

A DEVICE OF A BULK SHIP FOR SAND TRANSPORT AND FLUIDIZED
UNLOADING

This invention relates to a bulk ship for sand transport and fluidized unloading. More particularly, it relates to a bulk
5 ship for sand transport and fluidized unloading, in which an unloading pipe communicates with at least one of the holds of the bulk ship.

Hereinafter, the term "bulk ships" implies ships termed, in English, "Dry Bulk Carriers".

10 When filling in sea areas in order to gain land, oftentimes large amounts of mass are required. According to prior art, so-called self-unloading dredgers TSHD ("Trailing Suction Hopper Dredgers") are commonly used. During the transport from the loading site to the unloading site, the mass is
15 located in silo-like compartments in the vessel. The mass may be unloaded by opening the bottom of the vessel, for example by virtue of the hull being formed in two parts structured in a manner allowing them to be moved relative to each other.

However, vessels of the type mentioned are not particularly
20 suitable for carrying large quantities of mass over longer distances and not, in particular, when transport across open sea areas comes into question. The reason for this is related

to economy, given that these vessels are relatively expensive to build and operate, and also due to their relatively limited carrying capacity.

It is known to fluidize the mass before and during unloading.

5 As such, US patent 3445008 describes a method and device wherein the lower portion of the hold of the vessel is filled with water prior to pumping out water and mass.

It is known, from US patent 4033470, to use nozzles and water under pressure to fluidize the cargo.

10 Transport of mass in holds generally requires that the hold must be closed, and that the cargo must be classified as dry during transport in the open sea.

The use of bulk ships for carrying dredged mass has been proposed. Patent application NO 19986101 describes an
15 unloading device to be placed on the surface of the cargo, the device of which is structured in a manner allowing it to fluidize and pump out the cargo. However, the unloading capacity of such a solution has proven insufficient.

The object of the invention is to remedy or reduce at least
20 one of the disadvantages of the prior art.

In accordance with the invention, the object is achieved by virtue of the features disclosed in the following description and in the subsequent claims.

A bulk ship for sand transport and fluidized unloading is
25 provided, wherein an unloading pipe communicates with at least one of the holds of the bulk ship, and wherein the bulk ship is characterized in that the unloading pipe is connected to a submerged pipe connector.

Bulk ships of this type are relatively deep-draught, which

results in a relatively large height from the floor of the hold, frequently termed the tank top, and up to the deck. By disposing a connector under water, the unloading pipe may be connected to an external slurry pump without having to extend
5 the unloading pipe across the deck of the ship.

Depending on practical conditions, the pipe connector may be located in the side, the bottom or some other suitable place on the bulk ship for connection to a sand receiver, which preferably is provided with a submerged slurry pump.

10 The pipe connector may comprise a first connector part connected to the bulk ship, and a releasable second connector part connected to the sand receiver.

The releasable second connector part may be provided with a guide rope in the form of a rope, wire, chain or the like
15 being connected to the connector part, the rope of which is typically used to pull in the second connector part onto the first connector part.

The releasable second connector part may also be moved in onto or within the first connector part by means of a
20 manipulator arm located on the outside of the bulk ship.

The releasable second connector may be shaped in a complementary manner so as to fit into a lead-in portion on the bulk ship. The lead-in portion may be funnel-shaped, for example, or it may be comprised of a guide.

25 The unloading pipe may be selectably connected to a seawater inlet. For example, the sea water inlet may be used for filling seawater into a hold prior to unloading is to be started, and for flushing through the unloading pipe during start-up of the slurry pump.

The unloading pipe may be selectably connected to drainage pipes in at least one hold. Thereby, the unloading pipe may be used for drainage of excess water from the hold during the loading of fluidized sand. The unloading pipe may be
5 selectably connected to a drainage pump for transport of excess water from the hold and out of the bulk ship. Advantageously, the drainage pump may be located on board the bulk ship.

The bulk ship may be provided with closable drainage openings
10 in the ship side through which water discharges upon reaching a specific level in the hold.

A loading pipe extending along the bulk ship is selectably connected to the holds. The fluidized sand is supplied, via a loading connector, from a dredger and is carried into the
15 desired hold within which the fluidized sand is spread by means of a spreading device.

The loading pipe may be selectably connected to fluidization pipes located in the lower portion of the hold. Thereby, water for fluidization of the sand during unloading may be
20 supplied, via the loading connector and the loading pipe, onwards to the hold to be unloaded.

The device according to the invention allows for use of an external slurry pump during unloading of fluidized sand from a bulk ship. The invention thus contributes to render long-
25 distance transport of sand economically feasible, insofar as conventional bulk ship may be prepared for such transport at a relatively moderate cost.

An example of a preferred embodiment is described in the following and is depicted in the accompanying drawings,
30 where:

- Fig. 1 shows a side view of a mid-portion of a bulk ship prepared in accordance with the invention;
- Fig. 2 shows a plan view of the bulk ship of fig. 1;
- Fig. 3 shows a cross-section IIa-IIa of fig. 2;
- 5 Fig. 4 shows a cross-section I-I of fig. 1;
- Fig. 5 shows, on a somewhat larger scale, a cross-section IIb-IIb of fig. 2;
- Fig. 6 shows a cross-section IIc-IIc of fig. 2;
- Fig. 7 shows a cross-section IIId-IIId of fig. 2;
- 10 Fig. 8 shows, on a larger scale, a pipe connector in accordance with the invention having a second connector part being moved into a first connector part;
- Fig. 9 shows the pipe connector of fig. 8, but after
15 having moved the second connector part into a second connector part;
- Fig. 10 shows, on still a larger scale, a cross-section of fig. 9; and
- Fig. 11 shows an alternative embodiment of a pipe
20 connector.

In the drawings, the reference numeral 1 represents a bulk ship comprising holds 2 with hatches 4, wherein the holds 2 are partitioned by means of bulkheads 6. The hatches 4 may be closed also during loading and unloading.

- 25 A loading pipe 8 connected to a loading connector 10 of a design known *per se* extends along the bulk ship 1 above the

holds 2. The loading pipe 8 is provided with a loading valve 12 for every hold 2. Some holds 2 are not used for cargo. The reason may be load-related conditions, or that they are reserved for technical equipment.

5 In order to distribute inflowing fluidized sand in the hold 2, a distribution plate 14 is disposed below each loading valve 12.

Via fluidization valves 16 and downpipes 18, the loading pipe 8 is connected to fluidization pipes 20 of a design known *per se* on the tank top 22.

An unloading pipe 24 is disposed on the tank top 22 so as to extend through the bulkheads 6 along the bulk ship 1, see figs. 3 and 4. Via respective unloading valves 26, the unloading pipe 24 communicates with the holds 2 used for sand cargo. At the mid-portion thereof, and via connector valves 28, the unloading pipe 24 is connected to a pipe connector 30. At the end portions thereof, and via inlet valves 32, the unloading pipe 24 is connected to seawater inlets 34.

Via drainage valves 36, the unloading pipe 24 is connected to drainage pipes 38 in the form of drainage towers of a design known *per se*.

Via a three-way pump valve 42, a drainage pump 40 is connected to the unloading pipe 24 and to a pump inlet 43 for seawater. The outlet 44 of the drainage pump 40 discharges outside the bulk ship 1, and above or under water. Via a three-way valve 45 and an intermediate pipe 47, the outlet 44 is connected to the loading pipe 8 to allow fluidizing water to be delivered to the holds 2, see figs. 3 and 5.

In this preferred embodiment, the pipe connector 30 is disposed in the ship side 46 of the bulk ship 1, a first

connector part 48 being connected to the ship side 46 by means of a funnel-shaped lead-in portion 50.

Via a flexible pipe 54, for example in the form of a tube, a second connector part 52 is connected to a sand receiver (not shown). The second connector part 52 is structured in a manner allowing it to be pulled into the first connector part 48 by means of a guide rope 56.

Via the connector valves 28, the unloading pipe 24 is connected to the first connector part 48. The first connector part 48 comprises a main pipe 58 having a larger inner diameter than the external diameter of the unloading pipe 24. The main pipe 58 extends from an adapter sleeve 60 onto which the unloading pipe 24 is connected, and onwards to the lead-in portion 50. The main pipe 58 forms a sealing connection between the unloading pipe 24 and the ship side 46.

Preferably via two stuffing boxes 62, see fig. 10, the guide rope 56 extends in a movable manner through the adapter sleeve 60. Advantageously, a leakage detector (not shown) may be installed between the stuffing boxes.

, The unloading pipe 24, at the end portion thereof facing into the first connector part 48, is formed with a conical sealing surface 64.

Internally the main pipe 58 is provided with two ring seal holders 66 having, preferably, inflatable ring seals 68. A guide sleeve 70 is disposed between the ring seal holders 66.

Actuators 74 in the form of hydraulic cylinders connected each to a respective pull-in hook 76, are disposed in recesses 72 within the guide sleeve 70. The pull-in hook 76, which bears against a sloping dog 78, is structured in a manner allowing it to be moved radially inwards relative to

the main pipe 58 when being moved towards the unloading pipe 24 in the main pipe 58.

The second connector part 52 comprises an external guide pipe 80 and an internal pipe 82 connected to the flexible pipe 54.
5 At the leading end portion thereof, the second connector part 52 is formed with an internal conical end ring 84 so as to fit in a complementary manner onto the conical sealing surface 64 of the unloading pipe 24. The end ring 84 connecting the external guide pipe 80 to the internal pipe 82
10 is provided with an attachment 86 for the guide rope 56. A hook ring 88, which is structured in a manner allowing it to be gripped by the pull-in hooks 76, surrounds the guide pipe 80.

When the bulk ship 1 is to be loaded, the dredger (not shown)
15 is connected to the loading connector 10. The loading valve 12, which corresponding to the hold 2 to be loaded, is opened, after which fluidized sand is pumped into the hold 2 via the loading connector 10, the loading pipe 8 and the particular loading valve 12. The fluidized sand falls down
20 onto the distribution plate 14 and is spread within the hold 2. At the same time, excess water flows from the hold 2 and out into the sea via the drainage pipe 38, the drainage valve 36, the unloading pipe 24, the pump valve 42, the drainage pump 40 and the outlet 44. Upon having completed the loading,
25 the drainage valves 36 and the pump valve 42 are closed as the drainage pump 40 is stopped.

Prior to unloading, one or more holds 2 may be supplied with water via the seawater inlets 34, the inlet valves 32, the unloading pipe 24 and the unloading valves 26. Upon having
30 filled the desired amount of water into the holds, the unloading valves 26 are closed.

The guide rope 56, which extends through the first connector part 48 and up along the ship side 46 when not in use, is connected to the end ring 84 of the second connector part 52 by means of the attachment 86.

5 Then the second connector part 52 is pulled in through the lead-in portion 50 and the first connector part 48 by means of the guide rope 56, as shown in fig. 8 where the second connector part 52 is being pulled into the guide sleeve 70. In fig. 9, the second connector part 52 is located in its
10 connected position within the first connector part 48, the actuators 74 having moved their respective pull-in hooks 76 into abutment against the hook ring 88, and having moved the conical end ring 84 into sealing abutment against the conical sealing surface 64. The ring seals 68 have been activated so
15 as to seal against the guide pipe 80. A leakage detector (not shown) may be disposed between the ring seals 68.

Then the connector valves 28 may be opened, and the slurry pump (not shown) may be started. Water is thus circulated from the seawater inlets 34, via the unloading pipe 24, the
20 connector valves 28, the pipe connector 30 and the flexible pipe 54. When the inlet valves 32 are closed and the particular unloading valves 26 are opened, fluidized sand flows from the hold 2 and out of the bulk ship 1 via the unloading valves 26, the unloading pipe 24, the connector
25 valves 28 and the pipe connector 30.

Seawater for fluidization of the sand in the holds 2 is pumped in via the loading connector 10, the loading pipe 8, the particular fluidization valve 16, the downpipe 18 and the fluidization pipes 20. Alternatively, seawater for
30 fluidization may be pumped into the loading pipe 8 via the pump inlet 43, the pump valve 42, the drainage pump 40, the three-way valve 45 and the intermediate pipe 47.

Upon having carried out the unloading, the second connector part 52 is disconnected from the first connector part 48, as described above, but in the reverse order.

In an alternative embodiment, see fig. 11, the pipe connector
5 30 is formed with a second connector part 52 provided with a pipe flange 90. The pipe flange 90 is movable within a guide-shaped lead-in portion 92 fixed to the ship side 46. The pipe flange 90 corresponds to a seal part 94 on the first
connector part 48, wherein the seal part 94 comprises an
10 expandable seal 96. The guide-shaped lead-in portion 92 at the seal part 94 may be biasable in a direction towards the ship side 46.

When the second connector part 52 according to this alternative embodiment is to be connected to the first
15 connector part 48, the pipe flange 90 is moved into engagement within the guide-shaped lead-in portion 92, after which the second connector part 52 is moved along the guide-shaped lead-in portion until the pipe flange 90 corresponds to the seal part 94, whereupon the seal 96 is activated.
20 Disconnection is carried out in the reverse order.

C l a i m s

1. A device of a bulk ship (1) for sand transport and fluidized unloading, wherein an unloading pipe (24) communicates with at least one of the holds (2) of the bulk ship (1), and where the unloading pipe (24) is connected to a submerged pipe connector (30) characterized in that the unloading pipe (24) passes through more than one hold (2) and is connectable to each of the holds (2) by more than one valve (26).
2. The device in accordance with claim 1, characterized in that the pipe connector (30) is located in the side (46) of the bulk ship (1).
3. The device in accordance with claim 1, characterized in that the pipe connector (30) is located in the bottom of the bulk ship (1).
4. The device in accordance with claim 1, characterized in that the pipe connector (30) comprises a first connector part (48) connected to the bulk ship (1), and a releasable second connector part (52) connected to a receiver for sand.
5. The device in accordance with claim 4, characterized in that the releasable second connector part (52) is provided with a guide rope (56).
6. The device in accordance with claim 4, characterized in that the releasable second connector (52) fits in a complementary manner into a lead-in portion (50, 92) on the bulk ship (1).
7. The device in accordance with claim 1, characterized in that the unloading pipe (24) is selectably connected to a seawater inlet (34).

8. The device in accordance with claim 1,
c h a r a c t e r i z e d i n that the unloading pipe
(24) is selectably connected to drainage pipes (38) in at
least one hold (2).

5 9. The device in accordance with claim 1,
c h a r a c t e r i z e d i n that the unloading pipe
(24) is selectably connected to a drainage pump (40).

10. The device in accordance with claim 9,
c h a r a c t e r i z e d i n that the drainage pump
10 (40) is located in the bulk ship (1).