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(54) Title: A METHOD OF PREPARING A BULK SHIP HAVING AT LEAST THREE HOLDS

(57) Abstract: A method of preparing a bulk ship (1) having at least three holds (2) for sand transport and fluidized unloading, wherein the method comprises: - disposing, within a utility hold (4), fluidizing pipes (10) having inflow openings (12) and also a slurry inlet (34) for fluidized sand; - disposing, on the bulk ship (1), a water pump (18) connected between a water inlet (20) and the fluidizing pipe (10), and a slurry pump (38) connected between the slurry inlet (34) and an unloading pipe (40), of which at least the slurry pump is placed in a hold (2) adjacent to the utility hold (4).

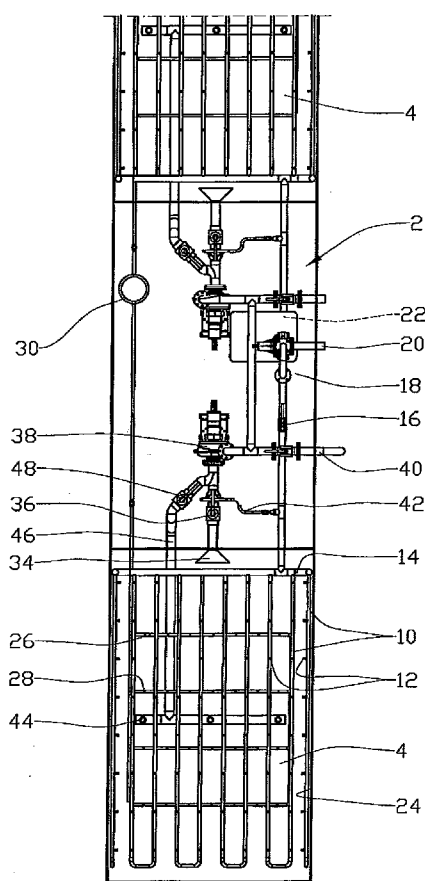


Fig. 2



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A METHOD OF PREPARING A BULK SHIP HAVING AT LEAST THREE HOLDS

This invention relates to a method of preparing a bulk ship having at least three holds. More particularly, it relates to a method of preparing a bulk ship having at least three holds
5 for sand transport and fluidized unloading.

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

When filling in sea areas in order to gain land, oftentimes large amounts of mass are required. According to prior art,
10 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 located in silo-like compartments in the vessel. The mass may be unloaded by opening the bottom of the vessel, for example
15 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 suitable for carrying large quantities of mass over longer distances and not, in particular, when transport across open
20 sea areas comes into question. The reason for this is of 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. As such, US patent 3445008 describes a method and device wherein the lower portion of the hold of the vessel is filled
5 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.

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

The use of bulk ships for carrying dredged mass has been proposed, and patent application NO 19986101 describes an unloading device to be placed on the surface of the cargo, the device of which is structured in a manner allowing it to
15 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 one of the disadvantages of the prior art.

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

A method of preparing a bulk ship having at least three holds for sand transport and fluidized unloading is provided, wherein the method comprises:

- 25
- disposing, within a utility hold, fluidizing pipes having inflow openings and also a slurry inlet for fluidized sand; and
 - disposing, on the bulk ship, a water pump connected between a water inlet and the fluidizing pipe, and a slurry pump

connected between the slurry inlet and an unloading pipe, of which at least the slurry pump is placed in a hold adjacent to the utility hold.

By virtue of disposing the pumps in an adjacent hold, the pumps are located at a level of height near the floor of the utility hold. Simultaneously, the slurry pump may be positioned near the slurry inlet. This reduces cavitation, which would otherwise take place at a substantial degree in the pumps. The outflow of slurry to the slurry pump is facilitated by virtue of the static pressure from the sand, which is located above the slurry in the utility hold, creating a pressure on the slurry.

During unloading, water may flow in from the water inlet and through the inflow openings, which may be comprised of nozzles, so as to fluidize the sand located closest to the floor of the utility hold - frequently termed the tank top. If desirable, fluidizing pipes having inflow openings may also be disposed on the walls of the utility hold, or at different levels of height in the utility hold.

In order to further improve the fluidizing of the sand, the method may also comprise disposing air injection pipes in the utility hold, preferably near the floor thereof. The air injection pipes may be provided with air injection openings, such as nozzles. The air injection pipe is connected to a compressor, typically via a pressure tank. Experiments have proven that water-fluidized sand obtains better fluidity by virtue of mixing some air into the fluidized sand.

A bulk ship may not be filled up with sand in all the holds, given that the carrying capacity of the bulk ship would be exceeded. For this reason, it is also appropriate to use e.g. every other hold for technical equipment which, in addition

to the pumps and a potential compressor, may comprise valves and control components. In order to be able to adjust the specific gravity of the fluidized sand before entering into the slurry pump, injection pipes for water to the slurry pipe
5 may also be disposed on the inlet side of the slurry pump.

In general, the equipment in one hold may serve two adjacent holds.

The fluidized material may be unloaded by allowing it to flow into the slurry inlet and onwards via the slurry pump and the
10 unloading pipe.

The method may further comprise allowing the unloading pipe to end outside the bulk ship when the sand is to be unloaded from the bulk ship, or connecting the unloading pipe to a transport pipe when the fluidized sand is to be delivered at
15 a distance from the bulk ship, for example onshore.

A ship for transport of sand is normally loaded with fluidized or very wet sand typically excavated from the seabed near the loading site. The sand must be drained in order to be classified as dry during the transport.

20 The method may comprise disposing at least one drainage column for drainage of the sand in the utility hold. A drainage column of this type may be comprised of a pipe having a number of openings in the pipe wall along the pipe, each opening being screened in such a way that water may
25 enter through the opening, whereas settled sand covers the screen and thus prevent significant quantities of sand from entering into the drainage column.

The method may further comprise connecting the drainage column to the slurry pump for pumping out water from the
30 surface of the sand.

The use of a bulk ship having at least three holds prepared in accordance with the invention for transport of sand across the open sea allows for a substantial reduction in time and costs for transport and unloading of sand.

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

Fig. 1 shows, in cross-section, a bulk ship in accordance with the invention during loading;

- 10 Fig. 2 shows a plan view of a segment of the hold of the bulk ship;

Fig. 3 shows, in perspective, details of the utility hold of the bulk ship, wherein the extent of the utility hold is indicated by means of dashed lines; and

- 15 Fig. 4 shows, on a larger scale, a section through a drainage column.

In the drawings, the reference numeral 1 represents a bulk ship comprising several holds 2, at least one thereof being used as a utility hold 4.

- 20 In fig. 1, the bulk ship 1 is moored next to a dredger 6, where sand in fluidized form flows from the dredger 6 and into the utility hold 4 via a filling pipe 8.

The utility hold 4 of the bulk ship 1, near the floor - tank top - thereof, is provided with a number of fluidizing pipes 10 having inflow openings 12. The fluidizing pipes 10 extend
25 horizontally in the longitudinal direction of the bulk ship 1 and are connected to a manifold 14. Via a first water valve 16, the manifold 14 is connected to a water pump 18 that receives water from a water inlet 20, see figure 2. The water

inlet 20 may comprise a sea chest (not shown). The water pump 18 is positioned in a hold 2 adjacent to the utility hold 4 and is designed in a manner allowing it supply water, via a second water valve 22, to another adjacent utility hold 4. In
5 figure 2, the second water valve 22 is hidden underneath the water pump 18.

A portion of the fluidizing pipes 10 is placed on the walls 24 of the utility hold 4.

A number of air injection pipes 26 having air injection
10 openings 28 are disposed near the floor of the utility hold 4. The air injection pipes 26 communicate with a pressure tank 30 located in an adjacent hold 2 relative to the utility hold 4.

Via a slurry valve 36, a slurry inlet 34 in the utility hold
15 4 is connected to the inlet of a slurry pump 38. The slurry pump 38, which is placed in a hold 2 adjacent to the utility hold 4, is connected to an unloading pipe 40. The unloading pipe 40 ends in the sea next to the bulk ship 1.

An intermediate pipe 42 is connected between the manifold 14
20 and the inlet of the slurry pump 38. The aim is to be able to adjust the specific gravity of the fluidized sand before entering into the slurry pump 38 and by supplying additional water via the intermediate pipe 42.

Three drainage columns 44 are disposed in the utility hold 4.
25 The drainage columns 44 are connected, at their lower portions, to a drainage pipe 46 which, via a drainage valve 48, is connected to the slurry pump 38.

The drainage columns 44 comprise a pipe 50 having a number of openings 52 in the pipe wall along the longitudinal extent
30 thereof, see figure 4. A screen 54, which is tight at the top

and open at the bottom, surrounds the pipe 50 at the openings 52, whereby an annular space 56 is formed between the screen 54 and pipe 50.

Water may flow into the annular space 56 and onwards into the pipe 50 via the openings 52, whereas sand settling around the screen 54 will seal the annular space 56 at the bottom as the utility hold 4 is being filled. Excess water 58 located above the sand 60, see figure 1, must therefore exit via openings 52 higher up on the drainage column 44.

During loading of the bulk ship 1, when fluidized sand flows into the utility hold 4 via the filling pipe 8, the sand 60 settles in the utility hold 4. The slurry valve 36 is closed and the drainage valve 48 is open. As described above, the excess water 58 is drained via the drainage columns 44, drainage pipe 46 and slurry pump 38 and into the sea via the unloading pipe 40.

Before unloading of the bulk ship 1 is to take place, the first water valve 16 is opened, the drainage valve 48 is closed, and the slurry valve 36 is opened.

Upon starting the water pump 18, water flows from the water inlet 20 and via the water pump 18, the first water valve 16, the manifold 14, the fluidizing pipes 10 and the inflow openings 12 and into the sand 60, whereby the part of the sand located closest to the inflow openings 12 is fluidized and forms a slurry.

Upon starting the slurry pump 38, the fluidized sand flows via the slurry inlet 34, the slurry valve 36 and the slurry pump 38 onto the unloading pipe 40.

If desirable, air is supplied to the fluidized sand from the pressure tank 30 via the air injection pipes 26 and the air

injection openings 28.

C l a i m s

1. A method of preparing a bulk ship (1) having at least three holds (2) for sand transport and fluidized unloading, c h a r a c t e r i z e d i n that the method comprises:
 - disposing, within a utility hold (4), fluidizing pipes (10) having inflow openings (12) and also a slurry inlet (34) for fluidized sand;
 - disposing, on the bulk ship (1), a water pump (18) connected between a water inlet (20) and the fluidizing pipe (10), and a slurry pump (38) connected between the slurry inlet (34) and an unloading pipe (40), of which at least the slurry pump is placed in a hold (2) adjacent to the utility hold (4).
2. The method in accordance with claim 1, c h a r a c t e r i z e d i n that the method further comprises: disposing fluidizing pipes (10) having inflow openings (12) on the wall (24) of the utility hold (4).
3. The method in accordance with claim 1, c h a r a c t e r i z e d i n that the method further comprises: disposing air injection pipes (26) in the utility hold (4).
4. The method in accordance with claim 1, c h a r a c t e r i z e d i n that the method further includes letting the unloading pipe (40) discharge at the bulk ship (1).
5. The method in accordance with claim 1, c h a r a c t e r i z e d i n that the method further comprises: connecting the unloading pipe (40) to a conveying pipe.

6. The method in accordance with claim 1,
c h a r a c t e r i z e d i n that the method further
comprises: disposing at least one drainage column (44) in
the utility hold (4).
- 5 7. The method in accordance with claim 7,
c h a r a c t e r i z e d i n that the method further
comprises: connecting the drainage column (44) to the
slurry pump (38).
8. Use of a bulk ship (1) prepared in accordance with claim
10 1 for transport of sand across the open sea.

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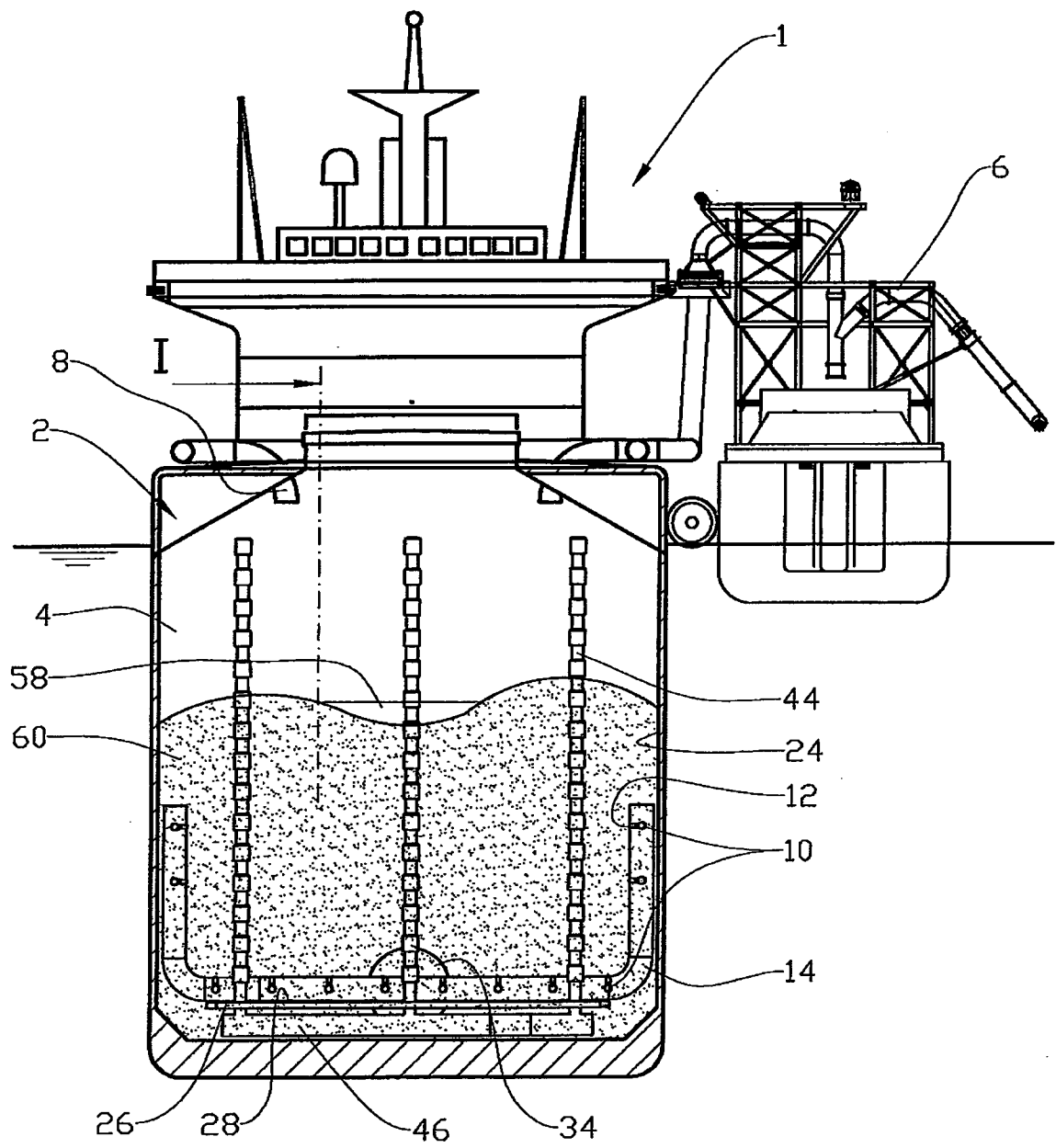


Fig. 1

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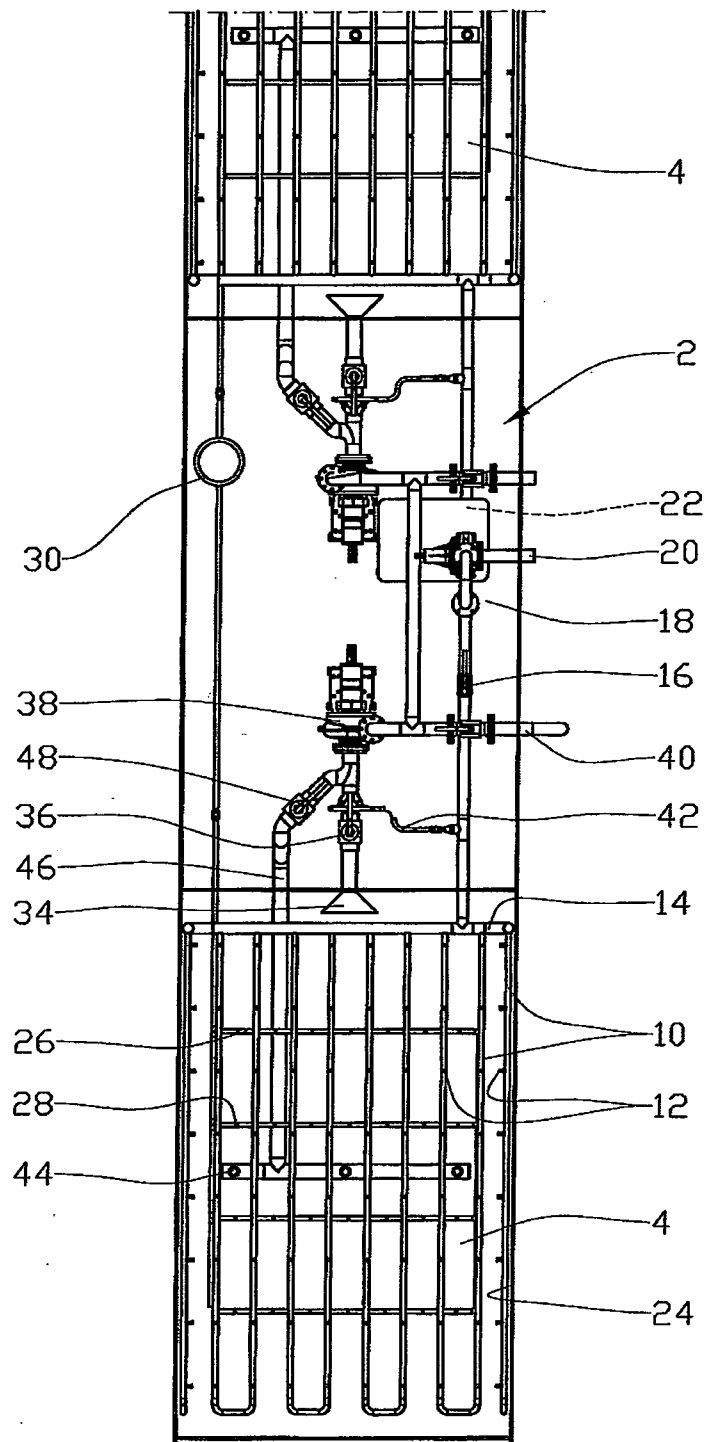


Fig. 2

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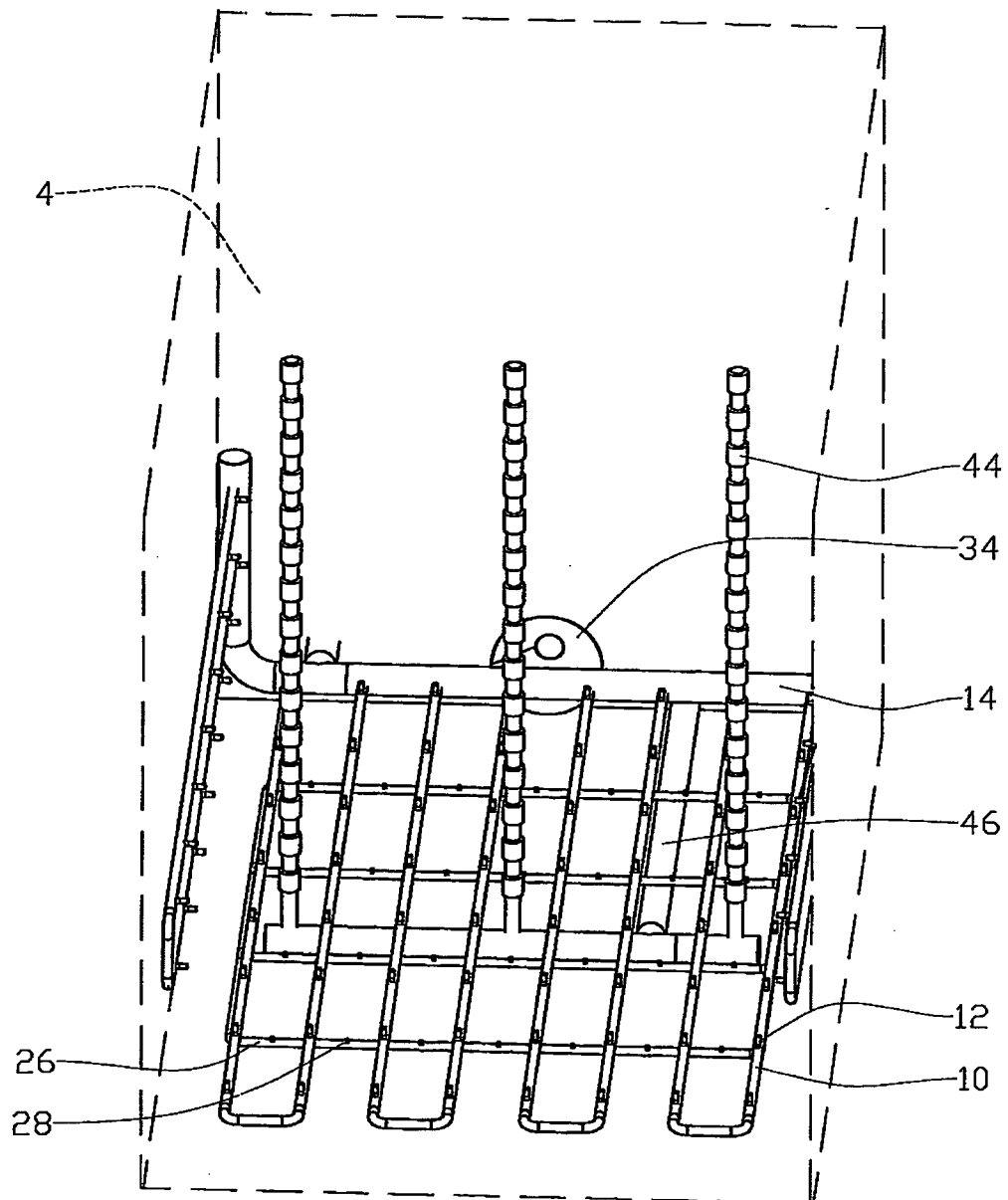


Fig. 3

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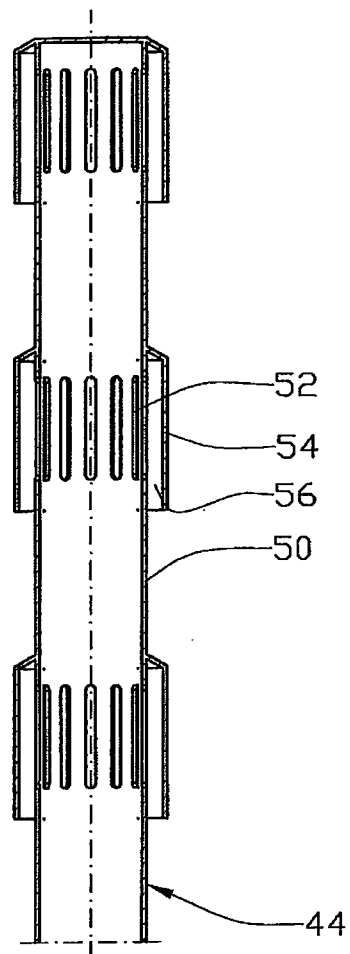


Fig. 4

INTERNATIONAL SEARCH REPORT

International application No.

PCT/NO2009/000446

A. CLASSIFICATION OF SUBJECT MATTER

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC: B63B

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

DK, FI, NO, SE

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

EPODOC, WPI

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	US 3729232 A (SAKATA, M. et al.) 1973.04.24 whole document	1-9
A	US 689741 A (McDOUGALL, A.) 1901.12.24 whole document	1-9



Further documents are listed in the continuation of Box C.



See patent family annex.

* Special categories of cited documents:

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"O" document referring to an oral disclosure, use, exhibition or other means

"P" document published prior to the international filing date but later than the priority date claimed

"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art

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INTERNATIONAL SEARCH REPORT
Information on patent family members

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Publication:	Publication date:	Family member:	Publication date:
US 3729232 A	1973-04-24	JP 51019218 B	1976-06-16
US 689741 A	1901-12-24	NONE	