

Description

Title: Device for holding a mesh of wave reinforcements.

5 The invention relates to the field of sealed and thermally insulating tanks for the storage and/or transport of liquid cargo at low temperature, such as tanks for the transport of Liquefied Petroleum Gas (LPG), having a temperature between -50°C and 0°C at atmospheric pressure, for example, or for the transport of Liquefied Natural Gas (LNG), at about -162°C at atmospheric pressure. These tanks can be installed on land
10 or on a floating structure. In the case of a floating structure, the tank may be intended for the transporting of gas in the liquid state or for receiving gas in the liquid state serving as fuel for the propulsion or the accessories of the floating structure.

The sealed and thermally insulating tanks used for the storage of these liquids at low
15 temperature are usually composed of an insulating mass and a corrugated membrane, composed of a plurality of corrugated plates, coming into contact with the liquid cargo. Between the insulating mass and the corrugated membrane, wave reinforcements may be arranged in waves of the corrugated plates. The wave reinforcements then have the function of mechanically supporting the waves of the corrugated membrane,
20 in the presence of a mechanical stress applied to the tank. The wave reinforcements are then assembled by connecting members to form a mesh of wave reinforcements. A mesh of wave reinforcements is then associated with each of the corrugated plates of the corrugated membrane.

25 A drawback of such a tank wall resides in its mounting. Indeed, the wave reinforcements constituting the mesh of wave reinforcements are not secured to each other, while also having a substantial size and weight, making it difficult to install them and keep them in place on the insulating mass. Thus, the tank wall being mounted has the drawback of requiring several operators in order to hold its mesh of wave
30 reinforcements against the insulating mass while offering little precision as to the positioning of said mesh of wave reinforcements against the insulating mass.

The invention therefore aims to overcome this drawback by designing a device for holding the mesh of wave reinforcements in place during positioning thereof on the

insulating mass, the invention allowing, by simple means, to facilitate the precise installation of the corrugated plate overlapping the mesh of wave reinforcements on the insulating mass.

5 The invention therefore relates to a method of mounting a tank wall for a floating structure for storing and/or transporting a liquid cargo, the tank wall comprising at least one insulating mass, at least one corrugated plate comprising series of waves, the wall comprising a plurality of wave reinforcements arranged in a mesh of wave reinforcements, the mesh of wave reinforcements being arranged between the
10 corrugated plate and the insulating mass by fitting into the series of waves of the corrugated plate, the mounting method using a device for holding the mesh of wave reinforcements in position against the insulating mass, the holding device comprising at least a first support bearing the mesh of wave reinforcements and a second support bearing the first support via a movable coupling member, during which method in a
15 first step the second support is secured to the insulating mass, in a second step the first support is secured to the second support by means of the movable coupling member, then in a third step the mesh of wave reinforcements is positioned on the first support.

20 The floating structure may in particular transport liquid natural gas, liquefied petroleum gas, liquid ammonia, and may then comprise several tanks for the storage and/or the transport thereof.

The insulating mass of the tank wall provides the thermal insulation of the tank
25 necessary for the transport of liquid natural gas and may in particular comprise at least one layer of insulation. The corrugated plate includes waves distributed over its surface. Such a configuration of the corrugated plate provides it with greater resistance to the stresses generated on the tank, in particular to thermal shrinkage when the tank is cold, the hydrostatic pressure due to the loading of the liquid cargo, as well as the
30 pressure dynamics due to the movement of the cargo, in particular due to the swell. The waves on the corrugated plate then allow it to deform to overcome these constraints.

The wave reinforcements have a complementary shape to the waves of the corrugated plate. Thus, the wave reinforcements may be arranged in a mesh of wave reinforcements by means of connecting members that connect the wave reinforcements to each other, said mesh being capable of being housed in the series of waves of the corrugated plate in order to reinforce the latter, in particular in the event of mechanical shocks.

The holding device allows the mesh of wave reinforcements to be held against the insulating mass during its positioning and at least until the positioning of the corrugated plate overlapping said mesh of wave reinforcements. More specifically, the first support of the holding device is capable of capturing or receiving one of the connecting members of the mesh of wave reinforcements, participating in holding said mesh of wave reinforcements in position against the insulating mass.

Advantage is taken of such a holding device in that it ensures the holding of the mesh of wave reinforcements against the insulating mass during the mounting of the tank wall, allowing on the one hand to facilitate said mounting and on the other hand to precisely arrange the corrugated plate overlapping the mesh of wave reinforcements.

According to one feature of the invention, during the second step, the position of the first support is adjusted with respect to the second support along a main axis of elongation of the first support.

Such an adjustment of the first support with respect to the second support allows the holding device to adapt to different dimensions of meshes of wave reinforcements arranged on separate parts of the tank wall.

According to one feature of the invention, during the second step, the position of the first support is adjusted relative to the second support by means of the movable coupling member.

It is therefore understood that the movable coupling member on the one hand allows the first support to be secured to the second support, and on the other hand makes it possible to participate in adjusting the position of the first support relative to the second

support. Furthermore, the term “movable” means that the movable coupling member is capable of joining and separating from the first support and the second support without breaking its material and a number of times greater than two.

5 According to one feature of the invention, the movable coupling member is a key or a part screwed into the first support and the second support or a system for pressing the first support against the tank wall. The movable coupling member may also be any system equivalent to those mentioned above.

10 According to one feature of the invention, in a step subsequent to the third step, the corrugated plate is placed against the insulating mass so that the mesh of wave reinforcements is housed in the series of waves of said corrugated plate, then said corrugated plate is fixed on the insulating mass.

15 During this step of installing the corrugated plate overlapping the mesh of wave reinforcements, the position of said corrugated plate is adjusted on the insulating mass. Such an adjustment of the position of the corrugated plate on the insulating mass is in particular facilitated by the holding of the mesh of wave reinforcements by the holding device.

20 According to one feature of the invention, the holding device comprises a third support, during which method between the third step and the step subsequent to the third step, in a sub-step, the third support is secured to the insulating mass by blocking the mesh of wave reinforcements.

25 More precisely, the third support of the holding device is arranged at one end of the mesh of wave reinforcements distinct from the end of the mesh of wave reinforcements that is borne by the first support and the second support. According to an example of the invention, the third support has identical structural characteristics to the second
30 support and is capable of receiving part of the mesh of wave reinforcements. It is also understood that the sub-step is an optional step of the mounting method and is implemented when the insulating mass intended to receive the mesh of wave reinforcements has a particular structure, for example by being inclined toward the inside of the tank, the mesh of wave reinforcements then requiring additional support

before the step subsequent to the third step during which the corrugated plate is installed against the insulating mass.

According to one feature of the invention, in a step subsequent to the step of installing the corrugated plate against the insulating mass referred to above, at least the first support is separated from the second support of the holding device by removing the movable coupling member, then at least the first support is removed from the tank wall.

According to an example of the invention, the second support of the device for holding the insulating mass is also subsequently removed. It is understood from such a step that the holding device may be used to hold another mesh of wave reinforcements against the insulating mass during the method of mounting the tank wall. It is also understood that the holding device is not intended to remain on the tank wall once the latter has been assembled, the holding device being secured to the insulating mass only during the mounting method of said tank wall.

The invention also relates to a tank wall for a floating structure for storing and/or transporting a liquid cargo, the tank wall comprising at least one insulating mass, at least one corrugated plate comprising series of waves, the wall comprising a plurality of wave reinforcements arranged in a mesh of wave reinforcements, the mesh of wave reinforcements being arranged between the corrugated plate and the insulating mass by being housed in the series of waves of the corrugated plate, the tank wall being characterized in that it comprises at least one device for holding the mesh of wave reinforcements in position against the insulating mass, the holding device comprising at least one first support bearing the mesh of wave reinforcements and a second support bearing the first support via a movable coupling member, the second support being secured to the insulating mass. It is understood that the method of mounting the tank wall uses the holding device comprising at least the first support and the second support.

Such a tank wall according to the invention makes it possible, at least during the construction phase of said wall, to facilitate the positioning and holding of the reinforcing mesh.

According to the invention, the mesh of wave reinforcements is produced by means of wave reinforcements linked to one another by the connecting members. Thus, according to an example of the invention, the first support comprises an opening for receiving one of the connecting members of the mesh of wave reinforcements positioned at one end of said mesh of wave reinforcements. According to a non-limiting example of the invention, the connecting members may assume the form of a cross or a straight bar.

According to one feature of the tank wall, the first support is a temporary wave reinforcement, distinct from the wave reinforcements of the mesh of wave reinforcements and intended to be removed from the tank wall.

It will be understood that the first support is arranged on the tank wall only during mounting of the latter, said first support not being a permanent component of the tank wall. Furthermore, the entire holding device is intended to be removed from the tank wall once the mounting of the latter has been completed. According to one feature of the tank wall, the holding device comprises means for adjusting the first support relative to the second support comprising at least two first adjustment orifices on one of the first support or of the second support and at least a second adjustment orifice on the other first support or second support.

It is understood that the adjustment step of the method of mounting the tank wall is implemented at least by the means for adjusting the holding device. The first adjustment orifices and the at least one second adjustment orifice are aligned along an axis parallel to the main elongation direction of the first support, corresponding to its main length direction, here longitudinal. The adjustment means then allow the position of the first support to be adjusted relative to the second support in the main elongation direction of said first support.

According to one feature of the tank wall, the holding device comprises a third support for blocking the mesh of wave reinforcements in position, the third support being fixed to the insulating mass.

It is understood that the method of mounting the tank wall uses the third support during the step subsequent to the third step, during which the mesh of wave reinforcements is blocked at an end opposite the end of the mesh of wave reinforcements that is blocked by the first support and the second support of the holding device.

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According to one feature of the tank wall, the holding device is capable of blocking the mesh of wave reinforcements in position in at least two directions perpendicular to the main elongation axis of the first support.

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The receiving opening of the first support extends along the main elongation direction of the first support. Thus, the association of the first support with one of the connecting members of the mesh of wave reinforcements that extends in the receiving opening of said first support in its main elongation direction allows said mesh of wave reinforcements to be blocked along transverse and vertical directions, perpendicular to the main direction of elongation of the first support, here longitudinal.

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According to one feature of the tank wall, the first support comprises at least one receiving opening able to house at least part of the mesh of wave reinforcements. According to an example of the invention, the receiving opening of the first support is intended to receive one of the connecting members of the mesh of wave reinforcements. Alternatively, part of the mesh of wave reinforcements, in particular a connecting member of the mesh of wave reinforcements, may comprise a receiving opening in which one end of the first support of the holding device according to the invention is housed.

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The invention also relates to a tank of a floating structure for the transport and/or storage of a liquid cargo, comprising at least one tank wall mounted according to any one of the preceding features, or at least one tank wall according to any one of the preceding features.

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The invention also relates to a tool for mounting a tank wall as described in this document, comprising at least one holding device that comprises at least a first support configured to bear a mesh of wave reinforcements and a second support

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bearing the first support via a movable coupling member constituting the mounting tool, said second support being configured to be secured to the insulating mass.

Other features, details and advantages of the invention will emerge more clearly on reading the description given below by way of indication, in relation to the drawings, in which:

[Fig. 1] is a cutaway side view of a floating structure for transporting liquid gas with four tanks comprising the invention;

[Fig. 2] is a perspective view of a corrugated plate of a corrugated membrane;

[Fig. 3] is a close-up view of a tank wall;

[Fig. 4] is a partial perspective view of a mesh of wave reinforcements;

[Fig. 5] is an exploded view of a mounting tool comprising a device for holding the mesh of wave reinforcements according to the invention;

[Fig. 6] is a side view of the holding device of Fig. 5;

[Fig. 7] is a view of the holding device of Fig. 5 secured to the insulating mass of the tank wall of Fig. 3;

[Fig. 8] is a perspective view of a third support of the holding device;

[Fig. 9] is a schematic view of the mesh of wave reinforcements and of the holding device during a step in a method for mounting the tank wall;

[Fig. 10] is a schematic view of the corrugated plate and the holding device during a step in the method of mounting the tank wall of Fig. 3.

It should first of all be noted that while the figures set out the invention in detail for its implementation, these figures can of course be used to better define the invention where appropriate. It should also be noted that these figures only show exemplary embodiments of the invention. Finally, the same references designate the same elements in all of the figures.

Fig. 1 shows a floating structure 1, for example an LNG carrier, which has four tanks 2 for the storage of gas in the liquid state, in particular liquid natural gas. The tanks 2 are separated from one another by double transverse partitions 4, otherwise known as “cofferdams.” Each of the tanks 2 is formed by a wall 6 comprising, among other things, an insulating mass, visible in Fig. 3, forming part of the thermal insulation of the wall 6, and a corrugated membrane composed of a plurality of corrugated plates,

in contact with the liquid cargo. The corrugated plate 100, visible in Fig. 2, is a plate of an anti-corrosion material, in particular stainless steel with a thickness for example between 0.5 mm and 2 mm, advantageously 1.2 mm, measured in a vertical direction V of the corrugated plate 100. The corrugated plate 100 may also comprise a length
5 comprised between 900 mm and 3300 mm measured in a longitudinal direction L of the corrugated plate 100. Finally, the corrugated plate 100 may comprise a width of between 600 mm and 1500 mm, measured in a transverse direction T of the corrugated plate 100. The corrugated plate 100 is then delimited at its periphery by an edge 160.

10 The corrugated plate 100 comprises a plurality of first series of waves 110 parallel to each other and extending in the transverse direction T of the corrugated plate 100. The corrugated plate 100 also comprises a plurality of second series of waves 120 parallel to each other and extending along the longitudinal direction L of the corrugated
15 plate 100. According to the invention, the corrugated plate 100 comprises nine first series of waves 110 and three second series of waves 120.

“Wave” means a deformation of the surface of the corrugated plate 100 in the vertical direction V of the corrugated plate 100. The cross-sectional waves then have a convex
20 shape with an apex 150.

The first series of waves 110 and the second series of waves 120 extend mainly along directions that are perpendicular to each other, and form nodes 130 at their intersection. The nodes 130 emerge vertically from a plane AB in which the corrugated
25 plate 100 fits. A peak of at least one node 130 is higher than the apices 150 of the series of waves 110, 120 of the corrugated plate 100.

The corrugated plate 100 also comprises flat portions 140 in the shape of a quadrilateral, whereof the two sides that extend along the longitudinal direction L of the corrugated plate 100 are delimited by two second series of waves 120, and the
30 sides that extend along the transverse direction T of the corrugated plate 100 are delimited by two first series of waves 110. All of the flat portions 140 define an undeformed surface, extending along the plane AB of the corrugated plate 100 and

coming into contact with the insulating mass, when the corrugated membrane is mounted against the insulating mass.

Fig. 3 partially illustrates the tank wall 6 in particular with a part of the corrugated plate 100 of the corrugated membrane 11, intended to be in contact with the cryogenic fluid contained in the tank and anchored on the insulating mass 8. Wave reinforcements 10, visible in Fig. 4 and divided into first wave reinforcements 10a and second wave reinforcements 10b, are also arranged on the insulating mass 8. In the rest of the detailed description, the first wave reinforcements 10a and the second wave reinforcements 10b will be grouped together under the term “wave reinforcement 10” when the characteristics mentioned apply to both types of wave reinforcements.

The first wave reinforcements 10a are aligned to form a first series of reinforcements 12a extending in the transverse direction T of the corrugated plate 100.

The second wave reinforcements 10b are aligned to form a second series of reinforcements 12b extending along the longitudinal direction L of the corrugated plate 100. The first series of reinforcements 12a and the second series of reinforcements 12b therefore intersect, in particular in perpendicular directions.

The first wave reinforcements 10a are received in the first series of waves 110 of the corrugated plate 100. It is understood that the first wave reinforcements 10a are positioned so as to be nested in the deformation of the wave, the shape of the first wave reinforcements 10a being complementary to the shape of the waves of the first series of waves 110 of the corrugated plate 100.

The second wave reinforcements 10b are received in the second series of waves 120 of the corrugated plate 100. It is then understood that the second wave reinforcements 10b are positioned so as to be nested in the deformation of the wave, the shape of the second wave reinforcements 10b being complementary to the shape of the waves of the second series of waves 120 of the corrugated plate 100.

It is also understood that an intersection between the first series of reinforcements 12a and the second series of reinforcements 12b is positioned under a node 130 of the corrugated plate 100.

Connecting members 14 are arranged in the first wave reinforcements 10a and in the second wave reinforcements 10b so that they are interconnected under the series of waves 110, 120 of the corrugated plate 100. The connecting members 14 may be, for example and without limitation, in the form of a cross or a straight bar.

In the rest of the detailed description, “mesh of wave reinforcements 16,” visible in Fig. 4, will refer to all of the first series of reinforcements 12a and the second series of reinforcements 12b, connected by at least one of the connecting members 14, and in particular a plurality of connecting members 14, under a single and same corrugated plate 100. The mesh of wave reinforcements 16 according to the invention is particularly visible in Fig. 4 and 9.

Transverse ends 18 and longitudinal ends 20 of the mesh of wave reinforcements 16 are defined. More precisely, the mesh of wave reinforcements 16 comprises a first transverse end 18a and a second transverse end 18b, opposite each other in the transverse direction T of the corrugated plate, as well as a first end longitudinal end 20a and a second longitudinal end 20b opposite each other along the longitudinal direction L of the corrugated plate. It is understood that each of the longitudinal 20 and transverse 18 ends of the mesh of wave reinforcements 16 is intended to be positioned in line with the edge 160 of the corrugated plate 100 when the latter is placed on the insulating mass covering the mesh of wave reinforcements 16, as mentioned above.

The wall 6 of the tank, and more precisely the corrugated membrane 11, is composed of a succession of corrugated plates 100, positioned on the insulating mass 8, with the wave reinforcements 10 therebetween forming the mesh of wave reinforcements 16. Thus, it is understood that each corrugated plate 100 covers a mesh of wave reinforcements 16 arranged in the waves of the corrugated plate 100. The wave reinforcements 10 then allow the waves of the corrugated membrane 11 to be mechanically supported in the event of deformation of the tank wall 6.

Fig. 5 to 8 illustrate at least one mounting tool 21 of the tank wall 6 described above, such a tool comprising at least one holding device 22 intended to hold the mesh of

wave reinforcements in position against the insulating mass 8, the holding device 22 comprising at least one first support 24 configured to bear the mesh of wave reinforcements and a second support 26 configured to bear the first support 24 via a movable coupling member 28 that is part of the mounting tool 21, said second support 26 being intended to be secured to the insulating mass 8. Once the plate has been assembled, the tool is removed from the tank wall in order to be reused.

According to the non-limiting example of the invention illustrated, the first support 24 of the holding device 22 is a temporary wave reinforcement 24, distinct from the wave reinforcements of the mesh of wave reinforcements and intended to be removed from the tank wall. It is understood in particular that the temporary wave reinforcement 24, forming the first support 24, is present on the insulating mass 8 only during the mounting operation of the corrugated plate 100, said temporary wave reinforcement being removed from the insulating mass 8 once said mounting has been completed.

It should be considered, in the remainder of the description and in order to facilitate understanding, that all of the longitudinal L, vertical V and transverse T directions of the holding device 22 are parallel to the directions previously associated with the corrugated plate.

The first support 24 extends along a main elongation direction P, here longitudinal L, and is perforated along this same direction. As seen in Fig. 6, an upper part 30 and a lower part 32 of the first support 24 are then delimited, opposite each other in the vertical direction V of the holding device 22, the upper part 30 comprising a warping 34 for reinforcing said first support 24 and the lower part 32 comprising a receiving opening 36 for at least part of the mesh of wave reinforcements, the receiving opening 36 extending in the longitudinal direction L of the first support 24.

More specifically, the lower part 32 of the temporary wave reinforcement 24 is capable of receiving part of one of the connecting members of the mesh of wave reinforcements, disposed at one of the longitudinal or transverse ends of said mesh of wave reinforcements. In other words, the lower part 32 of the first support 24 receives part of one of the connecting members 14 of the mesh of wave reinforcements 16, as can be seen in Fig. 9 and 10. The method of inserting the connecting member into the

first support will be detailed later in the following detailed description. Furthermore, it is understood that when the connecting member is inserted into the first support 24 of the holding device 22, said connecting member, and therefore the mesh of wave reinforcements, is blocked against the insulating mass in the vertical and transverse directions of the holding device 22. Such blocking in position of the mesh of wave reinforcements is in particular carried out in cooperation with the second support 26 secured to the insulating mass 8.

As seen in Fig. 5 or 6, the second support 26 of the holding device 22 is in the form of a metal sheet, here rectangular, a central portion 38 of which has been deformed into a U shape. The central portion 38 thus deformed into a U shape comprises at least one bottom wall 40 and two side walls 42 that extend from the bottom wall 40, perpendicular to the latter, so as to delimit a cavity 44 visible in Fig. 6. It is understood that the two side walls 42 extend parallel to and facing each other. At least one fixing flange 46 extends from one of the side walls 42, from an end opposite the bottom wall 40 of the central portion 38, and perpendicular to said side wall 42. According to the illustrated example of the invention, two fixing flanges 46 each extend from one of the side walls 42 of the central portion 38 of the second support 26, perpendicular to said side walls 42 and opposite the cavity 44 delimited by the central portion 38. It is then understood that the bottom wall 40 and the fixing flanges 46 each extend in planes parallel to each other. At least one of the fixing flanges 46 of the second support 26 comprises at least one fixing hole 48 for fixing the second support 26 to the insulating mass 8. More specifically, each of the fixing flanges 46 comprises two fixing holes 48 allowing the second support 26 to be secured to the insulating mass 8, for example by means of screws or threaded studs with nuts able to pass through the fixing holes 48 and to lodge in the insulating mass 8. According to an advantageous configuration of the second support 26, the fixing holes 48 are formed on the fixing flanges 46 so that they are arranged opposite fixing orifices, not shown, already formed on the insulating mass 8.

As mentioned above, the second support 26 is intended to bear the first support 24, said first support 24 being adapted to be housed at least partly in the cavity 44 of the second support 26 as is particularly visible in Fig. 6. It is then understood that the bottom wall 40 and the side walls 42 of the central portion 38 of the second support 26

have dimensions allowing the cavity 44 to be delimited so as to define a space compatible with the insertion of the first support 24 into said cavity 44. In other words, the central portion 38 of the second support 26 and the first support 24 have longitudinal, transverse and vertical dimensions that are compatible on the one hand
 5 for the insertion of the first support 24 in the cavity 44 and on the other hand for its displacement in longitudinal translation in the cavity 44 of the second support 26. There is therefore a clearance between the first support 24, the bottom wall 40 and the side walls 42 of the central portion 38 of the second support 26.

10 The holding device 22 also comprises at least one adjustment means 50 for adjusting the first support 24 relative to the second support 26 comprising at least two first adjustment orifices 52 on one of the first support 24 or of the second support 26 and at least a second adjustment orifice 54 on the other of the second support 26 or the first support 24.

15 According to the example illustrated in Fig. 5, the first support 24 comprises two first adjustment orifices 52 and the second support 26 comprises three second adjustment orifices 54. More specifically, the first two adjustment orifices 52 of the first support 24 are aligned along an axis parallel to the longitudinal direction L of the holding device 22
 20 and are formed on a crest 56 of the upper part 30 of said first support 24 so that said first adjustment orifices 52 are arranged in line with the bottom wall 40 of the central portion 38 of the second support 26, when the temporary wave reinforcement 24 is inserted into the cavity 44.

25 Furthermore, the three second adjustment orifices 54 of the second support 26 are aligned along an axis parallel to the longitudinal direction L of the first support 24 and are formed on the bottom wall 40 of the central portion 38. It will thus be understood that at least one of the first two adjustment orifices 52 of the first support 24 is capable of facing at least one of the three second adjustment orifices 54 of the second support
 30 26 when the first support 24 is housed in the cavity 44 of the second support 26. The longitudinal translation of the first support 24 in the cavity 44 of the second support 26 then allows the position of the first support 24 to be adjusted relative to the second support 26 by positioning one of the first adjustment orifices 52 opposite one of the second adjustment orifices 54.

In order to block the first support 24 in position with respect to the second support 26, the holding device 22 comprises the movable coupling member 28. The term “movable” means that the movable coupling member 28 is capable of joining and separating from the first support 24 and the second support 26 without breaking its material. The movable coupling member 28 is in particular able to pass through one of the first adjustment orifices 52 opposite one of the second adjustment orifices 54 of the first support 24 and of the second support 26, respectively, in order to block their position relative to each other. The movable coupling member 28 may for example be a threaded cylinder, a key or even a magnetic cylinder capable of being magnetized with the material of the first support 24 and/or of the second support 26, so that it blocks the first support 24 in position relative to the second support 26. The movable coupling member 28 is thus removable in that it is capable of joining and separating from the first support 24 and the second support 26 without breaking its material.

According to another embodiment, not shown, of the movable coupling member, used in the case where the first support does not comprise first adjustment orifices, the movable coupling member may comprise the threaded cylinder able to be screwed into the second support and an elastically deformable pad, for example made of rubber, arranged at a free end of the threaded cylinder, capable of exerting pressure against the first support, in particular at its crest, pressing said first support against the tank wall when screwing the threaded cylinder into the second support.

It is understood that the movable coupling member 28 on the one hand allows the position of the first support 24 to be blocked with respect to the second support 26, and on the other hand participates in adjusting the position of the first support 24 with respect to the second support 26 in cooperation with the adjustment means 50 described previously. Advantage is also taken of the adjustment means 50 and of the movable coupling member 28 in that they allow the holding device 22 to adapt to meshes of wave reinforcements of different structure and dimensions, that is to say, to meshes of wave reinforcements arranged on different parts of the tank wall or of different dimensions.

According to another example of the invention visible in Fig. 8, the holding device 22 comprises a third support 58. It should then be considered that in this non-limiting example of the invention, the holding device 22 comprises the first support and the second support as they have been described previously. The third support 58 of the holding device 22, according to this non-limiting example of the invention, has identical structural characteristics to the second support of said holding device 22. In other words, the third support 58 is presented as a deformed sheet with a receiving area 60 similar to the cavity of the second support and fixing walls 59 to the insulating mass 8.

As can be seen in Fig. 8, the third support 58 participates in holding the mesh of wave reinforcements 16 in position in cooperation with the first support and the second support. The third support 58 is in particular capable of receiving a part of the mesh of wave reinforcements 16 in its receiving area 60. More specifically, the third support 58 is capable of receiving one of the wave reinforcements 10 of the mesh of wave reinforcements 16 arranged at one of the longitudinal 20 or transverse 18 ends of said mesh of wave reinforcements 16, and in particular arranged at a longitudinal 20 or transverse 18 end of the mesh of wave reinforcements 16 distinct from the longitudinal 20 or transverse 18 end of the mesh of wave reinforcements 16 held by the first support and the second support. According to an example of the invention, the first support and the second support are arranged at the first longitudinal end of the mesh of wave reinforcements 16, while the third support 58 is arranged at the second longitudinal end of the mesh of wave reinforcements 16.

Advantage is taken of such a third support 58 due to the fact that it ensures optimal holding of the mesh of wave reinforcements 16 against the insulating mass 8, in particular when said mesh of wave reinforcements 16 is placed against one of the parts of the tank wall 6 that is inclined toward the inside of said tank. Thus, the placement of the third support 58 longitudinally opposite the first support and the second support with respect to the mesh of wave reinforcements 16 makes it possible to avoid tilting of said mesh of wave reinforcements 16 when the latter is arranged against the part of the tank wall 6 inclined toward the inside of said tank.

It is understood from the holding device 22 as it has just been described that this allows the mesh of wave reinforcements 16 to be held in position on the insulating mass 8

during the mounting of the tank wall, in particular by cooperation between at least one of the connecting members on the periphery of said mesh of wave reinforcements and the first support 24 of the holding device 22, which in turn is held against the insulating mass 8 by means of the second support 26 of the holding device 22. It should also be considered that several holding devices 22 as they have just been described may be arranged against the insulating mass 8 in order to increase the holding of the mesh of wave reinforcements 16 against the insulating mass 8 during the method of mounting the tank wall.

The method of mounting the tank wall will now be described in relation to Fig. 9 and 10.

The method comprises at least a first step during which the second support 26 of the holding device 22 is secured to the insulating mass 8 by means of the fixing holes formed on each of the two fixing flanges 46 of the second support 26. In a second step, the first support 24 is secured to the second support 26 by means of the movable coupling member 28 and the adjustment means. During this second step, it is then possible to adjust the position of the first support 24 with respect to the second support 26 in the longitudinal direction L of the holding device 22. The first support 24 is then slid into the cavity of the second support 26 in order to arrange one of the first adjustment orifices opposite one of the second adjustment orifices of the first support 24 and of the second support 26, respectively, then the movable coupling member 28 is adjusted through said selected adjustment orifices in order to block the first support 24 in position with respect to the second support 26.

Once the first support 24 has been blocked and possibly adjusted in position relative to the second support 26, in a third step, the mesh of wave reinforcements 16 is positioned on the first support 24. More specifically, one of the connecting members 14 arranged at one of the longitudinal 20 or transverse 18 ends of the mesh of wave reinforcements 16, here the first longitudinal end 20a, is inserted into the receiving opening of the first support 24, here in the form of the temporary wave reinforcement 24 as mentioned above. It is then understood that a preliminary step of mounting the mesh of wave reinforcements 16 is recommended prior to the third step, this step of mounting the mesh of wave reinforcements 16 being able to be carried out either before the first step or after the first step of the method.

In the case where the mesh of wave reinforcements 16 must be placed against a part of the insulating mass 8 that is inclined toward the inside of the tank, in a step subsequent to the third step called sub-step, the third support 58 of the holding device 22 is secured on the insulating mass 8 by blocking the mesh of wave reinforcements 16. More particularly, the third support 58 is secured to the insulating mass 8 in such a way that it blocks the second longitudinal end 20b of the mesh of wave reinforcements 16. This ensures optimum holding of the mesh of wave reinforcements 16 against the insulating mass 8 during mounting of the tank wall. It is also understood that this sub-step of mounting the third support 58 is optional and depends on the structure of the part of the insulating mass 8 on which the mesh of wave reinforcements 16 must be arranged. It is also understood that this sub-step is subsequent to the third step of positioning the mesh of wave reinforcements 16 on the first support 24 described above.

Once the third step has been carried out and possibly after the sub-step of securing the third support 58 has been implemented, in a step subsequent to the third step, the corrugated plate 100 is placed against the insulating mass 8 so that the mesh of wave reinforcements 16 is housed in the series of waves of said corrugated plate 100, then said corrugated plate 100 is fixed on the insulating mass 8. According to one effect of the invention, the mesh of wave reinforcements 16 being held by the holding device 22 against the insulating mass 16, the precise adjustment in position of the corrugated plate 100 against the insulating mass 16 by a technician is made easier.

Subsequently, in a step subsequent to the step of installing the corrugated plate 100 against the insulating mass 16, at least the first support 24 is separated from the second support 26 of the holding device 22 by removing the movable coupling member 28, then at least the first support 24 is removed from the tank wall. Subsequently, the second support 26 is also removed from the tank wall, and more precisely from the insulating mass 8. Optionally, the third support 58 is also removed from the insulating mass 8 secured to the latter during the sub-step between the third step and the step subsequent to the third step. It will then be understood that the holding device 22 may be reused in order to hold other meshes of wave reinforcements of the tank wall during mounting of the latter.

The invention as it has just been described cannot, however, be limited to the means and configurations exclusively described and illustrated, and also applies to all equivalent means or configurations and to any combination of such means or configurations.

CLAIMS

1. Method of mounting a tank (2) wall (6) for a floating structure (1) for storing and/or transporting a liquid cargo, the tank (2) wall (6) comprising at least one
5 insulating mass (8), at least one corrugated plate (100) comprising a series of waves (110, 120), the wall (6) comprising a plurality of wave reinforcements (10) arranged in a mesh of wave reinforcements (16), the mesh of wave reinforcements (16) being arranged between the corrugated plate (100) and the
10 insulating mass (8) by fitting into the series of waves (110, 120) of the corrugated plate (100), the mounting method using a device (22) for holding the mesh of wave reinforcements (16) in position against the insulating mass (8), the holding device (22) comprising at least a first support (24) bearing the mesh of wave reinforcements (16) and a second support (26) bearing the first support (24) via a movable coupling member (28), during which method in a first step the second support (26) is secured
15 to the insulating mass (8), in a second step the first support (24) is secured to the second support (26) by means of the movable coupling member (28), then in a third step the mesh of wave reinforcements (16) is positioned on the first support (24).
2. Mounting method according to the preceding claim, wherein during the second
20 step, the position of the first support (24) is adjusted with respect to the second support (26) along a main axis of elongation of the first support (24).
3. Mounting method according to claim 2, wherein during the second step, the
25 position of the first support (24) is adjusted relative to the second support (26) by means of the movable coupling member (28).
4. Mounting method according to one of the preceding claims, wherein in a step
subsequent to the third step, the corrugated plate (100) is placed against the insulating
30 mass (8) so that the mesh of wave reinforcements (16) is housed in the series of waves (110, 120) of said corrugated plate (100), then said corrugated plate (100) is fixed on the insulating mass (8).
5. Mounting method according to the preceding claim, wherein the holding
device (22) comprises a third support (58), during which method between the third

step and the step subsequent to the third step, in a sub-step, the third support (58) is secured to the insulating mass (8) by blocking the mesh of wave reinforcements (16).

6. Mounting method according to the preceding claim, wherein in a step subsequent to the step of installing the corrugated plate (100) against the insulating mass (8), at least the first support (24) is separated from the second support (26) of the holding device (22) by removing the movable coupling member (28), then at least the first support (24) is removed from the tank (2) wall (6).

7. Tank (2) wall (6) for a floating structure (1) for storing and/or transporting a liquid cargo, the tank (2) wall (6) comprising at least one insulating mass (8), at least one corrugated plate (100) comprising a series of waves (110, 120), the wall (6) comprising a plurality of wave reinforcements (10) arranged in a mesh of wave reinforcements (16), the mesh of wave reinforcements (16) being arranged between the corrugated plate (100) and the insulating mass (8) by being housed in the series of waves (110, 120) of the corrugated plate (100), the tank (2) wall (6) being characterized in that it comprises at least one device (22) for holding the mesh of wave reinforcements (16) in position against the insulating mass (8), the holding device (22) comprising at least one first support (24) bearing the mesh of wave reinforcements (16) and a second support (26) bearing the first support (24) via a movable coupling member (28), the second support (26) being secured to the insulating mass (8).

8. Tank (2) wall (6) according to the preceding claim, wherein the first support (24) is a temporary wave reinforcement (24), distinct from the wave reinforcements (10) of the mesh of wave reinforcements (16) and intended to be removed from the tank (2) wall (6).

9. Tank (2) wall (6) according to one of claims 7 or 8, wherein the holding device (22) comprises means for adjusting (50) the first support (24) relative to the second support (26) comprising at least two first adjustment orifices (52) on one of the first support (24) or of the second support (26) and at least a second adjustment orifice (54) on the other first support (24) or second support (26).

10. Tank (2) wall (6) according to one of claims 7 to 9, wherein the holding device (22) comprises a third support (58) for blocking the mesh of wave reinforcements (16) in position, the third support (58) being fixed to the insulating mass (16).

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11. Tank (2) wall (6) according to one of claims 7 to 10, wherein the holding device (22) is capable of blocking the mesh of wave reinforcements (16) in position in at least two directions perpendicular to the main elongation axis of the first support (24).

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12. Tank (2) wall (6) according to one of claims 7 to 11, wherein the first support (24) comprises at least one receiving opening (36) able to house at least part of the mesh of wave reinforcements (16).

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13. Tank (6) wall (2) according to one of claims 7 to 12, wherein the movable coupling member (28) is a key or a part screwed into the first support (24) and the second support (26) or a system for pressing the first support (24) against the tank (2) wall (6).

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14. Tank (2) of a floating structure (1) for the transport and/or storage of a liquid cargo, comprising at least one tank (2) wall (6) mounted according to one of claims 1 to 6, or at least one tank (2) wall (6) according to one of claims 7 to 12.

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15. Tool (21) for mounting a tank (2) wall (6) according to one of claims 7 to 13, comprising at least one holding device (22) that comprises at least a first support (24) configured to bear a mesh of wave reinforcements (16) and a second support (26) bearing the first support (24) via a movable coupling member (28) constituting the mounting tool (21), said second support (26) being configured to be secured to the insulating mass (8).

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