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PATENT SPECIFICATION

DRAWINGS ATTACHED

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COMPLETE SPECIFICATION

A Marine Platform for Vessel Mooring and like purposes

We, S.T.O. SOCIETA TRASPORTI ED OLEODOTTI S.P.A., of 41 Via Gustavo Fara, Milan, Italy, an Italian Joint Stock Company, do hereby declare the invention, for which we pray that a patent may be granted to us, and the method by which it is to be performed, to be particularly described in and by the following statement:—

The present invention relates to a marine platform for vessel mooring or docking and more particularly, but not exclusively, to a marine platform for the docking and unloading of tankers, for example oil-tankers.

According to the invention there is provided a marine platform for mooring vessels, comprising a stationary structure, one end portion of which is arranged to be driven into the sea-bed and the other end portion of which is arranged to project from the surface of the sea, a first platform carrying a plurality of bitts for mooring vessels, a plurality of water-tight hollow bodies fast with the first platform and arranged for at least partial immersion in the water to provide buoyancy for said first platform, valves and pumps selectively operable to introduce sea water into said hollow bodies and discharge said sea water from said bodies and means operable to prevent transverse displacement of said first platform relative to said stationary structure whilst allowing free vertical displacement and rotation of said first platform about a fixed vertical axis with respect to said stationary structure.

Further according to the invention there is provided a marine platform comprising a stationary structure arranged to be rigidly anchored to the sea-bed, and arranged to extend above the surface of the sea, a first platform, to which a vessel can be moored, rotatable about a fixed vertical axis through said structure, and vertically movable relatively to said structure, a plurality of water-tight hollow bodies fast with said first platform and arranged to provide buoyancy therefor whereby said first platform can float on the surface of the water, means selectively operable to introduce water into said hollow bodies to reduce the buoyancy thereof and to remove the said water therefrom, and means operable to prevent transverse displacement of said first platform relative to said structure.

An embodiment of the invention will now be described, by way of non-restrictive example, reference being made to the accompanying diagrammatic drawing, in which:

Fig. 1 is a cross-section of a marine platform taken on line I—I of Fig. 2;

Fig. 2 is a plan of the platform shown in Fig. 1;

Fig. 3 is a fragmentary section, to an enlarged scale, taken on line III—III of Fig. 1; and

Figs. 4 and 5 are schematic illustrations showing two different positions assumed by a vessel moored to the platform under the action of the wind and the tide.

Reference is made first to Figs. 1—3 wherein there is shown a marine platform comprising a stationary platform or structure formed from a plurality of piles 1, the lower end of which is driven into the sea-bed and the upper end of each of which projects above the surface of the sea, as particularly shown in Fig. 1.

A fixed platform 3 is fast with the upper ends of the piles 1, the platform 3 being above the surface of the sea and being circular in plan (Fig. 2). A rigid wall 4 is provided around and fast with the piles 1, the outer surface of said wall 4 being cylindrical and having its vertical axis coincident with the axis of platform 3. The cylindrical wall 4 extends above the surface of the sea to the surface of

[*Price 5s. 0d.*]

platform 3, as shown in Fig 1. An aperture is provided centrally within the platform 3, from which aperture there projects one end 5 of a sea-line 6 extending below the surface of the sea to the coast in a substantially conventional manner and formed by rigid metal pipes. The end 5 is connected to the remainder of the sea-line 6 by a double ball joint 7 enabling the end 5 to rotate within horizontal plane. The end 5 of the sea-line 6 is provided with a set of inlets 8 through which oil or other liquid can be introduced into the sea-line 6.

A floating platform 9 is anchored to the stationary structure, and includes a circular aperture through which the stationary structure extends.

The platform 9 is formed from a rigid metal reticular structure 10 (Fig. 1 and carries a plurality of rolling members 11 freely and rotatably mounted upon axles 12, fast with the platform 9 and coincident with the axis of the respective members 11. The rolling members can be made of steel coated with a resilient material, suitably thick rubber, and preferably comprise tyres mounted on rims of the type used in motor-vehicles (see particularly Fig. 3). A plurality of axles 12 is arranged around the cylindrical wall 4, a plurality of superimposed rolling members 11 being mounted on each axle 12.

Rolling members 11 abut against the cylindrical surface of wall 4 and can roll therealong and can also axially slide therealong so as to allow free rotation and vertical displacement of the floating platform 9 relative to the stationary structure, whilst preventing the platform 9 from moving transversely with respect to the stationary structure.

Six sets of water-tight hollow bodies 13 are fast with the platform 9 to provide buoyancy therefor, each hollow body 13 comprising a hollow rounded-bottom cylinder, as particularly seen in Fig. 1. The hollow bodies 13 are provided with valves and are connected to pumps, (not shown in the drawings), which are operable to introduce into and discharge sea-water from the hollow bodies. When the hollow bodies 13 are empty of sea-water, the platform 9 is raised relatively to the surface of the seat whereas, when sea-water is pumped into the hollow bodies 13 the platform 9 is lowered relatively to the surface of the sea, and can even be fully submerged in the sea; thus the height of the platform 9 can be readily adjusted according to the height of the vessel moored thereto. The platform 9 can also be protected from damage due to the wind and waves especially in violent storms, by complete submersion in the sea.

A propeller connected to a driving motor is fast with at least one of the sets of hollow bodies 13, the propeller being immersed in the sea-water and operable, to impart to the platform 9 a rotary motion about the vertical axis of platform 3. The propeller and driving motor have not been shown in the drawing, since the construction and operation thereof will be clearly apparent.

Finally, from Figs. 1 and 2 it will be noted that the platform 9 is of elongate shape and has a straight side from which a plurality of fenders 14 project, so that a vessel moored to the platform will bear thereagainst

Also the axis of rotation of the platform 9, i.e. the axis of platform 3, is closer to one end of the platform 9 than to the other end thereof, or in other words the structure of platform 9 is eccentric with respect to its axis of rotation.

Adjacent the ends of the platform 9 bitts 15 are provided and further bitts 16 are provided adjacent the free end portion of an extension extending laterally from the platform.

Assuming that a vessel 18, suitably an oil-tanker, is to be moored to the platform 1, the vessel will approach the platform from the most suitable direction, which will be determined by the prevailing wind and tide, the platform 9 being orientated accordingly. When the vessel 18 is adjacent the platform 9, ropes 17 are thrown from the vessel to be anchored to the bitts on the platform 9. The vessel then continues to approach the platform until its side bears against the fenders 14.

The vessel 18 will then assume the position shown in Figs. 4 and 5. Since the platform 9 is rotatable about a vertical axis, it will readily assume the most suitable orientation with respect to the vessel under the tension in the ropes 17, i.e. the platform will automatically orientate itself so that the fenders 14 are abutting against the side of the vessel. When mooring operations are completed, the tanks of the vessel are readily connected to the inlets 8 of the sea-line 6 by large diameter jointed pipes which may be made entirely of metal. The oil can then be easily and very rapidly unloaded from the vessel through the sea-line with reliability, and minimum load losses.

During mooring of the vessel to the platform, should the direction of the wind change to exert a pressure on the vessel side, indicated by a series of horizontal parallel arrows in Fig. 4, the vessel together with the platform 9 will rotate about the vertical axis of platform 3 to assume the position as shown in Fig. 5, wherein the resistance against the wind force of the sea is a minimum, thus reducing the risk of the vessel cutting free from the platform.

It will be apparent that the stationary structure of the marine platform has to be so dimensioned as to resist such impacts that are likely to occur during the mooring of a loaded vessel, such impacts being damped by the rolling members 11 which, as herein-

before stated, comprise resilient material. It will also be apparent that the level of the platform 9 can be easily and continuously adjusted according to the size of the vessel moored thereto

WHAT WE CLAIM IS:—

1. A marine platform for mooring vessels, comprising a stationary structure, one end portion of which is arranged to be driven into the sea-bed and the other end portion of which is arranged to project from the surface of the sea, a first platform carrying a plurality of bitts for mooring vessels, a plurality of water-tight hollow bodies fast with the first platform and arranged for at least partial immersion in the water to provide buoyancy for said first platform, valves and pumps selectively operable to introduce sea water into said hollow bodies and discharge said sea water form said bodies and means operable to prevent transverse displacement of said first platform relative to said stationary structure whilst allowing free vertical displacement and rotation of said first platform about a fixed vertical axis with respect to said stationary structure.

2. A marine platform according to claim 1, comprising means for imparting rotary motion to said first platform relative to said stationary structure.

3. A marine platform according to claim 2, wherein the said means for imparting rotary motion to said first platform comprises at least one propeller arranged for immersion in the sea water and connected by a drive shaft to a motor.

4. A marine platform according to any one of claims 1 to 3, wherein the said means for preventing transverse displacement of said first platform comprises a rigid cylindrical wall, the axis of which is coincident with said fixed vertical axis, said wall being fast with said stationary structure, and a plurality of rolling members rotatably supported by said first platform for rotation about substantially vertical axes, the rolling members being distributed around said cylindrical wall and being in abutting relationship therewith.

5. A marine platform according to claim 4, wherein said rolling members comprise rubber-coated steel.

6. A marine platform according to any one of claims 1 to 5, comprising a second platform fast with said stationary structure and arranged to lie above the surface of the sea and wherein one end of a pipe line is carried on said second platform said pipe line being arranged to extend below the surface of the sea, and said one end being located at said fixed vertical axis and being provided with at least one ball joint and at least one inlet through which liquid can be introduced into said pipe line from a vessel moored alongside said marine platform.

7. A marine platform according to any one of claims 1 to 6, wherein said first platform comprises a reticular structure and is elongate, said fixed vertical axis being nearer to one end thereof than the other end thereof, and said bitts being provided on the first platform at least adjacent said end thereof and on the free end portion of an extension extending laterally from said first platform.

8. A marine platform comprising a stationary structure arranged to be rigidly anchored to the sea-bed, and arranged to extend above the surface of the sea, a first platform, to which a vessel can be moored, rotatable about a fixed vertical axis through said structure, and vertically movable relatively to said structure, a plurality of water-tight hollow bodies fast with said first platform and arranged to provide buoyancy therefor whereby said first platform can float on the surface of the water, means selectively operable to introduce water into said hollow bodies to reduce the buoyancy thereof and to remove the said water therefrom, and means operable to prevent transverse displacement of said first platform relative to said structure.

9. A marine platform, substantially as described with reference to the accompanying drawing.

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