

CLAIMS

1. A sealed and thermally insulating tank which is integrated in a carrier structure in order to contain a fluid, wherein a tank wall comprises from the outer side of the tank to the inner side of the tank:

5 _____a carrier wall-(1),

_____a secondary thermal insulation barrier-(2) which is retained on the carrier wall, the thermal insulation barrier being constituted by a plurality of secondary thermally insulating elements (6)-which are juxtaposed so as to form a secondary support surface,

10 _____a primary thermal insulation barrier-(4) which is retained on the secondary thermal insulation barrier-(2), the primary thermal insulation barrier being constituted by a plurality of primary thermally insulating elements-(7) which are juxtaposed in order to form a primary support surface,

_____a sealing barrier (5)-which is in abutment with the primary support surface,

15 _____each primary thermally insulating element and each secondary thermally insulating element comprising:

_____a thermally insulating lining-(35),

_____a plurality of carrier elements {20, 28, 37, 40, 140}-which extend through the thermally insulating lining perpendicularly to the tank wall, and

20 _____a panel (17, 34, 122)-which is parallel with the tank wall and which is arranged at an end of the carrier elements of the thermally insulating element in order to form an outer wall of the thermally insulating element, wherein at least one from the panel of the primary thermally insulating element and the panel of the secondary thermally insulating element is arranged between the carrier elements of the primary insulation barrier and the carrier elements of the secondary insulation barrier,

_____characterized in that

30 _____in a view projected in a plane parallel with the tank wall, at least one carrier element {20, 28, 40} from the plurality of carrier elements of the primary thermally insulating element is spaced apart relative to the subjacent carrier elements {20, 37, 140}-of the secondary thermally insulating element, wherein ~~in which~~ the at least one carrier element from the plurality of carrier elements of the

primary thermally insulating element is not superimposed on the subjacent carrier elements of the secondary thermally insulating element.

2. The tank as claimed in claim 1, wherein the carrier elements ~~{20, 28, 37, 40, 140}~~ are pillars having a small cross-section in the plane parallel with the tank wall relative to the dimensions of the thermally insulating element ~~{6, 7}~~.

3. The tank as claimed in claim 2, wherein each pillar ~~{20, 28, 40}~~ from the plurality of pillars of the primary thermally insulating element is positioned outside ~~characteristic-defined~~ perimeters ~~{53, 55, 59, 57, 61}~~ which surround the subjacent pillars ~~{20, 37, 140}~~ of the secondary thermally insulating element and in which the thermally insulating elements ~~{6, 7, 16}~~ are parallelepipedal and in which the defined ~~characteristic-perimeter~~ ~~{59, 61}~~ which surrounds a pillar is rectangular, the perimeter comprising a first side which is parallel with a length direction ~~{21}~~ of the thermally insulating element, and a second side which is parallel with a width direction of the insulating element, the dimension of the first side of the perimeter being greater than

or equal to double a first characteristic dimension equal to the larger dimension ~~{C1, D4}~~ of the cross-section of the pillar in the length direction ~~{62}~~ of the thermally insulating element, and the dimension of the second side of the perimeter being greater than or equal to double a second characteristic dimension equal to the larger dimension ~~{C2, D3}~~ of the cross-section of the pillar in the width direction ~~{63}~~ of the thermally insulating element.

4. The tank as claimed in claim 2, wherein each pillar ~~{20, 28, 40}~~ from the plurality of pillars of the primary thermally insulating element is positioned outside defined ~~characteristic-perimeter~~ perimeters ~~{53, 55, 59, 57, 61}~~ which surround the subjacent pillars ~~{20, 37, 140}~~ of the secondary thermally insulating element and wherein the pillars have a rectangular cross-section ~~{58}~~, and wherein the defined perimeter ~~{59}~~ surrounding a subjacent pillar has a rectangular shape which is centered on the rectangular cross-section ~~{58}~~ of said subjacent pillar, the long sides of the defined perimeter surrounding said subjacent pillar being parallel with the long sides of the rectangular cross-section ~~{58}~~ of said subjacent pillar, the dimensions of the defined perimeter surrounding said subjacent pillar ~~{59}~~ being equal to double the dimensions ~~{C1, C2}~~ of the rectangular cross-section ~~{58}~~ of said subjacent pillar.

5. The tank as claimed in claim 2, wherein each pillar (20, 28, 40) from the plurality of pillars of the primary thermally insulating element is positioned outside defined characteristic perimeters (53, 55, 59, 57, 61) which surround the subjacent pillars (20, 37, 140) of the secondary thermally insulating element, said subjacent pillars of the secondary thermally insulating element having a circular cross-section, and wherein the defined perimeters (55, 57) have a circular shape and are each centered on a subjacent pillar (54, 56), the radius of the defined perimeter (55, 57) being equal to a characteristic the diameter (D1, D2) of the circular cross-section of the subjacent pillar.

6. The tank as claimed in ~~one of claims 2 to 5~~, wherein ~~the each pillars from the plurality of pillars of the primary thermally insulating element is positioned outside characteristic perimeters which surround the subjacent pillars of a thermally insulating element are arranged in rows of pillars (19, 23, 36) which are parallel with a side (21) of the secondary thermally insulating elements, a row of pillars of the primary thermal insulation barrier being positioned in each case in the projected view halfway between two rows of pillars of the secondary thermal insulation barriers~~ said subjacent pillars of the secondary thermally insulating element having a triangular cross-section, and wherein the characteristic perimeters have a circular shape and are each centered on a subjacent pillar, the radius of the characteristic perimeter being equal to the diameter of the circumscribed circle of the triangular cross-section of the subjacent pillar.

7. The tank as claimed in one of claims 1-2 to 6, wherein the pillars of a thermally insulating element are arranged in rows of pillars which are parallel with a side of the thermally insulating element, a row of pillars of the primary thermal insulation barrier being positioned in each case in the projected view halfway between two rows of pillars ~~carrier element of the primary thermal insulation barrier is in each case arranged in the projected view in a position located halfway between two adjacent carrier elements of the secondary thermal insulation barrier.~~

8. The tank as claimed in one of claims 1 to 7, wherein a carrier element of the primary thermal insulation barrier is in each case arranged in the projected view in a position located halfway between two adjacent carrier elements of the secondary thermal insulation barrier.

8-9. The tank as claimed in one of claims 1 to ~~7~~8, wherein the primary thermally insulating element comprises a lower panel (~~17~~) which extends parallel with the tank wall and which carries the carrier elements of the primary thermally insulating element.

5 **9-10.** The tank as claimed in one of claims 1 to ~~8~~9, wherein the secondary thermally insulating element comprises a lower panel (~~17~~) which extends parallel with the tank wall and which carries the carrier elements of the secondary thermally insulating element.

10 ~~10.~~ **11.** The tank as claimed in one of claims 1 to ~~9~~10, wherein the secondary thermally insulating element comprises a covering panel (~~34, 122~~) which extends parallel with the tank wall and which is carried by the carrier elements of the secondary thermally insulating element, the covering panel comprising an outer surface which forms the secondary support surface.

~~11.~~ **12.** The tank as claimed in claim ~~10~~11, wherein the covering panel of the secondary thermally insulating element comprises:

_____ a distribution panel ~~(25)~~ which is fixed to the carrier elements and which is in abutment with the carrier elements,

5 _____ a spacer element which is in abutment with and fixed to the distribution panel, the spacer element comprising a plurality of beams ~~(126)~~ which are spaced apart from each other and which extend parallel with the distribution panel,

_____ an upper panel ~~(24)~~ which is parallel with the distribution panel and which is fixed and supported by the plurality of beams.

10 ~~12.~~ **13.** The tank as claimed in one of claims 1 to ~~11~~12, wherein the primary thermally insulating element ~~(7)~~ comprises a covering panel which extends parallel with the tank wall and which is carried by the pillars, the covering panel comprising:

_____ a distribution panel ~~(25)~~ which is fixed to the carrier elements and which is in abutment with the carrier elements,

15 _____ a spacer element which is in abutment with and fixed to the distribution panel, the spacer element comprising a plurality of beams ~~(26)~~ which are spaced apart from each other and which extend parallel with the distribution panel,

_____ an upper panel ~~(24)~~ which is parallel with the distribution panel and which is fixed and supported by the plurality of beams, the upper panel comprising an outer
20 surface which forms the primary support surface.

13. **14.** The tank as claimed in claims ~~11 and 12~~ and 13 taken in combination, wherein the beams ~~(26)~~ from the plurality of beams of the primary thermally insulating element are perpendicular to the beams ~~(126)~~ of the plurality of beams of the secondary thermally insulating element.

25 **14.** **15.** The tank as claimed in one of claims 1 to ~~13~~14, wherein a primary thermally insulating element and a secondary thermally insulating element are parallelepipedal and wherein the primary thermally insulating element comprises primary securing pillars ~~(49)~~ which are each arranged in the region of a corner of the primary thermally insulating element, the

secondary thermally insulating element comprising secondary securing pillars ~~{49}~~ which are each arranged in the region of a corner of the secondary thermally insulating element, the primary securing pillars and the secondary securing pillars being superimposed.

5 ~~15.~~ 16. The tank as claimed in one of claims 1 to ~~14~~15, wherein the tank wall further comprises a secondary sealing barrier ~~{3}~~ which is in abutment with the secondary support surface of the secondary thermal insulation barrier.

10 ~~16.~~ 17. A ship ~~{70}~~ for transporting a cold liquid product, the ship comprising a double hull ~~{72}~~ and a tank ~~{71}~~ as claimed in one of claims 1 to ~~15~~16 arranged in the double hull.

~~17.~~ 18. Use of a ship ~~{70}~~ as claimed in claim ~~16~~17, wherein a cold liquid product is conveyed through insulated pipes ~~{73, 79, 76, 81}~~ from or to a floating or land-based storage installation ~~{77}~~ to or from the tank ~~{71}~~ of the ship in order to load or unload the ship.

15 ~~18.~~ 19. A transfer system for a cold liquid product, the system comprising a ship ~~{70}~~ as claimed in claim ~~16~~17, insulated pipes ~~{73, 79, 76, 81}~~ which are arranged so as to connect the tank ~~{71}~~ which is installed in the hull of the ship to a floating or land-based storage installation ~~{77}~~ and a pump for bringing about a flow of cold liquid product through the insulated pipes from or to the floating or land-based storage
20 installation to or from the tank of the ship.