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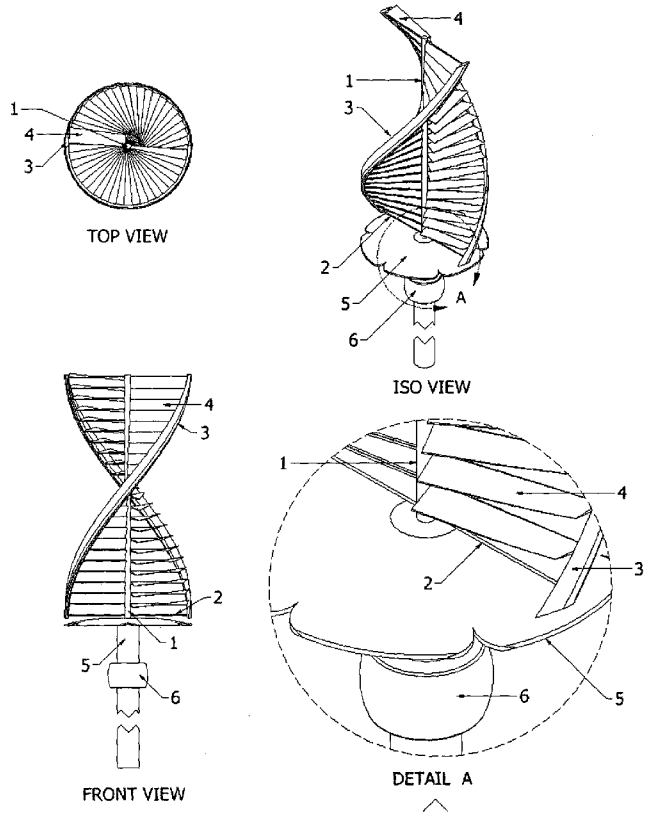
(54) Title: A WIND TURBINE



(57) Abstract: The present invention relates to a movable-fins vertical axis wind turbine which is a combination of aerodynamic lift and drag principles. It consists of helical airfoil blades (3) and movable fins (4). The airfoil blades (3) harness wind energy during upwind through their lift force, while movable fins (4) are able to move pivotally on shafts (2) that expose the least surface area during upwind and the largest surface area during downwind, thus generating very high rotor's rotational torque. The present invention can be used as vertical and horizontal axis for electrical power generation and mechanical works.

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Declarations under Rule 4.17:

— *as to the identity of the inventor (Rule 4.17(i))*

— *as to applicant's entitlement to apply for and be granted a patent (Rule 4.17(ii))*

— *as to the applicant's entitlement to claim the priority of the earlier application (Rule 4.17(iii))*

— *of inventorship (Rule 4.17(iv))*

Published:

— *with international search report (Art. 21(3))*

Description

Title of Invention: A WIND TURBINE

Technical Field

[1] The presented invention relates to a wind turbine that converts wind energy into electrical energy.

Background Art

[2] Wind turbines have been long used in human civilization for agricultural grinding stones and water pumping applications. Modern wind turbines are widely used for electrical power generation. There are two types of wind turbines, horizontal axis wind turbine (HAWT) and vertical axis wind turbine (VAWT). Wind turbines whose rotor shafts are parallel or horizontal in respect to the ground plane are termed HAWT, while wind turbines whose rotor shafts are perpendicular or vertical in respect to the ground plane are termed VAWT. For vertical axis wind devices, there are many patents based on aerodynamic drag and lift principles that were pioneered by S. J. Savonius (1922) and G. J. M. Darrieus (1931) US patent no. 1,835,018 respectively. However, such devices are typically limited to low wind speed for drag type and to high wind speed for lift type.

[3] There are attempts to produce a wind device that combines both the aerodynamic drag and lift principles. One of the mentioned attempts literally combines Savonius and Darrieus turbines on a single rotor where the very much smaller Savonius turbine is placed inside the Darrieus turbine and acts as the starter for the 'egg-beater' Darrieus turbine which extends far beyond the Savonius turbine from the rotor shaft. Although such device is able to improve the performance at low wind speed, it suffers from the lower efficiency at high wind speed.

[4] Another prior art by Goncalves Da Silva (1989) was a VAWT consisted of four sets of pivoted vertical flaps which are supported by straight frames. However, the prior art had disadvantages including lower efficiency due to only utilizing aerodynamic drag principle and straight frames constituting to torque irregularity. The invention lacked helical airfoil blades which are crucial in improving rotational power, i.e. efficiency of the turbine and regulating torque uniformity during the rotation.

Disclosure of Invention

Technical Problem

Summary of The Invention

[5] According to one aspect of the present invention, the present invention provides a wind turbine comprising: a rotor (1); a generator (6) attached to the rotor (1) on a tower assembly (5); a plurality of fins (4) attached to the rotor (1) where one end of the fins (4) are attached; characterized in that at least two helically-shaped airfoil blades (3) attached to the rotor (1) by a shaft (2) which connected perpendicularly to the rotor, the another end of the fins attached at the helically-shaped airfoil blades, forming a

helical-shaped wind turbine. The above provision is advantageous as the helical-shaped airfoil blades improves rotational power, i.e. efficiency of the turbine and regulating torque uniformity during the rotation. The present invention also provides a wind turbine that performs well in both situations, low and high wind speed. The present invention performs better than the HAWT in turbulent and frequently changing wind direction. In addition, it also performs better than other prior VAWT in respect to efficiency in low wind velocity.

[6] Preferably, the plurality of fins (4) are pivoted to the rotor (1) and the airfoil blades (3), which make the plurality of fins (4) movable.

[7] Preferably, the plurality of fins (4) are equipped with spring or soft padding to reduce impact noise.

[8] Preferably, the plurality of fins (4) having bearings.

[9] Preferably, the movements of the plurality of fins (3) are controlled mechanically or electronically.

[10] Preferably, the ends of the airfoil blades (3) are covered with plates to reduce vortices formed by the airfoil blades.

Brief Description of Drawings

[11] **Figure 1** illustrates a plurality of views of one embodiment of a wind turbine of the present invention.

[12]

[13] DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENT

[14] Generally, the present invention relates to a wind turbine comprising: a rotor (1); a generator (6) attached to the rotor (1) on a tower assembly (5); a plurality of fins (4) attached to the rotor (1) where one end of the fins (4) are attached; characterized in that at least two helically-shaped airfoil blades (3) attached to the rotor (1) by a shaft (2) which connected perpendicularly to the rotor, the another end of the fins attached at the helically-shaped airfoil blades, forming a helical-shaped wind turbine.

[15] Referring to Figure 1, the present invention comprising a rotating rotor (1) attached to the generator (6) on the tower assembly (5) with at least two helically shaped airfoil blades (3), each blade joins to a single or a plurality of fins (4) that are attached to perpendicularly positioned shafts (2) in respect to the rotor (1). The present invention has movable horizontal fins (4) in respect to the ground plane that pivot about the shafts (2) of the fins (4). The plurality of fins (4) are thin plates which act as wind collecting surface that are movable about a point or axis. The fins pivotal axis are perpendicular to rotor axis. The cross-sectional area of the fins (4) may be of plates, airfoil or other shapes, while the surface area of the fins (4) may be rectangular, circular or other shapes. The fins (4) are made flat or curved. The fins (4) cover area and position can be adjusted as desired. The fins (4) can be made to have bearing or without bearing. Preferably, the fins (4) are equipped with spring or soft padding to reduce impact noise. The fins (4) movement can be mechanical or electronically controlled. The fins

shafts (2) can be made of string, rod or hollow tube.

[16] The fins (4) during upwind move into in-line position with the wind thus exposing the least area to the incoming wind, while during downwind they move into perpendicular position to the wind thus exposing the largest area to the incoming wind, which results in a very high rotor torque generated by a drag type wind device. In addition, airfoil blades (3) enhance the rotor torque by harnessing wind energy during upwind due to lift force generated by the airfoil. Furthermore, helically-shaped airfoil blades (3) improve torque uniformity throughout the turbine rotation. There are at least two airfoil blades (3) assembled in the present invention. An airfoil blade (3) is a structure which produces lifting effect similar to that of an airfoil. The airfoil blades (3) can be made straight, helical or curved. The airfoil blades (3) can be made symmetrical, asymmetrical, thin foil and flat plate/sheet. Additional airfoil blades can be added to improve the performance of the turbine, but not limited to, such as upper and lower blades to improve structural strength and lifting effect in order to reduce axial load on turbine's bearing mechanism. The airfoil blades (3) length can be extended as desired to be longer than the fins coverage area. The ends of the airfoil blades (3) can be covered by plates in order to reduce the vortices formed by the blades (3).

[17] Although the present invention is categorized as VAWT, but it can be mounted as horizontal axis (HAWT) as well, and in fact, it can be mounted diagonally as well.

[18] The present invention configured to capture wind energy for electrical power generation and mechanical work, but not limited to, such as in water pumping, grinding stones, seawater desalination and hydrogen production applications.

[19] Although the invention has been described with reference to particular embodiment, it is to be understood that the embodiment is merely illustrative of the principles and applications of the present invention. It is therefore to be understood that numerous modifications may be made to the illustrative embodiment that other arrangements may be devised without departing from the scope of the present invention as defined by the appended claims.

Claims

[Claim 1] 1. A wind turbine comprising:
a rotor (1);
a generator (6) attached to the rotor (1) on a tower assembly (5);
a plurality of fins (4) attached to the rotor (1) where one end of the fins (4) are attached;
characterized in that
at least two helically-shaped airfoil blades (3) attached to the rotor (1) by a shaft (2) which connected perpendicularly to the rotor, the another end of the fins attached at the helically-shaped airfoil blades, forming a helical-shaped wind turbine.

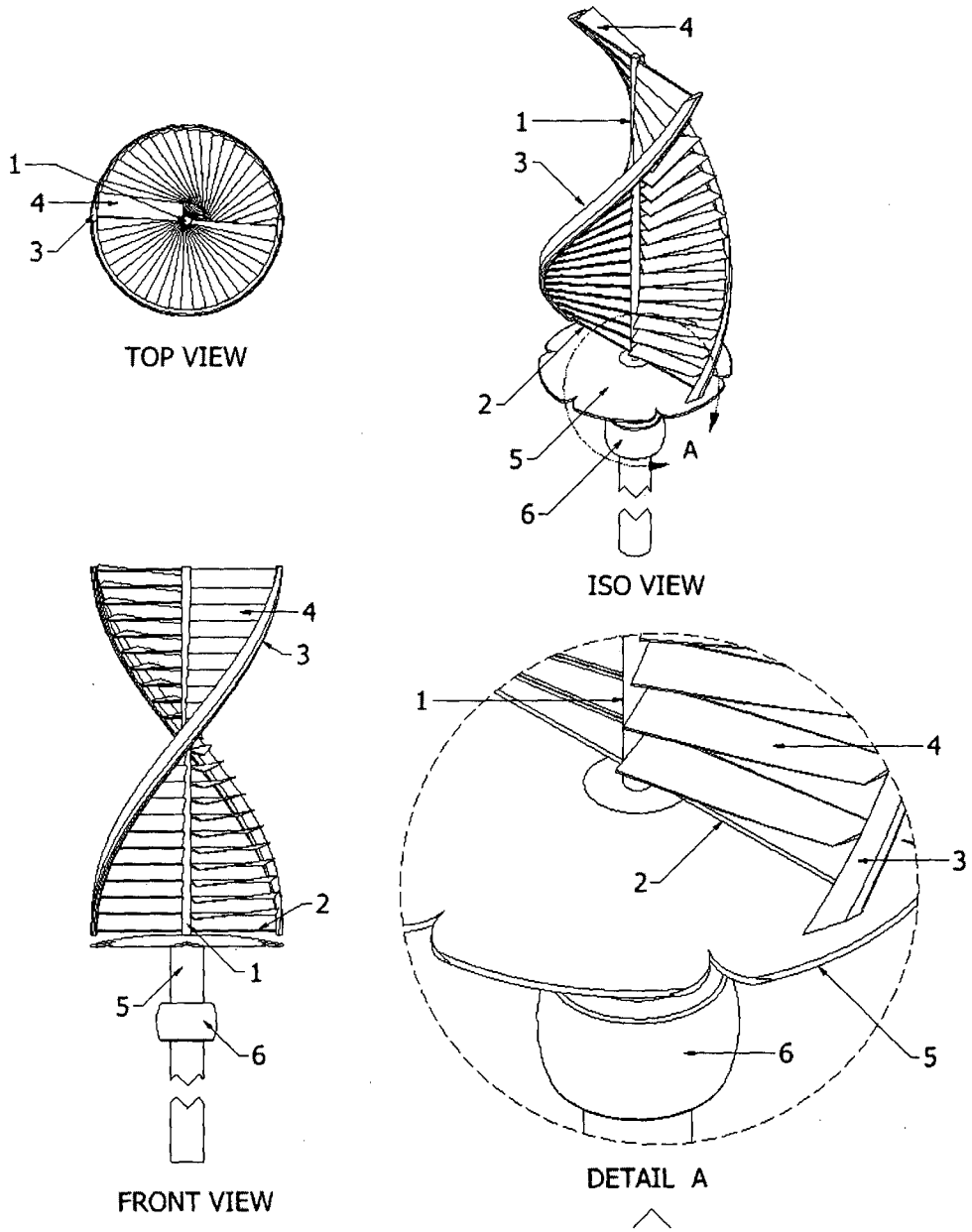
[Claim 2] 2. A wind turbine as claimed in Claim 1, wherein the plurality of fins (4) are pivoted to the rotor (1) and the airfoil blades (3), which make the plurality of fins movable.

[Claim 3] 3. A wind turbine as claimed in Claim 1 or Claim 2, wherein the plurality of fins (4) are equipped with spring or soft padding to reduce impact noise.

[Claim 4] 4. A wind turbine as claimed in Claim 1, wherein the plurality of fins (4) having bearings.

[Claim 5] 5. A wind turbine as claimed in Claim 1, wherein the movement of the plurality of fins (4) are controlled mechanically or electronically.

[Claim 6] 6. A wind turbine as claimed in Claim 1, wherein the ends of the airfoil blades (3) are covered with plates to reduce vortices formed by the airfoil blades.


1
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TOP VIEW
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ISO VIEW
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FRONT VIEW
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DETAIL A

Figure 1

INTERNATIONAL SEARCH REPORT

International application No.
PCT/MY2012/000216

A. CLASSIFICATION OF SUBJECT MATTER

F03D 3/00(2006.01)i, F03D 3/06(2006.01)i, F03D 11/00(2006.01)i

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

F03D 3/00; F03D 3/04; F03D 1/06; F03D 11/04; B23P 11/00; F03D 3/06; F03D 9/00; F03D 1/00

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Korean utility models and applications for utility models

Japanese utility models and applications for utility models

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

eKOMPASS(KIPO internal) & keywords: wind, turbine, helix, helical, blade, rotor, pivot, rotate

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X Y A	US 2011-0150652 A1 (COSBY et al.) 23 June 2011 See abstract, paragraphs [0030],[0032],[0033],[0037],[0041]; figures 2-8.	1,4,5 6 2,3
Y A	EP 1413748 A1 (DIXI HOLDING B.V.) 28 April 2004 See abstract, paragraph [0022]; figures 1,2.	6 1-5
A	WO 2011-001401 A1 (TEMBE, ANAND VISHWANATH) 06 January 2011 See abstract, page 5, lines 9-15, 21-24; figure 1.	1-6
A	US 2008-0191487 A1 (MORGAN et al.) 14 August 2008 See abstract, paragraphs [0020],[0022],[0023]-[0025]; figures 1-5,8.	1-6
A	US 2009-0129928 A1 (SAUER et al.) 21 May 2009 See abstract, paragraph [0042]; figures 1,4.	1-6
A	US 4,427,343 A (FOSDICK, GEORGE) 24 January 1984 See abstract, column 3, lines 52-59; figures 1,2.	1-6

☐ Further documents are listed in the continuation of Box C.

☒ See patent family annex.

* Special categories of cited documents:

"A" document defining the general state of the art which is not considered to be of particular relevance

"E" earlier application or patent but published on or after the international filing date

"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of citation or other special reason (as specified)

"O" document referring to an oral disclosure, use, exhibition or other means

"P" document published prior to the international filing date but later than the priority date claimed

"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents,such combination being obvious to a person skilled in the art

"&" document member of the same patent family

Date of the actual completion of the international search	Date of mailing of the international search report
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Form PCT/ISA/210 (second sheet) (July 2009)

INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No.

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