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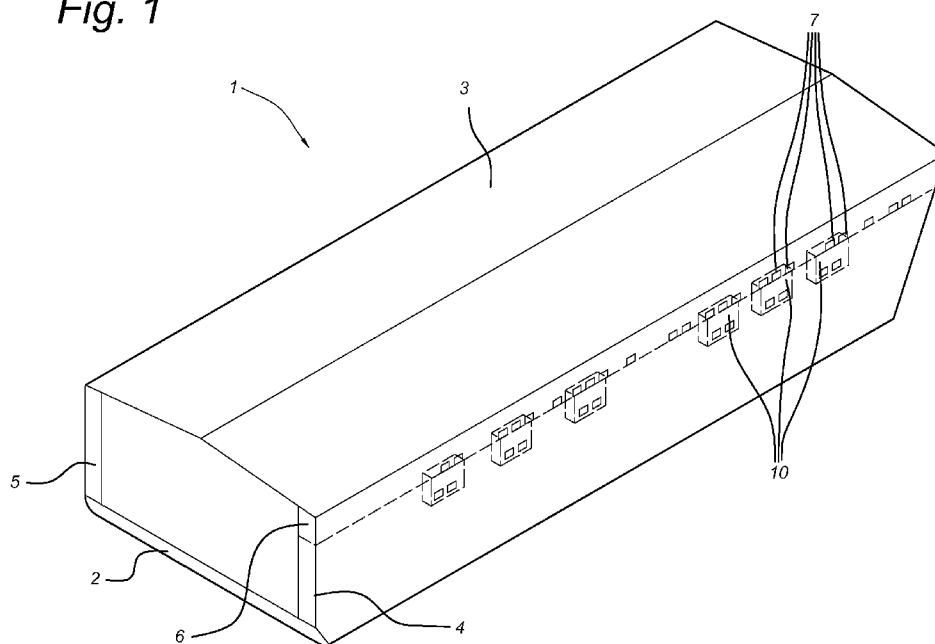
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(54) Title: HYDROCARBON PRODUCTION VESSEL

Fig. 1



(57) **Abstract:** Hydrocarbon production vessel, including a hull extending below a main deck and between a first and a second double sidewall; a corridor in the hull, parallel to the main deck and extending along a first sidewall; a plurality of anchoring points in the corridor, wherein the anchoring points are arranged on a first level above a waterline; at least one opening in the first sidewall, at the first level, adapted to provide access to the anchoring points from outside the hull; at least one compartment in the first or second sidewall of the hull, wherein the compartment includes an auxiliary anchoring point on a second level above the waterline, the second level being lower than the first level, and wherein the at least one compartment includes an auxiliary opening in said first or second sidewall of the hull, to provide access to the auxiliary anchoring point from outside the hull.

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Hydrocarbon production vessel

Technical field

The invention relates to a hydrocarbon production vessel, to a method for mooring a carrier
5 vessel to a hydrocarbon production vessel and a method for constructing a vessel.

Background art

Hydrocarbon production vessels such as Floating Liquefied Natural Gas (FLNG) production
vessels and Floating Production Storage and Offloading (FPSO) vessels typically stay moored at
10 an offshore location for an extended period of time. Produced hydrocarbons, such as Liquefied
Natural Gas (LNG), stabilised oil, hydrocarbon condensate, Natural Gas Liquids (NGLs) and
Liquefied Petroleum Gas (LPG), are offloaded using carrier vessels. These vessels may be of
widely varying size and are usually moored to the FLNG or FPSO production vessels by side-by-
side mooring. Due to the ratio of produced oil/LNG and NGLs/condensate such as LPG, the offload
15 of LPG is typically smaller than that of oil/LNG. LPG carrier vessels are therefore typically also
smaller than oil/LNG carrier vessels.

A disadvantage of the presently used mooring methods is that the slopes of mooring lines
connecting the carrier vessels to the hydrocarbon production vessel vary, depending on the size of
the carrier vessel. Slopes that make a large angle with respect to the horizontal are less capable
20 of transferring forces, which may lead to line snapping which causes dangerous situations.

It would be desirable to provide a hydrocarbon production vessel which at least mitigates the
problem of the prior art.

Summary of the invention

25 According to an aspect of the invention, there is provided a hydrocarbon production vessel,
comprising a hull extending below a main deck and between a first and a second double sidewall;
a corridor in the hull or at the main deck, parallel to the main deck and extending along at least a
part of the first sidewall; a plurality of anchoring points in the corridor, wherein the anchoring points
are arranged on a first level above a waterline; at least one opening in the first sidewall, at the first
30 level, adapted to provide access to the anchoring points from outside the hull for side-by-side
mooring a carrier vessel to the anchoring point; at least one compartment in the first or second
sidewall of the hull, wherein the compartment comprises an auxiliary anchoring point on a second
level above the waterline, the second level being lower than the first level, and wherein the at least
one compartment comprises an auxiliary opening in said first or second sidewall of the hull, to
35 provide access to the auxiliary anchoring point from outside the hull for side-by-side mooring a
carrier vessel to the auxiliary anchoring point.

The hydrocarbon production vessel may be a converted tanker or a newly built structure and
may have very large dimensions: typically a length of between 220-500 m, a width of 30-80 m and
a main deck level of 15-60 m above the waterline. The hydrocarbon production vessel may be
40 anchored to the sea bed. On the main deck of the hydrocarbon production vessel there may be

processing facilities such as gas treatment, gas liquefaction, gas / liquid separation, pumps, vaporizers, compressors, power generators etc. For loading and unloading hydrocarbons, a transfer arm is present on the main deck which is adapted to connect to a carrier vessel. The present invention relates in particular to FLNG production vessels. However, the invention is also applicable on hydrocarbon production vessels such as FPSO (Floating Production, Storage and Offloading) vessels or FSRU (Floating Storage Regasification Unit) vessels. In fact, any floating structure to which vessels of different sizes are moored can benefit from the features and advantages as described herein. In an embodiment, the hydrocarbon production vessel is an FLNG production vessel.

While offloading hydrocarbons from the hydrocarbon production vessel to the carrier vessel, the height difference between the vessels may change dramatically. Although the hydrocarbon production vessel's draught is not greatly affected, the carrier vessel may lower significantly, especially when it concerns a relatively small LPG carrier vessel. As a result, the angle of the mooring lines connecting the hydrocarbon production vessel to the carrier vessel, changes with respect to the horizontal. In fact, the mooring lines may be oriented increasingly vertical while loading the carrier vessel. As a result, transverse forces are not easily transferred anymore by the mooring lines, which may lead to dangerous situations. Also, part of the weight of the carrier vessel may be transferred to the mooring lines, which involves an increased risk for fatigue and excessive loads in the mooring lines. This problem illustrates the need for horizontal mooring lines, thus for auxiliary anchoring points, for mooring smaller carrier vessels such as LPG carrier vessels. In this context, smaller carrier vessels have typically storage volumes of between 20.000 and 100.000 m³ while larger carrier vessels have typically storage volumes of between 100.000 and 300.000 m³. When is referred to LPG carrier vessels, a person skilled in the art will understand that carrier vessels for other NGLs or condensates are included.

At offshore locations, waves may cause resonant effects in the mooring lines due to pitch and roll of the carrier vessel. The waves are especially relevant with smaller carrier vessels. When the angle of the mooring lines with respect to the horizontal increases, the mooring lines will be less and less capable of transferring the forces that come with these resonant effects. Therefore, maintaining the mooring lines as close to horizontal as possible is vital for mooring smaller carrier vessels such as LPG carrier vessels. Preferably, the angle between the mooring lines and the horizontal is less than 25 degrees, when the carrier vessel is moored to the hydrocarbon production vessel, in all stages of loading/offloading.

The construction of the corridor with at least one opening may be referred to as mooring balcony, which may be arranged inside the first double sidewall. Typically a plurality of openings is used in order to provide access to the anchoring points. A person skilled in the art will understand that instead of a plurality of openings one continuous opening along the length of the vessel may be used. Preferably, the vessel comprises a plurality of auxiliary anchoring points, possibly at least one auxiliary anchoring point per compartment or at least two auxiliary anchoring points per compartment.

The anchoring points and auxiliary anchoring points may be provided within the hull and are usually situated between the sidewalls. However, the anchoring points and auxiliary anchoring points may also protrude the mooring balconies or compartments if needed.

5 The hull is provided with double sidewalls, i.e. constructions with two substantially parallel walls at each lateral side. Typically, the space in between the parallel walls is used for water ballast tanks. The compartment is constructed within a double sidewall, i.e. in between the parallel walls. The compartment is located adjacent the outer one of the parallel walls. Preferably the compartment extends across the double sidewall. A person skilled in the art will understand that the openings in the sidewall do not extend all the way through the double sidewall, but are in the
10 outer one of the two parallel walls that together form the double sidewalls, i.e. forming an access opening from outside the hull to the anchoring points in the corridor or to the auxiliary anchoring point in the compartment. In use, mooring lines thus extend through the openings and/or auxiliary openings from a moored carrier vessel to the anchoring points and/or auxiliary anchoring points.

The mooring lines connecting the hydrocarbon production vessel with the carrier vessels
15 comprise spring lines for longitudinal positioning, breast lines and forward/stern lines for transverse positioning. Preferably 16 to 20 mooring lines are used for mooring the carrier vessel to the hydrocarbon production vessel. The mooring lines are preferably made of plastic or wire rope (either attached to a nylon tail for elasticity purposes).

In an embodiment, the compartment extends downwards from the corridor.

20 In that case, the compartment and the corridor are both in the first sidewall and thus provided at the same lateral side of the hydrocarbon production vessel, implying that the anchoring points and at least one auxiliary anchoring point are also on the same lateral side. The arrangement with anchoring points and auxiliary anchoring point at the same side has the advantage that a carrier vessel which is moored on this lateral side can use the anchoring points at the first level and at the
25 second level simultaneously. This arrangement allows for variable height mooring and may be convenient when the draught of the carrier vessel changes dramatically.

In an embodiment, the hydrocarbon production vessel further comprises a further corridor in the hull, parallel to the main deck and extending along at least part of the second sidewall, opposite to the corridor, wherein the compartment extends downwards from the further corridor.

30 This arrangement has the advantage that the corridor and further corridor are arranged at opposite sides of the vessel. Consequently, the anchoring points and at least one auxiliary anchoring point are arranged at opposite sides of the hydrocarbon production vessel. This arrangement allows for larger carrier vessels to moor side by side at one lateral side of the hydrocarbon production vessel, using the anchoring points at the first level, while smaller carrier
35 vessels can moor side by side at the opposite lateral side of the hydrocarbon production vessel, using the auxiliary anchoring point(s) at the second level. Simultaneous mooring with carrier vessels with different sizes is thus possible.

In an embodiment, compartments as described above are provided in the double sidewalls at both sides of the vessel. The compartments at both sides allow for the mooring of smaller vessels
40 at either side of the hydrocarbon production vessel.

In an embodiment, the first level is arranged at or below a level of the main deck.

The first level with anchoring points may be provided with the corridor at the main deck, which means that the double sidewall, which is used for water ballast tanks, can extend up to the main deck without being obstructed by the corridor. Alternatively, the first level with anchoring points is provided below the main deck, which is typically closer to the freeboard deck height of carrier vessels which results in more horizontal orientation of mooring lines. Furthermore, the corridor is in this case well-protected inside the hull, increasing the safety of the personnel.

In an embodiment, the compartment is accessible from the corridor or from the further corridor, preferably via a staircase in the compartment, connecting the first level to the second level. The staircase allows for personnel to access the compartment in an easy manner, which saves time in handling the mooring lines. A person skilled in the art will understand that the entrance from the corridor or further corridor to the compartment may be provided with doors which are preferably lockable and watertight for safety reasons.

In an embodiment, the staircase is surrounded by walls so as to protect it from ballistic objects such as snapping lines.

Although in the present invention line snapping is prevented to large extent, it is still important to protect personnel from any risk. Furthermore, the walls also protect from heavy winds and other weather conditions. Additionally, the openings at the first and/or second level may be provided with shutters to close them. The shutters will provide protection against piracy too.

In an embodiment, the compartment is arranged within said first or second double sidewall and separated from the rest of the first or second double sidewall by means of watertight walls. Watertight walls protect the hull from any water ingress, and thus improve durability and safety.

In an embodiment, the vessel comprises at least two compartments in said first or second sidewall of the hull, wherein the compartments each comprise an auxiliary anchoring point on the second level above the waterline, and wherein the compartments each comprise an auxiliary opening in said first or second sidewall of the hull to provide access to the auxiliary anchoring points from outside the hull.

Multiple compartments allow for anchoring points for the different mooring lines: spring lines, breast lines and stern lines. In an embodiment, five or more of such compartments are present in a sidewall of the hull.

In an embodiment, the compartments are connected by an auxiliary corridor at the second level. The auxiliary corridor allows for quick movement of personnel between the auxiliary anchoring points.

In an embodiment, the double sidewalls comprise water ballast tanks surrounding the at least one compartment. The presence of ballast tanks has the advantage that the double sidewalls are used effectively. It is also a reason why the compartments are preferably as small as possible, so as to allow for enough space to be used for the water ballast tanks. The height of the compartment may be defined as the distance between the floor of the compartment and the floor of the corridor or further corridor or main deck directly above, i.e. the level from which the compartment is accessed. In other words, this height may be the height of the vertical staircase if present. The

height is preferably less than 20 m, more preferably between 8 m and 16 m. The width of the compartment in the direction along the sidewall may be less than 15 m, preferably less than 10 m, more preferably between 4 m and 8 m. The depth of the compartment in the direction normal to the sidewall may be less than 8 m, preferably less than 6 m, more preferably between 3 m and 5 m.

5 In an embodiment, the anchoring points and/or auxiliary anchoring points comprise quick release hooks. Quick release hooks are safe and reliable options for anchoring.

In an embodiment, the auxiliary anchoring point comprises a sleeve for surrounding a mooring line. The mooring line may be received by a lubricated sleeve which is fixed in the compartment and leads to a winch or hook, either in the compartment or in the corridor above the
10 compartment.

In an embodiment, the compartment is formed from closed deck portions and bulkhead portions. This arrangement is a convenient way to construct the compartment in the double sidewall of the vessel. Decks and bulkheads are usually present in hull for structural stability. In the double sidewall, there are openings in the decks and bulkheads to allow water to flow through when the
15 space is used as ballast tanks. Closing off a number of deck portions and bulkhead portions is thus a convenient way of constructing a closed compartment.

In an embodiment, the first level is provided between 3 and 6 meters below the main deck, and wherein the second level is provided between 6 and 16 meters below the main deck. These levels are useful for mooring carrier vessels of typical sizes. Preferably, the first level is provided
20 about 4.5 meters below the main deck and the second level is provided about 8 meters below the main deck or the first level.

In an embodiment, the anchoring points are adapted for side-by-side mooring LNG carrier vessels, and the auxiliary anchoring points are adapted for side-by-side mooring LPG carrier vessels.

25 According to an aspect of the invention, there is provided a method for mooring an LPG carrier vessel to a hydrocarbon production vessel, wherein the hydrocarbon production vessel comprises anchoring points at a first level above the waterline, and an auxiliary anchoring point at a second level above the waterline, wherein the second level is below the first level, the method comprising the steps of:

30 - providing an LPG carrier vessel;
- side-by-side mooring the LPG carrier vessel to an auxiliary anchoring point of the hydrocarbon production vessel.

In an embodiment, the hydrocarbon production vessel is a hydrocarbon production vessel as described above, in particular an FLNG production vessel.

35 Mooring the LPG carrier vessel to at least one auxiliary anchoring point provides for mooring lines with smaller angles with respect to the horizontal, which reduces fatigue and line snapping risk.

According to an aspect of the invention, there is provided a method for constructing a vessel, comprising the steps of:

- providing a vessel including a hull with a double sidewall, wherein the vessel comprises a plurality of anchoring points at a first level above the waterline;
 - constructing a compartment in the double sidewall of the hull;
 - arranging an auxiliary anchoring point in the compartment at a second level above the
- 5 waterline, wherein the second level is lower than the first level.

The various aspects discussed in this patent can be combined in order to provide additional advantages.

Brief description of drawings

10 Embodiments will now be described, by way of example only, with reference to the accompanying schematic drawings in which corresponding reference symbols indicate corresponding parts.

Figure 1 shows a perspective view of a hydrocarbon production vessel according to the invention;

15 Figure 2 shows a side view of the hydrocarbon production vessel of Figure 1;

Figures 3A-B show cross-sectional views of an FLNG production vessel moored to a LNGC vessel;

Figures 3C-D show cross-sectional views of an FLNG production vessel moored to a LPGC vessel;

20 Figure 4A shows a cross-sectional view of a hydrocarbon production vessel according to an embodiment;

Figure 4B shows a cross-sectional view of a hydrocarbon production vessel according to an alternative embodiment;

25 Figure 5 shows a side view of the hydrocarbon production vessel according to an embodiment of the invention.

The figures are meant for illustrative purposes only, and do not serve as restriction of the scope or the protection as laid down by the claims.

Detailed description

30 Further advantages, features and details of the present invention will be explained in the following description of some embodiments thereof. In the description, reference is made to the attached figures.

Figure 1 shows a perspective schematic view of a hydrocarbon production vessel 1 which includes a hull 2, a main deck 3 and a first and a second double sidewall 4, 5. Note that some
35 details of the vessel 1 have been omitted for clarity reasons, but a person skilled in the art will understand which further components are required to operate the hydrocarbon production vessel 1. A corridor 6 is provided in the first sidewall 4 along at least a part thereof. The first sidewall 4 comprises openings 7 at the height of the corridor 6, to provide access to the corridor 6 from outside the hull 2. The first sidewall 4 further comprises compartments 10, which have the shape of a
40 cuboid, and extend downwards from the corridor 6.

Figure 2 shows a side view of the hydrocarbon production vessel 1. The openings 7 are provided at a first level L1 above the waterline WL in the first sidewall 4. The compartments 10 extend downwards and are provided with auxiliary openings 11 in the first sidewall 4, at a second level L2 above the waterline WL. The second level L2 is lower than the first level L1, i.e., L2 is closer to the waterline WL than L1.

Figures 3A-B show a cross-section of the hydrocarbon production vessel 1 – in particular a FLNG production vessel 1 – moored to a large carrier vessel, e.g. a LNG carrier vessel or LNGC vessel 20. In the corridor 6 of the FLNG production vessel 1 there are provided anchoring points 8 which can be accessed from outside the vessel 1. The LNGC vessel 20 is moored to the anchoring points 8 with mooring lines 40. Figure 3A shows the LNGC vessel 20 in ballast state, i.e. before loading LNG onto the LNGC vessel 20. In that state, the draught of the LNGC vessel 20 is limited and the mooring line 40 slope upwards from the FLNG production vessel 1 to the LNGC vessel 20. In Figure 3B, the LNGC vessel 20 is full and has a larger draught, causing the mooring lines 40 to slope downwards from the FLNG production vessel 1.

Figures 3C-3D show a cross-section of the FLNG production vessel 1 moored to a small carrier vessel, e.g. a LPG carrier vessel or LPGC vessel 30. For mooring small vessels, the FLNG production vessel 1 comprises a compartment 10 in the hull 2, extending downwards from the corridor 6 below the anchoring points 8. The compartment 10 comprises one or more auxiliary anchoring points 12, which can be accessed by personnel from the corridor 6 using a vertical staircase 13 in the compartment 10. The LPGC vessel is moored to the auxiliary anchoring points 12 using mooring lines 40. Figure 3C shows the LPGC vessel 30 in ballast state, i.e. before loading LPG onto the LPGC vessel 30. Although the LPGC vessel 30 is much smaller than the LNGC vessel of Figures 3A-3B, the mooring lines 40 slope still upwards from the FLNG production vessel 1 because it is moored to the auxiliary anchoring point 12. Figure 3D shows the LPGC vessel 30 in full state, when the draught is much larger. The mooring lines 40 now slope downwards from the FLNG production vessel 1 to the LPGC vessel 30. In this state, mooring the LPGC vessel 30 from the usual anchoring points 8 would result in the mooring lines 40 being almost vertical, which may lead to dangerous situations. Therefore, the presence of the auxiliary anchoring points 12 increases the safety of the mooring arrangement.

Figure 4A shows again a cross-section of the hydrocarbon production vessel 1. As shown before, the corridor 6 comprises anchoring points 8 and openings 7 at a first level L1 above the waterline WL. The compartment 10 is provided in the first sidewall 4 of the hydrocarbon production vessel 1. At least some of the remaining space in the first sidewall 4 is used for water ballast tanks 9. The compartment 10 comprises auxiliary anchoring points 12 and auxiliary openings 11 at a second level L2 above the waterline WL, and further comprises a staircase 13 for personnel access to the auxiliary anchoring points 12.

Figure 4B shows a cross-section of an alternative embodiment of a hydrocarbon production vessel 101. The hydrocarbon production vessel 101 shows a corridor 106 in the first sidewall 104 of the hull 102, from which a compartment 110 extends downwards. The compartment 110 comprises auxiliary anchoring points 112 and auxiliary openings 111 at a second level L2 above

the waterline WL. A staircase 113 in the compartment 110 provides personnel access to the auxiliary anchoring points 112 from the corridor 106. The hydrocarbon production vessel 101 further comprises a further corridor 141 in a second sidewall 105 along at least a part thereof, opposite to the first sidewall 104 which comprises the corridor 106. In the further corridor 141, there are
5 provided anchoring points 108 and openings 107 for accessing the anchoring points 108 from outside the hull 102. The anchoring points 108 and openings 107 are provided at a first level L1 above the waterline WL. This embodiment allows smaller carrier vessels to moor at the side of the auxiliary anchoring points 112, and larger carrier vessels simultaneously at the side of the anchoring points 108. To this end, the hydrocarbon production vessel 101 will have offloading arms
10 (not shown) at both lateral sides of the hull 102 for simultaneous offloading, for instance of both LNG and LPG.

Figure 5 shows a side view of the hydrocarbon production vessel 1 according to an embodiment of the invention.

In Figure 5 entities with the same reference number as shown in Figures 1 – 4 refer to
15 corresponding entities.

In this embodiment, the hydrocarbon production vessel comprises two or more compartments 10 as described above with reference to Figure 2. Between adjacent compartments an internal lower corridor 14 is provided that connects the compartments at the second level L2. The internal lower corridor 14 is arranged within the double side wall 4; 5. The internal lower corridor
20 14 provides an internal passage at the second level L2 between the adjacent compartments.

Typically the internal lower corridor 14 is arranged within said first or second double sidewall and separated from the rest of the first or second double sidewall by means of watertight walls.

Additionally, the internal lower corridor 14 has an entrance to the second level of the compartment that may be provided with a door (not shown) which is preferably lockable and
25 watertight for safety reasons.

As shown in Figure 5, most of the compartments are connected by internal lower corridors. The person skilled in the art will appreciate that depending on the design of the vessel, one or more additional compartments in the double sidewall may be present that are not connected to other compartments by such internal lower corridors.

30 The present invention may be embodied in other specific forms without departing from its spirit or essential characteristics. The described embodiments are to be considered in all respects only as illustrative and not restrictive. The scope of the invention is, therefore, indicated by the appended claims rather than by the foregoing description. It will be apparent to the person skilled in the art that alternative and equivalent embodiments of the invention can be conceived and
35 reduced to practice. All changes which come within the meaning and range of equivalency of the claims are to be embraced within their scope.

CLAIMS

1. A hydrocarbon production vessel (1; 101), comprising
 - 5 - a hull (2; 102) extending below a main deck (3) and between a first and a second double sidewall (4, 5; 104);
 - a corridor (6) in the hull or at the main deck, parallel to the main deck and extending along at least part of the first sidewall (4; 104);
 - a plurality of anchoring points (8; 108) in the corridor, wherein the anchoring points are arranged on a first level (L1) above a waterline;
 - 10 - at least one opening (7; 107) in the first sidewall, at the first level, adapted to provide access to the anchoring points from outside the hull for side-by-side mooring a carrier vessel to the anchoring point;
 - at least one compartment (10; 110) in the first or second sidewall of the hull, wherein the compartment comprises an auxiliary anchoring point (12; 112) on a second level (L2) above the waterline, the second level being lower than the first level, and wherein the at least one compartment comprises an auxiliary opening (11; 111) in said first or second sidewall of the hull, to provide access to the auxiliary anchoring point from outside the hull for side-by-side mooring a carrier vessel to the auxiliary anchoring point.
 - 15
 - 20
2. The hydrocarbon production vessel according to claim 1, wherein the compartment extends downwards from the corridor.
3. The hydrocarbon production vessel according to claim 1, further comprising a further corridor (141) in the hull, parallel to the main deck and extending along at least a part of the second sidewall (105), wherein the compartment extends downwards from the further corridor.
- 25
4. The hydrocarbon production vessel according to any one of the preceding claims, wherein the first level is arranged at or below a level of the main deck.
- 30
5. The hydrocarbon production vessel according to any one of the preceding claims, wherein the compartment is accessible from the corridor or from the further corridor, preferably via a staircase (13; 113) in the compartment, connecting the first level to the second level.
- 35
6. The hydrocarbon production vessel according to claim 5, wherein the staircase is surrounded by walls so as to protect it from ballistic objects such as snapping lines.

- 5
7. The hydrocarbon production vessel according to any one of the preceding claims, wherein the compartment is arranged within said first or second double sidewall and separated from the rest of said first or second double sidewall by means of watertight walls.
- 10
8. The hydrocarbon production vessel according to any one of the preceding claims, wherein the vessel comprises at least two compartments in said first or second sidewall of the hull, wherein the compartments each comprise an auxiliary anchoring point on the second level above the waterline, and wherein the compartments each comprise an auxiliary opening in said first or second sidewall of the hull to provide access to the auxiliary anchoring points from outside the hull.
- 15
9. The hydrocarbon production vessel according to claim 8, wherein the compartments are connected by an auxiliary corridor (14) at the second level.
- 20
10. The hydrocarbon production vessel according to any one of the preceding claims, wherein the double sidewalls comprise water ballast tanks surrounding the at least one compartment.
- 25
11. The hydrocarbon production vessel according to any one of the preceding claims, wherein the first level is provided between 3 and 6 meters below the main deck, and wherein the second level is provided between 6 and 10 meters below the main deck.
- 30
12. The hydrocarbon production vessel according to any one of the preceding claims, wherein the anchoring points are adapted for side-by-side mooring LNG carrier vessels, and wherein the auxiliary anchoring point is adapted for side-by-side mooring LPG carrier vessels.
- 35
13. The hydrocarbon production vessel according to any one of the preceding claims, wherein the vessel comprises at least two compartments in said first or second sidewall of the hull, and as the auxiliary corridor an internal lower corridor (14) is provided that connects the compartments at the second level (L2).
- 40
14. The hydrocarbon production vessel according to claim 13, wherein the internal lower corridor (14) is arranged within the double side wall (4; 5).
15. The hydrocarbon production vessel according to claim 13 or claim 14, wherein the internal lower corridor (14) provides an internal passage at the second level (L2) between the adjacent compartments.

16. A method for mooring an LPG carrier vessel to a hydrocarbon production vessel, wherein the hydrocarbon production vessel comprises anchoring points at a first level above the waterline, and an auxiliary anchoring point at a second level above the waterline, wherein the second level is below the first level, the method comprising the steps of:
- 5 - providing an LPG carrier vessel;
- side-by-side mooring the LPG carrier vessel to an auxiliary anchoring point of the hydrocarbon production vessel.
17. The method according to claim 16, wherein the hydrocarbon production vessel is a
- 10 hydrocarbon production vessel according to any one of claims 1-15.
18. A method for constructing a vessel, comprising the steps of:
- providing a vessel including a hull with a double sidewall, wherein the vessel comprises a plurality of anchoring points at a first level above the waterline;
- 15 - constructing at least one compartment in the double sidewall of the hull;
- arranging an auxiliary anchoring point in the compartment at a second level above the waterline, wherein the second level is lower than the first level.
19. The method for constructing a vessel according to claim 18, further comprising:
- 20 providing two or more compartments in the double sidewall of the hull;
- providing an internal lower corridor (14) that connects the compartments at the second level (L2), the internal lower corridor being arranged within the double sidewall.

Fig. 1

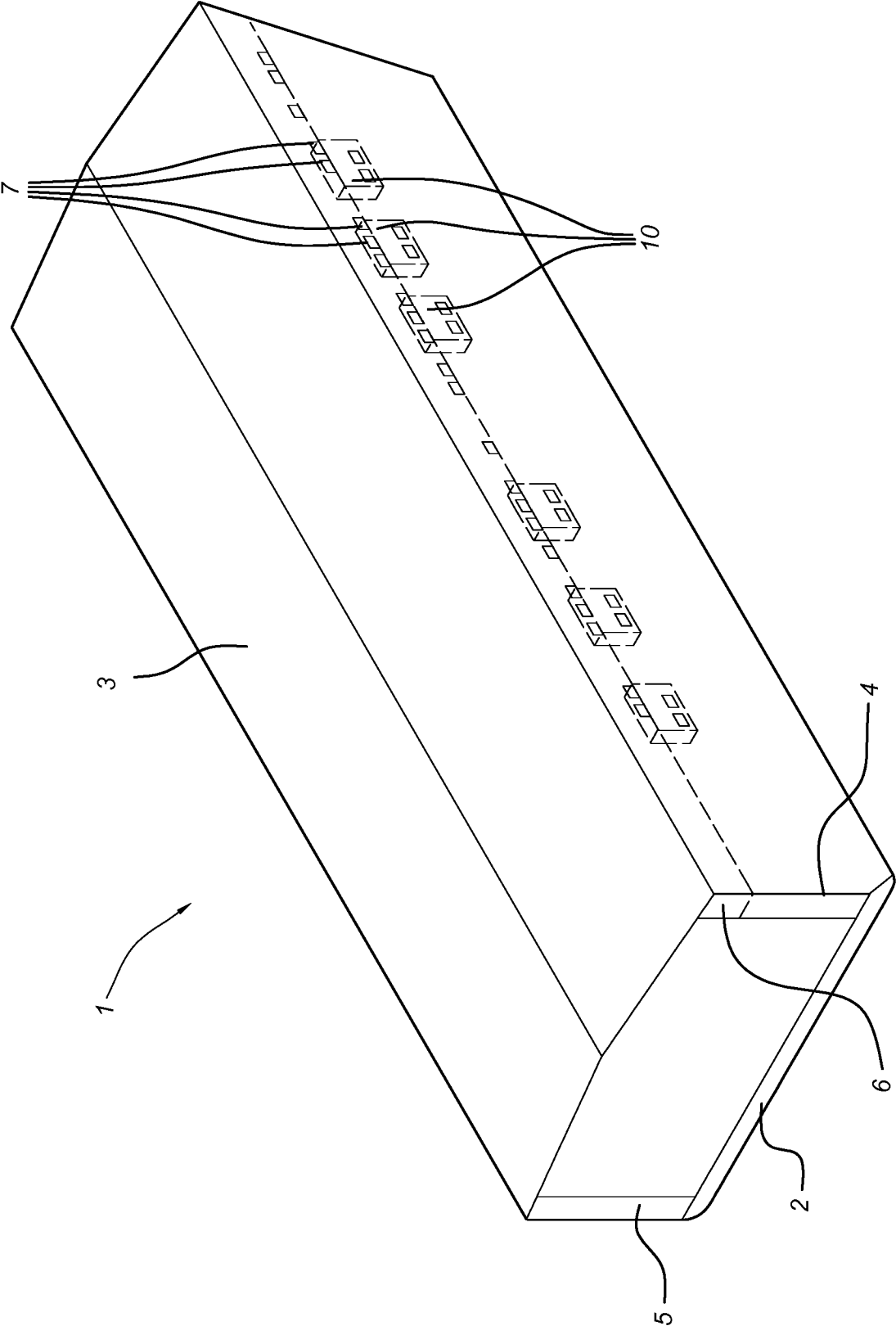
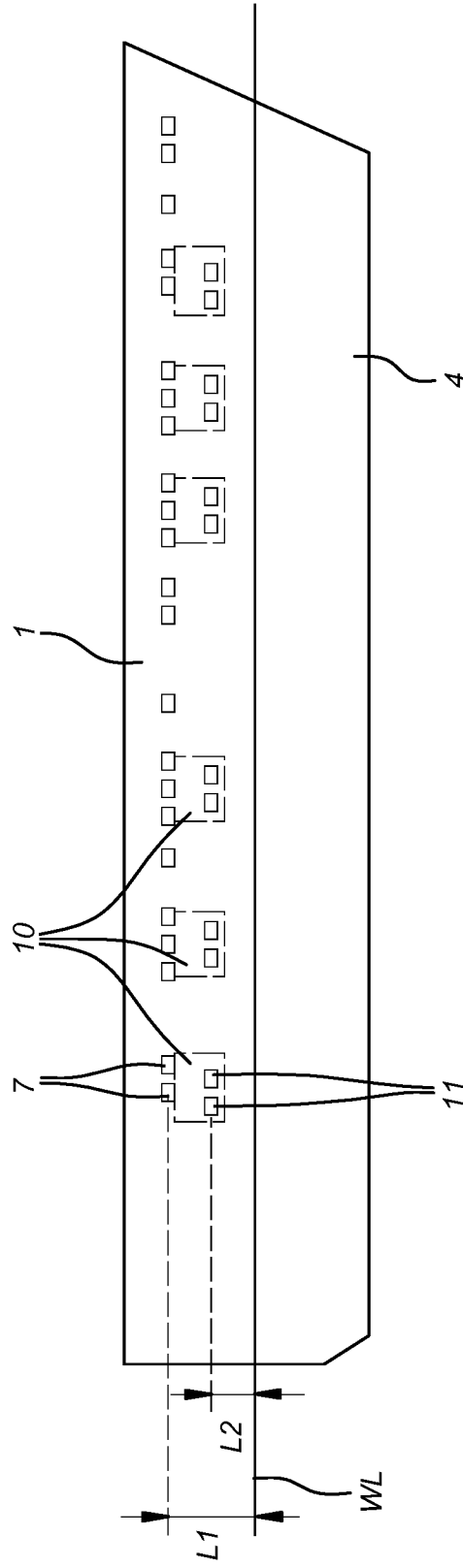


Fig. 2



3/5

Fig. 3A

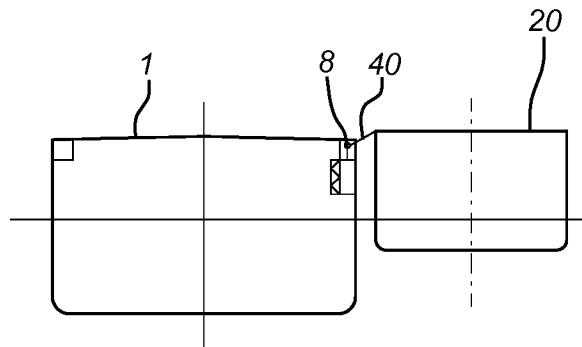


Fig. 3B

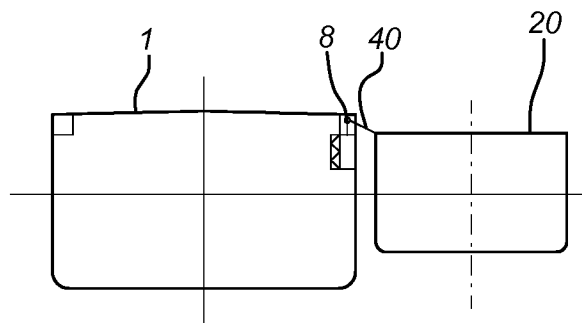


Fig. 3C

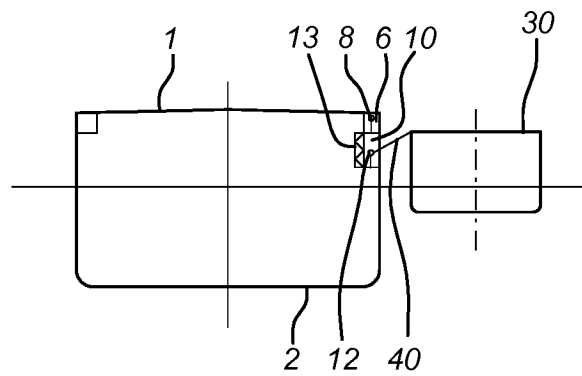
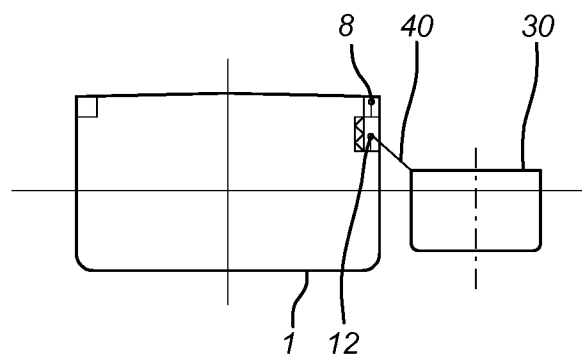


Fig. 3D



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Fig.4A

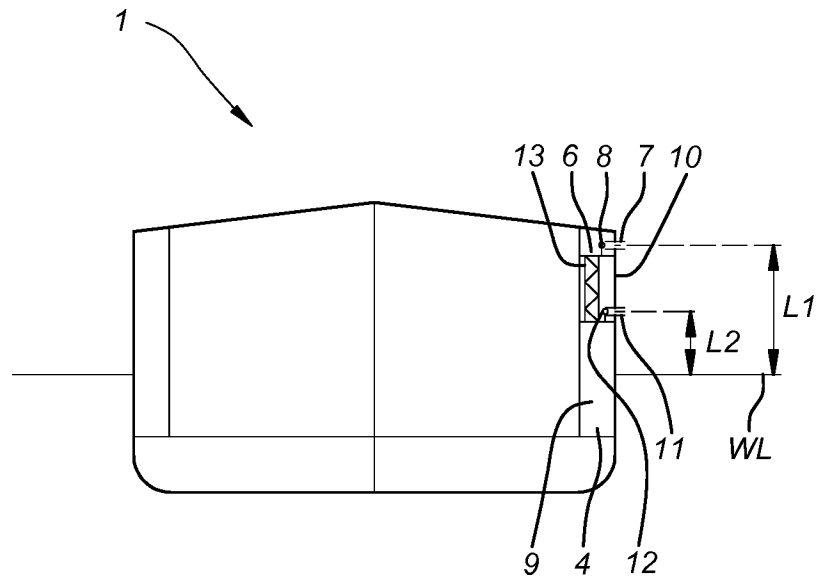


Fig.4B

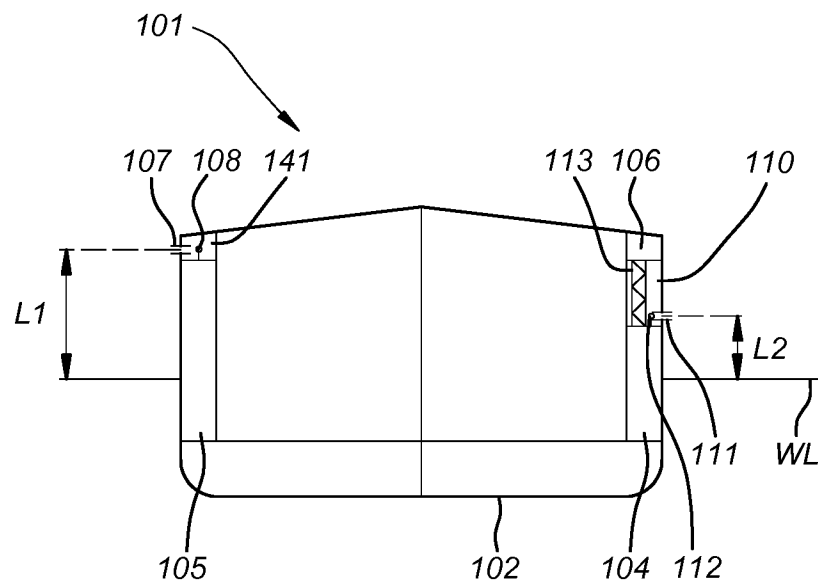
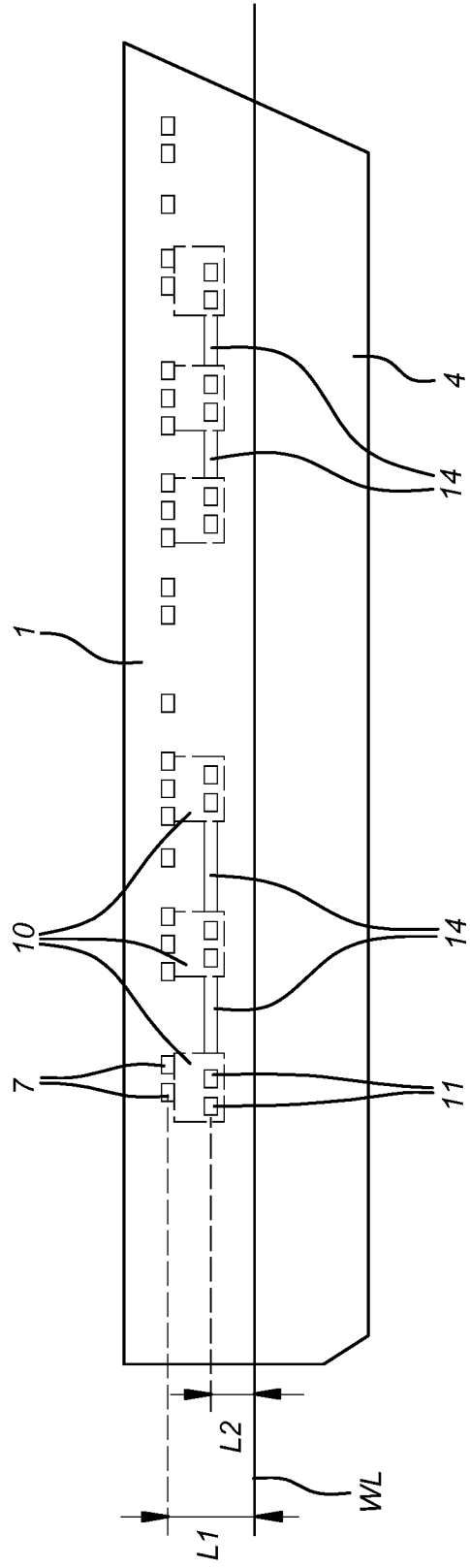


Fig. 5



INTERNATIONAL SEARCH REPORT

International application No
PCT/EP2019/075017

A. CLASSIFICATION OF SUBJECT MATTER INV. B63B27/24 B63B27/25 B63B21/04 B63B21/24 B63B27/30 ADD.		
According to International Patent Classification (IPC) or to both national classification and IPC		
B. FIELDS SEARCHED Minimum documentation searched (classification system followed by classification symbols) B63B		
Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched		
Electronic data base consulted during the international search (name of data base and, where practicable, search terms used) EPO-Internal, WPI Data		
C. DOCUMENTS CONSIDERED TO BE RELEVANT		
Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	EP 2 256 026 A1 (SHELL INT RESEARCH [NL]) 1 December 2010 (2010-12-01) paragraphs [0012], [0013], [0016] - [0027]; figures -----	1-19
A	KR 2012 0054349 A (SAMSUNG HEAVY IND [KR]) 30 May 2012 (2012-05-30) figures -----	1-19
X	KR 2016 0015874 A (DAEWOO SHIPBUILDING & MARINE [KR]) 15 February 2016 (2016-02-15) paragraphs [0016] - [0023]; claims; figures -----	1-19
☐ Further documents are listed in the continuation of Box C. ☒ See patent family annex.		
* Special categories of cited documents : "A" document defining the general state of the art which is not considered to be of particular relevance "E" earlier application or patent but published on or after the international filing date "L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified) "O" document referring to an oral disclosure, use, exhibition or other means "P" document published prior to the international filing date but later than the priority date claimed "T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention "X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone "Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art "&" document member of the same patent family		
Date of the actual completion of the international search 28 October 2019		Date of mailing of the international search report 07/11/2019
Name and mailing address of the ISA/ European Patent Office, P.B. 5818 Patentlaan 2 NL - 2280 HV Rijswijk Tel. (+31-70) 340-2040, Fax: (+31-70) 340-3016		Authorized officer Knoflachner, Nikolaus

INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No

PCT/EP2019/075017

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