SEALED AND INSULATING VESSEL COMPRISING A SUPPORT FOOT

The invention relates to the field of the construction of a sealed and insulated tank disposed in a supporting structure, in particular to the construction of a wall of such a tank having to accept a pedestal.

Sealed and thermally insulated tanks are used in various industries to store hot or cold products. For example, in the energy field, liquefied natural gas (LNG) is a liquid that may be stored at atmospheric pressure at approximately -163°C in storage tanks on land or on board floating structures. Such floating structures include methane tankers for transporting the product and offshore installations, known in particular as FPSO and FSRU, for storing, liquefying or regassing the product.

In membrane reservoirs, a corrugated sheet metal layer is used to produce a sealing barrier that also has sufficient elasticity to resist forces resulting for example from hydrostatic pressure, dynamic pressure in the case of movement of the cargo, and/or temperature variations. However, such a sealing barrier and the underlying thermal insulation material are relatively fragile and are not necessarily able to support heavy equipment to be immersed at the bottom of the tank, for example a pump.

In one embodiment, the invention provides a sealed and insulated tank disposed in a support structure, the tank including a tank wall disposed along the support structure, the tank wall including:

a sealing barrier,

a thermal insulation barrier disposed between the sealing barrier and the support structure and having a support surface for the sealing barrier, and

a pedestal for equipment immersed in the sealed tank,
the sealing barrier including a layer of corrugated sheet metal having at least one series of parallel corrugations, the layer of corrugated sheet metal being interrupted by a window around the pedestal,
the pedestal extending longitudinally through the window in the layer of corrugated sheet metal and having a first end portion bearing against the support structure, for example against a bottom area of the support structure, and a second end portion projecting into the tank to support the equipment at a distance from the sheet metal layer,
the sealing barrier including connecting parts disposed in the window around the pedestal to join the pedestal in sealed manner to a marginal portion of the layer of corrugated sheet metal delimiting the window,
wherein the window interrupts the directrices of a plurality of the parallel corrugations of said at least one series and the pedestal is centred at a position situated between the directrices of two parallel corrugations of said plurality.

In other advantageous embodiments, a tank of this kind may have one or more of the following features.

The pedestal may have various shapes, depending in particular on the characteristics of the equipment to be supported. In one embodiment, the pedestal has at least one convex lateral side and the directrices of said two corrugations between which the pedestal is centred intersect the convex lateral side of the pedestal. In one embodiment, the pedestal has a circular cross section.

In one embodiment, the window interrupts the directrices of an even number of parallel corrugations

of said at least one series, for example two parallel corrugations of said at least one series.

In one embodiment, the pedestal is centred substantially in the middle of the directrices of the two corrugations. Alternatively, the pedestal may be offset from the middle, so as to be closer to one corrugation than the other, for example if such a position makes it possible to reduce the length of the interruption of the corrugations given the shape of the pedestal.

In one embodiment, said at least one series of parallel corrugations is equidistantly distributed. Alternatively, the series of corrugations may have a less regular distribution, at least locally.

In one embodiment, the corrugations project from the side of an internal face of the sealing barrier intended to be in contact with a fluid.

In one embodiment, the connecting parts include a plurality of end parts disposed at a distance from the pedestal so as to close the interrupted ends of the two corrugations between the directrices of which the pedestal is centred. By means of such end parts, all the corrugations of which the window interrupts the directrices may be closed to re-establish the continuity of the sealing barrier.

In one embodiment, the pedestal includes a hollow envelope of globally tubular shape the longitudinal axis of which is substantially perpendicular to the tank wall and a transverse closure wall closing the envelope in sealed manner to provide continuity of the sealing barrier at the level of the pedestal. Such a hollow shape may in particular be preferred to limit

the effective cross section of the pedestal liable to create a thermal bridge.

The connecting parts intended to connect the pedestal in sealed manner to a marginal portion of the layer of corrugated sheet metal may have many shapes.

In one embodiment, the connecting parts include an annular plate joined to a peripheral wall of the pedestal at the level of the corrugated sheet metal layer. Such a plate may be pre-assembled to the pedestal.

In one embodiment, the connecting parts include an intermediate plate having a first edge welded to the annular plate and a second edge welded to the marginal portion of the corrugated sheet metal layer delimiting the window.

Such a tank may have a single sealing barrier or successive multiple sealing barriers, for example for reasons of reliability and safety. In one corresponding embodiment, the thermal insulation barrier includes a primary thermal insulation barrier disposed on the side of the sealing barrier, referred to as the primary sealing barrier, and a secondary thermal insulation barrier disposed on the side of the support structure, the tank wall including a secondary sealing barrier disposed between the primary and secondary thermal insulation barriers, the secondary sealing barrier being connected in sealed manner to a peripheral wall of the pedestal.

In one embodiment, the connecting parts include:
a connecting plate having a corrugation parallel to said at least one series of parallel corrugations and disposed on a line offset laterally at a distance from

the pedestal relative to one of the corrugation directrices interrupted by the window and bend parts each disposed to join an end of the corrugation of the connecting plate to an end portion of the corrugation the directrix of which is interrupted by the window, so that the corrugation of the connecting plate and the two bend parts extend the corrugation the directrix of which is interrupted in sealed manner via the window along the line offset laterally at a distance from the pedestal. The production of one or more offset corrugations in this way makes it possible to limit the number of corrugations rendered discontinuous by the pedestal and thus to preserve better the elasticity of the sealing barrier, notably if a pedestal of relatively large diameter must be fitted.

The provisions and features set out above in relation to a series of parallel corrugations may if necessary be applied to a plurality of series of parallel corrugations having different directions. In a corresponding embodiment, the corrugated sheet metal layer has a first series of parallel corrugations and a second series of parallel corrugations that intersects the first series of parallel corrugations at crossing points, the window interrupting the directrices of a first plurality of parallel corrugations of the first series and/or the directrices of a second plurality of parallel corrugations of the second series, the pedestal being centred at a position situated between the directrices of two parallel corrugations of the first plurality and/or between the directrices of two parallel corrugations of the second plurality.

In a preferred embodiment, the first series of parallel corrugations is perpendicular to the second series of parallel corrugations. Thus the elasticity of the

sealed membrane in different directions may be balanced.

The aforementioned window may have various shapes, depending notably on the shape of the pedestal and/or the shape of the components of the corrugated sheet metal layer. In one embodiment, the window is a quadrilateral, for example a rectangle, square or parallelogram, having two sides parallel to the first series of corrugations and two sides parallel to the second series of corrugations.

In one embodiment, the pedestal is disposed at the base of a mast for discharging the tank, for example to support a pump.

One basic idea of the invention is to support equipment to be immersed in a tank on a pedestal bearing directly or indirectly on the support structure to prevent or limit the force exerted on a relatively fragile corrugated sealing membrane. Another basic idea of the invention is to provide such a pedestal in a way that does not compromise the essential mechanical properties of the corrugated sealing membrane, notably its sealing effect and its resistance to thermal contraction or pressure forces. Some aspects of the invention start from the idea of interrupting the corrugations of a corrugated sealing membrane in an area through which a pedestal passes and positioning this pedestal at a location that makes it possible to limit the length of these interruptions in order to limit the loss of elasticity of the membrane that may result from such interruptions. Other aspects of the invention start from the idea of locally displacing the corrugations in order to circumvent the area through which the pedestal passes without interrupting the corrugations.

The invention will be better understood and other aims, details, features and advantages of the invention will become more clearly apparent in the course of the following description of particular embodiments of the invention selected by way of illustrative and non-limiting example only, which description is given with reference to the appended drawings.

In the drawings:

- Figure 1 is a part-sectional diagrammatic representation of a sealed and insulated tank of one embodiment of the invention,
- Figure 2 is a perspective view in cross section taken along the line II-II in Figure 3 of a pedestal and a tank wall structure that may be used in the Figure 1 tank,
- Figure 3 is a top view of the pedestal from Figure 2 and an area of the tank wall around the pedestal,
- Figure 4 is a representation analogous to Figure 2 at an intermediate stage of assembling the tank wall,
- Figure 5 is a detail view to a larger scale of the area V in Figure 4,
- Figure 6 is a top view of the Figure 4 tank wall area showing the production of the secondary sealing barrier,
- Figure 7 is a view analogous to Figure 6 showing an intermediate stage of assembling the primary sealing barrier,
- Figure 8 is a perspective view of an end piece that may be used in the production of the primary sealing barrier,
- Figure 9 is a view analogous to Figure 3 representing the primary sealing barrier around the pedestal in another embodiment of the invention,
- Figure 10 is a perspective view of a bend part that may be used in the production of the primary sealing barrier from Figure 9.

Figure 1 shows part of a sealed and thermally insulated tank 1 consisting of tank walls 2 and 3 fixed to the interior surface of corresponding walls 4 and 5 of a support structure. The support structure is for example the interior hull of a double-hull ship or a construction situated on land. To contain a cold liquid such as LNG, the walls of the tank include at least one sealing barrier 6 and at least one thermal insulation barrier 7. As a safety measure, it is possible to provide a secondary sealing barrier, not shown, between the support structure and the sealing barrier 6, which in this case is referred to as the primary sealing barrier.

The tank 1 may be produced with different well-known geometries, for example a prismatic geometry in the hull of a ship or a cylindrical geometry on land, etc. Moreover, many methods are available to produce the thermal insulation and sealing barriers, for example from prefabricated elements.

In the bottom wall 3 of the tank there is shown a rigid elongate member constituting a pedestal 10 that extends through the thermal insulation barrier 7 and the sealing barrier 6 so that one end bears on the bottom wall 5 of the support structure and the other end projects into the tank at a distance from the sealing barrier 6. The pedestal 10 may for example support equipment 9 to be immersed in the tank. To support a discharge pump, for example, it may be disposed at the base of a pumping mast of the tank, not shown. Although the pedestal is shown here on a bottom wall of the tank, a similar rigid member may be disposed in the same way at other places in the tank, for example as supporting or spacing elements to hold an object at a distance from the tank wall.

To produce the sealing barrier 6 it is possible to use thin sheet metal plates featuring corrugations that form elastic areas for absorbing thermal contraction and static and dynamic pressure forces. Such sealing corrugated or waferlike sheet metal barriers are described in particular in FR-A-1379651, FR-A-1376525, FR-A-2781557 and FR-A-2861060. This possibility is described in more detail next with reference to Figures 2 and 3.

Referring to Figure 3, the sealing barrier 6 consists of a plurality of corrugated sealing plates 11 the interior face of which is intended to be in contact with the fluid. The sealing plates 11 are thin metal, e.g. stainless steel or aluminium, members and are welded together in marginal overlap areas 12. The welds are of the overlapping weld type produced by the method described in detail in patent FR-A-1387955, for example. The sealing plates 11 may be of various designs as to their shapes and dimensions, with the result that the welded areas may be variously positioned.

The sealing plates 11 have on their internal face a first series of corrugations referred to as longitudinal corrugations 15 and a second series of corrugations referred to as transverse corrugations 16, the respective directions of which are mutually perpendicular. The first series of corrugations 15 has a height less than the second series of corrugations 16. Thus the corrugations 15 are discontinuous where they cross over at 18 the corrugations 16, which are continuous. The longitudinal corrugations 15 and the transverse corrugations 16 project toward the interior of the tank 1.

Here the pedestal 10 has a circular cross section, with a frustoconical lower part 13 which is joined at its smallest diameter end 17 to a cylindrical upper part 14. The largest diameter base of the frustoconical part 13 bears against the wall 5 of the support structure. The frustoconical part 13 extends through the thickness of the tank wall beyond the level of the sealing barrier 6. The cylindrical part 14 is closed in sealed manner by a circular plate 19 which may for example be welded to an interior rim, not shown, of the cylindrical part 14.

To provide a passage for the pedestal 10, the corrugated sealing plates 11 forming the sealing barrier 6 are cut in such a manner as to delimit a square window 25 around the pedestal 10. To establish the continuity of the sealing barrier 6 at the level of the window 25, a sealed assembly of connecting parts is produced between the pedestal 10 and the sealing plates 11. Since the diameter of the pedestal 10 is greater than the spacing between the corrugations 15 of the first series, some of these longitudinal corrugations indicated at 20 and the directrix A of which intersects the pedestal 10 are interrupted by the window 25. Similarly, since the diameter of the pedestal 10 is greater than the spacing between the corrugations 16 of the second series, some of the transverse corrugations indicated at 21 and the directrix B of which intersects the pedestal 10 are interrupted by the window around the pedestal.

Moreover, as may be seen in Figure 3, the window 25 is in practice larger than the diameter of the pedestal 10, so that fitting the connecting parts is relatively easy. Accordingly, the window 25, if produced in the corrugated sheet metal layer, would be liable to interrupt in a similar way corrugations the directrices

of which would be too close to the pedestal, without actually intersecting the pedestal, to enable the placing of connecting parts between it and the pedestal.

The centre C of the pedestal 10 is positioned between the directrices A of the interrupted corrugations 20 and between the directrices B of the interrupted corrugations 21, to be more precise in the middle of these directrices in Figure 3. As a result of this positioning, each directrix A or B intersects the pedestal 10 along a chord shorter than the diameter of the pedestal 10. Because of this, and given the space that must exist between the edge of the window 25 and the pedestal 10 to allow placement of the connecting parts, this positioning of the pedestal makes it possible to interrupt each of the corrugations 20 and 21 over a distance shorter than would be the case if the directrix A or B intersected the pedestal along its greatest transverse dimension, i.e. its diameter in the case of a circular cross section. It is advantageous to interrupt the corrugations of the sealing barrier over as short a distance as possible, given that these interruptions are liable to reduce the local flexibility of the sealing barrier and thus to encourage local fatigue and wear thereof.

In the case of a circular section, centring the pedestal halfway between the interrupted corrugations 20 and halfway between the interrupted corrugations 21 offers an optimum result. However, other section shapes and other positions of the pedestal may also be considered. A principle that may in each case serve to adapt the positioning of the pedestal between the corrugations is to choose a position that minimises, or at least reduces, the transverse dimension of the pedestal that intersects the directrix of the

interrupted corrugation. If the particular geometry of the pedestal and/or the particular distribution of the corrugations of the membrane involves interrupting different lengths of a plurality of corrugations, a pertinent optimisation parameter for adapting the position of the pedestal could be the length of the longest interruption or the cumulative length of the interruptions.

In Figure 3, the window 25 has a square shape that facilitates cutting the sealing plates 11 to the required shape. However, other window shapes may also be used, depending in particular on the geometry of the pedestal.

One embodiment of the tank wall in the area of the pedestal 10 is described in detail next with reference to Figures 4 to 8. This embodiment is in particular suited to a tank with walls that include two sealing barriers and two thermal insulation barriers. The barrier 6 is therefore referred to as the primary sealing barrier. Only the vicinity of the pedestal 10 is described, and the tank walls may be produced in accordance with the teaching of the application FR-A-2781557.

Figure 4 is a half-view in section of the pedestal 10 and a substantially square area of the tank wall around the latter at an intermediate assembly stage. The right-hand part is represented before placing the elements of the secondary sealing barrier and the primary insulation barrier and the left-hand part is represented after placing these elements.

For connecting it to the secondary sealing barrier, the pedestal 10 includes a square secondary plate 23 fixed around the frustoconical part 13 at a height corres-

ponding to the upper surface of the secondary thermal insulation barrier 22 and the secondary sealing barrier, which is very thin. For connecting it to the primary sealing barrier, the pedestal 10 includes a round primary plate 24 fixed around the frustoconical part 13 at a height corresponding to the upper surface of the primary thermal insulation barrier 26. The plates 23 and 24 may be made in one piece with the pedestal 10.

Below the secondary plate 23, the secondary insulation barrier 22 includes a glass-wool packing 27 which also has a square exterior contour. Below the primary plate 24, the primary insulation barrier 26 includes a glass-wool packing 28 that also has a circular exterior contour.

The secondary insulation barrier, the secondary sealing barrier and the primary insulating barrier around the packing 27 and the plate 23 are produced by means of four corner panels, one of which (30) may be seen in the right-hand part of Figure 4. The panel 30 has a stepped L-shaped overall shape with an L-shaped lower insulating block 31 constituting an element of the secondary insulating barrier 22, a sealed flexible coating 32 completely covering the L-shaped upper surface of the block 31, and a smaller L-shaped upper insulating block 33 constituting an element of a primary insulation barrier 26. The upper block 33 is aligned with the exterior sides of the lower block 31 so as to leave uncovered an area of the sealed coating 32 situated on an interior rim and on end rims of the bottom block 31. The panel 30 may be prefabricated by gluing materials similar to those taught in the application FR-A-2781557, notably polyurethane foam and plywood for the insulating barriers and an aluminium

foil/glass fibre composite material for the secondary sealing barrier.

The interior sides of the four corner panels 30 flank the contour of the packing 27 and the plate 23. The dimensions of the blocks 31 are such as to produce spaces between them in the form of four radial chimneys 34 each situated between the end faces of two adjacent lower blocks 31. To ensure continuity of the primary insulating barrier 22, each of the chimneys 34 is packed with glass fibre film 35. The porosity of the glass fibres of the films 35 and the packing 27 allow gas to circulate through the primary insulating barrier 22, notably for inerting the tank wall using nitrogen.

Figure 6 represents the production of the secondary sealing barrier in the area of the pedestal 10 as seen from above. To produce the continuity of the secondary sealing barrier around the pedestal 10, four strips 36 of the sealed aluminium foil and glass fibre composite material are stuck to the secondary plate 27 and to the sealed coating 32 of the panels 30. Each strip 36 is positioned to overlap one side of the secondary plate 27 and the uncovered interior rims of two lower blocks 31. The strips 36 overlap in end areas 37. To produce the continuity of the secondary sealing barrier above the chimneys 35, four strips 38 of the sealed aluminium film and glass fibre composite material are stuck to the sealed coating 32 of the panels 30, each time so as to overlap the rims at the edges of two lower blocks 31.

Figure 7 represents the same area of the tank wall after fitting the primary insulating barrier. The latter is completed between the upper insulating blocks 33 and the pedestal 10 by four corner blocks 40 and four middle blocks 41, the interior side of each of

which espouses the rounded contour of the primary plate 24 and the packing 28. These blocks 40 and 41 are also represented in the left-hand part of Figure 4.

As may be seen in the Figure 5 detail view, the upper surface of each of the middle blocks 41 has a rebate 44 delimited by a step 43. The rebates 44 are exactly at the level of the primary plate 24 to offer a plane support surface to metal closure plates 45 that provide the primary sealing barrier around the pedestal 10.

As may be seen in Figure 7, two closure plates 45 are disposed around the primary plate 24 and welded in sealed manner thereto around the whole of its periphery. To this end, the interior edges 46 of the plates 45 are cut to a semicircular shape while their exterior edge 47 delimits a square slightly larger than the window 25 in the corrugated sealing plates 11. The two closure plates 45 are superposed in areas 48 in which they are welded together. The closure plates 45 are fixed to the blocks 40 and 41 of the primary insulating barrier by means of woodscrews or rivets 49 disposed in the vicinity of their exterior edge 47 in order to press the closure plates 45 firmly against these blocks, notably because they must be prevented from lifting when welding them to the primary plate 24.

Returning to Figures 2 and 3, it is seen that the primary sealing barrier 6 in the area of the pedestal 10 is completed on the one hand by welding the edges of the sealing plate 11 delimiting the window 25 to the closure plates 45 and on the other hand by closing the ends of the interrupted corrugations 20 and 21 in sealed manner with end pieces 50. The sealing plates 11 are cut so as to overlap the border of the closure plates 45 including the screws 49.

Figure 8 shows one embodiment of an end piece 50. The end piece 50 includes a base plate in two parts 51 and 52 intended to be welded in sealed manner to the closure plate 45 and the sealing plate 11, respectively, and a shell 54 intended to be welded in sealed manner to the end of the corrugation 20 or 21. A step 53 between the parts 51 and 52 of the base plate has an amplitude substantially equal to the thickness of the sealing plate 11.

The manner of cutting the insulative blocks and other prefabricated components represented in Figures 2, 4, 6 and 7 to constitute the secondary insulating barrier, the secondary sealing barrier, and the primary insulating barrier is purely illustrative. Similar components may be cut and prefabricated with other shapes so that the tank wall assembly involves a greater or lesser number of components. In corresponding other embodiments, the four L-shaped corner panels 30 are replaced by two U-shaped panels or a single panel having the shape of a square frame.

As seen better in Figure 3, the pedestal considered above necessitates a window approximately twice the size of the spacing 55 between two corrugations 15 or 16, which here are equidistant. To this end, two corrugations of each series are interrupted. However, this arrangement of the pedestal and the tank wall in its vicinity may be adapted to other pedestal dimensions. For a wider pedestal for example, the corresponding window may interrupt a greater number of corrugations in one or each series, for example three or four corrugations or more. Furthermore, it is also possible to re-route locally some corrugations to limit the number of corrugations to be interrupted and thus to preserve a higher level of elasticity of the sealing

membrane. This possibility is illustrated by the Figure 9 embodiment.

In Figure 9, components identical or similar to those in Figure 3 carry the same reference number increased by 100. The transverse dimension of the pedestal 110 being greater, for example greater than or equal to approximately three times the spacing 155 between the corrugations 115 or 116, the window 125 produced in the corrugated metal membrane for the pedestal 110 to pass through in this case interrupts the directrices of four corrugations in each series. However, instead of interrupting four corrugations in each series, this embodiment interrupts two corrugations 120, respectively 121, of each series as in the preceding embodiment while the other two corrugations 158, respectively 159, of each series are locally offset from the pedestal 110 relative to their original directrix, but are not interrupted.

To this end, the sealing barrier 106 is modified at the level of two concentric square windows 125 and 160. Outside the window 160, the sealing barrier 106 consists of sealing plates 111 carrying equidistantly distributed longitudinal corrugations 115 and transverse corrugations 116. Between the window 160 and the window 125 the sealing barrier 106 is continuous with other corrugated sealing plates, i.e. two globally C-shaped plates 161 here, that carry corrugations distributed differently, i.e. less spaced apart here. The corrugations of the plates 161 constitute in particular a central segment 162, respectively 163, offset from the pedestal 110, for each of the corrugations 158, respectively 159. Finally, the structure of the sealing barrier 106 at the level of the window 125 and inside it is similar to the Figure 3 embodiment.

Bend parts 170 are employed to produce the junction at the window 160 between the central segment 162 or 163 of the corrugation 158 or 159 and the portions of the corrugations situated outside the window 160.

Figure 10 shows one embodiment of a bend part 170. The bend part 170 includes a base plate in two parts 171 and 172 intended to be welded in sealed manner to a respective plate 111 or 161 of the sealing barrier 106 and to an adjacent bend part 170, and a bent corrugation 174 the directrix of which forms a chosen angle, for example 135°. The bent corrugation 174 is intended to be connected in sealed manner to the adjacent end of the corrugation 158 or 159 and to the bent corrugation of the adjacent bend part. A step 173 between the parts 171 and 172 of the base plate has an amplitude substantially equal to the thickness of the sheet metal from which the sealing plates 111 or 161 or the bend parts 170 are made. Sheet metal of the same thickness is preferably used for these various parts.

In another embodiment, not shown, suitable for a pedestal of smaller diameter, for example, all the corrugations of which the directrix is interrupted by the window, for example two corrugations of each series as in Figure 3, are extended across the window in accordance with an offset routing, similarly to the corrugations 158 and 159 in Figure 9. In this embodiment the flexibility of the membrane may be improved since no corrugation is interrupted by an end piece at the level of the pedestal.

In the embodiments described above, the primary sealing barrier is produced in sheet metal including two series of mutually perpendicular corrugations. However, other types of corrugated metal membranes may be employed in

a similar manner with fewer or more corrugations and/or a different arrangement of the corrugations.

Although the invention has been described in relation to a plurality of particular embodiments, it is clearly evident that it is no way limited to them and comprises all technical equivalents of the means described and combinations thereof that are within the scope of the invention.

Use of the verb include or comprise and its conjugate forms does not exclude the presence of other elements or other steps than those stated in a claim. Unless otherwise indicated, use of the indefinite article "a" or "an" for an element or a step does not exclude the presence of a plurality of such elements or steps. A plurality of means or modules may be represented by the same hardware element.

In the claims, any reference symbol in brackets should not be interpreted as limiting the claim.

CLAIMS

1. Sealed and insulative tank disposed in a support structure, the tank including a tank wall disposed along the support structure, the tank wall including:

a sealing barrier,

a thermal insulation barrier disposed between the sealing barrier and the support structure and having a support surface for the sealing barrier, and

a pedestal for equipment immersed in the sealed tank,

the sealing barrier including a layer of corrugated sheet metal having at least one series of parallel corrugations, the layer of corrugated sheet metal being interrupted by a window around the pedestal,

the pedestal extending longitudinally through the window in the layer of corrugated sheet metal and having a first end portion bearing against the support structure and a second end portion projecting into the tank to support the equipment at a distance from the sheet metal layer,

the sealing barrier including connecting parts disposed in the window around the pedestal to join the pedestal in sealed manner to a marginal portion of the layer of corrugated sheet metal delimiting the window,

wherein the window interrupts the directrices of a plurality of the parallel corrugations of said at least one series and the pedestal is centred at a position situated between the directrices of two parallel corrugations of said plurality.

2. Tank according to Claim 1, wherein the pedestal has at least one convex lateral side,

the directrices of the two corrugations between which the pedestal is centred intersecting the convex lateral side of the pedestal.

3. Tank according to Claim 1 or 2, wherein the window interrupts the directrices of an even number of parallel lines of said at least one series.

4. Tank according to Claim 3, wherein the window interrupts the directrices of two parallel corrugations of said at least one series.

5. Tank according to any one of Claims 1 to 4, wherein the pedestal is centred substantially in the middle of the directrices of the two corrugations.

6. Tank according to any one of Claims 1 to 5, wherein the pedestal has a circular cross section.

7. Tank according to any one of Claims 1 to 6, wherein said at least one series of parallel corrugations is equidistantly distributed.

8. Tank according to any one of Claims 1 to 7, wherein the corrugations project on the side of an internal face of the sealing barrier intended to be in contact with a fluid.

9. Tank according to any one of Claims 1 to 8, wherein the connecting parts include a plurality of end parts disposed at a distance from the pedestal in such as manner as to close interrupted ends of the two corrugations between which the pedestal is centred.

10. Tank according to any one of Claims 1 to 9, wherein the pedestal includes a hollow envelope of generally tubular shape the longitudinal axis of which is substantially perpendicular to the tank wall and a transverse closure wall closing the envelope in sealed manner to produce the continuity of the sealing barrier at the level of the pedestal.

11. Tank according to any one of Claims 1 to 10, wherein the connecting parts include an annular plate joined to a peripheral wall of the pedestal at the level of the layer of corrugated sheet metal.

12. Tank according to claim 11, wherein the connecting parts include an intermediate plate having a first edge welded to the annular plate and a second edge welded to the marginal portion of the corrugated sheet metal layer delimiting the window.

13. Tank according to any one of Claims 1 to 12, wherein the thermal insulation barrier includes a primary thermal insulation barrier disposed on the side of the sealing barrier, referred to as the primary sealing barrier, and a secondary thermal insulation barrier disposed on the side of the support structure, the tank wall including a secondary sealing barrier disposed between the primary and secondary thermal insulation barriers, the secondary sealing barrier being joined in sealed manner to a peripheral wall of the pedestal.

14. Tank according to any one of Claims 1 to 13, wherein the connecting parts include:

a connecting plate having a corrugation parallel to said at least one series of parallel corrugations and disposed on a line offset laterally from the pedestal relative to one of the directrices interrupted by the window, and bend parts disposed in such a manner that each joins one end of the corrugation of the connecting plate to an end portion of the corrugation the directrix of which is interrupted by the window so that the corrugation of the connecting plate and the two bend parts extend the corrugation the directrix of which is interrupted in sealed manner across the window along the line offset laterally from the pedestal.

15. Tank according to any one of Claims 1 to 14, wherein the corrugated sheet metal layer includes a first series of parallel corrugations and a second series of parallel corrugations that intersects the first series of parallel corrugations at crossing points, the window interrupting the directrices of a first plurality of parallel corrugations of the first series and/or the directrices of a second plurality of parallel corrugations of the second series, the pedestal being centred at a position situated between the directrices of two parallel corrugations of the first plurality and/or between the directrices of two parallel corrugations of the second plurality.

16. Tank according to Claim 15, wherein the first series of parallel corrugations is perpendicular to the second series of parallel corrugations.

17. Tank according to Claim 15 or 16, wherein the window is a quadrilateral having two sides parallel to the first series of corrugations and two sides parallel to the second series of corrugations.

18. Tank according to any one of Claims 1 to 17, wherein the pedestal is disposed at the base of a mast for discharging the tank.