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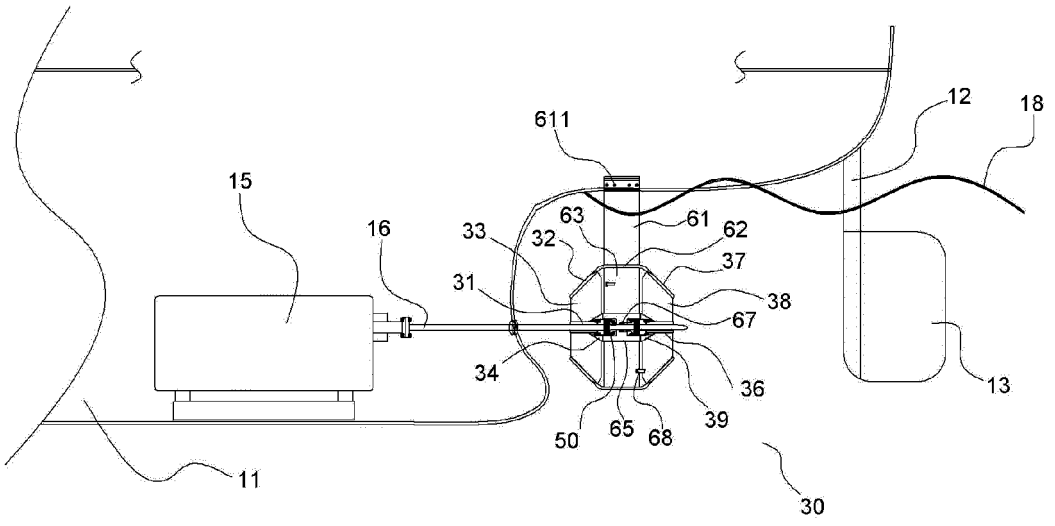
(54) CENTRIFUGAL PROPULSION APPARATUS AND SHIP HAVING SAME

(57) The present invention provides a centrifugal propulsion apparatus capable of forward and backward movement, and a ship having the same, the apparatus including: two impellers which are rotated by a power shaft, face each other, and are capable of jetting a fluid in opposite directions; and a power transmission unit provided between the power shaft and the two impellers so as to connect one impeller between the two impellers and the power shaft or connect the other impeller and the power shaft according to a rotational direction of the power shaft.

【FIG. 1】



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Description

[Technical Field]

[0001] The present invention relates to a centrifugal propulsion apparatus and a ship having the same, and more particularly, to a centrifugal propulsion apparatus capable of forward and backward movement, and a ship having the same.

[Background Art]

[0002] In general, a propulsion apparatus of a ship usually uses a propeller or a jet drive method of jetting water. The biggest problem of the propeller or the jet drive method is that both methods have low efficiency.

[0003] Centrifugal force is force on an object moving along a curved trajectory, outward from the center of the curvature. The size of the centrifugal force is simply proportional to the mass or radius of curvature of a revolving body and proportional to squared angular speed. Thus, when the angular speed of the object increases beyond a certain level, the centrifugal force increases astonishingly.

[0004] Because strong force can be easily attained using centrifugal force in this way, the centrifugal force has been applied to a dehydrator of a washing machine, a centrifuge, and generation of artificial gravity in a space station. Besides the above-described advantages, a vehicle or submarine generally attains its propulsion force due to action-reaction between a wheel and ground or action-reaction between a propeller and water. In the case of an airplane, lift is generated due to action-reaction between a wing and air. Thus, due to the advantage of being able to generate movement due to centrifugal force, attempts have been steadily made for attaining propulsion force for moving an object using centrifugal force.

[Disclosure]

[Technical Problem]

[0005] However, in a conventional centrifugal propulsion apparatus and a conventional ship having the same, forward and backward movement is not possible using just one centrifugal propulsion apparatus.

[0006] The present invention is directed to providing a centrifugal propulsion apparatus capable of forward and backward movement and a ship having the same. However, this objective is just exemplary, and the scope of the invention is not limited thereby.

[Technical Solution]

[0007] One aspect of the present invention provides a centrifugal propulsion apparatus including: two impellers, which are rotated by a power shaft, face each other, and are configured to jet a fluid in opposite directions; and a power transmission unit provided between the power shaft and two impellers to connect the power shaft to one or the other of the two impellers according to a rotational direction of the power shaft.

[0008] Each of the two impellers may include: a reflection shade having both ends opened and an increasing width from one end to the other end; and a plurality of blades provided in the reflection shade, disposed in a radial directions from a rotational central axis and having increasing width perpendicular to the rotational central axis with increasing width of the reflection shade.

[0009] The reflection shade may be coupled to the plurality of blades.

[0010] One of the two impellers may further include a streamlined induction layer that surrounds the rotational central axis and has gradually increasing width with increasing width of the reflection shade.

[0011] The two impellers may use the power shaft as a rotation center.

[0012] The power transmission unit may include two ratchet gears that connect the power shaft and each of the two impellers, and the two ratchet gears may be engaged when rotating in opposite directions.

[0013] One of the two ratchet gears may include: a ratchet frame coupled to the power shaft and having a latch installed therein; and a gear coupled to the impeller and making a pair with the ratchet frame.

[0014] The centrifugal propulsion apparatus may further include a diaphragm that is fixable to a ship, provided between the two impellers, and being parallel to the power shaft.

[0015] The centrifugal propulsion apparatus may further include a fixing unit installed at the fixed diaphragm and selectively fixing the two impellers to the fixed diaphragm.

[0016] The fixing unit may include: a brake plate installed at the fixed diaphragm, contacting an adjacent impeller of the two impellers and preventing rotation of the adjacent impeller; and a brake shaft rotatably coupling the brake plate to the fixed diaphragm

[0017] The centrifugal propulsion apparatus may further include a bearing unit provided between the fixed diaphragm and the power shaft.

[0018] The centrifugal propulsion apparatus may further include two nozzles disposed adjacent to each other outside of the two impellers, connected to the two impellers and having widths increasing with increasing distance from the two impellers.

[0019] Another aspect of the present invention provides a ship including: a body; an engine installed in the body; the above-described centrifugal propulsion apparatus installed in the body; and a power shaft connecting the engine and the centrifugal propulsion apparatus.

[0020] The ship may further include an installation plate rotatably installed in the body and having the centrifugal propulsion apparatus installed therein.

[0021] The power shaft may include a portion coupled

to the engine, a portion coupled to the centrifugal propulsion apparatus, and a portion passing through the body and connecting the two portions, and the three portions may be combined fit to and separated from one another.

[Advantageous Effects]

[0022] As described above, according to embodiments of the present invention having the above configuration, a centrifugal propulsion apparatus capable of forward and backward movement and a ship having the same can be implemented. Of course, the scope of the invention is not limited by this effect.

[Description of Drawings]

[0023]

FIG. 1 is a schematic cross-sectional conceptual view of a centrifugal propulsion apparatus according to an embodiment of the present invention and a ship having the same.

FIG. 2 is a schematic cross-sectional conceptual view of a centrifugal propulsion apparatus according to an embodiment of the present invention and part of a ship having the same.

FIG. 3 is a schematic cross-sectional conceptual view of a centrifugal propulsion apparatus according to an embodiment of the present invention and part of a ship having the same.

FIG. 4 is a schematic perspective view of a centrifugal propulsion apparatus according to an embodiment of the present invention and part of a ship having the same.

FIGS. 5 to 7 are schematic plan views of a centrifugal propulsion apparatus according to other embodiments of the present invention and part of a ship having the same.

FIG. 8 is a schematic cross-sectional conceptual view of a centrifugal propulsion apparatus according to another embodiment of the present invention and a ship having the same.

FIG. 9 is a schematic perspective view of movement of a centrifugal propulsion apparatus according to the embodiment of FIG. 8 and part of a ship having the same.

FIG. 10 is a detailed view of the concept of power transmission according to the embodiments of FIGS. 8 and 9.

[Modes of the Invention]

[0024] As the invention allows for various changes and numerous embodiments, particular embodiments will be illustrated in the drawings and described in detail in the written description. However, this is not intended to limit the present invention to particular modes of practice, and it is to be appreciated that all changes, equivalents, and substitutes that do not depart from the spirit and technical scope of the present invention are encompassed in the present invention. Similar reference numerals are used for similar elements in the drawings.

[0025] It will be understood that, although the terms first, second, A, B, etc. may be used herein to describe various elements, these elements should not be limited by these terms. These terms are only used to distinguish one element from another. For example, a first element could be termed a second element, and, similarly, a second element could be termed a first element, without departing from the scope of the present invention. As used here, the term "and/or" includes any and all combinations of one or more of the associated listed items.

[0026] It will be understood that when an element is referred to as being "connected" or "coupled" to another element, it can be directly connected or coupled to the other element or intervening elements may be present. In contrast, when an element is referred to as being "directly connected" or "directly coupled" to another element, there are no intervening elements present.

[0027] The terminology used herein is for the purpose of describing particular embodiments only and is not intended to be limiting the invention. As used herein, the singular forms "a," "an" and "the" are intended to include the plural forms as well, unless the context clearly indicates otherwise. It will be further understood that the terms "comprises," "comprising," "includes" and/or "including," when used herein, specify the presence of stated features, integers, steps, operations, elements, and/or components, but do not preclude the presence or addition of one or more other features, integers, steps, operations, elements, components, and/or groups thereof.

[0028] Unless otherwise defined, all terms (including technical and scientific terms) used herein have the same meaning as commonly understood by one of ordinary skill in the art to which this invention belongs. It will be further understood that terms, such as those defined in commonly used dictionaries, should be interpreted as having a meaning that is consistent with their meaning in the context of the relevant art and will not be interpreted in an idealized or overly formal sense unless expressly so defined here.

[0029] FIG. 1 is a schematic cross-sectional conceptual view of a centrifugal propulsion apparatus according to an embodiment of the present invention and a ship having the same. FIG. 2 is a schematic cross-sectional conceptual view of a centrifugal propulsion apparatus according to an embodiment of the present invention.

[0030] Referring to FIG. 1, the ship may include an engine 15 installed in a body 11 and a centrifugal propulsion apparatus 30 installed under the surface of water 18. The ship may include a power shaft 16 that connects the engine 15 and the centrifugal propulsion apparatus 30. That is, the centrifugal propulsion apparatus 30 may receive rotational force of the engine through the power shaft 16.

[0031] Here, the power shaft 16 may be divided into a portion extending from the engine and a portion coupled to the centrifugal propulsion apparatus 30. In this case, the portions of the power shaft 16 may be connected to each other using a coupler, etc. Thus, the centrifugal propulsion apparatus 30 may be easily separated from the body 11 of the ship.

[0032] Also, the ship may further include a rudder 13 and a direction shaft 12.

[0033] The centrifugal propulsion apparatus 30 may be rotated about a rotational central axis C to generate a centrifugal force, may jet a fluid in a predetermined direction (for example, in a radial direction) using centrifugal force from inside of the centrifugal propulsion apparatus 30, and may reflect the jetted fluid to jet the fluid to the outside to obtain propulsion force.

[0034] Also, the centrifugal propulsion apparatus 30 may obtain the propulsion force in both directions by jetting the fluid in directions in which two impellers face each other. Hereinafter, the centrifugal propulsion apparatus 30 will be described in detail.

[0035] The centrifugal propulsion apparatus 30 may include two impellers and a power transmission unit 50.

[0036] The two impellers may be rotated by the power shaft 16 and may face each other. In addition, two impellers may jet the fluid in opposite directions. Hereinafter, the two impellers will be described as a first impeller and a second impeller.

[0037] The two impellers may jet the fluid from inside in a predetermined direction and may reflect the jetted fluid. For example, the first impeller may jet the fluid in a first direction. Here, the first direction may be opposite to the forward direction of the ship. The second impeller may jet the fluid in a second direction. Here, the second direction may be opposite to the first direction and opposite to the backward direction of the ship.

[0038] First, the impellers will be described with reference to FIGS. 4 to 7.

[0039] FIG. 4 is an exploded perspective view of one of two impellers. In detail, FIG. 4 is an exploded perspective view of the first impeller. The second impeller is the same as or similar to the first impeller and thus, detailed descriptions thereof will be omitted.

[0040] One of the two impellers may include a reflection shade 32 and a plurality of blades 33. One impeller may include a shaft on which the plurality of blades 33 are coupled to each other in the radial direction. Here, the shaft may be a shaft pipe 31 into which the power shaft 16 may be inserted, as illustrated. Of course, the shaft is not limited thereto.

[0041] The reflection shade 32 may have both ends opened and an increasing width from one end to the other end. For example, the reflection shade 32 may have a shape of a truncated cone or funnel in which upper and lower portions of the reflection shade 32 are open and an inside thereof is hollow. Of course, the shape of the reflection shade 32 is not limited to the truncated cone.

[0042] In this case, a central axis of the reflection shade 32 may be parallel to an extension direction of the shaft pipe 31. In more detail, the central axis of the reflection shade 32 and a central axis of the shaft pipe 31 may be approximately in a straight line.

[0043] The plurality of blades 33 may be provided in the reflection shade 32 and may be disposed in a radial direction from their central axis. In detail, the plurality of blades 33 may extend from the shaft pipe 31 in the radial direction at the same angles. In this case, the plurality of blades 33 may be coupled to the shaft pipe 31 using welding, etc.

[0044] A width of each of the plurality of blades 33 perpendicular to a rotational central axis C may increase as the width (or radius) of the reflection shade 32 increases. For example, the plurality of blades 33 may have approximately a parallelogram shape.

[0045] Meanwhile, the reflection shade 32 may be rotated together with the plurality of blades 33. In detail, the reflection shade 32 may be coupled to the plurality of blades 33. For example, an outside surface of each of the plurality of blades 33 may be fixedly coupled to an inside surface of the reflection shade 32 using welding, etc. Alternatively, the plurality of blades 33 and the reflection shade 32 may also be integrally formed by casting.

[0046] Meanwhile, the impeller may further include a streamlined induction layer 34 that surrounds the rotational central axis C and has a width gradually increasing as the width of the reflection shade 32 increases. For example, the induction layer 34 may surround the shaft pipe 31 and may be coupled to the shaft pipe 31 using welding, etc. In this case, the width of the induction layer 34 perpendicular to the rotational central axis C may be smaller than the width of each of the plurality of blades 33. That is, the induction layer 34 may not get out of the plurality of blades 33.

[0047] The induction layer 34 may guide the fluid that passes through the reflection shade 32.

[0048] Thus, the first impeller may include a first reflection shade 32, a plurality of first blades 33, a first induction layer 34, and a first shaft pipe 31. The second impeller may include a second reflection shade 37, a plurality of second blades 38, a second induction layer 39, and a second shaft pipe 36. Hereinafter, each of the two impellers includes a reflection shade, a plurality of blades, an induction layer, and a shaft pipe. However, embodiments of the present invention are not limited thereto.

[0049] In this case, as illustrated in FIGS. 1 and 2, each of the first reflection shade 32 and the second reflection shade 37 may face a wide opening. Each of the first impeller and the second impeller may use the power shaft 16 as a rotation center. In addition, the first impeller and the second impeller may be rotated in opposite directions.

[0050] In detail, the power shaft 16 may be inserted into the first shaft pipe 31 and the second shaft pipe 36. That is, the first shaft pipe 31 and the second shaft pipe

36 may surround the power shaft 16. In this case, the first shaft pipe 31 may not be fixed to the power shaft 16 but may be freely rotated. Also, the second shaft pipe 36 may not be fixed to the power shaft 16 but may be freely rotated.

[0051] Thus, the centrifugal propulsion apparatus 30 is capable of forward and backward movement using one power shaft 16 so that the configuration of the centrifugal propulsion apparatus 30 may be simplified.

[0052] Also, each of the first impeller and the second impeller may serve as a nozzle when it does not jet any fluid.

[0053] FIG. 5 is a plan view schematically illustrating an impeller of the centrifugal propulsion apparatus 30 according to another embodiment of the present invention. According to the current embodiment, a plurality of blades 331 may be attached between the shaft pipe 31 and the reflection shade 32 in a radial direction and fixed thereto. Each of the plurality of blades 331 may have a shape of a plate with straight edges.

[0054] FIG. 6 is a plan view schematically illustrating an impeller of the centrifugal propulsion apparatus 30 according to another embodiment of the present invention. According to the current embodiment, a plurality of blades 332 may be curved blades 332, each having a shape of a curved plate.

[0055] FIG. 7 is a front view schematically illustrating an impeller of the centrifugal propulsion apparatus 30 according to another embodiment of the present invention. According to the current embodiment, a plurality of blades 333 may be propeller type blades 333 each having a shape of a plate that is twisted into a predetermined form.

[0056] Hereinafter, the power transmission unit 50 will be described with reference to FIGS. 1 to 3.

[0057] The power transmission unit 50 may be provided between the power shaft 16 and two impellers and may connect one of two impellers and the power shaft 16 or connect the other impeller and the power shaft 16 according to a rotational direction of the power shaft 16.

[0058] The power transmission unit 50 may include two ratchet gears that connect the power shaft 16 and each of the two impellers. In detail, the power transmission unit may include a first ratchet gear provided between the power shaft and the first impeller and a second ratchet gear provided between the power shaft and the second impeller.

[0059] The two ratchet gears may be engaged when rotating in opposite directions. Specifically, the first ratchet gear may be engaged when rotating clockwise and may connect the power shaft 16 and the first impeller. The second ratchet gear may be engaged when rotating counterclockwise and may connect the power shaft 16 and the second impeller.

[0060] In this case, when one of the two ratchet gears is rotated, the other one may not be rotated. For example, when the power shaft 16 is rotated in a predetermined direction, the first ratchet gear may be engaged and may be rotated together with the power shaft 16, and the second ratchet gear may be released and may not be rotated together with the power shaft 16. When the power shaft 16 is rotated in the opposite direction, the second ratchet gear may be engaged, and the first ratchet gear may be released.

[0061] Thus, the power transmission unit 50 may connect one power shaft 16 and the two impellers selectively so that the centrifugal propulsion apparatus 30 is capable of forward and backward movement.

[0062] The first ratchet gear and the second ratchet gear are the same as or similar to each other and thus, the first ratchet gear will be described in detail.

[0063] The first ratchet gear may include a first ratchet frame 51 having a first latch 511 installed therein and a first gear 52 that makes a pair with the first ratchet frame 51. Here, the first ratchet frame 51 may be coupled to the power shaft 16 using a frame fixing bolt 166, and the first gear 52 may be installed in the first impeller. The frame fixing bolt 166 will be described with reference to FIG. 10.

[0064] In more detail, the first gear 52 may be coupled to the first induction layer 34 using a first turbine bolt 341. Of course, embodiments of the present invention are not limited thereto, and the first gear 52 may also be coupled to the first shaft pipe 31.

[0065] The first latch 511 may be engaged on or released from the first gear 52 according to the rotational direction of the power shaft 16. For example, the power shaft 16 may be clockwise rotated. This will be later described in more detail in FIG. 10.

[0066] The second ratchet gear may include a second ratchet frame 55 having a second latch 551 installed therein and a second gear 56 that makes a pair with the second ratchet frame 55. Here, the second ratchet gear 55 may be coupled to the power shaft 16 due to the second latch 551, and the second gear 56 may be installed in the second impeller.

[0067] In more detail, the second gear 56 may be coupled to an inside of the second induction layer 39 by a second turbine bolt 391. Of course, embodiments of the present invention are not limited thereto, and the second gear 56 may also be coupled to the second shaft pipe 36.

[0068] The second latch 551 may be engaged on or released from the second gear 56 according to the rotational direction of the power shaft 16. For example, the power shaft 16 may be counterclockwise rotated. This will be later described in more detail in FIG. 10.

[0069] Meanwhile, according to another embodiment of the present invention, the centrifugal propulsion apparatus 30 may be fixed to the body 11 of the ship and may further include a fixed diaphragm 63 provided between the two impellers.

[0070] The fixed diaphragm 63 may have approximately a plate shape and may be lengthwise disposed along the extension direction of the power shaft 16. Thus, the fixed diaphragm 63 may make the flow of the fluid be parallel to the direction of the power shaft 16.

[0071] A plurality of fixed diaphragms 63 may be provided in the radial direction from the power shaft 16.

[0072] One fixed diaphragm among the plurality of fixed diaphragms 63 may extend in a direction of the body 11 of the ship and may be fixedly coupled to the body 11. Alternatively, as illustrated, one fixed diaphragm among the fixed diaphragms 63 may be directly or indirectly connected to an installation frame 61, and the installation frame 61 may be fixedly installed to the body 11 of the ship by an installation bolt 611. The centrifugal propulsion apparatus 30 may further include the installation frame 61 and the installation bolt 611.

[0073] Meanwhile, the centrifugal propulsion apparatus 30 may further include a fixed outer case 62 that is a case. The fixed outer case 62 may be provided between the two impellers and may surround the fixed diaphragms 63. The fixed diaphragms 63 may be connected and fixed to an inner circumferential surface of the fixed outer case 62 in the radial direction. Also, the installation frame 61 may be coupled to an outside surface of the fixed outer case 62.

[0074] Meanwhile, the centrifugal propulsion apparatus 30 may further include a bearing unit provided between the fixed diaphragm 63 and the power shaft 16. The bearing unit may include a bearing housing 65 and a bearing 67.

[0075] The bearing housing 65 may be provided between the two impellers, i.e., approximately in the middle of the two impellers. In addition, the bearing housing 65 may surround the power shaft 16. The bearing housing 65 may be coupled to the fixed diaphragm 63 in the radial direction. That is, the fixed diaphragms 63 may be provided between the fixed outer case 62 and the bearing housing 65. The bearing housing 65 may have a streamlined shape so that the flow of the fluid may be smooth.

[0076] The bearing 67 may be provided in the bearing housing 65 and may be coupled to the bearing housing 65 and the power shaft 16. Thus, the bearing unit may assist the power shaft 16 in smoothly rotating and may support the power shaft 16.

[0077] Meanwhile, when one of the two impellers is rotated, the other one may be fixed. In detail, when the first impeller is rotated, the second impeller needs to be fixed not to disturb the flow of the fluid, or vice versa.

[0078] Thus, the centrifugal propulsion apparatus 30 may further include a fixing unit that selectively fixes two impellers. For example, when the first impeller is rotated, the fixing unit may stop the second impeller to prevent the second impeller from being rotated by the jetting pressure of the fluid, or vice versa.

[0079] The fixing unit may include a brake plate 68 that moves along the flow of the fluid. Here, the brake plate 68 may be installed at the fixed diaphragms 63 and may have a length that may reach an adjacent impeller of the two impellers. In detail, one end of the brake plate 68 adjacent to the first impeller may be rotatably coupled to the fixed diaphragm 63, and the other end of the brake plate 68 may be free. Thus, when the brake plate 68 is rotated in a direction of the first impeller, the brake plate 68 may contact the first impeller, and the first impeller may be maintained in a stopped state.

[0080] A plurality of brake plates 68 may be adjacent to each of the first impeller and the second impeller.

[0081] The fixing unit may include a brake shaft 681 by which the brake plate 68 is rotatably installed to the fixed diaphragm 63. The brake shaft 681 may be installed approximately perpendicular to the direction of the flow of the fluid. That is, the brake shaft 681 may be installed approximately perpendicular to the power shaft 16.

[0082] Meanwhile, the fixing unit may further include a brake shaft plate 682. That is, the brake shaft plate 682 may be coupled to the fixed diaphragm using welding or a screw, etc. and rotatably coupled to the brake plate 68 by the brake shaft 681. Two brake shaft plates 682 may be provided adjacent to each of the first impeller and the second impeller.

[0083] Hereinafter, an operation of the fixing unit will be described.

[0084] When the first impeller is rotated, two brake plates 68 may be disposed in a first direction due to the fluid jetted from the first impeller. In this case, the brake plate 68 adjacent to the second impeller may contact a blade 38 of the second impeller and prevent the second impeller from being rotated.

[0085] Contrary to this, when the second impeller is rotated, two brake plates 68 may be disposed in a second direction due to the fluid jetted from the second impeller. In this case, the brake plate 68 adjacent to the first impeller may contact a blade 33 of the first impeller and prevent the first impeller from being rotated.

[0086] FIGS. 8, 9, and 10 are conceptual views and a perspective view schematically illustrating the centrifugal propulsion apparatus 30 according to another embodiment of the present invention and a part of a ship having the same. The centrifugal propulsion apparatus 30 according to the current embodiment and the ship having the same are the same as or similar to the centrifugal propulsion apparatus 30 according to the above-described embodiment and the ship having the same, and, thus, redundant descriptions thereof will be omitted.

[0087] Referring to FIG. 8, the ship may include an installation plate 25 which is rotatably coupled to a body and on which a centrifugal propulsion apparatus is installed. In detail, the installation plate 25 may be rotatably coupled to the body by a hinge 22. Meanwhile, the ship may further include a fixing bolt 26 that couples the installation plate 25 and the body 11 to firmly couple the installation plate 25 to the body 11. Here, the fixing bolt 26 may couple the installation plate 25 and the body 11 from a location at a long distance from the hinge 22.

[0088] In addition, the ship may further include a movement ring 28 coupled to the installation plate 25 so that the installation plate 25 in the body 11 may be smoothly rotated and maintained in a rotated state. Here, the movement hook 28 may be disposed at a long distance from the hinge 22.

[0089] As illustrated in FIG. 9, a worker may rotate the installation plate 25 by holding the movement ring 28. The worker may tie the movement ring 28 with a rope, etc. to maintain the installation plate 25 in a rotated state.

[0090] In this case, the ship may further include a barrier wall 21 installed in the body. The barrier wall 21 may be installed approximately perpendicular to the surface of water and may include a movement hole 29 into which the movement ring 28 may be inserted.

[0091] Thus, the worker may rotate the installation plate 25 until the movement ring 28 is inserted into the movement hole 29. The worker may insert a pin, etc. into the movement ring 28 inserted into the movement hole 29 to fix the pin to a barrier plate 21.

[0092] Meanwhile, the power shaft 16 needs to be separated from the centrifugal propulsion apparatus 30 so that the installation plate 25 may be rotated. For example, the power shaft 16 may be separated into a portion coupled to the engine 15 and a portion coupled to the centrifugal propulsion apparatus 30. In detail, the power shaft 16 may include at least two shafts that may be coupled to or separated from each other. In this case, the power shaft 16 may be divided into several portions that may be combined fit to one another. In detail, the portions of the power shaft 16 may be separated from and coupled to one another in a slip joint form.

[0093] Hereinafter, an example of a coupling and separation structure of the power shaft 16 will be described.

[0094] Referring to FIGS. 8 to 10, the power shaft 16 may include a shaft directly coupled to an engine, a shaft directly coupled to the centrifugal propulsion apparatus 30, and a connection shaft that connects these two shafts. Here, a portion directly coupled to the centrifugal propulsion apparatus 30 is hereinafter referred to as a turbine shaft 160. The connection shaft is hereinafter referred to as a slip power shaft 80.

[0095] The shaft directly coupled to the engine of the power shaft 16 may include a power protrusion slip 17 formed at one end of the shaft. The slip power shaft 80 may include a slip groove 82 into which the power protrusion slip 17 is inserted and which is formed at one end of the slip power shaft 80, and a connection protrusion slip 83 formed at the other end of the slip power shaft 80. The turbine shaft 160 may include a turbine shaft groove 169 into which the connection protrusion slip 83 is inserted and which is formed at one end of the turbine shaft 160.

[0096] In this case, the power protrusion slip 17 and the slip groove 82 may have corresponding shapes. This also applies to the connection protrusion slip 83 and the turbine shaft groove 169.

[0097] The ship may further include a shaft bolt 86 that passes through the slip power shaft 17 and the power protrusion slip 17 and couples them to securely couple the slip power shaft 80 and the power protrusion slip 17.

[0098] The slip power shaft 80 needs to reduce friction, because it passes through the body 11 of the ship. Thus, the ship may further include a fixed bushing 78 which is installed at the body 11 and through which the slip power shaft 80 passes. The slip power shaft 80 may include a slip friction portion 81 inserted into the fixed bushing 78. Here, the slip friction portion 81 may have an approximate pipe shape.

[0099] Meanwhile, the slip power shaft 80 may be moved in an axial direction for coupling and separation. In this case, the ship may further include a movement handle 88 fixedly coupled to the slip power shaft 80 so that the worker may move the slip power shaft 80 more easily. The movement handle 88 may be provided in the body 11.

[0100] Separation of the centrifugal propulsion apparatus 30 will be described with reference to FIGS. 8 and 9. Coupling of the centrifugal propulsion apparatus 30 is performed in reverse order with respect to the separation and thus, detailed descriptions thereof will be omitted.

[0101] When separating the centrifugal propulsion apparatus 30 to repair it, the worker may remove a shaft bolt 86 and may pull the movement handle 88 toward the engine 15 to remove the slip power shaft 80 inserted into the centrifugal propulsion apparatus 30.

[0102] The worker may release the fixing bolt 26 coupled to the installation plate 25 and move the installation plate 25 in which the centrifugal propulsion apparatus 30 is installed and lean toward the barrier wall 21 with respect to the hinge 22. In this case, the movement ring 28 may be inserted into the movement hole 29.

[0103] Meanwhile, the coupling relationship between the turbine shaft 160 and the centrifugal propulsion apparatus 30 will be described in detail with reference to FIG. 10. In the current drawing, the turbine shaft 160 may be the same as or similar to the power shaft 16 of FIG. 1. Also, the coupling relationship may also be similar.

[0104] Meanwhile, the first ratchet frame 51 and the second ratchet frame 55 may each be coupled to both sides of the turbine shaft 160 using the frame fixing bolt 166. The first gear 52 and the second gear 56 may be installed, as described above.

[0105] The first ratchet gear may further include a latch shaft 519 and a latch spring 518. Coupling of the first ratchet frame 51 and the first gear 52 may be determined by a direction in which they are combined with the latch spring 518 that inserts the first latch 511 into the latch shaft 519 to support the first latch 511. Coupling of the second ratchet frame 55 and the second gear 56 may be the same.

[0106] As described above, the slip power shaft 80 is included in the ship as an element of the power shaft 16. However, embodiments of the present invention are not limited thereto, and the slip power shaft 80 may also be included in the configuration of the centrifugal propulsion apparatus 30.

[0107] Meanwhile, the centrifugal propulsion apparatus 30 may include two nozzles 71 and 72 disposed adjacent to each other outside of the two impellers. Two nozzles 71 and 72 may be configured to efficiently accommodate the fluid jetted from two impellers. That is, two nozzles 71 and 72 may make inflow and jetting of

the fluid smooth. In detail, two nozzles 71 and 72 include a first nozzle 71 and a second nozzle 72.

[0108] The first nozzle 71 may be adjacent to a narrow opening of the first impeller. For example, the first nozzle 71 may gradually flare out, that is, in a form that is opposite to the first reflection shade 32. In this case, the centrifugal propulsion apparatus 30 may include a fixed shade 73 that surrounds the first reflection shade 32. The fixed shade 73 may have a shape that is the same as but slightly larger than the first reflection shade 32. The fixed shade 73 may be coupled to the first nozzle 71.

[0109] The first nozzle 71 and the fixed shade 73 may be coupled to a housing 75. They may be coupled to the body 11 of the ship using welding, etc.

[0110] The second nozzle 72 may be adjacent to the second impeller. The second nozzle 72 may be adjacent to a narrow opening of the second impeller. In more detail, the second nozzle 72 may be adjacent to the second reflection shade 37. The centrifugal propulsion apparatus 30 may be provided between the second nozzle 72 and the installation plate 25 and may further include a nozzle fixing plate 74 coupled to the second nozzle 72 and the installation plate 25. Here, the shape of the second nozzle 72 may be a cylindrical shape or a flare-out shape like a trumpet.

[0111] While the invention has been shown and described with reference to certain exemplary embodiments thereof, it will be understood by those skilled in the art that various changes in form and details may be made therein without departing from the spirit and scope of the invention as defined by the appended claims.

[Industrial Availability]

[0112] The present invention is for solving a number of problems including the above-described problems and can provide a centrifugal propulsion apparatus capable of forward and backward movement and a ship having the same.

Claims

1. A centrifugal propulsion apparatus comprising:

two impellers, which are rotated by a power shaft, face each other, and are configured to jet a fluid in opposite directions; and
a power transmission unit provided between the power shaft and two impellers to connect the power shaft to one or the other of the two impellers, according to a rotational direction of the power shaft.

2. The centrifugal propulsion apparatus of claim 1, wherein each of the two impellers comprises:

a reflection shade having both ends opened and an increasing width from one end to the other end; and
a plurality of blades provided in the reflection shade, disposed in radial directions from a rotational central axis and having increasing width perpendicular to the rotational central axis with increasing width of the reflection shade.

3. The centrifugal propulsion apparatus of claim 2, wherein the reflection shade is coupled to the plurality of blades.

4. The centrifugal propulsion apparatus of claim 2, wherein one of the two impellers further comprises a streamlined induction layer that surrounds the rotational central axis and has gradually increasing width with increasing width of the reflection shade.

5. The centrifugal propulsion apparatus of claim 1, wherein the two impellers use the power shaft as a rotation center.

6. The centrifugal propulsion apparatus of claim 1, wherein the power transmission unit comprises two ratchet gears that connect the power shaft and each of the two impellers, and
the two ratchet gears are engaged when rotating in opposite directions.

7. The centrifugal propulsion apparatus of claim 6 wherein one of the two ratchet gears comprises:

a ratchet frame coupled to the power shaft and having a latch installed therein; and
a gear coupled to the impeller and making a pair with the ratchet frame.

8. The centrifugal propulsion apparatus of claim 1, further comprising a diaphragm that is fixable to a ship, provided between the two impellers, and being parallel to the power shaft.

9. The centrifugal propulsion apparatus of claim 8, further comprising a fixing unit installed at the fixed diaphragm and selectively fixing the two impellers to the fixed diaphragm.

10. The centrifugal propulsion apparatus of claim 8, wherein the fixing unit comprises:

a brake plate installed at the fixed diaphragm, contacting an adjacent impeller of the two impellers and preventing rotation of the adjacent impeller; and
a brake shaft rotatably coupling the brake plate to the fixed diaphragm.

11. The centrifugal propulsion apparatus of claim 8, fur-

ther comprising a bearing unit provided between the fixed diaphragm and the power shaft.

12. The centrifugal propulsion apparatus of claim 1, further comprising two nozzles disposed adjacent to each other outside of the two impellers, connected to the two impellers and having widths increasing with increasing distance from the two impellers.

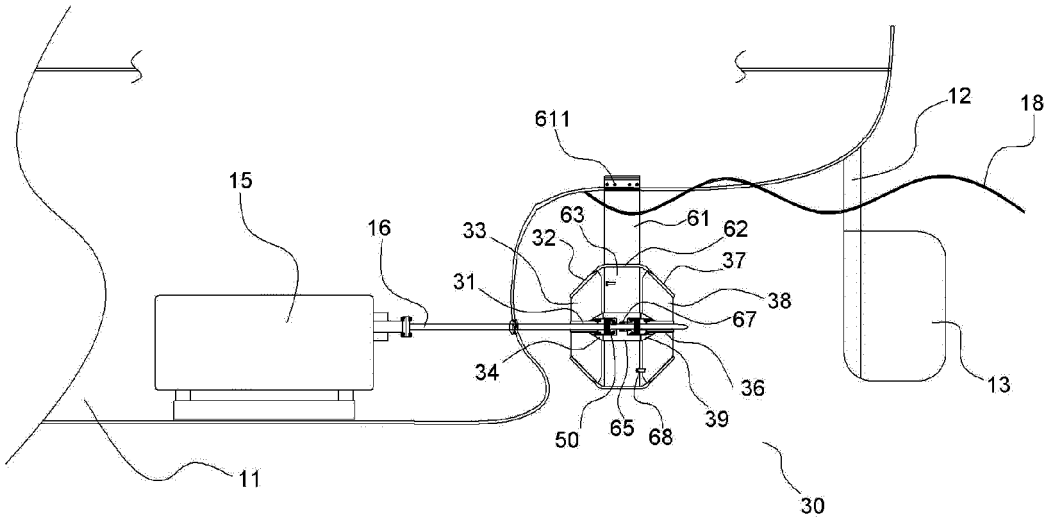
13. A ship comprising:

a body;
an engine installed in the body;
a centrifugal propulsion apparatus of one of claims 1 to 12 installed in the body; and
a power shaft connecting the engine and the centrifugal propulsion apparatus.

14. The ship of claim 13, further comprising an installation plate rotatably installed in the body and having the centrifugal propulsion apparatus installed therein.

15. The ship of claim 13, wherein the power shaft comprises a portion coupled to the engine, a portion coupled to the centrifugal propulsion apparatus, and a portion passing through the body and connecting the two portions, and the three portions are configured to fit one another by insertion and be separated from one another.

【FIG. 1】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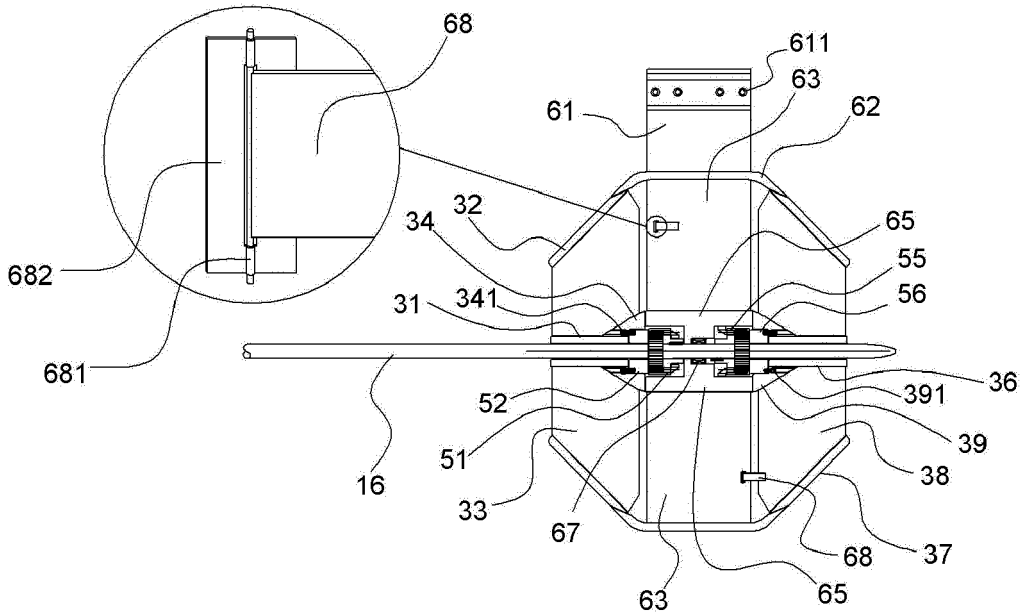
【FIG. 2】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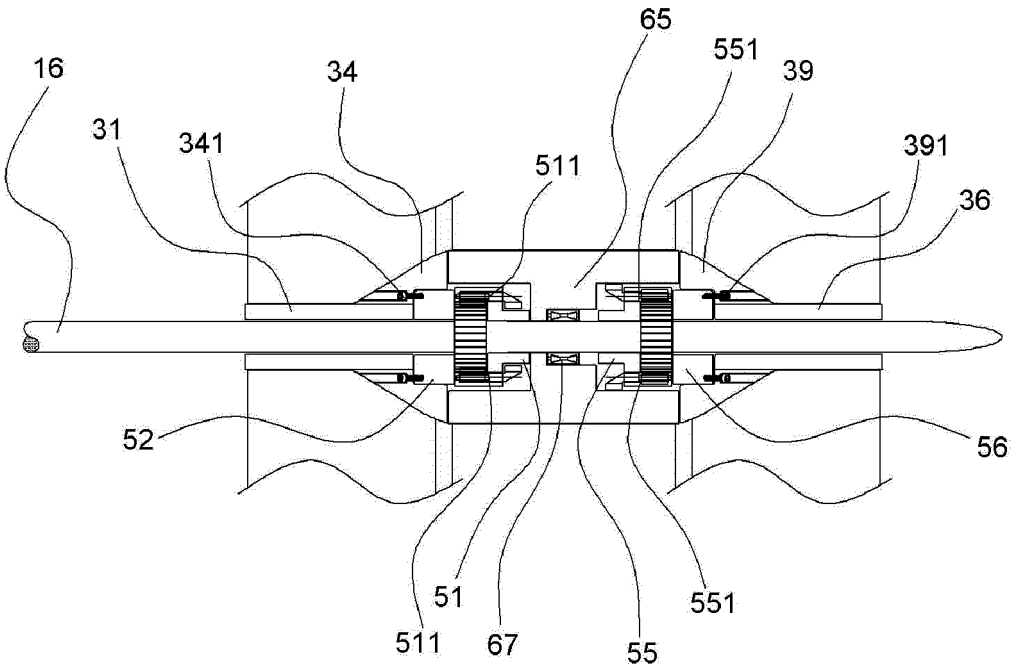
【FIG. 3】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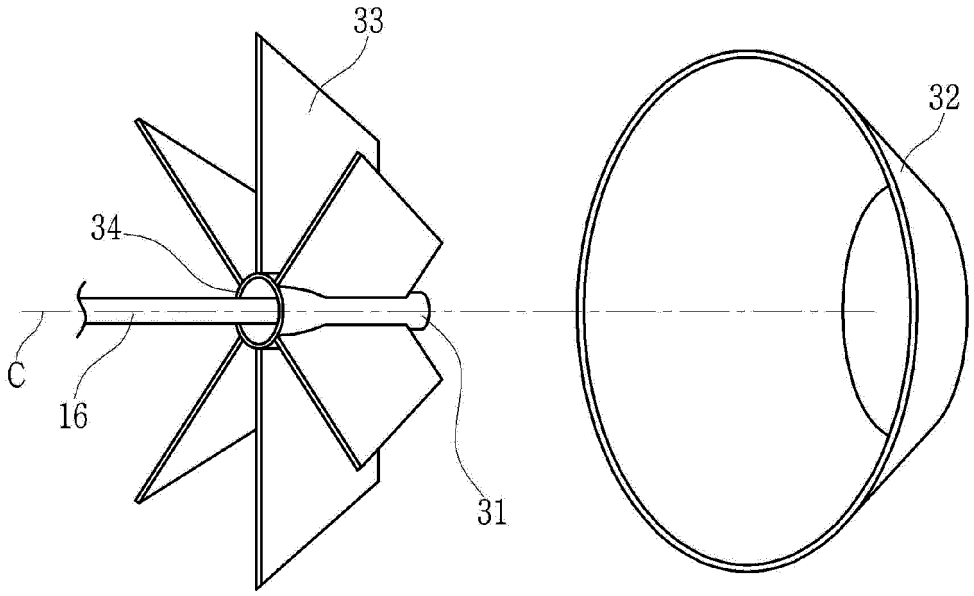
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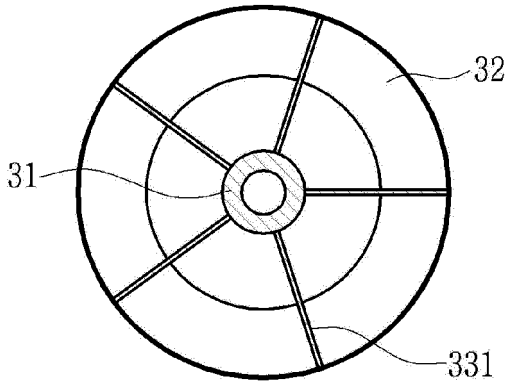
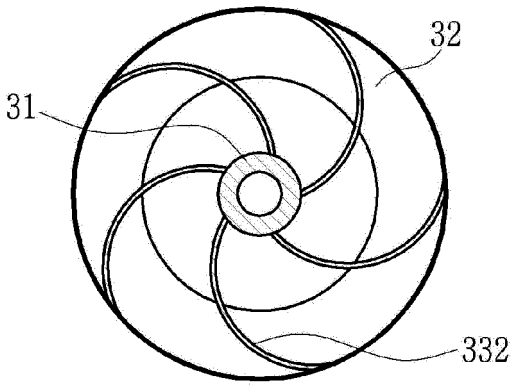
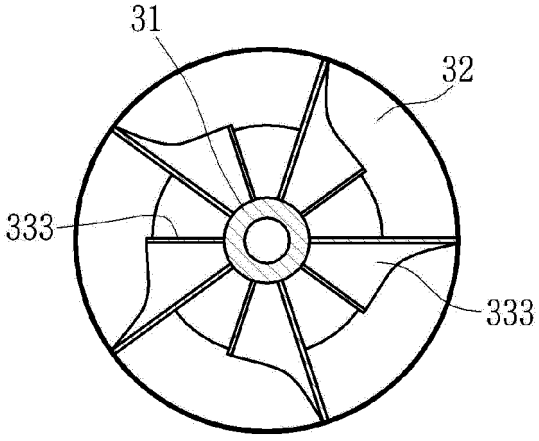
【FIG. 5】



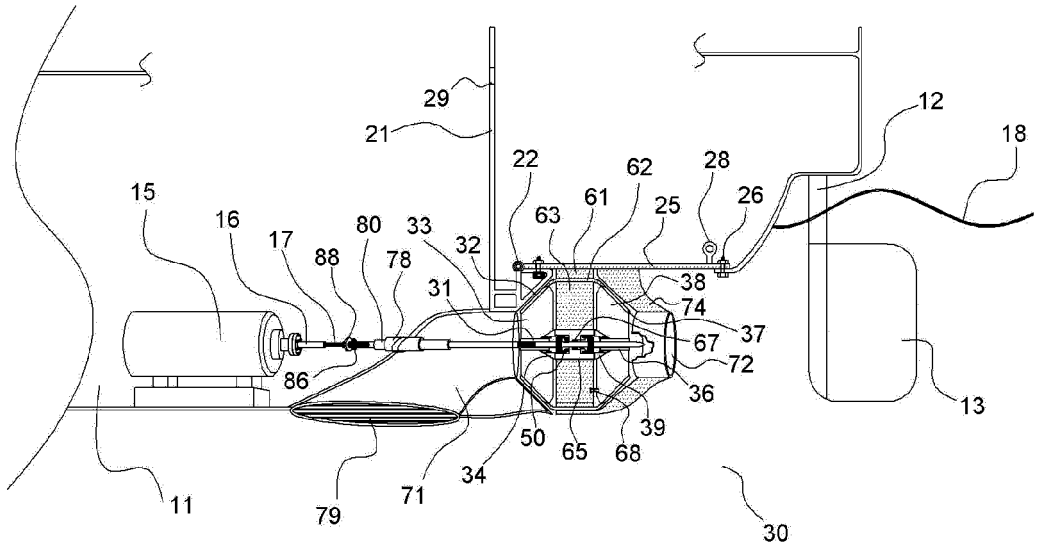
【FIG. 6】



【FIG. 7】



【FIG. 8】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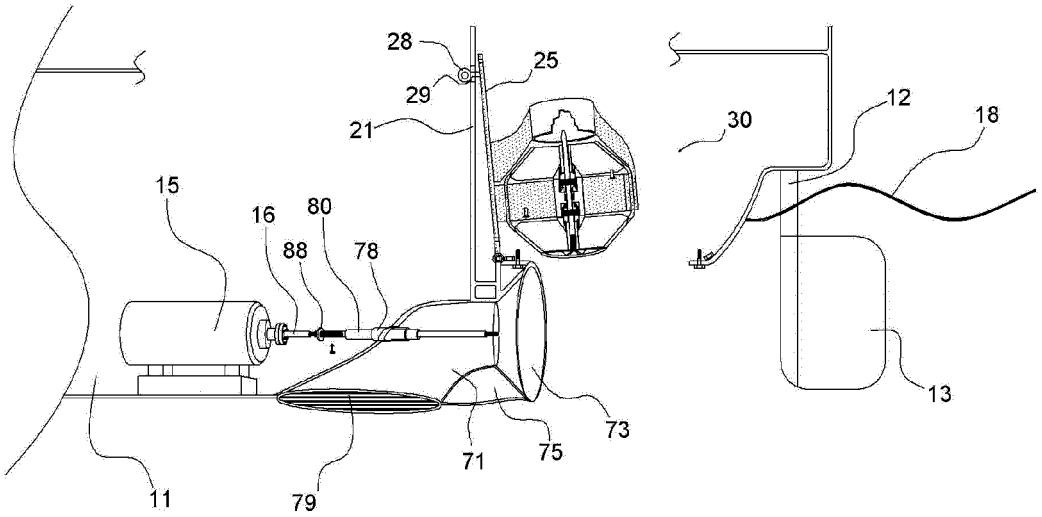
【FIG. 9】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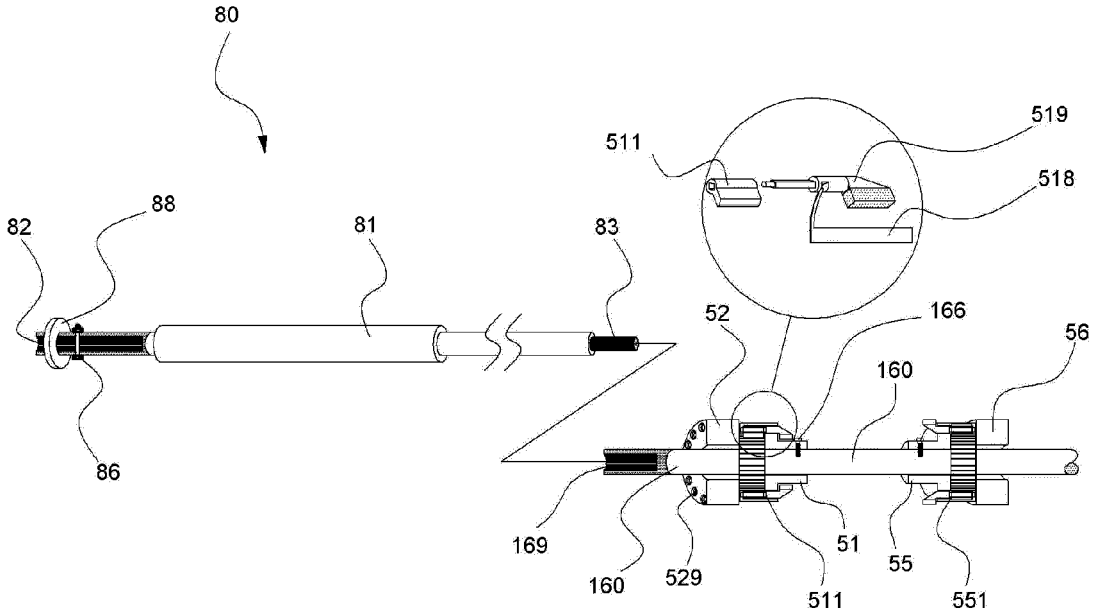
【FIG. 10】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INTERNATIONAL SEARCH REPORT

International application No.
PCT/KR2015/002399

A. CLASSIFICATION OF SUBJECT MATTER

B63H 5/14(2006.01)i, B63H 1/14(2006.01)i, B63H 1/26(2006.01)i, B63H 1/28(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 5/14; B63H 16/16; B64C 27/10; B63H 23/04; B63H 23/00; B63H 11/113; B63H 11/107; B63H 20/02; B64C 27/80; B63H 23/02; B63H 1/14; B63H 1/26; B63H 1/28

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched
Korean Utility models and applications for Utility models: IPC as above
Japanese Utility models and applications for Utility models: IPC as above

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

eKOMPASS (KIPO internal) & Keywords: dual, centrifugal, ship, bearing, impeller, propeller, power, blade, ratchet and nozzle

C. DOCUMENTS CONSIDERED TO BE RELEVANT

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Y	US 2011-0163199 A1 (CARDOZO, Giles) 07 July 2011 See paragraph [0119] and figures 7-8.	1-15
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A	EP 1967447 A2 (R.T.N. S.R.L.) 10 September 2008 See paragraph [0032] and figures 5-6.	4

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

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Date of the actual completion of the international search	Date of mailing of the international search report
04 JUNE 2015 (04.06.2015)	**05 JUNE 2015 (05.06.2015)**
Name and mailing address of the ISA/**KR** Korean Intellectual Property Office Government Complex-Daejeon, 189 Seonsa-ro, Daejeon 302-701, Republic of Korea Facsimile No. 82-42-472-7140	Authorized officer Telephone No.

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Information on patent family members

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