

Description

Title of Invention: WIND PROPULSION SYSTEM AND SHIP COMPRISING
SAME

Technical Field

5 **[0001]** The present invention relates to a wind power propulsion system and a ship provided with the same.

Background Art

[0002] In general, ships gain propulsion largely from fossil fuels. Ships are equipped with high-power engines to drive thrusters, etc., and
10 it is known that the amount of fuel consumed by large ships during long-distance operations is several hundred tons. The operation of these ships is prohibitively expensive, and the emission of pollutants from fuel consumption is also a serious problem.

[0003] To solve these problems, it is desirable to diversify the power
15 sources of ships. For example, electric propulsion ship technology that obtains part of the propulsion from an electric motor has been developed and applied, and other technologies for obtaining electricity using various environmental conditions experienced by ships at sea are being developed.

[0004] Furthermore, the use of solar and wind power as natural
20 energy that does not generate any exhaust is also attracting attention. In particular, in the case of wind power, it has the advantage of simple structure and low maintenance cost in that wind power can be easily converted into propulsion by installing facilities such as sails on the deck.

[0005] In addition, unlike sails that are commonly known, rotor

facility (for example, magnus rotors) that can convert wind power into propulsion in the desired direction by directly rotating with power has been mounted on solid ships recently. The rotor facility includes a stator fixed on the deck and a rotor provided in the form of a cylinder to wrap
5 around the surface and upper surface of the stator having a rotational speed or direction controlled.

[0006] Unlike sails, these rotor facility can process wind power into desired propulsion, so a lot of research and development has been done recently. However, since the rotor facility is in the form of a large column
10 with a diameter of several meters and a height of tens of meters, there are still many problems to be solved and improved from the perspective of installation on deck, durability due to ship movement, interference with front vision, and control.

Disclosure of the Invention

15 Technical Goals

[0007] Accordingly, the present disclosure has been proposed to solve the problems of the related art as described above, and an object of the present disclosure is to provide a wind power propulsion system and a ship provided with the same to facilitate structural performance
20 improvement and manufacturing of the rotor, secure structural stability of a driving part that drives the rotor, facilitate securing structural stability and maintenance of a lower bearing part installed between the rotor and the stator, and ensure structural stability through light weight of an end plate.

Technical Solutions

[0008] A wind power propulsion system according to an aspect of the present disclosure includes a stator provided perpendicular to a deck; a rotor provided in a form of a cylinder to wrap around an outer side of the stator; a driving part configured to transmit rotational power to the rotor through a disk connected to the rotor; and a lower bearing part installed in a lower part of the rotor to suppress lateral movement of the rotor, wherein the lower bearing part may be composed of an assembly of bearing units, at least a portion thereof may be installed along an edge of a window provided at a predetermined interval at a location where the bearing unit is installed inside the stator, and the lower bearing part may include a joint part configured to support a guide bearing for guiding rotation of the rotor to the stator.

[0009] Specifically, the joint part may include a first joint plate consisting of a pair and coupled to both ends of a bearing shaft of the guide bearing; and a second joint plate installed along the edge of the window inside the stator and coupled with the first joint plate.

[0010] Specifically, the first joint plate may extend horizontally to one side of the guide bearing in a state of being coupled to the bearing shaft, have a vertically bent shape at an extended end, and be provided with a plurality of first bolting holes for bolting with the second joint plate, and the second joint plate may have a protruding shape with a size of at least a radius of the guide bearing or less, and be provided with a plurality of second bolting holes corresponding to the first bolting holes.

[0011] Specifically, the joint part may include a joint box installed along the edge of the window inside the stator, and configured to fix the guide bearing in a state in which a portion of the guide bearing protrudes to an outside.

5 **[0012]** Specifically, the driving part may include a gearbox in which a driving shaft rotated by a motor, a driving gear provided on the driving shaft, a driven gear that meshes with the driving gear and rotates, and a first driven shaft coupled to the driven gear to support rotation of the driven gear are built-in, and installed inside the stator; and a bearing
10 housing connected to the first driven shaft by a coupling member and configured to hold a second driven shaft transmitting rotational force to the disk.

[0013] Specifically, the bearing housing may be installed inside an upper surface of the stator or installed outside the upper surface of the
15 stator.

[0014] Specifically, an upper part of the driving shaft may be rotatably coupled to an upper surface of the gearbox by a first bearing, and a lower part of the driving shaft may be rotatably coupled to a lower surface of the gearbox by a second bearing, and the first and second
20 bearings may be bearings that prevent lateral force of the driving shaft or lateral movement of the driving shaft.

[0015] Specifically, an upper part of the first driven shaft may be rotatably coupled to an upper surface of the gearbox by a third bearing, and a lower part of the first driven shaft may be rotatably coupled to a

lower surface of the gearbox by a fourth bearing, and the third and fourth bearings may be bearings that prevent lateral force of the first driven shaft.

[0016] Specifically, the second driven shaft may be rotatably coupled to an upper surface of the stator by a fifth bearing and a sixth bearing arranged in series, the fifth bearing may be a bearing that prevents axial force of the second driven shaft, and the sixth bearing may be a bearing that prevents lateral force of the second driven shaft.

[0017] Specifically, the rotor may include a lower rotor provided with a ring-shaped first edge panel having a space for accommodating the disk and extending a certain length inwardly at an upper end; an upper rotor provided with a ring-shaped second edge panel having a space for accommodating the disk and extending a certain length inwardly at a lower end; and a coupling member for coupling the lower rotor, the upper rotor, and the disk.

[0018] Specifically, the coupling member may include a first clamping plate configured to hold a lower surface of the first edge panel and a lower surface of the disk; a second clamping plate configured to hold an upper surface of the first edge panel and an upper surface of the disk; a first bolting member configured to fix the first and second clamping plates and the disk; and a second bolting member configured to fix the first edge panel and the second edge panel.

[0019] Specifically, the coupling member may further include a first bonding member provided between the first edge panel and the second

clamping plate; and a second bonding member provided between the second edge panel and the second clamping plate.

[0020] Specifically, the wind power propulsion system may mount the foundation structure on land on the deck using a lifting apparatus, install the disk and the driving part on an upper part of the stator on land, accommodate the stator inside the lower rotor by lifting the lower rotor with the lifting apparatus, couple the lower rotor and the disk using the coupling member, mount the lower rotor in which the stator is accommodated, on the foundation structure using the lifting apparatus, align the upper rotor on land to an upper part of the lower rotor mounted on the foundation structure using the lifting apparatus, and couple the lower rotor and the upper rotor using the coupling member.

[0021] A ship according to another aspect of the present disclosure may include the wind power propulsion system described above.

15 Advantageous Effects

[0022] A wind power propulsion system according to the present disclosure may facilitate the structural performance improvement and manufacturing of the rotor, secure the structural stability of the driving part that drives the rotor, facilitate securing structural stability and maintenance of the lower bearing part installed between the rotor and the stator, and ensure structural stability through light weight of the end plate.

Brief Description of Drawings

[0023] FIG. 1 is a diagram illustrating a ship having a wind power

propulsion system in accordance with an embodiment of the present disclosure.

[0024] FIG. 2 is a diagram for illustrating a wind power propulsion system in accordance with an embodiment of the present disclosure.

5 **[0025]** FIG. 3 is a diagram for illustrating a first embodiment of a rotor shown in FIG. 2.

[0026] FIG. 4 is a diagram for illustrating a unit panel constituting a rotor of the first embodiment.

[0027] FIG. 5 is a diagram for illustrating a second embodiment of
10 the rotor shown in FIG. 2.

[0028] FIG. 6 is a diagram for illustrating a coupling member connecting a lower rotor and an upper rotor constituting a rotor of the second embodiment.

[0029] FIGS. 7A to 7D are diagrams for illustrating a mounting
15 process of the rotor of the second embodiment.

[0030] FIG. 8 is a diagram for illustrating a first embodiment of an end plate shown in FIG. 2.

[0031] FIG. 9 is a diagram for illustrating a first embodiment of a driving part shown in FIG. 2.

20 **[0032]** FIG. 10 is a diagram for illustrating a second embodiment of the driving part shown in FIG. 2.

[0033] FIG. 11 is a diagram for illustrating a third embodiment of the driving part shown in FIG. 2.

[0034] FIG. 12 is a partial diagram of a wind power propulsion

system for illustrating a first embodiment of a lower bearing part shown in FIG. 2.

[0035] FIG. 13 is a diagram cut along the A-A' line of FIG. 12.

[0036] FIG. 14 is a diagram cut along the B-B' line of FIG. 13.

5 **[0037]** FIG. 15 is a partial diagram of a wind power propulsion system for illustrating a second embodiment of the lower bearing part shown in FIG. 2.

[0038] FIG. 16 is a diagram cut along the A-A' line of FIG. 15.

[0039] FIG. 17 is a diagram cut along the B-B' line of FIG. 16.

10 **[0040]** FIG. 18 is a partial diagram of a wind power propulsion system for illustrating a third embodiment of the lower bearing part shown in FIG. 2.

[0041] FIG. 19 is a diagram for illustrating a bearing unit constituting the lower bearing part of the third embodiment.

15 **[0042]** FIGS. 20A to 20C are diagrams illustrating a state in which the bearing unit of FIG. 19 is installed in a stator.

[0043] FIG. 21 is a partial diagram of a wind power propulsion system for illustrating a fourth embodiment of the lower bearing part shown in FIG. 2.

20 **[0044]** FIG. 22 is a diagram for illustrating a bearing unit constituting the lower bearing part of the fourth embodiment.

[0045] FIG. 23 is a partial diagram of a wind power propulsion system illustrating a fifth embodiment of the lower bearing part shown in FIG. 2.

[0046] FIG. 24 is a diagram cut along the A-A' line of FIG. 23.

[0047] FIG. 25 is a diagram cut along the B-B' line of FIG. 24.

[0048] FIG. 26 is a partial diagram of a wind power propulsion system illustrating a sixth embodiment of the lower bearing part shown in
5 FIG. 2.

[0049] FIG. 27 is a diagram cut along the A-A' line of FIG. 26.

Best Mode for Carrying Out the Invention

[0050] The objects, specific advantages and novel features of the present disclosure will become more apparent from the following detailed
10 description and preferred embodiments taken in conjunction with the accompanying drawings. In the present specification, in adding reference numerals to the components of each drawing, it should be noted that only the same components are given the same numeral as possible even though they are indicated on different drawings. In addition, in
15 describing the present disclosure, if it is determined that a detailed description of a related known art may unnecessarily obscure the subject matter of the present invention, the detailed description thereof will be omitted.

[0051] Hereinafter, with reference to the accompanying drawings,
20 the preferred embodiment of the present disclosure will be described in detail.

[0052] FIG. 1 is a diagram illustrating a ship S having a wind power propulsion system 1 in accordance with an embodiment of the present disclosure, and FIG. 2 is a diagram for illustrating the wind power

propulsion system 1 in accordance with an embodiment of the present disclosure.

[0053] As shown in FIGS. 1 and 2, the wind power propulsion system 1 according to an embodiment of the present disclosure is provided with at least one on the deck of the ship S, and can convert wind power into propulsion in a desired direction while directly rotating using power, and may include a foundation structure 10, a stator 20, a rotor 30, an end plate 40, a disk 50, a driving part 60, and a lower bearing part 70.

[0054] The foundation structure 10 is fixed and installed on the deck, and the stator 20 may be installed on the upper part.

[0055] The stator 20 may be arranged perpendicular on the foundation structure 10 fixed on the deck and may form the shaft of the rotor 30.

[0056] The stator 20 may be a cylindrical structure in which the interior is hollow, and the driving part 60 may be mounted on the upper part.

[0057] The rotor 30 is a structure provided in the form of a cylinder to wrap around the outer side of the stator 20, and using the stator 20 installed/fixed on the deck of the ship S as a shaft, may be rotated 360 degrees by the power added by the driving part 60. Here, due to hydrodynamic interference between the wind around the ship S and the cylindrical rotor 30, the wind may be converted into the propulsion of the ship S.

[0058] In other words, the rotor 30 may be rotated by the power of

the driving part 60 transmitted through the disk 50. Here, the rotor 30 is rotated relative to the stator 20, which is the central shaft in the vertical direction, an increased pressure is generated on one side and a reduced pressure/suction is generated on the opposite side, and positive and negative pressure are generated on each of the one side and opposite side of the rotor 30 to generate propulsion as a force to move the ship 100.

[0059] In addition, since the direction in which positive pressure and negative pressure are formed according to the direction of the rotor 30 may be different, the direction of operation of the ship S may be controlled through a conversion in which the direction of the rotor 30 is rotated clockwise or counterclockwise.

[0060] The ship of the present embodiment is not limited to forming propulsion by the drive of the rotor 30, and may be combined with the prior embodiment. For example, when the operation of the ship S by the main engine (not shown) and the rudder form the main, the rotor 30 may play an auxiliary role. Alternatively, as the operation by the rotor 30 may be performed as the main and the operation of the ship S by the main engine and the rudder may be assisted, the drive of the rotor 30 may be performed as necessary in various situations.

[0061] The rotor 30 may be rotatably connected to the lower bearing part 70 installed in the lower part and connected to the disk 50 that imparts rotational force by receiving the power of the driving part 60 installed on upper part of the stator 20.

[0062] In the rotor 30, the upper end part may be opened, and the end plate 40 may be installed in the opened part.

[0063] The disk 50 may be in a form corresponding to the inner circumferential surface of the rotor 30, for example, in the form of a disc, and the outer circumferential surface may be fixed and connected to the inner periphery surface of the rotor 30. The disk 50 may be connected to the driving part 60 to receive the power of the driving part 60 to impose rotational force to the rotor 30.

[0064] The driving part 60 may be installed in the upper part of the stator 20 and connected to the disk 50. The driving part 60 may generate a power capable of rotating the rotor 30 and transmit rotational force to the rotor 30 through the disk 50.

[0065] The lower bearing part 70 may be installed in the lower part of the rotor 30. The lower bearing part 70 may be configured to suppress transverse movement when the rotor 30 rotates with the power of the driving part 60.

[0066] As described above, the wind power propulsion system 1 of the present embodiment includes the stator 20, the rotor 30, the end plate 40, the disk 50, the driving part 60, and the lower bearing part 70, and hereinafter, each configuration of the wind power propulsion system 1 is described in detail with reference to FIGS. 3 to 27.

[0067] The rotor 30 shown in FIG. 2 is a cylindrical structure with an empty interior and can be implemented in various embodiments, hereinafter, a rotor 30a of the first embodiment is described with

reference to FIGS. 3 to 4, and the rotor 30a of the second embodiment is described with reference to FIGS. 5 to 7.

[0068] FIG. 3 is a diagram for illustrating a first embodiment of the rotor 30 shown in FIG. 2, and FIG. 4 is a diagram for illustrating a unit panel 31a constituting the rotor 30a of the first embodiment.

[0069] As shown in FIGS. 3 to 4, the rotor 30a of the first embodiment may include a combination of a plurality of unit panels 31a.

[0070] The unit panel 31a may be formed to have a certain width, length, and thickness by pultrusion molding using glass fiber, carbon fiber, or various composite materials.

[0071] The unit panel 31a may be configured to allow coercive fitting coupling with other neighboring unit panels 31a.

[0072] The unit panel 31a, as shown in FIG. 4, may include a curved plate 31a1 having a curved surface in the width direction and extending longitudinally, a female connector 31a2 provided along one edge of the curved plate 31a1, and a male connector 31a3 provided along the other edge of the curved plate 31a1. The thickness of each of the curved plate 31a1, the female connector 31a2, and the male connector 31a3 forming the unit panel 31a may be the same or similar.

[0073] The curved plate 31a1 may have a curved surface corresponding to the radius of the rotor 30a.

[0074] The female connector 31a2 and the male connector 31a3 may have various structures that can be coupled through coercive fitting between neighboring unit panels 31a.

[0075] As an example, the female connector 31a2 may consist of a first plate 31a21 bent and extended from one end of the curved plate 31a1 toward the inward direction of the rotor 30a, a second plate 31a22 bent and extended from the extended end of the first plate 31a21 toward the outward direction of the curved plate 31a1, a third plate 31a23 bent and extended from the extended end of the second plate 31a22 toward the outward direction of the rotor 30a, and a fourth plate 31a24 bent and extended from the extended end of the third plate 31a23 toward the inward direction of the curved plate 31a1, and an 'L'-shaped fit space 31a4 corresponding to the shape of the male connector 31a3 may be formed by the first to fourth plates 31a24. Here, the male connector 31a3 may consist of a fifth plate 31a31 bent and extended from the other end of the curved plate 31a1 toward the inward direction of the rotor 30a and a sixth plate 31a32 bent and extended from the extended end of the fifth plate 31a31 toward the inward direction of the curved plate 31a1, so as to correspond to the 'L'-shaped fit space 31a4 of the female connector 31a2.

[0076] Through this, the rotor 30a of the present embodiment may be formed in the form of a cylinder hollow inside by a coercive fitting coupling method using the unit panel 31a configured as described above, thereby simplifying the bonding process compared to the adhesive bonding method or the bolting method.

[0077] In addition, the rotor 30a of the present embodiment uses glass fiber, carbon fiber, or various composite materials for the unit panel

31a, and is fabricated by pultrusion, thereby reducing production costs as well as reducing weight by simplifying the manufacturing process.

[0078] In addition, in the rotor 30a of this embodiment, the coercive fitting coupling part of the female connector 31a2 and the male connector 31a3 is thicker than the curved plate 31a1, so it can naturally serve as a reinforcing agent in the longitudinal direction, which can be more economical than the existing sandwich manufacturing method in which resin is injected into the inside for reinforcement.

[0079] FIG. 5 is a diagram for illustrating a second embodiment of the rotor 30 shown in FIG. 2, FIG. 6 is a diagram for illustrating a coupling member 33b connecting a lower rotor 31b and an upper rotor 32b constituting a rotor 30b of the second embodiment, and FIGS. 7A to 7D are diagrams for illustrating a mounting process of the rotor 30b of the second embodiment.

[0080] As shown in FIGS. 5 to 7, the rotor 30b of the second embodiment may be composed of a two-stage assembly structure in which the lower rotor 31b and the upper rotor 32b are assembled by the coupling member 33b.

[0081] Each of the lower rotor 31b and the upper rotor 32b may be a cylindrical structure with an empty interior and may be formed of the same material and shape.

[0082] The lower rotor 31b may be formed in a size that can accommodate the stator 20, the disk 50, the driving part 60, and the lower bearing part 70.

[0083] At the upper end of the lower rotor 31b, a first edge panel 31b1 of a ring shape extending a predetermined length inward and having a space for accommodating the disk 50 is provided, and at the lower end of the upper rotor 32b, a second edge panel 32b1 of a ring shape
5 extending a predetermined length inward and having a space for accommodating the disk 50 may be provided.

[0084] The coupling member 33b may accommodate the stator 20 having the disk 50 and the driving part 60 installed at the upper part inside the lower rotor 31b, to couple the lower rotor 31b and the disk 50
10 in a state in which the first edge panel 31b1 and the disk 50 are matched, and in a state in which the lower rotor 31b and the disk 50 are coupled, the first edge panel 31b1 of the lower rotor 31b and the second edge panel 32b1 of the upper rotor 32b may be coupled.

[0085] Specifically, the coupling member 33b may include a first
15 clamping plate 33b1 holding the lower surface of the first edge panel 31b1 and the lower surface of the disk 50, a second clamping plate 33b2 holding the upper surface of the first edge panel 31b1 and the upper surface of the disk 50, a first bolting member 33b3 fixing the first and second clamping plates 33b1 and 33b2 and the disk 50, a second bolting
20 member 33b4 fixing the second edge panel 32b1 of the upper rotor 32b to the first edge panel 31b1 of the lower rotor 31b.

[0086] In the above, the first bolting member 33b3 may fix the first clamping plate 33b1, the disk 50, and the second clamping plate 33b2 to couple the lower rotor 31b and the disk 50, and the second bolting

member 33b4 may fix the first clamping plate 33b1, the first edge panel 31b1, the second clamping plate 33b2, and the second edge panel 32b1 to couple the lower rotor 31b and the upper rotor 32b.

[0087] In addition, the coupling member 33b may further include a first bonding member 33b5 provided between the first edge panel 31b1 of the lower rotor 31b and the second clamping plate 33b2, and a second bonding member 33b6 provided between the second edge panel 32b1 of the upper rotor 32b and the second clamping plate 33b2. Here, the first and second bonding members 33b5 and 33b6 may be various adhesives or adhesive films of the application method or the attachment method.

[0088] The mounting process of the lower rotor 31b and the upper rotor 32b assembled using the coupling member 33b as described above will be described with reference to FIGS. 7A to 7D.

[0089] First, as shown in FIG. 7, the foundation structure 10 on land is mounted on the deck of the ship S using a lifting apparatus L. Here, the lifting apparatus L may be a tower crane, a gantry crane or any suitable lifting means known to those skilled in the art.

[0090] As shown in FIG. 7B, a disk 50 and a driving part 60 are installed on upper part of the stator 20 on land, and the lower rotor 31b is lifted by the lifting apparatus L to accommodate the stator 20 therein, and the lower rotor 31b and the disk 50 are coupled using the coupling member 33b.

[0091] As shown in FIG. 7C, the lower rotor 31b in which the stator 20 is accommodated is mounted on the foundation structure 10 fixed to

the deck using the lifting apparatus L.

[0092] As shown in FIG. 7D, the upper rotor 32b on the land is aligned to the upper part of the lower rotor 31b mounted on the foundation structure 10 using the lifting apparatus L, and the lower rotor
5 31b and the upper rotor 32b are coupled using the coupling member 33b.

[0093] Through this, the rotor 30b of the present embodiment is composed of a two-stage assembly structure in which the lower rotor 31b and the upper rotor 32b are assembled by the coupling member 33b, thereby simplifying the assembly process through the implementation of a
10 two-stage connection structure and improving the weight and height requirements of the crane.

[0094] The end plate 40 shown in FIG. 2 is installed in the opened upper end part of the rotor 30, and can be implemented in various embodiments, hereinafter an end plate 40a of the first embodiment will
15 be described with reference to FIG. 8.

[0095] FIG. 8 is a diagram for illustrating a first embodiment of the end plate 40 shown in FIG. 2.

[0096] As shown in FIG. 8, the end plate 40a of the first embodiment may consist of a disc 41a and a stiffener 42a, and may be formed of glass
20 fiber reinforced plastic (GFRP) or carbon fiber reinforced plastic (CFRP).

[0097] The disc 41a may be divided into a central area 43a and an outlying area 44a. The central area 43a may be an area corresponding to the opened upper end part of the rotor 30, and the outlying area 44a may be an area extending outwards of the rotor 30, but is not limited thereto.

[0098] The central area 43a and the outlying area 44a of the disc 41a may not be identical. For example, the central area 43a of the disk 41a may be GFRP-2AXIS 10t in the radial direction, and the outlying area 44a of the disc 41a may be GFRP-UD 30t in the radial direction.

5 **[0099]** The stiffener 42a is intended to reinforce the central area 43a of the disc 41a, and may be formed by extending a plurality of pieces in a radial form from the center of the disc 41a to the edge of the central area 43a, and may be GFRP-UD 10t in the longitudinal direction.

[00100] In the above, the fiber direction and thickness figures of the
10 disc 41a and the stiffener 42a are merely examples, and various lamination patterns and thicknesses can be applied.

[00101] Through this, the end plate 40a of the present embodiment may be made of glass fiber reinforced plastic (GFRP) or carbon fiber reinforced plastic (CFRP), thereby improving the structural performance of
15 the wind power propulsion system 1 by lightening the end plate 40a.

[00102] The driving part 60 shown in FIG. 2 is installed on the upper part of the stator 20 to generate power to rotate the rotor 30, and can be implemented in various embodiments, hereinafter, the driving part 60a of the first embodiment will be described with reference to FIG. 9, the
20 driving part 60b of the second embodiment will be described with reference to FIG. 10 and the driving part 60c of the third embodiment will be described with reference to FIG. 11.

[00103] FIG. 9 is a diagram for illustrating a first embodiment of a driving part 60 shown in FIG. 2.

[00104] As shown in FIG. 9, the driving part 60a of the first embodiment may include a motor 61a, a gearbox 62a, a driving shaft 63a, a driving gear 64a, a driven gear 65a, a driven shaft 66a, and a bearing housing 67a.

5 **[00105]** The motor 61a generates a driving force and transmits it to the gearbox 62a and may be installed on the inner side of the stator 20.

[00106] The gearbox 62a is coupled with the motor 61a and built in with various gears for transmitting driving force necessary for rotating the driving shaft 63a, and may be installed on the inner side of the stator 20.

10 The gearbox 62a may be a reducer.

[00107] Inside the gearbox 62a of the present embodiment, a driving shaft 63a coupled to the motor 61a and rotated by the motor 61a, a driving gear 64a provided on the driving shaft 63a, a driven gear 65a engaged with the driving gear 64a and turned, and a driven shaft 66a
15 coupled with the driven gear 65a to support rotation of the driven gear 65a may be provided.

[00108] The driving gear 64a and the driven gear 65a may be a reduction gear having a reduction ratio of 6:1, but is not limited thereto and a reduction gear having various reduction ratios can be applied.

20 **[00109]** The driven shaft 66a may consist of a first driven shaft 66a1 and a second driven shaft 66a2.

[00110] In this case, the first driven shaft 66a1 may be installed inside the gearbox 62a, and may be installed so that the lower part is rotatably coupled to the lower surface of the gearbox 62a, and the upper

part penetrates the upper surface of the gearbox 62a to protrude outward and is coupled to the second driven shaft 66a2.

[00111] The second driven shaft 66a2 may be installed outside the gearbox 62a, and may be installed so that the lower part is coupled to the upper part of the first driven shaft 66a1 by the coupling member 68a, and the upper part penetrates the upper surface of the stator 20 and is coupled to the disk 50. The second driven shaft 66a2 may be connected to the first driven shaft 66a1 and transmit rotational force to the disk 50.

[00112] Each of the driving shaft 63a, the first driven shaft 66a1, and the second driven shaft 66a2 may be rotated by various bearings.

[00113] Specifically, the driving shaft 63a may have an upper part rotatably coupled to the upper surface of the gearbox 62a by the first bearing B1, and the lower part may be rotatably coupled to the lower surface of the gearbox 62a by the second bearing B2.

[00114] In the present embodiment, since the driving shaft 63a is a shaft that rotates with the driving force of the motor 61a, and is not a shaft to which a lot of axial force is applied, in this case, bearings capable of preventing lateral force of the driving shaft 63a or lateral movement of the driving shaft 63a, for example, self aligning bearings may be applied to the first and second bearings B1 and B2.

[00115] The upper part of the first driven shaft 66a1 may be rotatably coupled to the upper surface of the gearbox 62a by the third bearing B3, and the lower part may be rotatably coupled to the lower surface of the gearbox 62a by the fourth bearing B4.

[00116] In the present embodiment, the first driven shaft 66a1 is not a shaft to which a large amount of axial force is applied because the driving force is not directly transmitted from the motor 61a or the driving force is not directly transmitted to the disk 50, in this case, bearings
5 capable of preventing lateral force of the first driven shaft 66a1, for example, self aligning bearings may be applied to the third and fourth bearings B3 and B4.

[00117] The second driven shaft 66a2 may be rotatably coupled to the upper surface of the stator 20 by the fifth bearing B5 and the sixth
10 bearing B6 arranged in series.

[00118] In the present embodiment, the second driven shaft 66a2 is a shaft that directly transmits driving force to the disk 50, and since it is a shaft where axial force and lateral force are applied a lot, in this case, for the fifth bearing B5, a bearing capable of preventing the axial force of the
15 second driven shaft 66a2, for example, a thrust bearing may be applied and for the sixth bearing B6, a bearing capable of preventing the lateral force of the second driven shaft 66a2, for example, a self aligning bearing such as a spherical roller bearing (SRB) may be applied.

[00119] As described above, since a lot of axial force and lateral force
20 are applied to the second driven shaft 66a2, it is difficult to firmly couple the fifth bearing B5 and the sixth bearing B6 arranged in series to the stator 20 to withstand axial force and lateral force.

[00120] Accordingly, in the present embodiment, the bearing housing 67a may be fixed and installed on the inner side of the upper surface of

the stator 20 as a means of holding the second driven shaft 66a2. The bearing housing 67a is penetrated by the second driven shaft 66a2 and may accommodate the fifth and sixth bearings B5 and B6. By fixing and installing the bearing housing 67a on the inner side of the upper surface
5 of the stator 20, the second driven shaft 66a2 can withstand axial force and lateral force by the bearing housing 67a.

[00121] FIG. 10 is a diagram for illustrating a second embodiment of the driving part 60 shown in FIG. 2.

[00122] As shown in FIG. 10, the driving part 60b of the second
10 embodiment may include a motor 61a, a gearbox 62a, a driving shaft 63a, a driving gear 64a, a driven gear 65a, a driven shaft 66a consisting of first and second driven shafts 66a1 and 66a2, a bearing housing 67b, and a coupling member 68a.

[00123] The driving part 60b of the second embodiment has a
15 different installation location of the bearing housing 67b when contrasted with the driving part 60a of the first embodiment described above.

[00124] In other words, the bearing housing 67b of the present embodiment is installed on the outer side of the upper surface of the stator 20 and the bearing housing 67a of the first embodiment described
20 above is different in that it is installed on the inner side the upper surface of the stator 20, while the rest of the components are configurationally identical.

[00125] Since the rest of the components are configurationally identical to the first embodiment, same drawing numerals are used, and

accordingly, in order to avoid duplicate descriptions, the description of the same configuration is omitted here.

[00126] FIG. 11 is a diagram for illustrating a third embodiment of the driving part 60 shown in FIG. 2.

5 **[00127]** As shown in FIG. 11, the driving part 60c of the third embodiment may include a motor 61c, a gearbox 62c, a driving shaft 63c, a driving gear 64c, a driven gear 65c, and a driven shaft 66c.

[00128] The motor 61c generates driving force and transmits it to the gearbox 62c and may be installed on the inner side of the upper surface
10 of the stator 20.

[00129] The gearbox 62c is coupled with the motor 61c and built in with various gears for transmitting driving force necessary for rotating the driving shaft 63c, and may be installed on the outer side of the upper surface of the stator 20. The gearbox 62c may be a reducer.

15 **[00130]** Inside the gearbox 62c of the present embodiment, a driving shaft 63c coupled to the motor 61c and rotated by the motor 61c, a driving gear 64c provided on the driving shaft 63c, a driven gear 65c that meshes with the driving gear 64c and rotates, and a driven shaft 66c coupled with the driven gear 65c to support rotation of the driven gear
20 65c and transmitting rotational force to the disk 50 may be provided.

[00131] The driving gear 64c and the driven gear 65c may be reduction gears having a deceleration ratio of 6: 1, but is not limited thereto, and a reduction gear having various reduction ratios can be applied.

[00132] Each of the driving shaft 63c and the driven shaft 66c may be rotated by various bearings.

[00133] Specifically, the upper part of the driving shaft 63c may be rotatably coupled to the upper surface of the gearbox 62c by the seventh bearing B7, and the lower part may be rotatably coupled to the lower surface of the gearbox 62c by the eighth bearing B8.

[00134] In the present embodiment, since the driving shaft 63c is a shaft that rotates with the driving force of the motor 61a, and is not a shaft to which a lot of axial force is applied, in this case, bearings capable of preventing lateral force of the driving shaft 63c or lateral movement of the driving shaft 63c, for example, self aligning bearings may be applied to the seventh and eighth bearings B7 and B8.

[00135] The upper part of the driven shaft 66c may be rotatably coupled to the upper surface of the gearbox 62c by the ninth bearing B9, and the lower part may be rotatably coupled to the lower surface of the gearbox 62c by the tenth bearing B10 and the eleventh bearing B11 arranged in series.

[00136] In the present embodiment, the driven shaft 66c is a shaft that directly transmits driving force to the disk 50, and since it is a shaft where axial force and lateral force are applied a lot, in this case, for the tenth bearing B10, a bearing capable of preventing the axial force of the driven shaft 66c, for example, a thrust bearing may be applied and for the eleventh bearing B6, a bearing capable of preventing the lateral force of the driven shaft 66c, for example, a self aligning bearing may be

applied.

[00137] In addition, since the tenth and eleventh bearings B10 and B11 are arranged in series at the lower surface of the gearbox 62c to the driven shaft 66c, the lower surface of the gearbox 62c may be relatively
5 thicker than the other surfaces so that the tenth and eleventh bearings B10 and B11 are installed. When the lower surface thickness of the gearbox 62c is set to the same thickness as before, the bearing housing 67a of the first embodiment described above may be fixed inside the gearbox 62c to install the tenth and eleventh bearings B10 and B11.

10 **[00138]** As described above, in the present embodiment, the driven shaft 66c is a shaft that directly transmits driving force to the disk 50, and a lot of axial force and lateral force are applied, but the axial force and lateral force can be prevented by the tenth and eleventh bearings B10 and B11, and since the length of the driven shaft 66c itself is short,
15 the ninth bearing B9 can be applied as a bearing that can prevent lateral force of the driven shaft 66c, for example, a self aligning bearing.

[00139] The lower bearing part 70 shown in FIG. 2 above suppresses the lateral movement of the rotor 30 rotating by the power of the driving part 60, and can be implemented in various embodiments, hereinafter,
20 the lower bearing part 70a of the first embodiment will be described with reference to FIGS. 12 to 14, the lower bearing part 70b of the second embodiment will be described with reference to FIGS. 15 to 17, the lower bearing part 70c of the third embodiment will be described with reference to FIGS. 18 to 20, the lower bearing part 70d of the fourth embodiment

will be described with reference to FIGS. 21 and 22, the lower bearing part 70e of the fifth embodiment will be described with reference to FIGS. 23 to 25, and the lower bearing part 70f of the sixth embodiment will be described with reference to FIGS. 26 and 27.

5 **[00140]** FIG. 12 is a partial diagram of the wind power propulsion system 1 for illustrating a first embodiment of a lower bearing part 70 shown in FIG. 2, FIG. 13 is a diagram cut along the A-A' line of FIG. 12, and FIG. 14 is a diagram cut along the B-B' line of FIG. 13.

10 **[00141]** As shown in FIGS. 12 to 14, the lower bearing part 70a of the first embodiment may be composed of an assembly of bearing units 71a and may be installed in the foundation structure 10.

15 **[00142]** The bearing unit 71a may be installed in the foundation structure 10 and may consist of a guide bearing 71a1 and a bearing support 71a2.

20 **[00143]** The guide bearing 71a1 may be installed on the upper end of the bearing support 71a2 and may guide the rotation of the rotor 30.

25 **[00144]** The bearing support 71a2 supports the guide bearing 71a1 installed on the upper end and may be installed in the foundation structure 10.

30 **[00145]** The bearing unit 71a is arranged in plurality at predetermined intervals along the inner circumferential surface of the rotor 30 to form a lower bearing part 70a, wherein the guide bearing 71a1 is closely attached to the inner circumferential surface of the rotor 30, and the bearing support 71a2 may be installed on the foundation structure 10

without overlapping the rotor 30 and the stator 20.

[00146] In the present embodiment, a passage 81 may be provided between the lower bearing part 70a and the stator 20 to facilitate maintenance of the bearing unit 71a.

5 **[00147]** The passage 81 can be secured by making the diameter of the stator 20 smaller than the existing one. For example, when the diameter of the existing stator is 4 to 4.5 m, the stator 20 of the present embodiment may secure the passage 81 by making the diameter as small as 2 to 2.5 m.

10 **[00148]** The stator 20 may be smaller in diameter overall, but as shown in FIG. 12, it may be preferable that the diameter of the upper part in which the driving part 60 is provided as large as the existing diameter so that a space in which the driving part 60 is installed is provided at the upper part.

15 **[00149]** Through this, the lower bearing part 70a of the present embodiment is easy to manufacture the bearing part 71a, and the installation man-hours can be reduced by directly installing the bearing support 71a2 to the foundation structure 10, and maintenance can be facilitated by securing the passage 81, and the stator 20 can be
20 lightweight.

[00150] FIG. 15 is a partial diagram of the wind power propulsion system 1 for illustrating a second embodiment of the lower bearing part 70 shown in FIG. 2, FIG. 16 is a diagram cut along the A-A' line of FIG. 15, and FIG. 17 is a diagram cut along the B-B' line of FIG. 16.

[00151] As shown in FIGS. 15 to 17, the lower bearing part 70b of the second embodiment may be composed of an assembly of bearing units 71b and may be installed in the foundation structure 10.

[00152] The bearing unit 71b may be installed in the foundation
5 structure 10 and may consist of a guide bearing 71b1 and a bearing support 71b2.

[00153] The guide bearing 71b1 may be installed on the upper end of the bearing support 71b2 and may guide the rotation of the rotor 30.

[00154] The bearing support 71b2 supports the guide bearing 71b1
10 installed at the upper end and may be installed in the foundation structure 10.

[00155] The bearing unit 71b is arranged in plurality at predetermined intervals along the inner circumferential surface of the rotor 30 to form a lower bearing part 70b, wherein the guide bearing 71b1 is closely
15 attached to the inner circumferential surface of the rotor 30, and the bearing support 71b2 may be installed on the foundation structure 10 without overlapping the rotor 30 and the stator 20.

[00156] The stator 20 of the present embodiment is formed with a predetermined interval opening part 82 in the lower end part, and by
20 installing the bearing unit 71b in the opening part 82, the bearing unit 71b may be installed to be superimposed on the stator 20.

[00157] Through this, the lower bearing part 70b of the present embodiment is easy to manufacture the bearing unit 71b, and the installation man-hours can be reduced by directly installing the bearing

support 71b2 to the foundation structure 10, and the maintenance of the bearing unit 71b can be facilitated through the opening part 82.

[00158] FIG. 18 is a partial diagram of the wind power propulsion system 1 for illustrating a third embodiment of the lower bearing part 70 shown in FIG. 2, FIG. 19 is a diagram for illustrating a bearing unit 71c constituting the lower bearing part 70c of the third embodiment, and FIGS. 20A to 20C are diagrams illustrating a state in which the bearing unit 71c of FIG. 19 is installed in a stator 20, wherein A is a top view, B is a front view, and C is a rear view.

10 **[00159]** As shown in FIGS. 18 to 20, the lower bearing part 70c of the third embodiment may be composed of an assembly of bearing units 71c and may be installed in the stator 20.

[00160] The bearing unit 71c may be installed in the stator 20 and may include a guide bearing 71c1, a first joint plate 71c2, and a second joint plate 71c3. In the present embodiment, the stator 20 may have a window 83 at a predetermined interval at the location where the bearing unit 71c is installed.

[00161] The guide bearing 71c1 may be installed in the first joint plate 71c2 and may guide the rotation of the rotor 30.

20 **[00162]** The first joint plate 71c2 may be made in a pair and may be coupled to both ends of the bearing shaft 71c11 of the guide bearing 71c1. A pair of first joint plates 71c2 extends horizontally to one side of the guide bearing 71c1 in a state of being coupled to the bearing shaft 71c11 and may have a vertically bent form at the extended end. A pair of first

joint plates 71c2 may be provided with a plurality of first bolting holes 71c21 for bolting with the second joint plate 71c3.

[00163] The second joint plate 71c3 may be installed along the edge of the window 83 inside the stator 20, and a plurality of second bolting
5 holes 71c31 corresponding to the first bolting holes 71c21 may be provided for coupling with the pair of first joint plates 71c2. The second joint plate 71c3 may have a protruding form with a size of at least a radius of the guide bearing 71c1 or less.

[00164] The bearing unit 71c described above is installed on the stator
10 20 through bolting of the first and second joint plates 71c2 and 71c3, and a plurality of pieces are arranged at predetermined intervals along the inner circumferential surface of the rotor 30 to form the lower bearing part 70c, wherein in the guide bearing 71c1, as shown in FIGS. 20A to 20C, in a state fixed by the first and second joint plates 71c2 and 71c3, a
15 part may protrude outward through the window 83 of the stator 20 and may be closely attached to the inner circumferential surface of the rotor 30.

[00165] Through this, the lower bearing part 70c of the present embodiment may be not only easy to manufacture as the bearing unit 71c
20 is modularized, but may also reduce installation man-hours, and ensure structural safety as it is installed in the stator 20.

[00166] FIG. 21 is a partial diagram of the wind power propulsion system 1 for illustrating a fourth embodiment of the lower bearing part 70 shown in FIG. 2, and FIG. 22 is a diagram for illustrating a bearing unit

71d constituting the lower bearing part 70d of the fourth embodiment.

[00167] As shown in FIGS. 21 to 22, the lower bearing part 70d of the fourth embodiment may be composed of an assembly of bearing units 71d and may be installed in the stator 20.

5 **[00168]** The bearing unit 71d may be installed in the stator 20 and may consist of a guide bearing 71d1 and a joint box 71d2. In the present embodiment, the stator 20 may be provided with a window 84 at a predetermined interval at the location where the bearing unit 71d is installed.

10 **[00169]** The guide bearing 71d1 may be installed in the joint box 71d2 and may guide the rotation of the rotor 30.

[00170] The joint box 71d2 may be installed along the edge of the window 84 inside the stator 20, and the guide bearing 71d1 may be fixed in a state in which a part of the guide bearing 71d1 protrudes outward. A
15 plurality of first bolting holes 71d21 for bolting with the stator 20 may be provided in the joint box 71d2.

[00171] The stator 20 may be provided with a window 84 at a predetermined interval at the location where the bearing unit 71d is installed, and second bolting holes 71d22 corresponding to the first
20 bolting holes 71d21 may be provided along the edge of the window 84 for bolting with the joint box 71d2.

[00172] The bearing unit 71d described above is installed on the stator 20 through bolting of the joint box 71d2, and a plurality of pieces are arranged at predetermined intervals along the inner circumferential

surface of the rotor 30 to form the lower bearing part 70d, wherein in the state in which the joint box 71d2 is fixed to the stator 20, a part of the guide bearing 71d1 may protrude outward through the window 84 of the stator 20 and closely attached to the inner circumferential surface of the rotor 30.

[00173] Through this, the lower bearing part 70d of the present embodiment may be not only easy to manufacture as the bearing unit 71c is modularized, but may also reduce installation man-hours, and ensure structural safety as it is installed in the stator 20.

[00174] FIG. 23 is a partial diagram of the wind power propulsion system 1 for illustrating a fifth embodiment of the lower bearing part 70 shown in FIG. 2, FIG. 24 is a diagram cut along the A-A' line of FIG. 23, and FIG. 25 is a diagram cut along the B-B' line of FIG. 24.

[00175] As shown in FIGS. 23 to 25, the lower bearing part 70e of the fifth embodiment may be composed of a single body of the bearing unit 71e and may be installed in the stator 20.

[00176] The bearing unit 71e may be installed in the stator 20 and may consist of a guide bearing 71e1 and a guide rail 71e2.

[00177] The guide bearing 71e1 may be installed along the outer circumferential surface of the stator 20 and may guide the rotation of the rotor 30.

[00178] The guide bearing 71e1 may be a single bearing in the form of a ring, and may be, for example, a journal type or a ball/roller type bearing.

[00179] In view of the fact that the ring type guide bearing 71e1 is currently the maximum size bearing that can be installed in a structure having a diameter of 2.5 m, the stator 20 may be smaller than a diameter of at least 2.5 m. The stator 20 may have a diameter of 2.5 m or less
5 overall, but as shown in FIG. 23, it may be preferable to make the diameter of the upper part where the driving part 60 is provided as large as the existing diameter (e.g., 4 to 4.5 m) so that a space in which the driving part 60 is installed is provided at the upper part.

[00180] The guide rail 71e2 may be formed along the inner
10 circumferential surface of the rotor 30 at a location corresponding to the ring type guide bearing 71e1, and may guide the guide bearing 71e1. At this time, the guide rail 71e2 may implement various protruding heights, and the protrusion height may be determined according to the diameter of the rotor 30.

[00181] In other words, when the diameter of the stator 20 is 2.5 m,
15 the minimum diameter of the rotor 30 may correspond to the diameter of the guide bearing 71e1 installed on the outer circumferential surface of the stator 20, and the maximum diameter of the rotor 30 may be determined according to the protrusion height of the guide rail 71e2.

[00182] In general, since the larger the diameter of the rotor 30, the
20 better the wind power propulsion ability, the present embodiment allows to perform the function of the lower bearing part 70e by adjusting the protrusion height of the guide rail 71e2 even if the diameter of the rotor 30 is as large as desired.

[00183] The guide rail 71e2 may be manufactured separately and installed on the inner circumferential surface of the rotor 30, or may be manufactured integrally with the rotor 30.

[00184] Through this, the lower bearing part 70e of the present embodiment can secure structural safety by applying a single bearing in the form of a ring as the guide bearing 71e1 and installing it in the stator 20, and as the height of the guide rail 71e2 is adjusted, the size of the rotor 30 can be changed to a desired size, and thus wind power propulsion performance can be easily improved.

[00185] FIG. 26 is a partial diagram of the wind power propulsion system 1 for illustrating a sixth embodiment of the lower bearing part 70 shown in FIG. 2, and FIG. 27 is a diagram cut along the A-A' line of FIG. 26.

[00186] As shown in FIGS. 26 to 27, the lower bearing part 70f of the sixth embodiment may be composed of an assembly of bearing units 71f and may be installed in the rotor 30.

[00187] The bearing unit 71f may be installed in the rotor 30 and may consist of a guide bearing 71f1, an arm 71f2, and a guide rail 71f3.

[00188] The guide bearing 71f1 may be installed on one side of the arm 71f2 and may guide the rotation of the rotor 30.

[00189] The arm 71f2 may be installed on the inner circumferential surface of rotor 30. The arm 71f2 may be length variable, foldable, or stationary. When the arm 71f2 is length variable, it can be manually adjusted in length like a telescopic or tent pole.

[00190] The guide rail 71f3 may be formed along the outer circumferential surface of the stator 20 and may guide the guide bearing 71f1. In this case, the guide rail 71f3 may implement various protruding heights, and the protrusion height may be determined according to the
5 diameter of the stator 20 or the rotor 30.

[00191] For example, in a state in which the diameter of the rotor 30 is determined, when the diameter of the stator 20 is changed, it is possible to perform the function of the lower bearing part 70f by adjusting the protrusion height of the guide rail 71f3 according to the changed
10 diameter. In addition, the same applies when the diameter of the rotor 30 is changed in a state where the diameter of the stator 20 is determined.

[00192] The guide rail 71f3 may be manufactured separately and installed on the outer circumferential surface of the stator 20, or may be
15 manufactured integrally with the stator 20.

[00193] Through this, the lower bearing part 70f of the present embodiment can manufacture the size of the rotor 30 or the stator 20 to a desired size as the height of the guide rail 71f3 is adjusted, thereby easily improving the wind power propulsion performance.

[00194] The wind power propulsion system 1 of the present disclosure
20 is described in various embodiments with reference to FIGS. 3 to 27 for each of the stator 20, rotor 30, end plate 40, disk 50, driving part 60, and lower bearing part 70 shown in FIG. 2, and is not limited to embodiments for each configuration, and may include a combination of the above

embodiments or a combination of at least one of the above embodiments and known techniques as another embodiment.

[00195] Although the present disclosure has been described above through embodiments of the present disclosure, it is merely exemplary
5 and the present disclosure is not limited thereto, and it will be apparent to those skilled in the art that various combinations or modifications and applications not exemplified in the embodiments are possible without departing from the essential technical content of the present embodiment. Therefore, technical contents related to modifications and applications
10 that can be easily derived from embodiments of the present disclosure should be construed as being included in the present disclosure.

[00196] <Explanation of Symbols>

1:	Wind power propulsion system	10:	Foundation structure	
20:	Stator	30, 30a, 30b:	Rotor	
15	31a:	Unit panel	31a1:	Curved plate
	31a2:	Female connector	31a21:	First plate
	31a22:	Second plate	31a23:	Third plate
	31a21:	Fourth plate	31a3:	Male connector
	31a31:	Fifth plate	31a32:	Sixth plate
20	31a4:	Fit space	31b:	Lower rotor
	31b1:	First edge panel	32b:	Upper rotor
	32b1:	Second edge panel	33b:	Coupling member
	33b1:	First clamping plate	33b2:	Second clamping plate
	33b3:	First bolting member	33b4:	Second bolting member
25	33b5:	First bonding member	33b6:	Second bonding member

	40, 40a: End plate	41a: Circular plate
	42a: Stiffener	43a: Central area
	44a: Outlying area	50: Disk
	60, 60A, 60B, 60C: Driving part	61A, 61C: Motor
5	62a, 62c: Gearbox	63a, 63c: Driving shaft
	64a, 64c: Driving gear	65a, 65c: Driven gear
	66a, 66c: Driven shaft	66a1: First driven shaft
	66a2: Second driven shaft	67a, 67b: Bearing housing
	68a: Coupling member	
10	70, 70a, 70b, 70c, 70d, 70e, 70f: Lower bearing part	
	71a, 71b, 71c, 71d, 71e, 71f: Bearing unit	
	71a1, 71b1, 71c1, 71d1, 71e1, 71f1: Guide bearing	
	71c11: Bearing shaft	71a2, 71b2: Bearing support
	71c2: First joint plate	71c21: First bolting hole
15	71c3: Second joint plate	71c31: Second bolting hole
	71d2: Joint box	71d21: First bolting hole
	71d22: Second bolting hole	71e2: Guide rail
	71f2: Arm	71f3: Guide rail
	81: Passage	82: Opening part
20	83, 84: Window	B1 to B11: First to eleventh bearings
	S: Ship	L: Lifting apparatus

CLAIMS

1. A wind power propulsion system, comprising:
a stator provided perpendicular to a deck;
a rotor provided in a form of a cylinder to wrap around an outer
5 side of the stator;
a driving part configured to transmit rotational power to the rotor
through a disk connected to the rotor; and
a lower bearing part installed in a lower part of the rotor to
suppress lateral movement of the rotor,
10 wherein the lower bearing part is composed of an assembly of
bearing units, at least a portion thereof is installed along an edge of a
window provided at a predetermined interval at a location where the
bearing unit is installed inside the stator, and the lower bearing part
comprises a joint part configured to support a guide bearing for guiding
15 rotation of the rotor to the stator.

2. The wind power propulsion system of claim 1, wherein the joint
part comprises:
a first joint plate consisting of a pair and coupled to both ends of a
20 bearing shaft of the guide bearing; and
a second joint plate installed along the edge of the window inside
the stator and coupled with the first joint plate.

3. The wind power propulsion system of claim 2, wherein the first
25 joint plate extends horizontally to one side of the guide bearing in a state

of being coupled to the bearing shaft, has a vertically bent shape at an extended end, and is provided with a plurality of first bolting holes for bolting with the second joint plate, and

the second joint plate has a protruding shape with a size of at least
5 a radius of the guide bearing or less, and is provided with a plurality of second bolting holes corresponding to the first bolting holes.

4. The wind power propulsion system of claim 1, wherein the joint part comprises a joint box installed along the edge of the window inside
10 the stator, and configured to fix the guide bearing in a state in which a portion of the guide bearing protrudes to an outside.

5. The wind power propulsion system of claim 1, wherein the driving part comprises:

15 a gearbox in which a driving shaft rotated by a motor, a driving gear provided on the driving shaft, a driven gear that meshes with the driving gear and rotates, and a first driven shaft coupled to the driven gear to support rotation of the driven gear are built-in, and installed inside the stator; and

20 a bearing housing connected to the first driven shaft by a coupling member and configured to hold a second driven shaft transmitting rotational force to the disk.

6. The wind power propulsion system of claim 5, wherein the bearing housing is installed inside an upper surface of the stator or installed outside the upper surface of the stator.

5 7. The wind power propulsion system of claim 5, wherein an upper part of the driving shaft is rotatably coupled to an upper surface of the gearbox by a first bearing, and

 a lower part of the driving shaft is rotatably coupled to a lower surface of the gearbox by a second bearing, and

10 wherein the first and second bearings are bearings that prevent lateral force of the driving shaft or lateral movement of the driving shaft.

 8. The wind power propulsion system of claim 5, wherein an upper part of the first driven shaft is rotatably coupled to an upper surface of the gearbox by a third bearing, and

 a lower part of the first driven shaft is rotatably coupled to a lower surface of the gearbox by a fourth bearing, and

 wherein the third and fourth bearings are bearings that prevent lateral force of the first driven shaft.

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 9. The wind power propulsion system of claim 5, wherein the second driven shaft is rotatably coupled to an upper surface of the stator by a fifth bearing and a sixth bearing arranged in series,

 the fifth bearing is a bearing that prevents axial force of the second driven shaft, and

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the sixth bearing is a bearing that prevents lateral force of the second driven shaft.

10. The wind power propulsion system of claim 1, wherein the rotor
5 comprises:

a lower rotor provided with a ring-shaped first edge panel having a space for accommodating the disk and extending a certain length inwardly at an upper end;

an upper rotor provided with a ring-shaped second edge panel
10 having a space for accommodating the disk and extending a certain length inwardly at a lower end; and

a coupling member for coupling the lower rotor, the upper rotor, and the disk.

15 11. The wind power propulsion system of claim 10, wherein the coupling member comprises:

a first clamping plate configured to hold a lower surface of the first edge panel and a lower surface of the disk;

a second clamping plate configured to hold an upper surface of the
20 first edge panel and an upper surface of the disk;

a first bolting member configured to fix the first and second clamping plates and the disk; and

a second bolting member configured to fix the first edge panel and the second edge panel.

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12. The wind power propulsion system of claim 11, wherein the coupling member further comprises:

a first bonding member provided between the first edge panel and the second clamping plate; and

5 a second bonding member provided between the second edge panel and the second clamping plate.

13. The wind power propulsion system of claim 10, wherein the wind power propulsion system mounts the foundation structure on land
10 on the deck using a lifting apparatus,

installs the disk and the driving part on an upper part of the stator on land,

accommodates the stator inside the lower rotor by lifting the lower rotor with the lifting apparatus,

15 couples the lower rotor and the disk using the coupling member,
mounts the lower rotor in which the stator is accommodated, on the foundation structure using the lifting apparatus,

aligns the upper rotor on land to an upper part of the lower rotor mounted on the foundation structure using the lifting apparatus, and

20 couples the lower rotor and the upper rotor using the coupling member.

14. A ship provided with the wind power propulsion system according to any one of claims 1 to 13.

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