CLAIMS

1. A sealed and thermally insulated tank arranged in a bearing structure ~~(1)~~ to contain a fluid, said tank comprising tank walls fixed to walls of said bearing structure,

a tank wall having in succession, in the thickness direction from the inside toward the outside of said tank, a primary sealed barrier ~~(3)~~, a primary thermally insulating barrier ~~(4)~~, a secondary sealed barrier ~~(5)~~ and a secondary thermally insulating barrier ~~(6)~~, the tank further comprising a through-element ~~(7, 910)~~ arranged through the tank wall,

in which tank the tank wall around the through-element comprises:

secondary insulating blocks arranged on the wall of the bearing structure around the through-element and forming the secondary thermally insulating barrier around the through-element so that the through-element passes through the secondary thermally insulating barrier between said secondary insulating blocks, the secondary insulating blocks being covered by a first sealed layer forming the secondary sealed barrier,

a plate ~~(722, 923)~~ arranged parallel to the tank wall having a surface facing toward the inside of the tank at the same level as the first sealed layer ~~(17, 932)~~ forming the secondary sealed barrier, the plate being connected in a sealed manner directly or indirectly to a peripheral wall of the through-element all around the through-element,

a second sealed layer ~~(723, 936, 823, 1036)~~ fixed in a sealed manner straddling the first sealed layer and the plate all around the plate

in which tank the tank wall further comprises primary insulating elements arranged on the secondary sealed barrier around the through-element and forming the primary thermally insulating barrier around the through-element so that the through-element passes through the primary thermally insulating barrier between the primary insulating elements, the primary insulating elements being covered by

primary sealed barrier elements which are connected in a sealed manner to the peripheral wall of the through-element so that the through-element passes through the primary sealed barrier between the primary sealed barrier elements,

characterized in that

the plate ~~(722, 923)~~ is a circular plate having a circular exterior shape, and in that the second sealed layer comprises a circular window having a diameter smaller than the outside diameter of the circular plate, the secondary sealed barrier being passed through by the through-element through the window of the second sealed layer.

2. The tank as claimed in claim 1, in which the second sealed layer comprises an annular strip ~~(723, 936)~~ which follows the circular exterior shape of the circular plate ~~(722, 923)~~, the circular window being delimited by an interior edge of the annular strip.

3. The tank as claimed in claim 2, in which the annular strip ~~(723, 936)~~ is made up of a plurality of sealed strip portions, each sealed strip portion ~~(723a, 723d)~~ forming an arc of a circle.

4. The tank as claimed in claim 3, in which the sealed strip portions ~~(723b, 723c)~~ overlap in pairs so as to form regions of overlap each one corresponding to a marginal portion of the length of the two sealed strip portions.

5. The tank as claimed in claim 1, in which the second sealed layer ~~(823, 1036)~~ comprises a metal foil having an annular fold ~~(850, 1050)~~ surrounding the circular window ~~(1044, 1052)~~ and arranged between the exterior diameter of the circular plate and the first sealed layer, the annular fold forming an expansion joint between said circular plate and said first sealed layer.

6. The tank as claimed in claim 5, in which the annular fold is oriented toward the secondary thermally insulating barrier, the annular fold being fitted into a peripheral chimney ~~(1051)~~ between the through-element and the secondary insulating blocks.

7. The tank as claimed in claim 5 or 6, in which the peripheral chimney ~~(1051)~~ is filled with a compressible insulator.

8. The tank as claimed in one of claims 1 to 7, in which the second sealed layer is bonded to the first sealed layer and the circular plate.

9. The tank as claimed in one of claims 1 to 7, in which the second sealed layer is welded to the first sealed layer and the circular plate.

10. The tank as claimed in one of claims 1 to 9, in which the through-element is a support leg ~~(910)~~ for equipment immersed in the sealed tank, the support leg extending longitudinally through the tank wall and having a first end portion bearing against the wall of the bearing structure ~~(1)~~ and a second end portion projecting into the tank to support the equipment away from the layer of sheet metal, the circular plate being connected in a sealed manner to the peripheral wall of the support leg all around the support leg.

11. The tank as claimed in claim 10, in which the support leg passes through the primary sealed barrier in a window ~~(925)~~, said primary sealed barrier comprising connecting pieces arranged in the window around the support leg for connecting the support leg in a sealed manner to a marginal portion of the layer of corrugated sheet metal delimiting the window,

said window interrupting the directrix lines ~~(A, B)~~ of a plurality of the parallel corrugations of said at least one series and the support leg is centered on a position situated between the directrix lines of two parallel corrugations of said plurality.

12. The tank as claimed in claim 10 or 11, in which the support leg is placed at the base of a tank offloading mast.

13. The tank as claimed in one of claims 1 to 9, in which the through-element comprises a sealed pipe ~~(7)~~, the sealed pipes defining a passage between the interior space of the tank and a vapor manifold arranged on the outside of the tank.

14. The tank as claimed in claim 13, in which the tank wall around the sealed pipe further comprises:

a blanking plate ~~(727)~~ connected in a sealed manner to the periphery of the sealed pipe and extending parallel to the tank wall, the blanking plate being spaced toward the outside of the tank with respect to the secondary sealed barrier,

a peripheral first connecting plate ~~(21)~~ fixed in a sealed manner to the entire periphery of the blanking plate ~~(727)~~ and running parallel to the sealed pipe ~~(7)~~, the first connecting plate extending in the thickness direction of the tank wall and forming a rim projecting toward the secondary sealed barrier with respect to the blanking plate, the secondary insulating blocks being arranged on the wall of the bearing structure around the peripheral first connecting plate,

the circular plate ~~(722)~~ comprising a second connecting plate ~~(26)~~ fixed in a sealed manner to a surface of the circular plate that is oriented toward the blanking plate and projecting toward the bearing structure parallel to the sealed pipe ~~(7)~~, the second connecting plate being fixed in a sealed manner to the first connecting plate all around the first connecting plate, the two mutually-spaced plates delimiting a housing,

an opening ~~(25)~~ formed through the circular plate to allow gas to circulate between a primary space situated between the two sealing barriers and the housing,

and a pipe opening through the blanking plate and extending toward the bearing structure to define a passage between the housing and the vapor manifold.

15. A ship ~~(70)~~ for transporting a cold liquid product, the ship having a double hull ~~(72)~~ and a tank ~~(71)~~ as claimed in one of claims 1 to 14 arranged in the double hull.

16. The use of a ship ~~(70)~~ as claimed in claim 15 for loading or offloading a cold liquid product, in which a cold liquid product is conveyed through insulated pipelines ~~(73, 79, 76, 81)~~ from or to an off-shore or on-shore storage facility ~~(77)~~ to or from the tank of the ship ~~(71)~~.

17. A transfer system for a cold liquid product, the system comprising a ship ~~(70)~~ as claimed in claim 15, insulated pipelines ~~(73, 79, 76, 81)~~ arranged in such a way as to connect the tank ~~(71)~~ installed in the hull of the ship to an off-shore or on-shore storage facility ~~(77)~~ and a pump for driving a stream of cold liquid product through the insulated pipelines from or to the off-shore or on-shore storage facility to or from the tank of the ship.