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DESCRIPTION

Title of Invention:
SHIP AND BALLAST WATER TREATMENT SYSTEM

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Technical Field

The invention relates to a ballast water treatment system and a ship having this system installed therein.

Background Art

10 In recent years, in some cases, a ballast water treatment system configured to treat ballast water is installed in a ship in order to protect the environment. For example, there has been disclosed providing a ballast water treatment system in a non-
15 explosion-proof area in the stern of a ship (see Patent Literature 1).

However, there are many ships designed or built without a premise that a ballast water treatment system is installed. Such ships require much effort such as
20 remodeling in order to install the ballast water treatment system.

Citation List

Patent Literature 1

Jpn. Pat. Appln. KOKAI Publication No. 2009-67253

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Summary of Invention

Technical Problem

It is an object of the invention to provide a ship in which a ballast water treatment system capable of

being readily installed.

Solution to Problem

A ship according to an aspect of the invention comprises ballast water treatment means for treating
5 ballast water, the ballast water treatment means being installed in a cargo hold where a cargo is held.

Advantageous Effect of Invention

According to the invention, the ship in which the ballast water treatment system capable of being readily
10 installed can be provided.

Brief Description of Drawings

FIG. 1 is a side elevation showing a configuration of a ship according to a first embodiment of the invention;

15 FIG. 2 is a block diagram showing an internal configuration in a ballast water treatment system according to the first embodiment of the invention;

FIG. 3 is a block diagram showing a configuration that ballast water flows when taking on ballast water
20 by using a pump in the ship according to the first embodiment of the invention;

FIG. 4 is a block diagram showing a path of the ballast water when discharging ballast water by using the pump in the ship according to the first embodiment
25 of the invention;

FIG. 5 is a block diagram showing a path of the ballast water when taking on ballast water without

using the pump in the ship according to the first embodiment of the invention;

FIG. 6 is a block diagram showing a path of the ballast water when discharging ballast water without using the pump in the ship according to the first embodiment of the invention; and

FIG. 7 is a side elevation showing a configuration of a ship according to a second embodiment of the invention.

10 Description of Embodiments

Embodiments according to the invention will now be described hereinafter with reference to the drawings.

(First Embodiment)

FIG. 1 is a side elevation showing a configuration of a ship 1 according to a first embodiment of the invention. It should be noted that like reference numerals denote like parts in subsequent drawings, a detailed description thereof will be omitted, and different parts will be mainly explained. In a subsequent embodiment, likewise, an overlapping description will be omitted.

The ship 1 is a container ship configured to carry containers. It should be noted that a description will be given on a situation where the ship navigates the sea for the convenience's sake, but the ship can likewise navigate a lake or a river.

The ship 1 includes a ballast water treatment

system 2, a fore tank 3, a fore container hold 4, a
fuel tank 5, a ballast space 6, crew accommodation 8, a
aft container hold 9, an engine room section 10, a
mooring deck 11, a steering gear room 12, a void space
5 13, a screw propeller 14, and a rudder 15.

The ballast water treatment system 2 is installed
in the fore container hold 4. The ballast water
treatment system 2 takes the form of a standard
container. That is, the housing of the ballast water
10 treatment system 2 has the same shape as a container
conforming to the relevant International Organization
for Standardization (ISO) standard. A container
serving as the housing of the ballast water treatment
system 2 is, for example, two 20-foot containers
15 combined longitudinally which correspond to 40 feet or
a single 40-foot container.

The ballast water treatment system 2 treats
ballast water. Specifically, the ballast water
treatment system 2 kills or removes the microbes,
20 bacteria and the like in the ballast water. The
ballast water is water that is taken on into a ship for
the purpose of mainly lowering the center of gravity
when no cargo is held and thereby maintaining stability
of the ship. This water may be any one of sea water,
25 fresh water, and brackish water.

The fore tank 3 is a tank placed on the bow side.

The fore container hold 4 and the aft container

hold 9 are provided in cargo holds. A cargo hold is a section in which cargo is kept. Each of the fore container hold 4 and the aft container hold 9 is a place where containers are secured and kept. The fore
5 container hold 4 is placed in front of the engine room section 10 and at the rear of the fore tank 3. The aft container hold 9 is placed on the stern side that is an upper posterior part of the engine room section 10.

The ballast space 6 is a space placed below the
10 fore container hold 4. For example, a ballast tank, a pipe duct, a duct keel, and others are provided in the ballast space 6.

The crew accommodation 8 is located above deck. The crew accommodation 8 is a place where the crew and
15 other personnel reside.

The engine room section 10 is an area where an apparatus that drives a propulsion device of the ship 1 is installed, and it is a section including a rear part of the crew accommodation 8. The engine room section
20 10 is blocked from the fore container hold 4 and the aft container hold 9 by bulkheads.

The mooring deck 11 is provided in an upper part of the aft portion. The mooring deck 11 is a deck where a device for mooring the ship is installed.

25 The steering gear room 12 is located below the mooring deck 11. The steering gear room 12 is a chamber where a device for operating the rudder 15 is

disposed.

The void space 13 is a space placed below the steering gear room 12.

5 The screw propeller 14 and the rudder 15 are provided at the stern of the ship 1. The screw propeller 14 propels the ship 1. The rudder 15 is a device that controls a traveling direction of the ship 1.

10 FIG. 2 is a block diagram showing an internal configuration in the ballast water treatment system 2 according to this embodiment.

The ballast water treatment system 2 includes a filter 21, a sterilization unit 22, a power supply and control unit 23, and a pipe 24. The pipe 24 is
15 arranged so that the ballast water can flow to the filter 21 and the sterilization unit 22 in the ballast water treatment system 2.

The filter 21 is a device configured to filter the ballast water. The filter 21 removes microbes or
20 bacteria contained in the taken on ballast water. The ballast water that has passed through the filter 21 flows the sterilization unit 22. The filter 21 is provided with a function for externally discharging impurities such as polluted mud containing filtered
25 microbes and the like (drain discharge). When discharging ballast water, the ballast water is not filtered by the filter 21, but it flows through the

pipe 24 which bypasses the filter 21. It should be noted that, when discharging, the ballast water may be allowed to pass through the filter 21.

5 The sterilization unit 22 effects a sterilization treatment for killing living organisms, for example, unfiltered microbes, bacteria, or germs contained in the ballast water filtered by the filter 21. The sterilization unit 22 discharges the sterilized ballast water from the pipe 24. Two pipes 24 from which the
10 ballast water is discharged are extended from the sterilization unit 22. The first pipe 24 is configured to hold the taken on ballast water in a ballast tank. The second pipe 24 is configured to discharge the ballast water in the ballast tank. It should be noted
15 that the sterilization unit 22 may be provided with a function for externally discharging impurities remaining after treating the ballast water (drain discharge) like the filter 21.

The power supply and control unit 23 supplies
20 electric power to respective devices, for example, the filter 21, the sterilization unit 22, and other devices in the ballast water treatment system 2.

FIG. 3 to FIG. 6 are block diagrams each showing a path of the ballast water in the ship 1 according to
25 this embodiment.

The ship 1 has paths through which the ballast water flows in the following four patterns. The four

patterns correspond to a case that a pump 32 is used and ballast water is taken on, a case that the pump 32 is used and ballast water is discharged, a case that ballast water is taken on without using the pump 32, and a case that ballast water is discharged without using the pump 32.

FIG. 3 shows a path of the ballast water when the pump 32 is used and ballast water is taken on. FIG. 4 shows a path of the ballast water when the pump 32 is used and ballast water is discharged. FIG. 5 shows a path of the ballast water when ballast water is taken on without using the pump 32. FIG. 6 shows a path of the ballast water when ballast water is discharged without using the pump 32.

An intake/outlet port 16 is a hole provided on the outer side of the ship in order to take on or discharge ballast water. Seawater taken on as ballast water from the intake/outlet port 16 is treated by the ballast water treatment system 2 and held in the ballast tank. It should be noted that, while it is sufficient to provide a single ballast tank, any number of ballast tanks can be provided. The ballast water held in the ballast tank is treated by the ballast water treatment system 2 and discharged from the intake/outlet port 16.

Ballast pipes 31 are arranged to allow the ballast water to flow along a path between the intake/outlet port 16 and the ballast water treatment system 2 and a

path between the ballast tank and the ballast water treatment system 2.

Valves 33a to 33j are provided in the ballast pipes 31. The respective valves 33a to 33j are
5 opened/closed to determine the path through which the ballast water flows. As a result, one of the four path patterns is selected. Further, the valves 33a to 33j are capable of controlling a volume of ballast water flowing through the ballast pipes 31.

10 The pump 32 is a ballast pump that is used to take on or discharge ballast water. Whether the pump 32 should be used is determined in accordance with the level of the ballast water held in the ballast tank and sea level. For example, when taking on ballast water,
15 if the water level in the ballast tank is higher than sea level, the pump 32 is used. When discharging ballast water, if the water level in the ballast tank is below sea level, the pump 32 is used. It should be noted that the pump 32 may be a general service pump
20 that can be used not only for the intake and discharge of ballast water but also for any other application. Furthermore, a booster pump that supplements a lifting height when the lifting height of the pump 32 is not sufficient may be provided separately from the pump 32.

25 The ballast pipes 31, the pump 32, and the valves 33a to 33j are arranged in the ballast space 6 and the engine room section 10.

A method of controlling a flow of the ballast water will now be described in accordance with each pattern.

An example of using the pump 32 and taking on ballast water will now be explained with reference to FIG. 3. In this case, valve 33a, valve 33d, valve 33e, valve 33f, and valve 33g are opened, and valve 33b, valve 33c, valve 33h, valve 33i, and valve 33j are closed.

Ballast water taken on from the intake/outlet port 16 is pumped up by the pump 32. At this time, the ballast water enters the ballast water treatment system 2 from the intake/outlet port 16 through valve 33a, the pump 32, valve 33d, valve 33e, and valve 33f in the order mentioned. The ballast water pumped up by the pump 32 flows through the ballast water treatment system 2. The ballast water treated by the ballast water treatment system 2 is held in the ballast tank. At this time, the ballast water flows into the ballast tank from the ballast water treatment system 2 through valve 33g.

An example of using the pump 32 and discharging ballast water will now be described with reference to FIG. 4. In this case, valve 33b, valve 33c, valve 33d, valve 33e, valve 33f, and valve 33i are opened, and valve 33a, valve 33g, valve 33h, and valve 33j are closed.

The ballast water held in the ballast tank is pumped up by the pump 32. Here, the direction in which the ballast water flows through the pump 32 is configured to be the same as that when taking on ballast water shown in FIG. 3. At this time, the ballast water flows into the ballast water treatment system 2 from the ballast tank through valve 33c, the pump 32, valve 33d, valve 33e, and valve 33f in the order mentioned. The ballast water pumped up by the pump 32 flows through the ballast water treatment system 2. The ballast water treated by the ballast water treatment system 2 is discharged to the sea from the intake/outlet port 16 through valve 33i and valve 33b in the order mentioned.

An example of taking on ballast water without using the pump 32 will now be described with reference to FIG. 5. In this case, valve 33b, valve 33e, valve 33f, valve 33g, and valve 33j are opened, and valve 33a, valve 33c, valve 33d, valve 33h, and valve 33i are closed.

The ballast water taken on from the intake/outlet port 16 flows into the ballast water treatment system 2 through the ballast pipes 31 without using the pump 32. At this time, the ballast water enters the ballast water treatment system 2 from the intake/outlet port 16 through valve 33b, valve 33j, valve 33e, and valve 33f in the order mentioned. The ballast water treated by

the ballast water treatment system 2 is held in the ballast tank. At this time, the ballast water flows into the ballast tank from the ballast water treatment system 2 via valve 33g.

5 An example of discharging ballast water without using the pump 32 will now be described with reference to FIG. 6. In this case, valve 33b, valve 33f, valve 33h, and valve 33i are opened, and valve 33a, valve 33c, valve 33d, valve 33e, valve 33g, and valve 33j are
10 closed.

 The ballast water held in the ballast tank flows into the ballast water treatment system 2 through the ballast pipes 31 without using the pump 32.

 At this time, the ballast water flows into the
15 ballast water treatment system 2 from the ballast tank through valve 33h and valve 33f in the order mentioned. The ballast water treated by the ballast water treatment system 2 is discharged into the sea from the intake/outlet port 16 through valve 33i and valve 33b
20 in the order mentioned.

 According to this embodiment, the ballast water treatment system 2 can be easily installed in the ship 1. For example, in the case of a ship that is not designed or built on the assumption that the ballast
25 water treatment system is installed, providing a place for installing the ballast water treatment system is difficult. For example, when the ballast water

treatment system 2 should be installed in the engine room, it is often the case that sufficient space is not available in the engine room. In such a case, since the ballast water treatment system 2 is designed on the assumption that it is installed in the cargo hold, it can be installed in the cargo hold.

Moreover, since the ballast water treatment system 2 takes the form of a standard container and installed in the cargo hold, loading and unloading can be carried out by using a regular cargo handling gear. As a result, even in case that the ballast water treatment system 2 is not necessary or should be replaced, the ballast water treatment system 2 can be easily stowed or unstowed.

(Second Embodiment)

FIG. 7 is a side elevation showing a configuration of a ship 1A according to a second embodiment of the invention.

In the ship 1A, a ballast water treatment system 2 is disposed in a aft container hold 9 in place of disposing the same in the fore container hold 4 in the ship 1 according to the first embodiment shown in FIG. 1. Other points are the same as those in the ship 1 according to the first embodiment.

According to this embodiment, even when the ballast water treatment system 2 is installed in the aft container hold 9, the same functions and effects as

those in the first embodiment can be obtained.

It should be noted that the description has been given as to the ballast water treatment system 2 taking the form of a container in each of the foregoing
5 embodiments, the ballast water treatment system 2 does not have to take the form of a container as long as it is designed on the assumption that it is installed in the cargo hold. When the ballast water treatment system 2 can be installed in the cargo hold, an
10 installation space for the ballast water treatment system 2 can be easily assured.

Additionally, in each of the foregoing embodiments, the ballast pipes 31, the pump 32, and valves 33a to 33j may be provided at positions other
15 than those shown in FIG. 3 to FIG. 6. These devices can be changed in accordance with the configuration or the situation in the ship 1.

Further, in each of the foregoing embodiments, the ballast water treatment system 2 may take any form.
20 For example, in the ballast water treatment system 2, the treating order of the filter 21 and the sterilization unit 22 may be reversed, or the filter 21 may be eliminated.

It should be noted that the invention is not
25 restricted to the foregoing embodiments, and each constituent element may be deleted, added, or changed to realize each embodiment. Furthermore, when the

constituent elements in the respective embodiments are appropriately combined or replaced, the invention can be carried out in different modes. As explained above, when an embodiment directly different from the

5 foregoing embodiments has the same gist as that in the invention, it is considered that this embodiment has been already explained as the foregoing embodiment, and a description thereof is omitted.

C L A I M S

1. A ship characterized by comprising ballast water treatment means for treating ballast water, the ballast water treatment means being installed in a cargo hold where a cargo is held.

2. The ship according to claim 1, characterized in that the ballast water treatment means takes the form of a container.

3. The ship according to claim 2, characterized in that the ballast water treatment means is detachably installed.

4. The ship according to any one of claims 1 to 3, characterized in that the ballast water treatment means treats the ballast water at a time of water intake and drain discharge.

5. The ship according to claim 4, characterized by further comprising a pump used at a time of taking on and discharging ballast water.

6. A ballast water treatment system characterized by being configured to treat ballast water and to be installed in a cargo hold where a cargo is held.

7. The system according to claim 6, characterized in that the ballast water treatment system takes the form of a container.