Office de la Propriété Intellectuelle du Canada
Un organisme d'Industrie Canada

Canadian Intellectual Property Office
An agency of Industry Canada

CA 2610507 A1 2008/05/17

(21) 2 610 507

(12) **DEMANDE DE BREVET CANADIEN**
CANADIAN PATENT APPLICATION

(13) **A1**

(22) Date de dépôt/Filing Date: 2007/11/14
(41) Mise à la disp. pub./Open to Public Insp.: 2008/05/17
(30) Priorité/Priority: 2006/11/17 (US60/859,727)

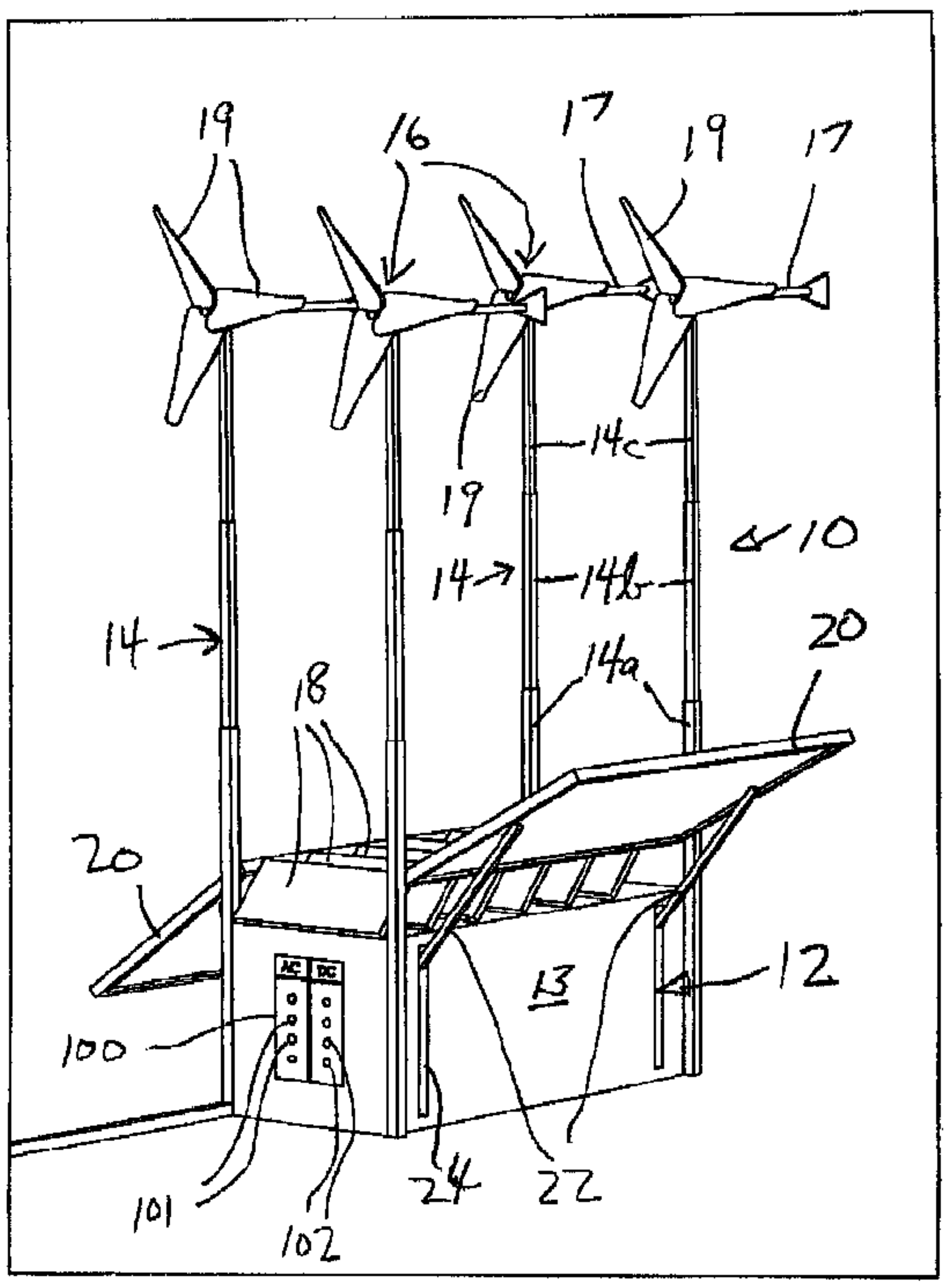
(51) Cl.Int./Int.Cl. *H02J 7/00* (2006.01), *F03D 9/02* (2006.01), *H02J 1/00* (2006.01), *H02J 15/00* (2006.01), *H02J 3/38* (2006.01), *H02J 3/40* (2006.01), *H02K 7/18* (2006.01)

(71) Demandeur/Applicant:
STAN, STEFAN, CA

(72) Inventeur/Inventor:
STAN, STEFAN, CA

(74) Agent: LESPERANCE & MARTINEAU S.E.N.C.

(54) Titre : GENERATEUR ELECTRIQUE MOBILE
(54) Title: MOBILE POWER GENERATOR



(57) Abrégé/Abstract:
A mobile power generator for use in remote areas, comprising a wind turbine, photovoltaic solar cell panels, an internal combustion engine motor generator, a rechargeable battery, operatively connected to the wind turbine, solar cell panels and motor generator, and a digital console having a CPU, operatively connected to the wind turbine, solar cell panels, motor generator, and battery whereby independent monitoring and operational synchronisation thereof is achieved for optimizing wind and sun energy collection. The control consle includes an electrical supply, for continuous independent delivery of electrical current from each wind turbine, solar cell panel, generator and battery, to external equipments, and the CPU including a power management algorithm routine, enabling prioritization of electrical supply to the battery selectively from at least one of the turbine, solar panel and motor generator, in accordance with relative energy supply therefrom and with remaining electrical charge at the level of the battery.

ABSTRACT

A mobile power generator for use in remote areas, comprising a wind turbine, photovoltaic solar cell panels, an internal combustion engine motor generator, a rechargeable battery, operatively connected to the wind turbine, solar cell panels and motor generator, and a digital console having a CPU, operatively connected to the wind turbine, solar cell panels, motor generator, and battery whereby independent monitoring and operational synchronisation thereof is achieved for optimizing wind and sun energy collection. The control consle includes an electrical supply, for continuous independent delivery of electrical current from each wind turbine, solar cell panel, generator and battery, to external equipments, and the CPU including a power management algorithm routine, enabling prioritization of electrical supply to the battery selectively from at least one of the turbine, solar panel and motor generator, in accordance with relative energy supply therefrom and with remaining electrical charge at the level of the battery.

TITLE OF THE INVENTION: MOBILE POWER GENERATOR

FIELD OF THE INVENTION

This invention relates to a mobile power generation unit, for use in supply of electricity where electric power grid is either damaged, destroyed or non existent.

BACKGROUND OF THE INVENTION

Autonomous power systems that collect renewable energy such as wind and sun, and convert same to generate electricity, are known. These power systems may be useful for residential, and commercial purposes for equipment already connected to the mains utility electrical grid of a city, for example, when under severe weather disturbances such as hurricanes, earthquakes or heavy freezing rain conditions, or after damages brought about as collateral damages in wars, electricity distribution network is damaged and rendered temporarily inoperative.

Another use for such autonomous power systems is when the electrical equipment is located in a remote area, never connected before to a mains electrical grid, for example in small uninhabited islands or hot or cold deserts, or otherwise unoccupied tracts of land. These renewable energy systems may also include batteries, to temporarily store the electrical energy under chemically converted condition, as known in the art.

However, operation of such known autonomous power systems is typically awkward. Moreover, the interplay between the electrical supply components of such known power systems creates inefficiencies that reduce the overall output performance thereof.

SUMMARY OF THE INVENTION

In accordance with the teachings of the invention, there is disclosed a mobile power generator for use in remote areas, said generator comprising : wind turbine means, for collecting kinetic energy from ambient air wind speed and for transforming same into electrical energy, and including a first electrical output; photovoltaic solar cell means, for collecting electromagnetic radiation from the sun and transforming the latter into electrical energy, and including a second electrical output; an internal combustion engine motor generator means, for transforming mechanical power generated by an internal combustion engine into electrical energy, and including a third electrical output; rechargeable battery cell means; including an electrical current intake, operatively connected to said first, second and third electrical outputs, and including a fourth electrical output; and control means, operatively connected to said wind turbine means, said solar cell means, said motor engine generator means, and said battery cell means, said control means including : - an electrical supply means, for continuous independent delivery of electrical current from at least one of each said first, second, third and fourth electrical outputs to external equipments, and - a power management means, enabling prioritization of electrical supply to said battery cell means electrical current intake selectively from at least one of said first, second and third electrical outputs, in accordance with relative energy supply from said first, second and third electrical outputs and with remaining electrical charge at the level of said battery cell means, whereby independent monitoring and operational synchronisation of said wind turbine means, solar cell means, motor generator means and battery cell means is achieved for optimizing wind and sun energy collection

Preferably, said control means further includes a control console, and further including a shelter unit having an enclosure receiving said control console and for accommodating an operator of said control console.

Preferably, said wind turbine means includes at least one telescopic tower member, mounted at a lower section thereof to said shelter unit, and carrying at an upper section thereof a rotor having a rotatable blade assembly, said control means having means to detect excess wind speed overload conditions and associated means to progressively telescopically retract and extend said telescopic tower member responsively to variable wind speed conditions.

Said shelter unit could be a freight container having a top wall with four corners, and wherein there would then be four telescopic tower members each upwardly projecting from a corresponding one of the four top corners of said container.

Tower mounting means preferably mount each of said tower members to said container for relative movement thereabout between an upright operative condition and a generally horizontal inoperative condition against said container top wall. These tower mounting means could include a reel and pulleys cables and hydraulic cylinder system, the latter system remotely actuatable via said control console.

Preferably, said solar cell means includes a first set of solar panels, first mounting means fixedly mounting said first set of solar panels to said container top wall, a second set of solar panels, second mounting means mounting said second set of solar panels to a pair of successive said telescopic tower members lower sections for relative sun tracking movement thereabout, a third set of solar panels, third mounting means mounting said third set of solar panels to a second pair of successive said telescopic tower members lower sections for relative sun-tracking movement thereabout, all said solar panels operatively electrically interconnected wherein said control means have means to track sun motion in the sky and associated power means to move said second and third sets of solar panels accordingly about their said first, second and third mounting means. AC/DC convertors should be provided, converting variable frequency current generated by said rotors and said solar panels through a common DC line, to a fixed voltage current through an AC line.

Pivotal mount means could mount each of said tower members for relative movement between an operative upright condition and an inoperative retracted condition generally abutting against the container top wall.

Preferably, said solar cell means further includes an additional set of solar panels, and ground support members supporting said additional set of solar panels spacedly over ground and spacedly laterally from said container, said additional set of solar panels all operatively electrically connected with said first, second and third set of solar panels.

DESCRIPTION OF THE DRAWINGS

In the annexed drawings :

Figure 1 is a front perspective view of the power generator according to the present invention, showing the wind turbines in erected and extracted position, and further showing a first set of stationary solar panels on the container top wall and a second set of solar panels pivotally carried on opposite lateral sides of the container.

Figure 2 is a schematic block diagram showing the various functional components of the power generator of the present invention;

Figure 3 is a partial side elevation of the power generator of figure 1, at an enlarged scale relative to figure 1, and sequentially showing the installation procedure of a wind turbine telescopic tower in full and phantom lines, respectively;

Figure 4 is a view similar to figure 1, but at a smaller scale and showing an additional set of solar panels supported horizontally over ground by a number of upright posts;

Figure 5 is a vertical sectional view at an enlarged scale of the mobile power generator of figures 1; and figure 6 is a front elevational view of the power generator of figure 1, suggesting the sun tracking tilting motion of the lateral solar panels.

DETAILED DESCRIPTION OF THE EMBODIMENTS

The present invention relates to a mobile power generator 10. Envisioned applications of the present invention are, for example, to meet the electricity needs of dwellings on remote constructions sites or in far removed villages where electricity is not readily accessible.

Power generator 10 comprises a container 12 of generally parallelepedic shape, defining a container interior (not shown).

At each one of the four corners of container 12 are mounted a number of removable telescopic towers 14, each telescopic tower 14 comprising three distinct sections, which are each hollow and preferably of generally square cross-section. Telescopic tower 14 comprises a bottom tower section 14a, an intermediate section 14b concentrically and slidably received within bottom tower section 14a, and an upper section 14c concentrically received in intermediate tower section 14b, and fixedly secured thereto. Each telescopic tower 14 pivotally carries a wind turbine 16 at the free top end of its upper section 14c, and wind turbine 16 can pivot with respect to tower 14 about the latter's longitudinal axis. Wind turbine 16 comprises a conventional weathervane 17 orienting the turbine in the direction of the wind, and three conventional blades 19 mounted to a rotor.

Each telescopic tower 14 is provided with a deployment mechanism, as shown in figure 3. It comprises a selectively actuated reel 110 commanded by a digital control console 80 of the generator 10 (figure 2), as described hereinafter. It further comprises two pulleys 112 and 114 attached to the outer side surface of bottom tower section 14a, and an internal pulley 116 located at the extremity of intermediate tower section 14b situated inside the lumen of bottom tower section 14a. The tower deployment mechanism further comprises a cable 117, the outer free end of which can be selectively attached and wound around actuated reel 110. Cable 117 is rollably supported sequentially by pulley 112, and then by pulley 114; it then penetrates in an orifice (not shown) made in tower bottom section 14a adjacently to pulley 114, and circulates in the interstice between the inner wall of tower bottom section 14a and the outer wall of intermediate section 14b. It then rollably bears against pulley 116, and runs back up along the above-mentioned interstice, and is fixedly secured to the inner wall of tower bottom section 14a at 119.

The functioning of the tower deployment mechanism will now be described. During transport, telescopic towers 14 are contracted to their shortest length, detached from container 12 and stored inside container 12. One purpose of the tower deployment mechanism is to erect the corresponding tower 14 to a vertical, operational position. To position a tower in a vertical position, the butt end of a tower bottom section 14a is pivotally attached to container 12 at 120. The outer free end of cable 117 is then attached to reel 110, and a blocking pin 122 is inserted transversally in tower 114, to secure the bottom and intermediate tower sections 14a, 14b of the tower together and prevent relative movement therebetween. Actuated reel 110 can then be activated (by digital control console 80 as described hereafter), to wind cable 117 therearound and thus pull and pivot the turbine-provided tower 14 towards container 12 as sequentially shown in figure 3 (positions 1 → 3). A semi-skilled worker can then manually secure bottom section 14a to container 12 in its erected condition, using bolts or other suitable fasteners.

The blocking pin 122 can then be disengaged from tower 14 to permit sliding movement of intermediate tower section 14b relative to bottom tower section 14a. Since tower 14 is now firmly secured to container 12 and can no longer move relative thereto, and since blocking pin 122 has been released from tower 14 to permit relative sliding motion of intermediate tower section 14b with respect to bottom tower section 14a, further actuation of reel 110 will bring about movement of intermediate section 14b in or out of bottom section 14a. If reel 110 is commanded to wind cable 117 therearound, cable 117 tightens and hoists intermediate section 14b upwardly, therefore extending tower 14. Inversely, if reel 110 is commanded to unwind cable 117, cable 117 loosens and intermediate section 14b retracts inside bottom tower section 14a under the biasing influence of its own weight, thus causing the contraction of tower 14.

Moreover, container 12 carries a number of top stationary solar panels 18 fixedly secured to its roof, as well as a pair of opposite, lateral solar panels 20, 20 hingedly attached to an intermediate section of the same bottom tower sections 14a of the telescopic towers 14 supporting top wind turbines 16. Lateral solar panels 20, 20, as best seen in figures 1 and 4, can pivot relative to container 12 towards or away from its outer lateral walls 13 (only one lateral wall 13 is apparent in figures 1 and 4). Moreover, mobile generator 10 is provided with a pair of positioning rods 22, 22, each rod pivotally connected to the rear surface of panels 20, 20 at a so-called panel end; and pivotally and slidably mounted in a track 24, 24 at an opposite so-called track end. A motor 23 (figure 3) can be selectively activated to actuate a chain for example (not shown), to raise or lower the track end of rods 22, 22 along tracks 24, 24 and thus modify the pivotal position of the lateral solar panels 20, 20 with respect to the container side walls 13.

Container 12 is also provided with a distribution panel, schematically shown at 100 in figure 1, which comprises a number of AC outputs 101, and a number of DC outputs 102. These outputs are destined to be connected to any sort of electricity-powered devices, directly to the electric panel of a dwelling, etc., as known in the art.

The electrical functioning of the power generator will now be detailed. Figure 2 shows the different functional components of the power generator 10 and their interaction. For further reference, it is noted that the wiring of generator 10 comprises two common electricity lines from which DC or AC current will be drawn or to which it will be delivered: a common DC line 40 (e.g. 24 V) and a common AC line 60 (e.g. 110/220 V, 60 Hz).

Wind turbines 14 output variable-frequency alternating current. Each wind turbine 14 is connected to distinct AC/DC converter 30 to convert the variable-frequency AC current generated by the wind turbine to a fixed-voltage current. Converter 30 then delivers the resulting DC current to common DC line 40.

Similarly, the power output of each solar panel 18, 20 (preferably being of the photovoltaic type) is connected to an AC/DC power converter 32 which converts the variable-voltage DC current output by the solar panels to a fixed-voltage one. Converters 32 deliver the resulting fixed-voltage signal to common DC line 40.

Figure 2 also shows that power generator 10 is provided with a back-up internal combustion engine generator group 50. Engine generator group 50 comprises for example a diesel-powered engine 52 outputting its mechanical energy to a power generator 54, as known in the art. When diesel engine 52 is running, generator 54 produces an AC current and delivers it to AC line 60 (provided that circuit breaker 56 is closed, as described hereinafter).

Common DC line 40 and common AC line 60 are each independently connected to a battery module 70, *via* DC battery line 44 and AC battery line 64 respectively. Battery module 70 comprises: (1) a battery charging controller 72, and (2) a large-capacity electricity storage device such as a battery group or battery 74. The battery module 70 only outputs DC current, and delivers it to DC line 40. Conversely, battery 74 is only recharged by AC current, conveyed thereto *via* AC battery line 64.

DC line 40 can selectively feed DC current directly to DC consumers 42 through connectors 102 of distribution panel 100. DC line 40 is also connected to a DC/AC converter 34, which converts DC current from DC line 40 to AC current, and delivers it to common AC line 60. Similarly, AC line 60 can selectively deliver AC current to AC consumers 62 through connectors 101 of distribution panel 100.

Mobile power generator 10 further comprises a digital control console 80 (see figure 2). The control links interconnecting the control console 80 to the various components of the generator are schematically shown by double dotted lines in figure 2. Digital control 80 is pivotal to the functioning of generator 10; it synchronises the operation of various components, monitors activity of certain components, optimizes the functioning of the generator, etc. The purposes of control console 80 are manifold, and are listed below:

- **Independent monitoring and control of each wind turbine 16.** As known in the art, wind turbines should be provided with protection against very strong winds to prevent it from spinning faster than its safe maximum rotation speed. Overspeeding of the turbine's rotor can indeed destroy or otherwise damage the turbine. It is thus desirable to protect the generator's wind turbines 16 from overspeeding when exposed to strong winds. To protect the wind turbines 16 against strong winds, digital control 80 continuously monitors the turbine's rotor speed, and if it exceeds a certain predetermined speed value, digital control 80 can engage a protection means. Protecting the turbine against overspeeding can be accomplished in a number of ways:

  - By conventionally controlling the turbine's furling weathervane 17 (see figure 1), so as to steer the wind turbine's rotor out of the wind, thus causing the turbine rotor to slow down.
  - By controlling and modifying the pitch of the rotor blades, to decrease their efficiency and thus prevent overspeeding of the turbine's rotor.
  - By activating an electrical braking means to automatically control the turbine's speed.
- **Control of telescopic towers 14.** Once telescopic towers 14 are mounted to the corners of the container 12, control console 80 can command actuated reel 110 to extend or contract telescopic towers 14. Extension and contraction of the telescopic towers 14 can be effected for different reasons, for example:
  - After having mounted telescopic towers 14 to the corners of the container 12 as described above, telescopic towers 14 can be extended to desired length.
  - Control console 80 can extend/contract telescopic towers 14 to desired length to protect the wind turbines from overspeeding. Wind speed generally rises with altitude, and thus lowering the turbine by contracting the towers can help reduce the rotor speed if it becomes too important.
  - The length of towers 14 can also be modified to optimize the wind turbine's efficiency. Indeed, if two given wind turbines are at the same vertical level, and if the wind direction is in line with these two turbines, the leading turbine (with respect to wind direction) will capture most of the wind's energy, and the trailing turbine will not be able to spin optimally due to the obstruction by the leading turbine of the incoming wind stream. Thus, if two turbines are in line with the wind's direction, control console 80 will command actuated reel 110 to position the two turbines at different vertical levels, thus minimizing the leading turbine's interference with the wind stream destined to drive the trailing turbine.
- **Solar panel control.** The control console can also control motors 23 to modify the position of the lateral solar panels 20, 20. As known in the art, maximal power output of a solar panel is obtained when incident sunrays impinge orthogonally on the panel's

surface. Therefore, the control console can automatically modify the position of lateral solar panels 20, 20 in accordance with sun position in the sky (figure 4). Sun position can either be sensed using a suitable sun position detection system, or be approximated by the control console in accordance with the time of the day and of the year. The position of lateral solar panels 20, 20 can also be modified according to wind speed regardless of the sun's position, to prevent damage to the panels if the winds are too violent, e.g. by folding the panels completely towards container walls 13.

- **Monitoring of DC/AC inverters 30, and AC/DC converter 34.**
- **Independent managements and monitoring of DC and AC consumers 42, 62.** As can be seen in figure 2, circuit breakers 43, 63 are interposed between the DC, AC lines 40, 60 and the DC, AC outputs 102, 101 respectively. Each circuit breaker 43, 63 is independently controllable by the control console 80, and the latter can selectively trip out/close a given circuit breaker 43, 63 to interrupt/enable the supply of electricity to a given power consumer. Now, mobile generator 10 can only handle a maximal power load. Even so, ideally, some critical electricity-powered devices should be the last to lack electricity even in the event of a demand overload. Therefore, to optimize power distribution to consumers, the control console 80 can be customized to prioritize certain of its power consumers 42, 62. To do so, a priority value — on a pre-established priority scale — can be assigned to each DC, AC connectors 101, 102 by programming the control console accordingly. For example, the refrigerator, heating or other critical electricity-powered device of a dwelling could be connected to a high-priority power output 101 (or 102), whereas a television or other non-critical electric devices could be connected to a low-priority power output 101 (or 102) of the generator. In the event of a demand overload, control console 80 can automatically trip out the circuit breakers 43, 63 to which are assigned lesser priority values to interrupt powering of non-essential consumers, while maintaining the electricity supply to essential consumers by keeping the corresponding circuit breakers closed.
- **Battery management.** To maximize the longevity of a battery, it is well known to allow the battery to go through complete charge/discharge cycles. In other words, it is desirable to allow the battery to almost fully discharge before recharging it to prevent it to wear out too rapidly. Therefore, control console 80 can control a circuit breaker 65

on battery AC line 64 to allow or prevent AC current to be delivered to battery module 70 to recharge the battery. The control console 80 hence constantly monitors the battery level, and when the battery nears depletion, control console 80 closes circuit breaker 65 in order to establish electrical communication between AC line 60 and battery module 70, thus allowing the battery 74 to recharge. Additionally, digital control console 80 also commands the battery charging controller 72 to regulate the delivery of DC current by the battery to DC line 40.

- **Management and synchronisation of main and back-up power supply circuits.** For security and stability purposes, the AC line 60 should not be fed simultaneously by the main supply circuit (whose power sources are the wind turbines, solar panels, and battery), and by the back-up diesel generator circuit, for extended periods of time. To prevent waste of non-renewable and costly fuel, the back-up diesel-generator group 50 is only activated if the electricity demand increases above certain value that can not be sustained solely by the main supply circuit. Thus, if the electricity demand increases above a certain level, digital control console 80 activates the diesel-generator group 50, and then calibrates it in order for its AC current output to have the same current characteristics (frequency, voltage, phase, etc.) as the current output of the inverter 34 of the main supply circuit. Once the characteristics of both power signals match, the control console closes circuit breaker 56 connecting generator 54 to AC line 60, and generator 54 starts delivering its generated AC current to AC line 60. A brief moment after circuit breaker 65 is closed, circuit breaker 35 — interposed between inverter 34 and AC line 60 — is tripped out by the control console 80. Power generated by the wind turbines and the solar panels, and discharged by the battery onto DC line 40 is no longer converted to AC and supplied to AC line 60, and is concentrated only at supplying DC current to DC consumers 42. On the other hand, the AC current fed by the generator 10 to the AC consumers 62 is produced exclusively by the diesel-generator group 50.

It is noted that since circuit breaker 34 is tripped out only <u>after</u> the circuit breaker 56 is closed, i.e. after the supply of AC current to AC line 60 by the diesel-generator group 50 is well established, the transition from one AC supply source to the other is seamless (i.e., the electrical current supply is continuous and uninterrupted) and does not affect the operations of the AC consumers.

All the data acquired during the monitoring activities of the control console 80 can be selectively displayed on a screen thereof (not shown).

Although automatic behaviour of the control console was almost exclusively described above, all of the controllable elements of mobile generator 10 can of course also be controlled manually by a human operator, through the instrumentality of input devices on the control console.

It is envisioned to provide the control console 80 with remote controlling and monitoring capabilities (e.g. by radio frequency, internet connection, etc.).

Figure 4 shows a plurality of additional solar panels 130, 132, supported horizontally spacedly over ground by a plurality of spaced upright posts 124, 126. The lower sections of posts 134, 136, may be driven into the ground, for example, to anchor same in vertical upright condition. The free height of posts 134, 136, may be for example slightly greater than an average person's height, and/or about the height of the container 12, to allow free circulation therebeneath by a serviceman for maintenance thereof.

Solar panels 130, 132, are electrically connected to an AC/DC convertor 80, similar to convertor 32, which converts the variable voltage DC current output from the solar panels to a fixed voltage one. These convertors then deliver the resulting fixed voltage signal to a common DC line similar to DC line 40, toward the digital console 80. Solar panels 130, 132, are preferably mounted adjacent to the container side 12.

The total surface area of the solar panels 130, 132, will depend of course on the in situ requirements, but may be for example 2500 square feet.

It is understood that the electricity generated by mobile generator 10 is used to meet its own power need, in addition to supplying electricity to external consumers.

In one embodiment of the present invention illustrated in figure 5, the digital control console 80, the diesel generator 140, the batteries, and additional components of the system are contained within the interior of container 12. It is envisioned that a desk and chair 142 be also provided within the containers to allow an operator of generator 10 to have a decent working environment within the container 12.

Moreover, it is also envisioned that if battery 74 is charged to its full capacity and the power demand remains inferior to the power generation potential of the wind turbines and solar panels, excess power could be rerouted to be used to power an external device, e.g. a water pump, instead of being wasted.

It is also understood that a plurality of containers can be connected in parallel to increase the power supply potential to consumers.

Other modifications could also be made to the present invention. Additional power generating units driven by renewable energies could be added to the system, e.g. a water turbine that could be installed in a nearby water stream. Similarly, additional power generating units driven by non-renewable energies could be added to the system, e.g. a coal engine.

CLAIMS

1. A mobile power generator for use in remote areas, said generator comprising :

a) wind turbine means, for collecting kinetic energy from ambient air wind speed and for transforming same into electrical energy, and including a first electrical output;

b) photovoltaic solar cell means, for collecting electromagnetic radiation from the sun and transforming the latter into electrical energy, and including a second electrical output;

c) an internal combustion engine motor generator means, for transforming mechanical power generated by an internal combustion engine into electrical energy, and including a third electrical output;

d) rechargeable battery cell means; including an electrical current intake, operatively connected to said first, second and third electrical outputs, and including a fourth electrical output; and

e) control means, operatively connected to said wind turbine means, said solar cell means, said motor engine generator means, and said battery cell means, said control means including :

- an electrical supply means, for continuous independent delivery of electrical current from at least one of each said first, second, third and fourth electrical outputs to external equipments, and

- a power management means, enabling prioritization of electrical supply to said battery cell means electrical current intake selectively from at least one of said first, second and third electrical outputs, in accordance with relative energy supply from said first, second and third electrical outputs and with remaining electrical charge at the level of said battery cell means, whereby independent monitoring and operational synchronisation of said wind turbine means, said solar cell means, said motor generator means and said battery cell means is achieved for optimizing wind and sun energy collection.

2. A mobile power generator as in claim 1,
with said control means further including a control console, and further including a shelter unit having an enclosure receiving said control console and for accommodating an operator of said control console.

3. A mobile power generator as in claim 2,
wherein said wind turbine means includes at least one telescopic tower member, mounted at a lower section thereof to said shelter unit, and carrying at an upper section thereof a rotor having a rotatable blade assembly, said control means having means to detect excess wind speed overload conditions and associated means to progressively telescopically retract and extend said telescopic tower member responsively to variable wind speed conditions.

4. A mobile power generator as in claim 3,
wherein said shelter unit is a freight container having a top wall with four corners, and wherein there are four telescopic tower members each upwardly projecting from a corresponding one of the four top corners of said container.

5. A mobile power generator as defined in claim 4,
further including tower mounting means mounting each of said tower members to said container for relative movement thereabout between an upright operative condition and a generally horizontal inoperative condition against said container top wall.

6. A mobile power generator as defined in claim 5,
wherein said tower mounting means includes a reel and pulleys cables and hydraulic cylinder system, the latter system remotely actuatable via said control console.

7. A mobile power generator as in claim 4,
wherein said solar cell means includes a first set of solar panels, first mounting means mounting said first set of solar panels to said container top wall, a second set of solar panels, second mounting means mounting said second set of solar panels to a pair of

successive said telescopic tower members lower sections for relative sun tracking movement thereabout, a third set of solar panels, third mounting means mounting said third set of solar panels to a second pair of successive said telescopic tower members lower sections for relative sun-tracking movement thereabout, all said solar panels operatively electrically interconnected wherein said control means have means to track sun motion in the sky and associated power means to move said second and third sets of solar panels accordingly about their said first, second and third mounting means.

8. A mobile power generator as defined in claim 7, Wherein said rotors and said solar panels including corresponding AC/DC convertors, converting variable frequency current generated by said blade assembly and said solar panels through a common DC line, to a fixed voltage current through an AC line.

9. A mobile power generator as in claim 7, further including pivotal mount means mounting each of said tower members for relative movement between an operative upright condition, and an inoperative retracted condition generally abutting against the container top wall.

10. A mobile power generator as in claim 7, wherein said solar cell means further includes an additional set of solar panels, and ground support members supporting said additional set of solar panels spacedly over ground and spacedly laterally from said container, said additional set of solar panels all operatively electrically connected with said first, second and third set of solar panels.

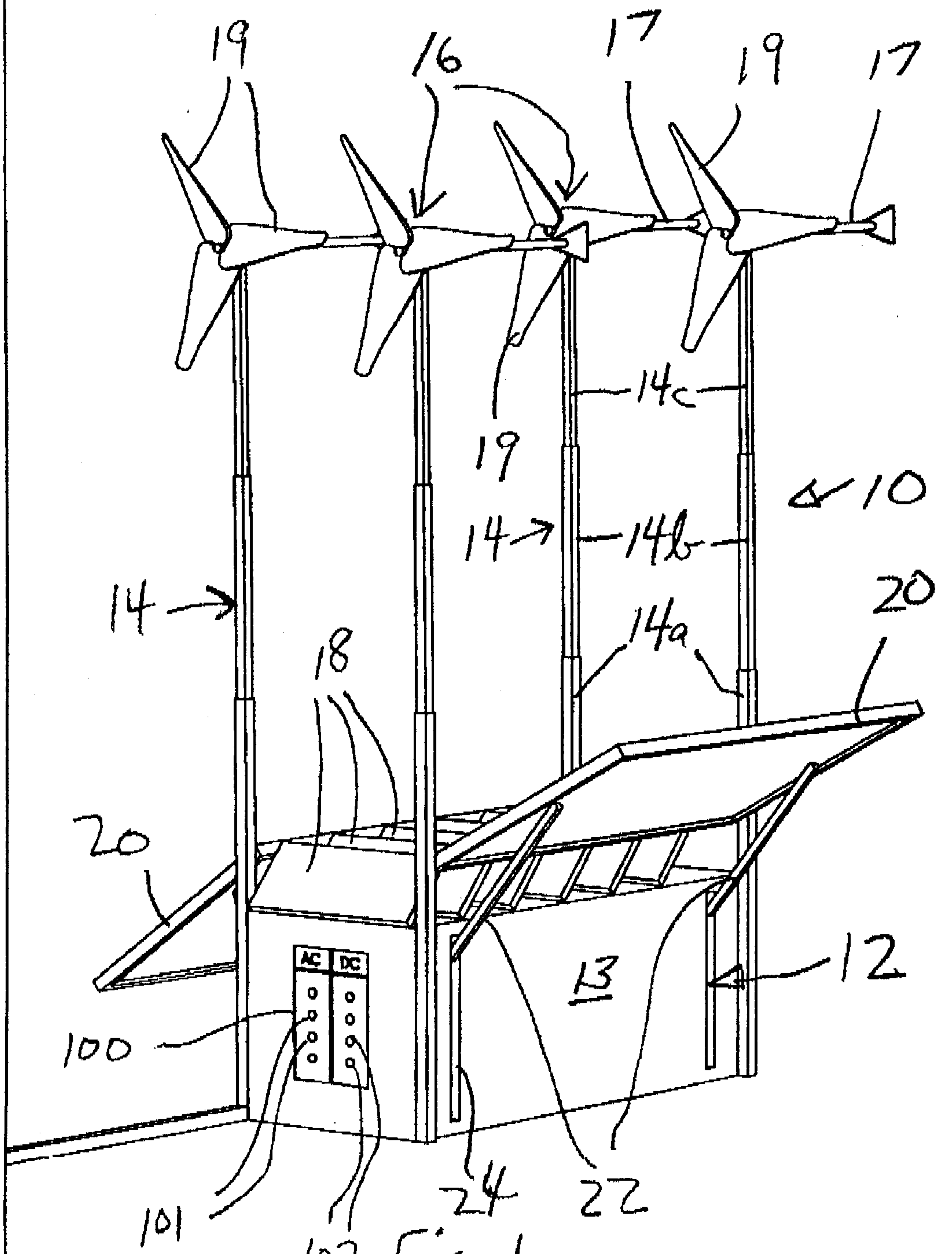

19
16
17
19
17
19
19
14c
10
14
14b
14
20
14a
18
20
AC
DC
13
12
100
24
22
101
102

FIG 1

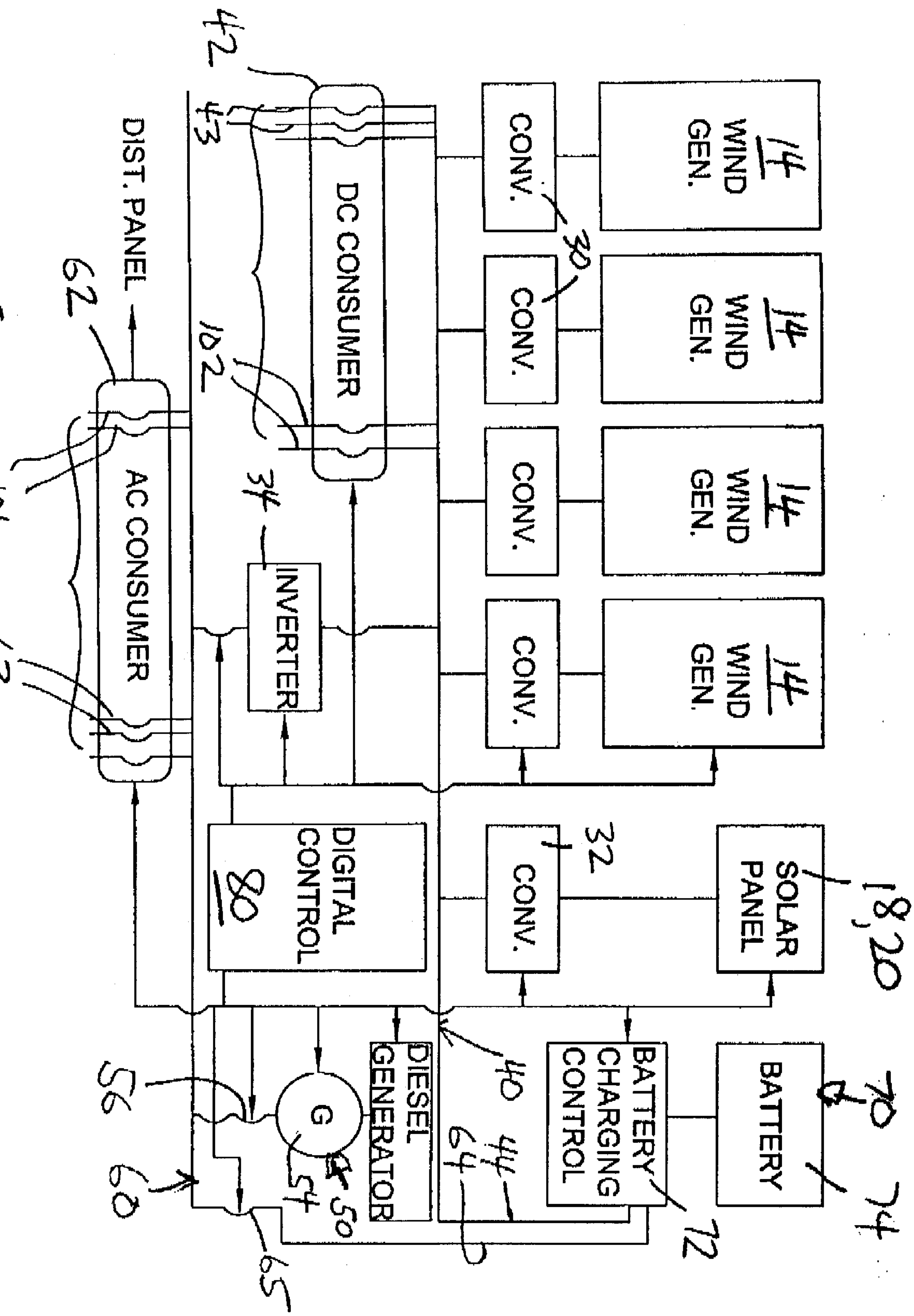
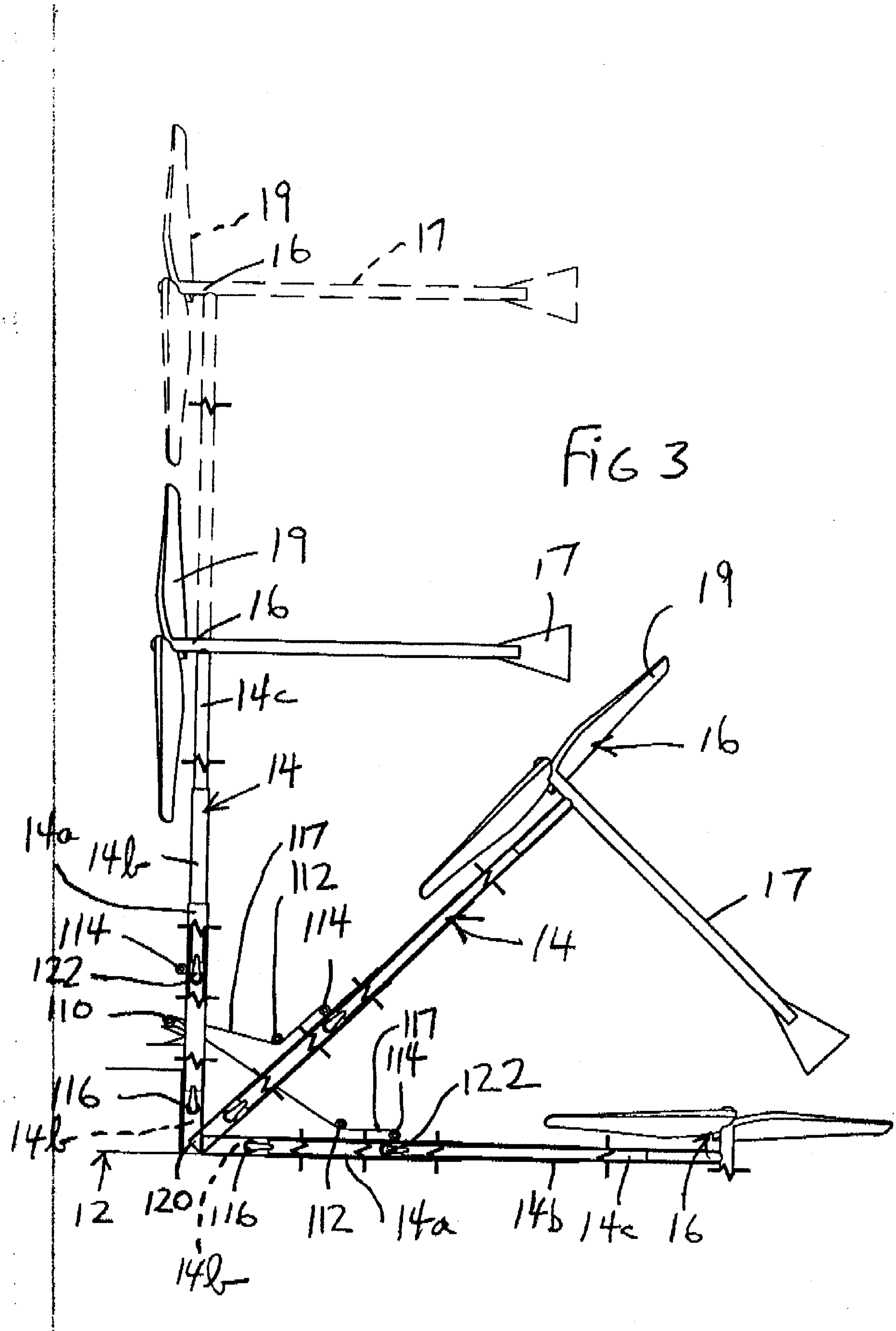

WIND GEN.
CONV.
DC CONSUMER
DIST. PANEL
AC CONSUMER
INVERTER
DIGITAL CONTROL
SOLAR PANEL
BATTERY
BATTERY CHARGING CONTROL
DIESEL GENERATOR
G

FIG 2


19
16
17
Fig 3
19
16
17
19
16
14c
14
14a
14b
117
112
114
14
17
114
122
110
116
14b
117
114
122
12
120
116
112
14a
14b
14c
16
14b

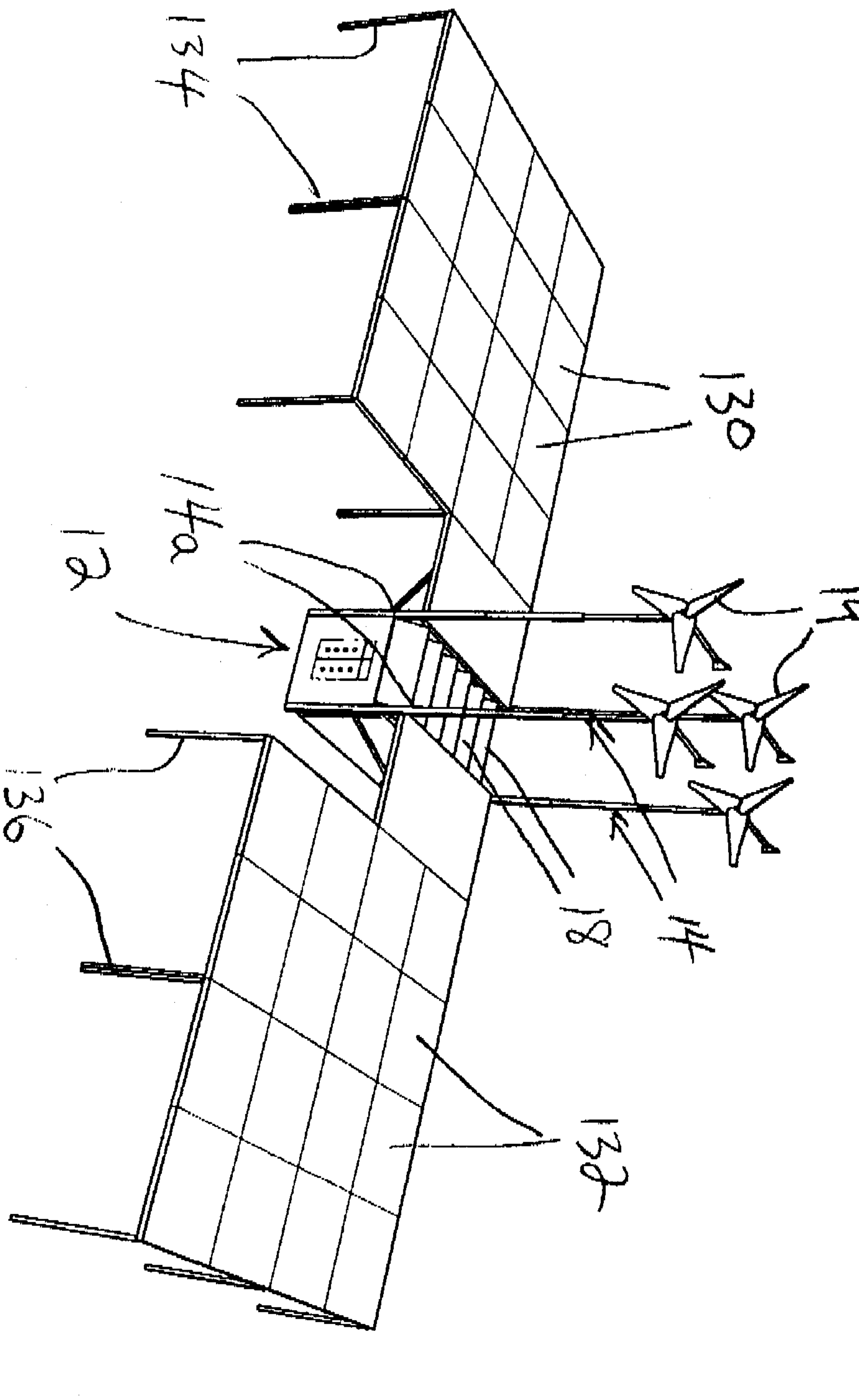


Fig. 4

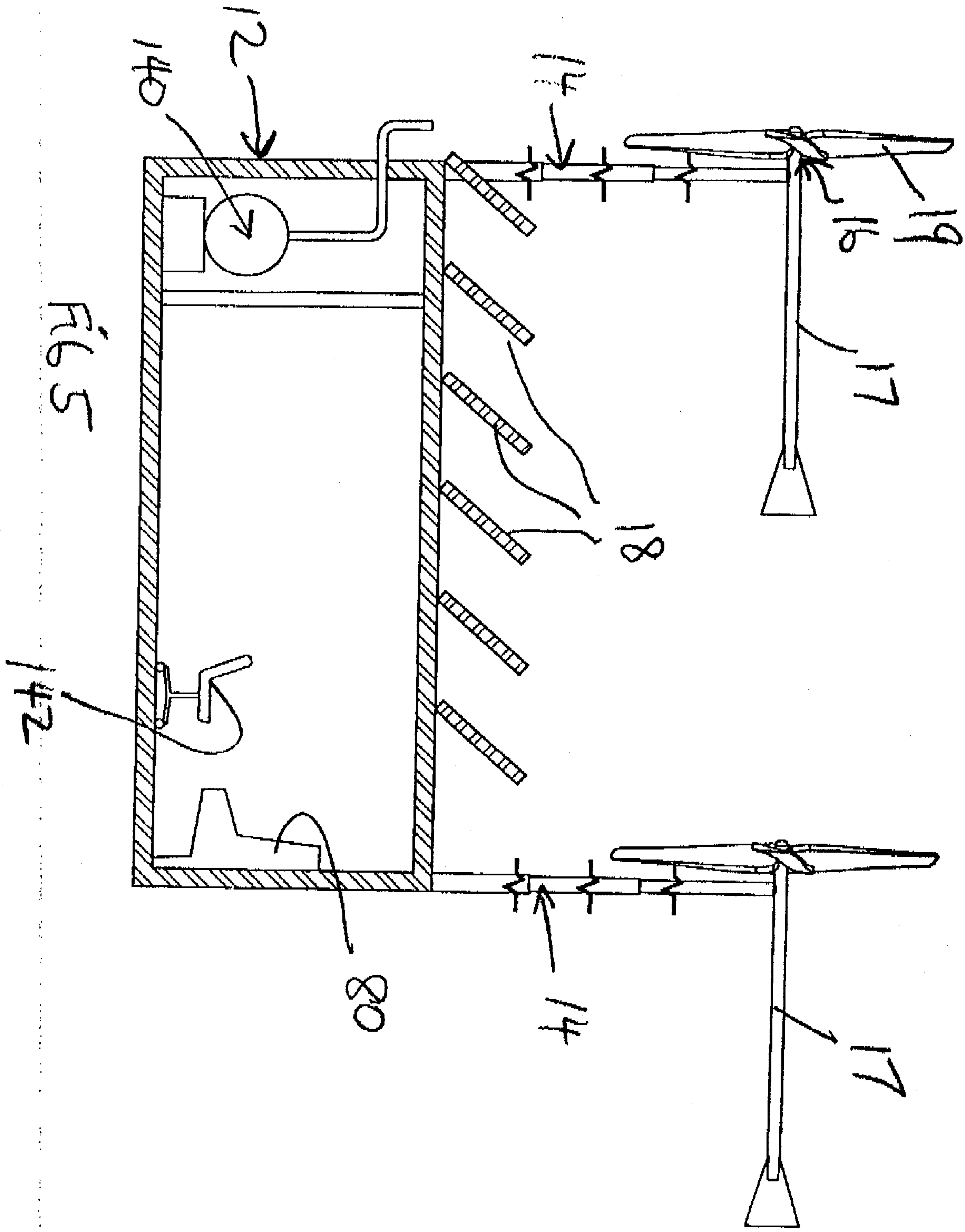


FIG 5

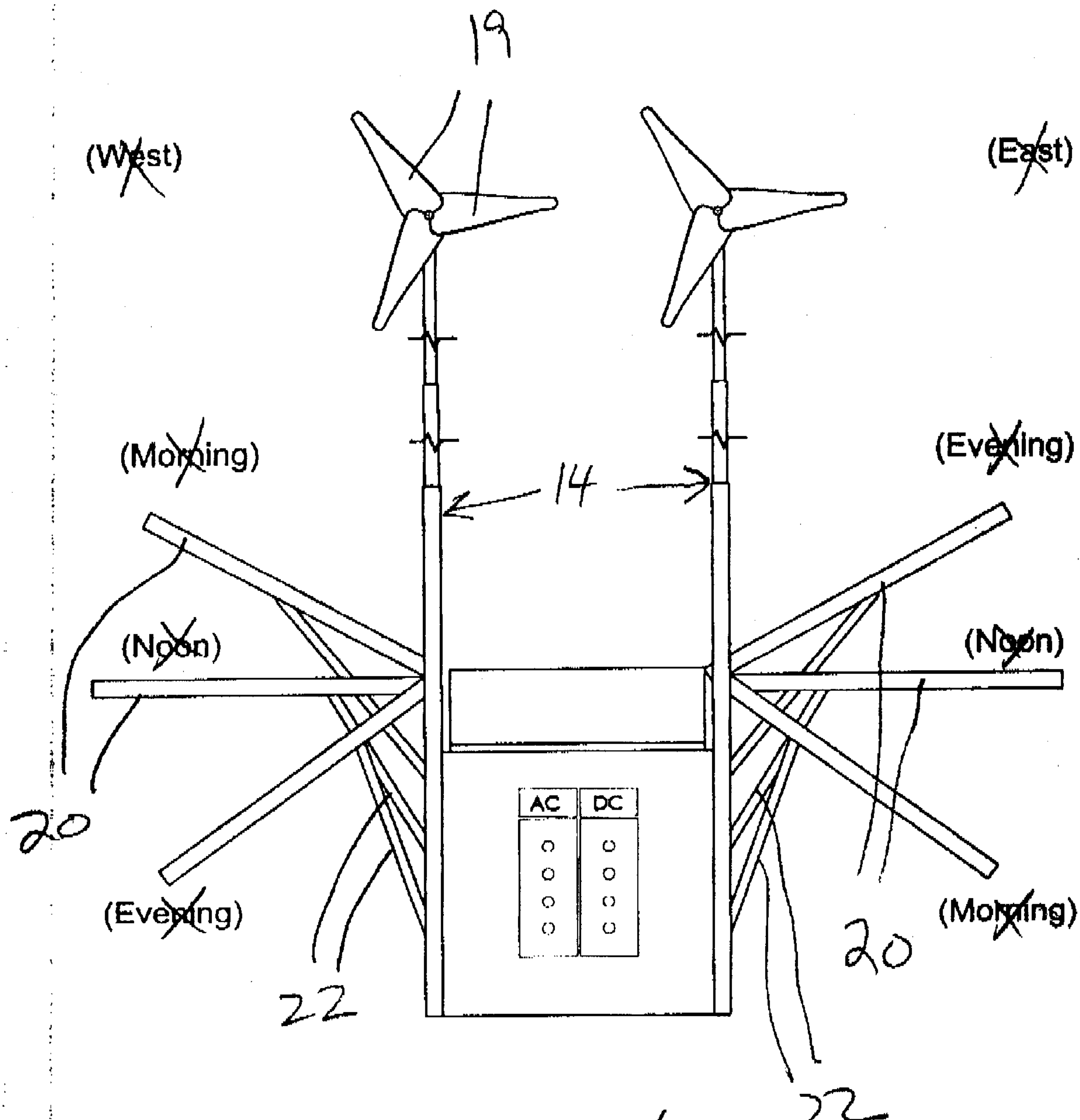
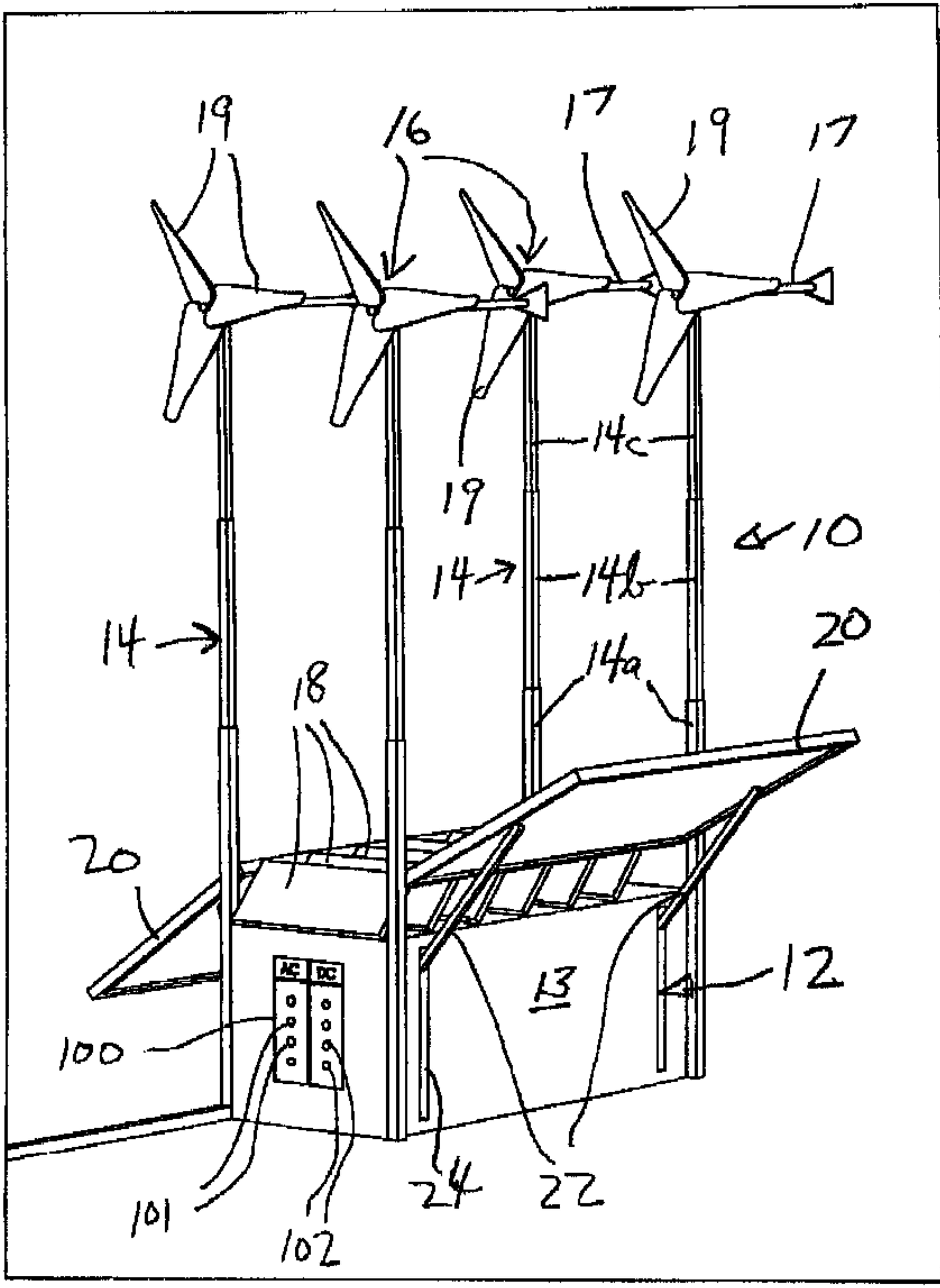

19
(West)
(East)
(Morning)
(Evening)
14
(Noon)
(Noon)
AC
DC
20
(Evening)
(Morning)
20
22
22

Fig. ~~4~~ 6



19
16
17
19
17
19
19
14c
10
14
14b
14
20
18
14a
18
20
20
12
13
100
101
102
24
22
22