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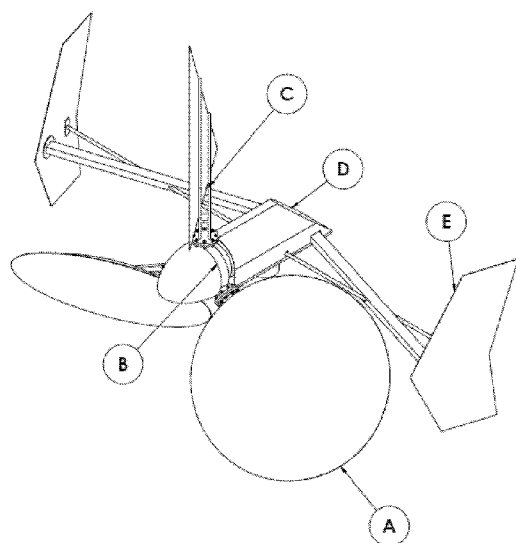


FIGURE 2

(57) Abstract: An adaptable disc turbine assembly comprising: disc shaped concave blades (A) configured to harness wind by angular displacement of a connected turbine by virtue of movement of said blades (A), with respect to a central hub (B); said central hub (B), mounted on a central shaft, configured to be connected to said disc shaped concave blades (A) by means of a mounting structure (C), said central hub (B) being angularly displaceable along with said discs (A) as wind blows, thereby; and a Mounting Structure (C), per blade (A), configured to connect said corresponding blade (A) to said central hub (B), said mounting structure (C) being configured to ensure that each disc (A) is at a pre-defined angle (F) with respect to a central axis (X-X), said central axis being an operative horizontal axis passing through a centre of said central hub (B).

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ADAPTABLE DISC TURBINE ASSEMBLY

FIELD OF THE INVENTION:

This invention relates to the field of renewable energy.

Particularly, this invention relates to wind energy and hybrid energy generating systems.

Specifically, this invention relates to an adaptable disc turbine assembly.

BACKGROUND OF THE INVENTION AND PRIOR ART:

The first known wind turbines were produced around 20th century for production of electrical energy. They were first built in Scotland with the help of cloth fibre and accumulators were used to store electrical energy in chemical form; which was later used for lightning process.

A 'wind belt' is a wind power harvesting device invented by Shawn Frayn for converting wind power to electricity. It consists of a flexible polymer ribbon stretched between supports along the wind direction, with magnets attached to it at its end section. When wind flows across it, the ribbon vibrates due to aero-elastic flutter. The vibrating movement of the magnets induces current in nearby pickup coils by electromagnetic induction.

The inventor was inspired by noticing the movement of spectacular Tacoma Narrow bridge collapse in 1940. The bridge collapsed due to a destructive phenomenon called aero-elastic flutter. As the speed of wind increases, there may be a point at which the structural damping is insufficient to damp out the motions

which are increasing due to aerodynamic energy being added to the structure. This vibration can cause structural failure and therefore, considering flutter characteristics is an essential part of designing any structure. This is the phenomenon that is being used in the Wind Belt for causing oscillatory motion of the band which has magnets attached at the corners and thus inducing an electric current in the coil placed nearby.

A key component of this design is a taut membrane of Mylar coated taffeta, which vibrates as the wind flows over it, triggered by air flow. This up and down movement is caused by the variation of wind flow above and below the foil, which also causes vertices to form and keep the membrane oscillating.

The disadvantage of this design is the fact that it could work effectively for a specific wind velocity and the output lowers significantly if the speed changes over the course of time.

The current capacity of a wind belt to produce electrical output is very limited to only about some milli-watts and hence cannot be implemented on a large scale.

Another factor that contributes to the difficulty in implementation of this design is that the structure itself is not very rigid and the cost per watt for producing energy is quite high.

Another prior art turbine is a Vortex Wind Turbine.

A Spanish startup 'Vortex Bladeless' has developed turbines that harness vortices, the spinning motion of air or other fluids. When wind passes one of the cylindrical turbines, it shears off the downwind side of the cylinder in a spinning whirlpool or vortex. That vortex then exerts a force on the cylinder, causing it to vibrate. The

kinetic energy of the oscillating cylinder is converted to electricity through a linear generator. The linear generator consists of an oscillating member which is attached to a rack and pinion mechanism to convert oscillatory motion into circular motion of the pinion which is then coupled with a generator to produce electricity.

Another prior art turbine is a Hummingbird Wind Turbine.

Developed by Tyer Wind, the turbine is equipped with a pair of flapping wings that are over five feet long and move in a figure-eight motion — just as a hummingbird flaps its wings while hovering.

The design allows the turbines to generate energy on both the upstroke and the down stroke. The firm designed the wings to capture energy from the wind and send it to a spinning axle inside the turbine housing, which serves as the moving agent in the turbine. It is different from other wind turbines, as it converts linear motion into a circular motion or figure-eight pattern. The firm currently has a test turbine installed in a remote area and is capable of producing 1kW of power.

The wings were designed using carbon fiber and are each 5.25 feet long — flapping together takes up about 12 square feet of space. It also produces less noise pollution and could possibly be less hazardous for birds, as they may even mistake it for another bird.

However, the test turbine is not generating as much energy as a similarly sized wind turbine should and research is still going on for improving the design.

Some of the challenges faced by these prior art designs are reduced output than conventional designs.

Additionally, complex designing leading to increased production cost.

Moreover, an actual scale model is not yet built to prove the efficiency of this prior art device. Power production reduces exponentially when wind velocity decreases.

Another prior art turbine is an Invelox Power turbine.

In this type of turbine, wind from any direction can be captured and then using a specific structure, it can increase speed of the captured wind and then direct it towards a conventional wind turbine.

Wind is captured at the top of the funnel shaped INVELOX system. In this prior art design, the omni-directional intake area allows wind collection from any direction then, the wind is funneled through the system which concentrates and further accelerates in a chamber of decreasing and then uniformly increasing area using the Venturi effect.

The Venturi effect is a phenomenon that occurs when a fluid that is flowing through a pipe is forced through a narrow section, resulting in a pressure decrease and a velocity increase. Wind is delivered to turbine / generators to convert the accelerated wind to electrical power. INVELOX is the first single wind tower capable of powering multiple turbines in a row or series. A diffuser section returns wind to nature. Sheer Wind's INVELOX is a solution that utilizes current wind power turbines and rotors but brings them to ground level for easier, safer, and cheaper operation and maintenance. Multiple turbines can be used in a row or series increasing output exponentially for each tower.

The major drawbacks for this prior art are:

- The construction of a complex shaped tower is difficult and expensive.
- It cannot be implemented in cities as the tall buildings might block surface winds.
- The design is implemented to utilize the wind flow near the surface as there are practical limitations on the height of the tower that can be constructed, thus the advantage of high altitude winds cannot be obtained.
- The overall design is quite bulky as compared to the existing bladed turbine.

- Whenever the direction of wind is changed inside the venturi section there is a major loss in power

Another prior art turbine is a Saphonian Wind Turbine.

A Tunisian company Saphon Energy created a bladeless wind turbine which draws inspiration from the design of a ship's sails, and promises to convert kinetic energy of wind into electricity at up to double the efficiency of a typical wind turbine. The Saphonian turbine implements a patented system called "Zero-Blade Technology" in order to harness the wind's energy. This is said to involve channeling the wind in a back and forth motion, until it is converted into mechanical energy using pistons. The pistons then produce hydraulic pressure, which can be instantly converted to electricity via a hydraulic motor and a generator, or stored in a hydraulic accumulator.

Drawbacks of this prior art design:

- It causes a slight wobbling effect when in operation, but that could be minimized by various vibration isolation materials.
- It is difficult to produce large scale disc blades which would retain their shape in high velocity wind. Currently there is no full scale model to test the hypothesis of the energy generation.

Another prior art turbine is a Wind Multiplier Turbine

This concept proposes to use similar technology as fans in a wind turbine in which the turbine is held at the base of windmill housing and is encapsulated except for slits that allow it to expel air. Air entering the annular ring at the top of the windmill is collected into the stem of the windmill and forced down to turn the turbine which powers a generator.

The Dyson airfoil technology may be used to accelerate the air into the stem housing of the windmill by directing the air around airfoils such that additional air and pressure can be directed to the turbine to enhance its operation. Like the Dyson fan, the annular ring contains no spinning blades and will be safe for birds to fly through. The windmill can be developed for use wherever windmills are used. Initially, smaller windmills might have the annular ring made of composite materials. Larger bladeless windmills can be made of bolted plates.

Major challenges of this prior art are:

- The amount of air that is being trapped is only limited to the area of the rim from where the wind is accumulated.
- The diameter of the cylindrical section will be equal to the blade diameter and hence the amount of space consumed will be relatively more.

Currently, there is no available evidence of the working of this prior art system as no prototype has been designed.

Due to structural difficulties it is not possible to construct tall towers and high velocity winds at higher altitudes cannot be captured.

Therefore, from the present wind mills, it is evident that due to non regulation of flow of air to the turbines the wind mills are less efficient. Thus, it proves costly to operate, and thus the present invention is provided with a disc system to regulate flow of air to turbines so it becomes more efficient.

OBJECTS OF THE INVENTION:

An object of the invention is to provide a system for converting kinetic energy from wind into rotational mechanical energy and then into electrical energy.

Another object of the present invention is to provide an effective and improved system for a wind turbine system.

Yet another object of the present invention is to provide an alternate system to present blades of the windmill.

Still another object the present invention is to provide specially designed discs for windmill for capturing the wind power in a completely different way and produce maximum power.

An additional object of the present invention is to provide an adaptable disc system for wind mill which is based on maximum interception of wind and not the flow concept as per the conventional design.

Still an additional object of the present invention is to provide alternative to blades of the present wind mill with a disc system which adapts to real time wind conditions.

Yet another additional object of the present invention is to provide a disc system, for wind-based electricity generation, which has the ability to intercept low speed wind from a mountain plateau or a sea coast.

SUMMARY OF THE INVENTION:

According to this invention, there is provided an adaptable disc turbine assembly comprising:

- disc shaped concave blades configured to harness / capture wind energy and, whilst harnessing, converting kinetic energy of the wind into rotational energy by

angular displacement of a connected turbine by virtue of movement of said blades, with respect to a central hub and, finally, into electrical energy;

- said central hub, mounted on a central shaft, configured to be connected to said disc shaped concave blades by means of a mounting structure, said central hub being angularly displaceable along with said discs as wind blows, thereby, producing a lift force on said blades, a tangential component of said lift force in the direction of angular displacement being responsible for producing torque required for generating said electrical energy; and
- a Mounting Structure, per blade, configured to connect said corresponding blade to said central hub, said mounting structure being configured to ensure that each disc is at a pre-defined angle with respect to a central axis, said central axis being an operative horizontal axis passing through a centre of said central hub.

In at least an embodiment, said blade is a conical disc.

In at least an embodiment, said blade is a disc with a shape configured to offer high value of drag coefficient which offers high starting torque when exposed to wind.

In at least an embodiment, each of said blades in said assembly being of equal diameter.

In at least an embodiment, each of these blades is mounted on an angularly displaceable central hub), located on a shaft of a generator unit.

In at least an embodiment, the central point of each blade is equidistant from said central hub.

In at least an embodiment, a generator unit being connected to said central hub so that it can harness said rotational energy to convert to said electrical energy.

In at least an embodiment, each of said blades being attached to its corresponding mounting structure at a pre-defined angle with respect to a central axis, said central axis being an operative horizontal axis passing through a centre of said central hub, said pre-defined angle ranging from 0 degrees to 45 degrees.

In at least an embodiment, said mounting structure is an adaptable connecting element in which angle of connection between said blade and said central hub changes depending on force of wind, said change of angle of said disc being with respect to said central axis, in correlation with increasing upwind force, thereby making said disc turbine adaptable to varying wind speed conditions. due to the virtue of the geometry and material selection offering appropriate torsional resistance thus facilitating the change of the angle of the disk with the central axis with increasing upwind force making the turbine adaptable to varying wind speed conditions.

In at least an embodiment, said central hub assembly comprising a pitch-angle variation mechanism to facilitate variation in pitch angle.

In at least an embodiment, said central hub assembly comprising a pitch-angle variation mechanism to facilitate variation in pitch angle, characterised in that, said pitch-angle variation mechanism consisting of:

- at least two L-section mountings such that the centre of a first L-section mounting is attached with a first rod of first diameter 'x' and a centre of a second L-section mounting is attached with a second rod of second diameter 'y', with said

second diameter being greater than said first diameter and said first rod being telescopically inside said second rod and can rotate easily having rolling fit;

- two torsion bars connecting two ends of said at least two L-section mountings such that with the application of moment on the first L-section mounting due to drag produced by upwind wind with the second L-section mounting being fixed, predefined torsional moment being produced by the non-fixed first L-section mounting – thus allowing to rotate said mechanism, and hence said disc attached to said non-fixed first L-section mounting, thus making it adaptable to said upwind wind;
- said fixed (second) L-section mounting being attached to said central hub and non-fixed (first) L-section mounting being attached to said disc.

In at least an embodiment, said central hub comprising three flange joints, at 120 degrees apart, said joints being configured to support said mounting structure which connects said central hub with each of said blades.

In at least an embodiment, said central hub comprising three flange joints, at 120 degrees apart, said joints being configured to support said mounting structure which connects said central hub with each of said blades, characterised in that, said mounting structure being configured to restrict to and from motion of shaft but allow it to rotate up to (0-45) degree angles as force is applied for adjusting said blade angle.

In at least an embodiment, said assembly comprising a tail fin assembly to drive a yaw mechanism, said tail fin assembly comprising a pair of fin-shaped blades located laterally and spaced apart from said central hub at a predefined angle with respect to central axis.

BRIEF DESCRIPTION OF THE ACCOMPANYING DRAWINGS:

The invention will now be described in relation to the accompanying drawings, in which:

FIGURE 1 illustrates a view of a blade along with its mounting structure, of the adaptable disc wind turbine assembly;

FIGURES 2, 3, 4, and 5 illustrate various views of the Adaptable disc wind turbine assembly;

FIGURE 6a, 6b, 6c, and 6d illustrate various views of the pitch-angle variation mechanism; and

FIGURE 7 illustrates a graph of Wind Speeds Increase with respect to Height.

DETAILED DESCRIPTION OF THE ACCOMPANYING DRAWINGS:

According to this invention, there is provided **an adaptable disc turbine assembly**.

In one of the aspect of this invention, an assembly for wind energy generation is provided with an improved design of **blades / discs (A)**, the blades / discs being configured to harness / capture wind energy and, whilst harnessing, converting kinetic energy of the wind into rotational energy by angular displacement of a turbine by virtue of movement of the blades / disc and, finally, into electrical energy. **FIGURE 1** illustrates a view of the blade / disc (A), along with its mounting structure, of the adaptable disc wind turbine assembly.

In at least an embodiment, each **blade**, of this assembly is a **disc**. The shape of this disc may be conical, concave, or the like shapes. Such shapes offer high value of lift coefficient which offers high starting torque when exposed to wind.

In at least an embodiment, each of the discs used in this assembly may have diameters equal to each other.

FIGURES 2, 3, and 4 illustrate various views of the adaptable disc wind turbine assembly.

In at least an embodiment, each of these blades (A) is mounted on an angularly displaceable **central hub (B)**, located on a shaft of a **generator unit (D)**. The central point of each blade may be equidistant from the central hub (B).

The central hub (B) starts angularly displacing along with the discs (A) as wind blows; which produces a lift force on the discs (A), a tangential component of the force in the direction of angular displacement is responsible for producing the necessary torque.

In at least an embodiment, a **turbine** is connected to the central hub (B) so that it can harness the rotational energy to convert to electrical energy. In a preferred embodiment, this turbine may be located in the generator unit (D). The turbine works on 'Drag/Thrust concept' but is not subjected to limitations of a drag turbine like Savonius turbine where the blades / discs cannot move faster than the speed of the wind since the movement of the blades / discs is in perpendicular direction to the wind and not in the same direction of the wind.

The rotational mechanical energy from the central hub (B) can be used to generate electrical power by coupling with a generator or directly used for pumping fluids like water (not shown in the diagram).

In at least an embodiment, there is provided a **Mounting Structure (C)** which is configured to connect a disc (A) to the central hub (B). The Mounting Structure (C) ensures that the each disc (A) is at a pre-defined angle (F) with respect to a central axis (X-X), central axis being an operative horizontal axis passing through the centre of the central hub (B) located on a generator (D). The value of this angle (F) determines speed (RPM - Rotations per Minute), of the turbine, and the resultant torque acting on a central shaft of the generator (D) attached to the centre of the central hub (B)

Each disc (A) is attached to its corresponding Mounting Structure (C) at a pre-defined angle ranging from 0 degrees to 45 degrees. The Mounting Structure is an adaptable connecting element in which the angle of connection changes depending on force of wind. The Mounting Structure allows for such change in angle between the disc (A) and its corresponding connector element (C); thereby, incorporating adaptability to wind conditions in order to provide maximum torque.

- At lower wind speeds, the angle (F) would be maximum (45 Degrees) to ensure maximum power output at the rated RPM.
- At higher wind speeds, the angle (F) would be adjusted using a variable pitch mechanism / Torsion Bar principle to limit the RPM, thus protecting the turbine from possible damages.

In at least a preferred embodiment, the central hub (B) assembly may encompass a **pitch-angle variation mechanism** to facilitate the variation in the pitch angle. Then, at 120 degrees apart, **three flange joints** would be mounted to support the Mounting Structure (C) which would connect the central hub (B) with each of the three discs (A). These mountings would be such that it would restrict to and fro

motion of the shaft but allow it to rotate up to (0-45) degree angles as force is applied for adjusting the disc angle.

FIGURE 6a, 6b, 6c, and 6d illustrate various views of the pitch-angle variation mechanism.

In at least an embodiment, the **pitch-angle variation mechanism** consists of **two L-section mountings (J and H)**. The centre of a **first L-section mounting (J)** is attached with a rod of diameter 'x' (first **rod M**) and the centre of a **second L-section mounting (K)** is attached with rod of diameter 'y' (second **rod N**), such that $y > x$ and rod M can enter rod N (telescopically) and can rotate easily having rolling fit. The two ends of the L-sections (J and H) are connected with **two torsion bars (L and K)** which are steel / composite rods having appropriate torsional stiffness. With the application of moment on the first L-section mounting (J) due to the drag produced by upwind wind with other L-section mounting (H) being fixed, predefined torsional moment would be produced by the non-fixed L section (J) thus allowing to rotate the entire assembly, and hence the disc attached to the non-fixed L section (J), thus making it adaptable to the upwind wind. The fixed L-section (H) is attached to the central hub and non-fixed L section (J) is attached to the disc. Three such pairs of L-section members (J and H) are attached in an equiangular manner to the central hub (B) with respect to the central axis (X-X).

In at least a preferred embodiment, a **tail fin assembly (E)** is used to drive a yaw mechanism. This ensures that the wind turbine continuously orients along the direction of wind. Typically, the tail fin assembly (E) comprises a pair of fin-shaped blades located laterally and spaced apart from the generator (D). The tail

fin assembly (E) derives support from a support platform which also supports / houses the generator (D).

Further, in at least a preferred embodiment, electrical systems including generator, capacitor, split ring commutator, rectifier, inverter, and battery enables power production and storage facilities.

In accordance with a non-limiting exemplary embodiment, a prior art turbine assembly was used to compete with the turbine assembly of this invention. A horizontal fan was placed, as a source, for generating actual wind conditions; keeping both the turbines to be tested at a fixed distance of 7 meters from the fan to simulate natural conditions of about 13.4 miles/hour wind speed (at the source of the fan) - noting the reading connected on a voltmeter connected to determine the preliminary results. In the experiment conducted, the prior art turbine was made out of the same material as the disc turbine, of this invention, and was given a slight air foil section. The normal turbine was made 22.5 inches long calculating the hub centre to the blade tip. The disc turbine, of this invention, was 18 inches long from centre to tip. The output voltage obtained from the disc turbine, of this invention, was around 14 volts with a maximum of 17 volts and that for the prior art turbine was around 6 volts and a maximum of 7.1volts. This experiment provided proof concept that the current invention's design was producing more than twice the amount of power along with being more compact than prior art designs and assemblies; thereby, producing more output power with minimum space consumption which is today's need.

According to a non-limiting exemplary embodiment, for the current invention, the following standard material was used for testing:

Sr. No.	Material	Specifications
1	MS Rods (2.5m)	ID 45mm OD 50mm
2	Thrust Bearing	ID 50mm OD70mm
3	Metal Housing for generator	Stainless Steel
4	Card Board	4- 1mm thick
5	Thermocol	1 inch thick
6	High density tape	3 inch wide
7	PVC pipe	ID 20mm
8	Generator	30 RPM Gear Motor
9	Multi stranded copper Wires	4m
10	Lighting load	12 Watt LED strip

Sr. No.	Equipment Utilized	Specifications
1	Drilling Machine	1000 watt
2	Welding Machine	10KW
3	Soldering Machine	35Watt
4	Anemometer	Standard
5	Spot Welding	SKW
6	Metal CutterStandard	

The calculation was based on the following criteria:

1. The diameter each disc blade is considered to be 1 metre
2. The angle G (Slant Angle) of each disc is 15 degrees

3. The pitch angle (F) is taken as 30-45 degrees (since the turbine is adaptable, the angle will vary according to the wind conditions)
4. Rated wind speed is 8 meters per second
5. Distance between central hub to the outermost point is 1 meter
6. Rotational speed is considered as 60 RPM

According to another non-limiting exemplary embodiment, the following paragraph discusses comparison of the current invention with prior art in respect of **wind potential**:

Most of the manufacturers rate their turbines by the amount of power they can safely produce at a particular wind speed, usually chosen between 24 mph or 10.5 m/s and 36 mph or 16 m/s. The following formula illustrates factors that are important to the performance of a wind turbine. Notice that the wind speed, V, has an exponent of 3 applied to it. These factors would help to decide the constructional specifications for the current invention. That is why a taller tower will increase productivity of any wind turbine by giving it access to higher wind speeds as shown in the Wind Speeds Increase with Height graph as seen in **FIGURE 7**.

The formula for calculating the power from a wind turbine is:

Wind-Power-calculation (P) = $kC_p \frac{1}{2} \rho A V^3$ Where:

P = Power output, kilowatts

Maximum power coefficient, ranging from 0.25 to 0.45, dimension less (theoretical maximum = 0.59)

ρ — Air density (lb/ft³)

A = Rotor swept area, ft² or $n D^2/4$ (D is the rotor diameter in ft., $n = 3.1416$) V = Wind speed (mph)

$k = 0.000133$, A constant to yield power in kilowatts. (Multiplying the above equation by 1.340 converts it to horse- power [i.e., 1 kW = 1.340 horsepower]).

The rotor swept area, A , is important because the rotor is the part of the turbine that captures the wind energy. So, the larger the rotor, the more energy it can capture. The air density, p , changes slightly with air temperature and with elevation. The ratings for wind turbines are based on standard conditions of 59° F (15° C) at sea level. A density correction should be made for higher elevations as shown in the Air Density Change with Elevation graph. A correction for temperature is typically not needed for predicting the long-term performance of a wind turbine.

According to a non-limiting exemplary embodiment, the comparison of the current invention with prior art in respect **of silence of operation:**

The prior art airfoil blade design has a very distinctive humming noise that is created due to the blade cutting through the wind. The turbine is capable of emitting humming sounds of low frequency caused by the blades. Even the internal components like gears and generators can create noise that is disturbing. The turbine noise can reach up to 43 decibels. This sound can be quite disturbing especially in areas where there is less population. This noise is completely eliminated in the current invention's disc design. There is low slicing through the air, and the discs use drag force to generate torque, thus there is less relative movement of the air across the disc resulting in silent operation of the turbine. This is especially useful in cities and highly populated areas since there is no noise disturbance caused by the turbine. It is a very useful feature at night when it will not cause any inconvenience due to noise.

According to a non-limiting exemplary embodiment, the following paragraph discusses comparison of the current invention with prior art in respect of **lesser space requirements**:

The prior art airfoil blade wind turbines have very long blades that span a distance of over 100 to 150m. Thus, a tri-bladed turbine will have a total center to tip distance of more than 110m. This makes the transportation and assembly of the turbine on-site very hazardous and challenging. The disc wind turbine, of the current invention, is much more compact and the centre-to-tip distance is much lesser as compared to prior art wind turbines. The compact size makes it easy to transport and assemble. The bladeless turbine, of this invention, also produces more power than the traditional wind turbine in- spite of being smaller in size. The compact size makes it possible to install in highly populated locations. The smaller size reduces the manufacturing cost.

According to a non-limiting exemplary embodiment, the following paragraph discusses comparison of the current invention with prior art in respect of **quick on-field assembly**:

The prior art wind turbines are enormous in size and weight, making them difficult to transport and assemble. The height of the turbine, of this invention, can be more than 120m and the blades can be over 100m long. Thus, heavy machinery is required for transportation and installation of these turbines. The risk factor is very high and any accident can lead to heavy loss. The disc wind turbine, of this invention, is very compact and thus easier to transport and install. The size and weight of the discs is less and thus it can be easily installed at any location. The equipment required for the installation does not consist of heavy machinery thus making installation quick and easy.

According to a non-limiting exemplary embodiment, the following paragraph discusses comparison of the current invention with prior art in respect of **lesser maintenance**:

The large airfoil wind turbines, of the prior art, need frequent maintenance owing to its large size and complex internal structure. The airfoil cross section of the turbine needs to be uniform throughout the length of the blade, but due to changing weather conditions the wear and tear of the blade occurs, causing lesser efficiency and thus higher cost of maintenance. The disc wind turbine, of the current invention, has a comparatively smaller structure. The maintenance cost reduces greatly since the internal structure and design is less complicated thus making its timely maintenance easy and cost effective. The materials used can withstand any weather and don't require heavy regular maintenance. This reduces the operating cost of the turbine significantly.

According to a non-limiting exemplary embodiment, the following paragraph discusses comparison of the current invention with prior art in respect of **use of synthetic materials**:

The material used in traditional wind turbines is usually glass fibre, due to its light weight. The disc turbine, of this invention has similar glass fibre materials used along with steel or aluminium canopy frame. The glass fibre is covered over the frame that is the wing capturing surface. The metal frame gives it more strength and the glass fibre being light weight helps in effectively maintaining a compact structure. The glass fibre used is synthetic; thus, reducing cost of the turbine and making it easier to manufacture.

According to a non-limiting exemplary embodiment, the following paragraph discusses comparison of the current invention with prior art in respect of **adaptability of mechanism:**

The adaptable mechanism implemented in the disc turbine, of this invention, is unique and can be implemented even in prior art wind turbines. This is the technique which we have developed and it gives turbine the name adaptable disc wind turbine. An ideal turbine should provide almost constant power output in variable wind speeds and also offer a control over the turbine speed in case of emergency or high wind conditions. This control over the speed could be effectively achieved by changing the blade angle with respect to the central shaft. When the winds are having a lower velocity the angle of all the blades could be increased due to which greater tangential forces would develop. When the wind speeds are very high, this angle will be reduced due to which a smaller component of tangential force would be generated and hence the speed of the turbine would decrease.

While this detailed description has disclosed certain specific embodiments for illustrative purposes, various modifications will be apparent to those skilled in the art which do not constitute departures from the spirit and scope of the invention as defined in the following claims, and it is to be distinctly understood that the foregoing descriptive matter is to be interpreted merely as illustrative of the invention and not as a limitation.

CLAIMS,

1. An adaptable disc turbine assembly comprising:
 - **disc shaped concave blades (A)** configured to harness / capture wind energy and, whilst harnessing, converting kinetic energy of the wind into rotational energy by angular displacement of a connected turbine by virtue of movement of said blades (A), with respect to a **central hub (B)** and, finally, into electrical energy;
 - said **central hub (B)**, mounted on a **central shaft**, configured to be connected to said **disc shaped concave blades (A)** by means of a **mounting structure (C)**, said central hub (B) being angularly displaceable along with said discs (A) as wind blows, thereby, producing a lift force on said blades (A), a tangential component of said lift force in the direction of angular displacement being responsible for producing torque required for generating said electrical energy; and
 - a **Mounting Structure (C)**, per blade (A), configured to connect said corresponding blade (A) to said **central hub (B)**, said mounting structure (C) being configured to ensure that each disc (A) is at a pre-defined angle (F) with respect to a central axis (X-X), said central axis being an operative horizontal axis passing through a centre of said central hub (B).
2. The adaptable disc turbine assembly as claimed in claim 1 wherein, said blade is a conical disc.
3. The adaptable disc turbine assembly as claimed in claim 1 wherein, said blade is a disc with a shape configured to offer high value of drag coefficient which offers high starting torque when exposed to wind.

4. The adaptable disc turbine assembly as claimed in claim 1 wherein, each of said blades in said assembly being of equal diameter.
5. The adaptable disc turbine assembly as claimed in claim 1 wherein, each of these blades (A) is mounted on an angularly displaceable **central hub (B)**, located on a shaft of a **generator unit (D)**.
6. The adaptable disc turbine assembly as claimed in claim 1 wherein, the central point of each blade being equidistant from said central hub (B).
7. The adaptable disc turbine assembly as claimed in claim 1 wherein, a **generator (D)** being connected to said central hub (B) so that it can harness said rotational energy to convert to said electrical energy.
8. The adaptable disc turbine assembly as claimed in claim 1 wherein, each of said blades (A) being attached to its corresponding mounting structure at a pre-defined angle (F) with respect to a central axis (X-X), said central axis being an operative horizontal axis passing through a centre of said central hub (B), said pre-defined angle ranging from 0 degrees to 45 degrees.
9. The adaptable disc turbine assembly as claimed in claim 1 wherein, said mounting structure is an adaptable connecting element in which angle of connection between said blade (A) and said central hub (B) changes depending on force of wind, said change of angle of said disc being with respect to said central axis (X-X), in correlation with increasing upwind force, thereby making said disc turbine adaptable to varying wind speed conditions.

The adaptable disc turbine assembly as claimed in claim 1 wherein, said central hub (B) assembly comprising a **pitch-angle variation mechanism** to facilitate variation in pitch angle.

10. The adaptable disc turbine assembly as claimed in claim 1 wherein, said central hub (B) assembly comprising a **pitch-angle variation mechanism** to facilitate variation in pitch angle, characterised in that, said **pitch-angle variation mechanism** consisting of:

- at least **two L-section mountings (J and H)** such that the centre of a **first L-section mounting (J)** is attached with a first rod of first diameter 'x' (**rod M**) and a centre of a **second L-section mounting (K)** is attached with a second rod of second diameter 'y' (**rod N**), with said second diameter (y) being greater than said first diameter (x) and said first rod (M) being telescopically inside said second rod (N) and can rotate easily having rolling fit;
- **two torsion bars (L and K)** connecting two ends of said at least two L-section mountings (J and H) such that with the application of moment on the first L-section mounting (J) due to drag produced by upwind wind with the second L-section mounting (H) being fixed, predefined torsional moment being produced by the non-fixed first L-section mounting (J) – thus allowing to rotate said mechanism, and hence said disc attached to said non-fixed first L-section mounting (J), thus making it adaptable to said upwind wind;
- said fixed (second) L-section mounting (H) being attached to said central hub and non-fixed (first) L-section mounting (J) being attached to said disc.

11. The adaptable disc turbine assembly as claimed in claim 1 wherein, said central hub (B) comprising **three flange joints**, at 120 degrees apart, said joints being

configured to support said mounting structure (C) which connects said central hub (B) with each of said blades (A).

12. The adaptable disc turbine assembly as claimed in claim 1 wherein, said central hub (B) comprising **three flange joints**, at 120 degrees apart, said joints being configured to support said mounting structure (C) which connects said central hub (B) with each of said blades (A), characterised in that, said mounting structure being configured to restrict to and fro motion of shaft but allow it to rotate up to (0-45) degree angles as force is applied for adjusting said blade angle.

13. The adaptable disc turbine assembly as claimed in claim 1 wherein, said assembly comprising a **tail fin assembly (E)** to drive a yaw mechanism, said tail fin assembly (E) comprising a pair of fin-shaped blades located laterally and spaced apart from said central hub (B) at a predefined angle with respect to central axis (X-X).

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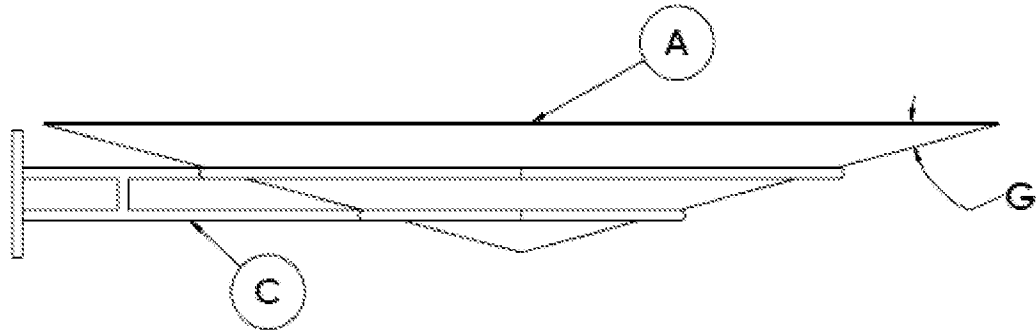


FIGURE 1

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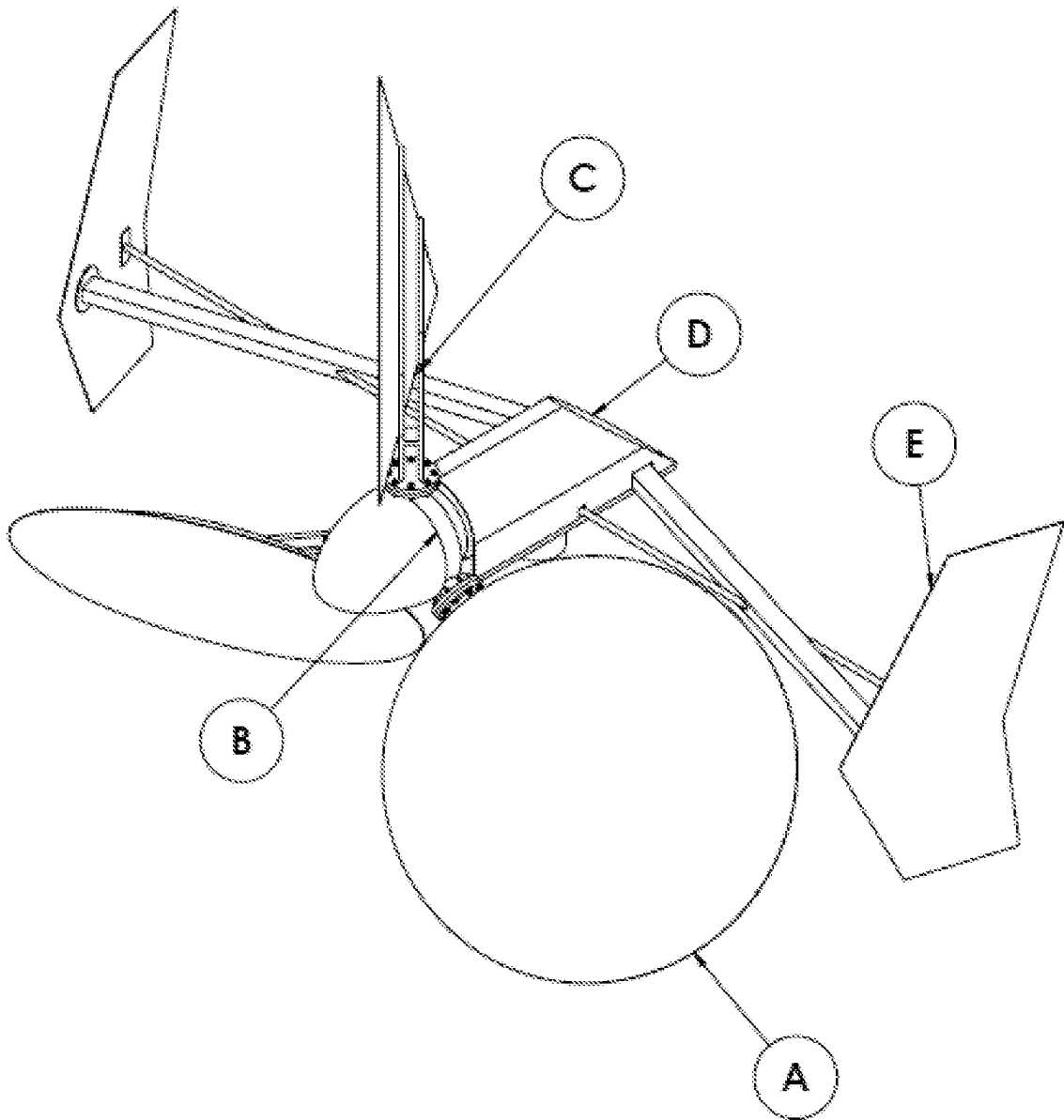


FIGURE 2

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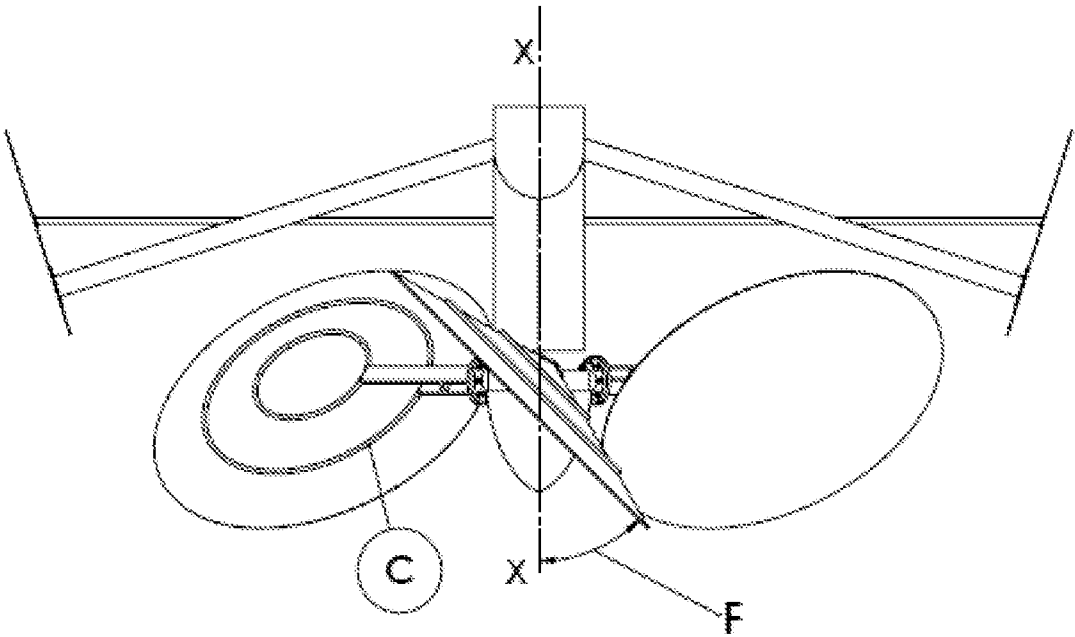


FIGURE 3

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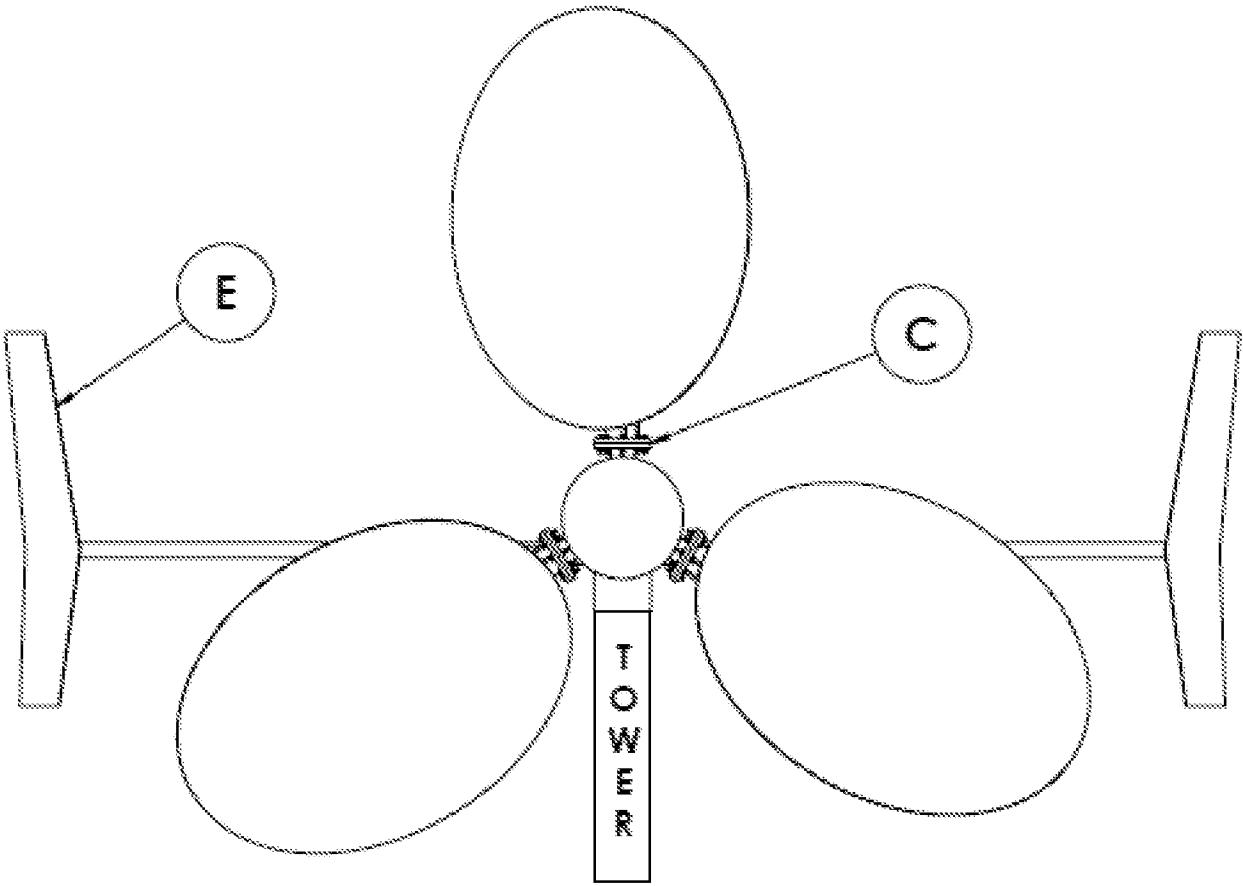


FIGURE 4

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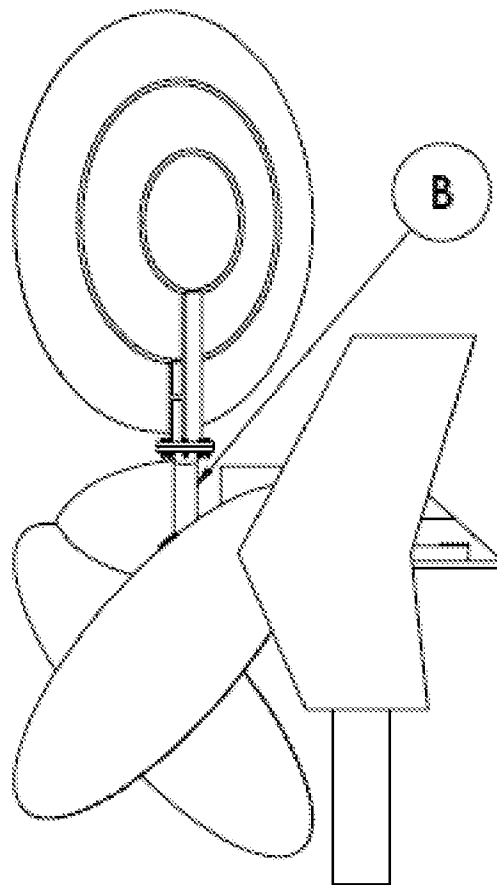


FIGURE 5

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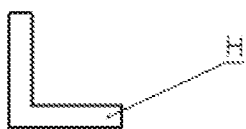


FIGURE 6a

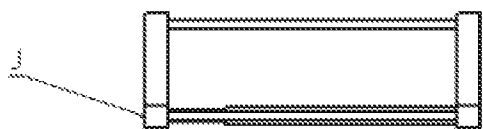


FIGURE 6b

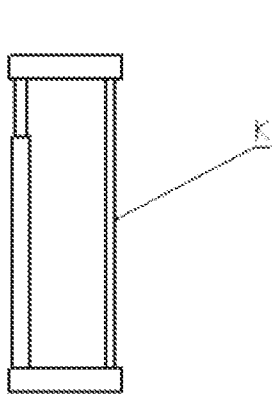


FIGURE 6c

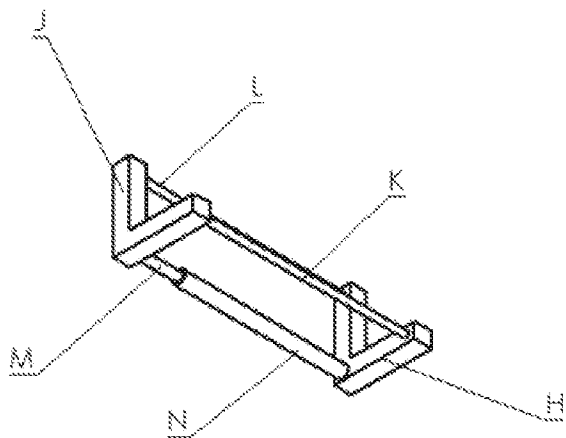


FIGURE 6d

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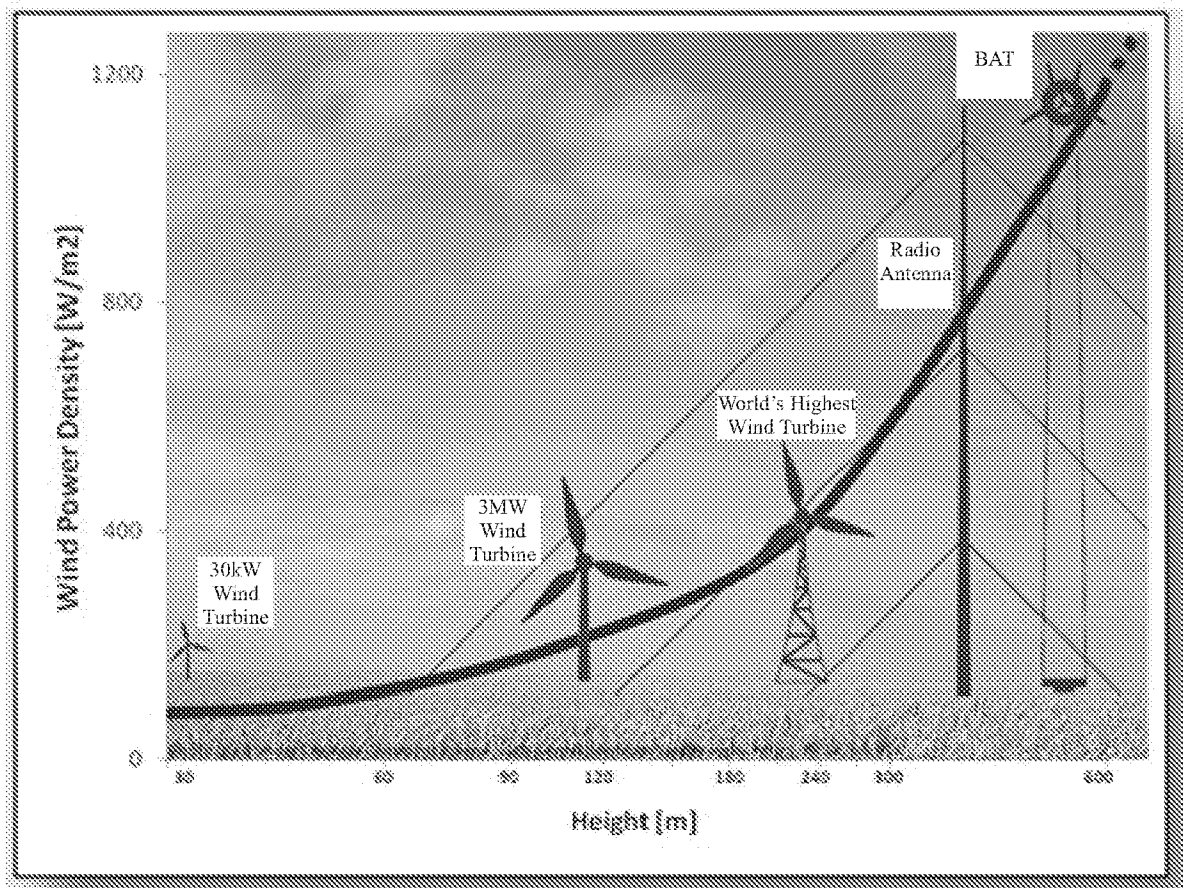


FIGURE 7