CLAIMS

1. A marine vessel cryogenic barrier, comprising a plurality of multi-layered insulation panels, each panel arranged to align with an adjacent panel on an inner surface of a tank space of a marine vessel, each panel comprising a single coupling means located at the centre of the panel and arranged to couple the respective panel to the inner surface of the tank space of the marine vessel, wherein the barrier is provided with an impervious layer on a surface of the barrier facing the tank space;

wherein each insulation panel comprises a main and a secondary insulation layers wherein an intermediate layer is formed between the main and secondary layers and the main and secondary insulation layers are not bonded to each other.

2. A barrier as claimed in claim 1, wherein each insulation panel comprises a first and second layer of polyurethane.

3. A barrier as claimed in any preceding claim, wherein the impervious layer is impervious to liquefied natural gas, liquefied propane gas or liquefied ethylene gas.

4. A barrier as claimed in any preceding claim, wherein the impervious layer is a glass fibre reinforced aluminium foil or a cryogenic coating.

5. A barrier as claimed in any preceding claim, wherein each insulation panel is a geometric shape allowing adjacent panels to tessellate the inner surface of the tank space.

6. A barrier as claimed in any preceding claim, wherein adjacent insulation panels are separated by a joint space, said space being filled with a polyurethane foam material extending between the edges of adjacent panels and entirely filling the joint space between adjacent panels.

7. A barrier as claimed in any preceding claim, wherein the joint between adjacent panels is sealed on a tank space facing surface with a reinforced flexible aluminium layer or cryogenic coating extending across the joint space defined between adjacent panels and overlapping a portion of the adjacent panels on a tank space facing surface.

8. A barrier as claimed in claim 7, wherein the flexible reinforced aluminium layer is bonded to adjacent panel surfaces with a cryogenic glue.

9. A barrier as claimed in claim 8, wherein the flexible reinforced aluminium layer or cryogenic coating is bonded to adjacent panels such that an excess of material is provided creating a concave joint profile between adjacent panels.

10. A barrier as claimed in claim 9, wherein a flexible reinforced aluminium layer or a cryogenic coating is bonded to adjacent panels such that an excess of material is provided creating a concave joint profile between intermediate layers of adjacent panels.

11. A barrier as claimed in any preceding claims, wherein the coupling means comprises a hole passing through the centre of the panel and arranged to receive a threaded bolt onto which a locking nut can be threaded.

12. A barrier as claimed in claim 11, wherein a first end of the threaded bolt is arranged to be coupled to the inner surface of the tank space of the marine vessel and the second end is arranged to receive an anchor cup and said locking nut.

13. A barrier as claimed in claim 12, wherein the anchor cup is located part-way through the thickness of the panel and arranged to bring the panel into contact with the inner surface of the tank space on attachment of the locking nut.

14. A barrier as claimed in claim 13, wherein the tank space facing surface of the panel is provided with a centrally positioned opening coaxial with the threaded rod and arranged to receive an anchor cup to allow positioning of the panel.

15. A barrier as claimed in claim 14, wherein the opining is arranged to be filled with a polyurethane foam and sealed on a tank space facing surface with cryogenic glue and a flexible reinforced aluminium layer or cryogenic coating.

16. A barrier as claimed in claim 1, wherein the intermediate layer is formed between the panel of an aluminium layer or cryogenic coating on a tank space facing side of said intermediate layer bonded to a plywood substrate.

17. A barrier as claimed in claim 16, wherein the intermediate layer is further provided with a locking nut arranged to secure the secondary layer to a threaded rod passing through the panel.

18. A barrier as claimed in any preceding claim, wherein the corner of each panel is truncated such that, in use, aligning adjacent panels defines an open space at the point at which four adjacent panels meet.

19. A barrier as claimed in claim 18, wherein the open space defines a corner joint space, said space being filled with a polyurethane foam material extending between edges of adjacent panels and entirely filling the joint space between adjacent panels.

20. A barrier as claimed in claim 19, wherein the corner joint between adjacent panels is sealed on a tank space facing surface with reinforced flexible aluminium layer or cryogenic coating extending across the joint space defined between adjacent panels and overlapping a portion of the adjacent panels on a tank space facing surface.

21. A barrier as claimed in claim 20, wherein the flexible aluminium layer is bonded to adjacent panel surfaces with a cryogenic glue.

22. A barrier as claimed in claim 21, wherein the flexible reinforced aluminium layer or cryogenic coating is bonded to adjacent panels such that an excess of material is provided across the corner joint.

23. A barrier as claimed in claim 22, wherein the excess of material forms a concave or convex dome joint profile between adjacent corner panels.

24. A multi-layer cryogenic barrier panel for aligning with an adjacent panel on an inner surface of a tank space of a marine vessel, said panel comprising a single through-hole at the centre of the panel arranged to receive a couple means, wherein the panel comprises a main impervious layer on an outer surface of said panel and a second impervious layer either within the multi-layer panel or on a face of the panel arranged in use to face a tank space.

25. A method of insulating a marine cryogenic liquid transporter, said method comprising the steps of (A) fitting a plurality of securing studs to an inner surface of a tank space of a transporter, (B) securing a plurality of panels as described in any preceding claim to each of said securing studs, (C)sealing the spaces between adjacent panels with an expanding foam and (D) covering the spaces between adjacent panels on a tank space facing side of each panel with an impervious material to create an uninterrupted impervious barrier within the tank space.

26. An LNG, LPG or LEG marine vessel comprising a barrier or a panel according to any preceding claim comprising a barrier as claimed in any of claims 1 to 23.

27. A marine vessel cryogenic barrier, comprising a plurality of multi-layered insulation panels, each panel arranged to align with an adjacent panel on an inner surface of a tank space of a marine vessel, each panel comprising a single coupling means located at the

centre of the panel, said barrier comprising a first impervious later on a surface of the barrier facing the tank space.

28. A marine vessel cryogenic barrier as claimed in claim 27 further comprising a second impervious layer arranged within the panel and further comprising a peripherally arranged impervious joint arranged in use to connect adjacent panels to each other.