【CLAIMS】

【Claim 1】

A scrubber installed inside of a funnel, the scrubber comprising:

a housing; and

a pretreatment unit configured to pretreat exhaust gas,

wherein the pretreatment unit is provided inside of the housing to reduce a cross-sectional area of the funnel increased for installation inside of the funnel,

wherein the housing is provided with an inlet duct, into which exhaust gas to be treated is introduced,

wherein the pretreatment unit includes a first injection unit injecting treatment liquid into the exhaust gas being introduced and flowing in the inside of the housing through the inlet duct,

wherein the first injection unit includes a first pretreatment supply pipe provided in the portion of housing, provided with the inlet duct, and a first pretreatment nozzle provided in the first pretreatment supply pipe,

wherein the first pretreatment supply pipe is disposed to be higher than the inlet duct in the inside of the housing by penetrating one side of the housing and extending towards the other side of the housing, and

wherein the first pretreatment nozzle is provided in the portion of the first pretreatment supply pipe, between one side of the inlet duct and one side of the housing, and between the other side of the inlet duct and the other side of the housing, respectively.

【Claim 2】

The scrubber of claim 1, wherein the funnel is provided on a ship, and the cross-sectional area of the funnel is increased in a stern or bow direction of the ship to install the scrubber.

【Claim 3】

The scrubber of claim 2, wherein the cross-sectional area of the funnel is not increased in a width direction of the ship.

【Claim 4】

The scrubber of claim 1, wherein the funnel has a rectangular cross section.

【Claim 5】

The scrubber of claim 4, wherein the scrubber has a rectangular cross section to significantly reduce a dead region inside of the funnel and a cross-sectional area of the funnel increased for installation inside of the funnel.

【Claim 6】

The scrubber of claim 1, comprising:

the housing installed inside of the funnel such that exhaust gas, introduced from an exhaust pipe installed inside of the funnel, is discharged while flowing in housing;

the pretreatment unit provided in a treatment space, formed inside of the housing, to pretreat exhaust gas introduced into the treatment space;

a posttreatment unit provided in the treatment space to posttreat the exhaust gas pretreated by the pretreatment unit; and

a packing unit provided in a portion of the treatment space

between the pretreatment unit and the posttreatment unit to increase a contact area between a pretreated exhaust gas and a treatment liquid.

【Claim 7】

The scrubber of claim 6, wherein the housing is provided with the inlet duct connected to the treatment space and an exhaust pipeand an outlet duct, connected to the treatment space, through which a treated exhaust is discharged.

【Claim 8】

The scrubber of claim 7, wherein the pretreatment unit supplies a treatment liquid to the exhaust gas, introduced through the inlet duct, to pretreat the exhaust gas, and

the posttreatment unit supplies a treatment liquid to the exhaust gas, pretreated by the pretreatment unit, to posttreat the exhaust gas.

【Claim 9】

The scrubber of claim 8, wherein an internal surface of a portion of the housing, into which exhaust gas is introduced through the inlet duct, is coated with a coating agent.

【Claim 10】

The scrubber of claim 9, wherein the coating agent is polyvinyl ester.

【Claim 11】

The scrubber of claim 9, wherein the pretreatment unit cools an introduced exhaust gas to a temperature at which the coating agent is not damaged.

【Claim 12】

The scrubber of claim 11, wherein the pretreatment unit cools the introduced exhaust gas to a temperature of 120°C or less.

【Claim 13】

The scrubber of claim 11, wherein the pretreatment unit cools the introduced exhaust gas to a temperature of 80°C or less.

【Claim 14】

The scrubber of claim 8, wherein the inlet duct is provided in a lower portion of the housing, and the outlet duct is provided in an upper portion of the housing.

【Claim 15】

The scrubber of claim 14, wherein the inlet duct is provided on a side surface of a lower portion of the housing having a height from a bottom of the housing.

【Claim 16】

The scrubber of claim 15, wherein the inlet duct is provided to be inclined toward the bottom of the housing at an angle.

【Claim 17】

The scrubber of claim 16, wherein the housing is provided with a flow guide extending from the inlet duct to the treatment space in a length direction of the housing by a length.

【Claim 18】

The scrubber of claim 17, wherein the flow guide has a length less than or equal to half of a length of the housing.

【Claim 19】

The scrubber of claim 18, wherein the flow guide has opposite sides spaced apart from an internal surface of the housing by a distance.

【Claim 20】

The scrubber of claim 19, wherein each of the opposite surfaces of the flow guide is inclined toward the treatment space from the inlet duct in a length direction of the housing.