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Declarations under Rule 4.17:

— *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))*

(54) Title: A DEVICE FOR HOLDING SOLAR PANELS AND WIND TURBINE FOR GENERATING POWER

(57) Abstract: The present disclosure provides a device for holding solar panels and wind turbine for generating power. The device comprises a tubular metallic base (1) grouted firmly on ground, a tubular trunk portion (2) extended vertically from the tubular metallic base (1), a set of rotatable sockets (4, 5) clamped at one or more levels of the tubular trunk portion (2). Each of the set of rotatable sockets is operated by respective gear and motor (6, 7). A set of metallic branches (3) is adjustably secured at each of the one or more levels of the tubular trunk portion (2). The device further comprises a set of solar photovoltaic panels (9) secured at each of the metallic branches along axis of the respective metallic branch and a wind turbine (8) comprising a set of blades, secured at top of the tubular trunk portion (2).

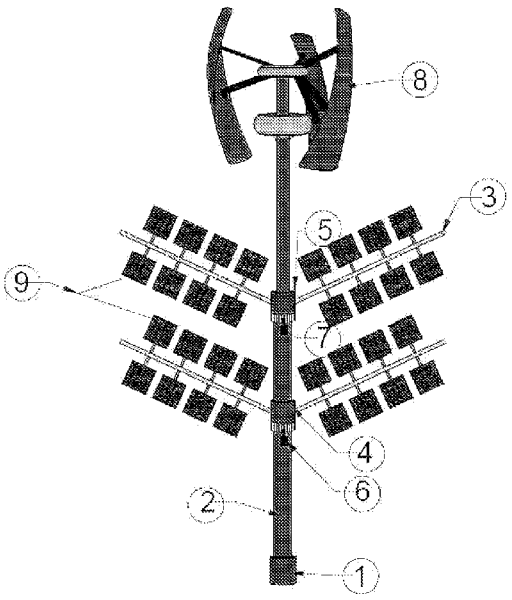

Figure 1

[Continued on next page]

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TITLE: A DEVICE FOR HOLDING SOLAR PANELS AND WIND TURBINE FOR GENERATING POWER

TECHNICAL FIELD

The present disclosure relates to a device for holding solar panels and wind turbine for generating power. Particularly, but not exclusively, the present disclosure is directed towards an improved vertical tree like device useful for holding branches with solar panels capable of rotating up to 180° and having a wind turbine on the top of the tree.

BACKGROUND

Solar energy is solar radiation that can generate heat, generate electricity, or cause chemical reactions. Solar energy is very good for several reasons. First, solar energy is a renewable and easily accessible source of energy. Second, the energy of the Sun is practically inexhaustible and therefore provides many possibilities as a source of energy. Third, the use and monitoring of solar energy has no harmful effects on the ecosystem. Fourth, the solar energy production system can be used efficiently in urban and rural areas, in industrial and domestic conditions, because it is easily accessible and usable. At present in conventional method solar photovoltaic (SPV) panels are generally laid on ground. These are rigidly installed with fixing arrangements on the ground and consume a considerable surface area. SPV module solar electric generator system requires huge amount of land for installation, but land is a subject of huge crisis in recent day.

The Patent application no US20080094818A1 entitled as “solar street light”, it is to be mentioned that the invented system provides street light and also the invented system could provide some sense of peace of mind in knowing that there is an effective device available to provide light in areas where there is no light with less taxpaying dollars. The invented solar street light has the potential to become an important ingredient in this recipe of energy usage technology. The drawback of the referred work is that it does not elaborate the solar PV device or panel.

The Patent no US4200904 entitled as “solar powered street lighting system”, it is to be mentioned that the invented system is a solar powered street lighting system that is totally independent of any external power supply. Solar panels are connected in such manner that a maintenance free storage battery with sufficient capacity to lights street light/traffic

signals. A plurality of solar cell panels is fixedly mounted on rod shaft at the upper end of pole. The drawback of the referred work is that the solar panel is rigidly fixed to the pole and may not withstand wind load if the solar panel is bigger in shape, not providing power throughout the day and night.

The Patent application no US20040212997 entitled as "solar powered lighting system", it is to be mentioned that the present invention relates to a solar powered street lighting system that may be used to decorate trees and other outdoor items. Here the solar (PV) panels are mounted at the top the tree for absorbing the maximum sunlight to convert to electrical energy. The drawback of the above said patent is that the member not flexible and may not withstand wind load if the solar panel is bigger in shape.

The Patent no US 5149188 entitled as "solar powered exterior lighting system", it is to be mentioned that this invention relates to a solar powered light having a battery system where the battery container is mounted between two cantilever arms on an upright vertical support. Here the solar (PV) panels are mounted on the upper cantilever arms and point upward toward the sun. The drawback of the referred work is that the panels are not flexibly mounted and may not withstand wind load if the solar panel is bigger in shape. Being rigidly mounted, the panels will gather fine dust which may lower its efficiency.

The Patent application no EP2017525A1 entitled "solar powered led street lamp with automatic light control", it is to be mentioned that the present invention relates to a solar powered LED street lamp with automatic light control comprising a solar photovoltaic board and other related accessories. Here the solar (PV) panel is mounted on top end of the lamp pole. The drawback of the referred work is the panels are not flexibly mounted, the panels will gather fine dust which may lower its efficiency.

All the above-mentioned inventions are of different individual solar powered lighting system. The main disadvantages of prior art are using different device or pole or base for fixing/mounting the solar photovoltaic panels which are rigid and not directionally adjustable.

Further, in conventional systems the solar panels are rigidly fixed at a finite direction,

wherein such panels are devoid of being rotated at the rate of rotation of movement of the sun in order to absorb the power from sun in a better way.

In view of the hitherto known prior art it is necessary to develop an improved device useful for holding solar (PV) panels on a strong vertical pole/tree with minimum foot print with the help of long branches so that the branches can rotate at an adjustable required angle facing towards the sun and also the same tree/pole will hold the wind generator or Turbine which will be light weight, easily installable, low cost, negotiating wind load.

The present disclosure is directed to overcome one or more limitations stated above, and any other limitation associated with the prior arts.

SUMMARY

The present disclosure provides a device for holding solar panels and wind turbine for generating power. The device comprises a tubular metallic base grouted firmly on ground, a tubular trunk portion extended vertically from the tubular metallic base, a set of rotatable sockets clamped at one or more levels of the tubular trunk portion. Each of the set of rotatable sockets is operated by respective gear and motor. A set of metallic branches is adjustably secured at each of the one or more levels of the tubular trunk portion. The device further comprises a set of solar photovoltaic panels secured at each of the metallic branches along axis of the respective metallic branch and a wind turbine comprising a set of blades, secured at top of the tubular trunk portion.

In an embodiment of the present invention, the tubular trunk portion comprises a smaller base on the ground so as to occupy minimum area for installation of the device. Further, the metallic branches with solar photovoltaic panels are adjustable to facilitate to absorb maximum solar radiations throughout day time i.e., from sunrise to sunset. The range of adjustment of rotational direction of the metallic branches comprising solar photovoltaic panel is 0 to 180 degree.

In another embodiment of the present invention, the device can uniquely hold the solar photovoltaic panels on the tubular trunk portion and also the wind turbine to produce green energy across the day consuming the minimum land space on the ground.

The details of one or more implementations are set forth in the accompanying drawings and the following description. Other features and advantages will be apparent from the description and drawings, and from the claims. This summary is provided to introduce subject matter that is further described in the detailed description and drawings. Accordingly, this summary should not be considered to describe essential features nor used to limit the scope of the claimed subject matter.

BRIEF DESCRIPTION OF THE ACCOMPANYING DRAWINGS

The novel features and characteristic of the disclosure are set forth in the appended claims. The disclosure itself, however, as well as a preferred mode of use, further objectives and advantages thereof, will best be understood by reference to the following detailed description of an illustrative embodiment when read in conjunction with the accompanying figures. One or more embodiments are now described, by way of example only, with reference to the accompanying figures wherein like reference numerals represent like elements and in which:

Figure 1 illustrates a structural diagram of a device for holding solar panels and wind turbine for generating power, in accordance with an embodiment of the present disclosure.

DETAILED DESCRIPTION

In the present document, the word "exemplary" is used herein to mean "serving as an example, instance, or illustration." Any embodiment or implementation of the present subject matter described herein as "exemplary" is not necessarily to be construed as preferred or advantageous over other embodiments.

While the disclosure is susceptible to various modifications and alternative forms, specific embodiment thereof has been shown by way of example in the drawings and will be described in detail below. It should be understood, however that it is not intended to limit the disclosure to the forms disclosed, but on the contrary, the disclosure is to cover all modifications, equivalents, and alternative falling within the spirit and the scope of the disclosure.

The terms "comprises", "comprising", or any other variations thereof, are intended to cover a non- exclusive inclusion, such that a setup, device or process that comprises a list of components or steps does not include only those components or steps but may include other components or steps not expressly listed or inherent to such setup or device or process. In other words, one or more elements in a system or apparatus proceeded by "comprises... a" does not, without more constraints, preclude the existence of other elements or additional elements in the system or apparatus.

Embodiments of the present disclosure provide a device for holding solar panels and wind turbine for generating power. The device comprises a tubular metallic base grouted firmly on ground, a tubular trunk portion extended vertically from the tubular metallic base, a set of rotatable sockets clamped at one or more levels of the tubular trunk portion. Each of the set of rotatable sockets is operated by respective gear and motor. A set of metallic branches is adjustably secured at each of the one or more levels of the tubular trunk portion. The device further comprises a set of solar photovoltaic panels secured at each of the metallic branches along axis of the respective metallic branch and a wind turbine comprising a set of blades, secured at top of the tubular trunk portion. In an embodiment of the present invention, the tubular trunk portion comprises a smaller base on the ground so as to occupy minimum area for installation of the device. Further, the metallic branches with solar photovoltaic panels are adjustable to facilitate to absorb maximum solar radiations throughout day time i.e., from sunrise to sunset. The range of adjustment of rotational direction of the metallic branches comprising solar photovoltaic panel is 0 to 180 degree. In another embodiment of the present invention, the device can uniquely hold the solar photovoltaic panels on the tubular trunk portion and also the wind turbine to produce green energy across the day consuming the minimum land space on the ground.

The following paragraphs describe the present disclosure with reference to **Figures 1**. In the figures, **Figure 1** is an exemplary embodiment of the present disclosure and illustrates a device for holding solar panels and wind turbine for generating power.

The device according to present disclosure is configured to provide improved tree like device useful for holding branches with solar photovoltaic panels capable of rotating

180° and having a wind turbine on the top of the device. The device is further configured to automatically adjust rotational direction of the solar photovoltaic panels in day time i.e., from sunrise till sunset base on a timer arrangement so as to keep the solar photovoltaic panels well exposed to the sun for generating maximum power from solar energy. The device is also configured to generate power from wind energy by using a wind turbine secured at top of the device. However, it is understood by a person skilled in the art that the size and configuration of the device may be variable in accordance with the requirement of the person. Any such variation/modification shall be construed to be within the scope of the present disclosure. The device comprises a tubular metallic base (**1**), a tubular trunk portion (**2**), a set of rotatable sockets (**4**, **5**), a set of metallic branches (**3**), a set of solar photovoltaic panels (**9**), and a wind turbine (**8**) as illustrated in **Figure 1**.

The tubular metallic base (**1**) is configured to contain weight so as to make base of the device more stable. The tubular metallic base (**1**) is also designed to distribute the device's weight over a small area and provide increased stability. The tubular metallic base (**1**) is having a small diameter so that a minimum area of land is occupied while installing the device in particular desired location. Therefore, the tubular metallic base (**1**) comprises a smaller base so as to occupy small area on the ground. The tubular metallic base (**1**) is grouted firmly on ground so as to avoid any kind of misalignments in the overall structure of the device. The tubular metallic base (**1**) can be manufactured from metal, heavy duty plastic etc.

The tubular trunk portion (**2**) is extended vertically from the tubular metallic base (**1**). The tubular trunk portion (**2**) can also be manufactured from metal, heavy duty plastic, fiber etc. The tubular trunk portion (**2**) is the primary component to firmly hold the overall structure including the metallic branches, the wind turbine, and the rotatable sockets. One end of the tubular trunk portion (**2**) is rigidly secured with one open end of the tubular metallic base (**1**), wherein anther end of the tubular trunk portion (**2**) holds the wind turbine (**8**). The tubular trunk portion (**2**) further comprises a set of rotatable sockets (**4**, **5**) clamped at one or more levels of the tubular trunk portion (**2**). Each of the one or more levels are configured to hold a set of metallic branches.

The set of metallic branches (**3**) are made of high-density metal. The set of metallic branches (**3**) are fixed at an oblique angle with the tubular trunk portion (**2**) in order to arrange the set of solar photovoltaic panels (**9**) in such a manner that the interference of shadow is zero. Each of the set of metallic branches (**3**) is associated with a rotatable socket (**4**, **5**) that is rotatable by means of the gear and motor (**6**, **7**), wherein the motor aids in rotating a metallic branch and the gear controls speed of such rotation of the metallic branch. In one embodiment, the set of metallic branches (**3**) comprises a timer arrangement so that the metallic branches holding the solar photovoltaic panels can automatically rotate 180° in a half day so as to keep the solar photovoltaic panels always towards the sun in day time.

The solar photovoltaic panel (**9**) is an assembly of photo-voltaic cells mounted in a framework for installation. The solar photovoltaic panels (**9**) use sunlight as a source of energy to generate direct current electricity. In the operation of solar cells, the principle is that when a photon reaches a semiconductor, the semiconductor ejects an electron leading to the creation of two conductors: a free electron and an electron hole. When a PN junction is exposed to light, photons with energy greater than bandgap of silicon cells are absorbed, causing the emergence of electron-hole pairs. Such carriers are separated under the influence of electric fields within the junction, creating a current that is proportional to the incidence of solar irradiation. The solar photovoltaic panels (**9**) further supply solar electricity to electrical equipment.

The rotatable socket (**4**, **5**) is a central component that transmits the electrically induced torque via a corresponding positive connection in the transmission. The rotatable socket (**4**, **5**) is designed to rotate about a longitudinal axis, transmit torque and withstand torsional forces. The rotatable socket (**4**, **5**) can be manufactured from metal, heavy duty plastic etc. In one embodiment, each of the set of rotatable sockets is operated by respective gear and motor (**6**, **7**).

The gear and motor (**6**, **7**) combination is an electric motor coupled with a gearbox. The addition of a gearbox is intended to limit the speed of the motor's shaft and increase the motor's output torque. The gear and motor produce more output in terms of running and holding torque than an ungeared, standard motor. The gear and the motor are combined

into one unit. Therefore, the gear and motor (**6**, **7**) combination can be any electric motor coupled with a gear train. The gear and motor use either AC (Alternating Current) or DC (Direct Current) power. Further, the gear and motor combination provide great angular rotational stability that leads to provide high level of precision, limited vibrations when dealing with various loads, uniform transmission capabilities allow for a greater repeatability. In one embodiment, the gear and motor (**6**, **7**) aids in rotating the respective metallic branch to a desired position and controlling speed of such rotation of the metallic branch, wherein the maximum range of rotation of a metallic branch is between 0° to 180°.

In one embodiment, the gear and motor combination can be powered by a continuous power source. The power source can be a direct current (DC) power source or an alternate current (AC) power source. The power source is suitably chosen based on supply voltage and output current to achieve good driving performance of the gear and motor. The supply voltage determines the speed performance of the gear and motor, while the output current determines the output torque of the driven motor particularly at lower speed.

The wind turbine (**8**) turns wind energy into electricity using the aerodynamic force from rotor blades engaged with the wind turbine (**8**), which work like an airplane wing or helicopter rotor blade. When wind flows across the blade, the air pressure on one side of the blade decreases. The difference in air pressure across the two sides of the blade creates both lift and drag. The force of the lift is stronger than the drag and such force causes a rotor to spin. The rotor connects to the generator, either directly (if it's a direct drive turbine) or through a shaft and a series of gears (a gearbox) that speed up the rotation and allow for a physically smaller generator. This translation of aerodynamic force to rotation of a generator creates electricity. In one embodiment, the wind turbine (**8**) in placed suitably at the top of the tubular trunk portion (**2**) in order to make the solar photovoltaic panels properly exposed to the sun.

The following paragraph(s) describe the operation of the device according to an embodiment of the present disclosure.

The device can be used for generating electricity from solar energy and/or wind energy by utilizing minimum area for configuring the components. Initially, the device is in idle

state. Once the power source is activated, the device starts the timer arrangement that in turn activates rotation of the metallic branches. Upon activation of the power source, the gear and motor are also electrically powered. Therefore, the metallic branches rotate on the rotational sockets and simultaneously expose the associated solar photovoltaic panels towards the sun in order to receive maximum solar energy. Further, the device automatically receives electricity generated from the wind energy by means of the wind turbine.

Therefore, the device of the present invention is an improved vertical structure device for holding solar panels on metallic branches and wind turbine together in a single arrangement, wherein the metallic branches holding the solar photovoltaic panels can rotate suitably to adjust the direction of sun in a day time of 12 hours. Further, the device can hold the wind turbine on top without hampering the movement of metallic branches and without any interference of shadow on the solar photovoltaic panels. Thus, the device saves a lot of land for fixing the solar panels as well as the wind turbine and produce green energy for 24 hours!

The technical effect obtained by the device of the present invention is to provide the directional adjustability of the solar photovoltaic panels. The solar photovoltaic panels are mounted on the branches with the help of motorized sockets which allow the face of solar photovoltaic panels to be directionally adjusted. The height and direction of the whole device with respect to pole/tree can be adjusted. Tilt of the solar photovoltaic panel and leaf stalk can also be adjusted at seasonal solar movement. Depending upon the optimum tilt angle of solar direction of a geographical location (latitude) the whole device may be suitably installed.

The device can also be fixed to any existing pole or stem of tree. The solar photovoltaic panel being hold by a flexible leafstalk at one end, having the other end inserted within a tubular elbow holder being hinged by a pin with a flat formed part, the said tubular elbow holder having an adjustable screw resting on the formed part, the said formed part is being tied with a stem of a tree or a pole by flexible belt on its both ends by means of fixing arrangement.

Advantages of the present disclosure:

The present disclosure provides a device can be mounted on a single pole like tree for fixing the solar PV panels.

The device of the present invention is slim, easy to manufacture, and consume least ground area.

The device is also stable in nature and can withstand wind load.

Further, the device incurs low maintenance cost and installation cost. Also, the device can produce green energy at any condition like cloudy weather or sunny weather.

In the detailed description of the embodiments of the disclosure, reference is made to the accompanying drawings that form a part hereof, and in which are shown by way of illustration specific embodiments in which the disclosure may be practiced. These embodiments are described in sufficient detail to enable those skilled in the art to practice the disclosure, and it is to be understood that other embodiments may be utilized and that changes may be made without departing from the scope of the present disclosure. The description is, therefore, not to be taken in a limiting sense.

Equivalents:

With respect to the use of substantially any plural and/or singular terms herein, those having skill in the art can translate from the plural to the singular and/or from the singular to the plural as is appropriate to the context and/or application. The various singular/plural permutations may be expressly set forth herein for sake of clarity.

It will be understood by those within the art that, in general, terms used herein, and especially in the appended claims (e.g., bodies of the appended claims) are generally intended as "open" terms (e.g., the term "including" should be interpreted as "including but not limited to," the term "having" should be interpreted as "having at least," the term "includes" should be interpreted as "includes but is not limited to," etc.). It will be further understood by those within the art that if a specific number of an introduced claim recitation is intended, such an intent will be explicitly recited in the claim, and in the absence of such recitation no such intent is present. For example, as an aid to understanding, the following appended claims may contain usage of the introductory

phrases "at least one" and "one or more" to introduce claim recitations. However, the use of such phrases should not be construed to imply that the introduction of a claim recitation by the indefinite articles "a" or "an" limits any particular claim containing such introduced claim recitation to inventions containing only one such recitation, even when the same claim includes the introductory phrases "one or more" or "at least one" and indefinite articles such as "a" or "an" (e.g., "a" and/or "an" should typically be interpreted to mean "at least one" or "one or more"); the same holds true for the use of definite articles used to introduce claim recitations.

In addition, even if a specific number of an introduced claim recitation is explicitly recited, those skilled in the art will recognize that such recitation should typically be interpreted to mean at least the recited number (e.g., the bare recitation of "two recitations," without other modifiers, typically means at least two recitations, or two or more recitations). Furthermore, in those instances where a convention analogous to "at least one of A, B, and C, etc." is used, in general such a construction is intended in the sense one having skill in the art would understand the convention (e.g., "a system having at least one of A, B, and C" would include but not be limited to systems that have A alone, B alone, C alone, A and B together, A and C together, B and C together, and/or A, B, and C together, etc.). In those instances where a convention analogous to "at least one of A, B, or C, etc." is used, in general such a construction is intended in the sense one having skill in the art would understand the convention (e.g., "a system having at least one of A, B, or C" would include but not be limited to systems that have A alone, B alone, C alone, A and B together, A and C together, B and C together, and/or A, B, and C together, etc.). It will be further understood by those within the art that virtually any disjunctive word and/or phrase presenting two or more alternative terms, whether in the description, claims, or drawings, should be understood to contemplate the possibilities of including one of the terms, either of the terms, or both terms. For example, the phrase "A or B" will be understood to include the possibilities of "A" or "B" or "A and B."

While various aspects and embodiments have been disclosed herein, other aspects and embodiments will be apparent to those skilled in the art. The various aspects and embodiments disclosed herein are for purposes of illustration and are not intended to be

limiting, with the true scope and spirit being indicated by the following claims.

Referral Numerals:

Reference Number	Description
1	Tubular metallic base
2	Tubular trunk portion
3	Metallic branch
4	Rotatable sockets
5	
6	Gear and Motor
7	
8	Wind Turbine
9	Solar photovoltaic panel

Claims:

1. A device for holding solar panels and wind turbine for generating power, the device comprising:

a tubular metallic base (**1**) grouted firmly on ground;

a tubular trunk portion (**2**) extended vertically from the tubular metallic base (**1**);

a set of rotatable sockets (**4**, **5**) clamped at one or more levels of the tubular trunk portion (**2**), wherein the each of the set of rotatable sockets is operated by respective gear and motor (**6**, **7**), and a set of metallic branches (**3**) is adjustably secured at each of the one or more levels of the tubular trunk portion (**2**);

a set of solar photovoltaic panels (**9**) secured at each of the metallic branches along axis of the respective metallic branch; and

a wind turbine (**8**) comprising a set of blades, secured at top of the tubular trunk portion (**2**).

2. The device as claimed in claim 1, wherein the tubular metallic base (**1**) comprises a smaller base so as to occupy small area on the ground.

3. The device as claimed in claim 1, wherein the set of metallic branches (**3**) are fixed at an oblique angle with the tubular trunk portion (**2**) in order to arrange the set of solar photovoltaic panels (**9**) in such a manner that the interference of shadow is zero.

4. The device as claimed in claim 1, wherein each of the set of metallic branches (**3**) being associated with the set of rotatable sockets (**4**, **5**) are rotatable by means of the gear and motor (**6**, **7**), wherein a motor aids in rotating a metallic branch and a gear controls speed of such rotation of the metallic branch.

5. The device as claimed in claim 1, wherein the set of metallic branches (**3**) comprises a timer arrangement so that the metallic branches holding the solar photovoltaic panels can automatically rotate 180° in a half day so as to keep the solar photovoltaic panels always towards the sun in day time.

6. The device as claimed in claim 1, wherein the wind turbine (**8**) in placed suitably at the top of the tubular trunk portion (**2**) in order to make the solar photovoltaic panels properly exposed to the sun.

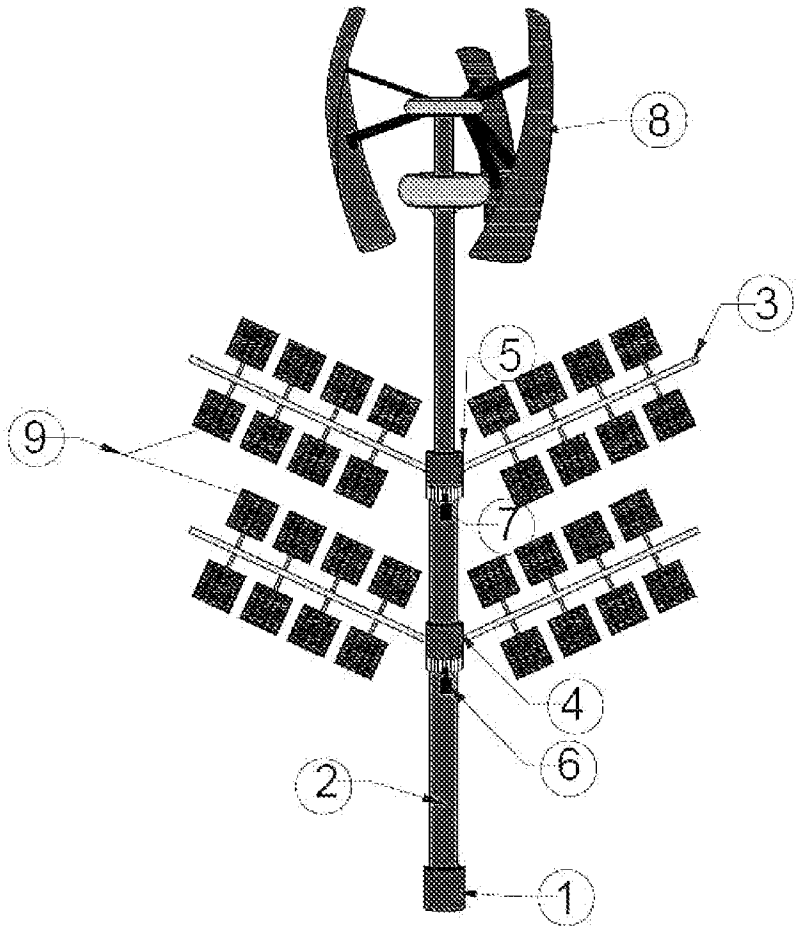

Figure 1

INTERNATIONAL SEARCH REPORT

International application No.
PCT/IN2022/050853

A. CLASSIFICATION OF SUBJECT MATTER
F03D3/02,F03D9/34 Version=2023.01

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

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

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

PatSeer, IPO Internal Database

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	KR102079713B1 (I HUI GON [KR]) 20 February 2020 abstract; para 30-45, 55-60 ; Fig. 1-3, 11-13 (espacenet machine translation)	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
"D" document cited by the applicant in the international application
"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 another 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
16-02-2023	16-02-2023

Name and mailing address of the ISA/	Authorized officer
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