pressure. In other words, the peripheral leaktightness lip 64 exhibits a section exhibiting an L general shape.

The portion bent towards the outside of the peripheral leaktightness lip 64 exhibits a width of the order of 15 to 40 mm. The peripheral leaktightness lip 64 is shaped in order to fit the geometry of the membrane 5, 8 along the welding bead to be tested. Consequently, in Figure 17, the peripheral leaktightness lip 64 comprises indentations 65 exhibiting a shape corresponding to that of the corrugations of the membrane 5, 8 which the detection hood 55 is intended to straddle when it is in position against the portion of the welding bead 62 to be tested.

The leaktightness seal 60 is advantageously made of an elastomer material exhibiting a Shore A hardness of between 20 and 50. The leaktightness seal is, for example, made of polyurethane elastomer, of silicone, of nitrile or of Viton®.

In an embodiment illustrated diagrammatically in Figure 18, the detection hood 55 is additionally equipped with a clamping system 66 capable of flattening the peripheral leaktightness lip 64 against the membrane 8 to be tested, so as to guarantee the leaktightness of the detection chamber 61. The clamping system 66 in this instance comprises a clamp 67 at each of the indentations 65 of the peripheral leaktightness lip 64. Each clamp 67 comprises two branches respectively positioned on either side of the indentation 65 and configured in order to apply an effort of clamping the peripheral leaktightness lip 64 against the membrane 8. Advantageously, the branches are configured in order to clamp the peripheral leaktightness lip 64 against the leaktightness membrane, close to the base of the corrugation.

Furthermore, in the embodiment represented, the clamping system 67 additionally comprises, at each of the longitudinal ends of the detection hood 55, a movable finger 68 which is configured in order to flatten one of the longitudinal ends of the peripheral leaktightness lip 64 against the membrane 8.

Figure 19 illustrates a leaktightness seal 60 according to an alternative embodiment. This leaktightness seal 60 is shaped in order to fit a membrane 5 in which the corrugations project towards the outside of the tank. Such a membrane is, for example, a secondary membrane 5 according to the Mark V technology, as illustrated in Figure 6. Consequently, the peripheral leaktightness lip 64 comprises

CLAIMS

1. Method for injection of a tracer gas into a thermally insulating space of a leaktight and thermally insulating tank, the leaktight and thermally insulating tank exhibiting a polyhedral shape defined by a plurality of tank walls (9, 10, 11, 12, 13, 14, 15, 16, 17) which are attached to a carrier structure (4), each of the tank walls comprising a thermally insulating barrier (2, 6) comprising insulating elements (3, 7) which are anchored to the carrier structure (4) and a membrane (5, 8) resting against the insulating elements (3, 7) of the thermally insulating barrier (2, 6), the thermally insulating barriers (2, 6) of each tank wall communicating with the thermally insulating barrier (2, 6) of the other tank wall (9, 10, 11, 12, 13, 14, 15, 16, 17) one another and together defining the thermally insulating space; the said plurality of tank walls including a bottom wall (11), the said injection method comprising injecting a tracer gas into the thermally insulating space by means of at least one device for injection of tracer gas (19, 28) which passes through the membrane (5, 8) of the bottom wall (11) and which emerges in the thermally insulating barrier (2, 6) of the bottom wall (11), the tracer gas being introduced and transported from the inner space of the vessel to said thermally insulating space and wherein, prior to the stage of injection of the tracer gas by means of at least one device for injection of tracer gas (19), the membrane (5, 8) is detached from the thermally insulating barrier (2, 6) in the region of the device for injection of the tracer gas (19) by introducing a lifting tool (25) through a hole (20) made in the membrane (5, 8) and by positioning said lifting tool (25) so as to be interposed between the membrane (5, 8) and the thermally insulating barrier (2, 6) of the bottom wall (11).

2. Method according to Claim 1, in which the tracer gas is chosen from helium, ammonia and a mixture of nitrogen and molecular hydrogen.

3. Method according to Claim 1 or 2, in which the bottom wall (11) exhibits a rectangular shape exhibiting two axes of symmetry, the said two axes of symmetry delimiting four regions of the bottom wall, and in which the tracer gas is injected by means of at least four devices for injection of tracer gas (19, 28) which each pass through the membrane (5, 8) of the bottom wall (11) and which emerge in the thermally insulating barrier of the bottom wall (11), each of the four regions of the

bottom wall being equipped with one of the four devices for injection of tracer gas (19, 28).

4. Method according to any one of Claims 1 to 3, in which the or each device for injection of tracer gas (19, 28) comprises a coupling member (22, 31) which is welded in leaktight fashion to the membrane (5, 8) of the bottom wall (11) at the periphery of a hole (20, 29) which is made in the said membrane (5, 8), the coupling member (22, 31) being combined with a pipe (18) connected to a source of tracer gas.

5. Method according to Claim 4, in which, the lifting tool (25) is introduced through the coupling member (22) and the hole (20) made in the membrane (5, 8) and is positioned so that a hook (27) of the said lifting tool (25) is inserted between the membrane (5, 8) and the thermally insulating barrier (2, 6) of the bottom wall (11).

6. Method for testing the leaktightness of a membrane of a leaktight and thermally insulating tank, the leaktight and thermally insulating tank exhibiting a polyhedral shape defined by a plurality of tank walls (9, 10, 11, 12, 13, 14, 15, 16, 17) which are attached to a carrier structure (4), each of the tank walls comprising a thermally insulating barrier (2, 6) comprising insulating elements (3, 7) which are anchored to the carrier structure (4) and a membrane (5, 8) resting against the insulating elements (3, 7) of the thermally insulating barrier (2, 6), the thermally insulating barriers (2, 6) of the tank walls communicating with one another and together defining a thermally insulating space; the said plurality of tank walls including a bottom wall (11), the method for testing the leaktightness comprising:

- carrying out the method for injection of a tracer gas according to any one of Claims 1 to 5 in order to inject the tracer gas into the thermally insulating space;

- providing a leak detection device (54) comprising a detection hood (55), configured in order to define, with the membrane (5, 8), a leaktight detection chamber (61), and a vacuum pump (57) which is, on the one hand, coupled to the leaktight detection chamber (61) and, on the other hand, to an analytical apparatus (56);

- positioning the detection hood (55) against a face of the membrane (5, 8) opposite the thermally insulating space, the detection hood (55) being positioned so that the leaktight detection chamber (61) is positioned facing a portion of a welding bead (62) to be tested;

- placing the detection chamber (61) under negative pressure using the vacuum pump (57);

- conveying the gas phase present in the detection chamber (61) towards the analytical apparatus (56); and

- analysing, using the analytical apparatus (56), the said gas phase and delivering a variable representative of a concentration of tracer gas in the said gas phase.

7. Method for testing the leaktightness of a membrane according to Claim 6, in which the detection hood (55) comprises a central core (59) and a leaktightness seal (60) which are attached to one another and are arranged in order to define, with the membrane (5, 8), the detection chamber (61).

8. Method for testing the leaktightness of a membrane according to Claim 7, in which the leaktightness seal (60) comprises a casing (63) attached to the central core (59) and a peripheral leaktightness lip (64) which extends the casing (63).

9. Method for testing the leaktightness of a membrane according to Claim 8, in which the peripheral leaktightness lip (64) is bent towards the outside of the detection hood (55) and is configured in order to be flexed and to be flattened against the membrane (5, 8) when the detection chamber (61) is placed under negative pressure.

10. Method for testing the leaktightness of a membrane according to claim 8 or 9, in which the portion of the welding bead (62) is traversed by at least one corrugation of the membrane and in which the peripheral leaktightness lip (64) is shaped in order to fit the geometry of the said corrugation.

11. Method for testing the leaktightness of a membrane according to Claim 10, in which the at least one corrugation of the membrane (8) projects towards the inside of the tank and in which the peripheral leaktightness lip (64) comprises at least two indentations (65) exhibiting a shape corresponding to that of the corrugation, the detection hood (55) being positioned against the membrane (8) so that the indentations (65) straddle the corrugation.

12. Method for testing the leaktightness of a membrane according to Claim 10, in which the at least one corrugation of the membrane (5, 8) projects towards the outside of the tank and in which the peripheral leaktightness lip (64)

comprises at least two regions in projection (69) exhibiting a shape corresponding to that of the corrugation, the detection hood (55) being positioned against the membrane (5) so that the regions in projection are inserted into the corrugation.

13. Method for testing the leaktightness of a membrane according to any one of Claims 8 to 12, in which the detection hood (55) is equipped with a clamping system (66) capable of flattening the peripheral leaktightness lip (64) against the membrane (8) and in which, prior to placing the detection chamber (61) under negative pressure, the clamping system (66) is actuated so as to guarantee the leaktightness of the detection chamber (61).

14. Method for testing the leaktightness of a membrane according to any one of Claims 7 to 13, in which the leaktightness seal (60) is made of an elastomer material exhibiting a Shore A hardness of between 20 and 50.

15. Method for testing the leaktightness of a membrane according to any one of Claims 6 to 14, in which the detection chamber (61) is placed under negative pressure down to an absolute pressure value of between 50 and 1000 Pa.

16. Method for testing the leaktightness of a membrane according to any one of Claims 6 to 15, in which the leak detection device additionally comprises a homogenization chamber (70) which is positioned between the detection chamber (61) and the analytical apparatus (56), the detection hood (55) comprising a gas inlet (71) equipped with a valve, the homogenization chamber (70) and the gas inlet (71) being coupled to two opposite ends of the detection chamber (61), the valve of the gas inlet (71) being closed during the placing of the detection chamber (61) under negative pressure, the stage of conveying the gas phase present in the detection chamber (61) comprising:

- opening the valve of the gas inlet (71) and conveying the gas phase present in the detection chamber (61) towards the homogenization chamber (70); and
- conveying the gas phase from the homogenization chamber (70) towards the analytical apparatus (56).