FORM 2

THE PATENT ACT 1970

(39 OF 1970)

AND

The patent rules, 2003

COMPLETE SPECIFICATION

(See section 10: rule 13)

TITLE OF INVENTION

Vertical windmill

APPLICANTS

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PREAMBLE TO THE DESCRIPTION

COMPLETE

Following specification particularly describes the invention and the manner in which it is to be performed.

DESCRIPTION

Technical field of invention

This invention generally relates to windmill for generating power when subjected to wind force and specifically for a self starting, Omni directional vertical windmill.

BACKGROUND OF THE INVENTION

A horizontal axis windmill has the disadvantage that the vane assembly needs to be oriented into the wind means in horizontal direction and thus in an area subject to gusting and changing wind direction, thus needs a wind direction sensing and control by means of a rudder else will result in lost output and further may need an extra mechanism to transmit horizontal plane torque in to vertical plane torque to drive load. However, a vertical axis windmill does not need to have its vane assembly oriented into the wind and will respond to wind pressure, regardless of wind direction.

Various vertical axis windmills are known such as the Savonius, which has a low efficiency due to higher drag. Darrieus has the disadvantage of not being a self starting and complex blade profile. In the Panomone vertical axis windmill, a number of paddles are hinged in a vertical direction to lever arms which are free to move in horizontal plane around a vertical axial rod. The paddles are hinged to the lever arm in such a manner that if the wind blows in one direction, each lifts against the wind presenting only its edge to the wind. If, however, the wind blows in the opposite direction, the paddle remains in vertical position and the paddle moves in a horizontal plane under the force of the wind. Thus, for half a revolution, each paddle falls until its full surface is presented to the wind. The advantage of this windmill that it will respond to all wind directions however, its operation depends upon centrifugal force.

US Patent 4566853 comprises a vertical axis windmill with a plurality of horizontal arms mounted on vertical rotatable shaft comprising plurality of hinged blades mounted at the end of the said arm member at desired horizontal tilt and vertical pitch angles. The advantage of this windmill that it will respond to all wind directions but its effective operation depends on centrifugal force caused due the speed of rotation.

US Patent 4776762 comprises plurality of vertical aerofoil rotatably mounted at certain radius with respect to the central rotating shaft and the diametrically opposite foils are coupled by means of pulley and cable such that while one foil faces the wind force the other does not. However, the mechanism is complex.

US 6242818: A vertical wind turbine with over speed protection comprising movable foils.

Hence there was a long felt need in the art to have such a windmill which is self starting, Omni- directional, smooth uniform torque, without drag, simple in construction, stackable, free from centrifugal actuation, cost economical, and able to be fabricated from easily available raw material like wood and bamboo.

Object:

1. Primary object of the present invention is to device a novel vertical windmill which is self starting,
2. Another object of the present invention is to device a windmill which is Omni directional,
3. Another object of the present invention is to device a windmill having no drag,
4. Another object of the present invention is to device a windmill having smooth uniform output torque,

5. Another object of the present invention wherein the output torque be enhanced by plurality of vanes mounted on vertical rotatable shaft,
6. Still another object of the present invention is to provide a vertical windmill to drive loads like water pump, floor mill, electrical generator, aeration of water treatment plant, aeration of fish pond,
7. Still another object of the present invention is to provide the driven machinery at lower end, thereby rendering easy accessibility and maintenance.

Other objects, features, and advantages will become apparent from detail description and appended claims to those skilled in art.

STATEMENT

According to the present invention, the vertical windmill comprising a rotatable upright vertical shaft; a plurality of horizontal arms rotatably mounted in substantially horizontal plane about said upright shaft; and a plurality of vanes preferably two in number and being rigidly coupled to the opposite free ends of the said arm and further mounted such that they hang downward by gravity and the angle of tilt between the said vanes preferably being a right angle and the said arm and the said coupled vanes thus forming a vane assembly and the said vane assembly swivels in the mounting in substantially horizontal plane about said upright shaft preferably through a right angle, means the degree of freedom, with reference to the axis of the said swivel angle of the said arm and that the degree of freedom means swivel angle being restricted by an arm stopper suitably provided on the said upright shaft and the said arm stopper allowing the swivel angle of the said coupled vanes, such that when the said vane assembly being subjected to wind force first vane aligns in the direction of wind, means become oriented in horizontal plane thus offering no drag while simultaneously the second vane subjected to full wind force means the orientation of said vane becomes vertical downward plane depending upon the relative direction of

oncoming wind, thus vertically oriented vane transferring the torque to the said vertical shaft during first half rotation and while during the remaining half rotation, the second vane aligns in direction of wind whereas the first vane oriented in vertical plane thus subjected to full wind force and in this manner the cycle being repeated thereafter converting horizontal wind force into rotating torque which being transferred to vertical rotatable shaft; and a vertical windmill comprising vane assembly wherein the shape of the vane preferably being in the form of a square, rectangle, a circular, elliptical, triangle, bowl, or cylindrical and the said vertical windmill comprising plurality of vanes being made up of aluminum, fiber glass, synthetic plastic, plywood sheet, bamboo mat and the said vertical windmill comprising plurality of said vane assemblies successively mounted over each other on the axis of the said vertical shaft rotatably mounted to swivel substantially in horizontal plane and the angle of pitch between the arm of said successive plurality of said vane assembly being preferably equal to 180^0 /n, where n is equal to number of said vane assembly and a vertical windmill comprising a vertical shaft rotatably mounted freely through antifriction support on a fixed structure thereby providing power to coupled load , whereby wind acting on the windmill causes one of the vanes. of each said first vane assembly, offering maximum surface to wind force whereas the remaining vane offering only its edge to the wind thereby for half a rotation and thereafter during the remaining half rotation the remaining vane facing the wind force thereby offering maximum surface to wind force whereas the said first vane now offering only its edge offering negligible resistance, resulting in net unidirectional torque and and further plurality of vane assembly mounted over each other on the said axis of the said vertical shaft at said pitch angle developing said unidirectional torque and in this manner the plurality of said vane assembly developing additive unidirectional smooth torque thereby rendering the said vertical windmill self-starting and Omni-directional

BRIEF DESCRIPTION OF THE DRAWINGS:

The present invention is further illustrated in the accompanying drawings, in which:

Figure-1a, Figure-1b shows the elevation and plan of vane assembly in accordance with the present invention;

Figure-2a, Figure-2b show the principle of operation with respect to relative position of vanes with respect to wind direction during its half rotation in accordance with the present invention and Figure-2c, Figure-2d show the principle of operation with respect to relative position of vanes with respect to wind direction during its remaining half rotation in accordance with the present invention ;

Figure-3a, Figure-3b show the plan and elevation of the windmill respectively with two vane assembly as in Figure-1a and Figure-1b in accordance with the present invention;

Figure-4 shows the elevation of the windmill with plurality of vane assembly respectively as in Figure-1a and Figure-1b in accordance with the present invention;

DESCRIPTION OF THE REFERRED EMBODIMENT

Figure-1a and Figure-1b show a windmill vane assembly in accordance with the present invention comprises an arm 103, centrally placed with respect to central line of shaft 104. A vane 101 is rigidly fixed to one end of arm 103 and another vane 102 is rigidly fixed to remaining end of the arm 103 such that the angle 105 between the vane 101 and 102 with respect to centre of axis of the arm 103 is preferably right angle. The vane assembly arm 103 is rotatably and centrally mounted on a substantially vertical shaft 111 bearing hole (not shown) such that the vane assembly arm 111 can rotate within an angle 107 preferably through 90^0 in horizontal plane by the help of a stopper 110

Figure-2a, Figure-2b show the operation of the windmill during half rotation wherein the said vane assembly is subjected to wind pressure in the direction 217, vane 201 forced to turns by the force of the wind so as to align against means in vertical plane, wherein further rotation being prevented by stopper 110, such that its entire surface of vane 201 takes on the wind force to develop the torque whereas vane 202 gets aligned along the direction of the wind to offer least resistance to the wind force and further vane 202 being rigidly coupled to rotating vane 201 through arm 103 also turns and both these torque being additive orients vane 202 in horizontal plane thereby offering least resistance to wind force during the half rotation of shaft 111. Figure-2c, Figure-2d show the operation of the windmill during remaining half rotation wherein the said vane assembly is subjected to wind pressure in the direction 217, and now vane 202 forced to turns against by the force of the wind so as to align in vertical plane, wherein further rotation being prevented by stopper 110, such that its entire surface of vane 202 takes on the wind force to develop the torque whereas vane 201 gets aligned along the direction of the wind to offer least resistance to the wind force and further vane 202 being rigidly coupled to rotating vane 201 through arm 103 also turns and both these torque being additive orients vane 202 in horizontal plane thereby offering least resistance to wind force during remaining half rotation of shaft 111 and thereby completing one full rotation and developing unidirectional torque to rotate shaft 111 continuously.

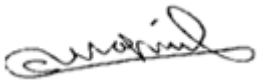
Figure-3a, Figure-3b show the windmill in accordance with the present invention comprising a substantially horizontal foundation 312, attached to a suitable elevated structure, grouted preferably to ground and placed in an unrestricted to wind flow region (not shown), on which a bearing 313 is provided for rotatably mounted on substantially vertical shaft 311. The vane assembly comprising an arm 303, vane 301 and vane 302, as described in Figure-1a and 1b, rotatably mounted in a horizontal bearing 305 whereas the said bearing is placed in a suitable hole provided on vertical shaft 311. A stopper mechanism preferably in the form of a structure 304 is provide to restrict overturning of vane 301 and vane

302 beyond right angle and plurality of vane assembly comprising an arm 308, vane 306 and vane 307, as described in Figure-1a and 1b rotatably mounted in a horizontal bearing 309 angularly placed preferably at right angle to bearing 305 with respect to vertical axis 315, whereas the said bearing is placed in a suitable hole provided on vertical shaft 311 at a suitable vertical distance. A stopper mechanism preferably in the form of a structure 410 is provide to restrict overturning of vane 307 and vane 308 beyond right angle.

Figure-4 shows another embodiment of the windmill in accordance with the present invention comprising plurality of windmill assembly 401, 402,..,409,410 as described in Figure-3a, Figure-3b mounted axially, and angularly rotated by suitable angle and placed vertically on vertical shaft 411 such that the said suitable angle for 'n' number of vane assemblies between two successive arms =180/n.

Additional advantages and modification will readily occur to those skilled in art. Therefore, the invention in its broader aspect is not limited to specific details and representative embodiments shown and described herein. Accordingly various modifications may be made without departing from the spirit or scope of the general invention concept as defined by the appended claims and their equivalents.

Dated this 03rd day of Dec 2018



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CLAIMS

We claim:-

1. Vertical windmill comprising an upright vertical shaft;
   a plurality of horizontal arms (103) rotatably mounted in substantially horizontal plane about said upright shaft (111);
   a plurality of vanes (101, 102) preferably two in number, preferably hanging downward due to gravity, and rigidly fixed to the opposite free ends of the said arm and the angle of tilt between the said vanes preferably being a right angle thus forming a vane couple;
   and the said arm and the said vane couple thereby forming a vane assembly;
   and the said vane assembly (101, 102, and 103) swivels in the mounting in substantially horizontal plane about said upright shaft (111);
   and degree of freedom of the swivel angle of the said vane assembly restricted preferably to a right angle with reference to the axis of the said arm (103) by an arm stopper (110) provided on the said upright shaft (111);
   and the said arm stopper (110) allowing the said coupled vanes either in substantially horizontal or in vertical position means when one vane becoming substantially in vertically downward plane then concurrently the remaining vane becoming substantially in horizontal plane and vice the versa.

2. A vertical windmill according to claim 1 comprising vane assembly wherein the shape of the said vane preferably being in the shape of square, rectangle, a circular, elliptical, bowl, truncated cylinder .

3. A vertical windmill according to claim 1, claim 2 comprising plurality of vanes being made up of aluminum, fiber glass, synthetic plastic, plywood sheet, bamboo mat or a light material sheet.

4. A vertical windmill according to claim 1, claim 2, claim 3 comprising plurality of said vane assemblies successively mounted, to swivel substantially in horizontal plane, over each other on the axis of the said common vertical shaft rotatably mounted on a grouted structure; and the angle of pitch between the said arm of said successive vane assembly being preferably equal to 180^0 /n, where 'n' being equal to number of said vane assemblies.

5. A vertical windmill according to claim 1, claim 2, claim 3, and claim 4 comprising a common vertical shaft rotatably mounted on a grouted structure thereby providing power to coupled load ;
   such that when the said vane assembly being subjected to wind force the first vane aligns in the direction of wind means oriented in horizontal plane, thus offering no drag, whereas the second vane subjected to full wind force, means being oriented in vertical plane, means thus forced to rotate in the direction of wind and during further rotation the second vane aligns in the direction of wind means oriented in horizontal plane, thus offering no drag, whereas the first vane subjected to full wind force, means being oriented in vertical plane, means thus forced to rotate in the direction of wind and the action thus being repeated thereafter; thus transferring the torque to the said common vertical shaft; and further plurality of vane assembly (401, 402, 409, 410) mounted over each other on the said axis of the said vertical shaft (411) at said pitch angle developing said unidirectional torque and in this manner the plurality of said vane assembly developing additive unidirectional smooth torque thereby rendering the said vertical windmill a drag free, self-starting and Omni-directional with uniform torque.

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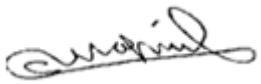

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Ingole Vijay Tulshiram

Ingole Indira Vijay Sheet 3/1

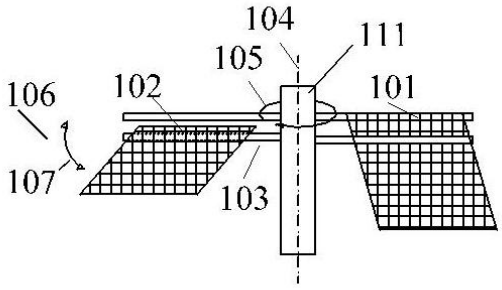

Figure-1a

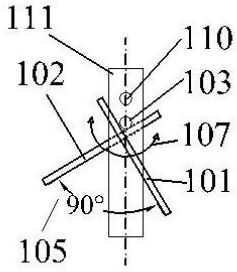

Figure-1b

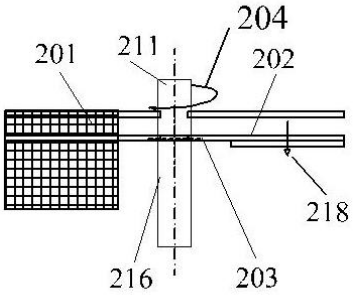

Figure-2a

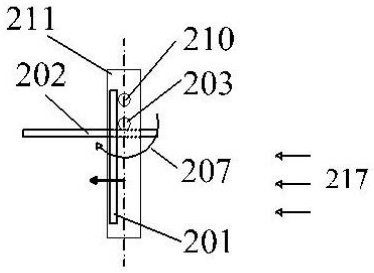

Figure-2b

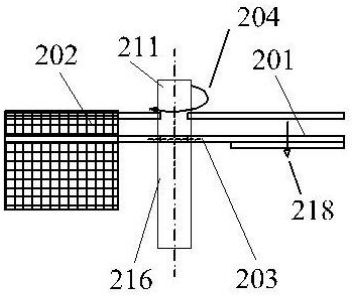

Figure-2 c

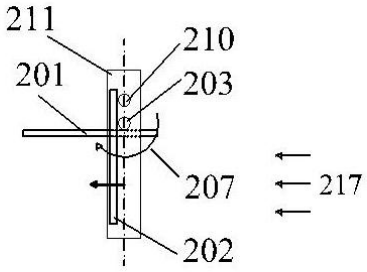

Figure-2 d

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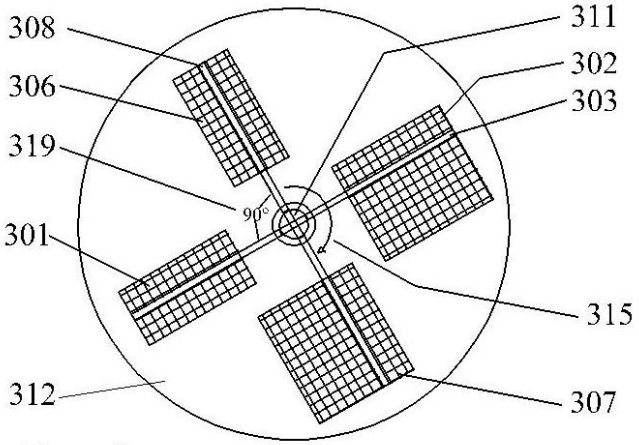

Figure-3a

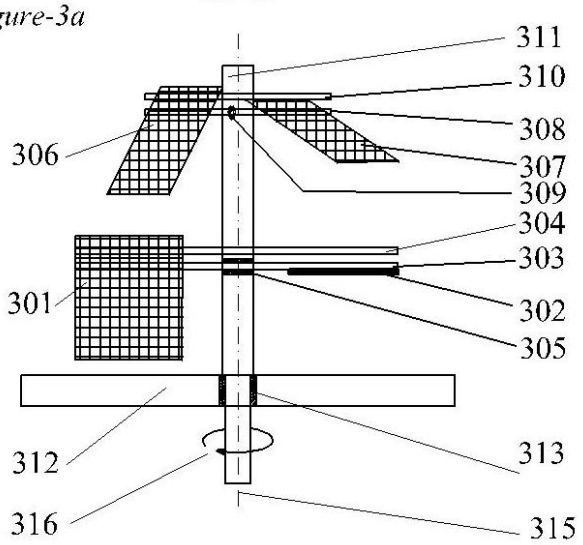

Figure-3b

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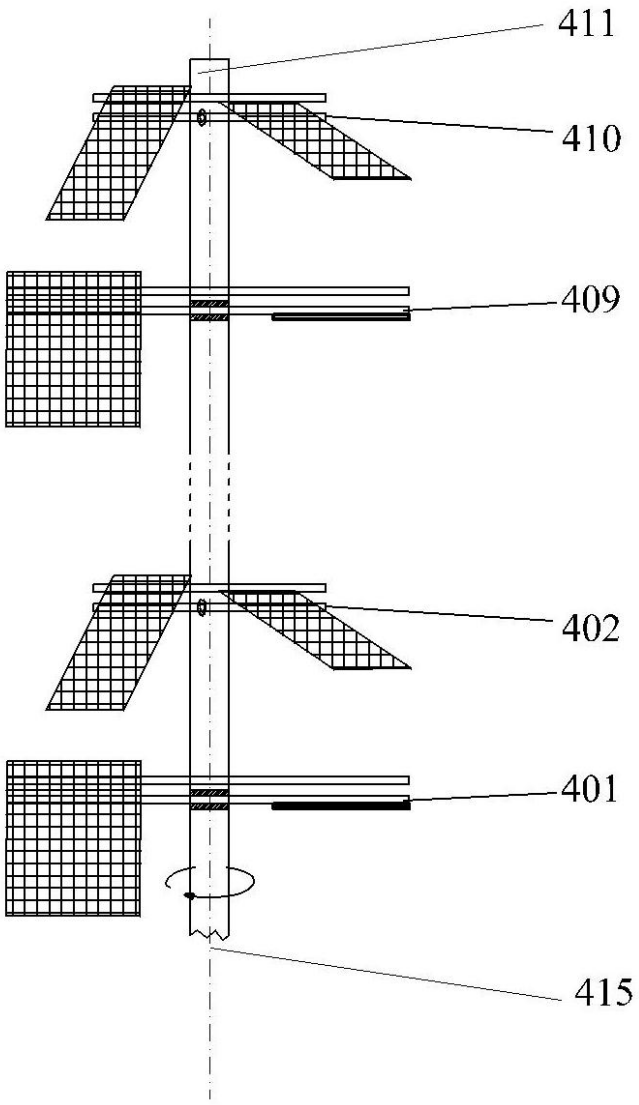

Figure-4

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ABSTRACT

The present invention relates to vertical windmill comprising an upright vertical shaft; a plurality of horizontal arms rotatably mounted in substantially horizontal plane about said upright shaft; a plurality of vanes preferably two in number being coupled to the opposite free ends of the said arm and the angle of tilt between the said vanes preferably being a right angle; the said arm and the said coupled vanes thus forming a vane assembly; the said vane assembly swivels in the mounting in substantially horizontal plane about said upright shaft; degree of rotation means swivel angle of the said vane assembly restricted preferably to a right angle with reference to the axis of the said arm; the said swivel angle accomplished by an arm stopper provided on the said upright shaft; and the said arm stopper allowing the said coupled vanes either in substantially horizontal or vertical position means when one vane becoming substantially in vertically down position then concurrently the remaining vane becoming substantially in horizontal position and vice the versa. Following invention is described in detail with the help of Figure-1a and Figure-1b show a windmill vane assembly.

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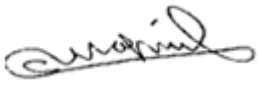

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