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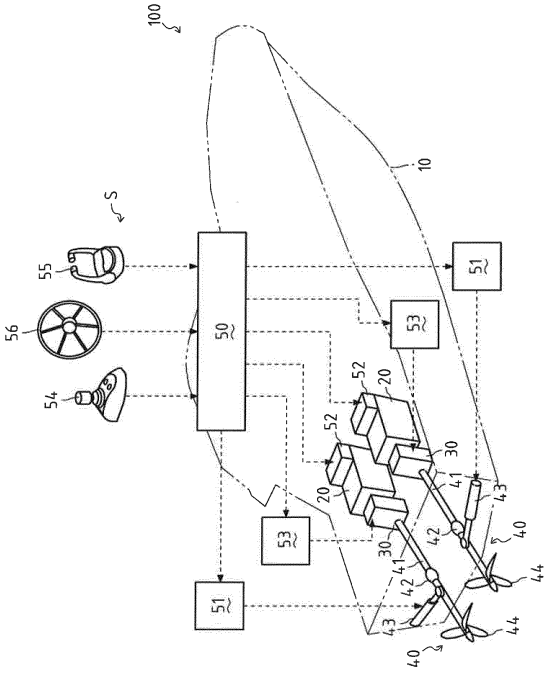
(54) **BOAT**

(57) The purpose of the present invention is to provide a boat capable of obtaining a propulsion force in a discretionary direction. A boat (100) is provided with Arneson drives 40 which drive propellers (44) by means of propeller shafts (41) via universal joints (42), and which control the left and right directions of the propellers (44) by means of hydraulic cylinders (43). Two of the Arneson drives (40) are provided, and the Arneson drives (40) are respectively provided to the left and right sides of a hull (10). The propellers (44) are controlled in the left and right directions in a mutually independent manner.

Fig. 1



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Description

TECHNICAL FIELD

[0001] The present invention relates to a technique regarding a vessel.

BACKGROUND ART

[0002] Conventionally, a technique of an Arneson Surface Drive for a vessel is known. The Arneson Surface Drive is a drive system that drives a propeller by a propeller shaft via a universal joint and controls the vertical and horizontal directions of the propeller by a hydraulic cylinder (for example, Patent Document 1).

[0003] In addition, a vessel is known in which only two right and left Arneson Surface Drives are disposed and propellers are controlled in the horizontal direction to steer the vessel. In such a vessel, right and left propellers are interlockingly controlled to steer the vessel. However, no vessel is disclosed which includes Arneson Surface Drives whose right and left propellers are controlled independently of each other in order to obtain propulsive force in an arbitrary direction.

PRIOR ART DOCUMENT

PATENT DOCUMENT

[0004] Patent Document 1: JP H06-92286 A

SUMMARY OF THE INVENTION

PROBLEMS TO BE SOLVED BY THE INVENTION

[0005] An object of the present invention is to provide a vessel capable of obtaining propulsive force in an arbitrary direction.

SOLUTION TO THE PROBLEMS

[0006] A vessel according to the present invention includes an Arneson Surface Drive which drives a propeller by a propeller shaft via a universal joint and which controls the propeller in a horizontal direction by a hydraulic cylinder. It is preferable that the vessel includes only two Arneson Surface Drives which are disposed on the right and left of a hull, and the propellers are controlled in the horizontal direction independently of each other.

[0007] In the vessel according to the present invention, when there is an abnormality in the hydraulic cylinder, control is performed such that a current slidable region of the hydraulic cylinder is set as entirety of a subsequent slidable region.

EFFECTS OF THE INVENTION

[0008] With the vessel according to the present invention, it is possible to obtain propulsive force in an arbitrary direction.

BRIEF DESCRIPTION OF THE DRAWINGS

[0009]

Fig. 1 is a schematic diagram showing a configuration of a vessel.
Fig. 2 is a schematic diagram showing an effect of the vessel.
Fig. 3 is a schematic diagram showing another effect of the vessel.

EMBODIMENTS OF THE INVENTION

[0010] The configuration of a vessel 100 will be described with reference to Fig. 1.

[0011] In Fig. 1, for the sake of easy understanding, a hull 10 is illustrated in a see-through manner. In the following description, front-back and right-left directions are determined assuming that a bow of the vessel 100 is a front of the vessel.

[0012] The vessel 100 is an embodiment regarding a vessel according to the present invention. The vessel 100 according to the present embodiment is a vessel with a twin-screw propulsion system including only two Arneson Surface Drives 40. The vessel 100 includes the hull 10, two engines 20, two switching clutches 30, the two Arneson Surface Drives 40, and a vessel steering device S.

[0013] The engine 20 rotates a propeller 44 provided on the port side or the starboard side. The engine 20 is disposed on each of the rear port side and the rear starboard side of the hull 10. The switching clutch 30 is connected to an output shaft of each engine 20.

[0014] The engine 20 is provided with an engine control unit (hereinafter referred to as ECU) 52. The ECU 52 comprehensively controls the engine 20. The ECU 52 is connected to a controller 50 to be described later.

[0015] The switching clutch 30 outputs power transmitted from the output shaft of the engine 20 such that the rotation direction is switched over between a normal rotation direction and a reverse rotation direction. The output shaft of the engine 20 is connected to an input side of the switching clutch 30. A propeller shaft 41 is connected to an output side of the switching clutch 30.

[0016] The operation of the switching clutch 30 is controlled by a hydraulic circuit 53. The hydraulic circuit 53 is provided with a plurality of solenoid valves (not shown) for performing circuit switchover or direction control. The solenoid valves are connected to the controller 50 to be described later.

[0017] The Arneson Surface Drive 40 is a drive system that drives the propeller 44 by the propeller shaft 41 via the universal joint 42 and controls the vertical and horizontal directions of the propeller by the hydraulic cylinder 43.

[0018] The propeller 44 generates thrust in the front-back direction. The propeller 44 is connected to the propeller shaft 41. The propeller 44 is rotationally driven by power of the engine 20 transmitted via the propeller shaft 41. A plurality of blades is disposed around the rotation axis of the propeller 44. The blades generate thrust by pushing water around the blades down and backwards.

[0019] The propeller shaft 41 transmits power of the engine 20 to the propeller 44. The propeller shaft 41 is provided so as to penetrate the hull 10 and reach the outside of the vessel.

[0020] The universal joint 42 is provided in the middle of the propeller shaft 41. The propeller shaft 41 is pivotally supported such that the propeller shaft can pivot around the universal joint 42 in the horizontal direction.

[0021] The hydraulic cylinder 43 causes the propeller 44 and the propeller shaft 41 on a distal end side with respect to the universal joint 42 to pivot around the universal joint 42 in the horizontal direction. A base end of the hydraulic cylinder 43 is pivotally supported on a rear end of the hull 10. A distal end of the hydraulic cylinder 43 is pivotally supported on the propeller shaft 41 on the distal end side with respect to the universal joint 42.

[0022] Operation of the hydraulic cylinder 43 is controlled by a hydraulic circuit 51. The hydraulic circuit 51 is provided with a plurality of solenoid valves (not shown) for performing circuit switchover or direction control. The solenoid valves are connected to the controller 50 to be described later.

[0023] The vessel steering device S includes the controller 50 as a control means, the hydraulic circuit 51, the ECU 52, the hydraulic circuit 53, a joystick lever 54, an accelerator lever 55, and a steering wheel 56.

[0024] The controller 50 comprehensively controls the vessel 100. The hydraulic circuit 51, the ECU 52, the hydraulic circuit 53, the joystick lever 54, the accelerator lever 55, and the steering wheel 56 are connected to the controller 50.

[0025] The controller 50 has a function of continuing subsequent control (steering control in abnormality) by setting a current slidable region of the hydraulic cylinder 43 as 100% of a slidable region when there is an abnormality in the hydraulic cylinder 43.

[0026] More specifically, in the steering control in abnormality, when a piston (not shown) of the hydraulic cylinder 43 stops halfway and cannot move to a target position, steering control is continued such that the region up to the location where the piston stops is set as a new slidable region. With such a configuration, even if the piston cannot move to the target position due to some cause, steering control can be continued.

[0027] Furthermore, in the steering control in abnormality, when the distance (piston sliding distance) from one end to the other end of the slidable region is smaller than a predetermined value, steering control can be stopped. With such a configuration, it is possible to prevent temperature rise of hydraulic fluid caused by an increase in pressure of the hydraulic fluid.

[0028] The joystick lever 54 generates a signal for moving the vessel 100 in an arbitrary direction. The joystick lever 54 is configured to be inclined at an arbitrary angle in an arbitrary direction. The joystick lever 54 is configured to generate a signal regarding rotational speed of the engine 20 and the switchover state of the switching clutch 30 according to an operation mode and an operation amount.

[0029] The accelerator lever 55 generates signals regarding rotation speed of the propeller 44 on the port side, the rotation speed of the propeller 44 on the starboard side, and rotation directions of the propellers 44. The accelerator lever 55 is configured of a lever corresponding to the propeller 44 on the port side and a lever corresponding to the propeller 44 on the starboard side.

[0030] An effect of the vessel 100 will be described with reference to Fig. 2.

[0031] In Fig. 2, the effect of the vessel 100 is schematically shown in plan view.

[0032] According to the vessel 100, it is possible to obtain propulsive force in an arbitrary direction. According to the vessel 100, for example, propulsive force can be obtained in a diagonally left direction. At that time, the controller 50 controls both the hydraulic cylinders 43 such that the propellers 44 of both the Arneson Surface Drives 40 are directed left rearward, and causes both the propellers 44 to normally rotate so that the vessel 100 moves forward (a white arrow in Fig. 2).

[0033] The effect of the vessel 100 will be described with reference to Fig. 3.

[0034] Note that in Fig. 3, the effect of the vessel 100 is schematically shown in plan view.

[0035] According to the vessel 100, it is possible to obtain propulsive force in an arbitrary direction. According to the vessel 100, for example, propulsive force toward the right can be obtained. At that time, the controller 50 controls the hydraulic cylinder 43 such that the propeller 44 of the left Arneson Surface Drive 40 is directed left rearward, and causes the propeller 44 to reversely rotate so that the vessel 100 moves backward (a white arrow in Fig. 3).

[0036] At the same time, the controller 50 controls the hydraulic cylinder 43 such that the propeller 44 of the right Arneson Surface Drive 40 is directed right rearward, and causes the propeller 44 to normally rotate so that the vessel 100 moves forward (a white arrow in FIG. 3). In this way, by generating different moments around the center of gravity of the hull 10, propulsive force toward the right can be obtained.

INDUSTRIAL APPLICABILITY

[0037] The present invention is applicable to a vessel.

DESCRIPTION OF REFERENCE SIGNS

[0038]

10: Hull
20: Engine
30: Switching clutch
40: Arneson Surface Drive
41: Propeller shaft
42: Universal joint
43: Hydraulic cylinder
44: Propeller
100: Vessel

Claims

1. A vessel comprising two Arneson Surface Drives, each of which drives a propeller by a propeller shaft via a universal joint and controls the propeller in a horizontal direction by a hydraulic cylinder, wherein the two Arneson Surface Drives are disposed on right and left of a hull, and
a plurality of the propellers is controlled in the horizontal direction independently of each other.

2. The vessel according to claim 1, wherein control is performed such that a current slidable region of the hydraulic cylinder is set as entirety of a subsequent slidable region when there is an abnormality in the hydraulic cylinder.

Fig. 1

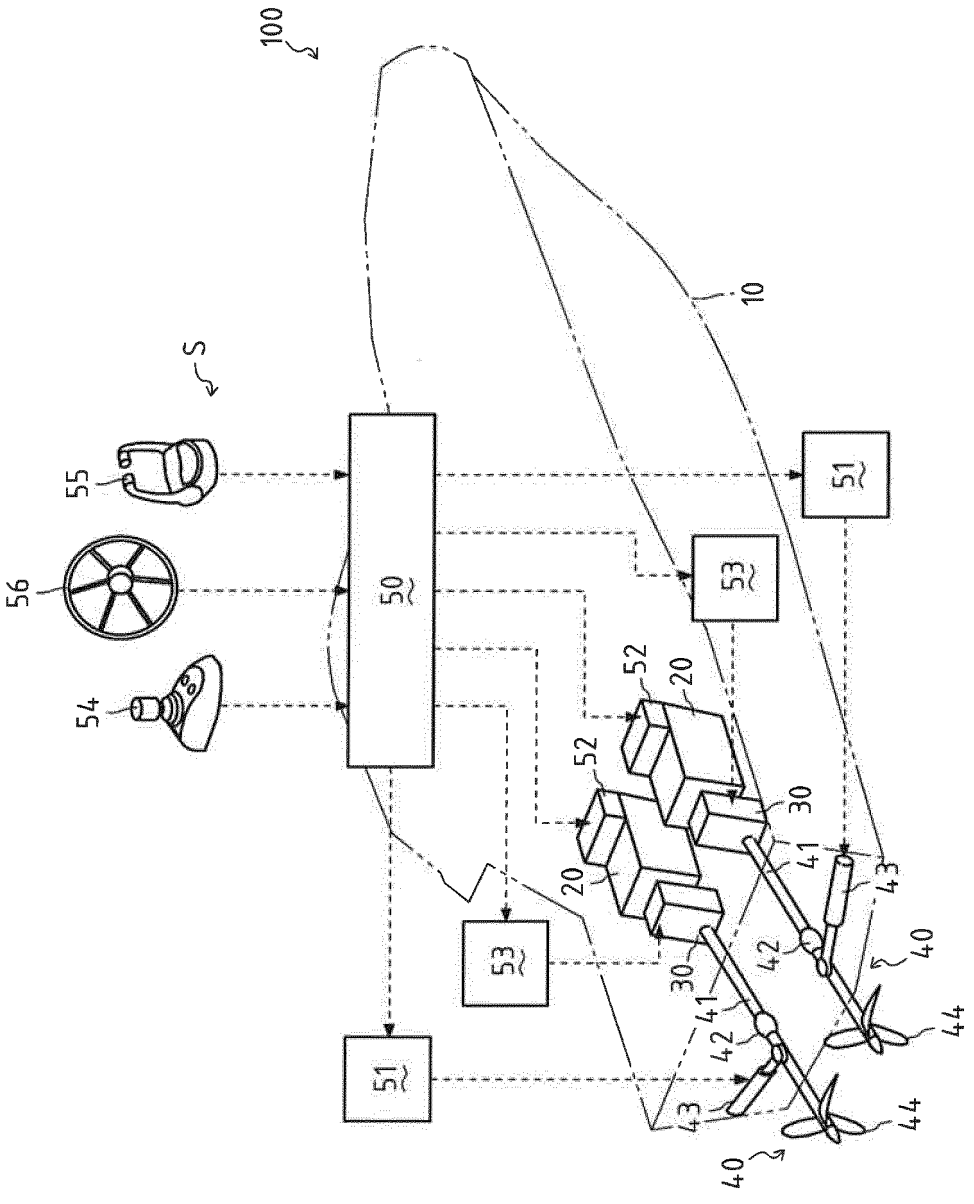


Fig. 2

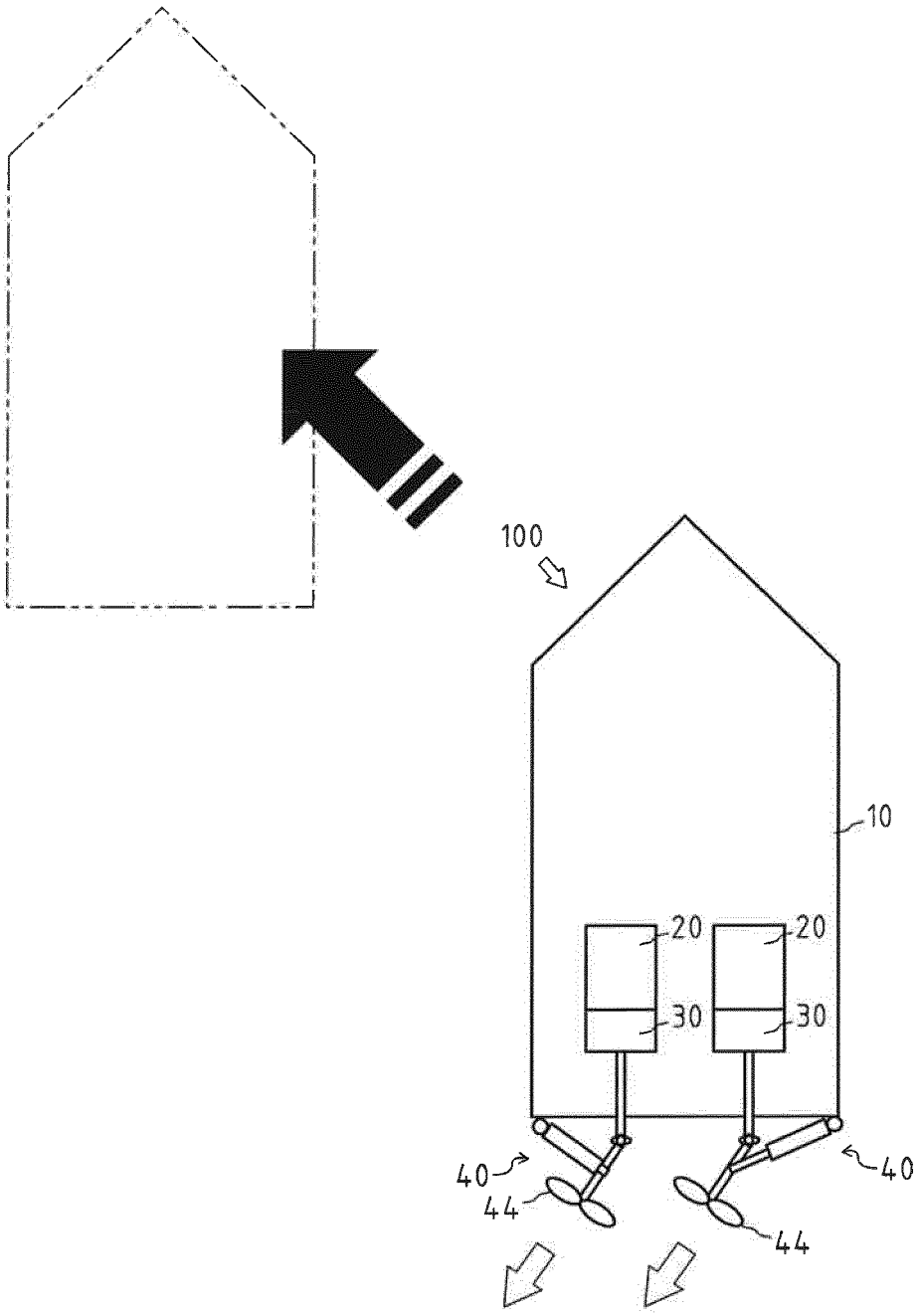
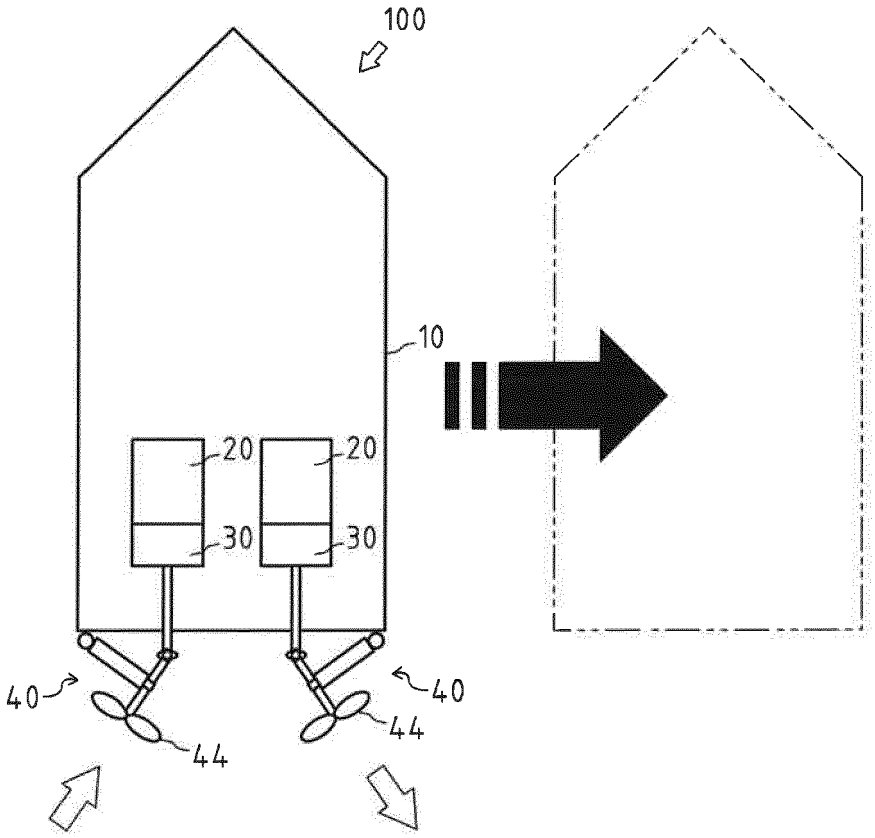


Fig. 3



INTERNATIONAL SEARCH REPORT

International application No.
PCT/JP2016/055857

A. CLASSIFICATION OF SUBJECT MATTER
B63H25/42(2006.01)i, *B63H5/08*(2006.01)i

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)
B63H

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched
Jitsuyo Shinan Koho 1922-1996 Jitsuyo Shinan Toroku Koho 1996-2016
Kokai Jitsuyo Shinan Koho 1971-2016 Toroku Jitsuyo Shinan Koho 1994-2016

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

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y	US 5667415 A (ARNESON, Howard M), 16 September 1997 (16.09.1997), fig. 1 to 3 & WO 1996/040550 A1 & EP 869899 A1 & DE 69630612 T2 & AU 707695 B2 & AU 5983296 A & CA 2223901 A1 & DK 869899 T3	1-2
Y	JP 2013-14173 A (Yanmar Co., Ltd.), 24 January 2013 (24.01.2013), claim 1; paragraphs [0017], [0022]; fig. 1 to 3, 6 & US 2014/0156124 A1 claim 1; paragraphs [0062], [0067] to [0068]; fig. 1 to 3, 6 & US 2014/0364018 A1 & WO 2013/001875 A1 & EP 2727819 A1	1-2

☒ Further documents are listed in the continuation of Box C. ☐ See patent family annex.

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"&" document member of the same patent family

Date of the actual completion of the international search	Date of mailing of the international search report
10 May 2016 (10.05.16)	24 May 2016 (24.05.16)
Name and mailing address of the ISA/ Japan Patent Office 3-4-3,Kasumigaseki,Chiyoda-ku, Tokyo 100-8915,Japan	Authorized officer Telephone No.

Form PCT/ISA/210 (second sheet) (January 2015)

INTERNATIONAL SEARCH REPORT

International application No.
PCT/JP2016/055857

C (Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y	JP 2013-10446 A (Yanmar Co., Ltd.), 17 January 2013 (17.01.2013), claim 1; fig. 2 (Family: none)	2
A	Microfilm of the specification and drawings annexed to the request of Japanese Utility Model Application No. 157938/1986(Laid-open No. 63299/1988) (Mitsubishi Heavy Industries, Ltd.), 26 April 1988 (26.04.1988), (Family: none)	1-2

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REFERENCES CITED IN THE DESCRIPTION

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Patent documents cited in the description

- JP H0692286 A **[0004]**