Claims

1. A system for treating ballast water in ballast tanks (1) onboard vessels and offshore constructions, said system (20) comprising:

- one or more ballast tanks (1),
- a circulation pump (22) capable of circulating or recirculating, via a tubing, ballast water from and to the one or more ballast tanks (1),
- a recirculation system (20) supplements the conventional ballast pumping system (10) the ballast water is pumped, by means of the recirculation pump (22), from a ballast tank via return pipes (23) to return pipes (24) and back to the ballast tank (1) via a feeder pipe (25) and distribution pipes 26;
- a gas supply unit (21) which is connected to the tubing (22) in such a manner that gas, such as atmospheric air and/or inert gas, such as nitrogen and/or carbon dioxide, can be supplied to the ballast water; and
- one or more nozzle heads (28) that are functionally connected to the tubing and is/are arranged in one or more ballast tanks (1), said one or more nozzle heads comprising at least one nozzle for injection of the gas-containing water into the one or more ballast tanks (1);
- characterised in
- a device (37) configured for removing and/or killing live organisms in the ballast water.

2. A system according to claim 1, **characterised in that** the device (37) comprises a means for supplying heat (40) to the ballast water.

3. A system according to one or more of the preceding claims, **characterised in that** the device (37) comprises at least one heat exchanger.

4. A system according to one or more of the preceding claims, **characterised in that** the at least one heat exchanger (41) cools the treated ballast water by exchanging heat on the circulation pipe to and from the means for supplying heat (40) to the ballast water.

5. A system according to one or more of the preceding claims, **characterised in that** the device (37) comprises at least two heat exchangers, wherein the device for supplying heat (40) is constituted by a heat exchanger.

6. A system according to one or more of the preceding claims, **characterised in that** the recirculation pipe between the device for supplying heat (40) to the ballast water and the heat exchanger (41) for cooling the ballast water is functionally connected to a dwell-time increaser (42).

7. A system according to one or more of the preceding claims, **characterised in that** the bas supply unit (21) comprises a pump.

8. A system according to one or more of the preceding claims, **characterised in that** the gas supply unit (21) comprises at least two units for supplying gas to the ballast water, such as a pump/compressor capable of supplying air and hence oxygenating the ballast water and/or an inert-gas generator capable of supplying inert gas and thereby deoxygenating the ballast water while simultaneously stirring the ballast water in a ballast tank.

9. A system according to one or more of the preceding claims, **characterised in that** one or more nozzle heads (28) is/are arranged in a lower zone of the ballast tank (1) in the part of the ballast tank where inflow (32) of ballast water takes place.

10. A system according to claim 1, **characterised in that** the at least one nozzle is a not movable nozzle.

11. A system according to claim 1, **characterised in that** the at least one nozzle is configured for powered rotation about one or two axes.

12. A system according to claims 1, 10 and 11, **characterised in that** the system comprises at least two nozzle heads, of which one nozzle is a non-movable nozzle and one nozzle is configured for powered rotation about one or two axes.

13. A method for treating ballast water in ballast tanks, wherein the method comprises the steps of:

- pumping ballast water into the ballast tank (1) by means of a ballast pump;
- recirculating ballast water in a recirculation system by means of a recirculation pump;
- supplying inert gas such as nitrogen and/or carbon dioxide to the ballast water in the recirculation system via a gas supply unit (21);
- injecting the gas-containing water into a ballast tank via one or more nozzles;
- that the ballast water is circulated through a device (37) which is functionally connected to the recirculation system in order to remove and/or kill live organisms.

14. A method for treating ballast water in ballast tanks according to claim 10, wherein the circulation of the ballast water through the device (37) comprises the following steps:

- circulating the ballast water through a heat exchanger (41) in order to absorb heat from previously heated ballast water;
- supplying heat to the ballast water from a heat source via a device for supplying heat (40);

- reducing the flow rate of the ballast water by a dwell-time increaser (42) to the effect that the time for heat-treating the ballast water is increased;
- cooling the ballast water by it being caused to travel through the heat exchanger (41).

15. A method according to claims 13 - 14, wherein the method further comprises the following steps:

- interrupting the supply of inert gas;
- pumping gas to the ballast water via the gas supply unit (21) and/or the pump to the effect that the ballast water is oxidized before ballast water is discharged to the aquatic environment at the destination.

16. A method according to claims 13 - 14, wherein the method further comprises the following steps:

- interrupting the supply of inert gas;
- pumping atmospheric air to the ballast water via the gas supply unit (21) and/or the pump to the effect that the ballast water is oxidized before the ballast water is discharged to the aquatic environment at the destination.

17. A method for treating ballast water in ballast tanks, wherein the method comprises the following steps:

- pumping, by means of a ballast water pump, ballast water into the ballast tank (1);
- recirculating, by means of a recirculation pump, ballast water into a recirculation system;

- supplying atmospheric air to the ballast water in the recirculation system via the gas supply unit (21);
- injecting the gas-containing water into a ballast tank via one or more nozzles;
- circulating the ballast water through a device (37) which is functionally connected to the recirculation system to remove and/or kill live organisms.

Claims

1. A system for treating ballast water in ballast tanks (1) onboard vessels and offshore constructions, said system (20) comprising:
- one or more ballast tanks (1),
- a circulation pump (22) capable of circulating or recirculating, via a tubing, ballast water from and to the one or more ballast tanks (1),
- a recirculation system (20) that supplements the conventional ballast pumping system (10) whereby the ballast water is pumped, by means of the recirculation pump (22), from a ballast tank via return pipes (23) to return pipes (24) and back to the ballast tank (1) via a feeder pipe (25) and distribution pipes 26;
- a gas supply unit (21) which is connected to the tubing (22) in such a manner that gas, such as atmospheric air and/or inert gas, such as nitrogen and/or carbon dioxide, can be supplied to the ballast water; and
- one or more nozzle heads (28) that are functionally connected to the tubing and is/are arranged in one or more ballast tanks (1), said one or more nozzle heads comprising at least one nozzle for injection of the gas-containing water into the one or more ballast tanks (1);
- **characterised in**
- a device (37) configured for removing and/or killing live organisms in the ballast water.

2. A system according to claim 1, **characterised in that** the device (37) comprises a means for supplying heat (40) to the ballast water.

3. A system according to one or more of the preceding claims, **characterised In that** the device (37) comprises at least one heat exchanger.

4. A system according to one or more of the preceding claims, **characterised in that** the at least one heat exchanger (41) cools the treated ballast water by exchanging heat on the circulation pipe to and from the means for supplying heat (40) to the ballast water.

5. A system according to one or more of the preceding claims, **characterised In that** the device (37) comprises at least two heat exchangers, wherein the device for supplying heat (40) is constituted by a heat exchanger.

6. A system according to one or more of the preceding claims, **characterised in that** the recirculation pipe between the device for supplying heat (40) to the ballast water and the heat exchanger (41) for cooling the ballast water is functionally connected to a dwell-time increaser (42).

7. A system according to one or more of the preceding claims, **characterised in that** the bas supply unit (21) comprises a pump.

8. A system according to one or more of the preceding claims, **characterised in that** the gas supply unit (21) comprises at least two units for supplying gas to the ballast water, such as a pump/compressor capable of supplying air and hence oxygenating the ballast water and/or an inert-gas generator capable of supplying inert gas and thereby deoxygenating the ballast water while simultaneously stirring the ballast water in a ballast tank.

9. A system according to one or more of the preceding claims, **characterised in that** one or more nozzle heads (28) is/are arranged in a lower zone of the ballast tank (1) in the part of the ballast tank where inflow (32) of ballast water takes place.

10. A system according to claim 1, **characterised in that** the at least one nozzle is a not movable nozzle.

11. A system according to claim 1, **characterised in that** the at least one nozzle is configured for powered rotation about one or two axes.

12. A system according to claims 1, 10 and 11, **characterised in that** the system comprises at least two nozzle heads, of which one nozzle is a non-movable nozzle and one nozzle is configured for powered rotation about one or two axes.

13. A method for treating ballast water in ballast tanks, wherein the method comprises the steps of:

- pumping ballast water into the ballast tank (1) by means of a ballast pump;
- recirculating ballast water in a recirculation system by means of a recirculation pump;
- supplying inert gas such as nitrogen and/or carbon dioxide to the ballast water in the recirculation system via a gas supply unit (21);
- injecting the gas-containing water into a ballast tank via one or more nozzles;
- circulating ballast water through a device (37) which is functionally connected to the recirculation system in order to remove and/or kill live organisms.

14. A method for treating ballast water in ballast tanks according to claim 13, wherein the circulation of the ballast water through the device (37) comprises the following steps:
- circulating the ballast water through a heat exchanger (41) in order to absorb heat from previously heated ballast water;
- supplying heat to the ballast water from a heat source via a device for supplying heat (40);
- reducing the flow rate of the ballast water by a dwell-time increaser (42) to the effect that the time for heat-treating the ballast water is increased;
- cooling the ballast water by it being caused to travel through the heat exchanger (41).

15. A method according to claims 13 - 14, wherein the method further comprises the following steps:
- interrupting the supply of inert gas;
- pumping gas to the ballast water via the gas supply unit (21) and/or the pump to the effect that the ballast water is oxidized before ballast water is discharged to the aquatic environment at the destination.

16. A method according to claims 13 - 14, wherein the method further comprises the following steps:
- interrupting the supply of inert gas;
- pumping atmospheric air to the ballast water via the gas supply unit (21) and/or the pump to the effect that the ballast water is oxidized before the ballast water is discharged to the aquatic environment at the destination.

17. A method for treating ballast water in ballast tanks, wherein the method comprises the following steps:

- pumping, by means of a ballast water pump, ballast water into the ballast tank (1);
- recirculating, by means of a recirculation pump, ballast water into a recirculation system;
- supplying atmospheric air to the ballast water in the recirculation system via the gas supply unit (21);
- injecting the gas-containing water into a ballast tank via one or more nozzles;
- circulating the ballast water through a device (37) which is functionally connected to the recirculation system to remove and/or kill live organisms.