

Vessel**TECHNICAL FIELD**

The invention relates to a vessel comprising a hull, a deck and at least one
5 superstructure fixedly mounted to the deck of the vessel, the vessel further comprising
equipment attached to the deck of the vessel, the equipment comprises at least one
equipment part that can be positioned in

- an onboard position and
- an outboard position, wherein the equipment part at least partially protrudes

10 from the hull of the vessel, wherein the vessel further comprises a frame for supporting
the at least one equipment part.

STATE OF THE ART

Dredging vessels collect material from a water bottom (e.g. seafloor). The
15 dredged material may be discharged at a location remote from the location where it is
collected. Discharging dredged material from a dredging or hopper vessel can be done
via a discharge pipe.

The discharge pipe can be arranged to spray the material into the air such that it
lands at a distance of approximately 70 – 80 metres from the vessel. This requires much
20 energy and time.

An alternative is described in GB 1 562 068. According to this document, the
discharge pipe is a horizontally orientated discharge pipe which, in use, at least
partially protrudes outboard. The discharge pipe is rotatable about an approximately
vertical axis supported by the vessel. The output end of the discharge pipe is positioned
25 close to the location where the dredged material is to be discharged and the dredged
material can exit the discharge pipe with a relatively low velocity. Such a solution
allows discharging dredged material with less energy in less time.

So, one end of the horizontal discharge pipe is rotatable connected to the vessel
and is arranged to rotate about a substantially vertical rotational axis. The discharge
30 pipe is arranged to receive material to be discharged. In use, the discharge pipe is
rotated such that the output end of the discharge pipe is positioned close to the
discharging position. In order to keep the discharge pipe in a substantially horizontal
orientation when the discharge pipe is in the outboard position, a frame is provided.

The frame is provided to support the discharge pipe. Such a frame needs to be strong enough to support the weight of the discharge pipe, which may have a length of more than 60 metres. Therefore, the frame takes up a lot of space on the deck of the vessel. In order to balance the construction, the frame also comprises constructional parts that are located behind the rotational axis, opposite to the discharge pipe. This makes the frame relatively spacious.

A similar construction is disclosed in US 3,352,035.

Patent document JP51031332 discloses a vessel comprising a rotatable horizontal pipe which requires a frame to support the rotatable horizontal pipe or a dedicated mast to which supporting cables are attached to support the pipe.

The constructions described above have the disadvantage that they all require relatively voluminous constructions or additional constructions to support the horizontal discharge pipe in the outboard position. This imposes restrictions on the position of the discharge pipe on the vessel. The above described constructions cannot be positioned on relatively small deck areas, such as on starboard or part side of a superstructure .

A superstructure is a structure that is formed on the deck which forms an integral part of the vessel. The superstructure rises above the level of the main deck. A superstructure may be one of a deckhouse, accommodation, chimney, ventilation house, cabin, forecastle deck, etc. The superstructure may be arranged to provide living accommodation and/or working accommodation.

SHORT DESCRIPTION

Embodiments of the invention seek to provide a vessel comprising equipment parts that can be positioned in an outboard position, wherein the equipment part at least partially protrudes from the hull of the vessel while being supported by a frame, where the equipment can be positioned on relatively small deck areas.

According to an aspect there is provided a vessel comprising a hull, a deck and at least one superstructure fixedly mounted to the deck, the vessel further comprising equipment attached to the deck, the equipment comprises at least one equipment part that can be positioned in

- an onboard position and

- an outboard position, wherein the equipment part at least partially protrudes from the hull,

wherein the vessel further comprises a frame for supporting the at least one equipment part, wherein the frame is connected to the superstructure via a hinge construction allowing the at least one equipment part to be moved from the onboard to the outboard position and vice versa while being supported by the frame, and

wherein the hinge construction comprises a first hinge part and a second hinge part, the first hinge part being fixedly connected to or integrally formed with the superstructure, the first hinge part protruding from the superstructure,

the second hinge part being fixedly connected to or integrally formed with the frame, the first and second hinge parts being arranged to be coupled together to form the hinge construction.

The frame may be directly connected to the superstructure via the hinge construction, forming a rigid connection which can withstand pressing forces as well as pulling forces. Such a direct connection is thus different from a connection via a rope, as ropes cannot withstand pressing forces.

The term onboard position means that the equipment is fully on board the vessel and no parts of the equipment protrudes from the vessel, i.e. protrudes from the outer circumference of the vessel.

The term outboard position means that equipment parts at least partially protrude from the outer circumference of the vessel and are thus positioned directly above the water surface. The protruding equipment parts may protrude from the stern, the bow or the starboard and port sides of the vessel.

As described above, a superstructure is a structure that is formed on top of the main deck which forms an integral part of the vessel. The superstructure rises above the main deck and may be one of a deckhouse, accommodation, chimney, ventilation house, cabin, forecastle deck, etc. The superstructure may be arranged to provide living accommodation and/or working accommodation.

By providing a frame which is connected to a superstructure of the vessel, no counterweights or spacious support constructions are required. The equipment can thus be positioned on relatively small deck areas, for instance in between a superstructure and the starboard or port sides of the vessel, where only a limited amount of space is available, i.e. there is no room for spacious support constructions with counterweights.

This allows to position equipment close to the stem of the vessel when the stem of the vessel is already occupied by other equipment and a superstructure.

According to an embodiment the equipment is dredging equipment. Dredging equipment may comprise a gantry, a loading system, cranes, (bow-) connections,
5 discharge pipe. A gantry is hoisting equipment which may for instance be used to handle a suction pipe. A gantry may be attached to the deck. A loading system may be

a barge loading system which may be used to load vessels or barges with dredged material, the vessels or barge may be positioned alongside the vessel. A crane may be a boom crane to move parts on deck. The connections may be any type of connections which may be positioned on any side of the vessel.

5 According to an embodiment the equipment part is a discharge pipe for discharging dredged material. Discharge pipes used for discharging dredged material are often relatively long, i.e. more than 50 meters, and thus require sufficient support to prevent the discharge pipe from bending or breaking under the influence of gravity.

The vessel may be a dredging vessel or a hopper vessel.

10 According to an embodiment the equipment part is rotatable about a substantial vertical rotational axis to move the equipment part from the onboard to the outboard position and vice versa and the hinge construction defines a hinge axis, which is substantially in line with the vertical rotational axis.

Rotating equipment parts about a vertical rotational axis is a relatively easy way
15 to move equipment parts from an onboard to an overboard position.

According to an embodiment the vertical rotation axis runs through the vessel. The vertical rotation axis preferably runs through the deck of the vessel. This has the advantage that a reversible drive mechanism that may be provided to move the at least one equipment part from the outboard to the onboard position and vice versa can be
20 positioned within the outer circumference of the vessel, for instance on the deck of the vessel.

The reversible drive mechanism is preferably a compact drive mechanism.

According to an embodiment the frame is further rotatable connected to the deck. This rotatable connection may be provided by a second hinge construction, defining a
25 second hinge axis which is in line with the first hinge axis defined above and the vertical rotational axis R.

According to an embodiment the frame is attached to the superstructure at a height above the deck. The superstructure may be structure that is a relatively high structure. Supporting equipment parts protrude relatively far from the vessel can best be
30 done from a relatively high position. The frame is preferably attached at least 5 metres above the deck, and more preferably at least 10 metres above the deck.

By attaching the frame to the superstructure at a substantial height above the deck, a relatively strong construction is provided, which is capable of supporting

equipment parts in an outboard position and preventing such protruding equipment parts from bending or breaking under influence of gravity.

The superstructure preferably is a relatively strong and high object which is an integral part of the vessel.

5 According to an embodiment the frame comprises a first hinge part and a second hinge part, the first hinge part being fixedly connected to or integrally formed with the superstructure, the first hinge part protruding from the superstructure, the second hinge part being fixedly connected to or integrally formed with the frame, the first and second hinge parts being arranged to be coupled together to form the hinge construction. This
10 provides an advantageous hinge construction.

 According to an embodiment the frame is attached to a roof part of the superstructure. A roof part of the superstructure is an easy and accessible part of a superstructure to connect a frame to. A first hinge part can be connected to the roof part and may also be replaced easily.

15 According to an embodiment the frame comprises a first hinge part connected to the superstructure, wherein the first hinge part is integrally formed with the superstructure. This provides a relatively strong construction.

SHORT DESCRIPTION OF THE DRAWINGS

20 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, and in which:

- Figures 1 and 2 schematically depict a side-view of a vessel according to an embodiment,
- 25 - Figure 3 schematically depicts a perspective view of the vessel according to an embodiment.

DETAILED DESCRIPTION

 Fig. 1 schematically depicts a side-view of a vessel 1, comprising a hull 2 and a
30 deck 3 on which a superstructure 4 is positioned. The superstructure shown in Fig. 1 is an accommodation, also comprising the bridge. The superstructure 4 has roof parts, one of which is indicated with reference 5. The superstructure 4 may comprise different roof parts located at different heights as shown in Fig. 1.

The vessel may be a dredging vessel or a hopper vessel arranged to discharge dredged material. In order to do this, equipment 10 is positioned on the deck. The equipment 10 is formed by a discharge pipe 11 which can be positioned in an outboard position as shown in Fig. 1.

5 According to alternative embodiments, different types of equipment may be provided, such as a gantry, a loading system, a crane, a (bow-)connection.

Fig. 2 schematically depicts a side-view of the same vessel, now showing the discharge pipe 11 in an onboard position. Fig. 3 schematically shows part of the same vessel, now in a perspective view, showing the discharge pipe 11 in the outboard
10 position. The discharge pipe 11 can be rotated from the outboard to the onboard position and vice versa by rotating about rotational axis R. In the example shown, the discharge pipe 10 can be rotate over angles above 180 degrees, for instance over 190 degrees or even 225 degrees depending on the presence of other equipment which may limit the rotational movement of the discharge pipe 11.

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To prevent the discharge pipe from falling overboard or bending/breaking under influence of gravity, a frame 20 is provided to support the discharge pipe, especially when in the outboard position.

The frame 20 may be formed as a skeleton formed by rigid frame elements. The
20 shape of the skeleton may be optimized for providing a relatively strong frame. The frame may also comprise cables to further strengthen the frame 20 and preventing the frame 20 from being too heavy.

The discharge pipe 11 may be rotated about a vertical rotational axis R. Any suitable rotational drive mechanism may be used to actuate the discharge pipe 11. The
25 discharge pipe 11 and the frame 20 are connected to the deck 3 in a rotatable manner, allowing rotation about the rotational axis R. The connection may be formed by a hinge construction 40.

The frame 20 is also connected to the superstructure 4 via a hinge construction 30, allowing the frame to rotate about a hinge axis H, being in line with the rotational
30 axis R. The hinge construction 30 may be formed by a first hinge part 31, fixedly mounted to the superstructure 4 and a second hinge part 32 fixedly mounted to the frame 20. The first hinge part 31 may also be integrally formed with the superstructure 4.

In the figures, the first hinge part 31 may be connected to a roof part 5 of the superstructure 4. However, the first hinge part 31 may also be connected to a wall of the superstructure 4.

5 The frame 20 may be connected to the superstructure at a distance d above the deck 3. This provides a relatively strong support structure. A skilled person will understand that the equipment parts 11 in the outboard position will be pulled downward by gravity. This downward momentum (force times arm) needs to be compensated by a compensating momentum via the connection to the superstructure 4.

10 The first hinge part 31 may protrude from the superstructure 4 to ensure that the rotational axis of the first hinge H is in line with the rotational axis R defined by the rotatable connection of the discharge pipe 11 and the frame 20 to the deck 3.

The embodiments described above provide a relatively small and compact mechanism for positioning equipment on the deck 3 of vessel 1, the equipment comprising a frame 20 to support the equipment 10 when positioned in an outboard
15 position.

The embodiments therefore provide an arrangement that can be positioned on relatively small deck areas, such as next to a superstructure like an accommodation or bridge. In the examples shown in the figures, the arrangement is positioned on the deck 3 in between the superstructure 4 and the railing, i.e. in the gangway. This allows to
20 position equipment close to the superstructure 4 from where the equipment 10 can be operated even when only a limited amount of deck area is available.

For instance, this allows to position the equipment 10 close to the stem of the vessel 1, even when a superstructure 4 and possible other equipment is already located close to the stem of the vessel 1. Discharge equipment is preferably located close to the
25 stem of the vessel 1 as this allows to position the vessel 1 relatively close to the discharge location. Also, this provides the discharge pipe 11 with a relatively large freedom of movement.

The other equipment may comprise rainbow equipment arranged to spray dredged material. In this case, it is especially advantageous to be able to position the
30 rotatable connection of the discharge pipe 11 close to the rainbow equipment and close to the accommodation from where the discharge equipment is operated from. When operating the discharge equipment, either the rainbow equipment or the discharge pipe 11, the operator is preferably located close to the discharge equipment to be able to see

the equipment that he/she is operating. Also, when positioned close to each other, both the rainbow equipment and the discharge pipe can be driven by one and the same pump unit (not shown) and may share internal piping to transport the material to be discharged from for instance a hopper to the equipment.

- 5 Descriptions above are intended to be illustrative, not limiting. Thus, it will be apparent to one skilled in the art that modifications may be made to the invention as described without departing from the scope of the claims set out below.

LIST OF ELEMENTS

	1	Vessel
	2	hull
	3	deck
5	4	superstructure
	5	roof part of the superstructure
	10	equipment
	11	equipment part
	20	frame
10	30	hinge construction
	31	first hinge part
	32	second hinge part
	40	second hinge construction
	R	vertical rotational axis
15	H	hinge axis
	d	distance

CLAIMS

1. Vessel comprising a hull, a deck and at least one superstructure fixedly mounted to the deck of the vessel, the vessel further comprising equipment attached to the deck
5 of the vessel, the equipment comprises at least one equipment part that can be positioned in
 - an onboard position and
 - an outboard position, wherein the equipment part at least partially protrudes from the hull of the vessel,
10 wherein the vessel further comprises a frame for supporting the at least one equipment part,
 - wherein the frame is connected to the superstructure via a hinge construction allowing the at least one equipment part to be moved from the onboard to the outboard position and vice versa while being supported by the frame, and
15 wherein the hinge construction comprises a first hinge part and a second hinge part, the first hinge part being fixedly connected to or integrally formed with the superstructure, the first hinge part protruding from the superstructure,
 - the second hinge part being fixedly connected to or integrally formed with the frame, the first and second hinge parts being arranged to be coupled together to form
20 the hinge construction.
2. Vessel according to claim 1, wherein the equipment is dredging equipment.
3. Vessel according to any one of the preceding claims, wherein the equipment part
25 is a discharge pipe for discharging dredged material.
4. Vessel according to any one of the preceding claims, wherein the equipment part is rotatable about a substantial vertical rotational axis to move the equipment part from the onboard to the outboard position and vice versa and the hinge construction is
30 defined by a hinge axis, which is substantially in line with the vertical rotational axis.

5. Vessel according to claim 4, wherein the vertical rotation axis runs through the vessel.
 6. Vessel according to any one of the claims 4 -5, wherein the frame is further
- 5 rotatable connected to the deck.

7. Vessel according to any one of the preceding claims, wherein the frame is attached to the superstructure at a height above the deck.
- 5 8. Vessel according to any one of the preceding claims, wherein the frame is attached to a roof part of the superstructure.
9. Vessel according to any one of the preceding claims, wherein the hinge construction comprises a first hinge part connected to the superstructure, wherein the
- 10 first hinge part is integrally formed with the superstructure.