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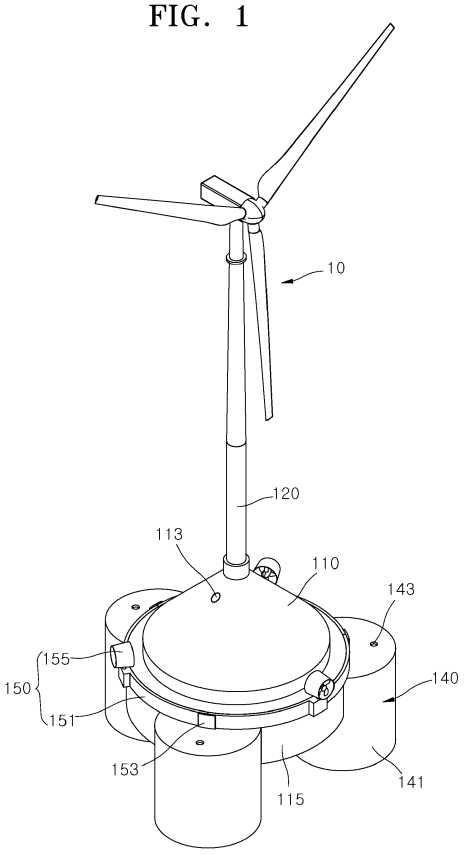
(54) MARINE FOUNDATION AND CONSTRUCTION METHOD THEREOF

(57) Disclosed are a marine foundation and a construction method thereof. The marine foundation of the present invention includes a self-weight control tank unit moving while floating at sea level and submerged and installed on the ocean floor when seawater is supplied thereto, a monopod unit installed on the self-weight control tank unit to be lowered and connected to a marine structure, a guide bucket unit installed under the monopod unit and mounted on the ocean floor by discharging seawater, and a leg unit installed under the self-weight control tank unit.

FIG. 1



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Description

CROSS-REFERENCE TO RELATED APPLICATION

[0001] This application claims priority to and the benefit of Korean Patent Application No. 2015-0134167, filed on September, 22, 2015, the disclosure of which is incorporated herein by reference in its entirety.

BACKGROUND

1. Field of the Invention

[0002] The present invention relates to a marine foundation and a construction method thereof, and more specifically, to a marine foundation capable of being easily moved in the sea and submerged and installed at a correct installation position, and a construction method thereof.

2. Discussion of Related Art

[0003] Generally, a marine structure, such as a wind turbine, is installed in the sea. A marine structure foundation is mounted on the ocean floor to support the marine structure. The marine structure foundation is loaded on a barge ship or a ship and is then moved to an installation position. The marine structure foundation of the barge ship or the ship is moved to sea level using a crane or the like and is submerged. The marine structure foundation is mounted on the ocean floor, and then the marine structure is installed on the marine structure foundation.

[0004] However, a conventional marine structure foundation is loaded on a barge or a ship and is moved to an installation position, and thus several tugs are used to move the marine structure foundation to the installation position.

[0005] Also, when the marine structure foundation is submerged at the installation position, the installation position of the marine structure foundation may be changed due to a tide or wave.

[0006] Therefore, improvement for the above-described problems is necessary.

[0007] The background of the present invention is disclosed in Korean Laid-open Patent Application No. 2004-0037263 (Published on 2004. 05. 04, Title: Method for Establishing a Foundation in Particular for a Tower of a Wind Energy Plant).

SUMMARY OF THE INVENTION

[0008] The present invention is directed to a marine foundation capable of being easily moved and installed at an accurate installation position, and a construction method thereof.

[0009] According to an aspect of the present invention, there is provided a marine foundation including a self-weight control tank unit configured to move while floating at sea level and submerged and installed on an ocean floor by receiving seawater, a monopod unit installed in the self-weight control tank unit to be lowered and connected to a marine structure, a guide bucket unit installed under the monopod unit and mounted on the ocean floor by discharging seawater, and a leg unit installed under the self-weight control tank unit.

[0010] The marine foundation may further include a thrust device installed in the self-weight control tank unit and configured to control a submerged installation position of the self-weight control tank unit by applying a thrust to the self-weight control tank unit.

[0011] The thrust device may include a belt unit coupled to the self-weight control tank unit, and a propeller unit installed on the belt unit and applying the thrust to the self-weight control tank unit.

[0012] The belt unit may include a plurality of band units arranged to surround the self-weight control tank unit, and a belt unfastening unit coupling and separating adjacent ends of the plurality of band units.

[0013] The self-weight control tank unit may include a guide unit formed so that the monopod unit is movably inserted therein, a seawater chamber formed so that the seawater is supplied thereto, and a hose connection unit formed so that pumping hoses are connected thereto.

[0014] The marine foundation may further include an opening and closing valve installed in the self-weight control tank unit to supply the seawater to the self-weight control tank unit and block the seawater from being supplied to the self-weight control tank unit.

[0015] The guide unit may be formed to vertically pass through the center of the self-weight control tank unit.

[0016] The leg unit may include a leg bucket unit disposed along a lower circumference of the self-weight control tank unit and mounted on the ocean floor by discharging seawater.

[0017] The leg bucket unit may have an open lower side, and the leg bucket unit may have a hose coupling unit so that pumping hoses are connected thereto.

[0018] According to another aspect of the present invention, there is provided a method of constructing a marine foundation, the method including moving a self-weight control tank unit to an installation position while the self-weight control tank unit floats at sea level by buoyancy, lowering a guide bucket unit installed in the self-weight control tank unit and mounting the guide bucket unit on an ocean floor, submerging and installing the self-weight control tank unit on the ocean floor by supplying seawater to a seawater chamber of the self-weight control tank unit, and lowering a leg unit coupled to the self-weight control tank unit along with the self-weight control tank unit and mounting the leg unit on the ocean floor.

[0019] The submerging and installing of the self-weight control tank unit on the ocean floor may include operating a thrust device coupled to the self-weight control tank unit to control a submerged installation position of the self-weight control tank unit.

[0020] The method may further include unfastening the self-weight control tank unit from the thrust device and collecting the thrust device after the lowering of the leg unit coupled to the self-weight control tank unit along with the self-weight control tank unit and the mounting of the leg unit on the ocean floor.

[0021] The lowering of the leg unit coupled to the self-weight control tank unit along with the self-weight control tank unit to mount the leg unit on the ocean floor may include discharging seawater in the leg unit to an outside of the leg unit to generate suction pressures in the leg unit.

BRIEF DESCRIPTION OF THE DRAWINGS

[0022] The above and other objects, features and advantages of the present invention will become more apparent to those of ordinary skill in the art by describing exemplary embodiments thereof in detail with reference to the accompanying drawings, in which:

FIG. 1 is a perspective view illustrating a marine foundation according to one embodiment of the present invention;

FIG. 2 is a front view illustrating the marine foundation according to one embodiment of the present invention;

FIG. 3 is a cross-sectional view illustrating the marine foundation according to one embodiment of the present invention;

FIG. 4 is a perspective view illustrating a thrust device in the marine foundation according to one embodiment of the present invention;

FIG. 5 is a front view illustrating movement of the marine foundation according to one embodiment of the present invention while floating at sea level;

FIG. 6 is a front view illustrating a state in which a guide bucket unit in the marine foundation according to one embodiment of the present invention is lowered and positioned on the ocean floor;

FIG. 7 is a front view illustrating a state in which the guide bucket unit in the marine foundation according to one embodiment of the present invention is lowered and mounted on the ocean floor;

FIG. 8 is a front view illustrating a state in which leg bucket units in the marine foundation according to one embodiment of the present invention are lowered to the ocean floor;

FIG. 9 is a front view illustrating a state in which the leg bucket units in the marine foundation according to one embodiment of the present invention are submerged and installed on the ocean floor; and

FIG. 10 is a flowchart illustrating a method of constructing a marine foundation according to one embodiment of the present invention.

DETAILED DESCRIPTION OF EXEMPLARY EMBODIMENTS

[0023] Hereinafter, embodiments of a marine foundation according to the present invention and a method of constructing a marine foundation will be described with reference to the accompanying drawings. In the process of describing the marine foundation and the method of constructing a marine structure, the thickness of lines, the size of components, or the like shown in the drawings may be exaggerated for convenience and clearness of explanation. Some terms described below are defined by considering functions in the invention and meanings may vary depending on, for example, a user or operator's intentions or customs. Therefore, the meanings of terms should be interpreted based on the scope throughout this specification.

[0024] FIG. 1 is a perspective view illustrating a marine foundation according to one embodiment of the present invention, FIG. 2 is a front view illustrating the marine foundation according to one embodiment of the present invention, FIG. 3 is a cross-sectional view illustrating the marine foundation according to one embodiment of the present invention, and FIG. 4 is a perspective view illustrating a thrust device in the marine foundation according to one embodiment of the present invention.

[0025] Referring to FIGS. 1 to 4, the marine foundation according to the embodiment of the present invention includes a self-weight control tank unit 110, a monopod unit 120, a guide bucket unit 130, and leg units 140.

[0026] The self-weight control tank unit 110 moves while floating at sea level, and is submerged and installed on the ocean floor when seawater is supplied thereto. The self-weight control tank unit 110 moves while floating at sea level, and thus a marine foundation may be moved to an installation position using one tug. Therefore, a barge ship and a ship may be disused to mount the self-weight control tank unit 110, and thus delivery costs of the marine foundation may be reduced.

[0027] The self-weight control tank unit 110 has a conical upper side. A circular ring-shaped skirt unit 115 is formed along a circumference of the self-weight control tank unit 110.

[0028] The self-weight control tank unit 110 includes a guide unit 111 formed so that the monopod unit 120 is movably inserted therein, a seawater chamber 112 formed so that seawater is supplied thereto, and a hose connection unit 113 formed so that pumping hoses are connected thereto. The guide unit 111 is formed in a cylindrical pipe shape. The hose connection unit 113 is connected to the upper side of the self-weight control tank unit 110.

[0029] The seawater chamber 112 is formed in the self-weight control tank unit 110, and thus, when the marine foundation is transferred to the installation position, air is accommodated in the seawater chamber 112 to apply buoyancy to the self-weight control tank unit 110. When the marine foundation arrives at the installation position,

seawater is supplied to the self-weight control tank unit 110, and thus the self-weight control tank unit 110 is submerged in the sea.

[0030] The guide unit 111 is formed to vertically pass through the center of the self-weight control tank unit 110. Since the guide unit 111 is formed to pass through the center of the self-weight control tank unit 110, the monopod unit 120 is movably installed in the center of the self-weight control tank unit 110. Therefore, the monopod unit 120 may be stably supported by the self-weight control tank unit 110.

[0031] The marine foundation further includes an opening and closing valve 117 installed in the self-weight control tank unit 110 to supply seawater to the self-weight control tank unit 110 or block the seawater from being supplied to the self-weight control tank unit 110. When the opening and closing valve 117 is opened, the seawater is supplied to the self-weight control tank unit 110, and when the opening and closing valve 117 is closed, the seawater is blocked from being supplied to the self-weight control tank unit 110.

[0032] Therefore, the self-weight of the self-weight control tank unit 110 may be controlled depending on the amount of supplied water, and thus the self-weight of the self-weight control tank unit 110 may be controlled depending on the strength of the ground. For example, the self-weight of the self-weight control tank unit 110 may be reduced when the strength of ground is relatively weak, and the self-weight of the self-weight control tank unit 110 may be increased when the strength of ground is relatively strong. The self-weight of the self-weight control tank unit 110 is controlled depending on the strength of ground, and thus the monopod unit 120 may be vertically positioned according to a parallel mounting of the self-weight control tank unit 110 on the ground.

[0033] The monopod unit 120 is installed in the self-weight control tank unit 110 to be lowered therefrom. A marine structure 10, such as a wind turbine, is connected to an upper side of the monopod unit 120. The monopod unit 120 is formed in a cylindrical pipe shape.

[0034] The guide bucket unit 130 is installed under the monopod unit 120 and is mounted on the ocean floor by discharging seawater. The guide bucket unit 130 is formed in a cylindrical shape with an open lower side. The guide bucket unit 130 is mounted on the ocean floor, and then the self-weight control tank unit 110 is lowered to the ocean floor. Therefore, when the self-weight control tank unit 110 is lowered, the self-weight control tank unit 110 can be prevented from leaving the installation position due to a tide or wave.

[0035] The guide bucket unit 130 is formed in a cylindrical shape with the open lower side. The inside of the guide bucket unit 130 communicates with the inside of the monopod unit 120. The pumping hoses approach the guide bucket unit 130 through the monopod unit 120, and thus seabed sediment in the guide bucket unit 130 is discharged to the outside through the pumping hoses. Therefore, the guide bucket unit 130 is lowered into seabed sediment to be mounted on the ground of the ocean floor.

[0036] Leg units 140 are installed under the self-weight control tank unit 110 to support the self-weight control tank unit 110. The leg units 140 are disposed around a lower circumference of the self-weight control tank unit 110 and include a plurality of leg bucket units 141 that are mounted on the ocean floor by discharging seawater. The leg bucket units 141 are lowered into seabed sediment by discharging seawater and are stably mounted on the ground of the ocean floor. When the leg bucket units 141 are lowered into the seabed sediment, the self-weight control tank unit 110 is also lowered along with the leg bucket units 141, and thus the monopod unit 120 is moved relative to the upper side of the self-weight control tank unit 110. Therefore, the leg bucket units 141, the self-weight control tank unit 110, and the guide bucket unit 130 may be stably mounted on the ground.

[0037] The leg bucket units 141 are formed in a cylindrical shape with an open lower side. The leg bucket units 141 include hose coupling units 143 to be connected to the pumping hoses. The hose coupling units 143 are disposed on upper sides of the leg bucket units 141. The pumping hoses are inserted into the hose coupling units 143 to suction seabed sediment in the leg bucket units 141, and thus the leg bucket units 141 are lowered into the seabed sediment.

[0038] The marine foundation further includes a thrust device 150 installed in the self-weight control tank unit 110 and preventing a submerged installation position of the self-weight control tank unit 110 from being changed by applying a thrust to the self-weight control tank unit 110. The thrust device 150 generates a thrust at the self-weight control tank unit 110 when the self-weight control tank unit 110 is lowered, thereby preventing the self-weight control tank unit 110 from leaving the installation position due to a tide or wave. For example, when the position of the marine foundation is measured by a global positioning system (GPS) and the self-weight control tank unit 110 slightly leaves the installation position, the thrust device 150 generates a thrust so that the self-weight control tank unit 110 is moved to the installation position. Therefore, the marine foundation may be mounted at the correct installation position.

[0039] The thrust device 150 includes a belt unit 151 coupled to the self-weight control tank unit 110, and a plurality of propeller units 155 generating a thrust at the self-weight control tank unit 110. The plurality of propeller units 155 are disposed along the circumference of the self-weight control tank unit 110 at regular gaps. In this case, when the self-weight control tank unit 110 is swept to one side by a tide or wave, the propeller units 155 positioned on one side of the self-weight control tank unit 110 are operated to prevent the self-weight control tank unit 110 from leaving the installation position.

[0040] The belt unit 151 includes a plurality of band units 152 disposed to surround the self-weight control tank unit 110, and a belt unfastening unit 153 coupling

to or separated from adjacent ends of the plurality of band units 152. When the marine foundation is completely mounted on the ocean floor, the belt unfastening unit 153 separates the adjacent ends of the band units 152 from each other to separate the thrust device 150 from the self-weight control tank unit 110 and collect the thrust device 150.

[0041] A method of constructing the marine foundation according to the embodiment of the present invention configured as described above will be described below.

[0042] FIG. 5 is a front view illustrating movement of the marine foundation according to one embodiment of the present invention while floating at sea level, FIG. 6 is a front view illustrating a state in which a guide bucket unit in the marine foundation according to one embodiment of the present invention is lowered and positioned on the ocean floor, FIG. 7 is a front view illustrating a state in which the guide bucket unit in the marine foundation according to one embodiment of the present invention is lowered and mounted on the ocean floor, FIG. 8 is a front view illustrating a state in which leg bucket units in the marine foundation according to one embodiment of the present invention are lowered to the ocean floor, FIG. 9 is a front view illustrating a state in which the leg bucket units in the marine foundation according to one embodiment of the present invention are submerged and installed on the ocean floor, and FIG. 10 is a flowchart illustrating a method of constructing a marine foundation according to one embodiment of the present invention.

[0043] Referring to FIGS. 5 to 10, the self-weight control tank unit 110 is moved to an installation position while floating at sea level by buoyancy (S11). The self-weight control tank unit 110 floats at sea level, and the self-weight control tank unit 110 may be easily moved in the sea even in shallow water. Also, the self-weight control tank unit 110 moves to the installation position while floating at sea level, and thus a marine foundation may be moved using one tug. Therefore, a barge ship or a ship is disused to mount the marine foundation, and thus costs for installing the marine structure 10 may be reduced.

[0044] Pumping hoses are connected to the hose connection unit 113 of the self-weight control tank unit 110 and the hose coupling units 143 of the leg bucket units 141, respectively. Also, the pumping hoses are inserted into the guide bucket unit 130 through the monopod unit 120. In this case, a diver may connect the pumping hoses to the hose connection unit 113, the hose coupling units 143, and the guide bucket unit 130. The pumping hoses are connected to a pump installed in the tug, a platform, or the like. Strainers may be installed at lower ends of the pumping hoses to prevent seabed sediment, such as gravel, from being suctioned into the pumping hoses.

[0045] The guide bucket unit 130 is lowered to be mounted on the ocean floor (S12). In this case, when a worker or a diver unfastens a hook unit from the monopod unit 120 and pressurizes the monopod unit 120 downward, the guide bucket unit 130 is lowered along with the guide unit 111. When the guide bucket unit 130 is lowered, the guide bucket unit 130 is lowered by a weight of the guide bucket unit 130. When the guide bucket unit 130 reaches seabed sediment, the lowering of the guide bucket unit 130 is stopped. In this case, as the pump installed in the tug or the platform is operated, seabed sediment in the guide bucket unit 130 is suctioned into the pump hoses. In this case, as a suction pressure is generated in the guide bucket unit 130, the guide bucket unit 130 is lowered into the seabed sediment. Therefore, the guide bucket unit 130 is mounted on the ocean floor.

[0046] Seawater is supplied to the self-weight control tank unit 110 (S13). In this case, when the opening and closing valve 117 installed at a lower side of the self-weight control tank unit 110 is opened, the seawater is supplied to the seawater chamber 112 of the self-weight control tank unit 110. The seawater chamber 112 of the self-weight control tank unit 110 is filled with the seawater, and the self-weight control tank unit 110 is lowered in the sea (S14).

[0047] In this case, the guide bucket unit 130 is mounted on the ocean floor and the monopod unit 120 supports the self-weight control tank unit 110, thereby preventing the self-weight control tank unit 110 from leaving the installation position when the self-weight control tank unit 110 is lowered.

[0048] Also, when the self-weight control tank unit 110 is lowered, the thrust device 150 is operated to compensate for the installation position of the self-weight control tank unit 110 (S15). That is, when self-weight control tank unit 110 is lowered, the thrust device 150 applies a thrust to the self-weight control tank unit 110 to prevent the self-weight control tank unit 110 from being swept by a tide or wave. For example, when the self-weight control tank unit 110 is swept to the left, the thrust device 150 applies a thrust to the left of the self-weight control tank unit 110 to prevent movement of the self-weight control tank unit 110. Therefore, the self-weight control tank unit 110 may be prevented from leaving the installation position due to a tide or wave.

[0049] When the self-weight control tank unit 110 is submerged and installed on the ocean floor, the leg units 140 are mounted on the ocean floor along with the self-weight control tank unit 110 (S16). In this case, seabed sediment in the leg bucket units 141 is suctioned through the pumping hoses, and thus suction pressures in the leg bucket units 141 are generated. As the seabed sediment is suctioned from the leg bucket units 141, the leg bucket units 141 may be lowered into the seabed sediment. In this case, when the self-weight control tank unit 110 is lowered, the monopod unit 120 is lifted along with the guide unit 111.

[0050] When the self-weight control tank unit 110 is completely submerged and installed on the ocean floor, the belt unfastening unit 153 unfastens the locking of the belt unit 151 (S17). In this case, the band units 152 are separated from the self-weight control tank unit 110 along with the propeller units 155, and thus the thrust device

150 may be collected from the self-weight control tank unit 110 (S18). The belt unfastening unit 153 is operated through wireless communication, or a diver may directly separate the belt unfastening unit 153 from the belt unit 151. Also, when the diver ties the thrust device 150 or the band units 152 with a rope, the tug pulls the rope to collect the thrust device 150. Therefore, the thrust device 150 may be reinstalled in another marine foundation.

[0051] As described above, the self-weight control tank unit 110 moves while floating at sea level, and thus the self-weight control tank unit 110 may be easily moved in the sea even in shallow water. Also, the marine foundation may be moved using one tug, and thus the installation costs of the marine structure can be reduced.

[0052] Also, the monopod unit 120 is movably installed in the center of the self-weight control tank unit 110, and thus the monopod unit 120 may be stably supported by the self-weight control tank unit 110.

[0053] Also, when the opening and closing valve 117 is opened, seawater is supplied to the self-weight control tank unit 110, and when the opening and closing valve 117 is closed, the seawater is blocked from being supplied to the self-weight control tank unit 110. Therefore, the self-weight of the self-weight control tank unit 110 is controlled depending on the amount of supplied water, and thus the self-weight of the self-weight control tank unit 110 can be controlled depending on the strength of the ground.

[0054] The guide bucket unit 130 is mounted on the ocean floor, and then the self-weight control tank unit 110 is lowered to the ocean floor, and thus the self-weight control tank unit 110 may be prevented from leaving the installation position due to a tide or wave when the self-weight control tank unit 110 is lowered.

[0055] The thrust device 150 generates a thrust at the self-weight control tank unit 110 when the self-weight control tank unit 110 is lowered, thereby preventing the self-weight control tank unit 110 from leaving the installation position due to a tide or wave.

[0056] According to the present invention, as the self-weight control tank unit is moved to an installation position while floating at sea level, the self-weight control tank unit can be easily moved even in shallow water. Also, the marine foundation can be moved using one tug, and thus the installation costs of the marine structure can be reduced.

[0057] Also, according to the present invention, as the monopod unit is movably installed in the center of the self-weight control tank unit, the monopod unit can be stably supported by the self-weight control tank unit.

[0058] Also, according to the present invention, seawater is supplied to the self-weight control tank unit when the opening and closing valve is opened and seawater is blocked from being supplied to the self-weight control tank unit when the opening and closing valve is closed. Therefore, the self-weight of the self-weight control tank unit can be controlled depending on the amount of supplied seawater, and thus the self-weight of the self-weight control tank unit can be controlled depending on the strength of the ground.

[0059] Also, according to the present invention, the guide bucket unit is mounted on the ocean floor and then the self-weight control tank unit is lowered to the ocean floor, and thus the self-weight control tank unit can be prevented from leaving the installation position due to a tide or wave when the self-weight control tank unit is lowered.

[0060] Also, according to the present invention, the thrust device generates a thrust at the self-weight control tank unit when the self-weight control tank unit is lowered, and thus the self-weight control tank unit can be prevented from leaving the installation position due to a tide or wave.

[0061] The present invention has been described with reference to the examples illustrated in the drawings, but these are only examples. It should be understood by those skilled in the art that various modifications and equivalent other examples may be made.

[0062] Therefore, the scope of the present invention is defined by the appended claims.

Claims

1. A marine foundation comprising:

   a self-weight control tank unit configured to move while floating at seal level and submerged and installed on an ocean floor by receiving seawater;
   a monopod unit installed in the self-weight control tank unit to be lowered and connected to a marine structure;
   a guide bucket unit installed under the monopod unit and mounted on the ocean floor by discharging seawater; and
   a leg unit installed under the self-weight control tank unit.

2. The marine foundation of claim 1, further comprising a thrust device installed in the self-weight control tank unit and configured to control a submerged installation position of the self-weight control tank unit by applying a thrust to the self-weight control tank unit.

3. The marine foundation of claim 2, wherein the thrust device includes:

   a belt unit coupled to the self-weight control tank unit; and
   a propeller unit installed on the belt unit and applying the thrust to the self-weight control tank unit.

4. The marine foundation of claim 3, wherein the belt

unit includes:

a plurality of band units arranged to surround the self-weight control tank unit; and
a belt unfastening unit coupling and separating adjacent ends of the plurality of band units.

5. The marine foundation of claim 1, wherein the self-weight control tank unit includes a guide unit formed so that the monopod unit is movably inserted therein, a seawater chamber formed so that the seawater is supplied therein, and a hose connection unit formed so that a pumping hose is connected thereto.

6. The marine foundation of claim 5, further comprising an opening and closing valve installed in the self-weight control tank unit to supply the seawater to the self-weight control tank unit and block the seawater from being supplied to the self-weight control tank unit.

7. The marine foundation of claim 5, wherein the guide unit is formed to vertically pass through the center of the self-weight control tank unit.

8. The marine foundation of claim 1, wherein the leg unit includes a leg bucket unit disposed along a lower circumference of the self-weight control tank unit and mounted on the ocean floor by discharging seawater.

9. The marine foundation of claim 8, wherein the leg bucket unit has an open lower side, and the leg bucket unit has a hose coupling unit so that a pumping hose is connected thereto.

10. A method of constructing a marine foundation, the method comprising:

moving a self-weight control tank unit to an installation position while the self-weight control tank unit floats at sea level by buoyancy;
lowering a guide bucket unit installed in the self-weight control tank unit and mounting the guide bucket unit on an ocean floor;
submerging and installing the self-weight control tank unit on the ocean floor by supplying seawater to a seawater chamber of the self-weight control tank unit; and
lowering a leg unit coupled to the self-weight control tank unit along with the self-weight control tank unit to mount the leg unit on the ocean floor.

11. The method of claim 10, wherein, the submerging and installing of the self-weight control tank unit on the ocean floor includes operating a thrust device coupled to the self-weight control tank unit to control a submerged installation position of the self-weight control tank unit.

12. The method of claim 11, further comprising unfastening the self-weight control tank unit from the thrust device and collecting the thrust device after the lowering of the leg unit coupled to the self-weight control tank unit along with the self-weight control tank unit to mount the leg unit on the ocean floor.

13. The method of claim 10, wherein, the lowering of the leg unit coupled to the self-weight control tank unit along with the self-weight control tank unit to mount the leg unit on the ocean floor includes discharging seawater in the leg unit to an outside of the leg unit to generate suction pressure in the leg unit.

FIG. 1

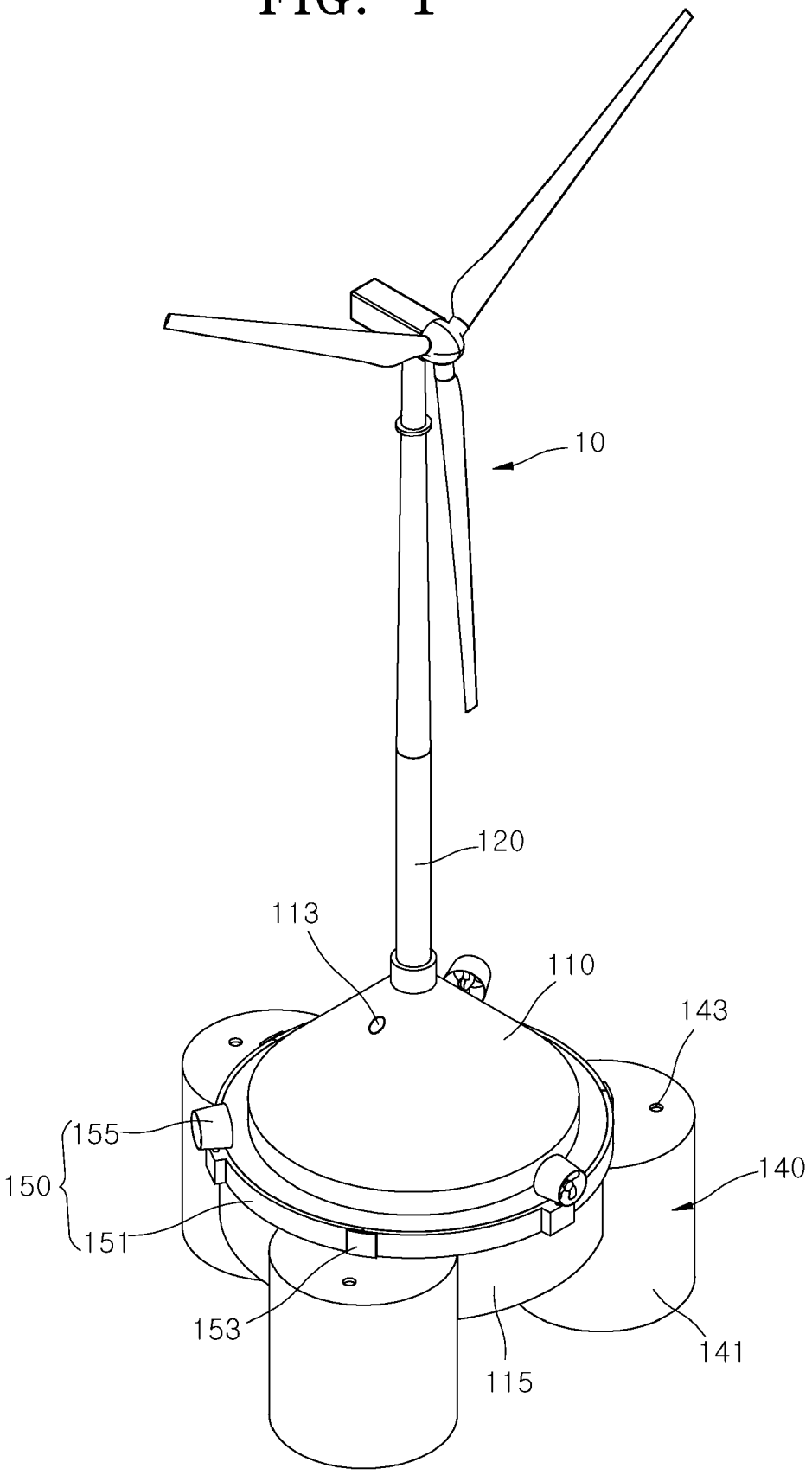


FIG. 2

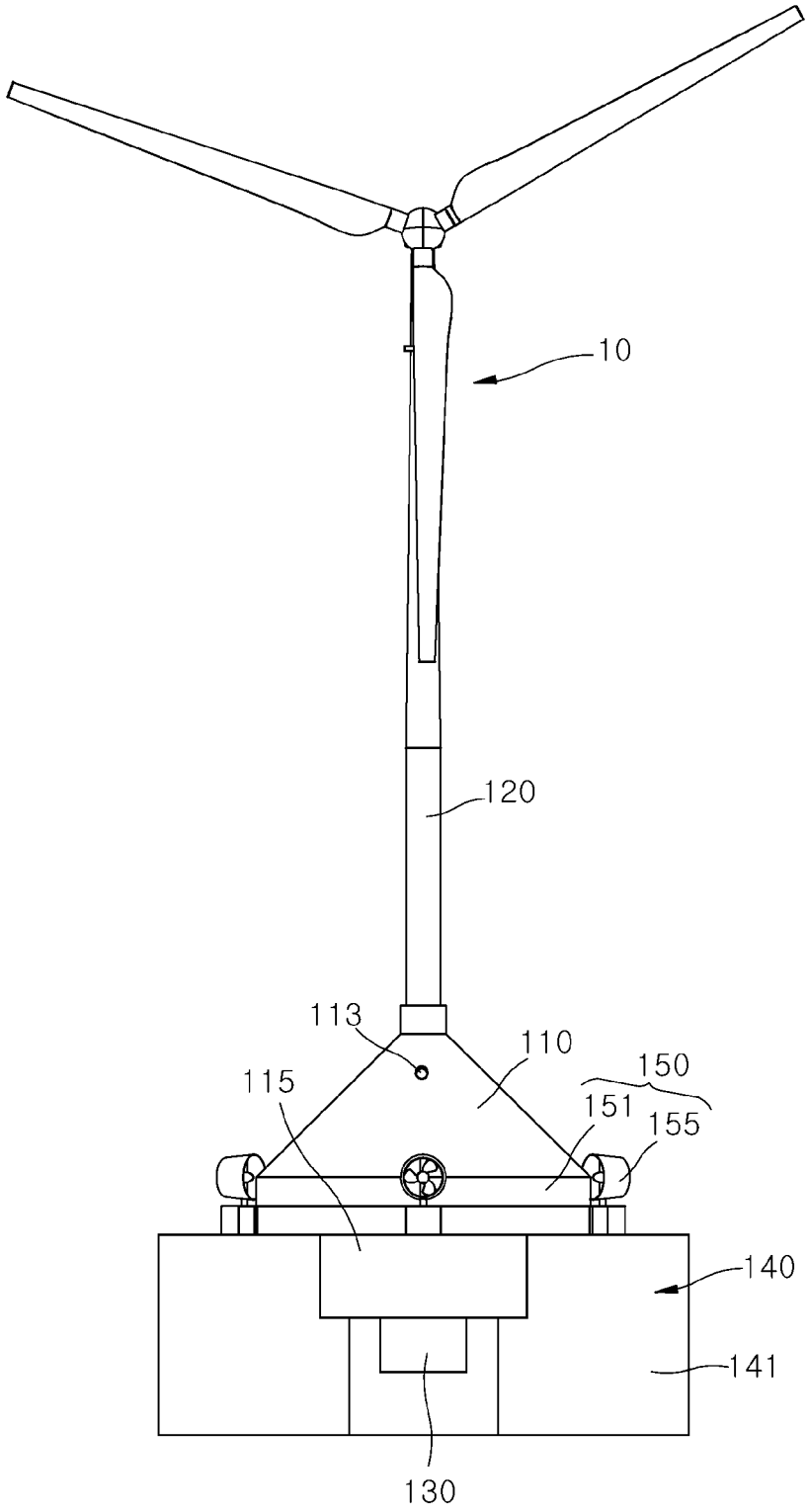


FIG. 3

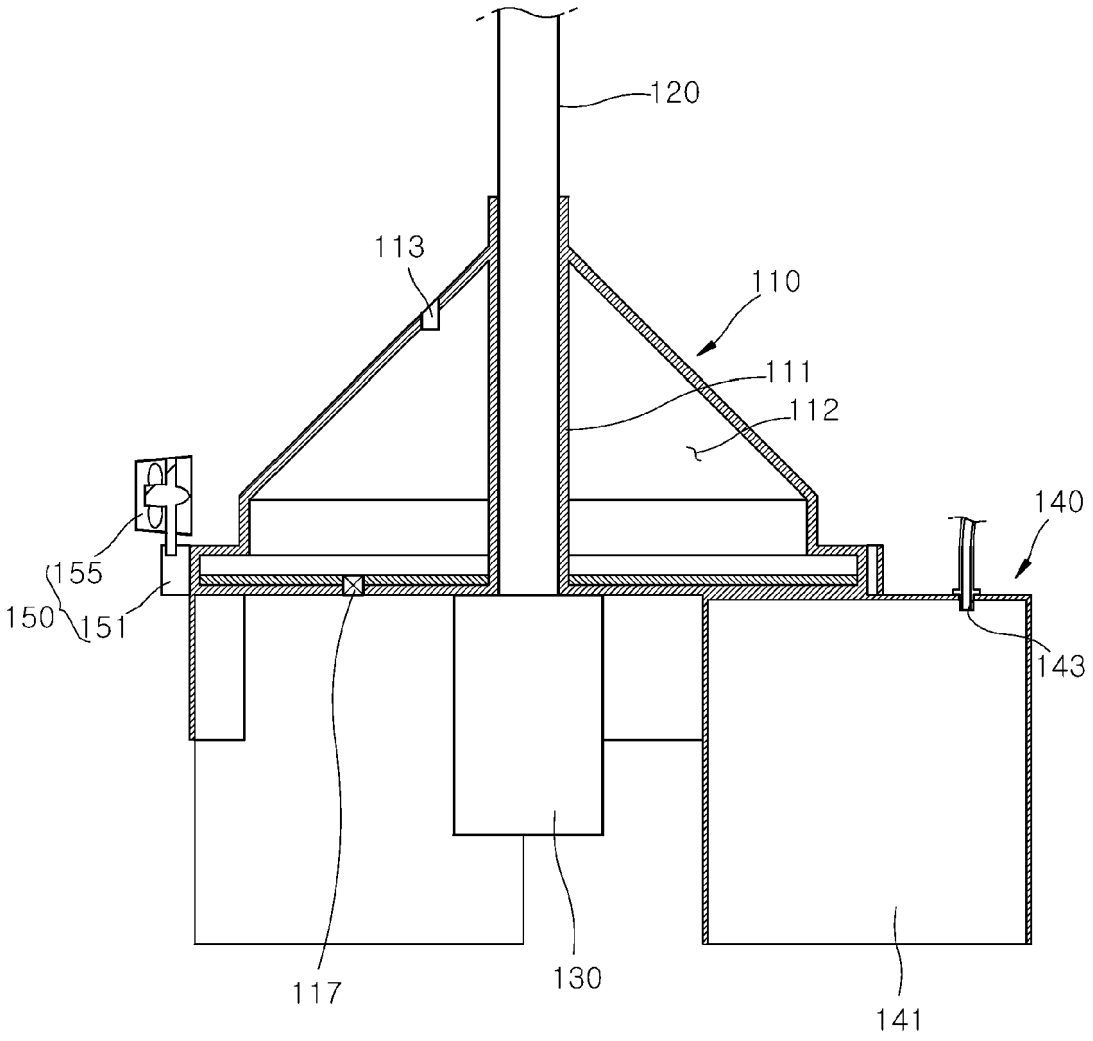


FIG. 4

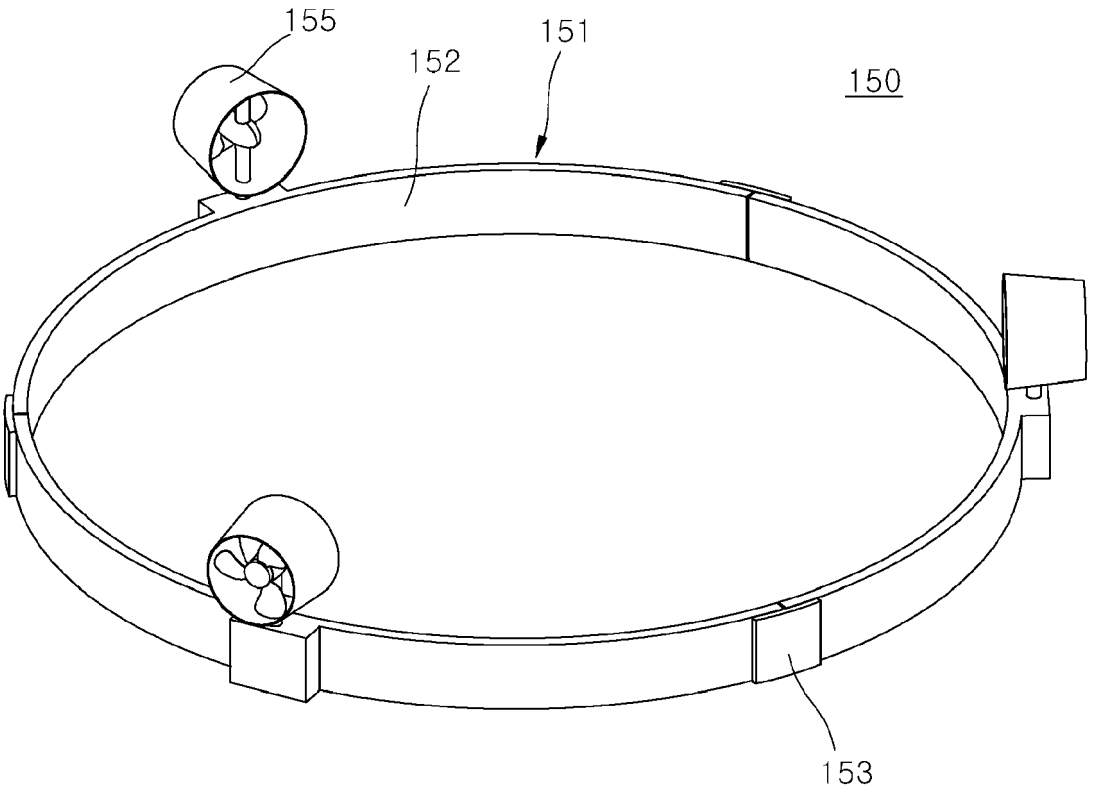


FIG. 5

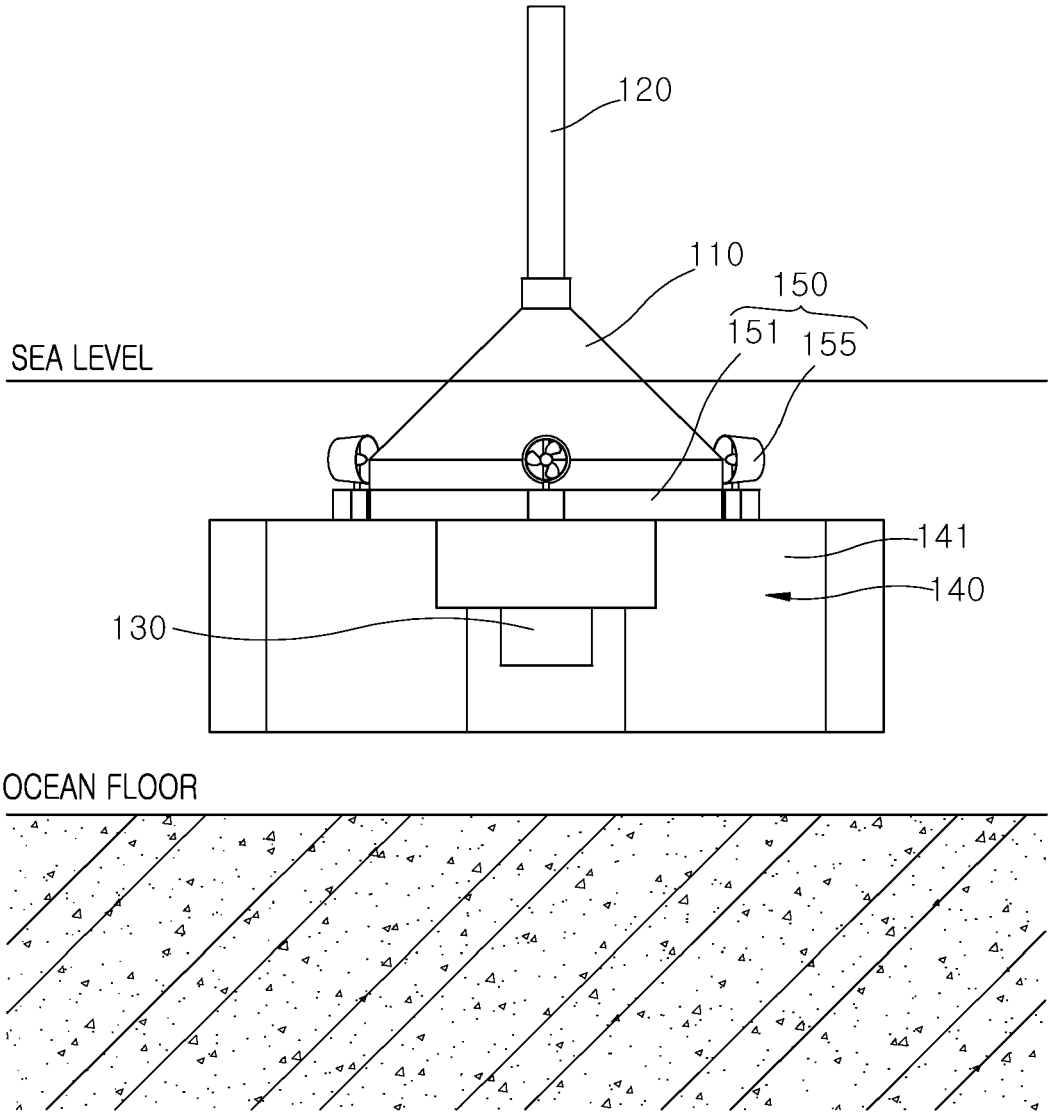


FIG. 6

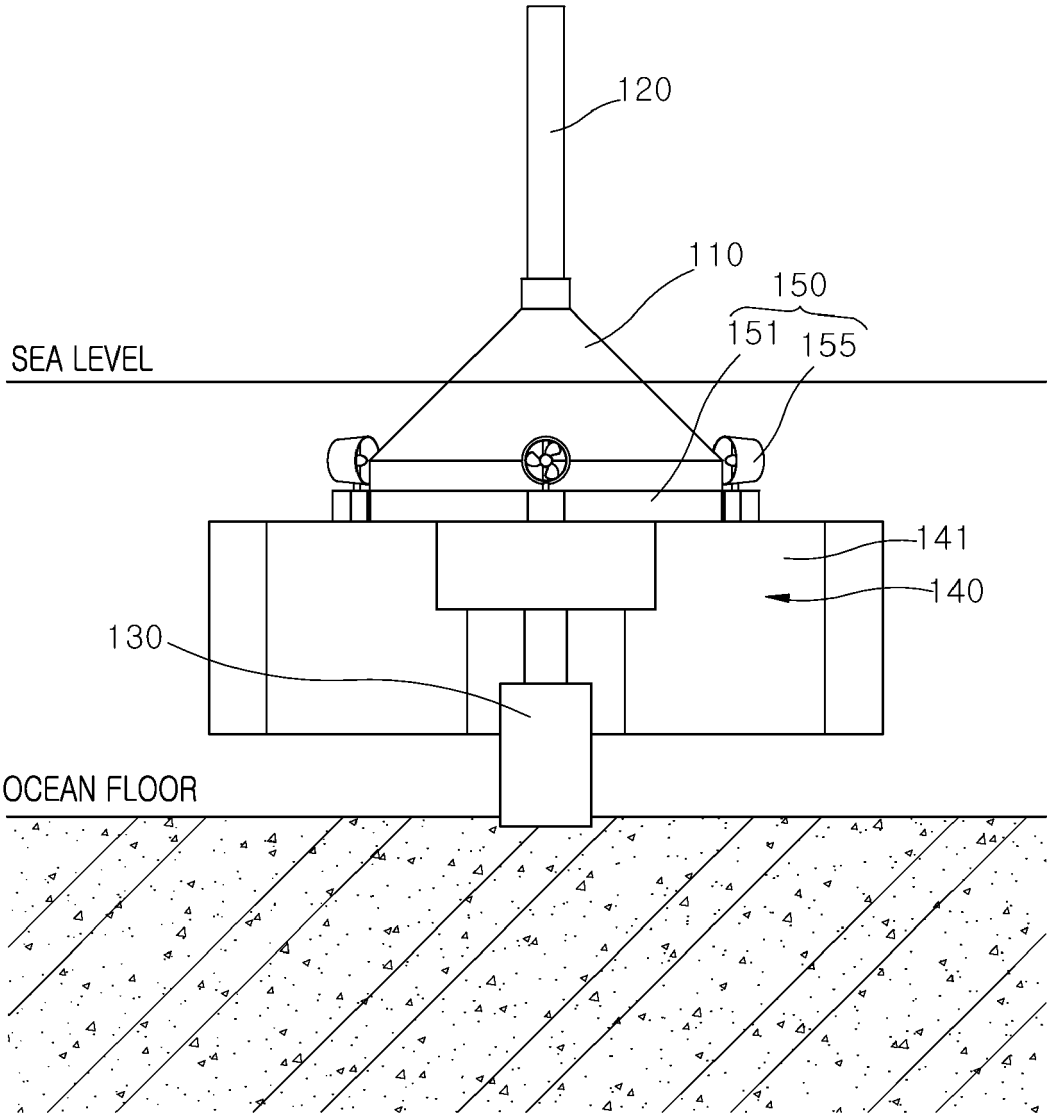


FIG. 7

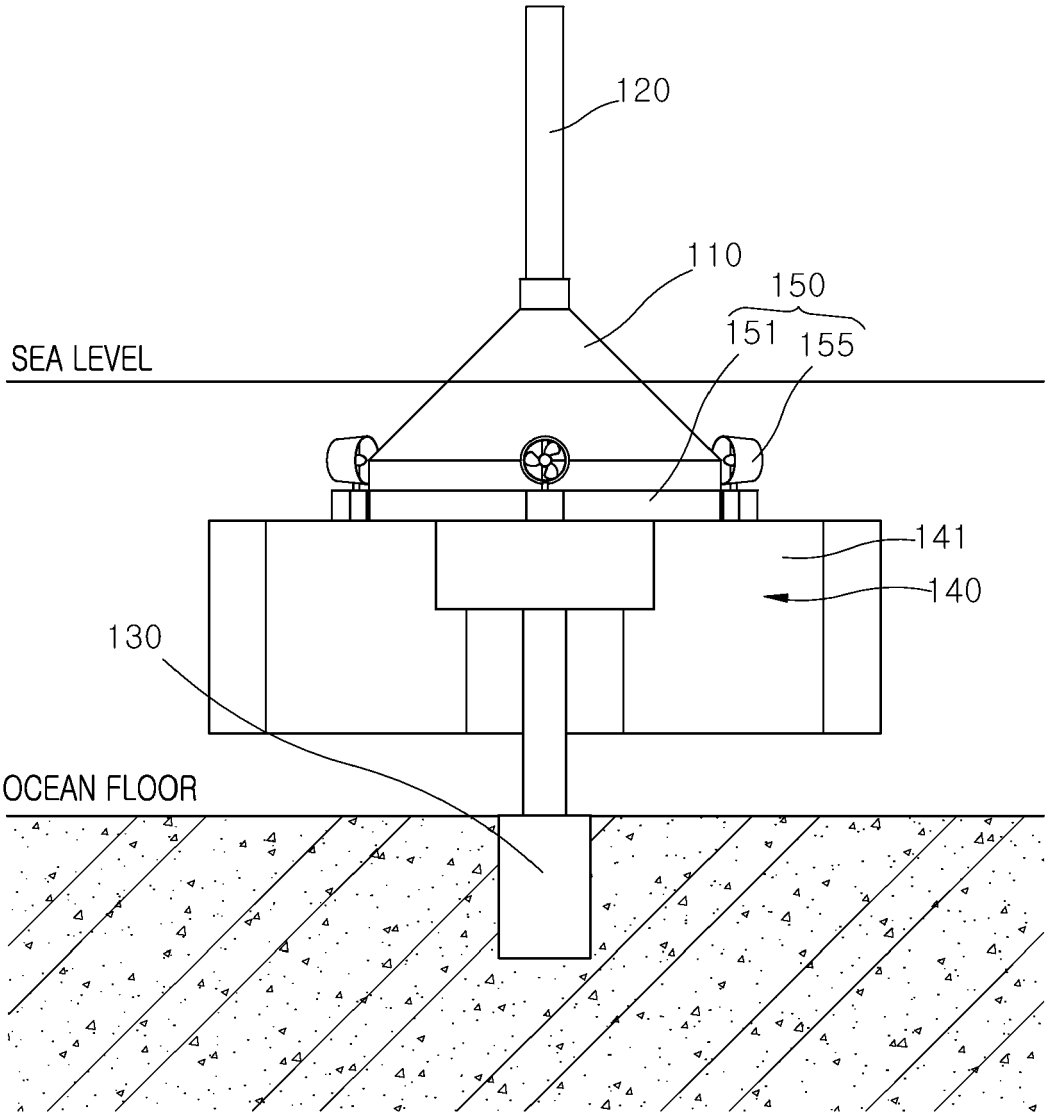


FIG. 8

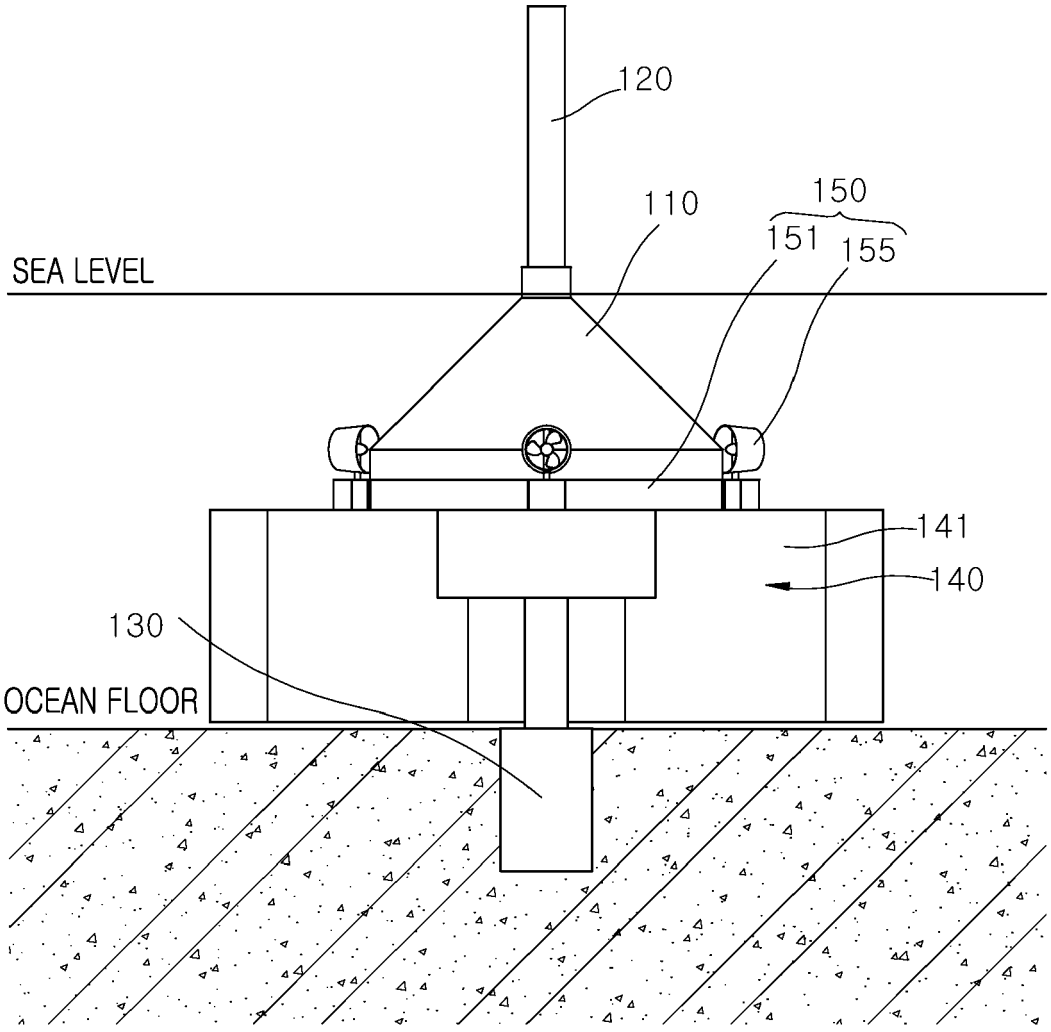


FIG. 9

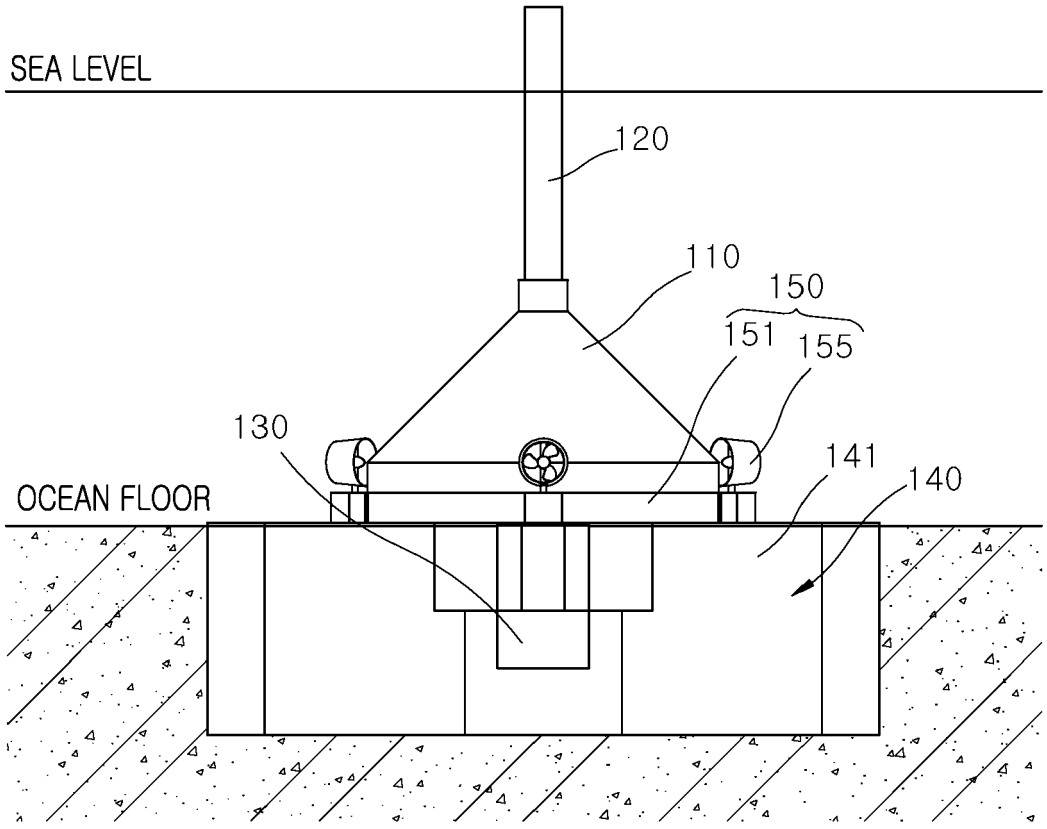
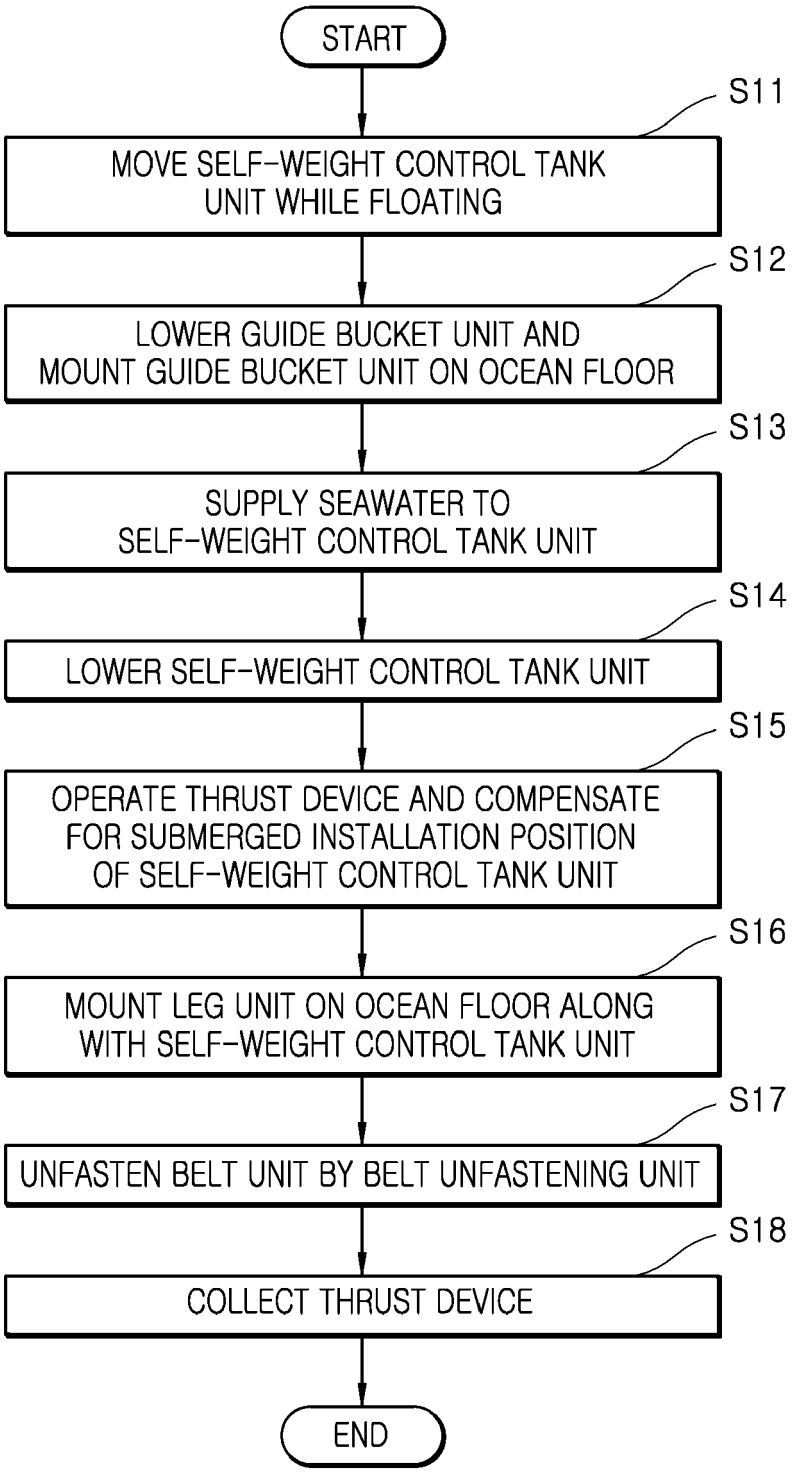


FIG. 10


START
S11
MOVE SELF-WEIGHT CONTROL TANK UNIT WHILE FLOATING
S12
LOWER GUIDE BUCKET UNIT AND MOUNT GUIDE BUCKET UNIT ON OCEAN FLOOR
S13
SUPPLY SEAWATER TO SELF-WEIGHT CONTROL TANK UNIT
S14
LOWER SELF-WEIGHT CONTROL TANK UNIT
S15
OPERATE THRUST DEVICE AND COMPENSATE FOR SUBMERGED INSTALLATION POSITION OF SELF-WEIGHT CONTROL TANK UNIT
S16
MOUNT LEG UNIT ON OCEAN FLOOR ALONG WITH SELF-WEIGHT CONTROL TANK UNIT
S17
UNFASTEN BELT UNIT BY BELT UNFASTENING UNIT
S18
COLLECT THRUST DEVICE
END

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EUROPEAN SEARCH REPORT

Application Number
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DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
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X	WO 2013/152757 A1 (PRIOR ENERGY GMBH N [DE]; DE BUHR INGO [DE]) 17 October 2013 (2013-10-17) * figures 1-7 *	1,10	
A	WO 03/004869 A1 (VESTAS WIND SYS AS [DK]; SIEG PER [DK]) 16 January 2003 (2003-01-16) * figures 3,5 *	1-13	

TECHNICAL FIELDS SEARCHED (IPC)

E02B
E02D

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
The Hague	10 January 2017	Zuurveld, Gerben

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