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(54) **Control of propulsion unit**

(57) A control arrangement of a ship comprising a control lever (100) for controlling at least one control parameter of an azimuthing propulsion unit, the control arrangement comprising at least two operation modes having different available control parameter ranges of at least one control parameter of the azimuthing propulsion unit. The control lever (100) is adapted to a change of the operation mode by changing an available control range (110) of the at least one control parameter controllable by the control lever (100).

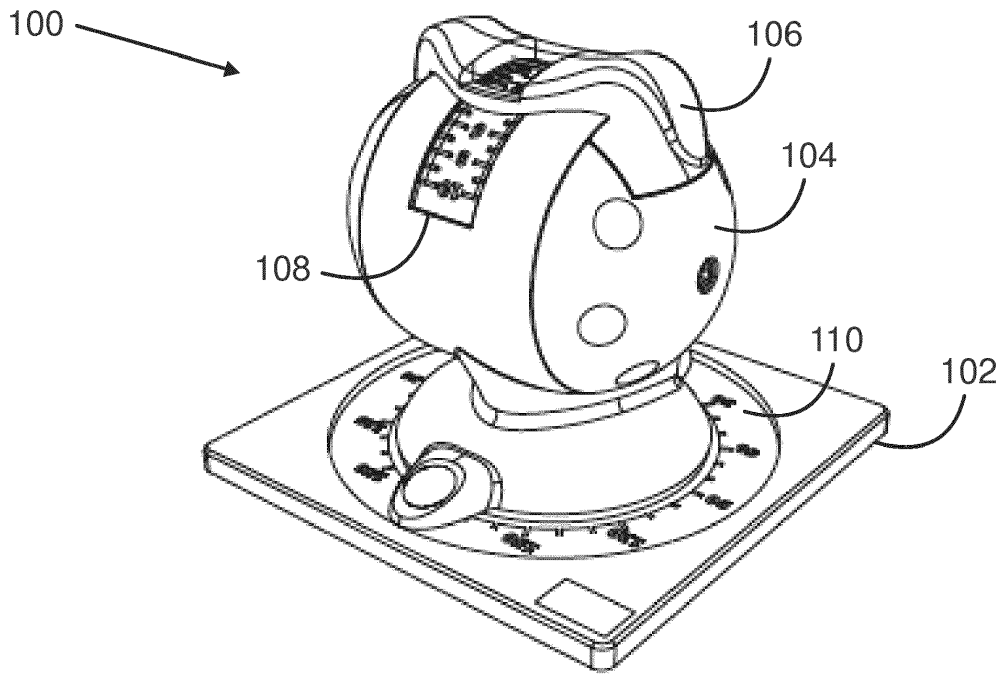


Fig. 1

EP 3 048 038 A1

Description

FIELD

[0001] The present invention relates to control of a propulsion unit.

BACKGROUND

[0002] Ship control is normally carried out by a control desk having a plurality of control units such as levers and buttons. Many different control units may confuse the operator to use a wrong control unit. Furthermore, the increased number of control members adds the cost and complexity of the system.

[0003] An improved solution is thus called for.

SUMMARY

[0004] An object of the present invention is to provide an apparatus and a method so as to alleviate the above disadvantages. The object of the invention is achieved with a control arrangement and a method, which are defined in the independent claims. Some embodiments are disclosed in the dependent claims.

DRAWINGS

[0005] In the following, the invention will be described in greater detail by means of some embodiments with reference to the accompanying drawings, in which

Figure 1 shows an embodiment of an azimuthing control lever as a perspective view;
Figure 2 shows the control lever of Figure 1 as a top view;
Figure 3 shows an embodiment of control lever operation range indication in an azimuthing operation mode;
Figure 4 shows an embodiment of control lever operation range indication in an open water operation mode; and
Figure 5 shows an embodiment of a method.

DETAILED DESCRIPTION

[0006] The embodiments relate to a ship having one or more azimuthing propulsion units. The embodiments especially relate to the control arrangement controlling the azimuthing propulsion unit(s). The control arrangement may comprise one or more levers and one or more buttons for controlling one or more control parameters of the azimuthing propulsion unit. The set of control parameters comprises one or more of orientation and/or propulsion speed (revolutions per minute) of the azimuthing propulsion unit.

[0007] Figures 1 and 2 highlight an embodiment of a control lever 100 for controlling an azimuthing propulsion unit. There may be provided a base plate 102 to which may be attached or attachable to a control board of a ship. The control lever is arranged to the base plate such that it may be rotated horizontally for rotation of the azimuthing propulsion unit. There may be provided an indication member 110 for indicating the current rotation of the propulsion unit. The indication member may be printed to the base 102 or may contain a display element whose indications may be altered according to need.

[0008] The control lever may comprise a rounded handle portion 104 for receiving a palm of the operator such as a captain of a ship. On top of the lever 100 there may be provided a speed controller 106 for controlling the revolution speed of the propulsion unit. When the speed controller is pushed forward from the neutral top position, the propulsion unit rotates into forward direction. When the speed controller is pulled backwards from the neutral top position, the azimuthing propulsion unit is in a reverse mode.

[0009] Figure 2 further illustrates the indication members for the rotation angle 110 and for the revolution speed 108. It can be seen that the scale for the revolution speed may be from 0 to 10, for instance, both in forward and reverse directions. The scale in rotation may be -180 to +180 degrees. Figure 2 also shows a pointer 112 for pointing the prevailing rotation angle.

[0010] When controlling the ship, there are different operation modes available. One of the operations modes is a cruising mode or an open water mode. In this mode, the ship often has a relatively high speed. Due to the high speed, the turning angles of the propulsion unit may be limited/restricted to avoid capsizing of the ship. Another operation mode is an azimuthing mode, which is typically used in ports, for instance. In the azimuthing mode the speed of the ship is lower, whereby the operator is given more freedom to manoeuvre the propulsion unit and thus greater turning angles are allowed. In the azimuthing propulsion mode, full 360 degree rotation of the propulsion unit may be permitted.

[0011] In the embodiments of the invention, there is a single control lever for controlling the azimuthing propulsion unit in both operation modes and/or possible further operation modes. This is a significant improvement over prior art, where different control units for different operation modes have been applied. That is, there have been one or more azimuth levers for controlling the ship in the azimuthing mode and a wheel or miniwheel for controlling the ship in the cruising mode. Changing between the modes and between the different levers has been carried out by a press button, for instance. The plurality of control buttons may have caused confusion for the user and may be lead to hazard situations if a wrong controller is applied at a wrong moment.

[0012] In the embodiments of the invention, changing between the operation modes can be made either based on user input or automatically.

[0013] In an embodiment, there is provided a control board housing all the needed control devices such as the

azimuthing levers, for instance. On the control board, there may also be provided a push button for changing the operation mode of the ship. When the push button is pressed and the operation mode is changed, the operation of the azimuthing lever is adapted. The adaptation of the azimuthing lever refers here to that at least of the control parameters controlled by the lever is set to a different operation range.

[0014] The control parameter may be the allowed rotation range of the propulsion unit, for instance. For example, if the ship is changed from the azimuthing mode to a cruise mode, the available rotation angle is changed. In the azimuthing mode the rotation angle may be 360 degrees, whereas in the cruise mode the rotation angle may be limited e.g. to -35 degrees to 35 degrees, and vice versa.

[0015] Another control parameter to be adapted may be the number of revolutions of the propeller per minute (rpm). That is, when shifting from the cruise mode to the azimuth mode, the rpm value available for the lever may be limited to a smaller range that was available in the cruise mode.

[0016] In another embodiments of the invention, changing between the modes can be made automatically and may be dependent on utilizing information of the speed and/or the rpm of the ship. There may be a direct linear or non-linear relationship between the speed and the allowed orientation range of the propulsion unit. Thus, there may be provided a control arrangement of a ship comprising a control lever 100 for controlling an azimuthing propulsion unit. The control lever operation range is adapted automatically based on a change in the speed of the ship. That is, when the speed of the ship increases, the available rotation range of the lever is decreased and when the speed of the ship decreases, the available operation range may be increased. The alteration of the control lever operation may be carried out such that the lever is physically adjusted to a new range such that rotation of the lever over the newly defined limits is prevented. Alternatively the lever can be rotated as always but the relationship between the lever's rotation and the propulsion unit's rotation is modified. That is, when the speed of the ship increases, the rotation of the lever has less influence on the rotation of the propulsion unit than before the adjustment, and vice versa.

[0017] Figures 3 and 4 illustrate examples of the different operation modes of the ship and how the information associated with the control lever is shown to the operator of the ship.

[0018] To the lever there can be associated an indication member indicating the available range of a control parameter. The indication member may comprise a display illustrating the available orientation range by means of one or more of lights, colour(s), text and numbers. The lever may also physically restricted from being operated over the available range.

[0019] In Figure 3 there is shown the indication member 310 of the lever in the azimuthing mode, and in Figure 4 the indication member 410 of the lever is shown in the open water cruise mode. The indication member associated with the lever may be a display element, such a LCD display, showing the available rotation range. In the azimuth mode of Figure 3 the rotation range is 360 degrees, whereas in the cruise mode of Figure 4 the allowed rotation range is a predefined range being under 360 degrees. It can be substantially 70 degrees (from -35 degrees to +35 degrees), for example, but may be some other range too. When changing the mode from the azimuthing mode to the cruise mode, the numbered and coloured display range in the display element may be decreased accordingly and vice versa.

[0020] In another embodiment, the whole rotation area of the control lever is utilized even though the rotation angle range of the propulsion unit is modified. That is, if the available rotation range of the propulsion unit is restricted to 90 degrees, for instance, the control lever is still allowed to rotate 360 degrees as shown in Figure 3. The influence relationship between the rotation of the control lever and the rotation of the propulsion unit is thus adjusted from being a one-to-one relationship (one degree rotation of the lever causes a one degree rotation of the propulsion unit). In this way the accuracy of the control lever is improved. In such an exemplary embodiment turning of the control lever 4 degrees would result the azimuthing propulsion unit to rotate only 1 degree. The display element may be updated accordingly such that the full display circle 310 in Figure 3 corresponds to 90 degrees being from -45 degrees to +45 degrees.

[0021] The embodiments provide the significant advantage that only one controller is applied for controlling the propulsion unit in all operation modes of the ship. As each propulsion unit has a dedicated azimuth lever which can be used also in the cruise mode, the previously provided wheel/miniwheel becomes superfluous.

[0022] Figure 5 shows one embodiment of a method. In 500, the operation mode of the ship is changed. The ship may have at least two operation modes, such as cruising mode and azimuthing mode. Between these two extreme states, there may be one or more intermediate states. In an embodiment, different speed values of the ship may be considered to be different modes/states, whereby there may be considered to be existing a great number of modes.

[0023] In 502, a lever dedicated for controlling an azimuthing propulsion unit is adapted to the new operation mode. The adaptation may be carried out by either physically limiting the operation range of the lever and/or modifying the effect of the lever operation on the propulsion unit.

[0024] In 504, the adaptation of the lever is indicated for the operator of the ship. The indication may be carried out by using a display associated with the lever, for instance.

[0025] It will be obvious to a person skilled in the art that, as the technology advances, the inventive concept can be implemented in various ways. The invention and

its embodiments are not limited to the examples described above but may vary within the scope of the claims.

Claims

1. A control arrangement of a ship comprising a control lever (100) for controlling at least one control parameter of an azimuthing propulsion unit, the control arrangement comprising at least two operation modes having different available control parameter ranges of at least one control parameter of the azimuthing propulsion unit, **characterized in that** the control lever is adapted to a change of the operation mode by changing an available control range of the at least one control parameter controllable by the control lever.

2. A control arrangement according to claim 1, **characterized in that** the control parameter controlled by the control lever (100) comprises one or more of a rotation angle of the azimuthing propulsion unit and/or propulsion revolution range of the propulsion unit.

3. A control arrangement according to any preceding claim, **characterized in that** the control lever (100) is physically adapted to the change of the operation mode such that controlling of the control lever over the allowed control range of the at least one control parameter is prevented.

4. A control arrangement according to any preceding claim, **characterized in that** the physical operation range of the control lever (100) is maintained but the influence relationship between the rotation of the lever and the rotation of the propulsion unit is adjusted.

5. A control arrangement according to any preceding claim, **charac- terized** in that the operation mode comprises a cruise mode for driving the ship in open water, in which cruising mode the rotation angle of the azimuthing propulsion unit is limited to a predefined rotation angle range being less than 360 degrees, the operation mode further comprising an azimuthing mode for manoeuvering orientation of the ship in confined space, in which azimuthing mode the azimuthing propulsion unit has a rotation range of substantially 360 degrees.

6. A control arrangement according to any preceding claim, **characterized in that** the control arrangement comprises an indication member (110) associated with the control lever (100) for indicating an available range of the control parameter.

7. A control arrangement according to any preceding claim, **characterized in that** the indication member (110) comprises a display, which is updated to the prevailing range when the operation mode is changed.

8. A control arrangement according to any preceding claim, **characterized in that** the control arrangement comprises a push button for controlling the change of the operation mode of the control arrangement.

9. A control arrangement according to any preceding claim, **charac- terized** in that the control arrangement is configured to change between the operation modes automatically based on one or more operation parameters of the ship.

10. A control arrangement according to claim 9, **characterized in that** the operation parameter is a speed of the ship.

11. A method of controlling an azimuthing propulsion unit of a ship wherein the ship is controlled in at least two operation modes having different available control parameter ranges of at least one control parameter of the azimuthing propulsion unit, **characterized in that** the azimuthing propulsion unit is controlled with a control lever (100), which control lever is adapted to the change of the operation mode by changing the allowable control range of the control lever.

12. A method according to claim 11, **characterized in that** there is an associated display element (410) with the control lever, which is adapted to a change of the operation mode by changing an indication range of the indication member.

13. A method according to claim 12, **characterized in that** control lever (100) is adapted to a change of the operation mode such that allowed rotation angle of the azimuthing lever is decreased in a cruising mode.

14. A method according to any of the claims 11 to 13, **characterized in that** the operation mode comprises an open water cruising mode and an azimuthing mode, in which azimuthing mode an allowed propagation speed is lower but the rotation angle of the azimuthing propulsion unit is greater than in the open water cruising mode.

15. A method according to any of the claims 11 to 14, **characterized in that** the operation mode is changed by using a push button or automatically based on a propagation speed of the ship.

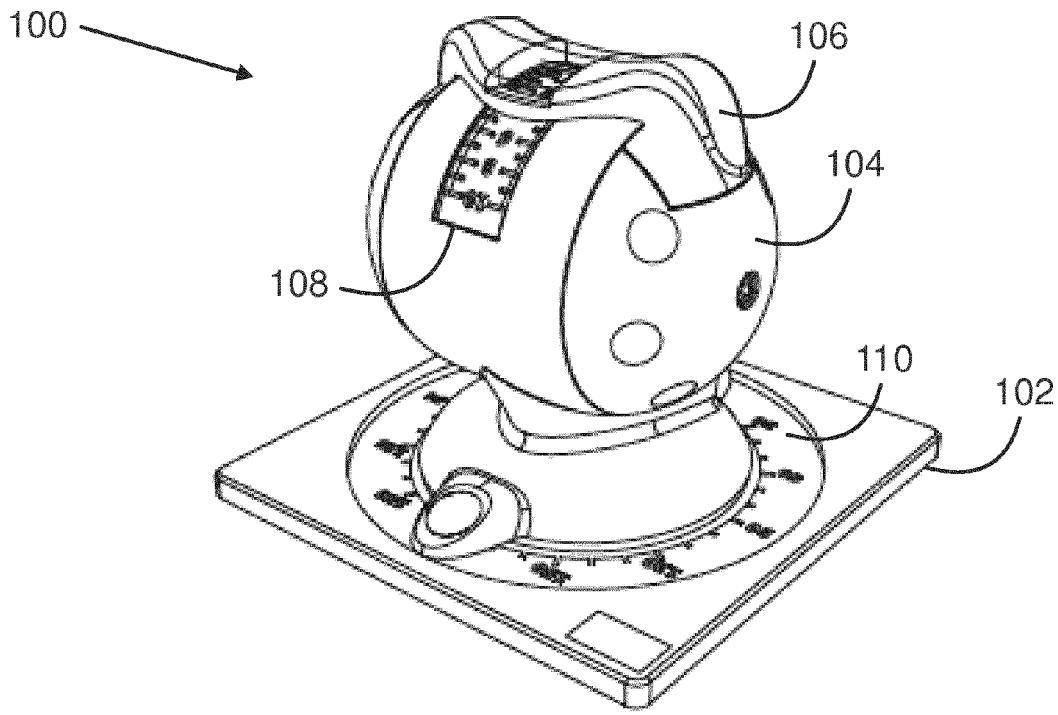
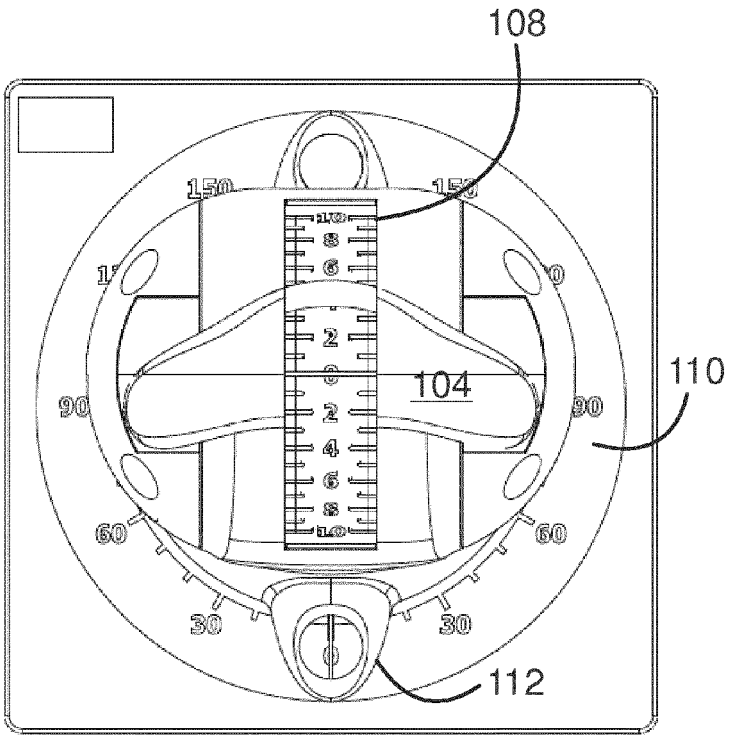

100
106
104
108
110
102

Fig. 1


108
150
150
120
8
6
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4
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8
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30
104
110
112

Fig. 2

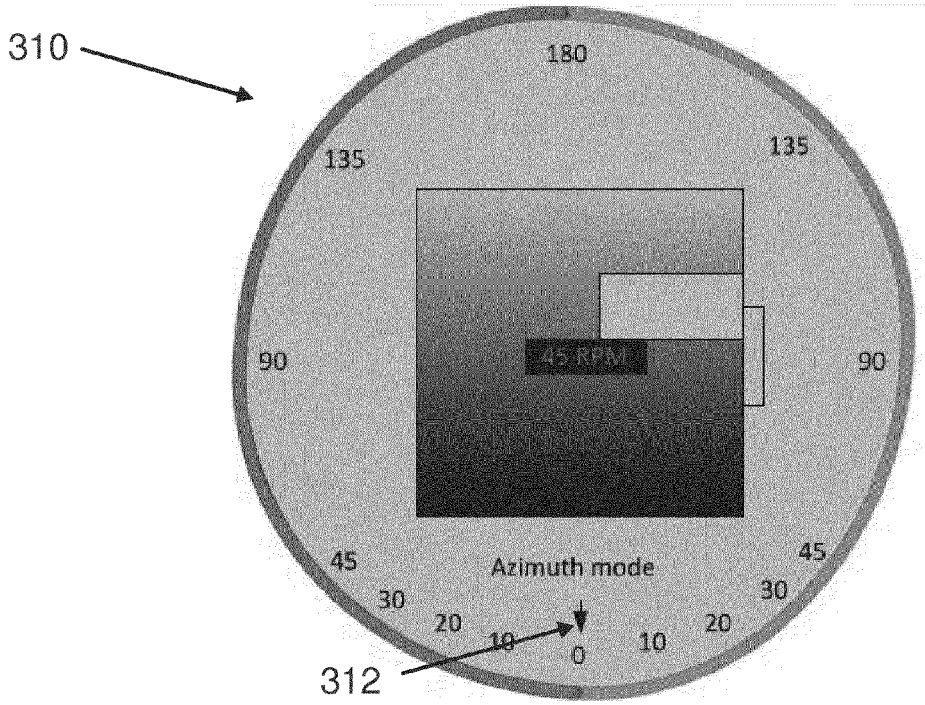
310
180
135
135
90
90
45
RPM
45
Azimuth mode
30
30
20
20
10
10
0
312

Fig. 3

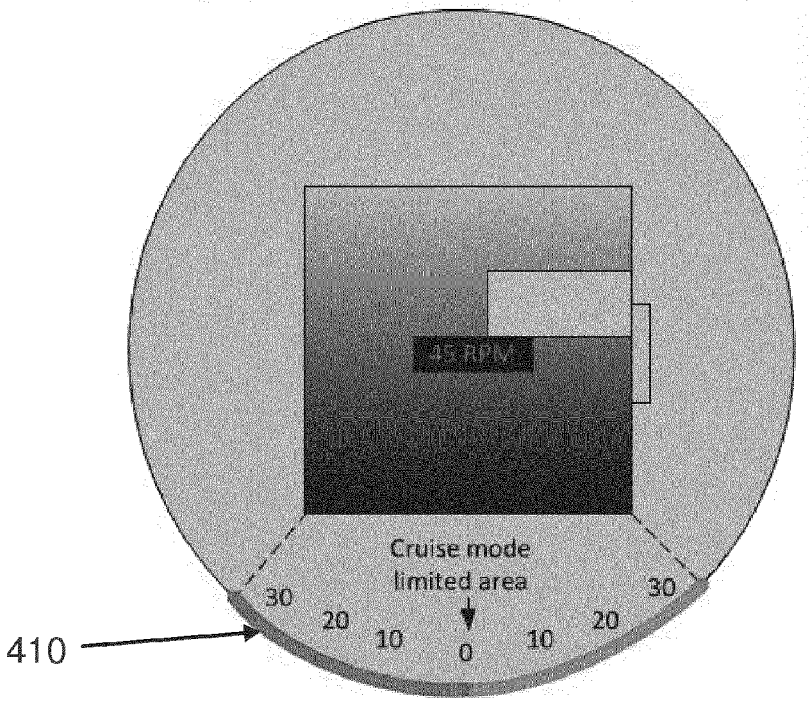
45 RPM
Cruise mode
limited area
30
30
20
20
10
10
0
410

Fig. 4

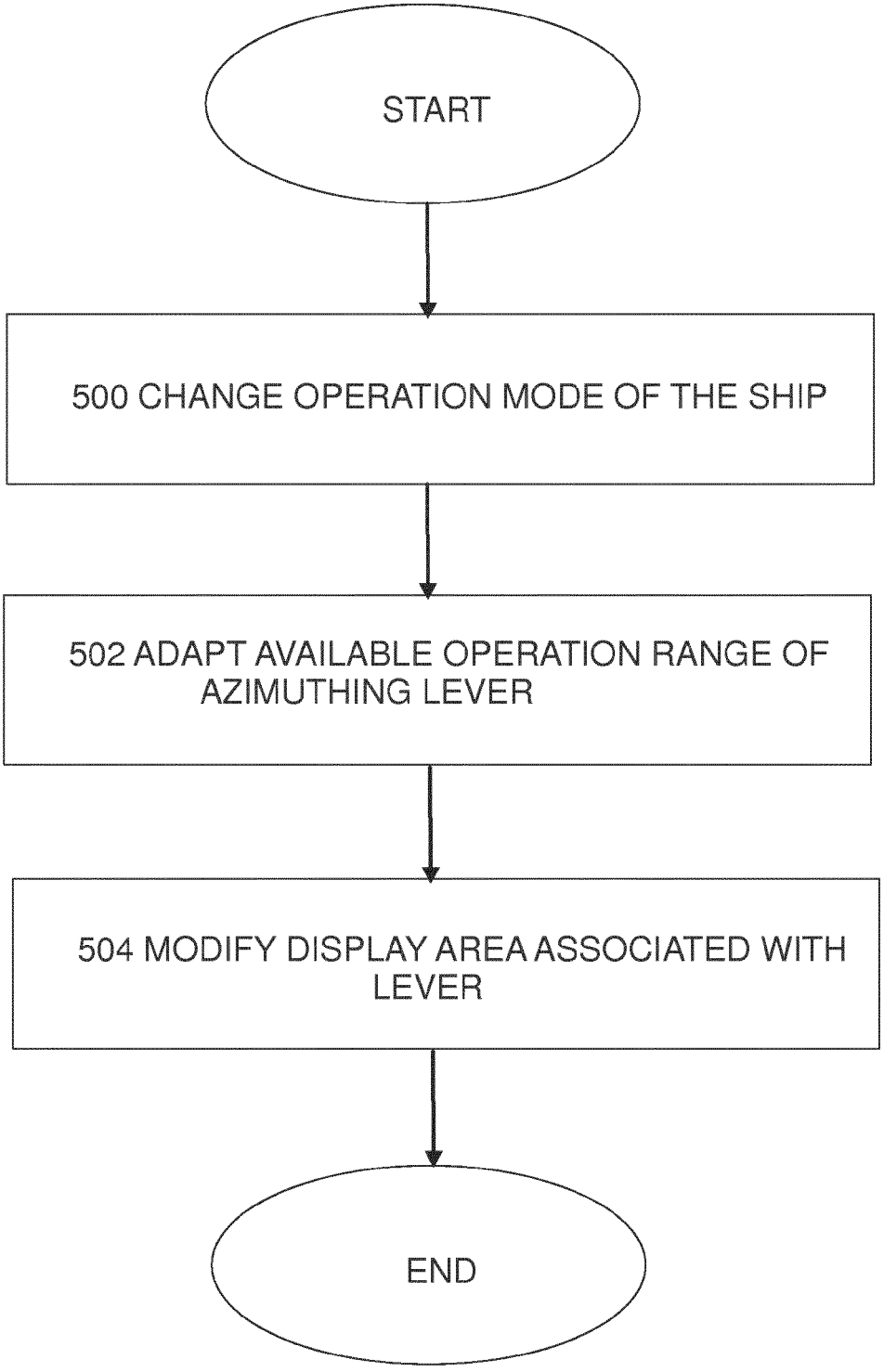
START
500 CHANGE OPERATION MODE OF THE SHIP
502 ADAPT AVAILABLE OPERATION RANGE OF AZIMUTHING LEVER
504 MODIFY DISPLAY AREA ASSOCIATED WITH LEVER
END

Fig. 5

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EUROPEAN SEARCH REPORT

Application Number
EP 15 15 2514

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Y	* column 1, line 42 - column 2, line 12 * * column 3, line 58 - column 4, line 7 * * figures * * column 4, line 8 - line 45 * * column 5, line 16 - line 22 * * column 7, line 22 - line 31 * * claims 3-7,8 , 9 *	12	

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TECHNICAL FIELDS SEARCHED (IPC)
B63H
G05G

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
The Hague	9 July 2015	Barré, Vincent

CATEGORY OF CITED DOCUMENTS

X : particularly relevant if taken alone
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