

Sealed and thermally insulating tank

Technical field

The invention relates to the field of sealed and thermally insulating membrane tanks for storing and/or transporting fluid, such as a cryogenic fluid.

Sealed and thermally insulating membrane tanks are used in particular for storing liquefied natural gas (LNG), which is stored, at atmospheric pressure, at approximately -162°C. These tanks can be installed onshore or on a floating structure. In the case of a floating structure, the tank can be intended for transporting liquefied natural gas or receiving liquefied natural gas used as a fuel for propelling the floating structure.

Technological background

Various techniques are known for constructing a sealed and thermally insulating membrane tank incorporated into a load-bearing structure having a substantially polyhedral internal surface and having in succession, in a thickness direction, a secondary insulating barrier, a secondary sealing barrier, a primary insulating barrier and a primary sealing barrier.

For example, WO-A-2014167214 or WO-A-2017006044 discloses a tank wall in which the secondary insulating barrier is substantially made up of secondary insulating blocks that are juxtaposed on the polyhedral inner surface of the load-bearing structure, the secondary sealing barrier is made up of a corrugated metal membrane that is disposed on an internal surface of the secondary insulating blocks, the primary insulating barrier is substantially made up of primary insulating blocks that are juxtaposed on the secondary metal membrane and anchored to the secondary insulating barrier by anchoring members borne by the secondary insulating blocks, and the primary sealing barrier is made up of a corrugated metal membrane disposed on an internal surface of the primary insulating blocks. Along the edge corners of the load-bearing structure, the primary and secondary insulating blocks are made up of prefabricated corner structures.

Summary

Certain aspects of the invention will now be explained with reference to figure 1. Figure 1 partially illustrates an insulating barrier that is substantially made up of insulating blocks that are juxtaposed on a polyhedral support surface 1 having two flat regions 2 and 3 that form an angle between one another and meet at an edge corner

4. The insulating blocks have a corner structure 5 disposed along the edge corner that has two faces that are respectively parallel to each of the two flat regions 2 and 3, and flat insulating panels 6 disposed on the flat regions of the support surface on either side of the corner structure 5.

As can be seen in figure 1, if the flat insulating panels 6 have been mounted first, a space problem can occur that prevents the corner structure 5 from being positioned along the edge corner, as indicated by the arrow 7. As a result, it may be preferable to construct the insulating barrier by finishing with a flat region. However, once the corner structure 5 has been positioned along the edge corner, an entire region of the support surface close to the edge corner 4 is no longer accessible.

Furthermore, it is preferable to produce an insulating barrier with insulating blocks that are as standardized as possible in order to reduce manufacturing costs. However, the construction of a large load-bearing structure such as the hull of a vessel is subject to high dimensional tolerances, for example of several centimeters, that prevent the dimensions of a tank from being plotted in full before its construction. As a result, it may be necessary to construct at least some of the insulating blocks to measure, depending on the actual dimensions of the load-bearing structure.

One idea underlying the invention is to propose a sealed and thermally insulating tank of multi-layer structure that makes it easier to allow for at least some of the aforementioned constraints. Another idea underlying the invention is to provide a sealed and insulating multi-layer structure that is easy to produce on large surfaces.

To this end, the invention provides a sealed and thermally insulating tank intended for storing a fluid, the sealed and thermally insulating tank having an insulating barrier and a sealing barrier disposed on an inner surface of the insulating barrier, the insulating barrier being disposed on a support surface, for example a substantially polyhedral support surface, bearing anchoring members and being retained on the support surface by said anchoring members,

wherein the insulating barrier has insulating elements disposed in a plurality of parallel rows,

wherein an anchoring member has a bearing element that is mounted on the support surface between two insulating elements of a first of said parallel rows and is movable with respect to the support surface transversely to said first row between:

a retracted position, in which the bearing element is housed entirely between the two insulating elements so as to leave the location of a second of said parallel rows free, the second row being adjacent to the first row, and

an extended position, in which the bearing element overlaps the location of the second row and is engaged with at least one insulating element of the second row so as to retain said insulating element of the second row on the support surface.

By virtue of these features, the insulating element of the second row can be fitted easily when the bearing element is retracted and can be retained reliably on the support surface when the bearing element is extended. In addition, given that the bearing element is engaged with the insulating element laterally from a side of the insulating element facing the first row and not through the insulating element in the thickness direction, the structure of the insulating element of the second row can be relatively simple.

According to embodiments, such a tank may have one or more of the following features.

The anchoring member can be realized in different ways. According to one embodiment, the anchoring member also has a pin that is fixed to the support surface and protrudes inwardly into a space between the two insulating elements of the first row, and a nut that is screwed onto the pin and is able to clamp the bearing element in the direction of the support surface in order to lock the position of the bearing element.

The bearing element can be realized in different ways. According to one embodiment, the bearing element has a bearing bar having a slot through which the pin passes, such that, when the nut is not clamping the bearing bar, the bearing bar can be slid in a direction transverse to the first row between the retracted position, in which the bearing bar is housed entirely between the two insulating elements, and the extended position(s), in which a portion of the bearing bar protrudes beyond the first row so as to engage with said at least one insulating element of the second row. According to one embodiment, the bearing bar has a U-shaped cross section.

The insulating elements can be realized in different ways, in particular in the form of flat panels on flat portions of the support surface or in the form of dihedral blocks on edge-corner zones of the support surface.

According to one embodiment, the insulating element of the second row is a flat insulating panel that has a layer of insulating polymer foam sandwiched between a rigid bottom sheet and a rigid cover sheet, the rigid cover sheet and the layer of insulating polymer foam having a recess made in the thickness of the insulating panel so as to uncover a bearing zone on the internal surface of the rigid bottom sheet, said recess opening onto an edge of the flat insulating panel parallel to the first row and facing the first row, the anchoring member being engaged with said bearing zone of the bottom sheet.

According to one embodiment, the recess made in the thickness of the insulating panel is a groove oriented perpendicularly to said edge of the flat insulating panel. Such grooves can be made at different locations, for example at the ends of the edge of the flat insulating panel facing the first row and/or in a central portion of this edge of the flat insulating panel.

According to one embodiment, the flat insulating panel has a rectangular parallelepipedal shape, the recess being made in a corner of the flat insulating panel.

According to one embodiment, the support surface bears a plurality of anchoring members that are distributed along the first row of insulating elements and have bearing elements that are mounted on the support surface between the insulating elements of the first row and are movable with respect to the support surface between the retracted position and the extended position(s),

said bearing elements engaging with respective zones of said insulating element of the second row in order to retain said insulating element on the support surface. Thus, the retention of the insulating element of the second row on the support surface can be ensured entirely by the movable bearing elements or by a combination of the movable bearing elements and further anchoring members.

According to one embodiment, the support surface has at least two flat regions that form an angle between one another and meet at an edge-corner zone, and the first row of insulating elements has a row of corner structures disposed along said edge-corner zone of the support surface and the second row of insulating elements has a row of flat insulating panels disposed on a said flat region of the support surface.

By virtue of these features, it is possible to anchor a flat insulating panel adjacent to the row of corner structures by means of one or more anchoring members

situated between the successive corner structures. This arrangement simplifies the positioning and employment of the anchoring members, in particular when the flat insulating panel adjacent to the row of corner structures has to be made to measure and therefore cannot be standardized.

When the support surface is provided by a secondary barrier that itself is made up of secondary corner structures and secondary flat insulating panels, this arrangement also has the advantage of making it possible to position these anchoring members relatively close to the edge-corner zone, in particular on the secondary corner structures. Thus, since the secondary flat insulating panels adjacent to the secondary corner structures do not need to bear these anchoring members for the primary flat insulating panels, these secondary flat insulating panels can be made to measure more easily.

The corner structure can be realized in different ways. According to one embodiment, a said corner structure has:

a dihedral insulating block having two faces that are parallel to the two flat regions and form an angle between one another, said face having a flat outer surface bearing against a corresponding flat region of the support surface and a flat inner surface parallel to said corresponding flat region and spaced apart from said flat outer surface in a thickness direction, and

a metal corner piece fixed to the flat inner surfaces of the dihedral insulating block so as to form said sealing barrier in line with the edge-corner zone of the support surface.

According to one embodiment, the metal corner piece has a protruding portion that protrudes with respect to the dihedral insulating block along the direction of the edge-corner zone,

two successive corner structures in said row are disposed so as to exhibit a spacing along the direction of the edge-corner zone between the dihedral insulating blocks, said spacing being at least partially covered by the protruding portion of the metal corner piece of one of the two successive corner structures,

and said bearing element of the anchoring member is mounted on the support surface between the dihedral insulating blocks of the two corner structures.

According to one embodiment, a block of insulating material is disposed in the space between the dihedral insulating blocks between the protruding portion of

the metal corner piece and the bearing element. By virtue of these features, the insulating barrier can be made substantially continuous in spite of the spacing between the insulating blocks, in order to limit convection phenomena.

It may be desired to make it easier to access the anchoring member between the dihedral insulating blocks of the two corner structures. To this end, according to one embodiment, at least one of the two successive corner structures has a cutout formed in the protruding portion of the metal corner piece in line with said anchoring member disposed between the dihedral insulating blocks, in order to provide access to said anchoring member.

According to another embodiment, one said metal corner piece, the protruding portion of which covers said space, has a drilled hole in its internal surface for receiving a fixing member intended to engage with the dihedral insulating block in order to fix said metal corner piece to the dihedral insulating block of the corner structures, the fixing member being able to be inserted into the drilled hole from the internal surface of the metal corner piece. For example, the fixing member has a screw or a rivet, the head of which faces the interior of the tank and the body of which passes through the drilled hole in the metal corner piece in order to engage with the dihedral insulating block.

According to one embodiment, the dihedral insulating block bears an insert mounted on the flat inner surface of at least one face in order to receive and lock said body of the fixing member in the thickness direction of said at least one face.

According to one embodiment, the insert is mounted on said flat inner surface with a clearance in a direction parallel to the flat inner surface. Such a clearance allows in particular adjustment of the position of the metal corner piece after mounting, for example in response to cooling, and thus makes it possible to reduce thermal stresses.

According to one embodiment, said at least one face of the dihedral insulating block has a groove that extends parallel to the edge-corner zone and opens onto said flat inner surface, the insert being housed in a sliding manner in said groove.

According to one embodiment, said groove has a width that decreases along the thickness direction toward the flat inner surface, so as to block said insert in the thickness direction.

According to one embodiment, the support surface has a third flat region transverse to the edge-corner zone at one end of the edge-corner zone, and a final corner structure of the row of corner structures has, in addition to said dihedral insulating block, a third face that is parallel to the third flat region and forms angles with said two faces of the dihedral insulating block.

According to one embodiment, said dihedral insulating block of the penultimate corner structure of the row of corner structures has a larger dimension along the direction of the edge-corner zone than corner structures situated along a central portion of the edge-corner zone, the metal corner piece of said penultimate corner structure being made up of two corner-piece segments that are juxtaposed along the direction of the edge-corner zone and are fixed to the flat inner surfaces of the dihedral insulating block.

According to one embodiment, a first corner-piece segment of said penultimate corner structure is fixed to said dihedral insulating block by means of a fixing member that is situated on the external surface of the first corner-piece segment and is inaccessible from the internal surface of the first corner-piece segment,

and a second corner-piece segment of said penultimate corner structure, said second corner-piece segment being situated on the end side of the edge-corner zone, has said drilled hole in its internal surface for receiving said fixing member intended to engage with the dihedral insulating block in order to fix said second corner-piece segment to the dihedral insulating block of the corner structures, the fixing member being able to be inserted into the drilled hole from the internal surface of the second corner-piece segment.

According to one embodiment, a first corner-piece segment of said penultimate corner structure has orifices for the passage of anchoring members that are used to fix said dihedral insulating block to the support surface and a second corner-piece segment of said penultimate corner structure situated on the end side of the edge-corner zone has a continuous surface away from the or each drilled hole receiving the or each fixing member.

By virtue of these features, the penultimate corner structure can be adapted fairly easily to the dimension of the support structure along the direction of the edge-corner zone, in order to take manufacturing tolerances of this support structure into account.

According to one embodiment, the sealing barrier has a closure piece disposed in a manner straddling the metal corner pieces of the two successive corner structures so as connect the metal corner pieces of the two corner structures in a sealed manner,

said closure piece covering a gap situated between the metal corner pieces and the cutout in said or each protruding portion that covers the space between the dihedral insulating blocks.

According to one embodiment, the sealing barrier in line with one or each flat region of the support surface has a metal membrane having corrugations parallel to the edge-corner zone and corrugations perpendicular to the edge-corner zone, and flat zones situated between said corrugations, an edge of the metal membrane that is parallel to the edge-corner zone being welded to the metal corner pieces of the successive corner structures, said corrugations perpendicular to the edge-corner zone being aligned with gaps situated between the metal corner pieces of the successive corner structures.

According to one embodiment, the closure piece has a corrugation perpendicular to the edge-corner zone aligned with a corrugation of the metal membrane and two flat portions that are situated on either side of the corrugation and are respectively welded to the metal corner pieces of the two corner structures.

The abovementioned features can be employed in the construction of an insulating barrier constructed directly on a load-bearing structure providing the support surface, or in the construction of a primary insulating barrier constructed on a pre-existing secondary barrier providing said support surface.

According to one embodiment, said insulating barrier is a primary insulating barrier and said sealing barrier is a primary sealing barrier, the tank also having a secondary insulating barrier having a substantially polyhedral internal surface that is covered with a secondary sealing barrier and forms said support surface.

Such a tank can form part of an onshore storage installation, for example for storing LNG, or be installed in an inshore or offshore floating structure, in particular a methane tanker, a floating storage regasification unit (FSRU), a floating production storage and offloading (FPSO) unit or the like.

According to one embodiment, a vessel for transporting a cold liquid product has a double hull and an abovementioned tank disposed in the double hull.

According to one embodiment, the invention also provides a method for loading or offloading from such a vessel, wherein a fluid is passed through insulated pipelines from or to a floating or onshore storage installation to or from the tank of the vessel.

According to one embodiment, the invention also provides a system for transferring a fluid, the system having the abovementioned vessel, insulated pipelines arranged so as to connect the tank installed in the hull of the vessel to a floating or onshore storage installation and a pump for conveying a fluid through the insulated pipelines from or to the floating or onshore storage installation to or from the tank of the vessel.

The invention also provides a method for manufacturing an abovementioned sealed and thermally insulating tank, the method involving:

providing a support surface,

mounting an anchoring member on the support surface, said anchoring member having a bearing element mounted in a movable manner with respect to the support surface,

mounting the first row of insulating elements on the support surface such that the bearing element is housed entirely between two insulating elements of the first row of insulating elements and such that said bearing element is mounted so as to be movable transversely to said first row,

disposing a second row of insulating elements on the support surface, the second row being parallel and adjacent to the first row,

moving the bearing element into an extended position, in which the bearing element overlaps the location of the second row and is engaged with at least one insulating element of the second row so as to retain said insulating element of the second row on the support surface, and

locking the bearing element in the extended position.

The invention also provides a corner structure having:

a dihedral insulating block having two faces that are respectively parallel to each of the two flat regions and form an angle between one another, each face having a flat outer surface and a flat inner surface spaced apart from said flat outer surface in a thickness direction, and

a metal corner piece fixed to the flat inner surfaces of the dihedral insulating block so as to form a sealing barrier, the metal corner piece having a protruding portion that protrudes with respect to the dihedral insulating block along the direction of the edge corner,

wherein said metal corner piece has a drilled hole in its internal surface for receiving a fixing member intended to engage with the dihedral insulating block in order to fix said metal corner piece to the dihedral insulating block of the corner structures, the fixing member being able to be inserted into the drilled hole from the internal surface of the metal corner piece.

Brief description of the figures

The invention will be understood better and further aims, details, features and advantages thereof will become more clearly apparent from the following description of a number of particular embodiments of the invention, which are given solely by way of illustration and without limitation, with reference to the appended drawings.

- **Figure 1** is a schematic cross-sectional view of a thermally insulating barrier of modular construction with generally parallelepipedal modules on a polyhedral support surface, at an edge corner.

- **Figure 2** is a perspective view of a wall of a sealed and thermally insulating tank at a corner zone of the tank, the primary sealing membrane having been omitted.

- **Figure 3** is a view similar to figure 2, in which a primary corner structure has been omitted but primary flat insulating panels adjacent to the primary corner structure are shown.

- **Figure 4** is an enlarged perspective view showing a row of primary corner structures, seen in cross section from a section plane IV-IV in figure 2 and for a different angle value.

- **Figure 5** is an enlarged perspective view of a detail of the row of primary corner structures.

- **Figure 6** is a top view of a wall of a sealed and thermally insulating tank at a corner zone of the tank, showing the location of a flat insulating panel when bearing bars are retracted.

- **Figure 7** is a perspective view showing a disposition of the secondary corner structures at the intersection between three walls of the tank.

- **Figure 8** is a perspective view showing a disposition of the primary corner structures on the secondary corner structures in figure 7.

- **Figure 9** is a perspective view of the tank at the intersection between three walls of the tank, partially showing the primary sealing membrane and a primary flat insulating panel.

- **Figure 10** is a view similar to figure 9, in which the primary sealing membrane covering the primary flat insulating panel is shown.

- **Figure 11** is a perspective view of a wall of a sealed and thermally insulating tank according to another embodiment, at a corner zone of the tank, wherein the sealing membrane have been omitted.

- **Figure 12** is a cutaway schematic depiction of a methane tanker tank and of a terminal for loading/offloading from this tank.

- **Figure 13** is a perspective view of a corner structure according to another embodiment.

- **Figure 14** is a perspective view of an insert housed in the corner structure in figure 13.

- **Figure 15** shows a wall of a sealed and thermally insulating tank employing the corner structure in figure 13, seen from above with respect to a flat primary insulating panel.

- **Figure 16** is a perspective view of the tank wall in figure 15 after the fitting of a metal corner piece fixed from inside the tank.

Detailed description of embodiments

By convention, the terms “external” and “internal” are used to define the relative position of one element with respect to another, by reference to the inside and the outside of the tank.

The multi-layer structure of a sealed and thermally insulating tank for storing liquefied natural gas will be described below. Each wall of the tank has, from the outside to the inside of the tank, a secondary thermally insulating barrier having juxtaposed secondary insulating elements anchored to a load-bearing structure by secondary anchoring members, a secondary sealing membrane borne by the secondary insulating elements, a primary thermally insulating barrier having juxtaposed primary insulating elements anchored to the secondary insulating elements by primary anchorage members 19 and a primary sealing membrane borne by the primary insulating elements and intended to be in contact with the liquefied natural gas contained in the tank.

The load-bearing structure may in particular be formed from self-supporting metal sheets or, more generally, any type of rigid partition having suitable mechanical properties. The load-bearing structure may be formed in particular by the hull or double hull of a vessel. The load-bearing structure has a plurality of walls defining the overall shape of the tank, which is usually a polyhedral shape.

The flat zones of the tank can be realized in different ways, for example according to the teaching of WO-A-2016046487 or WO-A-2017006044. A corner zone of the tank along an edge corner of the load-bearing structure will be described more particularly below.

Figures 2 and 3 show the structure of the walls of the tank at an edge corner 10 between a first load-bearing wall 11 and a second load-bearing wall 12.

The angle formed between the first load-bearing wall 11 and the second load-bearing wall 12 is approximately 90° in the embodiment shown. The angle can have any other value, however, for example around 135°.

The secondary thermally insulating barrier has a row of secondary corner structures 13 disposed along the edge corner 10, a single secondary corner structure 13 being shown in figures 2 and 3. The secondary corner structure 13 and the secondary sealing membrane 15 disposed on the internal surface 14 thereof can be realized in different ways, for example according to the teaching of WO-A-2017006044.

The secondary corner structure 13 in this case has a sandwich structure made up of a layer of insulating polymer foam 16 sandwiched between two rigid sheets 17, 18, made for example of plywood. The internal sheet 18 has a network of

perpendicular grooves 19 for receiving the corrugations 24 of the secondary sealing membrane 15. The corrugations 24 protrude toward the outside of the tank in the direction of the load-bearing structure and are each received in a groove 19.

In an embodiment variant that is not shown, the orientation of the corrugations of the secondary sealing membrane is towards the inside of the tank.

The inner sheet 18 is also equipped with a plurality of metal plates 20, made for example of stainless steel or an alloy with a low coefficient of thermal expansion, notably Invar®, that are intended to anchor edges of the secondary sealing membrane. The metal plates 20 are fixed in recesses made in the internal sheet 18 and fixed thereto, using screws, rivets or clips for example. Alternatively, the metal plates 20 are fixed directly to the insulating polymer foam layer 16, for example by gluing.

The internal sheet 18 is also equipped with anchoring plates 21 intended to fix primary corner structures 30 to the secondary corner structure 13. The anchoring plates 21 are for example glued to the internal sheet 18 and/or fixed thereto, using screws, rivets or clips for example.

Furthermore, the secondary sealing membrane 15 has a plurality of orifices, through each of which an anchoring member for anchoring the primary corner structures 30 passes. A cap nut 22 passes through each of the orifices and has on its outer periphery a thread that engages with a threaded bore 23 formed in one of the anchoring plates 21. Furthermore, the cap nut 22 has a threaded blind bore intended to receive a pin for fixing the primary corner structures 30. The cap nut 22 also has a collar that makes it possible to sandwich the secondary sealing membrane 15 between said collar and the anchoring plate 21. The periphery of this collar is welded to the secondary sealing membrane 15 in order to ensure the sealing thereof.

The primary thermally insulating barrier has, along the edge corner 10 of the tank, a plurality of primary corner structures 30. The primary corner structure 30 is a pre-assembled assembly comprising a dihedral insulating block 31 and a corner piece 32. The dihedral insulating block 31 has an internal face on which the corner piece 32 rests and an external face resting against the secondary sealing membrane 15. The dihedral insulating block 31 has a composite structure in its thickness, having a layer of insulating polymer foam 33 sandwiched between two plywood sheets 34, 35 glued to said polymer foam layer 33.

The corner pieces 32 are metal corner pieces, for example, made of stainless steel. The corner piece 32 has two flanges resting against the internal face of the dihedral insulating block 31. Each flange of a corner piece 32 has pins (not shown) that are welded to the external face of said flange and protrude toward the inside of the tank in order to fix the corner piece 32 to the dihedral insulating block 31, before the primary corner structure 30 is mounted in the tank.

Each flange of the corner piece 32 also has a pin 36 on its internal face, protruding toward the inside of the tank. The pins 36 make it possible to anchor welding equipment during the welding of the primary sealing membrane elements to the corner pieces 32.

As described in WO-A-2017006044, the corner piece 32 is provided with orifices 37, for example eight per corner piece 32, making it possible to mount nuts on pins (not shown) borne by the plates 21, in order to fix the primary corner structure 30 to the secondary corner structure 13.

As can be seen more clearly in figures 2 and 4, the primary corner structures 30 are disposed on the secondary corner structures 13 in the form of a row bordering the edge corner 10. In this row, two successive primary corner structures 30 exhibit a space 38 between the two dihedral insulating blocks 31. Generally, insulating joint elements 39 are inserted in the space 38 between the two dihedral insulating blocks 31, so as to ensure continuity of the thermal insulation.

In at least some of the spaces 38, the secondary corner structure 13 can bear an anchoring member intended to engage with a primary insulating element. This case will be described more specifically with reference to figures 3 to 5. The anchoring member as a whole is sectioned along its mid-plane of symmetry in figure 4, such that the half-view is sufficient for understanding the structure thereof.

In this embodiment, the anchoring member has a plate 40 fixed to the internal surface of the secondary corner structure 13 between two plates 21. The plate 40 can be fixed to the secondary corner structure 13 in different ways, like the plates 21. It has a tapped hole 41 intended to receive a cap nut 42 shown in half-view in figure 4. The plate 40 can be present in line with each space 38 or in line with some, for example one in three, of the spaces 38.

The cap nut 42 passes through an orifice in the secondary sealing membrane (not shown) and has on its outer periphery a thread 43 that engages with the tapped

hole 41 made in the plate 40. Furthermore, the cap nut 42 has a blind threaded bore 44 receiving a pin 45. The cap nut 42 also has a collar 46 that makes it possible to sandwich the secondary sealing membrane between said collar and the plate 40. The periphery of this collar is welded to the secondary sealing membrane 15 in order to ensure the sealing thereof.

As can be seen in figure 4, the pin 45 protrudes inwardly into the space 38 between the two dihedral insulating blocks 31 and serves to fix a bearing bar 50 oriented perpendicularly to the edge corner 10. The bearing bar 50 in this case has a U-shaped cross-section, the base of which faces the load-bearing structure. In the mounted state as shown, a first portion of the bearing bar 50 extends in the space 38 between the two dihedral insulating blocks 31 and has a slot 58 through which the pin 45 passes. A nut 47 screwed onto the pin 45 makes it possible to clamp the bearing bar 50 toward the internal surface of the secondary corner structure 13.

A second portion 51 of the bearing bar 50 protrudes beyond the row of primary corner structures 30 in order to bear on a flat primary insulating panel 29 adjacent to the row of primary corner structures 30. The length of the slot 58 makes it possible to adjust the length of the second portion 51 protruding beyond the row of primary corner structures 30.

Preferably, the slot 58, the two ends 58a and 58b of which are indicated in the cross-sectional view in figure 4, is long enough to make it possible to fully retract the bearing bar 50 into the space 38 between the two dihedral insulating blocks 31. Thus, before the nut 47 is tightened, it is possible to slide the bearing bar 50 between this retracted position (shown in figure 6), which makes it easier to fit the flat primary insulating panel 29 by completely freeing up its location indicated by chain dotted lines at the reference sign 99, and the extended position illustrated in figure 4. The extending movement the bearing bar 50 is schematically indicated by the arrow 98 in figure 6.

In one embodiment, the length of the flat primary insulating panel 29 is equal to nine times the width of the primary corner structure 30, such that four bearing bars spaced apart from one another at an interval of three times the width of the primary corner structure 30 engage with the flat primary insulating panel 29 along its edge facing the edge corner, that is to say two bearing bars 50 at the two ends of this edge, i.e. at two corners of the flat primary insulating panel 29, and two bearing bars in a

central zone of the edge of the flat primary insulating panel 29. This central zone is shown in figure 3.

As partially shown in figure 3, the flat primary insulating panel 29 has a rectangular parallelepipedal overall shape with a longitudinal edge 26 parallel to the edge corner 10. The flat primary insulating panel 29 has for example a composite structure made up of a layer of insulating polymer foam sandwiched between a rigid bottom sheet, an uncovered zone 28 of which is visible, and a rigid cover sheet 25. A groove 27 is recessed into the rigid cover sheet 25 and the insulating polymer foam layer, said groove 27 extending perpendicularly to the edge corner 10 in line with the plate 20 and opening onto the longitudinal edge 26 so as to uncover the uncovered zone 28 of the rigid bottom sheet.

In the mounted state, the second portion 51 of the bearing bar 50 is inserted in the groove 27 and bears on the uncovered zone 28 of the rigid bottom sheet, optionally via a shim 48. Another shim 49 can be interposed between the other end of the bearing bar 50 and the secondary membrane (not shown). The shims 48 and 49 are dimensioned to ensure that the bearing bar 50 and the bottom sheet of the flat primary insulating panel 29 are parallel. They are made of a material that is sufficiently soft to avoid the risk of piercing, marking or damaging the secondary sealing membrane 15. For example, they can be made of plywood, plastics material or epoxy resin.

The bearing bar 50 mounted in this way has a number of advantages: the second portion 51 is a cantilevered length substantially parallel to the flat wall of the tank that bears on the flat primary insulating panel 29, preferably at a distance from the edge of this panel. It therefore makes it possible to retain the flat primary insulating panel 29 on the secondary membrane without the need for complex arrangements on the flat primary insulating panel 29: all that is necessary is to free up a flat portion of the bottom sheet.

In addition, the length of the second portion 51 is easily adjustable by sliding the pin 45 in the length of the slot 58. This disposition can therefore be adapted easily to flat primary insulating panels having different dimensions or grooves 27 having different lengths. The length of the groove 27 can in particular be shortened following cutting of the edge 26 in order to reduce the width of the insulating panel 29.

In addition, given that the bearing bar 50 is anchored on a pin borne by the secondary corner structure 13, its position is not affected by the dimensioning of the

flat secondary insulating panels (not shown) adjacent to the secondary corner structure 13. This disposition is therefore adapted easily to flat secondary insulating panels with different dimensions.

As can be seen in figure 4, each corner piece 32 has two protruding rims 53 that protrude with respect to the dihedral insulating block 31 at two opposite ends of the corner piece 32 along the direction of the edge corner 10. Thus, the space 38 between the two dihedral insulating blocks 31 is partially covered by the two protruding rims 53 on either side thereof.

In order to maintain access to the anchoring member disposed in the space 38, at least each of the two protruding rims 53 on either side of the anchoring member is provided with a cutout 54 that is situated in line with the pin 45 and is formed in the end edge 55 oriented transversely to the edge corner 10.

Optionally, as outlined in figure 2, all of the protruding rims 53 of all of the corner pieces 32 can have this cutout 54 in order to standardize manufacture.

As can be seen more clearly in figure 5, the cutouts 54 serve to make sufficient space between the two protruding rims 53 for the passage of a tightening tool 60, for example a socket wrench having a cylindrical head 61, or a screwdriver. The depth of the cutout 54 in the direction of the edge corner 10 can therefore be dimensioned so as to form a distance D slightly greater than the diameter of the cylindrical head 61 between the bottoms of the two facing cutouts 54. The length of the cutout 54 along the end edge 55 can be substantially equal to the same distance D, for example approximately 30 mm.

The sequence of mounting the corner zone of the tank will now be briefly described:

- mounting the secondary insulating barrier and the secondary sealing membrane 15, including the cap nuts 42,
- fitting the bearing bars 50 in the retracted position, the slot 58 in the bearing bar being positioned in line with the cap nut 42,
- inserting and screwing the pin 45 into the cap nut 42 through the slot 58 in the pressing bar 50, fitting the nut 47 on the pin 45 in the untightened position,

- fitting the insulating joints 39 between the locations of the primary corner structures 30. Where the bearing bar 50 is present, the insulating joint 39 has at its base a post inserted into the hollow U-shaped section of the bearing bar 50. The insulating joint 39 also has a cylindrical well 56 in line with the cap nut 42 in order to receive the pin 45 and the nut 47,
- fixing the primary corner structures 30 to the secondary corner structures 13, on either side of the insulating joints 39,
- installing the flat primary insulating panels 29 adjacent to the row of primary corner structures 30,
- moving the bearing bars 50 into the extended position, the insulating joint 39 remaining immobilized by the pin 45 inserted in the cylindrical well 56,
- screwing the nut 47 onto the pin 45 through the cutouts 54 in the corner pieces 32 and the cylindrical well 56 in the insulating joint 39, in order to clamp the bearing bar 50,
- inserting a cylindrical plug 57 into the cylindrical well 56 in order to close it,
- fitting the primary sealing membrane.

The flat portions of the tank wall that are situated on the two sides of an edge corner can be realized identically or differently, and symmetrically or asymmetrically. Furthermore, although only one corner of the tank has been described above, the other corners of the tank can be arranged identically or differently.

With reference to figures 7 to 10, the structure of the tank wall at one end of the edge corner 10, that is to say at the intersection between three flat walls, will now be described. The three walls that are shown here constitute a bottom wall, an end wall and a lower oblique wall, respectively. The lower oblique wall forms an angle of 135° with the bottom wall. The lower oblique wall and the bottom wall are perpendicular to the end wall. Such an arrangement corresponds for example to a tank that has a polyhedral overall shape and has two octagonal end walls that are connected to one another by eight walls, namely a horizontal bottom wall and a horizontal ceiling wall, two vertical side walls, two upper oblique walls that each connect one of the side walls to the ceiling wall, and two lower oblique walls that each connect one of the side walls to the bottom wall.

In this zone, as shown in figure 7, the row of secondary corner structures 13 ends in a final secondary corner structure 113, which is formed by a set of three insulating panels that are respectively fixed to the load-bearing structure of each of the three load-bearing walls. The three insulating panels of the final secondary corner structure 113 each have a sandwich structure identical to that of the secondary corner structures 13, that is to say made up of a layer of insulating polymer foam 116 sandwiched between two rigid sheets 117, 118 made for example of plywood.

On each of the three insulating panels of the final secondary corner structure 113, the rigid sheet 118 bears anchoring plates 121 and 140, the structures and functions of which are identical to those of the anchoring plates 21 and 40 described above in relation to the secondary corner structure 13. In particular, the anchoring plates 121 make it possible to fix a final primary corner structure 130 (figure 7) to the final secondary corner structure 113.

The plate 40 makes it possible to fix an anchoring member in a space between the final primary corner structure 130 and a penultimate primary corner structure 230 (figure 7) of the row of primary corner structures. This anchoring member has a pin 145 inserted in a slot 158 in a bearing bar 150, these being able to be seen in figure 9.

Figure 8 is also a view of the end zone of the edge corner, also showing the primary corner structures mounted on the secondary corner structures in figure 7. The secondary sealing membrane has been omitted in its entirety in order to simplify the depiction.

As shown, the final primary corner structure 130 of the row is made up of three insulating blocks that rest respectively against each of the three insulating panels of the final secondary corner structure 113. Furthermore, the insulating blocks of the final primary corner structure 130 each have an internal face on which a three-faced corner piece 132 rests, the overall structure of which is similar to the metal corner piece 32 of the primary corner structure 30, apart from the presence of a third flange 100 parallel to the lower oblique wall. The three-faced corner piece 132 has in particular pins 136, orifices 137 and rims 153, the structures and functions of which are similar to those of the pins 36, orifices 37 and rims 53 described above.

The penultimate primary corner structure 230 is shown using reference signs increased by 200 for elements that are similar or identical to those of the primary corner structure 30. The dihedral insulating block 231 is longer than the dihedral

insulating block 31 and bears on its internal surface two successive metal corner pieces in the direction of the edge corner. The metal corner piece 232 is substantially identical to the metal corner piece 32 of the primary corner structure 30 but, because the dihedral insulating block 231 is elongate in the direction of the final primary corner structure 130, it can have a longer dimension along the edge corner 10 and it projects beyond only one side (not illustrated) of the dihedral insulating block 231.

The metal corner piece 65 is positioned next to the metal corner piece 232 with a small gap therebetween, and is fixed to the dihedral insulating block 231 in the same way as the metal corner piece 32 of the primary corner structure 30. The metal corner piece 65 has a protruding rim 253 that protrudes with respect to the dihedral insulating block 231 along the direction of the edge corner 10 above the space 138. The space 138 is partially covered by the two protruding rims 153 and 253 on either side thereof.

The protruding rim 153 and/or the protruding rim 253 can have a cutout to make it easier to access the anchoring member situated in the space 138. In this case, a cutout 254 is present only in the protruding rim 253.

Furthermore, the penultimate primary corner structure 230 is fixed to the secondary insulating barrier only on the portion farthest from the final primary corner structure 130, that is to say the portion bearing the metal corner piece 232 that is fixed to an underlying penultimate secondary corner structure 13 in the same way as described above. To this end, the metal corner piece 232 also has the orifices 237.

Conversely, the metal corner piece 65 does not have orifices and can be continuous, since the portion of the dihedral insulating block 231 facing the final primary corner structure 130 straddles the gap 66 between the penultimate secondary corner structure 13 and the final secondary corner structure 113 and continues over the final secondary corner structure 113 without being fixed thereto.

This arrangement has the advantage of being independent of the precise dimension of the gap 66 in the secondary insulating barrier, which can be adjusted easily to compensate for the manufacturing tolerances.

In addition, to adjust the primary insulating barrier to the dimensional manufacturing tolerances of the load-bearing structure, it is possible to cut the penultimate primary corner structure 230 to measure, that is to say to cut the end of the dihedral insulating block 231 and the end of the metal corner piece 65 that face

the final primary corner structure 130. Given that this end portion is not fixed to the secondary insulating barrier, this cutting does not result in any complications. In this case, the cutout 254 is added after the metal corner piece 65 has been cut to the desired length.

Figure 9 shows the same zone of the tank as figure 8, but with the addition of a final flat primary insulating panel 129 adjacent to the penultimate primary corner structure 230. This flat primary insulating panel 129 has, in a similar way to the groove 27 in figure 3, a recess 127 made in line with a corner zone of the rigid bottom sheet (not shown) in order to uncover said corner zone. Figure 9 also shows the bearing bar 150, which is inserted in the recess 127 and bears on the uncovered zone in the above-described way.

With reference to figures 9 and 10, the structure of the primary sealing membrane at the corners of the tank will now be described.

The primary sealing membrane is for example a membrane having two series of mutually perpendicular corrugations. It can be made substantially as described in WO-A-2017006044. Metal sheets 67 of the primary sealing membrane bordering an edge corner are welded along their edge directed toward the edge corner to the metal corner pieces 32, 232, 65, 132. Furthermore, metal corner parts 68, 168, 268 are welded in a manner straddling each interface between two consecutive metal corner pieces 32, 232, 65, 132.

The corner parts 68, 168, 268 cover the orifices 37, 137, 237 and the cutouts 54, 254 in the metal corner pieces bring about the continuity of the corrugations of the primary sealing membrane that are oriented perpendicularly to the edge corner 10.

With reference to figures 13 to 16, a second embodiment of the structure of the tank wall at the end of the edge corner 10 will now be described. In this embodiment, the penultimate primary corner structure 1230, shown in perspective in figure 13, has been modified to make it possible to mount the second metal corner piece 1065 (figure 16) from the inside of the tank, after the penultimate primary corner structure 1230 has been mounted.

To this end, on the side of the penultimate primary corner structure 1230 that faces the final primary corner structure 130, the two faces of the dihedral insulating block 231 have a respective groove 83, which extends parallel to the edge corner 10 and opens onto the inner surface of the inner sheet 235 and on the side of the inner

sheet 235 facing the final primary corner structure 130. The groove 83 has a width that increases along the thickness direction from the inner surface, that is to say, in the embodiment illustrated, it successively has a narrower inlet portion and a wider bottom portion.

An insert 84 shown in perspective in figure 14 is housed in a sliding manner in the groove 83. The insert 84 has a profiled overall shape with a wider base portion 85 intended to be housed in the bottom portion of the groove 83 and a narrower head portion 86 intended to be housed in the inlet portion of the groove 83. The head portion 86 has a tapped hole 87 in its upper surface for receiving a fixing screw 88 (figure 16). Preferably, the insert 84 is slightly narrower than the groove 83 so as to allow an adjustment clearance also in the direction transverse to the edge corner 10.

Figures 15 and 16 show the region of the tank wall situated at the end of the edge corner before the primary sealing membrane has been mounted. Figure 15 is a plan view from above with respect to the final flat primary insulating panel 129. It shows that the penultimate primary corner structure 1230 is mounted on the secondary insulating barrier without the second metal corner piece 1065 being present. This therefore frees up access to the space 138 between the final primary corner structure 130 and the penultimate primary corner structure 1230. This access from the top makes it possible to easily adjust the position of the bearing bar 150 in the extended position in order to bear on the uncovered zone 128 of the bottom sheet of the final flat primary insulating panel 129, as shown in figure 15, and to lock it in position by tightening the nut 145.

Next, insulating linings (not shown) are positioned in the space 138 and in the recess 127 in order to supplement the primary insulating barrier, and then the second metal corner piece 1065 is fixed to the penultimate primary corner structure 1230 as shown in figure 16. To this end, a fixing screw 88 is inserted into a drilled hole in each of the two faces of the second metal corner piece 1065 and screwed into the tapped hole 87 in the insert 84. Alternatively, a rivet could be employed.

The primary membrane can then be realized as described above.

The metal corner piece 1065, which is fixed from the inside of the tank, makes it possible to provide easy access to an anchoring member. This solution can be used with anchoring members made in different forms.

Figure 11 illustrates another embodiment of the tank wall along the edge corner 10. The primary and secondary sealing membranes have been omitted in order to simplify the depiction. Elements similar or identical to those in figures 2 to 4 bear the same reference sign increased by 300 and will only be described inasmuch as they differ from those in figures 2 to 4.

In this embodiment, the primary corner structure 330 is fixed to the secondary corner structure 313 by means of pins 345 disposed in each space 338 between two dihedral insulating blocks 331. To this end, the rigid sheet 334 is slightly wider than the polymer foam layer 333 so as to uncover two lateral rims of the rigid sheet 334.

A bearing bar 350 has a drilled hole, which can be oblong and through which the pin 345 passes, and bears on the lateral rims of the rigid sheet 334 of the two primary corner structures 330 between which the pin 345 is disposed. Thus, each primary corner structure 330 is retained by two bearing bars 350 engaged with the two lateral rims of its rigid sheet 334. A nut (not shown) is screwed onto each pin 345 in order to clamp the bearing bar 350 in the direction of the load-bearing structure. The cutouts 354 in the edges of the metal corner pieces 332 make it easier to mount the pin 345 and then to fit the nut in the above-described way.

On account of this manner of fixing the primary corner structures 330, the orifices are not present in the metal corner piece 332, which can therefore be continuous.

In order to anchor the flat primary insulating panel 329 adjacent to the row of primary corner structures 330 on the secondary barrier, a row of pins 69 can be provided on each side of the row of primary corner structures 330. This can make it necessary to provide a wider secondary corner structure 313, as shown.

In a variant of figure 11 that is not shown, there are no pins 69 and the bearing bar 350 is rendered slidable in the same way as the bearing bar 50 in figure 6, in order to be positioned in an extended position straddling the primary corner structure 330 and over the flat primary insulating panel 329, so as to ensure the joint anchoring of these two insulating elements. To this end, the length of the bearing bar 350 can be increased and the geometry of the flat primary insulating panel 329 can be adapted such that the bearing bar 350 is received in a groove or a recess uncovering the bottom sheet.

In one embodiment, the secondary insulating barrier and the secondary sealing membrane are not present and the pins that anchor the primary insulating barrier are borne directly by the load-bearing walls 11, 12.

The technique described above for producing a sealed and thermally insulating tank for storing a fluid can be used in different types of reservoir, for example to form an LNG reservoir in an onshore installation or in a floating structure such as a methane tanker or the like.

The technique illustrated above in the context of a support surface that is actually polyhedral, in which flat portions meet at edge corners, is also applicable to an approximately polyhedral support surface which, rather than edge corners, has rounded portions that form a connection between flat portions. The term edge-corner zone is used to denote the connection between two flat portions in both contexts and can correspond to an actual edge corner or to a rounded portion between the two flat portions.

With reference to figure 12, a cutaway view of a methane tanker 70 shows a sealed and insulated tank 71 with a prismatic overall shape mounted in the double hull 72 of the vessel. The wall of the tank 71 has a primary sealing barrier intended to be in contact with the LNG contained in the tank, a secondary sealing barrier arranged between the primary sealing barrier and the double hull 72 of the vessel, and two insulating barriers arranged between the primary sealing barrier and the secondary sealing barrier and between the secondary sealing barrier and the double hull 72, respectively.

In a manner known *per se*, loading/offloading pipelines 73 disposed on the upper deck of the vessel can be connected, by means of appropriate connectors, to a maritime or port terminal in order to transfer a cargo of LNG from or to the tank 71.

Figure 12 shows an example of a maritime terminal having a loading and offloading station 75, an underwater pipe 76 and an onshore installation 77. The loading and offloading station 75 is an offshore fixed installation having a movable arm 74 and a tower 78 supporting the movable arm 74. The movable arm 74 carries a bundle of insulated flexible hoses 79 that can be connected to the loading/offloading pipelines 73. The orientable movable arm 74 adapts to all sizes of methane tanker. A connecting pipe (not shown) extends inside the tower 78. The loading and offloading station 75 makes it possible to load and offload from the methane tanker 70 from or to the onshore installation 77. The latter has liquefied gas storage tanks 80 and

connecting pipes 81 connected to the loading or offloading station 75 by the underwater pipe 76. The underwater pipe 76 makes it possible to transfer the liquefied gas between the loading or offloading station 75 and the onshore installation 77 over a large distance, for example 5 km, making it possible to keep the methane tanker 70 at a large distance from the coast during the loading and offloading operations.

In order to generate the pressure necessary for transferring the liquefied gas, use is made of pumps on board the vessel 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.

Although the invention has been described in connection with a number of particular embodiments, it is obvious that it is in no way limited thereby and that it comprises all the technical equivalents of the means described and the combinations thereof where these fall within the scope of the invention.

The use of the verb “have”, “comprise” or “include” and of the conjugated forms thereof does not exclude the presence of elements or steps other than those set out in a claim. The use of the indefinite article “a/an” or “one” for an element or a step does not, unless stated otherwise, rule out the presence of a plurality of such elements or steps.

In the claims, any reference sign between parentheses should not be interpreted as limiting the claim.

CLAIMS

1. A sealed and thermally insulating tank intended for storing a fluid, the sealed and thermally insulating tank having an insulating barrier and a sealing barrier disposed on an inner surface of the insulating barrier, the insulating barrier being disposed on a support surface bearing anchoring members and being retained on the support surface by said anchoring members,

wherein the insulating barrier has insulating elements disposed in a plurality of parallel rows,

wherein a said anchoring member has a bearing element (50, 150) that is mounted on the support surface between two insulating elements (30, 130, 230, 1230) of a first of said parallel rows and is movable with respect to the support surface transversely to said first row between:

a retracted position, in which the bearing element (50, 150) is housed entirely between the two insulating elements (30, 130, 230, 1230) so as to leave the location (99) of a second of said parallel rows free, the second row being adjacent to the first row, and

an extended position, in which the bearing element overlaps the location of the second row and is engaged with at least one insulating element (129) of the second row so as to retain said insulating element (29, 129) of the second row on the support surface.

2. The tank as claimed in claim 1, wherein the anchoring member also has a pin (45, 145) that is fixed to the support surface and protrudes inwardly into a space between the two insulating elements (30, 130, 230, 1230) of the first row, and

a nut (47) that is screwed onto the pin and is able to clamp the bearing element (50, 150) in the direction of the support surface in order to lock the position of the bearing element.

3. The tank as claimed in claim 2, wherein the bearing element has a bearing bar (50, 150) having a slot (58, 158) through which the pin (45, 145) passes, such that, when the nut is not clamping the bearing bar, the bearing bar can be slid in a direction transverse to the first row between:

the retracted position, in which the bearing bar (50, 150) is housed entirely between the two insulating elements (30, 130, 230, 1230), and

the extended position(s), in which a portion (51) of the bearing bar protrudes beyond the first row so as to engage with said at least one insulating element (29, 129) of the second row.

4. The tank as claimed in any one of claims 1 to 3, wherein the insulating element of the second row is a flat insulating panel (29, 129) that has a layer of insulating polymer foam sandwiched between a rigid bottom sheet and a rigid cover sheet (25), the rigid cover sheet and the layer of insulating polymer foam having a recess (127) made in the thickness of the insulating panel so as to uncover a bearing zone (28) on the internal surface of the rigid bottom sheet, said recess opening onto an edge (26) of the flat insulating panel parallel to the first row and facing the first row, the anchoring member being engaged with said bearing zone (28) of the bottom sheet.

5. The tank as claimed in claim 4, wherein the flat insulating panel has a rectangular parallelepipedal shape, the recess (127) being made in a corner of the flat insulating panel.

6. The tank as claimed in any one of claims 1 to 5, wherein the support surface bears a plurality of anchoring members (45, 145) that are distributed along the first row of insulating elements and have bearing elements (50, 150) that are mounted on the support surface between the insulating elements (30, 130, 230, 1230) of the first row and are movable with respect to the support surface between the retracted position and the extended position,

said bearing elements engaging with respective zones of said insulating element (29, 129) of the second row in order to retain said insulating element on the support surface.

7. The tank as claimed in any one of claims 1 to 6, wherein the support surface has at least two flat regions that form an angle between one another and meet at an edge-corner zone (10),

wherein the first row of insulating elements has a row of corner structures (30, 130, 230, 1230) disposed along said edge-corner zone of the support surface and the second row of insulating elements has a row of flat insulating panels (29, 129) disposed on a said flat region of the support surface.

8. The tank as claimed in claim 7, wherein a said corner structure (30, 130, 230, 1230) has:

a dihedral insulating block (31, 131, 231) having two faces that are parallel to the two flat regions and form an angle between one another, said face having a flat outer surface bearing against a corresponding flat region of the support surface and a flat inner surface parallel to said corresponding flat region and spaced apart from said flat outer surface in a thickness direction, and

a metal corner piece (32, 232, 65, 1065, 132) fixed to the flat inner surfaces of the dihedral insulating block so as to form said sealing barrier in line with the edge-corner zone of the support surface.

9. The tank as claimed in claim 7, each said corner structure (30, 130, 230, 1230) of the row has a dihedral insulating block (31, 131, 231) having two faces that are parallel to the two flat regions and form an angle between one another, said face having a flat outer surface bearing against a corresponding flat region of the support surface and a flat inner surface parallel to said corresponding flat region and spaced apart from said flat outer surface in a thickness direction, and a metal corner piece (32, 232, 65, 1065, 132) fixed to the flat inner surfaces of the dihedral insulating block so as to form said sealing barrier in line with the edge-corner zone of the support surface,

wherein the metal corner piece has a protruding portion (53, 153, 253) that protrudes with respect to the dihedral insulating block along the direction of the edge-corner zone,

wherein two successive corner structures in said row are disposed so as to exhibit a spacing (38, 138) along the direction of the edge-corner zone between the dihedral insulating blocks, said spacing being at least partially covered by the protruding portion (53, 153, 253) of the metal corner piece of one of the two successive corner structures,

wherein said bearing element of the anchoring member (45, 145) is mounted on the support surface between the dihedral insulating blocks (31, 131, 231) of the two corner structures.

10. The tank as claimed in claim 9, wherein a block of insulating material (39) is disposed in the space (38, 138) between the dihedral insulating blocks between the protruding portion (53, 153, 253) of the metal corner piece and the bearing element.

11. The tank as claimed in claim 9 or 10, wherein one said metal corner piece (1065), the protruding portion (253) of which covers said space, has a drilled hole in its internal surface for receiving a fixing member (88) intended to engage with the dihedral insulating block (1230) in order to fix said metal corner piece to the dihedral insulating block of the corner structures, the fixing member being able to be inserted into the drilled hole from the internal surface of the metal corner piece (1065).

12. The tank as claimed in claim 11, wherein the fixing member (88) has a screw or a rivet, the head of which faces the interior of the tank and the body of which passes through the drilled hole in the metal corner piece in order to engage with the dihedral insulating block.

13. The tank as claimed in claim 12, wherein the dihedral insulating block bears an insert (84) mounted on the flat inner surface of at least one face in order to receive and lock said body of the fixing member in the thickness direction of said at least one face.

14. The tank as claimed in claim 13, wherein the insert (84) is mounted on said flat inner surface with a clearance in a direction parallel to the flat inner surface.

15. The tank as claimed in claim 14, wherein said at least one face of the dihedral insulating block has a groove (83) that extends parallel to the edge-corner zone (10) and opens onto said flat inner surface, the insert (84) being housed in a sliding manner in said groove.

16. The tank as claimed in claim 15, wherein said groove (83) has a width that decreases along the thickness direction toward the flat inner surface, so as to block said insert (84) in the thickness direction.

17. The tank as claimed in any one of claims 11 to 16, wherein the support surface has a third flat region transverse to the edge-corner zone at one end of the edge-corner zone (10), wherein a final corner structure (130) of the row of corner structures has, in addition to said dihedral insulating block, a third face (100) that is parallel to the third flat region and forms angles with said two faces of the dihedral insulating block (130), and

wherein said dihedral insulating block (231) of a penultimate corner structure (230) of the row of corner structures has a larger dimension along the direction of the edge-corner zone than corner structures situated along a central portion of the edge-corner zone, the metal corner piece of said penultimate corner structure being made up of two corner-piece segments (232, 1065) that are juxtaposed along the direction of the edge-corner zone and are fixed to the flat inner surfaces of the dihedral insulating block (231),

wherein a first corner-piece segment (232) of said penultimate corner structure is fixed to said dihedral insulating block (231) by means of a fixing member that is situated on the external surface of the first corner-piece segment and is inaccessible from the internal surface of the first corner-piece segment,

and a second corner-piece segment (1065) of said penultimate corner structure, said second corner-piece segment (1065) being situated on the end side of

the edge-corner zone, has said drilled hole in its internal surface for receiving said fixing member intended to engage with the dihedral insulating block (231) in order to fix said second corner-piece segment (1065) to the dihedral insulating block of the corner structures, the fixing member being able to be inserted into the drilled hole from the internal surface of the second corner-piece segment (1065).

18. The tank as claimed in claim 17, wherein the first corner-piece segment (232) of said penultimate corner structure has orifices (237) for the passage of anchoring members that are used to fix said dihedral insulating block (231) to the support surface and the second corner-piece segment (1065) of said penultimate corner structure situated on the end side of the edge-corner zone has a continuous surface away from the or each drilled hole receiving the or each fixing member.

19. The tank as claimed in any one of claims 1 to 18, wherein said insulating barrier is a primary insulating barrier and said sealing barrier is a primary sealing barrier, the tank also having a secondary insulating barrier (13, 113, 213) having a substantially polyhedral internal surface that is covered with a secondary sealing barrier (15) and forms said support surface.

20. A vessel (70) for transporting a fluid, the vessel having a double hull (72) and a tank (71) as claimed in any one of claims 1 to 19 disposed in the double hull.

21. A system for transferring a fluid, the system having a vessel (70) as claimed in claim 20, insulated pipelines (73, 79, 76, 81) arranged so as to connect the tank (71) installed in the hull of the vessel to a floating or onshore storage installation (77) and a pump for conveying a fluid through the insulated pipelines from or to the floating or onshore storage installation to or from the tank of the vessel.

22. A method for loading or offloading from a vessel (70) as claimed in claim 20, wherein a fluid is passed through insulated pipelines (73, 79, 76, 81) from or to a floating or onshore storage installation (77) to or from the tank (71) of the vessel as claimed in claim 20.

23. A manufacturing method for manufacturing a sealed and thermally insulating tank as claimed in one of claims 1 to 19, the method involving:

providing a support surface,

mounting an anchoring member on the support surface, said anchoring member having a bearing element (50, 150) mounted in a movable manner with respect to the support surface,

mounting the first row of insulating elements (30, 130, 230, 1230) on the support surface such that the bearing element (50, 150) is housed entirely between two insulating elements of the first row of insulating elements and such that said bearing element is mounted so as to be movable transversely to said first row,

disposing a second row of insulating elements (29, 129) on the support surface, the second row being parallel and adjacent to the first row,

moving the bearing element (50, 150) into an extended position, in which the bearing element overlaps the location (99) of the second row and is engaged with at least one insulating element (29, 129) of the second row so as to retain said insulating element of the second row on the support surface, and

locking the bearing element in the extended position.