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(54) **Semi-weathervaning anchoring system**

Halbschwenkendes Verankerungssystem

Système d'anchorage semi-pivotant

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Description

[0001] The invention relates to a vessel comprising at least two anchor lines connected with a first end respectively at a substantially fixed position near the bow and near the stern of the vessel, at least one anchor line comprising a first line section extending to a connection point located below keel level of the vessel and at least two branching anchor lines, each connected with one end to the anchor line in the connection point and connected with the other end to the seabed.

[0002] From GB-A-2,061,850 such a mooring system is known in which a vessel is moored to a drilling rig, the mooring lines being attached to mooring winches. By tightening or slackening the mooring lines, the vessel can assume a large number of different orientations with respect to the drilling rig. From the seabed, an anchor line extends to a submerged buoy to which the vessel is attached via a wire rope. The buoy is attached to the seabed by a branching anchor line which extends at an obtuse angle with respect to the seabed. The branching anchor line does not have a load bearing function for the moored vessel but maintains the submerged buoy in a fixed position.

[0003] From US-A-3,583,354 a bow-stern spread catenary mooring system is known in which the vessel is maintained in a fixed position by means of four anchor lines, two of which are connected to the bow of the vessel and two at the stern. By applying the correct tension to these anchor lines it is possible in normal weather to maintain the ship in a reasonably fixed position. According to US-A-3,583,354 during storm conditions the stern anchor lines are slackened, such that the vessel can weathervane around the bow through 90°.

[0004] From US-A-3,822,663 a weathervaning vessel is known, which is anchored to the seabed by means of four anchor lines. The vessel is provided with a track which encircles the hull of the vessel. A plurality of movable carriages are guided along the track, one anchor line being connected to each carriage. The carriages can be placed at specific point along the track, each carriage being equipped with a winch for accumulating or discharging a respective anchor line. By moving the position of the carriages along the track, and by selectively paying in or paying out the anchor lines, the vessel can weathervane about a substantially fixed position point located between the bow and the stern. The known anchoring construction, however, is relatively complex and the anchor line arrangement covers a relatively large part of the seabed. Hence the anchor lines may interfere with the operating area for the risers and leaves little room for the anchoring spread of a drilling/workover rig when such a rig is anchored next to, or in close proximity to the drilling vessel.

[0005] It is therefore an object of the present invention to provide for a vessel which can weathervane within a predetermined area, in a controlled manner, using a relatively simple anchoring system. It is a further object of

the present invention to provide a vessel comprising such a weathervaning anchoring system having a reduced anchoring layout and leaving a relatively large seabed area for the risers and for the anchoring spread of adjacent vessels such as drilling/workover rigs or shuttle tankers.

[0006] Thereto the vessel according to the present invention is characterized in that at least one riser extends from the vessel to a subsea structure, the two branching anchor lines enclosing an acute angle with the seabed, all anchor lines of the vessel being attached to the seabed, for allowing weathervaning of the vessel around the stern and/or bow through relatively small angles. With the above anchoring arrangement the vessel according to the present invention can be easily accessed along its sides. Thereby other vessels can easily approach and moor aside the vessel according to the present invention, and sufficient space is available for location of for instance flexible risers.

[0007] By providing at least one anchor line with two branching anchor lines, a very stable multiple point mooring system (at least a three point system) is provided which will leave enough play for the vessel to weathervane through angles less than 90° in both directions. Preferably both the bow and the stern anchor lines each comprise at least two branching anchor lines.

[0008] In one embodiment the anchor lines extend substantially vertically downward. Hereby access of the vessel is further increased.

[0009] As used herein, the term "substantially vertical" shall mean a position from the first anchor line section being inclined from the vertical position by no more than 45°.

[0010] In another embodiment a buoyancy member is connected near the branching anchor lines. In this way the stiffness of the anchor arrangement can be adjusted for varying the weathervaning action. The term "anchor line" as used herein comprises anchor cables, ropes, chains or combinations thereof.

[0011] In one embodiment at least one anchor line extends through a generally vertical shaft extending through the hull of the vessel from deck level to keel level. In this way the anchor lines are located below the vessel, and the bow and stern are easily accessible as well.

[0012] Preferably a counterweight is connected to at least one of the anchor lines, such that the tension in the vertically extending part can be adjusted and the stiffness of the anchor line system can be varied for adjustment of the weathervaning action.

[0013] Another embodiment of a vessel according to the present invention is characterized in that the pulling device can vary the length of the at least one anchor line such that both anchor lines are maintained in a tensioned state, and the vessel can weathervane around the bow anchor line or the stern anchor line.

[0014] The invention is based on the insight that during normal operating conditions, a vessel will be sub-

jected to wind and wave directions which are more or less constant for larger time periods. During these substantially constant conditions, the vessel only needs to weathervane through a relatively small angle such as between 0° and 90°. For these conditions, by properly tensioning and slackening at least one of the anchor lines at the bow and stern of the vessel, an efficient and controlled weathervaning action can be achieved, without the need of a complex system of displaceable winches.

[0015] In one embodiment the pulling device, such as for instance a winch system, according to the invention varies the length of the anchor lines simultaneously. Variation of the anchor lines can take place under the control of a mean position sensor which actuates the winch system on the basis of the mean position of the vessel, the wind or wave directions, etc. The change in one of the above environmental characteristics will change the control signal and hence the stiffness of the anchor line system.

[0016] Preferably each anchor line is connected to the pulling device via a sheave located generally at the centre line of the vessel. By the placement of the sheaves on the centre line of the vessel, a symmetric weathervaning action to both sides is achieved.

[0017] According to an embodiment of the vessel according to the present invention the anchor lines are connected to a single pulling device or winch. By operation of this single pulling device, bow and stern anchor lines can be simultaneously slackened or tightened to obtain a proper weathervaning position of the vessel. In one embodiment, a single anchor line passes from the bow, via the pulling device to the stern of the vessel, such that the length of the anchor line that is for instance taken in at the bow corresponds with the length of anchor line payed out at the stern.

[0018] By passing the anchor lines through a vertical shaft or hawser pipe extending from deck level to keel level, the sides of the vessel are easily accessible, and a shuttle tanker can be moored alongside the vessel according to the present invention without interference with the anchor lines. vessel according to the present invention without interference with the anchor lines.

[0019] By connecting at least one of the anchor lines below sea level to a counterweight, which in turn is connected to the seabed, the vertical arm of the weathervaning system can be adjusted and thereby the stiffness of the weathervaning system can be varied. Preferably the vessel according to the invention is connected to a subsea hydrocarbon structure via at least one riser. The riser is connected to the side of the vessel near midship where dynamic movements are minimum thereby increasing the longevity of these risers. The riser may pass through the vessel via the moonpool. As the movements of the vessel are limited to rotations of approximately 90 degrees, the risers also do not require complicated swivels at their attachment points as the riser itself can twist this angle.

[0020] Some embodiments of a vessel according to the present invention will be explained in detail, by way of example, with reference to the accompanying drawings. In the drawings:

Figure 1a shows a schematic side view of a vessel according to the present invention wherein the anchor lines are connected to the bow and the stern, Figure 1b shows an anchoring arrangement according to figure 1 comprising buoyancy means,

Figure 2 shows a schematic side view in which the front most anchor line is connected to a pulling device, both front and rear anchor lines extending through a vertical shaft in the vessel,

Figure 3 shows a schematic side view of a vessel wherein the anchor lines at the bow and at the stern are mutually connected to a cable, the bow anchor line being connected to a winch,

Figure 4 shows a schematic side view of an embodiment of a vessel according to the present invention wherein each anchor line is connected to a separate winch,

Figure 5 shows a schematic side view of an embodiment wherein the anchor lines are connected to a single winch,

Figure 6 shows an embodiment wherein the anchor lines are passed through vertical shafts in the vessel,

Figures 7 and 8 show a schematic plan view of the vessel according to the present invention in different weathervaning positions, and

Figure 9 shows a schematic perspective view of the embodiment using a single winch and a single anchor line as shown in figure 8.

[0021] Figure 1a shows a vessel 1 which at its bow 2 and at its stern 4 is connected to anchor lines 3 and 5. The anchor lines 3 and 5 comprise a generally vertically extending section and two branching sections 11,11', 12,12' attached to the vertical parts.

[0022] In the embodiment of figure 1b, submerged buoys 13,14 are attached to the stern and bow anchor lines. By positioning of the buoys 13,14, the stiffness of the anchoring system can be varied.

[0023] In the embodiment shown in figure 2, the bow anchor line 3 is connected to a fixed position winch 6. Both stern and bow anchor lines are connected to counter weights 9 and 10. Each anchor line extends through a vertical shaft 19,20 extending from deck level to keel level. The vessel will weathervane around the anchor line which is stiffest. If both anchor lines have the same stiffness and the winch 6 pays out bow anchor line 3, the vessel will weathervane around the stern anchor line 5 because this anchor line is relatively stiffer than anchor line 3. In reverse, if winch 6 takes in bow anchor line 3, then the vessel will be weathervaning around anchor line 3 because this anchor line will be stiffer than the stern anchor line 5.

[0024] In the embodiment shown in figure 3, the bow anchor line and stern anchor line are mutually connected by a cable 13. By adjusting the length of the bow anchor line 3 by operation of the winch 6, the stern counter weights 9 will be lifted or lowered and the stiffness of the system will be varied for adjustment of the weathervaning action thereof.

[0025] Figure 4 shows a vessel 1 with at its bow 2 and its stern 4 respective winches 6,7. To each winch 6,7 an anchor line 3,5 is connected. The anchor lines 3,5 may be comprised of ropes, chains or cables. Each anchor line 3,5 in the present embodiment is connected to a counterweight 9,10 which counterweight in turn is connected to the seabed by means of chains or cables 11,12. The stiffness of the weathervaning system according to the present invention may be adjusted by changing the weight of the counterweight 9 and 10 or by changing the length of the vertical arm (vertical part of the anchor line 3,5). The use of the counterweights 9 and 10 however is optional, and instead thereof buoys could be used as in figure 1b.

[0026] Risers 8 are connected near midship of the vessel 1, which risers are connected to a subsea oil or gas structure which is not shown in the drawings.

[0027] Figure 5 shows an embodiment wherein the anchor lines 3,5 are connected to a fixed position sheave 16,17 at the stern and bow of the vessel 1. The anchor lines are connected to a single winch 15 on the vessel 1.

[0028] In the embodiment of figure 6, each anchor line 3,5 is passed through a vertical shaft 19,20 extending from deck level to keel level through the hull of the vessel 1. In this way, the anchor lines 3,5 stay clear from the sides of the vessel and do not interfere with other vessels which need to moor alongside the vessel 1 according to the present invention.

[0029] As can be seen in figure 7, the sheaves 15 and 16 and the winch 15 are all located on the longitudinal centre line of the vessel 1. In this way, a symmetric construction is obtained and weathervaning to both sides of the centre line of the vessel can take place around the bow anchor line 3 or the stern anchor line 5. As can be seen from figure 4, in this embodiment each anchor line 3,5 is connected to the seabed by means of three chains or cables 11,11',11" and 12,12',12" which extend from the counterweights 9,10 to the seabed.

[0030] Figure 8 shows a situation in which the anchor line 3 at the bow is payed out and the anchor line at the stern is taken in, such that the vessel 1 will weathervane around the stern anchor line 5 in the direction of the arrow as indicated. In this construction it is possible to use a single anchor line for the bow and stern anchor lines 3,5, such that the anchor line which is payed out at the bow corresponds to the length of anchor line which is taken in at the stern, as shown in figure 6.

Claims

1. Vessel comprising at least two anchor lines (3, 5) a first said line being connected with a first end at a substantially fixed position near the bow (2), and a second line being connected with a first end near the stern (4) of the vessel, at least one said anchor line comprising a first line section extending to a connection point located below keel level of the vessel and at least two branching anchor lines, each connected at one end to the anchor line in the connection point and at the other end to the seabed, **characterized in that** at least one riser (8) extends from the vessel to a subsea structure, the two branching anchor lines enclosing an acute angle with the seabed, all anchor lines of the vessel being attached to the seabed, for allowing weathervaning of the vessel around the stern and/or bow through relatively small angles.
2. Vessel according to claim 1, **characterized in that** the anchor lines extend from their fixed position substantially vertically downward.
3. Vessel according to claim 1, **characterized in that** a buoyancy means is connected to at least one anchor line at or near the connection point.
4. Vessel according to claim 2, **characterized in that** at least one anchor line extends through a generally vertical shaft extending through the hull from deck level to keel level of the vessel.
5. Vessel according to claim 1, 2 or 4, **characterized in that** least one anchor line is at or near the connection point connected to a ballast weight or buoyancy means.
6. Vessel according to claim 1, 2, 3, 4 or 5, **characterized in that** both anchor lines are connected to respective branching anchor lines.
7. Vessel according to any if the previous claims, **characterized in that** the first section of at least one anchor line is connected to a pulling device for lengthening or shortening the anchor line, wherein the pulling device can vary the length of the at least one anchor line such that both anchor lines are maintained in tensioned state and the vessel can weathervane around the bow anchor line (3) or the stern anchor line (5).
8. Vessel according to claim 7, **characterized in that** the pulling device is a winch system (6, 7, 15)/
9. Vessel according to claim 7 or 8, **characterized in that** each anchor line is connected to a pulling device.

10. Vessel (1) according to claim 7, 8 or 9, **characterized in that** the pulling device (6, 7, 15) varies the length of the anchor lines (3, 5) simultaneously.
11. Vessel (1) according to claim 7, 8, 9 or 10, **characterized in that** each anchor line (3, 5) is connected to the pulling device (15) via a sheave (16, 17) located generally at the center line of the vessel (1). 5
12. Vessel (1) according to any of claims 7 to 11, **characterized in that** the anchor lines (3, 5) are connected to a single pulling device (15). 10
13. Vessel (1) according to claim 12, **characterized in that** an anchor line extends from the bow (2) via the pulling device (15) to the stern. 15
14. Vessel (1) according to any of claims 7 to 13, **characterized in that** the anchor lines pass (3, 5) from the pulling device (15) through the hull of the vessel to a respective anchoring point. 20
15. Vessel (1) according to claim 14, **characterized in that** the vessel is at least near its bow (2) or stern (4) provided with a generally vertical shaft (19, 20) extending through the hull, at least one anchor line extending through the shaft (19,20)/ 25
16. Vessel (1) according to claim 15, **characterized in that** the vessel comprises a shaft (19, 20) near the bow (2) and near the stern (4). 30
17. Vessel (1) according to any of the claims 7 to 16, **characterized in that** at least one of the anchor lines is connected below sear level to a counter weight (9, 10) which in turn is connected to the seabed via the branching lines. 35
18. Vessel (1) according to any of claims 7 to 16, **characterized in that** a buoyancy member is connected to at least one of the anchor lines. 40
19. Vessel (1) according to any of the previous claims, **characterized in that** the vessel is connected to a subsea hydrocarbon structure via at least one riser (8). 45
20. Vessel according to any of the previous claims, **characterized in that** the vessel does not comprise a turret structure. 50

Patentansprüche

1. Ein Schiff umfassend wenigstens zwei Ankerstränge (3, 5), wobei ein erster der Stränge mit einem ersten Ende an einer im wesentlichen fixen Position nahe des Buges (2) verbunden ist, und wobei ein 55

zweiter Strang nahe des Hecks (4) des Schiffs mit einem ersten Ende verbunden ist, wobei wenigstens einer der Ankerstränge einen ersten Strangbereich umfasst, der sich zu einem Verbindungspunkt erstreckt, der unterhalb des Kielniveaus des Schiffs angeordnet ist, und wenigstens zwei verzweigende Ankerstränge, wobei jeder an einem Ende mit dem Ankerstrang am Verbindungspunkt verbunden ist, und an dem anderen Ende mit dem Meeresgrund, **dadurch gekennzeichnet, dass** sich wenigstens ein Steigrohr (8) vom Schiff zu einer Meeresgrundstruktur erstreckt, wobei die zwei verzweigenden Ankerstränge einen spitzen Winkel mit dem Meeresgrund einschließen, wobei alle Ankerstränge des Schiffs an dem Meeresgrund befestigt sind, um ein Witterschwanken des Schiffs um das Heck und/oder des Buges über relativ kleine Winkel zu erlauben.

2. Ein Schiff gemäß Anspruch 1, **dadurch gekennzeichnet, dass** die Ankerstränge sich von ihrer fixen Position im wesentlichen vertikal nach unten hin erstrecken.
3. Ein Schiff gemäß Anspruch 1, **dadurch gekennzeichnet, dass** ein Auftriebsmittel mit wenigstens einem Ankerstrang an oder nahe des Verbindungspunktes verbunden ist.
4. Ein Schiff gemäß Anspruch 2, **dadurch gekennzeichnet, dass** sich wenigstens ein Ankerstrang durch einen im allgemeinen vertikalen Schaft erstreckt, der sich durch den Schiffskörper vom Deckniveau zum Kielniveau des Schiffs erstreckt.
5. Ein Schiff gemäß Anspruch 1, 2, oder 4, **dadurch gekennzeichnet, dass** wenigsten ein Ankerstrang bei oder nahe des Verbindungspunktes mit einem Ballastgewicht oder einem Auftriebsmittel verbunden ist.
6. Ein Schiff gemäß Anspruch 1, 2, 3, 4 oder 5, **dadurch gekennzeichnet, dass** beide Ankerstränge mit entsprechenden verzweigenden Ankersträngen verbunden sind.
7. Ein Schiff gemäß irgendeinem der vorhergehenden Ansprüche, **dadurch gekennzeichnet, dass** der erste Bereich des wenigstens einen Ankerstranges verbunden ist mit einer Zugvorrichtung zum Verlängern oder Verkürzen des Ankerstranges, wobei die Zugvorrichtung die Länge des wenigstens einen Ankerstranges variieren kann derart, dass beide Ankerstränge in einem unter Zugspannung stehenden Zustand beibehalten werden, und das Schiff sich um den Bugankerstrang (3) oder den Heckankerstrang (5) witterungsbedingt schwanken kann.

8. Ein Schiff gemäß Anspruch 7, **dadurch gekennzeichnet, dass** die Zugvorrichtung ein Windensystem (6, 7, 15) ist.
9. Ein Schiff gemäß Anspruch 7 oder 8, **dadurch gekennzeichnet, dass** jeder Ankerstrang mit einer Zugvorrichtung verbunden ist.
10. Ein Schiff (1) gemäß Anspruch 7, 8 oder 9, **dadurch gekennzeichnet, dass** die Zugvorrichtung (6, 7, 15) die Länge der Ankerstränge (3, 5) gleichzeitig variiert.
11. Ein Schiff (1) gemäß Anspruch 7, 8, 9 oder 10, **dadurch gekennzeichnet, dass** jeder Ankerstrang (3, 5) mit der Zugvorrichtung (15) über eine Antriebsscheibe (16, 17) verbunden ist, die im allgemeinen an der Mittellinie des Schiffs (1) angeordnet ist.
12. Ein Schiff (1) gemäß irgendeinem der Ansprüche 7 bis 11, **dadurch gekennzeichnet, dass** die Ankerstränge (3, 5) mit einer einzigen Zugvorrichtung (15) verbunden sind.
13. Ein Schiff (1) gemäß Anspruch 12, **dadurch gekennzeichnet, dass** sich ein Ankerstrang vom Bug (2) über die Zugvorrichtung (15) zum Heck erstreckt.
14. Ein Schiff (1) gemäß irgendeinem der Ansprüche 7 bis 13, **dadurch gekennzeichnet, dass** die Ankerstränge (3, 5) von der Zugvorrichtung (15) durch den Schiffskörper des Schiffs zu einem entsprechendem Verankerungspunkt verlaufen.
15. Ein Schiff (1) gemäß Anspruch 14, **dadurch gekennzeichnet, dass** das Schiff wenigstens nahe seines Buges (2) oder Hecks (4) versehen ist mit einem im allgemeinen vertikalen Schaft (19, 20), der sich durch den Schiffskörper erstreckt, wobei wenigstens ein Ankerstrang sich durch den Schaft (19, 20) erstreckt.
16. Ein Schiff (1) gemäß Anspruch 15, **dadurch gekennzeichnet, dass** das Schiff einen Schaft (19, 20) nahe des Buges (2) und nahe des Hecks (4) umfasst.
17. Ein Schiff (1) gemäß irgendeinem der Ansprüche 7 bis 16, **dadurch gekennzeichnet, dass** wenigstens einer der Ankerstränge unterhalb des Meeresspiegels mit einem Gegengewicht (9, 10) verbunden ist, welches wiederum mit dem Meeresgrund über die verzweigenden Stränge verbunden ist.
18. Ein Schiff (1) gemäß irgendeinem der Ansprüche 7

bis 16, **dadurch gekennzeichnet, dass** ein Auftriebsbauteil mit wenigstens einem der Ankerstränge verbunden ist.

19. Ein Schiff (1) gemäß irgendeinem der vorhergehenden Ansprüche, **dadurch gekennzeichnet, dass** das Schiff mit einer Untersee-Kohlenwasserstoff-Struktur über wenigstens ein Steigrohr verbunden ist.
20. Ein Schiff gemäß irgendeinem der vorhergehenden Ansprüche, **dadurch gekennzeichnet, dass** das Schiff keine Turmstruktur umfasst.

Revendications

1. Navire comprenant au moins deux câbles de mouillage (3, 5), un premier desdits câbles étant relié par une première extrémité à une position sensiblement fixe proche de la proue (2), un deuxième câble étant relié par une première extrémité à proximité de la poupe (4) du navire, au moins l'un desdits câbles de mouillage comprenant une première section de câble qui s'étend vers un point de liaison situé au-dessous du niveau de la quille du navire et au moins deux câbles de mouillage de branchement, reliés chacun, à une extrémité, au câble de mouillage au niveau du point de liaison et, à l'autre extrémité, aux fonds marins, **caractérisé en ce qu'**au moins un tube prolongateur (8) s'étend depuis le navire jusqu'à une structure sous-marine, les deux câbles de mouillage de branchement formant un angle aigu avec les fonds marins, tous les câbles de mouillage du navire étant fixés aux fonds marins, pour permettre au navire de tourner autour de la poupe et/ou de la proue selon de faibles angles.
2. Navire selon la revendication 1, **caractérisé en ce que** les câbles de mouillage s'étendent depuis leur position fixe sensiblement verticalement vers le bas.
3. Navire selon la revendication 1, **caractérisé en ce que** des moyens de flottaison sont reliés à au moins un câble de mouillage au niveau ou à proximité du point de liaison.
4. Navire selon la revendication 2, **caractérisé en ce qu'**au moins un câble de mouillage s'étend à travers un arbre généralement vertical qui s'étend à travers la coque depuis le niveau du pont jusqu'au niveau de la quille du navire.
5. Navire selon la revendication 1, 2 ou 4, **caractérisé en ce qu'**au moins un câble de mouillage est relié, au niveau ou à proximité du point de liaison, à un contrepoids ou à des moyens de flottaison.

6. Navire selon la revendication 1, 2, 3, 4 ou 5, **caractérisé en ce que** les deux câbles de mouillage sont reliés à des câbles de mouillage de branchement respectifs.
7. Navire selon l'une quelconque des revendications précédentes, **caractérisé en ce que** la première section d'au moins un câble de mouillage est reliée à un dispositif de traction pour allonger ou raccourcir le câble de mouillage, dans lequel le dispositif de traction peut modifier la longueur du au moins un câble de mouillage de sorte que les deux câbles de mouillage soient maintenus dans un état tendu et que le navire puisse tourner autour du câble de mouillage de proue (3) ou du câble de mouillage de poupe (5).
8. Navire selon la revendication 7, **caractérisé en ce que** le dispositif de traction est un système de treuil (6, 7, 15).
9. Navire selon la revendication 7 ou 8, **caractérisé en ce que** chaque câble de mouillage est relié à un dispositif de traction.
10. Navire (1) selon la revendication 7, 8 ou 9, **caractérisé en ce que** le dispositif de traction (6, 7, 15) modifie la longueur des câbles de mouillage (3, 5) en même temps.
11. Navire (1) selon la revendication 7, 8, 9 ou 10, **caractérisé en ce que** chaque câble de mouillage (3, 5) est relié au dispositif de traction (15) par l'intermédiaire d'une poulie à gorge (16, 17) située généralement au niveau de la ligne médiane du navire (1).
12. Navire (1) selon l'une quelconque des revendications 7 à 11, **caractérisé en ce que** les câbles de mouillage (3, 5) sont reliés à un seul dispositif de traction (15).
13. Navire (1) selon la revendication 12, **caractérisé en ce qu'un** câble de mouillage s'étend depuis la proue (2) par l'intermédiaire du dispositif de traction (15) jusqu'à la poupe.
14. Navire (1) selon l'une quelconque des revendications 7 à 13, **caractérisé en ce que** les câbles de mouillage (3, 5) passent du dispositif de traction (15) à travers la coque du navire jusqu'à un point de mouillage respectif.
15. Navire (1) selon la revendication 14, **caractérisé en ce que** le navire est, au moins à proximité de sa proue (2) ou de sa poupe (4), pourvu d'un arbre généralement vertical (19, 20) qui s'étend à travers la coque, au moins un câble de mouillage s'étendant à travers l'arbre (19, 20).
16. Navire (1) selon la revendication 15, **caractérisé en ce que** le navire comprend un arbre (19, 20) à proximité de la proue (2) et à proximité de la poupe (4).
17. Navire (1) selon l'une quelconque des revendications 7 à 16, **caractérisé en ce qu'au** moins l'un des câbles de mouillage est relié au-dessous du niveau de la quille à un contre-poids (9, 10) qui, à son tour, est relié aux fonds marins par l'intermédiaire de câbles de branchement.
18. Navire (1) selon l'une quelconque des revendications 7 à 16, **caractérisé en ce qu'un** élément de flottaison est relié à au moins l'un des câbles de mouillage.
19. Navire (1) selon l'une quelconque des revendications précédentes, **caractérisé en ce que** le navire est relié à une structure pétrolière sous-marine par l'intermédiaire d'au moins un tube prolongateur (8).
20. Navire selon l'une quelconque des revendications précédentes, **caractérisé en ce que** le navire ne comprend pas de structure de tourelle.

fig-1a

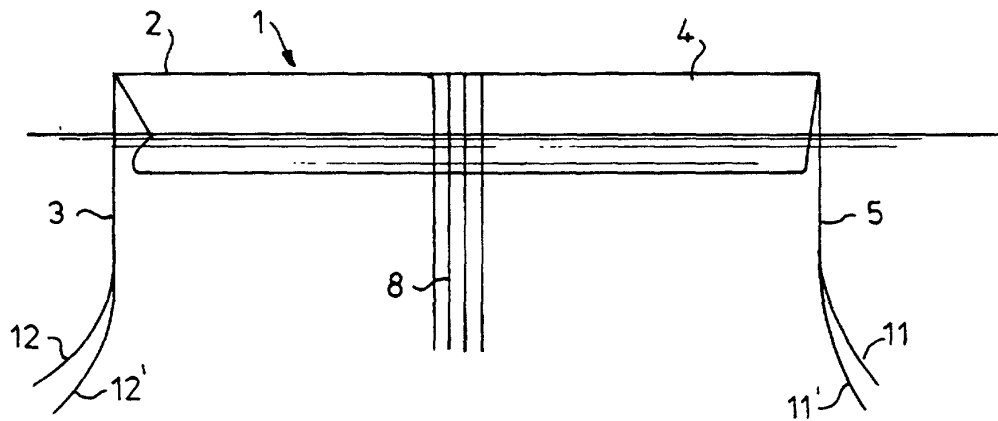


fig-1b

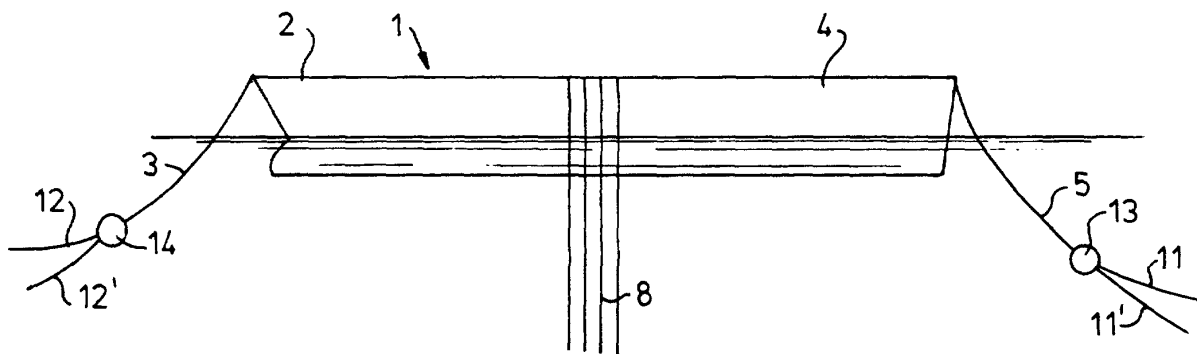


fig-2

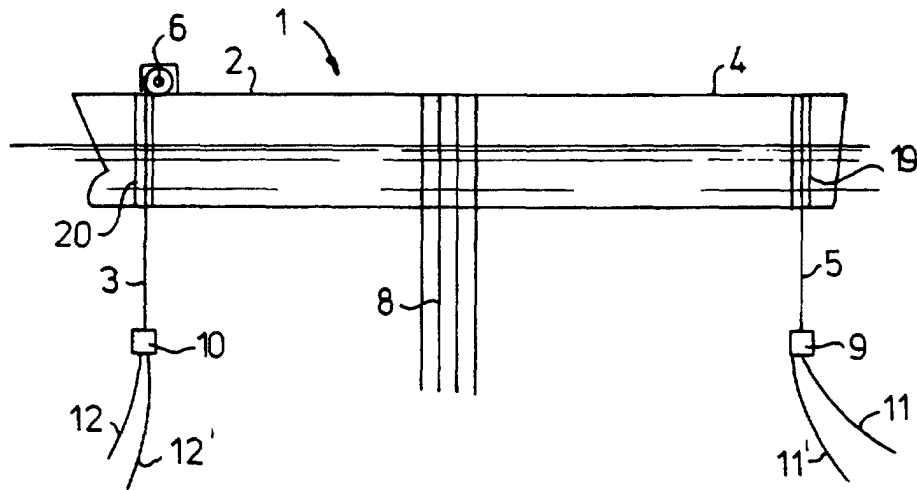


fig-3

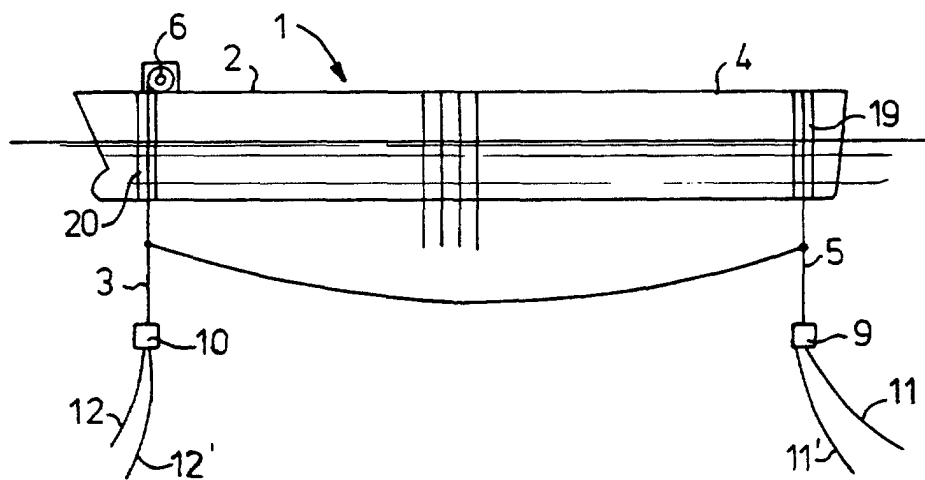


fig-4

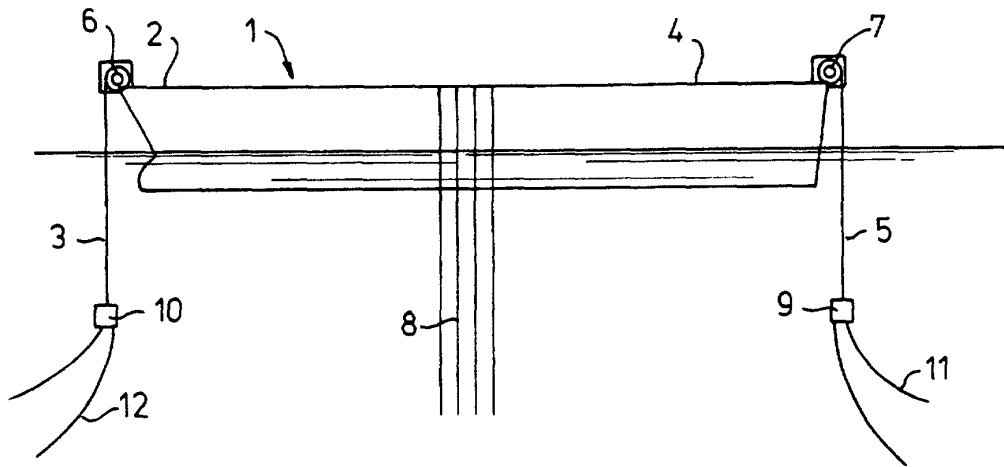


fig-5

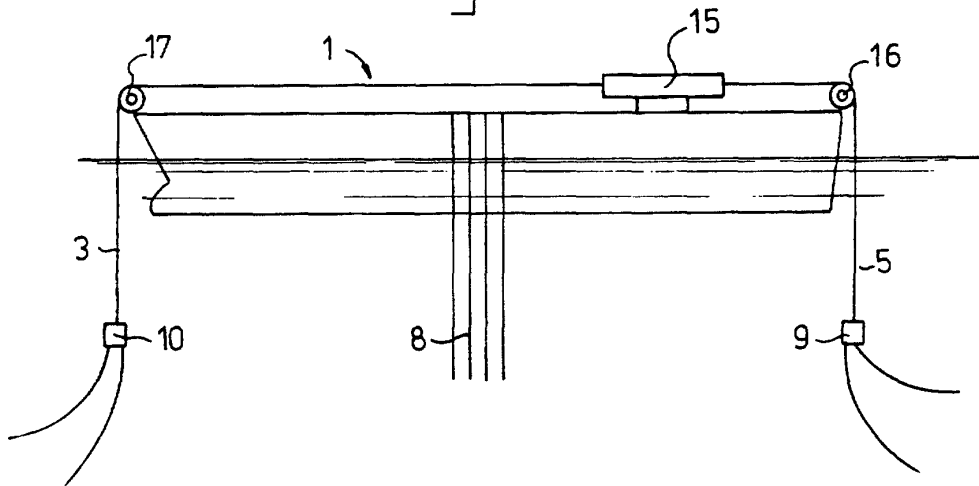


fig-6

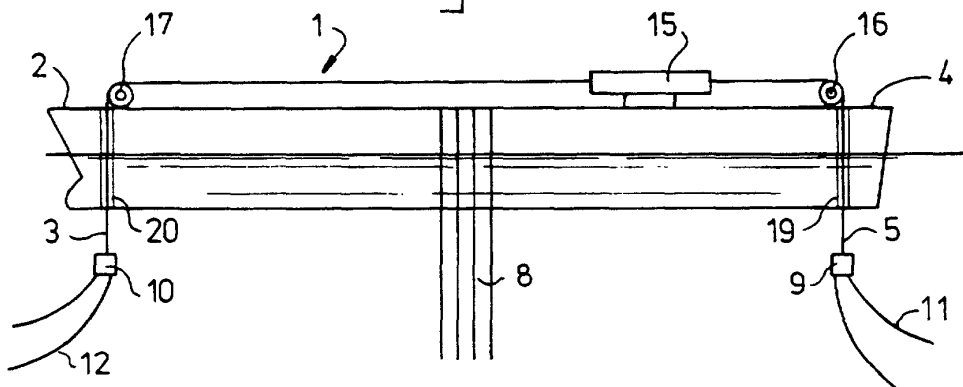


fig - 7

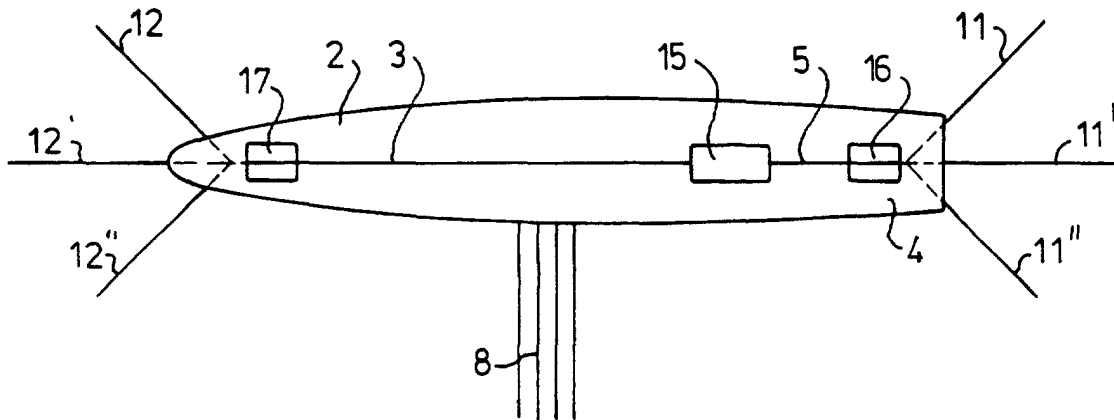


fig - 8

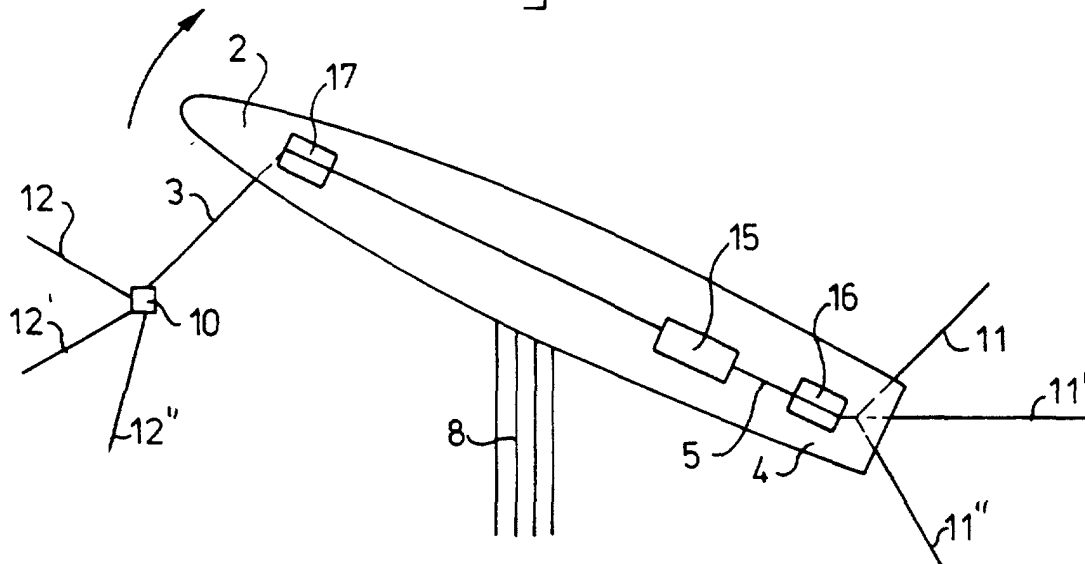


fig - 9

