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(54) **A single point mooring buoy with rigid arm.**

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Description

The invention relates to a mooring system for mooring a vessel on the surface of a body of water comprising a mooring point having buoyancy and being anehored to the floor of the body of water and a rigid arm structure, connected at one end to said mooring point and at the other end to the respective, ballasted, ends of two tension members, one on each side of the vessel hill.

Such a mooring system is known from FR-A-2.420.475, fig.7 and 8. In this known mooring system the mooring point is a tower structure which is kept upright by its own buoyancy and anehored to the floor of the body of water by means of a universal joint. The upper end of this tower supports by means of a horizontal pivot axis two rigid arms which are at their respective other ends via respective horizontal pivot axes connected to the vertical tension members of which the other ends are the bow of the vessel interconnected by a further horizontal axis.

Such a mooring system allows a limited movement in the longitudinal direction of the vessel and provides a restoring force when the vessel moves towards the mooring point and away from it. However, for rolling movements of the vessel this mooring system is in fact a rigid structure so that rolling movements of the moored vessel impart very severe bending moments on the entire structure resulting in a heavy loading of the various parts and pivots and a rapid wear therof, the more so because they are constantly subjected to the corrosive influence of the seawater.

The invention aims to provide an improved mooring system of the abovementioned kind. To this end according to the invention the mooring point is a floating buoy having a limited lateral stability and anchored by means of anchor chains or anchor cables, the tension members are pivotable tension members such as chains of cables and the rigid arm structure is Y-shaped each vessel end therof being connected to a tension member, the arrangement being such as to allow a rotational movement around the longitudinal axis of the Y-shaped structure.

This results into a mooring system which has, as far as the counteracting of movements toward and away from the mooring point is concerned, the same advantages as the prior art mooring system but of which the structure is subjected to much smaller forces and loadings than in the prior art mooring system; moreover the whole has less pivot points and is considerable simpler. Rolling movements of the vessel do not result into heavy loading and the resultant wear and tear of the structure, the buoy simply rolling together with the rigid arm structure around the longitudinal axis thereof. Such rolling movements of the vessels are smoothed out by the up and down movements of the arms of the Y-shaped structure. Another, however far more impractical, solution would be to provide an axial rotational connection in the rigid arm.

It is observed that mooring systems with a floating buoy are known in itself from NL-A-66.00321 and 72.07903. These known mooring systems lack the combination of the rigid arm and in the mooring system according to NL-A-6600321 the floating buoy has a considerable lateral stability so that the rigid arm is subjected by very heavy forces resulting from rolling movements of the vessel. Consequently this structure must have considerable inherent strength and stiffness and a heavy hinge structure at the end which is connected to the vessel to provide adequate strength and stability, resulting in an expensive construction.

In the mooring system according to NL-A-7207903 the buoy has less lateral stability but this mooring system has the drawback of a considerable resistance against sideways (swaying) movements of the vessel so that here, too, the structure must satisfy the demands as outlined above.

The invention is elucidated on the hand of the drawing.

The figure shows the vessel 1 floating on a body of water 2, and moored by means of two pivotable tension members 6, 7, a rigid arm 15 and a floating mooring buoy 3 which is anchored by one of more anchor chains 5. The single point mooring buoy 3 is of a type known as such and consists of a body 4 on which the turntable 8 is free to rotate about the vertical axis A-A of the buoy body 4. The buoy body 4 is attached to the floor of the body of water 2 by means of one or more anchor chains 5.

The rigid arm 15 is in this embodiment attached to the mooring buoy 3 by means of the hinges 9. These hinges 9 allow relative movement between the buoy 3 and the rigid arm 15 about the horizontal axis B-B. Furthermore, the arrangement allows rotational movement of the rigid arm 15 around its longitudinal axis by virtue of the limited lateral stability of the mooring buoy 3. A less practical solution would be to incorporate an axial rotational connection in the rigid arm 15 such as the one indicated with reference numeral 10.

The rigid arm 15 is 6-shaped and the two side arms 11-12 incorporate ballasting arrangements 13, 14. This implies that the two side arms 11, 12 can be ballasted or alternatively deballasted, in which case rigid arm 15 can become independently booyant. Two pivotable tension members 6, 7 such as chain or cables connect the two side arms 11, 12 to the vessel 1. These tension members 6, 7 run from the ballasting members 13, 14 upwards through hawses 19 to fixing points 22 on deck 21 of the vessel 1. Any rolling movement of the vessel 1 is thus smoothed out by the up-and-down movement of the side arms 11, 12 causing the middle leg of the Y-shaped rigid arm to oscillate about its axis.

In addition, a mooring hawser 18 connects the

single point mooring buoy 3 to a fixing point 24 on deck of the vessel 1. This is not essential but provides both an additional mooring facility and a factor of safety in the mooring arrangement.

The product fluid is carried to the single point mooring buoy 3 by means of the submarine riser 16. It is then transported to the vessel 1 by means of the floating hose string 17.

Claims

1. Mooring system for mooring a vessel (1) on the surface of a body of water (2), comprising a mooring point (3) having buoyancy and being anchored to the floor of the body of water (2) and a rigid arm structure (15, 11, 12) connected at one end to said mooring point (3) and at the other end to the respective, ballasted, ends of two tension members (6, 7) one on each side of the vessel hull, characterized in that said mooring point (3) is a floating buoy (4) having a limited lateral stability and anehored by means of anehor chains or anchor cables, the tension members (6, 7) are pivotable tension members such as chains or cables and the rigid arm structure (15, 11, 12) is Y-shaped, each vessel end (13, 14) thereof being connected to a tension member (6, 7), the arrangement being such as to allow a rotational movement around the longitudinal axis of the Y-shaped structure.

2. Mooring system according to claim 1, characterised by an axial rotational connection (10) in the rigid arm (15).

Patentansprüche

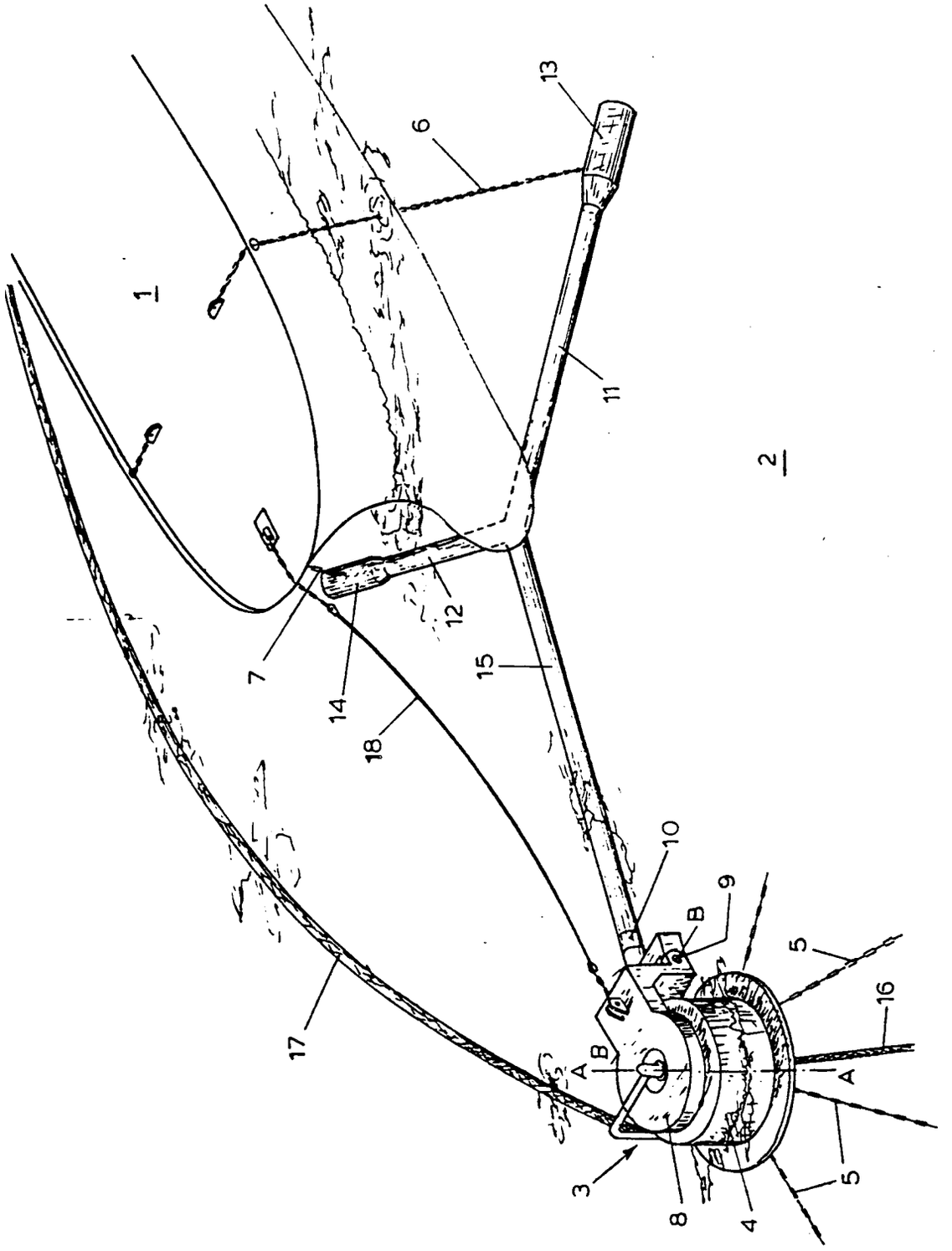
1. Verankerungseinrichtung zum Festmachen eines Wassersfahrzeugs (1) auf der Oberfläche eines Wasserkörpers (2) mit einem Verankerungspunkt (3) mit Schwimmfähigkeit und am Boden des Wasserkörpers (2) verankert, und mit einem aus starren Schenkeln bestehenden Gestänge (15, 11, 12), das an einem Ende mit dem Verankerungspunkt (3) und am anderen Ende mit den jeweiligen, beschwerten Enden von zwei Zuggliedern (6, 7) verbunden ist, von denen je eines auf jeder Seite des Wasserfahrzeugkörpers vorgesehen ist, dadurch gekennzeichnet daß der Verankerungspunkt eine Schwimmboje ist (4) mit beschränkter lateraler Stabilität welche mittels Ankerketten oder Ankerzeilen verankert ist, daß die Zugglieder (6, 7) scharnierende Zugglieder wie ketten oder Zeilen sind und daß das starre Gestänge (15, 11, 12) Y-förmig gestaltet ist, ein jedes von den Wasserfahrzeug zugeordneten Endstücken (13, 14) davon mit einem Zugglied (6, 7) verbunden ist, und die Anordnung derart ist daß eine Drehbewegung um die Längsaxe des Y-förmige Gestänges möglich ist.

2. Verankerungseinrichtung nach Anspruch 1, dadurch gekennzeichnet, daß an dem starren Schenkel (15) des Gestänges eine axial drehbare Verbindung (10) vorgesehen ist.

Revendications

1. Système d'amarrage pour l'amarrage d'un navire (1) sur la surface d'une masse d'eau (2), comprenant un point d'amarrage (3) présentant de la flottabilité et ancré au fond de la masse d'eau (2) et une structure à bras rigide (15, 11, 12) reliée à une extrémité audit point d'amarrage (3) et à l'autre extrémité aux extrémités ballastées respectives de deux organes de tension ou traction (6, 7) respectivement placés de chaque côté de la coque du navire, caractérisé en ce que ledit point d'amarrage (3) est une bouée flottante (4) présentant une stabilité latérale limitée et ancrée à l'aide de chaînes ou de câbles d'ancrage, en ce que les organes de traction (6, 7) sont des organes de traction articulés, tels que des chaînes ou des câbles, et en ce que la structure à bras rigide (15, 11, 12) présente une forme en Y, chacune de ses extrémités (13, 14) située du côté du navire étant reliée à un organe de traction (6, 7), l'agencement étant tel qu'il permette un mouvement de rotation autour de l'axe longitudinal de la structure en forme d'Y.

2. Système d'amarrage selon la revendication 1, caractérisé par une liaison tournante axiale (10) dans le bras rigide (15).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