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(54) SEA TERMINAL

(71) I, LEROY MARTIN SYLVERST, of 910 Riverside Drive, New York, New York 10032, United States of America, a citizen of the United States of America, do hereby declare the invention for which I pray that a patent may be granted to me and the method by which it is to be performed to be particularly described in and by the following statement:—

This invention relates to sea terminals.

Our co-pending Application No. 48577/75 (Serial No. 1527887) from which the present invention is divided describes and claims a sea terminal comprising cargo storage means including a structure and a housing rotatable with respect to said structure about an axis of rotation, said housing being constructed and arranged for storing material therein and being substantially symmetrically disposed about said axis, positioning means carried by said structure for maintaining said sea terminal at a preselected location, and mooring means carried by said housing for receiving a mooring line for mooring a vessel to said housing while it is discharging material into said housing or taking on material from said housing, whereby said housing and the vessel moored thereto may rotate with respect to said structure as a result of forces externally applied to the vessel.

According to the present invention there is provided a sea terminal comprising cargo storage means including a structure and a platform positioned above said structure and rotatable with respect to said structure about an axis of rotation, said structure being constructed and arranged for storing material therein and being substantially symmetrically disposed about said axis, drive means acting between said structure and said platform for effecting rotation of said platform with respect to said structure positioning means carried by said structure for maintaining said sea terminal at a preselected location, and mooring means carried by said platform for receiving a mooring line for mooring a vessel to said platform while it is discharging material into said structure or taking on material from said structure, whereby said platform and the vessel moored thereto may rotate with respect to said structure as a result of forces externally applied to the vessel.

An embodiment of the invention will now be described by way of example with reference to the accompanying drawings in which:—

Figure 1 is an elevational schematic view of a sea terminal in an offshore position with the sea terminal being shown in phantom in a berth;

Figure 2 is a top plan view of the sea terminal of Figure 1; and

Figure 3 is an enlarged elevational view of the sea terminal of Figures 1 and 2.

Referring to Figures 1 to 3, a sea terminal capable of standing on the sea bed is indicated generally at 81. Sea terminal 81 has a cargo storage tank 81, which may comprise a plurality of compartments, from which extends a plurality of hollow struts 83 which support a platform generally indicated at 84.

Platform 84 carries oil drilling apparatus 85 whereby a sub-sea oil well may be drilled by the drilling apparatus. The sea terminal also carries motors, generators, pumps and all means of support equipment necessary for drilling, pumping and providing power for use on or for the sea terminal.

Sea terminal 81 can be positioned utilizing a wide variety of means. Legs 86 are shown in an extended position where the sea terminal is located in sufficiently shallow water so that the legs may make contact with the ocean bed. Legs 86 may be raised for moving the terminal or if the legs are

not to be used and a raised position of legs is shown in phantom lines in Figures 1, and 3.

If the sea terminal 81 is to be moored in deep water making use of legs 86 impracticable, the legs are raised and the sea terminal is anchored by means of suitable anchors 87 carried at the ends of anchor lines 88 which pass through hawse pipes 89.

In addition, the sea terminal carries a plurality of drive motors or engines 91 which operate propellors 92 under the control of a position control system including hydrophones 93.

As such position control systems are known, no further description thereof is deemed necessary.

The sea terminal 81 after drilling a well can pump oil from the well into cargo tank 82. If desired, the sea terminal 81 can be self-propelled to a discharge location such as a port generally indicated at 95 through use of drive motors 91. The sea terminal can be navigated automatically between an offshore location and a port 95 (Figure 1) by appropriate computer control of the drive motors 91 in response to the hydrophones 93 following a plurality of beacons 94 positioned on the ocean floor to define a predetermined route. Alternatively, sea terminal 81 could be navigated by suitable navigation control operated from a bridge 90.

It is desired to pump the oil from the cargo tank 82 into a cargo ship 96. The cargo ship would be moored to the sea terminal by means of a mooring line 97 with oil discharge taking place through a cargo transfer hose 98.

In the embodiment of Figures 1 to 3, the platform generally indicated at 84 is constructed with a lower fixed deck 101 and an upper rotatable deck 102 capable of rotating about the lower deck on bearings 103. Mooring line 97 is connected to a mooring box 104 carried by the upper rotatable deck 102 whereby a pull on mooring line 97 as a result of a change in position of the cargo ship will tend to cause rotation of the upper rotatable deck 102. Upper deck 102 is provided with a fender 105.

In view of the large size and weight of the upper rotatable deck 102 (it may, for example, have a helicopter landing pad 106,). The upper rotatable deck 102 may be rotatably driven in response to movement of the cargo ship 96. To this end, an inner edge of the upper rotatable deck 102 is formed as a slewing gear 107 which is engaged by a drive spur gear 108 driven through a clutch 109 by a motor 111. Mooring box 104 carries electronic sensing gear which senses lateral angular pulls on mooring line 97 as the cargo ship shifts. Through suitable electronic circuitry (not shown) a lateral angular pull on mooring line 97 will cause motor 111 to rotate in the appropriate direction to rotate the upper rotatable deck 102 in the requisite direction.

It may be understoood from the foregoing description that sea terminal 81 is a self-contained unit of massive size. It may be provided with living and working quarters, navigational and other equipment.

WHAT I CLAIM IS:—

1. A sea terminal comprising cargo storage means including a structure and a platform positioned above said structure and rotatable with respect to said structure about an axis of rotation, said structure being constructed and arranged for storing material therein and being substantially symmetrically disposed about said axis, drive means acting between said structure and said platform for effecting rotation of said platform with respect to said structure, positioning means carried by said structure for maintaining said sea terminal at a preselected location, and mooring means carried by said platform for receiving a mooring line for mooring a vessel to said platform while it is discharging material into said structure or taking on material from said structure, whereby said platform and the vessel moored thereto may rotate with respect to said structure as a result of forces externally applied to the vessel.

2. A sea terminal as claimed in Claim 1, wherein said platform carries drilling apparatus.

3. A sea terminal as claimed in Claim 1 or Claim 2, wherein said positioning means includes a plurality of propellors, drive motors for driving the propellors and hydrophone apparatus for operating the drive motors.

4. A sea terminal as claimed in any one of Claims 1 to 4, wherein said positioning means includes a plurality of positionable legs.

5. A sea terminal as claimed in any one of Claims 1 to 4, wherein soid positioning means includes a plurality of anchors.

6. A sea terminal as claimed in any preceding Claim, wherein said drive means includes means responsive to the rotational movement of a mooring line secured to

not to be used and a raised position of legs is shown in phantom lines in Figures 1 and 3.

If the sea terminal 81 is to be moored in deep water making use of legs 86 impracticable, the legs are raised and the sea terminal is anchored by means of suitable anchors 87 carried at the ends of anchor lines 88 which pass through hawse pipes 89.

In addition, the sea terminal carries a plurality of drive motors or engines 91 which operate propellors 92 under the control of a position control system including hydrophones 93.

As such position control systems are known, no further description thereof is deemed necessary.

The sea terminal 81 after drilling a well can pump oil from the well into cargo tank 82. If desired, the sea terminal 81 can be self-propelled to a discharge location such as a port generally indicated at 95 through use of drive motors 91. The sea terminal can be navigated automatically between an offshore location and a port 95 (Figure 1) by appropriate computer control of the drive motors 91 in response to the hydrophones 93 following a plurality of beacons 94 positioned on the ocean floor to define a predetermined route. Alternatively, sea terminal 81 could be navigated by suitable navigation control operated from a bridge 90.

It is desired to pump the oil from the cargo tank 82 into a cargo ship 96. The cargo ship would be moored to the sea terminal by means of a mooring line 97 with oil discharge taking place through a cargo transfer hose 98.

In the embodiment of Figures 1 to 3, the platform generally indicated at 84 is constructed with a lower fixed deck 101 and an upper rotatable deck 102 capable of rotating about the lower deck on bearings 103. Mooring line 97 is connected to a mooring box 104 carried by the upper rotatable deck 102 whereby a pull on mooring line 97 as a result of a change in position of the cargo ship will tend to cause rotation of the upper rotatable deck 102. Upper deck 102 is provided with a fender 105.

In view of the large size and weight of the upper rotatable deck 102 (it may, for example, have a helicopter landing pad 106,). The upper rotatable deck 102 may be rotatably driven in response to movement of the cargo ship 96. To this end, an inner edge of the upper rotatable deck 102 is formed as a slewing gear 107 which is engaged by a drive spur gear 108 driven through a clutch 109 by a motor 111. Mooring box 104 carries electronic sensing gear which senses lateral angular pulls on mooring line 97 as the cargo ship shifts. Through suitable electronic circuitry (not shown) a lateral angular pull on mooring line 97 will cause motor 111 to rotate in the appropriate direction to rotate the upper rotatable deck 102 in the requisite direction.

It may be understoood from the foregoing description that sea terminal 81 is a self-contained unit of massive size. It may be provided with living and working quarters, navigational and other equipment.

WHAT I CLAIM IS:—

1. A sea terminal comprising cargo storage means including a structure and a platform positioned above said structure and rotatable with respect to said structure about an axis of rotation, said structure being constructed and arranged for storing material therein and being substantially symmetrically disposed about said axis, drive means acting between said structure and said platform for effecting rotation of said platform with respect to said structure, positioning means carried by said structure for maintaining said sea terminal at a preselected location, and mooring means carried by said platform for receiving a mooring line for mooring a vessel to said platform while it is discharging material into said structure or taking on material from said structure, whereby said platform and the vessel moored thereto may rotate with respect to said structure as a result of forces externally applied to the vessel.

2. A sea terminal as claimed in Claim 1, wherein said platform carries drilling apparatus.

3. A sea terminal as claimed in Claim 1 or Claim 2, wherein said positioning means includes a plurality of propellors, drive motors for driving the propellors and hydrophone apparatus for operating the drive motors.

4. A sea terminal as claimed in any one of Claims 1 to 4, wherein said positioning means includes a plurality of positionable legs.

5. A sea terminal as claimed in any one of Claims 1 to 4, wherein soid positioning means includes a plurality of anchors.

6. A sea terminal as claimed in any preceding Claim, wherein said drive means includes means responsive to the rotational movement of a mooring line secured to

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said mooring means about said structure.

7. A sea terminal as claimed in any preceding Claim, wherein the structure for storing material comprises a plurality of compartments.

8. A sea terminal substantially as herein described with reference to and as shown in the accompanying drawings.

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