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(22) Date of Filing:	20.07.2021	(56) Documents Cited:	WO 2012/006411 A1 WO 2009/045349 A2 WO 2003/062636 A1 CN 209860842 U CN 201502871 U CN 109989879 A CN 104234938 A CN 001884822 A
(71) Applicant(s): Savebox Limited Unit 1 Alexandria Industrial Estate, Wentloog Road, Rumney, Cardiff, CF3 1EY, United Kingdom		(58) Field of Search:	INT CL F03D Other: WPI, EPODOC, Patent Fulltext
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(54) Title of the Invention: **A wind turbine**
Abstract Title: **Portable wind turbine device with extension section**

(57) Portable wind turbine device and a system for controlling the same. The wind turbine device comprises a base unit 12, an extension section 16 mounted upon the base unit, and a vertical axis wind turbine 18 connected to the extension section. The distance between the base unit and the vertical axis wind turbine is adjustable by adjustment of the extension apparatus, which may be a pantograph or telescopic. Preferably the device is portable and the base unit comprises wheels and deployable legs or outriggers. The base unit may further comprise deployable solar cells and an electrical energy storage. An anemometer may be connected to the wind turbine device and a central processing unit arranged to receive a signal from the anemometer and to control the raising and or lowering of the vertical axis wind turbine according to the wind conditions.

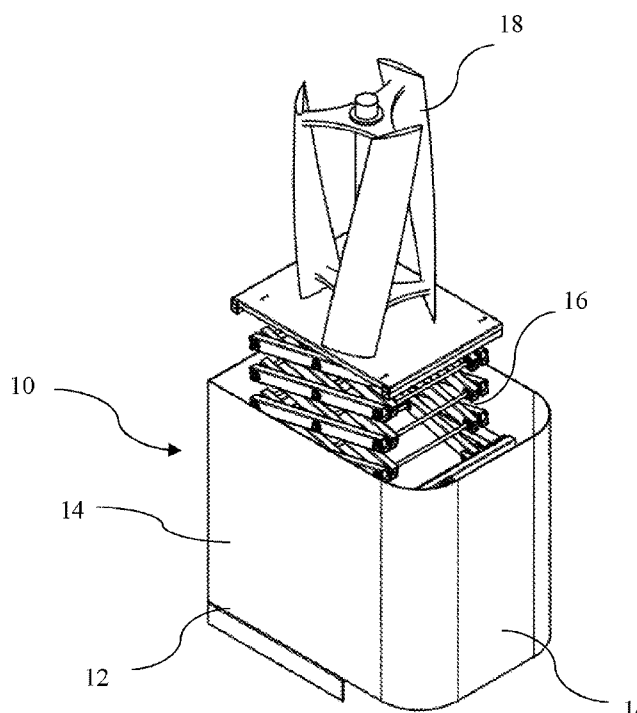


Fig. 2

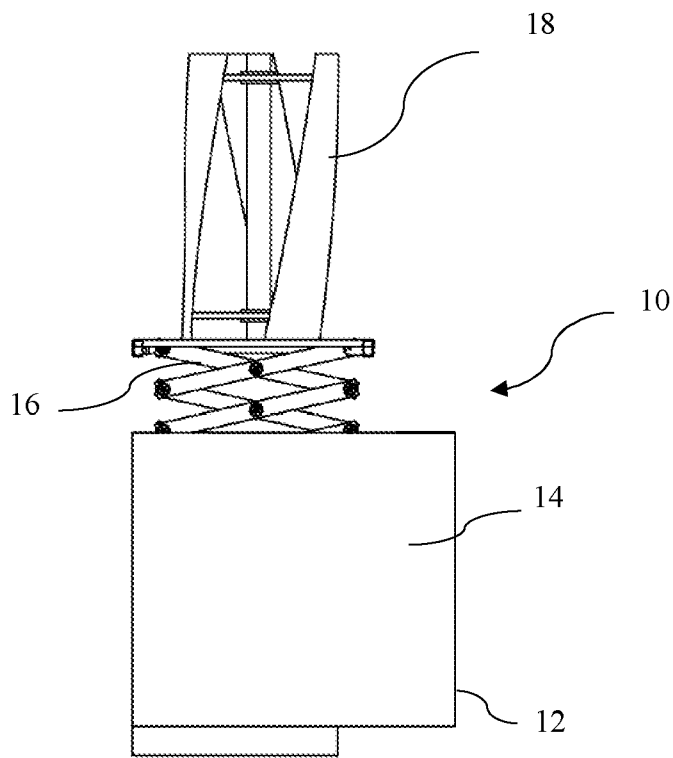


Fig. 1

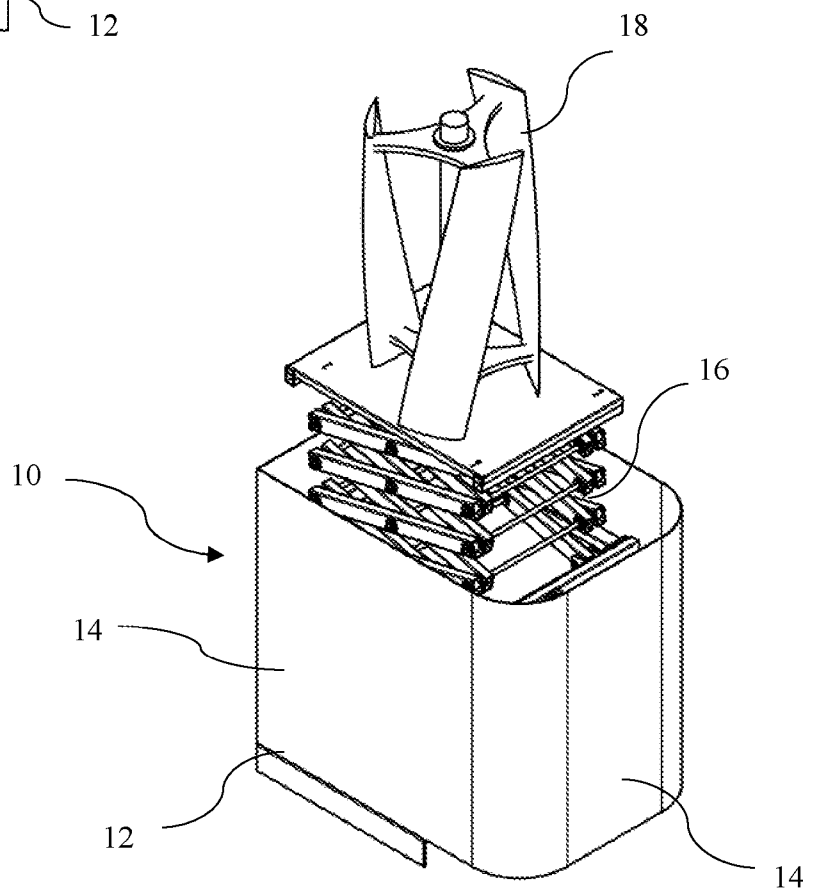


Fig. 2

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A Wind Turbine

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Field of the Invention

The invention relates to a wind turbine and, more especially, to a portable wind turbine.

Background to the Invention

Wind turbines are often fixed in place with deep foundations to ensure that they are stable and do not blow over in the wind. Sites in which such wind turbines are extensively prepared and the electrical energy that is generate is often transported long distances to
25 join a power grid. Whilst this is useful for powering large areas, there is a need for local, temporary electrical generation, for example, where construction is taking place and lighting is required or electrical power for powering or charging tools and devices.

This is particularly the case with battery-powered portable lighting is needed for the
30 evening and night.

Additionally, the efficiency of wind turbines is affected by the wind speed, which changes regularly. Having a wind turbine statically positioned is not ideal in respect of

maximising the efficiency of the system and gearing and clutches may be required to avoid damage to the internal turbine mechanics in strong winds.

Summary of the Invention

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Accordingly, the present invention is directed to a wind turbine device comprising:

a base unit;

an extension section mounted upon the base unit; and

a vertical axis wind turbine connected to the extension section;

10 wherein the distance between the base unit and the vertical axis wind turbine is adjustable by adjustment of the extension apparatus.

Thus, the present invention provides a vertical axis wind turbine that can be easily transported in a collapsed state and deployed in the required location. The vertical axis
15 wind turbine can be raised and lowered to allow it to be exposed to the wind, thereby allowing it to generate electricity. By employing a vertical axis wind turbine, rather than a horizontal axis wind turbine, device can be more compact and more readily stored and transported. The base unit can be provided with walls, which may be removable, to enable the device to provide protection during transit, where the device is portable.

20 Additionally, the walls can be shaped to be more aerodynamic.

In a preferred arrangement, the extension section comprises a pantograph. The use of a pantograph allows for a controlled raising and lowering of the vertical axis wind turbine. Furthermore, the pantograph can be lowered to be relatively flat, thereby allowing the
25 device to be readily transported. Additionally, the pantograph, or scissor lift, provides stability to the extension section. A further advantage of the use of a pantograph in the present invention is that the operation of the extension mechanism can be positioned in the base unit. Thus, an actuator, which may be a motor, or a pneumatic or hydraulic control, can be situated in the base unit, thereby providing the base unit with a relatively
30 low centre of mass in order to improve stability, because the weight of the actuator is kept low, relative to the wind turbine. The actuator can operate the pantograph and can extend or contract the pantograph by operating the lower most linkage thereof. Therefore, the whole arrangement is more stable and easily operated.

It may be that in an alternative arrangement the adjustable section comprises a telescopic structure having a plurality of telescopic elements. Such an arrangement is readily extended and contacted.

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Preferably, the device is portable and the base unit comprises, or is provided with, wheels or tracks to allow the device to be readily transported to the desired location.

Furthermore, whether static or portable, the base unit may further comprise deployable legs or outriggers, which can provide further stability to the device, particularly in strong
10 winds.

Advantageously, the base unit further comprises deployable solar cells. Providing solar cells on the base unit provides a secondary method of power generation. It might be that walls of the device may be pivoted open with solar cells contained thereupon. This allows
15 the solar panels to be stowed conveniently and easily deployed. Alternatively, or additionally, a flexible solar panel may be deployed from the base unit, which may be rolled up when not in use.

It is particularly preferable that the device further comprises electrical energy storage.

20 By providing energy storage, which may be in the form of a battery or a flywheel, the energy can be stored and used at a later time, for example for powering lighting in the dark.

The invention extends to a portable wind turbine system comprising a portable wind
25 turbine device according to any proceeding claim, wherein the system further comprises an anemometer connected to the wind turbine device and a central processing unit arranged to receive a signal from the anemometer and to control the raising and or lowering of the vertical axis wind turbine according to the wind conditions. Thus, the anemometer can be used to determine the best height for operating the wind turbine.

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In the system of the present invention, the vertical height can be controlled in relation to the weather and, more specifically, the wind speed and direction. For example, in low wind speeds, such as in the Summer in the United Kingdom, it may be desirable to have

the vertical axis wind turbine raised as high as possible to harness the fastest wind; however, in stronger winds, such as the Winter in the United Kingdom, it may be preferable to operate the device at a lower height to avoid wind speeds that are too fast for the device. Therefore, the optimum height can be calculated, depending upon the local conditions. Additionally, it may be desirable for the arrangement to incorporate an accelerometer. An accelerometer can be employed to monitor the stability of the device and to lower or collapse the vertical axis wind turbine should the conditions be unsuitable and the risk of toppling be too great.

- 10 The use of a pantograph element allows for accurate and reliable height adjustment, whilst retaining the stability of the arrangement.

The device may be provided with a lighting arrangement, that can provide light to the surrounding area and that is powered by the device itself, preferable via an accumulator.

- 15 Additionally, or alternatively, a charging point, for example, a plug socket or a universal serial bus outlet, can be providing in the base unit.

Brief Description of the Drawings

- 20 An embodiment of the invention will now be described, by way of example only, and with reference to the accompanying drawings, in which:

Figure 1 shows a side view of a deployable vertical axis wind turbine system in accordance with the present invention; and

Figure 2 shows a perspective view of the wind turbine system of Figure 1.

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Detailed Description of Exemplary Embodiments

- Figures 1 and 2 show a vertical axis wind turbine device 10 and system for operating the same. The device 10 may be fixed to the ground or onto a structure or support, or it may be portable.

The device 10 comprises a base unit 12 that has a floor and walls 14 around the periphery thereof, one of more of which may be fixedly connected to the floor or may be pivotable

thereon. Mounted upon the floor of the base unit 12 is a pantograph, or scissor lift 16. The pantograph 16 is provided with an actuator in the form of a motor and gears that bring the two supports of one end towards one another or moves them away from one another. Due to the nature of a pantograph, this extends or contracts the linkages therein
5 and so raises or lowers the distal end of the pantograph 16 accordingly.

Connected to the end of the pantograph 16 distal from the actuator is a vertical axis wind turbine 18. Mounted at the same end of the pantograph 14 as the wind turbine 18 is a sensor for detecting the wind speed and/or direction.

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The base unit 12 is provided with a central processing unit to monitor the wind conditions are the position of the vertical axis wind turbine 18. The base unit may be provided with an accumulator, such as a battery in order to store the electrical energy generated by the vertical axis wind turbine 18. This provides a storage mechanism so that the electrical
15 energy can be used at a later time and also provides weight to the base unit to provide better stability to the device.

When the device is in its lowered state, the vertical axis wind turbine is contained within the walls 14 of the base unit 12 and a lid may be applied to the tops of the walls 14 to
20 enclose the vertical axis wind turbine 18.

The actuator may be a motor, which may further incorporate a worm gear, to operate the linkages of the pantograph. Furthermore, the motor may be powered by the battery of the device itself and/or it may be provided with secondary power supply, such as a fuel driven
25 engine.

Whist the base unit is provided with wheels or tracks, those may be passive to allow the device to be towed or transported, or they may be motorised, either electrically or using fuel, to allow the device to be readily moved around. Alternatively, the device may fixed
30 in one position, which may include the use of building foundations. The wind turbine device could also be fixed to a building or other structure, rather than being portable.

Whist it is considered that a base unit may be in the form of foundations or the actuator body, it is preferable that the base unit is a structure upon which other parts can be mounted.

Claims

1. A wind turbine device comprising:
 - a base unit;
 - 5 an extension section mounted upon the base unit; and
 - a vertical axis wind turbine connected to the extension section;wherein the distance between the base unit and the vertical axis wind turbine is adjustable by adjustment of the extension apparatus.
- 10 2. A wind turbine device according to claim 1, wherein the extension section comprises a pantograph
3. A wind turbine device according to claim 1, wherein the adjustable section comprises a telescopic structure having a plurality of telescopic elements.
- 15 4. A wind turbine device according to any preceding claim, wherein the device is portable and the base unit comprises wheels.
5. A wind turbine device according to claim 4, wherein the base unit further
- 20 comprises deployable legs or outriggers.
6. A wind turbine device according to any proceeding claim, wherein the base unit further comprises deployable solar cells.
- 25 7. A wind turbine device according to any proceeding claim, wherein the device further comprises electrical energy storage.
8. A wind turbine system comprising a portable wind turbine device according to any proceeding claim, wherein the system further comprises an anemometer connected
- 30 to the wind turbine device and a central processing unit arrange to receive a signal from the anemometer and to control the raising and or lowering of the vertical axis wind turbine according to the wind conditions.



Application No: GB2110407.0

Examiner: Kingsley Robinson

Claims searched: 1-8

Date of search: 11 October 2021

Patents Act 1977: Search Report under Section 17

Documents considered to be relevant:

Category	Relevant to claims	Identity of document and passage or figure of particular relevance
X	1, 2, 4-8.	CN109989879 A (HANGZHOU ROUQING E COMMERCE CO LTD) See especially vertical axis wind turbine blades 103.
X	1, 3-8.	CN209860842 U (UNIV GUILIN TECHNOLOGY) See whole document.
X	1, 3-8.	WO2012/006411 A1 (ATOPIA RES) See whole document.
X	1, 3-8.	CN201502871 U (MILLENNIUM POWER MFG SHANGHAI CO LTD) See whole document.
X	1, 3-8.	CN1884822 A (ZHANG JIANMING) See whole document.
X	1, 3-8.	WO03/062636 A1 (DERMOND INC) See whole document.
X	1, 3-8.	CN104234938 A (UNIV WUHAN TECH) See whole document.
A	8	WO2009/045349 A2 (TECH INTERNAT LLC C) See anemometer 1130.

Categories:

X	Document indicating lack of novelty or inventive step	A	Document indicating technological background and/or state of the art.
Y	Document indicating lack of inventive step if combined with one or more other documents of same category.	P	Document published on or after the declared priority date but before the filing date of this invention.
&	Member of the same patent family	E	Patent document published on or after, but with priority date earlier than, the filing date of this application.

Field of Search:

Search of GB, EP, WO & US patent documents classified in the following areas of the UKC^X:

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Worldwide search of patent documents classified in the following areas of the IPC

F03D

The following online and other databases have been used in the preparation of this search report

WPI, EPODOC, Patent Fulltext

International Classification:

Subclass	Subgroup	Valid From
F03D	0009/30	01/01/2016
F03D	0003/00	01/01/2006
F03D	0013/20	01/01/2016