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(54) **MULTI-DIRECTIONAL WIND POWER GENERATOR**

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(57) **ABSTRACT**

The present invention relates to a wind power generator, and more particularly, to a multi-directional wind power generator capable of maximizing use efficiency of wind as well as enabling effective power generation regardless of the wind direction. The multi-directional wind power generator of the invention can generate electric power regardless of wind direction as well as minimize the resistance against the wind thereby enhancing its efficiency.

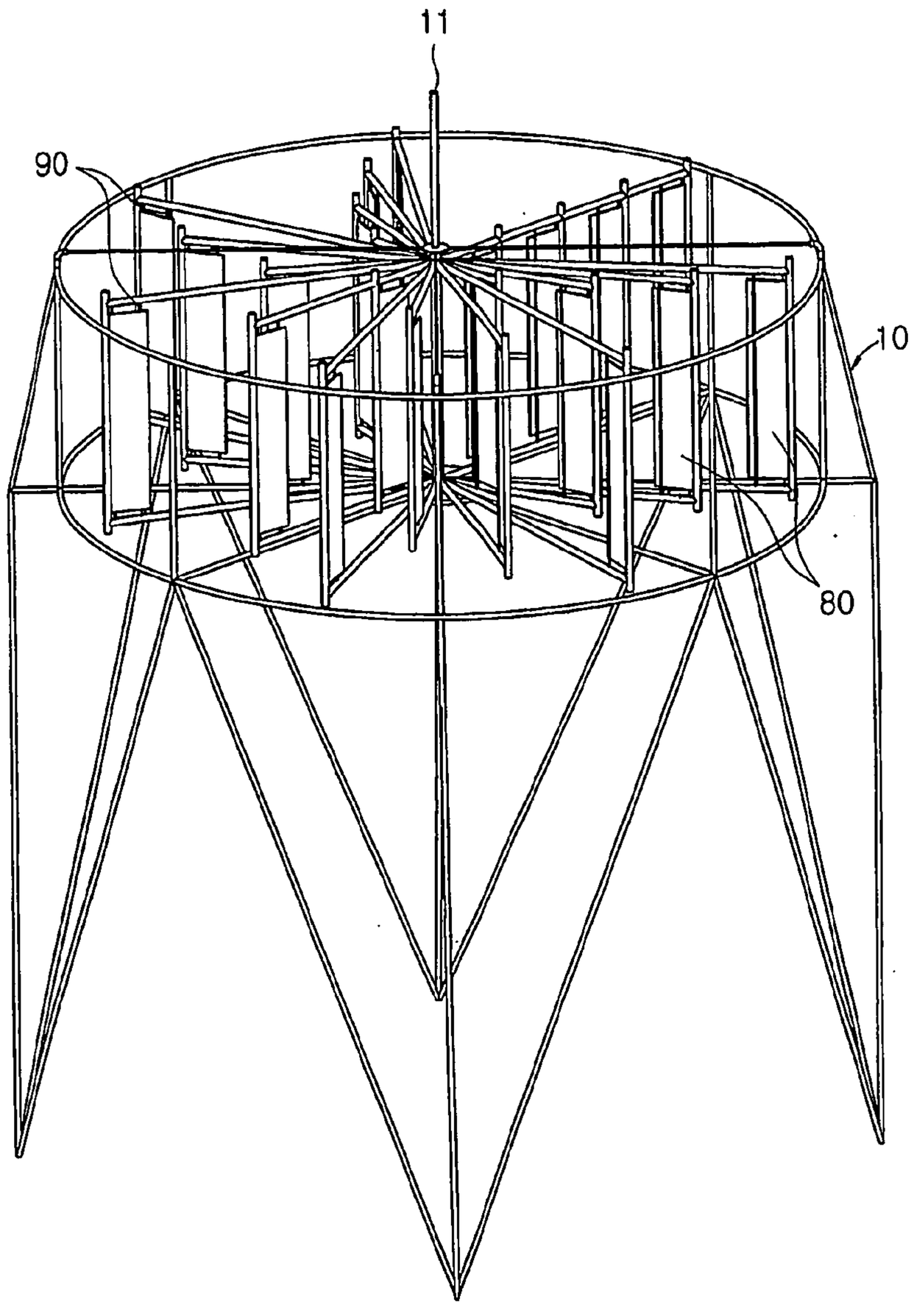


FIG. 1

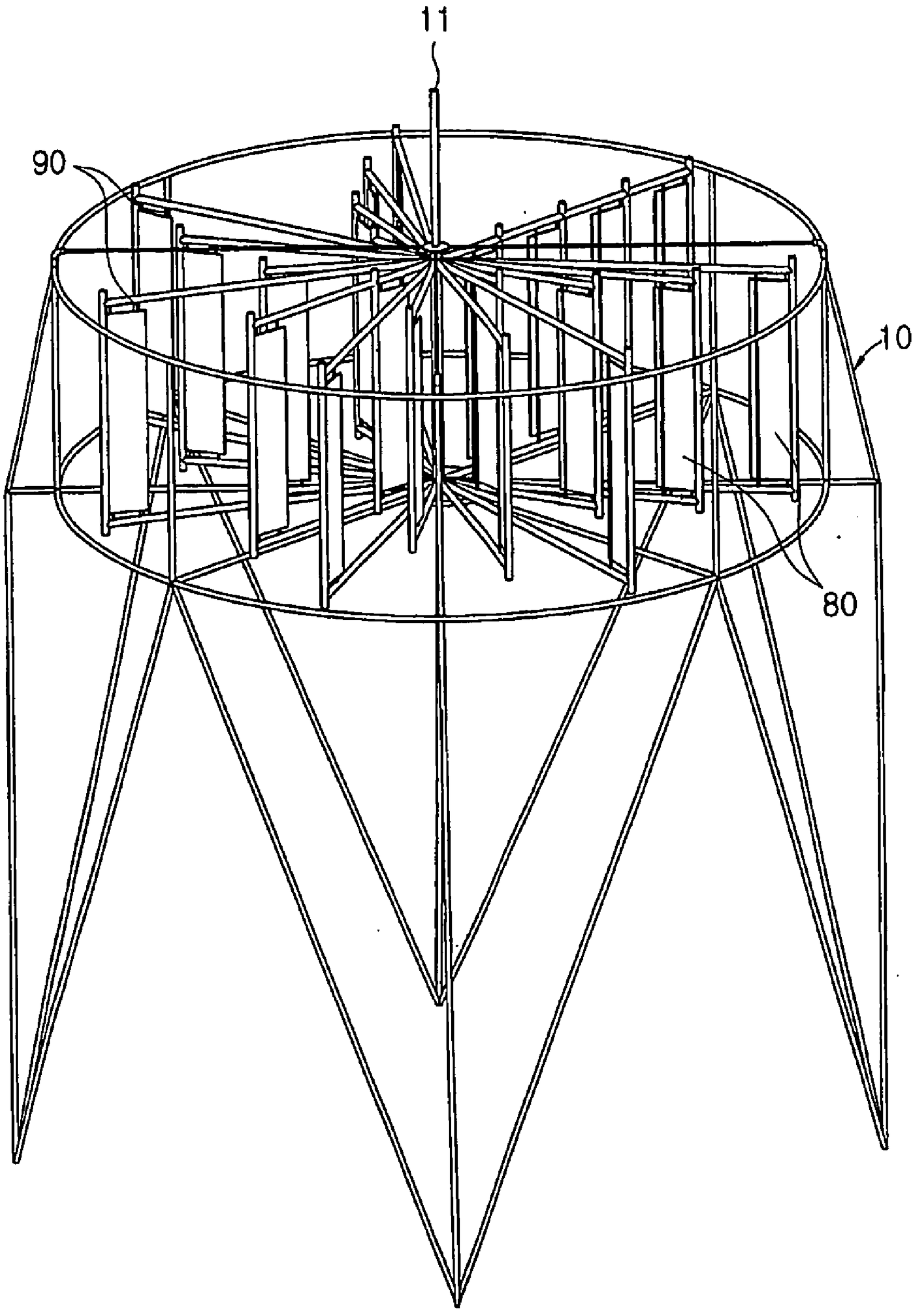


FIG. 2

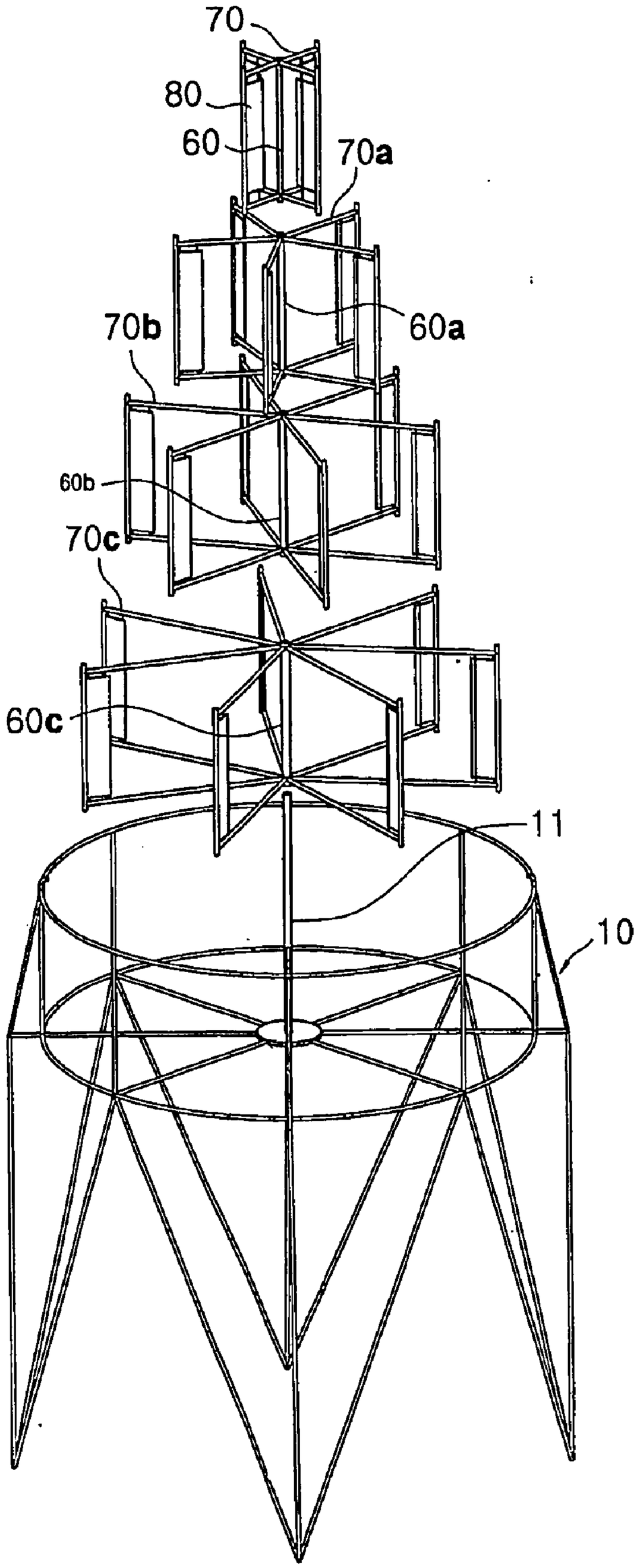
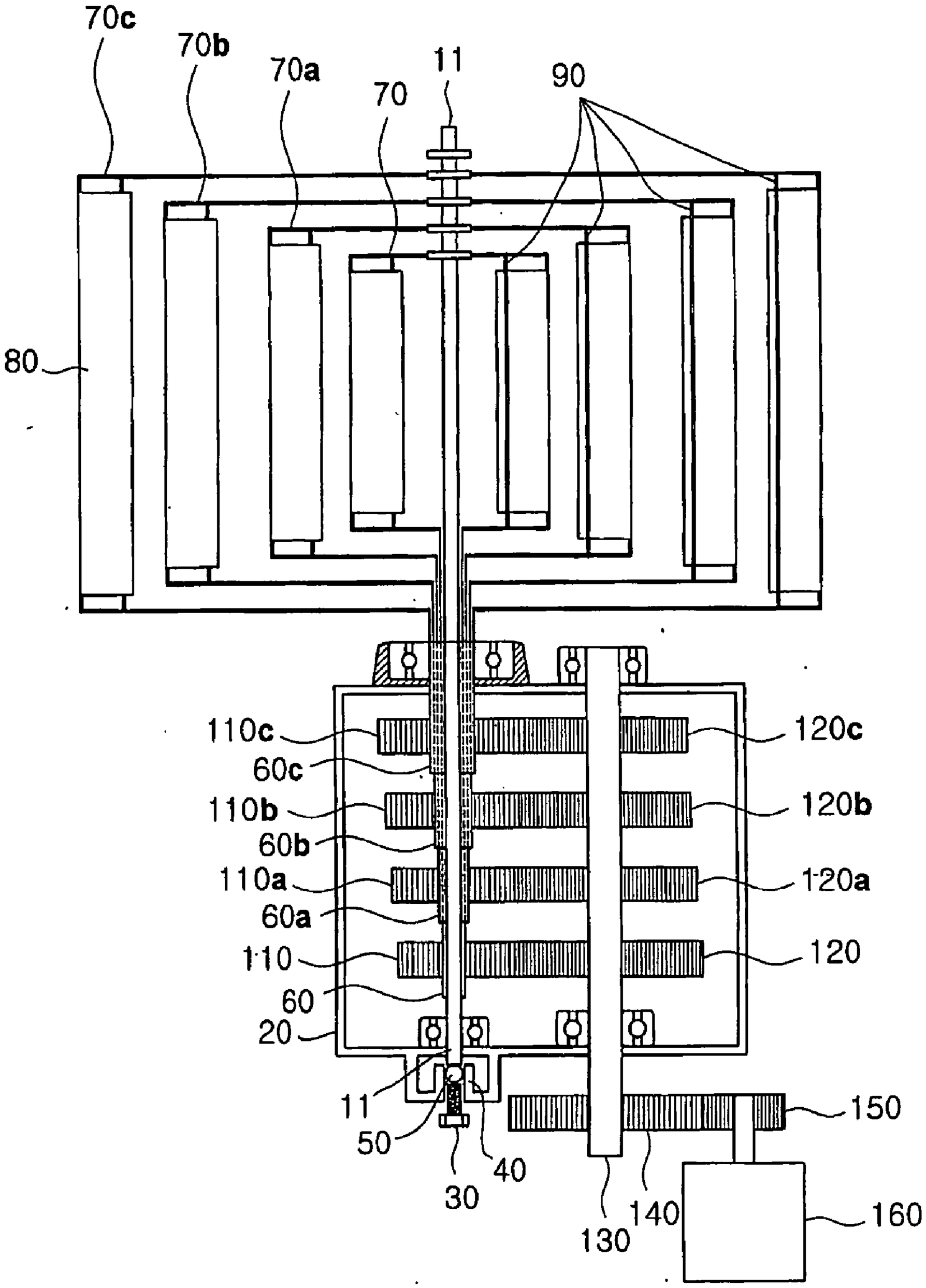


FIG. 3


70c
70b
70a
70
11
90
80
110c
60c
110b
60b
110a
60a
110
60
20
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50
30
40
120c
120b
120a
120
150
130
140
160

FIG. 4

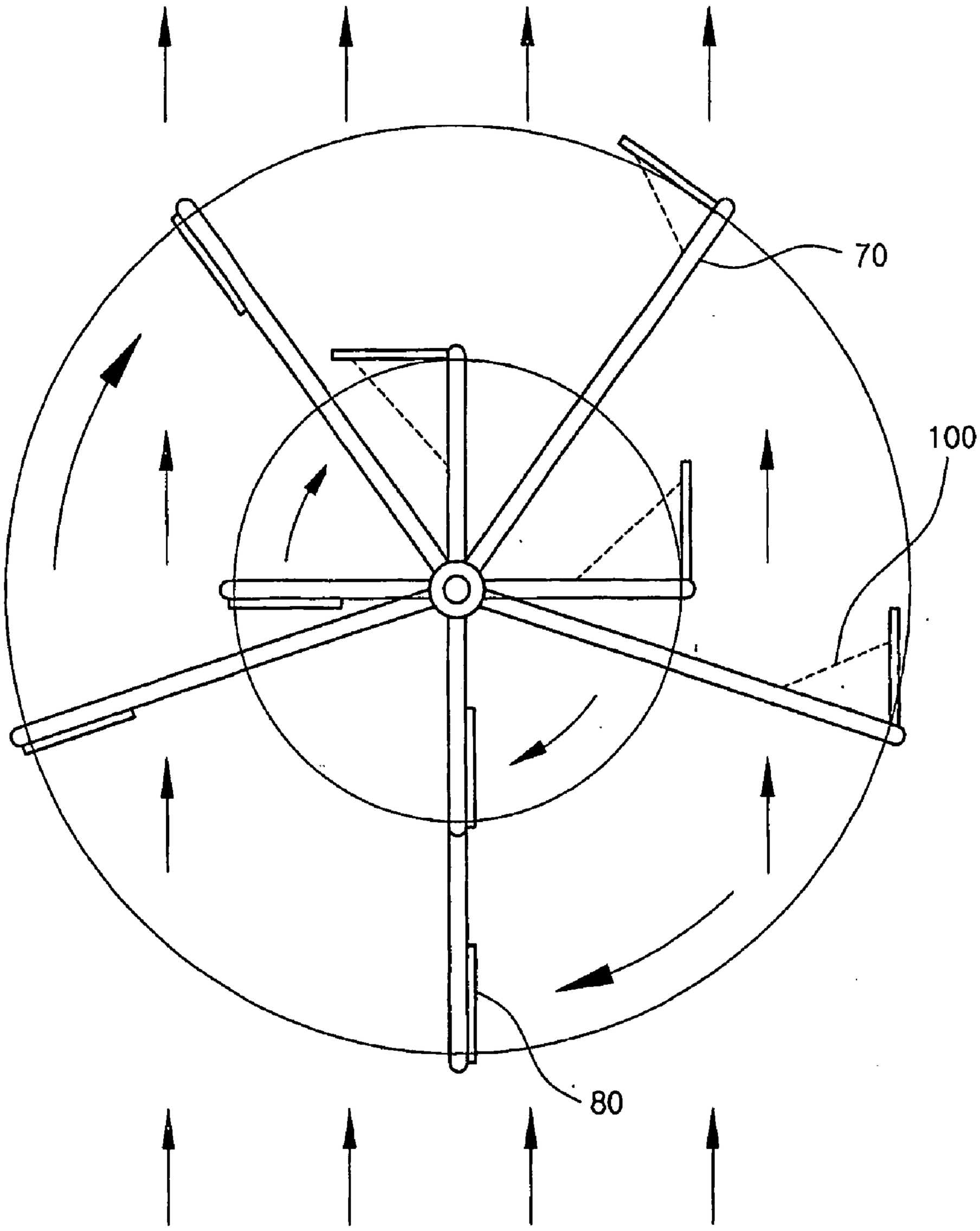


FIG. 5

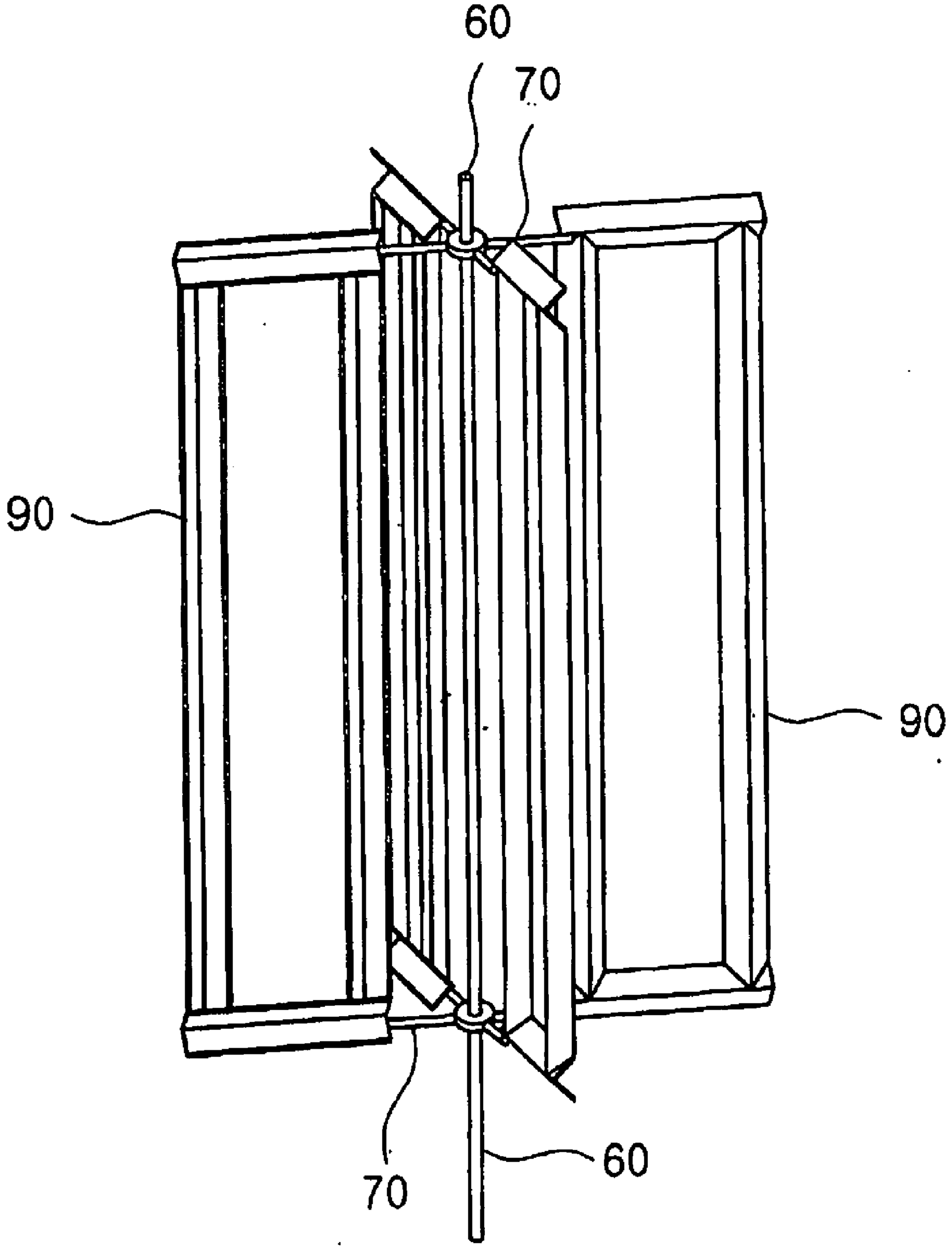


FIG. 6

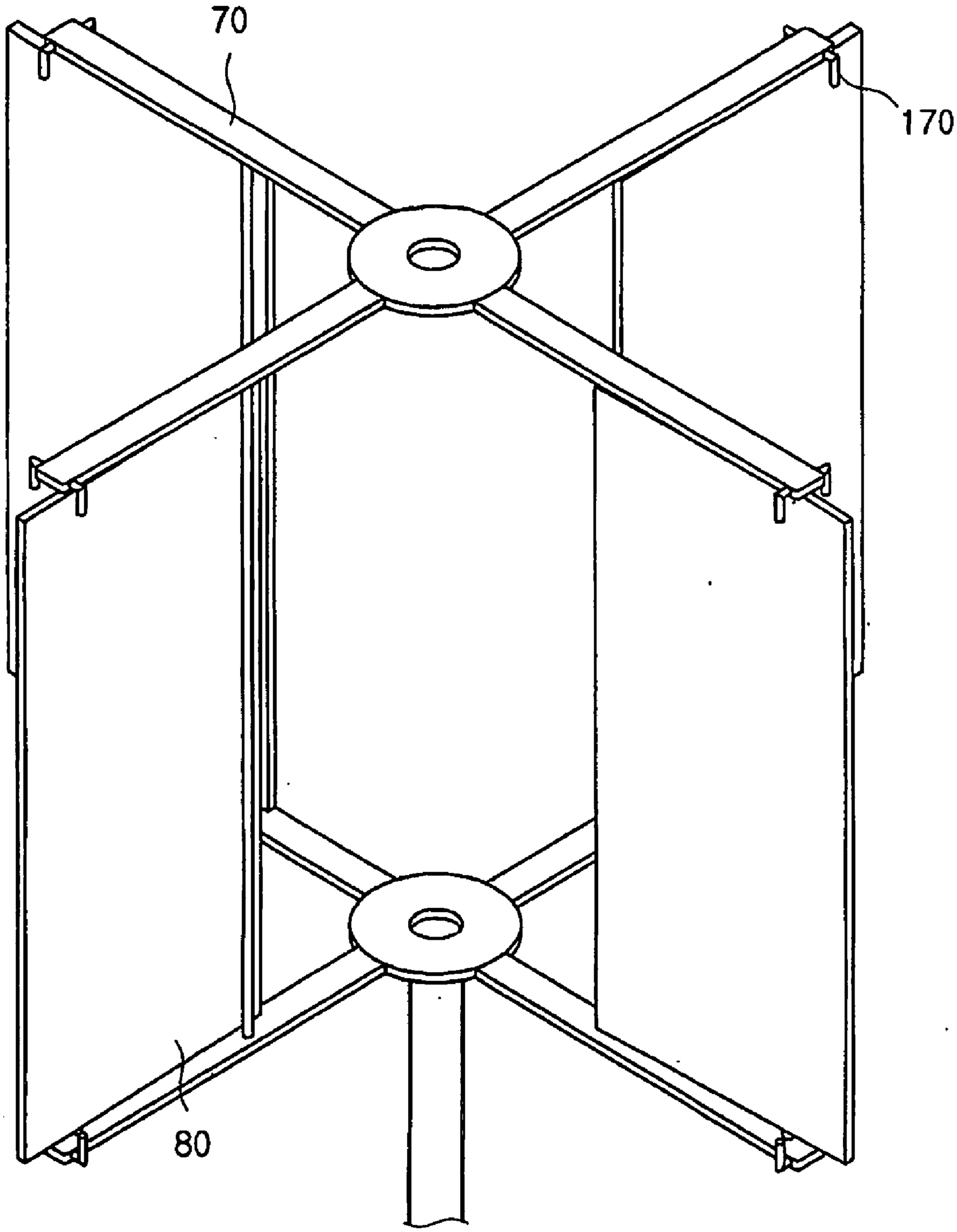


FIG. 7

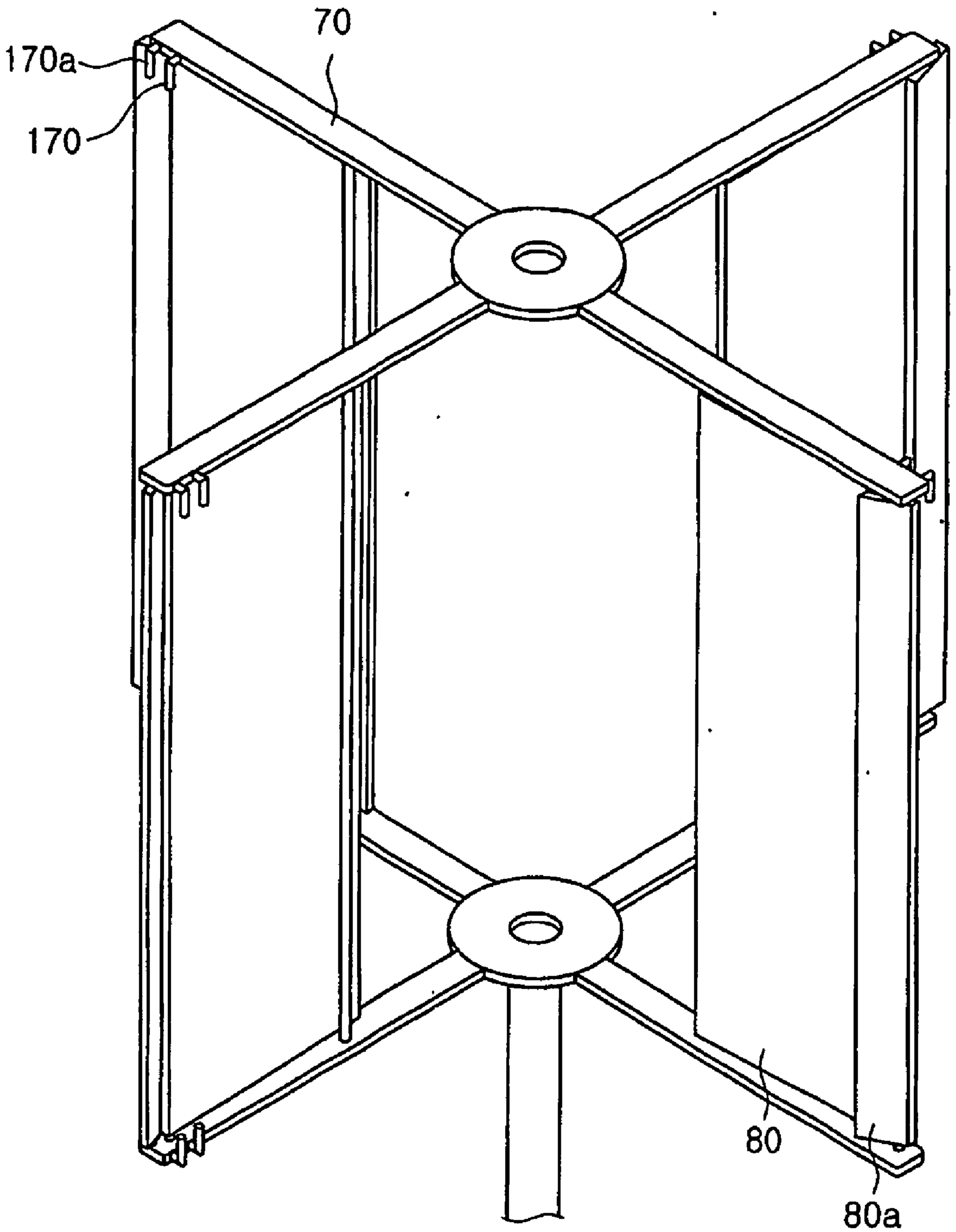
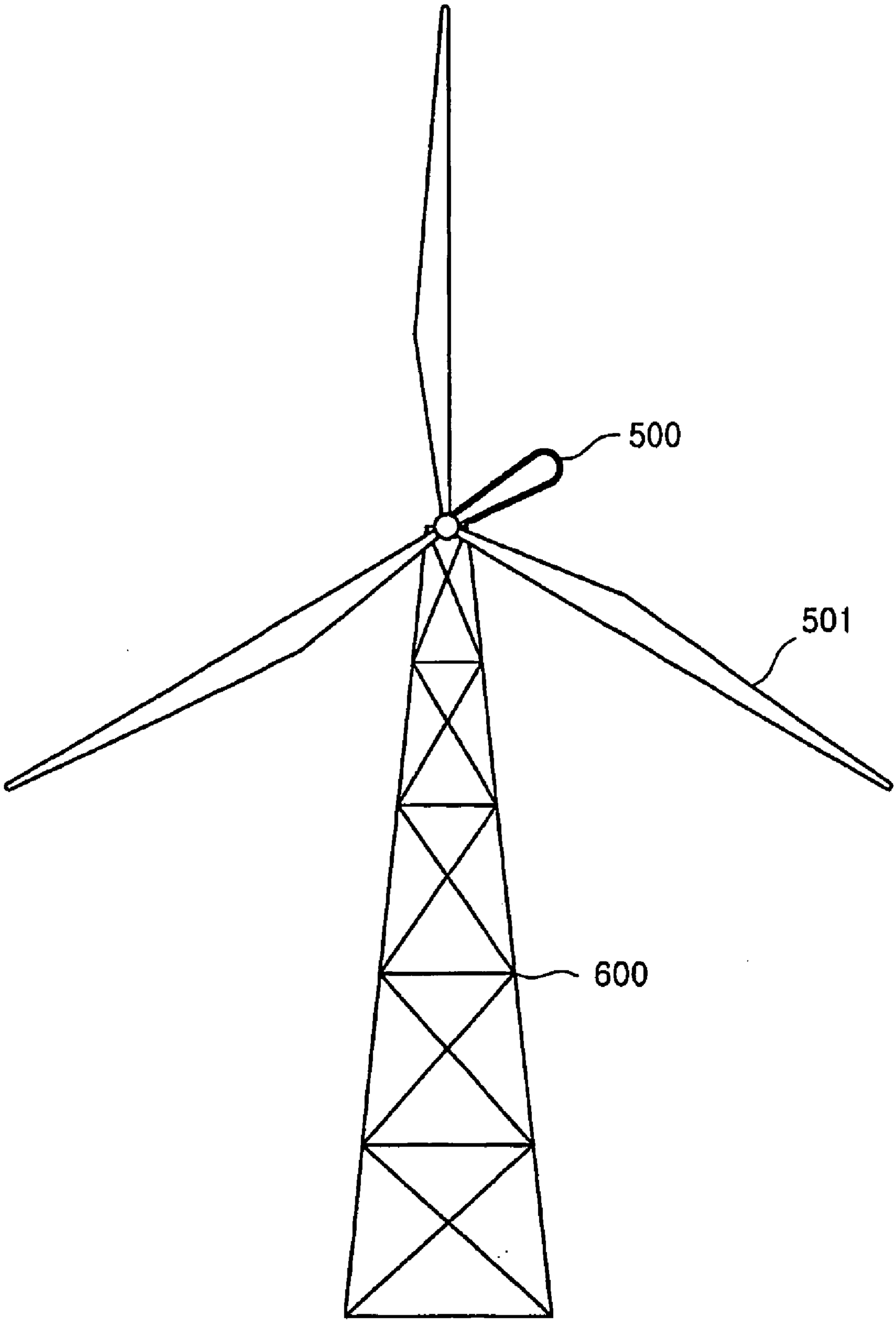


FIG. 8



MULTI-DIRECTIONAL WIND POWER GENERATOR

TECHNICAL FIELD

[0001] The present invention relates to a wind power generator, and more particularly, to a multi-directional wind power generator capable of maximizing the use of the wind as well as enabling effective power generation regardless of the wind direction.

BACKGROUND ART

[0002] In general, electric power generations can be classified into hydroelectric power generation using head drop of water, thermal power generation which obtains electric power by means of combustion of fuel, nuclear power generation using nuclear fission and wind power generation using wind. A proper power generator is established considering season and geographic influence to obtain electric power.

[0003] Among these power generations, wind power generator produces electric power utilizing wind that is a kind of natural phenomena, and has advantages in that installation cost is inexpensive unlike other power generating plants and power generation can be performed individually in the unit of home or local community.

[0004] **FIG. 8** is a front elevation view of a conventional wind power generator.

[0005] As shown in **FIG. 8**, the conventional wind power generator includes blades **501** that rotate by wind, a generator **500** for generating electric power from the rotational force of the blades **501** and a support frame **600** for supporting the generator **500** and the blades **501**.

[0006] The above wind power generator is provided with the radial blades each having a predetermined length from a rotary shaft thereof. When wind collides against each rotary blade to rotate the rotary blade, a portion of the rotary blade obstructs rotation of the rotary blade resulting from its weight. The rotation distance of the rotary blade becomes different as it travels from one end of each of the rotary blades to the other end. Thus, in the integral rotary blades rotating with an equal angle, the rotation power of the rotary blades is counterbalanced thereby decreasing the efficiency of the wind power generator.

[0007] Further, the rotary blades can rotate only when the wind collides against the front of the rotary blades. However, since the wind direction is not constant, a separate device is needed to turn the rotary blades according to the wind direction, causing inconvenience to manufacture.

DISCLOSURE OF THE INVENTION

[0008] The present invention has been made to solve the foregoing problems and it is therefore an object of the present invention to provide a multi-directional wind power generator that can generate electric power regardless of wind direction as well as minimize the resistance against the wind, thereby enhancing its efficiency.

[0009] According to an aspect of the invention, there is provided a multi-directional wind power generator comprising: a base frame having a central shaft and being supported on the ground, disposed around the central shaft defining a space of a predetermined radius; a first rotary shaft rotatably fitted around the central shaft of the base frame; a plurality of first upper/lower support frames extended from upper and lower outer peripheries of the first rotary shaft to a predetermined radius; first rotary blades hinged by their both ends, respectively, on distal ends of the first upper/lower support frames; first anti-pivoting bars disposed, respectively, at portions of the first upper/lower frames to prevent pivoting of the first rotary blades so that the first rotary blades are oriented parallel with the first upper/lower support frames; first control means disposed respectively in the first upper/lower support frames for controlling pivoting of the first rotary blades; rotation power transmission means disposed around a lower portion of the central shaft of the base frame to transmit the rotation power of the first rotary shaft at a rotation rate changed via gear combination; and a generator for generating electric power under the rotation power transmitted from the rotation power transmission means.

[0010] Preferably, the multi-directional wind power generator of the invention may further comprise auxiliary rotary blades hinged by both ends, respectively, on the distal ends of the upper/lower support frames to rotate in the wind and auxiliary stopper protrusions formed, respectively, at the distal ends of the upper/lower frames to contact with one sides of the auxiliary rotary blades in pivoting of the auxiliary rotary blades.

[0011] In the multi-directional wind power generator of the invention, the pivoting-control means are wires that are fixed, respectively with one portion of the anti-pivoting bars and one portion of the rotary blades to regulate the rotation angle of the pivoting blades. Also, the pivoting-control means are stopper protrusions that are formed, respectively, at both sides of the distal ends of the upper/lower support frames to contact one side of the rotary blades in pivoting of the auxiliary rotary blades.

[0012] In the multi-directional wind power generator of the invention, the rotation power transmission means include a gear housing disposed around a lower portion of the central shaft and having an inner space, a female threaded portion projected downward from an underside of the gear housing to a predetermined height for receiving an adjustment bolt, a central shaft supporting member disposed on the adjustment bolt for supporting the central shaft, a drive gear fitted around one end of the rotary shaft which is fitted around the central shaft and extended into the gear housing, a driven gear shaft having a driven gear meshed with the drive gear and rotating within the gear housing, a transmission gear disposed at an end of the driven gear shaft and extending through a bottom of the gear housing, and a generator gear meshed with the transmission gear for transmitting rotation power to the generator.

[0013] Preferably, the multi-directional wind power generator of the invention may further comprise first to third rotation shafts fitted around the first rotation shaft in the order of the first to third rotation shafts; a plurality of first to third upper/lower support frames extended, respectively, from upper and lower outer peripheries of the first to third rotary shafts to respective predetermined radii of rotation; first to third rotary blades hinged by their both ends, respectively, on distal ends of the first to third upper/lower support frames to rotate in the wind; first to third anti-pivoting bars disposed, respectively, at portions of the first to third upper/

lower frames to prevent pivoting of the first to third rotary blades at respective positions; first to third control means disposed, respectively, on the first to third upper/lower support frames for controlling pivoting of the first to third rotary blades; first to third drive gears coupled, respectively, with one ends of the first to third rotation shafts extended into the gear housing; and first to third driven gears meshed, respectively, with the first to third drive gears at respective rotation rates.

[0014] In the multi-directional wind power generator of the invention, the upper/lower support frames and the anti-pivoting bars are preferably made of shape steels having V-shaped cross sections.

[0015] Further, in the multi-directional wind power generator of the invention, gear ratios of drive gears in respect to the driven gears are 2.5, 1.7, 1.25 and 1 in the order of the drive gear to the driven gear, the second drive gear to the second driven gear, the third drive gear to the third driven gear and the fourth drive gear to the fourth driven gear.

BRIEF DESCRIPTION OF THE DRAWINGS

[0016] The above and other objects, features and other advantages of the present invention will be more clearly understood from the following detailed description taken in conjunction with the accompanying drawings, in which:

[0017] **FIG. 1** is a perspective view of a multi-directional wind power generator of the invention;

[0018] **FIG. 2** is an exploded perspective view of the multi-directional wind power generator of the invention;

[0019] **FIG. 3** is a longitudinal sectional view of the multi-directional wind power generator of the invention;

[0020] **FIG. 4** is a cross-sectional view of the multi-directional wind power generator of the invention;

[0021] **FIG. 5** is a perspective view of a part of the multi-directional wind power generator of the invention;

[0022] **FIG. 6** is a perspective view of an alternative to rotary blades in the multi-directional wind power generator of the invention;

[0023] **FIG. 7** is a perspective view of another alternative to rotary blades in the multi-directional wind power generator of the invention; and

[0024] **FIG. 8** is a front elevation view of a conventional wind power generator.

DESCRIPTION OF SYMBOLS IN MAIN PORTIONS OF THE DRAWINGS

[0025]

10: Base frame	11: Central shaft
20: Gear case	30: Adjustment bolt
40: Female threaded portion	50: Central shaft supporting member
60: Rotary shaft	70: Upper/lower support frames
80: Rotary blades	90: Anti-pivoting bar
100: Wire	110: Drive gear
120: Driven gear 120	130: Driven gear shaft
140: Transmission gear	150: Generator gear
160: Generator	170: Stopper protrusion

BEST MODE FOR CARRYING OUT THE INVENTION

[0026] The following detailed description will present a multi-directional wind power generator of the invention in reference to the accompanying drawings.

[0027] **FIG. 1** is a perspective view of a multi-directional wind power generator of the invention, **FIG. 2** is an exploded perspective view of the multi-directional wind power generator of the invention, **FIG. 3** is a longitudinal sectional view of the multi-directional wind power generator of the invention, **FIG. 4** is a cross-sectional view of the multi-directional wind power generator of the invention, **FIG. 5** is a perspective view of a part of the multi-directional wind power generator of the invention, **FIG. 6** is a perspective view of an alternative to rotary blades in the multi-directional wind power generator of the invention, and **FIG. 7** is a perspective view of another alternative to rotary blades in the multi-directional wind power generator of the invention.

[0028] As shown in FIGS. **1** to **7**, the multi-directional wind power generator of the invention comprises a central shaft **11** and a base frame **10** supported on the ground, disposed around the central shaft **11** defining a space of a predetermined radius.

[0029] A gear housing **20** is disposed in the base frame **10** around a lower portion of the central shaft **11**. A female threaded portion **40** is projected downward from the underside of the gear housing **20** to a predetermined height, an adjustment bolt **30** is meshed into the female threaded portion **40**, and a central shaft supporting member **50** is seated on the adjustment bolt **30** to perform point-to-point contact with the bottom of the central shaft **11** thereby supporting the same.

[0030] A rotary shaft **60** is rotatably fitted around the central shaft **11** of the base frame **10**, and a plurality of upper/lower support frames **70** are extended from upper and lower outer peripheries of the rotary shaft **60** to a predetermined radius.

[0031] Their both ends hinge rotary blades **80**, respectively, on distal ends of the upper/lower support frames **70** so that the rotary blades **80** can rotate in the wind.

[0032] Anti-pivoting bars **70** vertically connect between the upper and lower frames **70** at predetermined portions of the upper/lower frames **70** in order to prevent pivoting of the rotary blades **80** at a predetermined position.

[0033] Preferably, the upper/lower frames **70** and the anti-pivoting bars **90** are made of shape steel having a V-shaped cross section. Then, in addition to the rotary blades **80**, the wind collides against the upper/lower frames and the anti-pivoting bars **90** to enhance torque.

[0034] A wire **100** fixedly connects between each anti-pivoting bar **90** and each rotary blade **80** to regulate the pivoting angle of the rotary blade **80**.

[0035] Alternatively, stopper protrusions **170** are formed at both sides of distal ends of each upper/lower support frames **70** to regulate the pivoting angle of each rotary blade **80**. During pivoting of the rotary blade **80**, the stopper protrusions **170** contact one side of the rotary blade **80** to block pivoting of the rotary blade **80**.

[0036] In addition to the stopper protrusions **170** blocking the rotary blade **80**, it is preferred that the rotary blade **80** is extended beyond the distal ends of the upper/lower support frames **70** to enlarge the area of the rotary blade **80** thereby increasing the effect of the wind.

[0037] Alternatively, an auxiliary rotary blade **80***a* is hinged by its both ends on distal ends of each upper/lower frames **70** adjacent to one end of each rotary blade **80**, in which one side of the auxiliary rotary blade **80***a* is blocked by one side of the rotary blade **80** so that pivoting of the auxiliary blade **80***a* is stopped by the one side of the rotary blade **80**. Also, auxiliary stopper protrusions **170***a* are formed at the distal ends of the upper/lower frames **70** to regulate the pivoting angle of the auxiliary rotary blade **80***a*.

[0038] The rotary shaft **60** is fitted around the central shaft **11**, extended into the gear housing **20**. A drive gear **110** is coupled with a lower end of the rotary shaft **60**, and a driven gear **120** is meshed with the drive gear **110** within the gear housing **20**.

[0039] A driven gear shaft **130** rotating within the gear housing **20** by the driven gear **120** is extended through the underside of the gear housing **20**. A lower end of the driven gear shaft **130** is coupled with a transmission gear **140**, which is meshed with a generator gear **150** of a generator **160**.

[0040] Preferably, first to third rotary shafts **60***a*, **60***b* and **60***c* are fitted around the rotary shaft **60** around the central shaft **11**, and first to third upper/lower support frames **70***a*, **70***b*, **70***c* are extended, respectively, from upper and lower outer peripheries of the first to third rotary shafts **60***a* to **60***c* to predetermined radii.

[0041] Further, rotary blades **80** are hinged by their both ends, respectively, on distal ends of the first to third upper/lower frames **70***a* to **70***c* so that the rotary blades **80** can rotate In the wind. Anti-pivoting bars **90** prevent pivoting of the rotary blades **80**, respectively, at predetermined positions. A wire **100** fixedly connects between each anti-pivoting bar **90** and each rotary blade **80** to regulate the pivoting angle of the rotary blade **80**.

[0042] The second upper/lower support frames **70***a* are extended to a predetermined length and the rotary blades **80** attached to the second support frames **70***a* are placed on the equal height. The third upper/lower support frames **70***b* are extended to a predetermined length larger than that of the second support frames **70***a* and the rotary blades **80** attached to the third support frames are placed on the equal height. The fourth upper/lower support frames **70***c* are extended to a predetermined length larger than that of the third support frames **70***b* and the rotary blades **80** attached to the fourth support frames are placed on the equal height. As a result, the first to third upper/lower support frames **70***a* to **70***c* rotate on respective radii of rotation that are different from one another.

[0043] The first to third rotary shafts **60***a* to **60***c* are extended into the gear housing **20**. First to third driving gears **110***a*, **110***b* and **110***c* are coupled, respectively, to lower ends of the first to third rotary shafts **60***a* to **60***c*, and the driven gear shaft **130** is also coupled with first to third driven gears **120***a*, **120***b* and **120***c* which are meshed, respectively with the first to third driving gears **110***a* to **110***c*.

[0044] With the invention of the above structure, the wind influences the plurality of blades connected to the wires that are fixed to the anti-pivoting bars.

[0045] Also, the blades can be influenced by the sea water or tide and thus the invention can be used for tidal powder generation.

[0046] Where the plurality of rotary blades are under the influence of the wind or the sea water, as the wind for example collides against one side of each rotary blade disposed in the outer periphery of each rotary shaft, the pertinent rotary blade, instead of pivoting, is supported by a corresponding anti-pivoting bar or bars.

[0047] As a result, the rotary blade turns the rotary shaft under the influence of the wind.

[0048] Also, the rotary blade is fixed by one side to a corresponding wire fixed to the anti-pivoting bar to regulate the pivoting angle of the rotary blade.

[0049] According to alternatives of the invention, the stopper protrusions and the auxiliary stopper protrusions are provided to regulate the pivotal angle of the rotary blades. After the rotary blade pivot a predetermined angle, one side of a first one of the rotary blades is stopped by corresponding stopper protrusions disposed at distal ends of corresponding upper/lower frames. Also, each auxiliary blade is stopped by corresponding auxiliary stopper protrusions after pivoting a predetermined angle.

[0050] When the auxiliary rotary blade is under the influence of the wind, one sides of the corresponding auxiliary stopper protrusions contact one side of the auxiliary rotary blade preventing its pivoting so that the auxiliary rotary blade cooperates with the rotary blade to rotate the rotary shaft.

[0051] When the wind collides into a second one of the auxiliary rotary blades remote from the first rotary blade, the pertinent rotary blade pivots to avoid the influence of the wind as a corresponding anti-pivoting bar is placed in front of the rotary blade that is in the windward side.

[0052] As a result, in rotation of the rotary shaft where the first rotary blade rotates under the influence of the wind to add rotation power to the rotary shaft whereas the second rotary blade rotates against the wind, the second rotary blade pivots to avoid the Influence of the wind without decreasing the rotation power of the rotary shaft so that the rotation power of the rotary shaft can be enhanced.

[0053] As shown in **FIG. 1**, the rotary shaft together with rotary blades rotates clockwise in the wind, wherein each rotary blade has a position angle of zero degree as the rotary blade is placed on the leeward of the rotary shaft. In the position angle of about 0 to 180 degree, the rotary blade is greatly influenced by the wind and thus adds the rotation power of the rotary shaft. As passing by the position angle of about 180 degree, the rotary blade pivots by the wind.

[0054] In the position angle of about 180 to 270 degree, the rotary blade is inclined in respect to the direction of the wind so that the wind flows against the inclination of the rotary blade to reinforce the rotation power of the rotary shaft.

[0055] In the position angle of about 270 to 360 degree, the rotary blade is oriented parallel with the direction of the

wind and thus free from the influence of the wind without decreasing the rotation power of the rotary shaft.

[0056] As a result, the rotary blade can generate rotation power from the wind in a range of about to 0 to 270 degree so as to enhance the rotation power of the rotary shaft.

[0057] As the rotary shaft rotates under the enhanced rotation power, the driving gear in the gear housing transmits the rotation power to the driven gear and then the driven gear shaft transmits the rotation power via the transmission gear to the generator so that the generator generates electric power.

[0058] In the meantime, the first to third rotary shafts are fitted around the rotary shaft to enhance the rotation power of the rotary shaft.

[0059] Where the rotation power of the first to third rotary shafts is transmitted to the driven gear shaft within the gear housing, first to third driving gears are coupled, respectively, with lower ends of the first to third drive gear shafts. The driven gear shaft is coupled with the first to third driven gears that are meshed, respectively, with the first to third drive gears at different rotation rates.

[0060] Where the drive gears mesh respectively with the driven gears, the rotary shaft has the smallest radius of rotation whereas the fourth rotary shaft has the largest radius of rotation. Preferably, gear ratios of drive gears in respect to the driven gears are 2.5, 1.7, 1.25 and 1 in the order of the drive gear to the driven gear, the second drive gear to the second driven gear, the third drive gear to the third driven gear and the fourth drive gear to the fourth driven gear.

[0061] Industrial Applicability

[0062] As set forth above, the multi-directional wind power generator of the invention can generate electric power regardless of wind direction as well as minimize the resistance against the wind thereby enhancing its efficiency.

1. A multi-directional wind power generator comprising:

a base frame having a central shaft and being supported on the ground, disposed around the central shaft defining a space of a predetermined radius;

a first rotary shaft rotatably fitted around the central shaft of the base frame;

a plurality of first upper/lower support frames extended from upper and lower outer peripheries of the first rotary shaft to a predetermined radius;

first rotary blades hinged by their both ends, respectively, on distal ends of the first upper/lower support frames;

first anti-pivoting bars disposed, respectively, at portions of the first upper/lower frames to prevent pivoting of the first rotary blades so that the first rotary blades are oriented parallel with the first upper/lower support frames;

first control means disposed respectively in the first upper/lower support frames for controlling pivoting of the first rotary blades;

rotation power transmission means disposed around a lower portion of the central shaft of the base frame to transmit the rotation power of the first rotary shaft at a rotation rate changed via gear combination; and

a generator for generating electric power under the rotation power transmitted from the rotation power transmission means.

2. The multi-directional wind power generator of claim 1, further comprising:

first to third rotation shafts fitted around the first rotation shaft in the order of the first to third rotation shafts;

a plurality of first to third upper/lower support frames extended, respectively, from upper and lower outer peripheries of the first to third rotary shafts to respective predetermined radii of rotation;

first to third rotary blades hinged by their both ends, respectively, on distal ends of the first to third upper/lower support frames to rotate in the wind;

first to third anti-pivoting bars disposed, respectively, at portions of the first to third upper/lower frames to prevent pivoting of the first to third rotary blades at respective positions;

first to third control means disposed, respectively, on the first to third upper/lower support frames for controlling pivoting of the first to third rotary blades;

first to third drive gears coupled, respectively, with one ends of the first to third rotation shafts extended into the gear housing; and

first to third driven gears meshed, respectively, with the first to third drive gears at respective rotation rates.

3. The multi-directional wind power generator of claim 1 or **2**, wherein the first to fourth pivoting-control means are stopper protrusions which are formed, respectively, at both sides of one ends of the first to fourth upper/lower support frames to contact, respectively, one sides of the first to fourth rotary blades.

* * * * *