

PATENT SPECIFICATION

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(54) FLOATING-REFUSE-COLLECTING BOAT

(71) We, MITSUBISHI JUKOGYO KABUSHIKI KAISHA, a Japanese Body Corporate of 5-1 Marunouchi 2-chome, Chiyoda-ku, Tokyo, Japan, do hereby declare the invention, for which we pray that a patent may be granted to us, and the method by which it is to be performed, to be particularly described in and by the following statement:—

This invention relates to a boat for collecting floating refuse from the surfaces of harbours, rivers and other bodies of water.

Floating-refuse-collecting boats of conventional designs include, for example, twin-hulled boats equipped with a rotor between the bows of the hulls to gather waterborne solid wastes in front of the boat towards the interhull water channel and also boats for directly hauling or scooping up floating refuse by a bow conveyor or rotary bucket. They have common problems of high maintenance cost in addition to the necessity of most careful inspection and maintenance because of the complexities of their mechanical drives. Nevertheless, the refuse-collecting efficiencies of those existing boats are not necessarily high.

The present invention is directed to the provision of a boat with simplified equipment capable of collecting floating refuse with an adequate efficiency at a low maintenance cost.

The present invention resides in a floating-refuse-collecting boat of twin-hulled construction comprising a floating-refuse collector carried in a fore-and-aft water channel formed between the hulls, a plurality of main water-jet units directly installed on the bows of said hulls and arranged to emit jets of water for guiding and forcing the refuse afloat in the vicinity of the entrance into the channel and towards said collector, and a plurality of auxiliary water-jet units installed on the hull portions forward of said collector and arranged to emit jets of water for preventing the collected refuse from

flowing out of said collector when the boat moves astern. 50

The present invention will be further described in connection with the accompanying drawings, in which:

Fig. 1 is a plan view of part of a floating-refuse-collecting boat embodying the invention; 55

Fig. 2 is a vertical sectional view of the boat of Fig. 1; and

Figs. 3 to 5 are schematic diagrams of control systems for water-jets units of the boat. 60

Figs. 1 and 2 show the forward part of a twin-hulled boat 1 carrying a floating-refuse collector 3 semisubmerged in the water channel 2 formed between the twin hulls. The refuse collector 3, when not in use, can be raised above the water surface W by a crane or other hoist means. 65

On the inwardly facing opposite walls of the bows 1a of the two hulls there are directly installed a plurality of main water-jet units 4, 5, above and below the water level, which eject jets of water to force the refuse afloat in the vicinity of the bows towards the interhull channel 2. 70 75

In front of the floating-refuse collector 3 are also installed a plurality of auxiliary water-jets units 6, 7, above and under the water, which emit jets of water to keep collected refuse contained in the collector 3 when the boat moves backward. 80

Between the lower fore parts of the twin hulls is held a submerged guide plate 8, which extends across the interhull channel 2 to aid the main water-jet units in inducing the flow of water and floating refuse towards the interhull channel 2. 85

Each of the water-jets units 4 to 7 comprises, for example, a nozzle secured to the hull wall with a ball joint and adapted to be supplied with water under pressure through a hose. The direction of the water jet from the nozzle can be changed as desired. As shown in Fig. 1 some of the units comprise a water pipe 6a supported horizontally between the twin hulls and 90 95

rotatable about a horizontal axis, and a bank of nozzles 6b attached to the pipe.

Fig. 3 schematically illustrates a system for controlling the direction and quantity of the water jets from each unit, for example, of the type consisting of the water pipe 6a and nozzles 6b.

In Fig. 3 there are shown a motor M, a water pump 9, an inlet valve 10, a water suction line 11, a flow control valve 12, and a water line 13, the pump 9 being used to supply water to the nozzles 6b to provide jets of water.

Controls for the above arrangement include a motor 14, an oil hydraulic pump 15, hydraulic fluid lines 16, 17, solenoid-operated directional control valves 18, 18', actuators 19, 19', potentiometers 20, 20' with open-close limit switches for sensing the positions of the valve 12 and nozzles 6b and an electric operation stand 21 from which the actuators and remotely controlled and at which the sensed positions of the valve 12 and nozzles are indicated.

Water flow to the water pipe 6a is controlled at the stand 21 by energizing the solenoid-operated directional control valve 18 to admit pressurised hydraulic fluid to the actuator 19 so that the opening of the flow control valve 12 can be adjusted.

Similarly, the inclination of the bank of nozzles 6b can be controlled at the stand 21 by actuating the solenoid-operated directional control valve 18' and thereby turning the water pipe 6a to a desired angle.

The potentiometer 20 may be directly attached to the flow control valve 12 or, alternatively, as shown in Fig. 4, a rack-and-pinion motor 22 may be used to control the operation of the flow control valve 12 via the potentiometer 20 with an open-close limit switch.

Fig. 5 shows a control system which permits the auxiliary water-jet units 6, 7 to emit jets of water automatically when the boat goes astern, so that the collected refuse is kept from flowing out of, or being left behind by, the refuse collector of the backing vessel. In this figure the reference numeral 23 designates a main-engine control lever and 24 designates electric contact points. The other numerals like those in Fig. 3 denote like or corresponding parts.

When the lever 23 is in the neutral position the flow control valve 12 is totally closed. As the lever 23 is turned to the backing position, the solenoid-operated directional control valve 18 supplies hydraulic pressure to the actuator 19, so that the flow control valve 12 is fully opened to enable the auxiliary water-jet units 6, 7 to emit jets of water toward the entrance of the floating-refuse collector 3.

The boat collects refuse from the water surface in the following way. The jets of water from the main water-jet units 4, 5 on the bows 1a of the two hulls are directed inwardly of the interhull channel 2, whereby the refuse afloat in the vicinity of the entrance is positively carried into the channel 2. In this manner floating refuse can be efficiently gathered by the collector 3.

If the collector 3 is built, for example, as a cage-like receptacle with an open front, a backwards motion of the boat can cause an outflow of the collected refuse from the collector due to a counter flow of water. This possibility is eliminated by the provision of the auxiliary water-jet units 6, 7 for containment, in front of the collector 3. While the boat is backing the auxiliary units will continue to emit sufficient jets of water to avoid any escape of the collected wastes from the collector.

Moreover, if the floating refuse is too much for the main water-jet units 4, 5 to guide satisfactorily into the collector 3, the auxiliary units 6, 7 may be used to give an additional push for increased collecting efficiency.

As shown in Fig. 5, shifting the main-engine control lever 23 to the "astern" position will automatically actuate the auxiliary water-jet units 6, 7, so that the latter can fully exhibit their refuse-containment function.

The directions of jets from the water-jet units 4 to 7 are adjusted to optimum angles according to changes in the draft of the boat. The control is simple, requiring no such elaborate effort as in adjusting the position of a rotor or conveyor aboard prior art refuse-collecting boats. Of the water-jet units, those installed on the underwater wall portions of the vessel may be ejectors.

The pumps supplying the water-jet units 4 to 7 may be newly installed as exclusive ones or, as an alternative, the general-purpose pumps originally in use aboard the vessel may be utilised for this purpose.

The water-jet units 4 to 7, when used in forcing and guiding floating refuse toward the collector, involve no such mechanical contact with the refuse as the conventional refuse-collecting rotor or conveyor does. They are, therefore, easy to maintain and helpful in reducing the maintenance cost considerably.

WHAT WE CLAIM IS:—

1. A floating-refuse-collecting boat of twinhulled construction comprising a floating-refuse collector carried in a fore-and-aft water channel formed between the hulls, a plurality of main waterjet units directly installed on the bows of said hulls



rotatable about a horizontal axis, and a bank of nozzles 6b attached to the pipe.

Fig. 3 schematically illustrates a system for controlling the direction and quantity of the water jets from each unit, for example, of the type consisting of the water pipe 6a and nozzles 6b.

In Fig. 3 there are shown a motor M, a water pump 9, an inlet valve 10, a water suction line 11, a flow control valve 12, and a water line 13, the pump 9 being used to supply water to the nozzles 6b to provide jets of water.

Controls for the above arrangement include a motor 14, an oil hydraulic pump 15, hydraulic fluid lines 16, 17, solenoid-operated directional control valves 18, 18', actuators 19, 19', potentiometers 20, 20' with open-close limit switches for sensing the positions of the valve 12 and nozzles 6b and an electric operation stand 21 from which the actuators and remotely controlled and at which the sensed positions of the valve 12 and nozzles are indicated.

Water flow to the water pipe 6a is controlled at the stand 21 by energizing the solenoid-operated directional control valve 18 to admit pressurised hydraulic fluid to the actuator 19 so that the opening of the flow control valve 12 can be adjusted.

Similarly, the inclination of the bank of nozzles 6b can be controlled at the stand 21 by actuating the solenoid-operated directional control valve 18' and thereby turning the water pipe 6a to a desired angle.

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If the collector 3 is built, for example, as a cage-like receptacle with an open front, a backwards motion of the boat can cause an outflow of the collected refuse from the collector due to a counter flow of water. This possibility is eliminated by the provision of the auxiliary water-jet units 6, 7 for containment, in front of the collector 3. While the boat is backing the auxiliary units will continue to emit sufficient jets of water to avoid any escape of the collected wastes from the collector.

Moreover, if the floating refuse is too much for the main water-jet units 4, 5 to guide satisfactorily into the collector 3, the auxiliary units 6, 7 may be used to give an additional push for increased collecting efficiency.

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The water-jet units 4 to 7, when used in forcing and guiding floating refuse toward the collector, involve no such mechanical contact with the refuse as the conventional refuse-collecting rotor or conveyor does. They are, therefore, easy to maintain and helpful in reducing the maintenance cost considerably.

WHAT WE CLAIM IS:—

1. A floating-refuse-collecting boat of twinhulled construction comprising a floating-refuse collector carried in a fore-and-aft water channel formed between the hulls, a plurality of main waterjet units directly installed on the bows of said hulls



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5 and arranged to emit jets of water for guiding and forcing the refuse afloat in the vicinity of the entrance into the channel and towards said collector, and a plurality of auxiliary water-jet units installed on the hull portions forward of said collector and arranged to emit jets of water for preventing the collected refuse from flowing out of said collector when the boat moves astern.

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2. A boat according to claim 1, wherein said main and auxiliary water-jet units are freely turnable to control the directions of the jets of water they provide, and are

installed on the hull walls and under the water. 15

3. A boat according to claim 1 or 2, including control means for causing said auxiliary water-jet units to emit jets of water automatically when the vessel moves astern. 20

4. A boat for collecting floating refuse, substantially as herein described with reference to the accompanying drawings.

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