only a very small part of the electric cables 41 ; also, it is not necessary to fix the sections 31 to one another (by welding or bolting for example) to constitute the sheath 30, which is advantageous from the economic and industrial point of view.

[0074] In the example represented in figure 1, figure 2 and figure 4, the sheath 30 extends vertically above the housing 23. In other words, in a top view parallel to the vertical direction of the masts 11, 12, 13 and the sheath 30, the hollow annular cross-section of the sections 31 is included in the outer contour of the housing 21, entirely (as represented in figure 2) or else partially. This tends to minimise the length of electric cable 41 necessary to the electrical connection with the housing 23, and further tends to simplify the assembly of the tank 1, notably because the sheath 30 can have no bent portions which otherwise could be necessary to have the electric cables 41 run to the housing 23 through the sheath 30.

[0075] Referring to figure 4, a bottom end 33 of the sheath 30 facing the housing 23 is separated from the housing 23 by a non-zero gap C2. The gap C2 is between 20 mm and 200 mm when the tank 1 is in thermal equilibrium at 20°C. Thus, it is easy to produce the electrical connection of the electric cables 41 with the housing 23, since there remains a free space between the bottom end 33 and the housing 23 which allows an operator to manipulate the electric cables 41. It is specified here that although figure 4 shows an electric cable 41 connected to the housing 23 on a face of the housing 23 facing the sheath 30, the electrical connection of the electric cables 41 with the housing 23 can be positioned differently, notably inside the housing 23 and/or on another face of the housing 23.

[0076] According to one embodiment, as represented in figure 4, the bottom end 33 of the sheath 30 is embodied by a terminal section 32, of the same diameter as the sections 31 but of smaller length. The terminal section 32 is fixed at 312 to an adjacent section 31. Preferably, the fixing 312 of the terminal section 32 is removable, which makes it possible to dismantle the terminal section 32 and uncover a greater length of electric cable 41, for example with a view to a maintenance operation on the pump 20.

[0077] Referring to figure 2, the masts 11 and 12 are situated in a plane Q1, and the mast 13 is situated in a plane Q2 that is parallel to and spaced apart from the plane Q1. According to one embodiment, the planes Q1 and Q2 are orthogonal to a longitudinal direction L of

the ship. More particularly, as represented in figures 1 and 2, the plane Q2 is situated closer to the prow of the ship, in other words more forward in the longitudinal direction L oriented towards the prow of the ship, than the plane Q1.

[0078] As mentioned above, the sheath 30 is produced without fixing the sections 31 to one another. This very substantially improves the resistance of the sheath 30 to the impacts, and notably to the impacts due to the sloshing of liquefied gas in the tank 1, since the sheath 30 has no fixings between the sections 31 which would be more likely to be damaged by impacts. This makes it possible to freely position the sheath 30 on the tower 10 in the longitudinal direction L. Indeed, the construction of the sheath 30 in the form of adjacent tubular sections 31 offers the advantages cited above. Thus, and contrary to what is done in the prior art mentioned above, it is no longer necessary for the sheath 30 to be in a position which tends to shelter the sheath 30 from the sloshing. Notably, as represented in figure 2, the sheath 30 can be situated between the planes Q1 and Q2 in the longitudinal direction L rather than between the masts 11 and 12.

[0079] As represented in figure 2, the mast 13 can have a greater diameter than the masts 11 and 12, for example in order to form an emergency well allowing an emergency pump and an offloading line to be lowered in the case of failure of the pump 20.

[0080] In a variant, it is possible for the planes Q1 and Q2 to not be orthogonal to the longitudinal direction L. In this case also, the sheath 30 can be positioned freely on the tower 10.

[0081] A method for assembling the tank 1 equipped with the tower 10, the pump 20 and the sheath 30 will now be described.

[0082] First of all, the tank 1 is anchored in the bearing structure according to known techniques.

[0083] Next, in the internal space 4 of the tank 1, the tower 10, the pump 20 comprising the housing 23, and the sheath 30 provided with the electric cables 41 are installed. As has been described above, at the end of this step, the bottom end 33 of the sheath 30 facing the housing 23 is separated from the housing 23 by the gap C2.

[0084] Finally, the electric cables 41 are connected to the housing 23.

[0085] Several different orders can be envisaged for the installation of the tower 10, of the pump 20 comprising the housing 23, and of the sheath 30 provided with the electric cables 41 in the internal space 4 of the tank 1.

[0086] In one example, initially, the tower 10 and the pump 20 comprising the housing 23 are installed. In a second step, the sections 31 are supplied, and the sections 31 are fixed to

the tower 10 as has been described above, in such a way that the sections 31 are aligned vertically and each section 31 is separated from an adjacent section 31 by the first gap C1. The sections 31 that are thus aligned form at least a part of the sheath 30. Finally, in a third step, one or more electric cables 41 are run through the sheath 30 to the housing 23, and the electric cables 41 are connected to the housing 23.

[0087] In another example, the tower 10 is installed in the internal space 4 of the tank 1 after having fixed the sections 31 to the tower 10, and the electric cables 41 are made to run through the sheath 30 after having installed the tower 10.

[0088] In yet another example, the tower 10 is installed in the internal space 4 after having fixed the sections 31 to the tower 10 and after having made the electric cables 41 run through the sheath 30. In this example, the assembly method therefore comprises a step of installation of the electric cable or cables 41 in the rigid sheath 30, preferentially when the loading/offloading tower 10 is in horizontal position. This example of installation horizontally will be detailed hereinbelow.

[0089] Referring to figures 5 to 9, an advantageous way of having the electric cables 41 run through the sheath 30 to the housing 23 is described.

[0090] In figure 5, a cable support device 60 is represented in perspective. The cable support device 60 comprises a cable support assembly 65 and an armouring 61.

[0091] The cable support assembly 65 comprises two cable support pieces 66. Each of the two cable support pieces 66 has a groove 66C for each electric cable 41. The cable support pieces 66 are fixed to one another such that the grooves 66C are facing pairwise, and thereby together define a space that is sufficient to receive each electric cable 41 as will be detailed hereinbelow. The cable support pieces 66 are, here, fixed to one another by means of two bolts 67; in a variant, the cable support pieces 66 can be fixed to one another in other ways.

[0092] The armouring 61 comprises two armouring pieces 62. Each of the two armouring pieces 62 has two apertures 63A. Two bolts 63 (only one of which is visible in figure 5) are received in the apertures 63A and fix the two armouring pieces 62 and the two cable support pieces 66 together, such that the two armouring pieces 62 sandwich the two cable support pieces 66.

[0093] Each of the two armouring pieces 62 comprises an aperture 64. The apertures 64 are positioned such that, when the two armouring pieces 62 sandwich the two cable support pieces 66, the cable support device 60 has two central spaces 81, each central space 81 being formed by an aperture 64 and a facing cable support piece 66. As can be seen in

particular in figure 5, the central spaces 81 free up a space that is sufficient for the bolts 67. Furthermore, a central space 81 receives a cable attachment piece 82, visible in figure 5 and figure 6.

[0094] The cable attachment piece 82 is fixed, for example added, to one of the cable support pieces 66, so as to extend on either side of the armouring 61 and the cable support assembly 65. Furthermore, the cable attachment piece 82 has, at each of its two ends, a through-hole 83 (only one of which is visible in the drawings). Each of the two through-holes 83 receives a shackle 84 (only one of which is visible in figure 6). Each of the two shackles 84 allows the attachment of a support cable 42. In the example represented, the support cables 42 are stainless steel cables, and each end of a support cable 42 is wound around the shackle 84 then receives a spot weld or another fixing 42W to prevent the support cable 42 from unwinding.

[0095] Referring to figures 6 to 9, the use of the cable support devices 80 to have the electric cables 41 run through the sheath 30 to the housing 23 will now be described.

[0096] A desired number N of cable support devices 60 is installed on the electric cables 41. As represented in figure 6, each cable support device 60 is installed in such a way that the electric cables 41 pass through the cable support devices 60 by being received in the grooves 66C. Furthermore, as represented in figure 7, the cable support devices 60 are spaced apart on the electric cables 41, and N-1 support cables 42 are attached between the N cable support devices 60 by means of the shackles 84.

[0097] N is an integer number greater than or equal to 2. The value of N is chosen notably as a function of the length of the sheath 30 and of the desired length of the support cables 42.

[0098] Referring to figures 4, 8 and 9, the electric cables 41 provided with the N cable support devices 60 are inserted in the sheath 30, with the N-1 support cables 42 attached between the cable support devices 60.

[0099] As can be seen in particular in figure 4, the cable support devices 60 have a greater dimension which is strictly smaller than the diameter D1 of the sections 31. This makes it possible to insert the electric cables 41 provided with the N cable support devices 60 without risking the cable support devices 60 being wedged in the sheath 30.

[0100] The electric cables 41 provided with the N cable support devices 60 are inserted in the sheath 30 through an input point situated outside of the tank 1.

[0101] In the example represented in figures 8 and 9, the sheath 30 emerges in a hollow coupling piece 50. More specifically, referring to figure 8, the sheath 30 passes through

the ceiling bearing wall 3 and the upper deck 6 situated above the ceiling bearing wall 3. For that, the sheath 30 comprises a bushing duct 34, and the section 31 closest to the ceiling bearing wall 3 is fixed, for example welded, to the bushing duct 34. The bushing duct 34 passes through the ceiling tank wall 303 supported by the ceiling bearing wall 3, for example by passing through one or more insulating elements 303B of the ceiling tank wall 303, or else a space formed between these insulating elements 303B, and passes through the ceiling bearing wall 3. Furthermore, the bushing duct 34 passes through the upper deck 6 to emerge in the hollow coupling piece 50.

[0102] The bushing duct 34 can be fixed to the ceiling bearing wall 3 on the side opposite to the ceiling tank wall 303, for example by being welded to a collar 403 welded to the ceiling bearing wall 3. Furthermore, the bushing duct 34 can be fixed to the upper deck 6, for example by being welded to a duct 406 welded to the upper deck 6. The bushing duct 34 can be formed in a single piece or else be formed by several sections similar to the sections 31 fixed to one another.

[0103] Referring to figure 9, the hollow coupling piece 50 comprises a T-coupling 51. The T-coupling 51 comprises a first branch 52 in the extension of the sheath 30, and a second branch 53 oriented at right angles to the sheath 30. In a variant, the second branch 53 can be oriented obliquely but not at right angles to the sheath 30.

[0104] In the example represented, the bushing duct 34 has an inner diameter equal to D1, the first branch 52 and the second branch 53 have an inner diameter strictly greater than D1, and the hollow coupling piece 50 comprises a reduction (or reducing coupling, referred to as "reducer") 59 between the bushing duct 34 and the T-coupling 51. In the example represented, the reducer 59 is an "eccentric reducer".

[0105] The first branch 52 embodies the input point for the insertion of the electric cables 41 provided with the N cable support devices 60 in the sheath 30. In other words, referring to figure 8, the electric cables 41 provided with the N cable support devices 60 are inserted in the sheath 30 by passing through the first branch 52.

[0106] Furthermore, a terminal support cable 43 is attached to the last cable support device 60 inserted in the sheath 30, in other words to the cable support device 60 which will be the closest to the T-coupling 51 after having inserted the electric cables 41. The attachment of the terminal support cable 43 to this cable support device 60 can be produced in a way similar to the attachment of the support cables 42 to the cable support devices 60.

[0107] After having inserted the electric cables 41 provided with the N cable support devices 60 in the sheath 30, the electric cables 41 are made to run through the sheath 30 to the

housing 23, and the electric cables 41 are connected to the housing 23. The terminal support cable 43 is then attached to an attachment point 49 situated in the first branch 52. For example, the attachment point 49 is embodied by an attachment piece welded to the T-coupling 51 in the first branch 52, and the terminal support cable 43 is attached to this attachment piece by means of a shackle 85 in a way similar to the attachment of the support cables 42 by means of the shackles 84.

[0108] When the terminal support cable 43 is attached to the attachment point 49, the terminal support cable 43 is stretched between the attachment point 49 and the cable support device 60 (not represented in figure 9) closest to the T-coupling 51, under the effect of the force of gravity being applied to this cable support device 60.

[0109] The length of the terminal support cable 43, the length of the support cables 42 and the spacing between the cable support devices 60 can be chosen such that the support cables 42 are then stretched between the cable support devices 60, as can be seen in figure 7. The electric cables 41 are compressed in the grooves 66C, within the admissible limit of compression of the electric cables 41, and if necessary within the admissible limit of compression of the cable jackets of the electric cables 41. The total length of the electric cables 41 is consequently chosen such that the electric cables 41 are not stretched between the cable support devices 60, as represented in figure 7. This makes it possible to not apply too much tensile stress to the electric cables 41, which is beneficial for the mechanical integrity thereof.

[0110] More specifically, the total length of the electric cables 41 is chosen such that the electric cables 41 are not stretched between the cable support devices 60 at ambient temperature and at the low temperature of the liquefied gas, given the respective thermal contraction coefficients of the support cables 42 and of the electric cables 41. In concrete terms, between two given cable support devices 60, the length of electric cable 41 is chosen to be greater than the length of support cable 42. Since the cable support devices 60 have a greater dimension which is strictly smaller than the diameter D1 of the sections 31, the cable support devices 60 are allowed to be displaced in the sheath 30 when the electric cables 41 and the support cables 42 thermally contract.

[0111] Returning to figure 9, the ends of the electric cables 41 that are thus inserted in the sheath 30 are extracted from the hollow coupling piece 50 through the second branch 53. The electric cables 41 can then be connected as desired to an electrical equipment item outside the tank 1, which makes it possible to terminate the electrical connection of the housing 23 and of the pump 20.

[0112] Furthermore, the first branch 52 can be blocked by a stopper 58, such as a cap. The stopper 58 is for example fixed to an end flange 52A of the first branch 52. The stopper 58 tends to better ensure the seal-tightness of the tank 1, notably by avoiding leaks of the liquefied gas contained in the tank 1 via the sheath 30. The stopper 58 can be fixed
 5 removably, for example by bolting, to the end flange 52A, in order to allow access to the sheath 30 for maintenance of the sheath 30.

[0113] Although the drawings show the running of three electric cables 41 through the sheath 30, a different number of electric cables 41 can be employed if desired.

[0114] The grooves 66C of the cable support pieces 66 can, in an alternative, be facing the
 10 apertures 64, notably if a significant number of electric cables 41 is employed. In this case, the cable support assembly 65 can comprise a single cable support piece 66, back-plates being added to this cable support piece 66 to compress the electric cables 41 in the grooves 66C as was described above. The cable attachment piece 82 can be added to one of these back-plates.

[0115] In the example represented, the cable support pieces 66 and the cable attachment
 15 piece 82 are flat plates made of stainless steel, and the armouring pieces 62 are pieces made of high-density polythene, moulded or machined. In a variant, other geometries and/or other materials can be envisaged for the cable support pieces 66 and/or the cable attachment piece 82 and/or the armouring pieces 62.

[0116] As described above, the assembly method has been described when the
 20 loading/offloading tower is installed in the tank, vertically. In an alternative, it is possible to install the cables in the rigid sheath prior to the installation of the loading/offloading tower in the tank. In this example of installation when horizontal, the assembly method comprises, prior to the step of placement of the loading/offloading tower in the tank, a step
 25 of installation of the electric cable or cables 41 in the rigid sheath 30, preferentially when the loading/offloading tower 10 is in horizontal position.

[0117] The installation step comprises a step of insertion of the electric cable or cables 41 and of the N-1 support cables 42 in the rigid sheath 30 (N being an integer number greater than or equal to 2).

[0118] In a variant, the step of insertion of the electric cable or cables 41 and of the N-1
 30 support cables 42 is performed with the cables 41, 42 and the N cable support devices 60 spaced apart on the electric cable or cables 41, the electric cable or cables 41 each passing through the N cable support devices 60 previously put in place. In other words, in this variant, the N cable support devices are disposed on the electric cables and linked to

the support cables 42. Advantageously, the insertion step can be accompanied by a step of pulling of the cables by means of fishing wires at the other end of the rigid sheath.

[0119] In another variant, the installation step comprises a step of inserting, in line with N openings of the rigid sheath 30, N cable support devices 60 spaced apart on the electric cable or cables 41, the electric cable or cables 41 passing through each of the N cable support devices 60, and each cable support device 60 having a greater outer dimension strictly less than a greater inner diameter of the rigid sheath 30, and attaching N-1 support cables 42 between the N cable support devices 60.

[0120] By virtue of this feature of the assembly method, the electric cables and the support cables are installed on the loading/offloading tower when it is in horizontal position, which makes it possible not to increase the time to install the tower in the tank.

[0121] In one embodiment, the N openings of the rigid sheath are each formed by the first gap C1 between two adjacent sections 31. Advantageously, the first gap C1 is of the order of 30 mm to 50 mm to allow the insertion of the cable support device. Optionally, in order to facilitate the placement of the cable support devices, the cables can be extracted at the opening to position the cable support device and reinserted through the opening.

[0122] In another embodiment, specific openings are put in place. In this embodiment, the assembly method comprises:

- prior to the step of inserting, in line with N openings of the rigid sheath 30, N cable support devices 60 and N-1 support cables 42, a step of creation of the N openings of the rigid sheath 30;
- after the step of attaching the N-1 support cables 42, a step of closure of the N openings of the rigid sheath. The closure of the openings can be performed by the fitting of a cover, for example welded, on each of the openings. Discontinuous welds can be envisaged in order to limit the welding work.

[0123] In a variant of the assembly method according to the invention, the step of inserting the electric cable or cables 41 and the N-1 support cables 42 in the rigid sheath 30 can comprise a step of pulling of the electric cable or cables 41 and the N-1 support cables 42 through at least one of the N openings. The pulling can be performed through the use of a cable gripping tool, for example a hook or a clamp, inserted into the rigid sheath by an operator at the opening such that the tool comes into contact with said cable for the operator to be able to pull above in order to assist in the correct positioning of the cable in the rigid sheath.

[0124] This reveals that the openings have a dual role: on the one hand, they form a passage making it possible to pull the cables in the rigid sheath. On the other hand, they offer access to the cable support devices 60 in the rigid sheath 30 for the latter to be able to be easily put in place around the electric cable or cables.

5 [0125] Advantageously, the assembly method according to the invention further comprises, after the step of attaching the support cables 42, a step of holding of the ends of the electric cable or cables 41. Thus, when transporting the loading/offloading tower, notably during the transition from the horizontal position to the vertical position, the cables and their supports are held under tension in order to ensure that they remain well in place. To this
10 end, a system of temporary supports can be installed at the ends of the rigid sheath. By virtue of this feature, entangling of the cables during the displacement of the loading/offloading tower is avoided.

[0126] Up to this point, embodiments have been described in which the tower 10 comprises a pump 20 and a sheath 30. It is of course possible to envisage the tower 10 comprising
15 several pumps 20. In this case, each pump 20 comprises a housing 23, and a sheath 30 is associated with each housing 23. Each sheath 30 can extend vertically above the corresponding housing 23 as has been described above. In a variant, a sheath 30 can be associated with two adjacent pumps 20. In this case, the sheath 30 receives a first set of electric cables 41 to supply a first pump 20 with electricity and a second set of electric
20 cables 41 to supply a second pump 20 with electricity. For example, the first set of electric cables 41 is connected to a first housing 23 that the first pump 20 comprises, and the second set of electric cables 41 is connected to a second housing 23 that the second pump 20 comprises. The sheath 30 can extend vertically above the first housing 23 or can extend vertically above the second housing 23 or midway between them.

25 [0127] Referring to figure 10, a cutaway view of a methane tanker ship 70 shows a sealed and thermally insulating tank 71 of generally prismatic form mounted in the double hull 72 of the ship. The wall of the tank 71 comprises a primary sealing membrane intended to be in contact with the LNG contained in the tank, a secondary sealing membrane arranged between the primary sealing membrane and the double hull 72 of the ship, and two
30 thermally insulating barriers arranged respectively between the primary sealing membrane and the secondary sealing membrane and between the secondary sealing membrane and the double hull 72.

[0128] As is known per se, loading/offloading pipelines 73 disposed on the upper deck of the ship can be coupled, by means of appropriate connectors, to a maritime or port terminal
35 to transfer a cargo of LNG from or to the tank 71.

[0129] Figure 10 represents an example of maritime terminal comprising a loading and offloading station 75, a submarine duct 76 and an onshore installation 77. The loading and offloading station 75 is a fixed offshore installation comprising a movable arm 74 and a tower 78 which supports the movable arm 74. The movable arm 74 bears a bundle of insulated flexible pipes 79 that can be connected to the loading/offloading pipelines 73. The orientable movable arm 74 adapts to all methane tanker templates. A link duct that is not represented extends inside the tower 78. The loading and offloading station 75 allows the loading and the offloading of the methane tanker 70 from or to the onshore installation 77. The latter comprises liquefied gas storage tanks 80 and link ducts 81 linked by the submarine duct 76 to the loading or offloading station 75. The submarine duct 76 allows the transfer of the liquefied gas between the loading or offloading station 75 and the onshore installation 77 over a great distance, for example 5 km, which makes it possible to keep the methane tanker ship 70 at a great distance from the coast during the loading and offloading operations.

[0130] To generate the pressure necessary to the transfer of the liquefied gas, pumps embedded in the ship 70 and/or pumps with which the onshore installation 77 is equipped and/or pumps with which the loading and offloading station 75 is equipped are implemented.

[0131] Although the invention has been described in association with several particular embodiments, it is quite clear that it is in no way limited thereto and that it encompasses all the technical equivalents of the means described as well as the combinations thereof if the latter fall within the framework of the invention.

[0132] The use of the verb “include” or “comprise” and its conjugated forms does not preclude the presence of elements or steps other than those stated in a claim.

[0133] In the claims, any reference symbol between parentheses should not be interpreted as a limitation of the claim.

Claims

[Claim 1] Sealed and thermally insulating tank (1), the tank (1) being anchored in a bearing structure of a ship, the tank (1) comprising a loading/offloading tower (10), the loading/offloading tower (10) comprising at least one mast (11, 12, 13), the at least one mast (11, 12, 13) extending vertically in an internal space (4) of the tank (1), the tank (1) further comprising at least one pump (20), the pump (20) being secured to the loading/offloading tower (10) and comprising an electrical power supply housing (23), and a rigid sheath (30) extending vertically, the rigid sheath (30) being hollow and receiving at least one electric cable (41) connected to the electrical power supply housing (23),

the rigid sheath (30) comprising a plurality of sections (31) that are aligned vertically and fixed to the loading/offloading tower (10), each said section (31) being tubular and being separated from an adjacent section by a first gap (C1).

[Claim 2] Sealed and thermally insulating tank (1) according to Claim 1, wherein the loading/offloading tower (10) comprises a single mast (11), and each said section (31) is fixed to the mast (11).

[Claim 3] Sealed and thermally insulating tank (1) according to Claim 1, wherein the loading/offloading tower (10) comprises a first, a second and a third masts (11, 12, 13), spaced apart from one another, and wherein the loading/offloading tower (10) further comprises crossmembers (19) fixing the masts (11, 12, 13) to one another, and wherein each said section (31) is fixed to at least two crossmembers (19).

[Claim 4] Sealed and thermally insulating tank (1) according to any one of Claims 1 to 3, wherein the first gap (C1) is between 5 mm and 50 mm, preferentially between 5 mm and 20 mm, when the tank (1) is in thermal equilibrium at 20°C.

[Claim 5] Sealed and thermally insulating tank (1) according to any one of Claims 1 to 4, wherein an end (33) of the rigid sheath (30) facing the electrical power supply housing (23) is separated from the electrical power supply housing (23) by a second gap (C2), the second gap (C2) being between 20 mm and 200 mm when the tank (1) is in thermal equilibrium at 20°C.

[Claim 6] Sealed and thermally insulating tank (1) according to any one of Claims 1 to 5, wherein the rigid sheath (30) passes through a ceiling wall (3) of the bearing structure and emerges in a hollow coupling piece (50) above the ceiling wall (3), and wherein the rigid sheath (30) further receives:

-N cable support devices (60) that are spaced apart, said at least one electric cable (41) passing through each of the N cable support devices (60), and each cable support device (60) having a greater outer dimension which is strictly less than a greater inner

diameter (D1) of the rigid sheath (30) ;

- N-1 support cables (42) attached between the N cable support devices (60), in which N is an integer number greater than or equal to 2; and
- a terminal support cable (43) stretched between an attachment point (49) situated in the hollow coupling piece (50) and the cable support device (60) closest to the hollow coupling piece (50).

[Claim 7] Sealed and thermally insulating tank (1) according to Claim 6, wherein the hollow coupling piece (50) comprises a T-coupling (51), the T-coupling (51) comprising a first branch (52) in the extension of the rigid sheath (30) and a second branch (53) oriented at right angles or obliquely to the rigid sheath (30), the attachment point (49) is situated in the first branch (52), and said at least one electric cable (41) passes through the hollow coupling piece (50) by exiting through the second branch (53).

[Claim 8] Assembly method for assembling a sealed and thermally insulating tank (1), the assembly method comprising the steps of:

A) anchoring the tank (1) in a bearing structure which is incorporated in a ship;

B) in an internal space (4) of the tank (1), installing:

- a loading/offloading tower (10) comprising at least one mast (11, 12, 13), the at least one mast (11, 12, 13) extending vertically in an internal space (4) of the tank (1), and
- at least one pump (20), the pump (20) being secured to the loading/offloading tower (10) and comprising an electrical power supply housing (23), and a rigid sheath (30) extending vertically, the rigid sheath (30) being hollow and receiving at least one electric cable (41) connected to the electrical power supply housing (23), the rigid sheath (30) comprising a plurality of sections (31) that are aligned vertically and fixed to the loading/offloading tower (10), each said section (31) being tubular and being separated from an adjacent section by a first gap (C1) ;

C) connecting said at least one electric cable (41) to the electrical power supply housing (23).

[Claim 9] Assembly method according to Claim 8, wherein the loading/offloading tower (10) comprises a single mast (11, 12, 13), and wherein the step B) comprises fixing each section (31) to the mast (11, 12, 13).

[Claim 10] Assembly method according to Claim 8, wherein the loading/offloading tower (10) comprises a first, a second and a third masts (11, 12, 13), spaced apart from one another, and the loading/offloading tower (10) further comprises crossmembers (19) fixing the masts (11, 12, 13) to one another, and wherein the step B) comprises fixing each section (31) to at least two crossmembers (19).

[Claim 11] Assembly method according to any one of Claims 8 to 10, wherein the step B) comprises:

- making a ceiling wall (3) of the bearing structure pass through the rigid sheath (30), and making the rigid sheath (30) emerge in a hollow coupling piece (50) above the ceiling wall (3);

-installing N cable support devices (60) spaced apart on said at least one electric cable (41), said at least one electric cable (41) passing through each of the N cable support devices (60), and each cable support device (60) having a greater outer dimension strictly less than a greater inner diameter of the rigid sheath (30), and attaching N-1 support cables (42) between the N cable support devices (60), in which N is an integer number greater than or equal to 2;

- inserting said at least one electric cable (41) provided with the N cable support devices (60) in the rigid sheath (30); and

- attaching a terminal support cable (43) to an attachment point (49) situated in the hollow coupling piece (50) and to the cable support device (60) closest to the hollow coupling piece (50).

[Claim 12] Assembly method according to any one of Claims 8 to 10, comprising, prior to the step B), a step of installation of the at least one electric cable (41) in the rigid sheath (30), preferentially when the loading/offloading tower (10) is in a horizontal position.

[Claim 13] Assembly method according to Claim 12, wherein the step of installation of the at least one electric cable (41) in the rigid sheath (30) comprises:

- inserting the at least one electric cable (41) and N-1 support cables (42) in the rigid sheath (30), in which N is an integer number greater than or equal to 2;

- inserting, in line with N openings of the rigid sheath (30), N cable support devices (60) spaced apart on said at least one electric cable (41), said at least one electric cable (41) passing through each of the N cable support devices (60), and each cable support device (60) having a greater outer dimension strictly less than a greater inner diameter of the rigid sheath (30), and attaching the N-1 support cables (42) between the N cable support devices (60) ;

and after the step B), the rigid sheath (30) emerging in a hollow coupling piece (50) above a ceiling wall (3) of the bearing structure, a step of attaching a terminal support cable (43) to an attachment point (49) situated in the hollow coupling piece (50) and to the cable support device (60) closest to the hollow coupling piece (50).

[Claim 14] Assembly method according to Claim 13, wherein the N openings of the rigid sheath are formed by the first gap (C1) between two adjacent sections (31).

[Claim 15] Assembly method according to Claim 13, comprising:

- prior to the step of inserting, in line with N openings of the rigid sheath (30), N cable support devices (60) and N-1 support cables (42), a step of creation of the N openings of the rigid sheath (30) ;

- after the step of attaching the N-1 support cables (42), a step of closure of the N openings of the rigid sheath.

[Claim 16] Assembly method according to any one of Claims 13 to 15, wherein the step of inserting the at least one electric cable (41) and the N-1 support cables (42) in the rigid sheath (30) comprises a step of pulling the at least one electric cable (41) and the N-1 support cables (42) through at least one of the N openings.

[Claim 17] Assembly method according to any one of Claims 13 to 16, further comprising, after the step of attaching the N-1 support cables (42), a step of holding the ends of the at least one electric cable (41).

[Claim 18] Assembly method according to any one of Claims 11 to 17, wherein the hollow coupling piece (50) comprises a T-coupling (51), the T-coupling (51) comprising a first branch (52) in the extension of the rigid sheath (30) and a second branch (53) oriented at right angles or obliquely to the rigid sheath (30), the attachment point (49) is situated in the first branch (52), and wherein, in the step B), said at least one electric cable (41) provided with the N cable support devices (60) is inserted in the rigid sheath (30) through the first branch (52), then an end of the electric cable (41) opposite the electrical power supply housing (23) is extracted from the hollow coupling piece (50) through the second branch (53).

[Claim 19] Assembly method according to Claim 18, further comprising blocking the first branch (52) after having inserted said at least one electric cable (41) provided with the N cable support devices (60) in the rigid sheath (30).

[Claim 20] Assembly method according to any one of Claims 8 to 19, wherein, at the end of the step B), an end (33) of the rigid sheath (30) facing the electrical power supply housing (23) is separated from the electrical power supply housing (23) by a second gap (C2).

[Claim 21] Ship (70) for transporting a liquefied gas, the ship comprising a double hull (72) and a tank (71) according to any one of Claims 1 to 7 disposed in the double hull.

[Claim 22] Ship (70) according to Claim 21, wherein the tank (71) is according to either one of Claims 5 and 6 and wherein the hollow coupling piece (50) is disposed above a deck (6) of the ship situated above the ceiling wall (3) of the bearing structure.

[Claim 23] Transfer system for a liquefied gas, the system comprising a ship (70) according to either one of Claims 21 and 22, insulated pipelines (73, 79, 76, 81) arranged so as to link the tank (71) installed in the hull of the ship to a floating or onshore storage installation (77) and a pump for driving a flow of liquefied gas through the insulated pipelines from or to the floating or onshore storage installation to or from the tank of the ship.

[Claim 24] Method for loading or offloading a ship (70) according to either one of Claims 21 and 22, wherein a liquefied gas 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 (70). |