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(54) MULTISOURCE RENEWABLE ENERGY GENERATION

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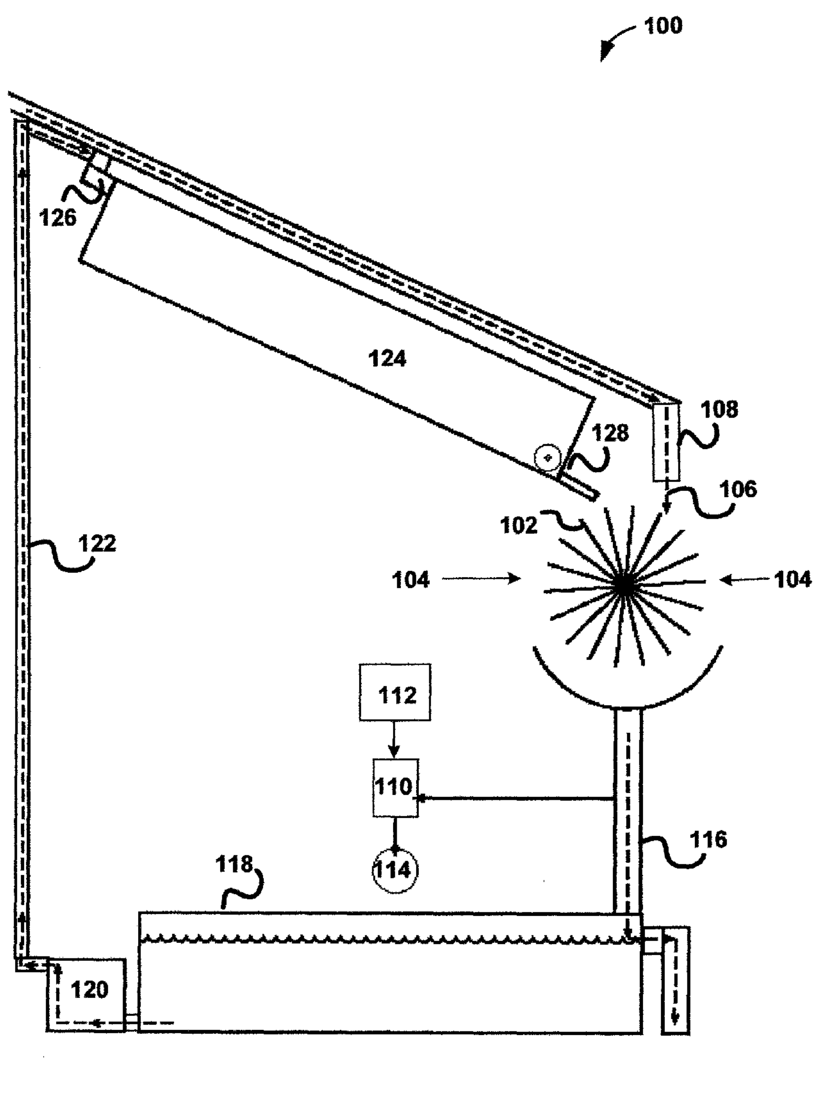
(57) **ABSTRACT**

A multisource generator system and associated processes generate electricity using one or more of wind power, hydropower, mechanical power, and solar power. The power sources may be selectively attached and activated to generate the electricity. A rotor may be actuated in response to both the wind power and the hydropower. The mechanical power may further actuate the rotor.



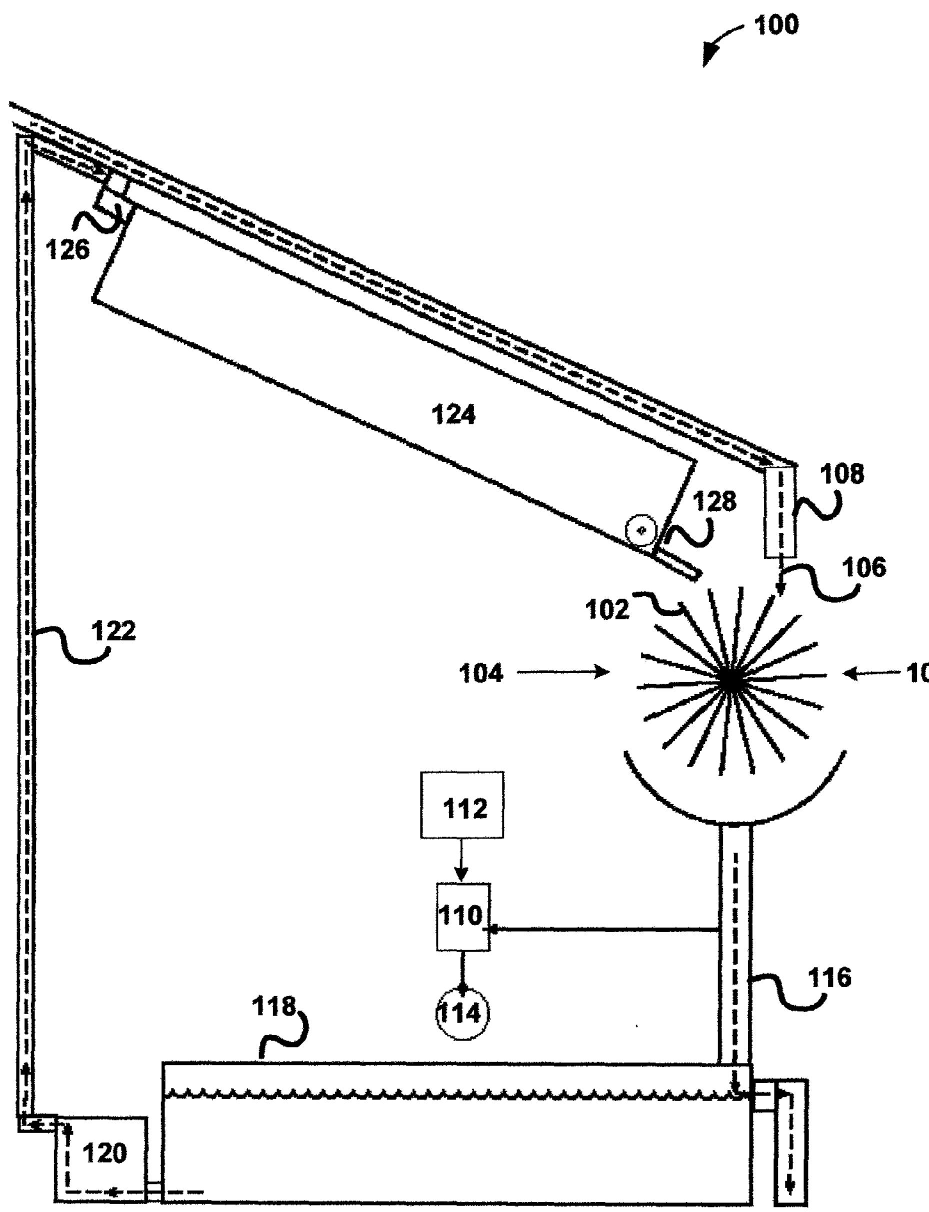


FIG. 1

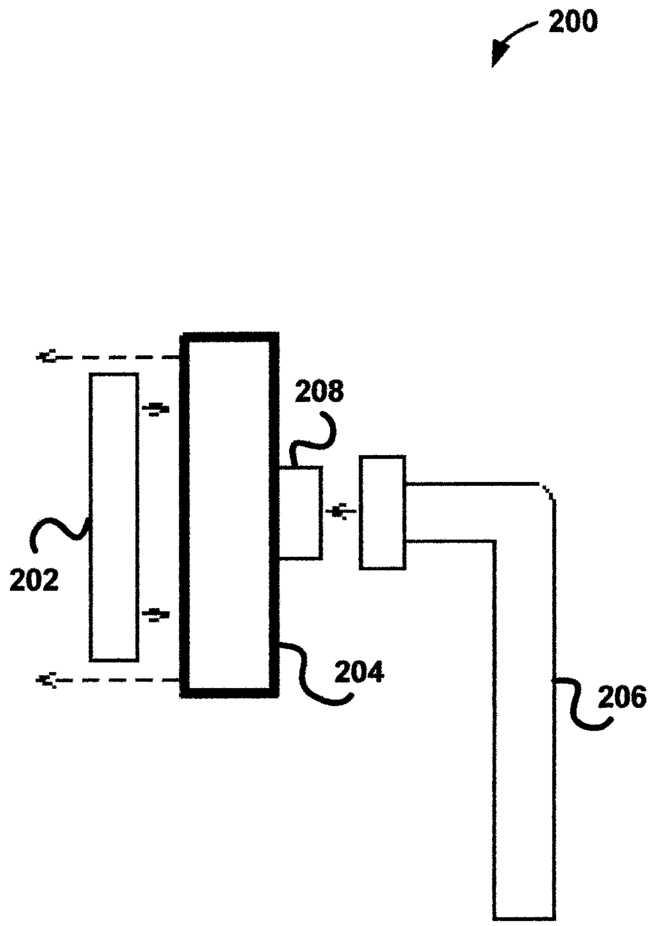


FIG. 2

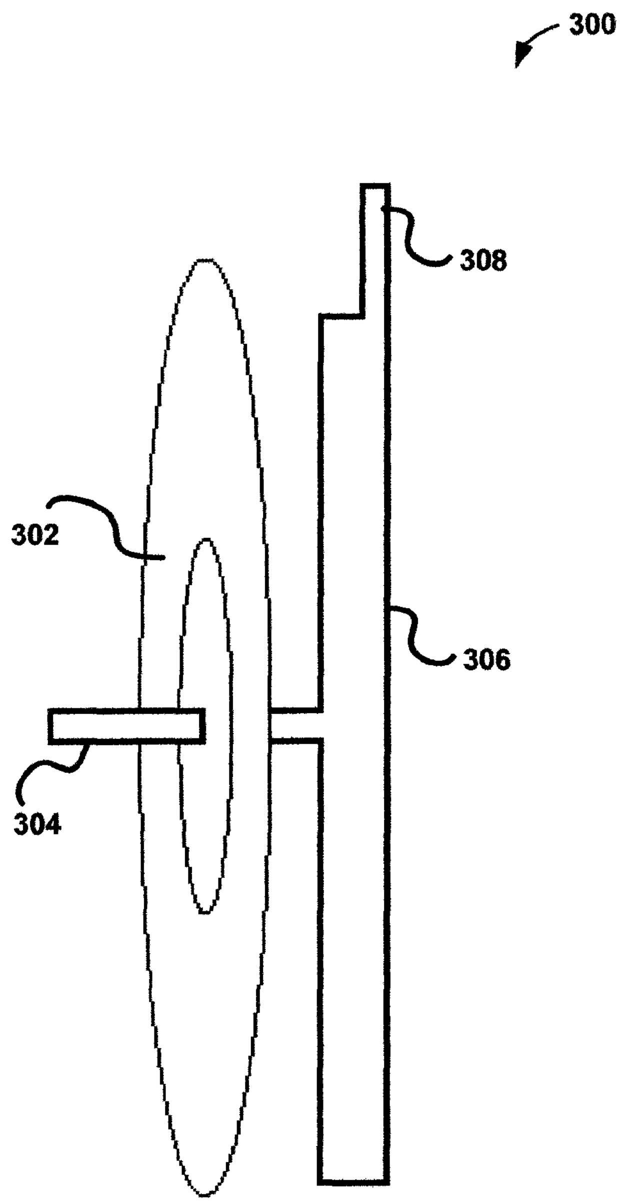


FIG. 3

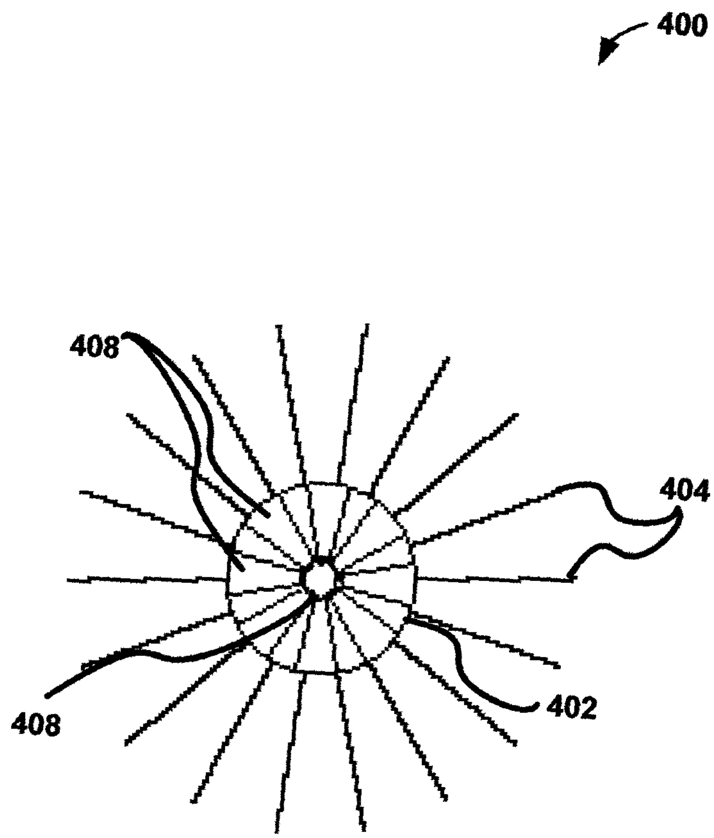


FIG. 4

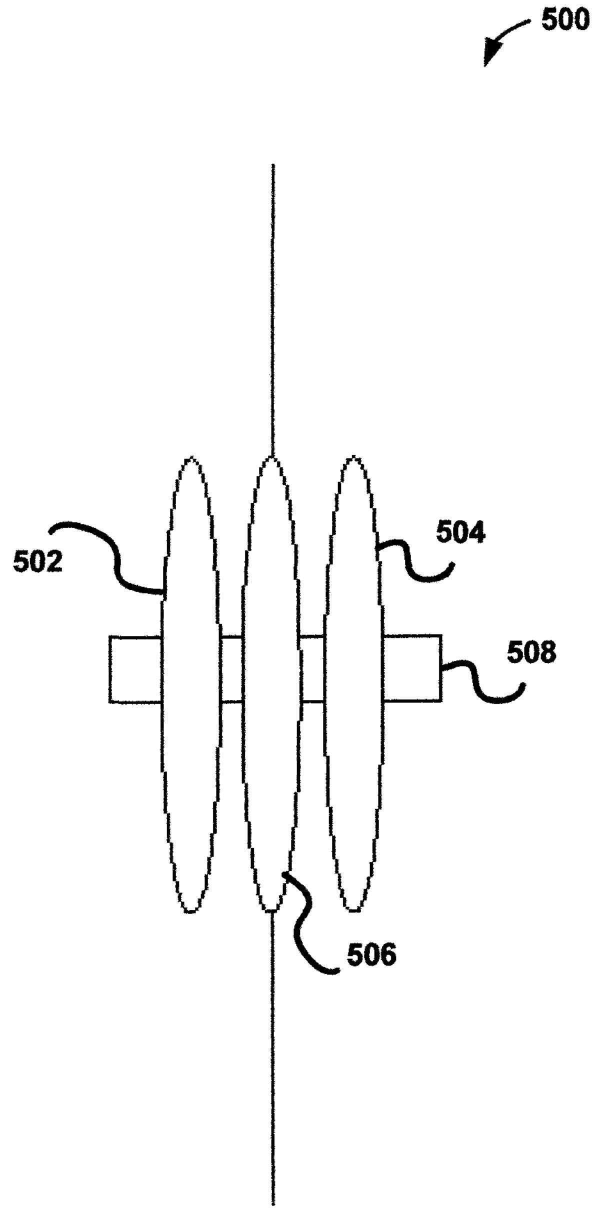


FIG. 5

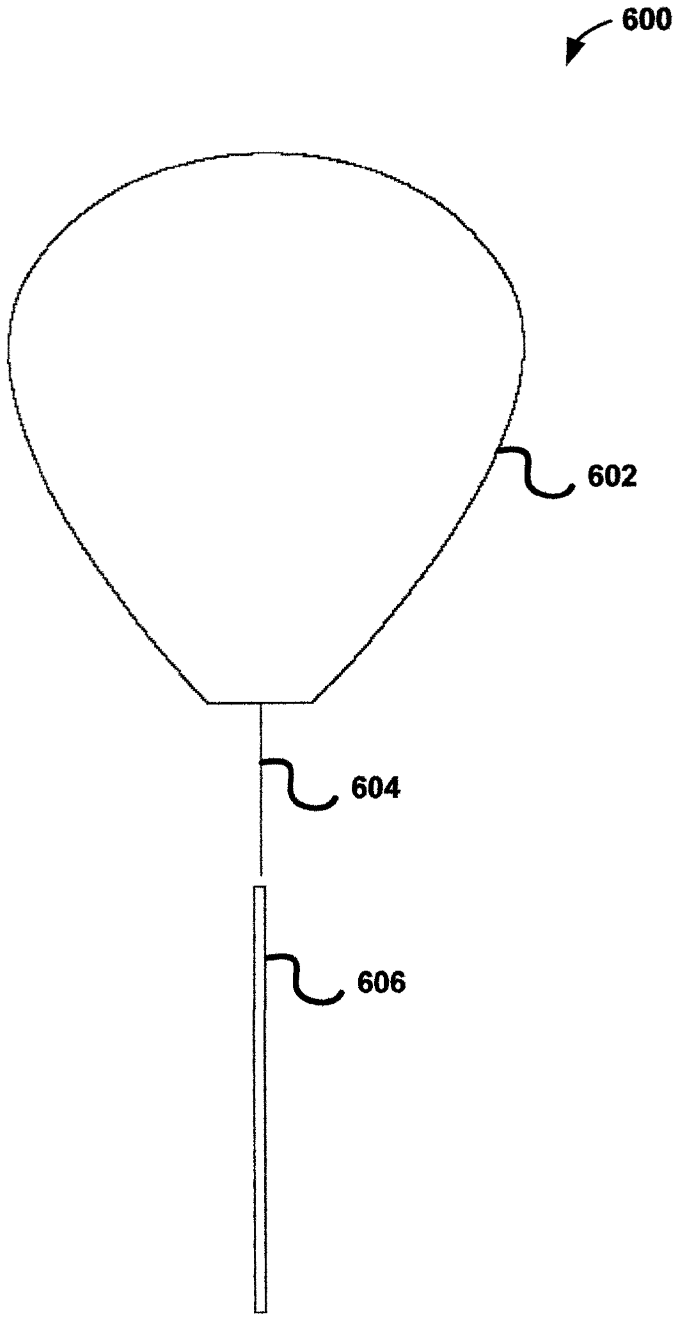


FIG. 6

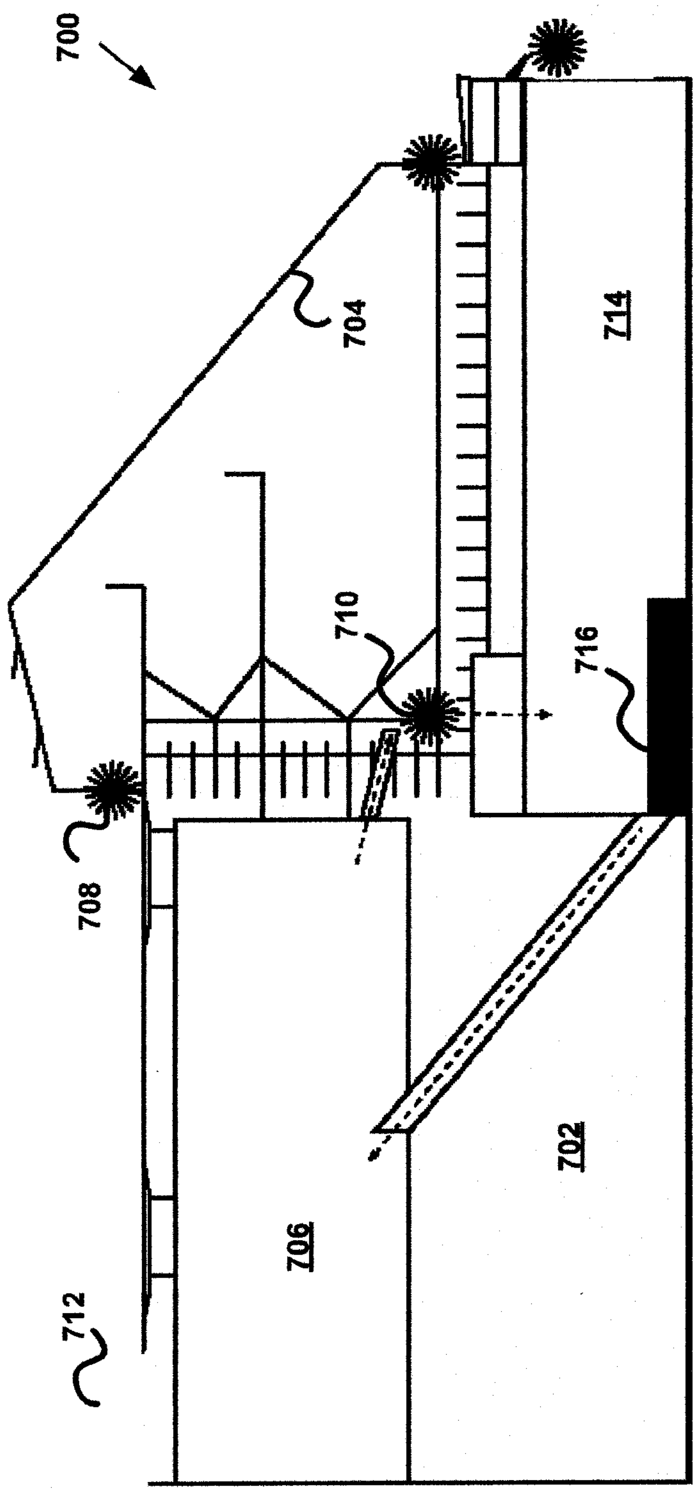


FIG. 7

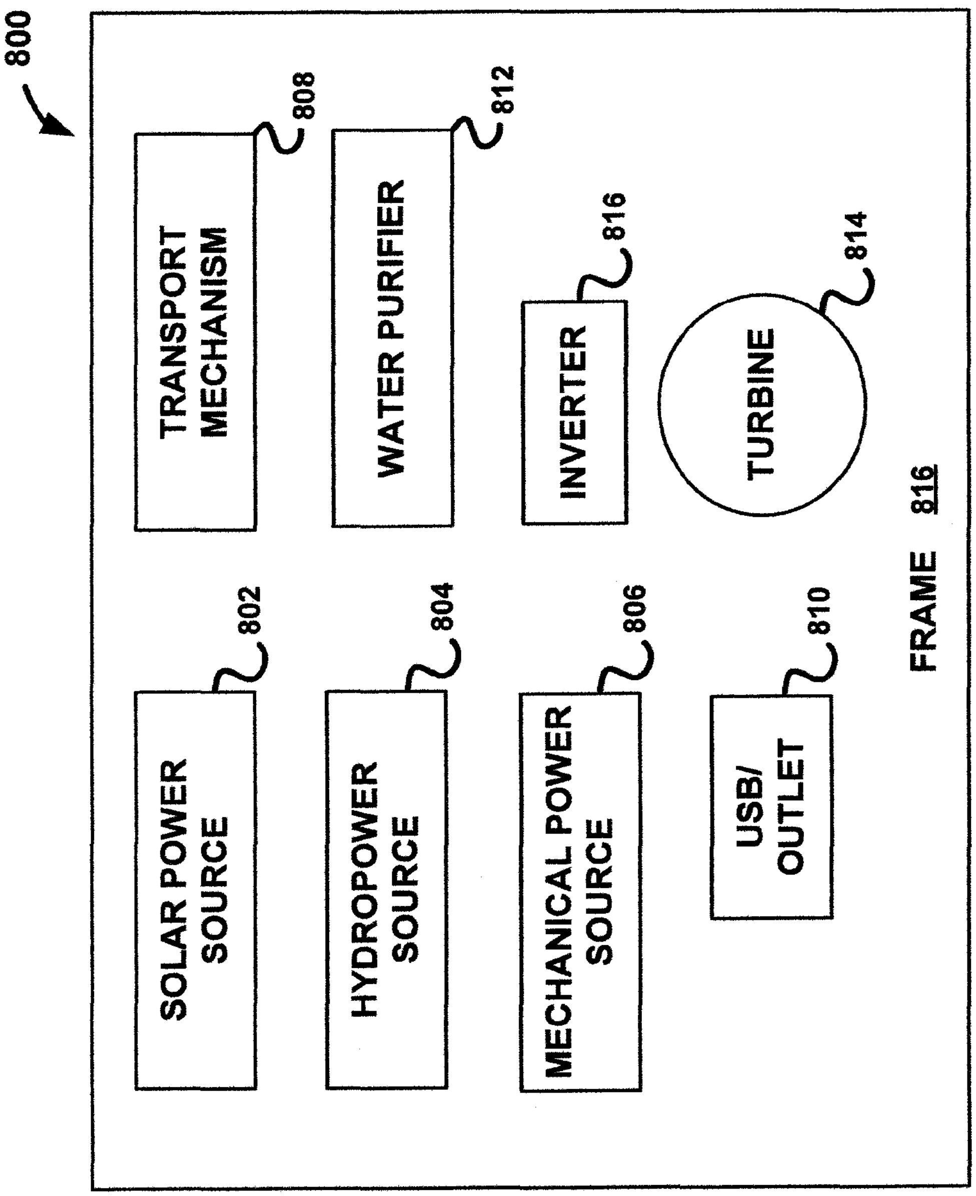

800
SOLAR POWER SOURCE
802
HYDROPOWER SOURCE
804
MECHANICAL POWER SOURCE
806
TRANSPORT MECHANISM
808
USB/ OUTLET
810
WATER PURIFIER
812
TURBINE
814
INVERTER
816
FRAME 816

FIG. 8

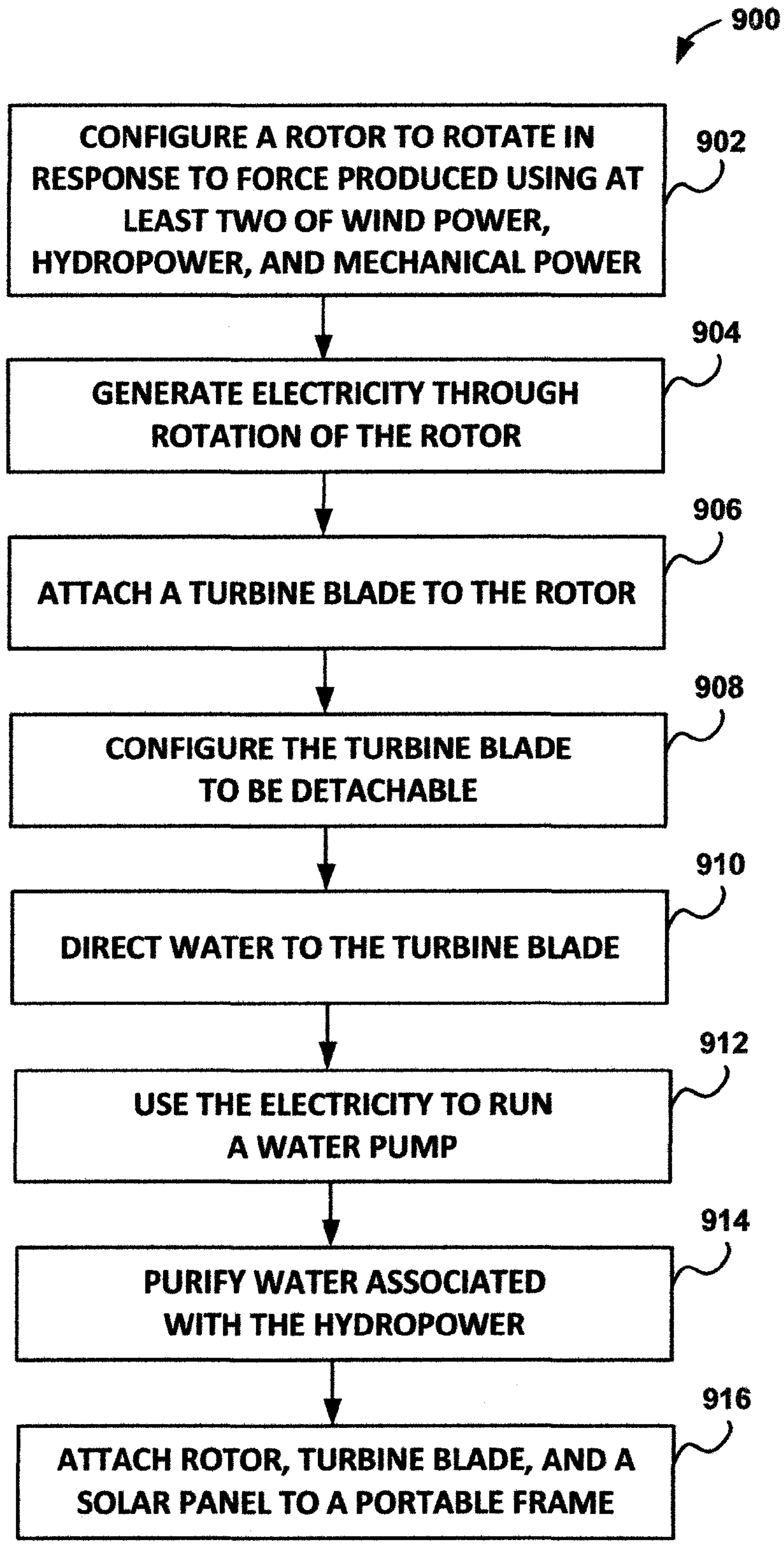

900
CONFIGURE A ROTOR TO ROTATE IN RESPONSE TO FORCE PRODUCED USING AT LEAST TWO OF WIND POWER, HYDROPOWER, AND MECHANICAL POWER
902
GENERATE ELECTRICITY THROUGH ROTATION OF THE ROTOR
904
ATTACH A TURBINE BLADE TO THE ROTOR
906
CONFIGURE THE TURBINE BLADE TO BE DETACHABLE
908
DIRECT WATER TO THE TURBINE BLADE
910
USE THE ELECTRICITY TO RUN A WATER PUMP
912
PURIFY WATER ASSOCIATED WITH THE HYDROPOWER
914
ATTACH ROTOR, TURBINE BLADE, AND A SOLAR PANEL TO A PORTABLE FRAME
916

FIG. 9

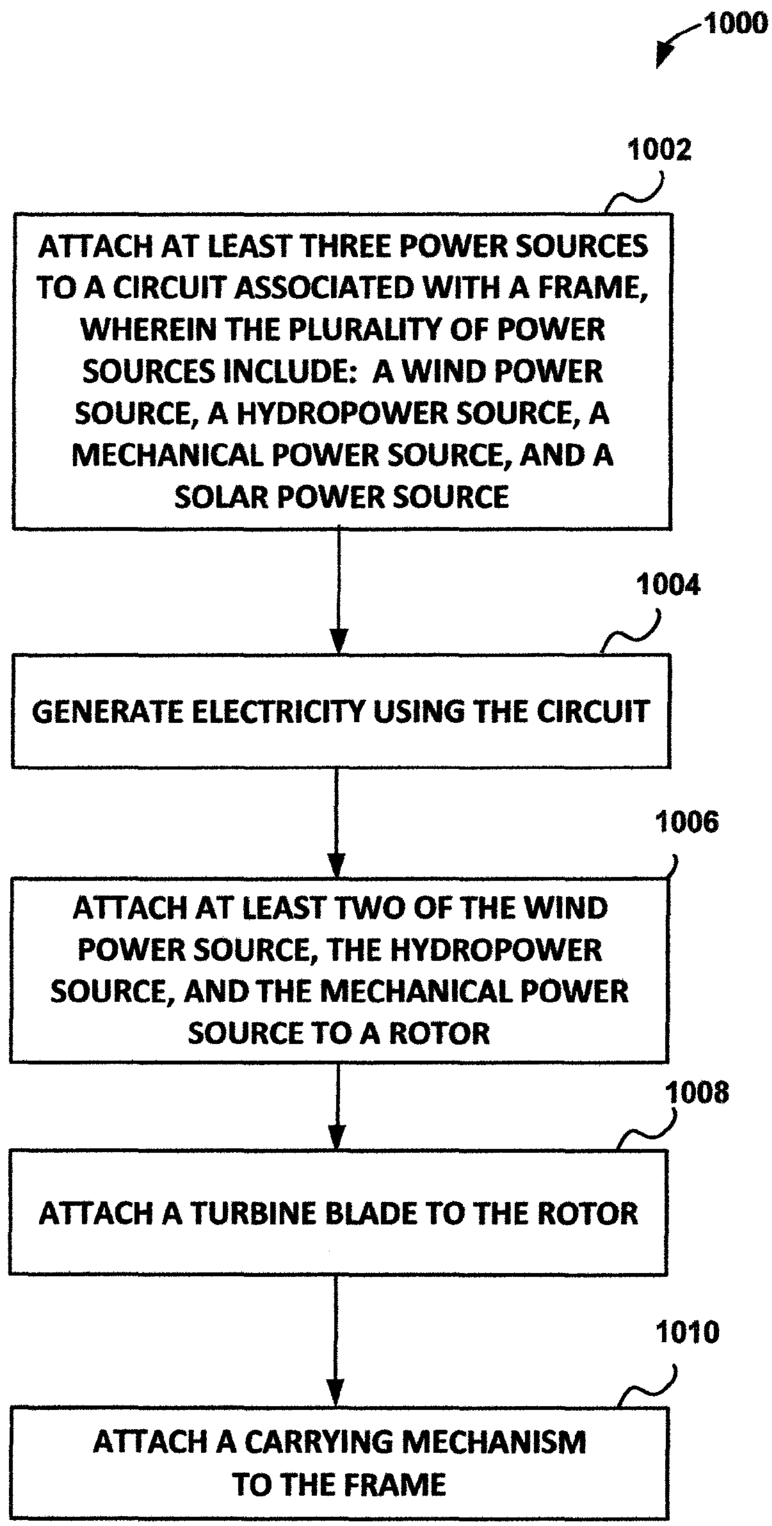

1000
1002
ATTACH AT LEAST THREE POWER SOURCES TO A CIRCUIT ASSOCIATED WITH A FRAME, WHEREIN THE PLURALITY OF POWER SOURCES INCLUDE: A WIND POWER SOURCE, A HYDROPOWER SOURCE, A MECHANICAL POWER SOURCE, AND A SOLAR POWER SOURCE
1004
GENERATE ELECTRICITY USING THE CIRCUIT
1006
ATTACH AT LEAST TWO OF THE WIND POWER SOURCE, THE HYDROPOWER SOURCE, AND THE MECHANICAL POWER SOURCE TO A ROTOR
1008
ATTACH A TURBINE BLADE TO THE ROTOR
1010
ATTACH A CARRYING MECHANISM TO THE FRAME

FIG. 10

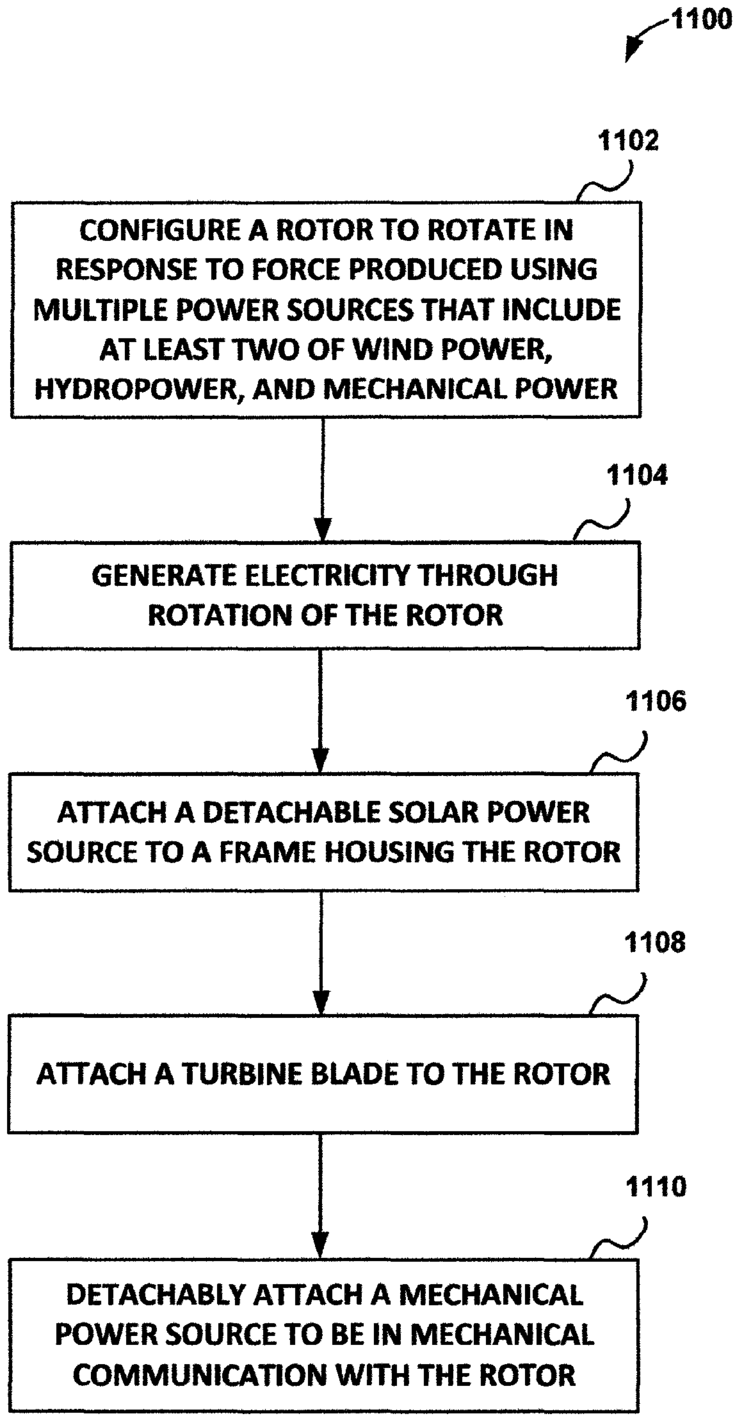

1100
1102
CONFIGURE A ROTOR TO ROTATE IN RESPONSE TO FORCE PRODUCED USING MULTIPLE POWER SOURCES THAT INCLUDE AT LEAST TWO OF WIND POWER, HYDROPOWER, AND MECHANICAL POWER
1104
GENERATE ELECTRICITY THROUGH ROTATION OF THE ROTOR
1106
ATTACH A DETACHABLE SOLAR POWER SOURCE TO A FRAME HOUSING THE ROTOR
1108
ATTACH A TURBINE BLADE TO THE ROTOR
1110
DETACHABLY ATTACH A MECHANICAL POWER SOURCE TO BE IN MECHANICAL COMMUNICATION WITH THE ROTOR

FIG. 11

MULTISOURCE RENEWABLE ENERGY GENERATION

I. CLAIM OF PRIORITY

[0001] This application is a continuation patent application of, and claims priority from, U.S. Provisional Patent Application Ser. No. 61/642,790, filed on May 4, 2012 and entitled, "Energy Production Using Turbine Blade Responsive to Both Wind and Water Forces," which is incorporated by reference herein in its entirety for all purposes.

II. FIELD OF THE DISCLOSURE

[0002] The present disclosure relates generally to power generation, and more specifically, to power generation using alternative energy sources.

III. BACKGROUND

[0003] Renewable energy sources, such as solar power, wind power, and hydropower continue to hold promise for providing an environmentally and fiscally responsible alternative to fossil fuels. Despite the advantages of using alternative energy sources, obstacles to their implementation persist. For example, the effectiveness of conventional renewable energy systems may be subject to weather and seasonal-related fluctuations. Additionally, conventional resource generation systems may be bulky, immobile, and difficult to scale.

IV. SUMMARY OF THE DISCLOSURE

[0004] In a particular embodiment, a method of producing electrical power includes configuring a rotor to rotate in response to force produced using at least two of wind power, hydropower, and mechanical power. Electricity is generated through rotation of the rotor.

[0005] A turbine blade may be attached to the rotor. The turbine blade may be configured to translate the force to the rotor, and wherein the turbine blade is responsive to at least one of the wind power and the hydropower. At least one of the turbine blade and the rotor includes a hollow portion. The turbine blade may be detachable.

[0006] An embodiment may further enable hand generated power to be communicated to the rotor. An illustrative method may include directing water to a turbine blade that is in mechanical communication with the rotor. A water storage reservoir may be positioned in such a manner as to direct water to a turbine blade in mechanical communication with the rotor. The electricity may be used to run a water pump that pumps water to the water storage mechanism. Water associated with the hydropower may be purified by an embodiment of the method.

[0007] The rotor and a turbine blade may be attached to a portable or fixed frame. Likewise, a solar panel may be connected to the frame. Power from a solar panel may be used to supply a water pump, as discussed herein.

[0008] Inverter circuitry, which may include a micro-inverter, may be configured to perform at least one of: converting direct current to alternating current, receiving external power from an external power source, and providing the electricity to a battery, such as via a universal serial bus (USB) or other computer port

[0009] According to another particular embodiment, a method of producing electrical power includes attaching at least three power sources to a circuit associated with a frame. The plurality of power sources may include: a wind power source, a hydropower source, a mechanical power source, and a solar power source. Electricity is generated using the circuit.

[0010] At least two of the wind power source, the hydropower source, and the mechanical power source may be attached to a rotor. A turbine blade may be attached to the rotor. The turbine blade may be responsive to both the wind power source and to the hydropower source. Where so configured, a carrying mechanism may be attached to the frame.

[0011] According to another particular embodiment, a method of producing electrical power includes configuring a rotor to rotate in response to force produced using multiple power sources that use at least two of wind power, hydropower, and mechanical power. At least two of the multiple power sources are detachably connected to the rotor, and electricity is generated through rotation of the rotor.

[0012] A detachable solar power source may be attached to a frame housing the rotor. A turbine blade may be attached to the rotor. The turbine blade may be configured to translate the force to the rotor. The mechanical power source may be removably attached so as to be in mechanical communication with the rotor.

[0013] Embodiments of the multisource renewable power generation system enable extended flexibility and usefulness, when compared to conventional power generation techniques. By enabling different sources of potential green energy, embodiments reduce the variability traditionally associated with wind, solar, hydro and other alternative energy sources. Embodiments may be scalable to meet different needs, and energy sources may be added to existing systems as desired. Optionally, some of the electricity produced by an embodiment may be used to purify water or store potential energy for future use. An inverter of an embodiment may be used to convert direct current to alternating current. An embodiment of the inverter may include an additional input to directly connect existing solar panels and may allow for the addition of panels at any time with reduced cost. The modular construction of an embodiment may further decrease variability by enabling different energy sources to be fastened and wired to a common frame.

[0014] Features that characterize embodiments are set forth in the claims annexed hereto and forming a further part hereof. However, for a better understanding of embodiments, and of the advantages and objectives attained through their use, reference should be made to the drawings and to the accompanying descriptive matter.

V. BRIEF DESCRIPTION OF THE DRAWINGS

[0015] FIG. **1** shows an embodiment of a multisource renewable energy generation system that includes a turbine that is responsive to both wind power and hydropower;

[0016] FIG. **2** shows a bladder system, such as may have application in the embodiment of FIG. **1**;

[0017] FIG. **3** shows an embodiment of a turbine assembly, such as may have application in the embodiment of FIG. **1**;

[0018] FIG. **4** shows a side view of an illustrative turbine assembly;

[0019] FIG. **5** shows block diagram of a turbine assembly having dual stators, such as may have application in the embodiment of FIG. **1**;

[0020] FIG. 6 shows an embodiment of a blade that includes a fan blade that is connected to a shaft;

[0021] FIG. 7 shows an embodiment of a large dwelling structure that includes multiple renewable power sources;

[0022] FIG. 8 shows a block diagram of an electricity producing system that selectively incorporates wind power, hydropower, solar power, and mechanical power sources;

[0023] FIG. 9 is a flowchart illustrating an embodiment of a method of producing electrical power;

[0024] FIG. 10 is a flowchart illustrating an embodiment of another method of producing electrical power; and

[0025] FIG. 11 is a flowchart illustrating an embodiment of another method of producing electrical power.

VI. DETAILED DESCRIPTION

[0026] An embodiment of a multisource generator system generates electricity using one or more of wind power, hydropower, mechanical power, and solar power. The power sources may be selectively attached and activated to generate the electricity. A particular embodiment includes a rotor that is moved in response to both the wind power and the hydropower. The mechanical power may further actuate the rotor.

[0027] A particular embodiment includes a hybrid turbine that spins and produces electricity with either wind or water forces, such as rainwater. The system may include a gearless rotor and stator, though another embodiment may include gears. The rotor may include blades of a turbine and mounted permanent magnets set into a chassis. Other embodiments may use different types of magnets. The rotor blades may catch the wind from either direction, causing spinning around the stator on an axle and the generation of current.

[0028] The turbine may additionally generate current from the flow of water. The turbine of an embodiment may be situated on a side of a permanent or temporary structure and may be fed by gutter system or tarp. When it rains, the resulting water may be directed towards the blades of the rotor causing them to spin and create current. Other embodiments may use other sources of moving water, including stored water.

[0029] The design of an embodiment of the turbine may be compact and portable for transport considerations. For instance, a handle may be incorporated into the design to facilitate carrying or mounting. Another embodiment may be implemented on a much larger scale, such as part of a building.

[0030] An embodiment may include a water storage bladder system that is positioned above the turbine. The bladder may fill with rain from a gutter, tarp, stream, or other source of water. When installed and tilted at an angle, gravity may force the water to a lower portion of the bladder that may be directed and released to spin the rotor of the turbine. The bladder may thus allow for the generation of additional electricity after it has stopped raining. The water of an embodiment may be released using a timer and an automated actuator, so as to generate electricity during peak hours. The water can also be stored to be used at any time either as energy, or as a source of clean water for drinking or gardening, among other uses. A nipple may be located at the base of the bladder that may be unscrewed and a water filter may be incorporated. The end of the nipple may include an attachment for a standard size hose. The hose may be connected and selectively blocked at the ground level by a nozzle. Whenever the nozzle is unblocked, or opened, the resulting water may be forced through the filter and into the hose for use. Optionally, some of the electricity produced by an embodiment may be used to purify water using an electrically powered water purifier, such as a germicidal ultraviolet light or reverse osmosis system. The availability of electricity to purify water offers more flexibility when choosing a filter or a filtering method. Purification may similarly be enabled during or after a power outage or in another situation when electricity is unavailable.

[0031] When the bladder of an embodiment is full, the water may overflow up the same opening and spill back into the gutter, and down towards the turbine. According to another particular embodiment, a second water storage system may be positioned at ground level. Electricity generated using solar or wind power (or a battery or other external power source) may be used to run an electric water pump. When water in the upper water storage system is less than full (e.g., a preset threshold level), the pump may move the water from the ground level storage system to the upper level storage system where it can be released at anytime. Optimally, the hydropower may be utilized when there is no other current being produced from the sun, wind, or rain. Therefore this transfer of energy from the variable sources of sun and wind, to the predictable and reliable form of stored water up high, serves to provide more constant and evenly distributed electricity from the variable sources of the sun and wind.

[0032] An inverter may convert direct current (e.g., generated using solar power) to alternating current. An embodiment of the inverter may include an additional input to directly connect existing solar panels and may allow for the addition of panels at any time. With the installation of the inventor, the panels may be added simply, at any time, and with reduced cost. Inclusion of the solar power also adds the flexibility to produce more electricity, and under more variable conditions.

[0033] In many instances, renewable energy is variable and depends on the amount of sun or wind available. With the addition of hydropower and/or mechanical (e.g., hand crank or pedal power), the combination of multiple power elements may allow for greater flexibility and power generation under different conditions than any single component. The addition of stored energy in the form of water up high may further help to reduce the variability of the sources. These features may address the issue of variability with respect to renewable energy sources.

[0034] Turning more particularly to the Drawings, FIG. 1 shows an embodiment of a multisource renewable energy generation system **100** that includes a turbine **102** that is responsive to both wind power and hydropower. More particularly, the turbine **102** may rotate in either direction according to the direction of the wind **104**, and may be further spun by water **106** flowing from a water source, such as a gutter **108**. A water source of another embodiment may include a tarp used to catch rainwater. The turbine **102** may additionally be positioned such that it is actuated from failing rain.

[0035] Direct current generated from the turbine movement may be supplied to inverter circuitry **110**, which may include a micro-inverter. The inverter **110** may convert the direct current to alternating current. Where so desired, the inverter circuitry **110** may receive electricity from a solar power source **112**. The inverter circuitry **110** may be coupled to a power module **114**. The power module **114**, which may include a battery or electrically powered machine, may receive the electrical current.

[0036] The water flowing from the turbine **102** may be captured and directed via a downspout **116** into a secondary water storage tank **118**. Excess water levels in the storage tank **118** may result in the overflow of water back into the downspout **116**.

[0037] An electric water pump **120** may pump water via a conduit **122** from the water storage tank **118** into the gutter **108** or bladder system **124**. The electric water pump **120** may be powered by electricity supplied from the inverter circuitry **110** (e.g., electricity generated by rotation of the turbine **102** and by the solar power source **112**). The bladder system **124** may include a bladder overflow mechanism **126** that allows water from the bladder system **124** to flow back into the gutter **108**. The bladder system **122** may additionally include a bladder outlet **128** that may selectively release water back onto the turbine **102**.

[0038] As shown in FIG. **2**, an embodiment of a bladder outlet **200** may include a water filter **202**. The bladder outlet **200** may be similar to the bladder outlet **128** of FIG. **1**. An embodiment of a water filter **202** may be inserted inside a cap mechanism **204** that attaches to the bladder reservoir. A hose, pipe, or other conduit **206** may attach to the cap mechanism **204** via an attachment mechanism **208**.

[0039] FIG. **3** illustrates an embodiment of a turbine assembly **300**. The turbine assembly **300** may be similar to the turbine **102** in the embodiment of FIG. **1**. The turbine assembly **300** may include a rotor **302** (shown without blades) that is mounted on an axle **304**. The axle **304** may be attached to a stator **306**. The stator **306** may include wound copper wires. A handle mount **308** may be included as a component of the turbine assembly **300**.

[0040] FIG. **4** shows a side view of a turbine assembly **400**. The turbine assembly **400** may be similar to the turbine **102** of FIG. **1** and/or the turbine assembly **300** of FIG. **3**. The turbine assembly **400** may include a rotor **402** mounted on an axle **408**. Blades **404** may be attached to the rotor **402**. The rotor **402** may comprise a wire chassis with mounted magnets **406**. The mounted magnets **406** may be positioned on one or both flat surfaces of the rotor **402** or may be mounted inside.

[0041] FIG. **5** shows block diagram of a turbine assembly **500** having dual stators **502**, **504**. A rotor **506** may be similar to the rotor **402** of FIG. **4**, having magnets on either side facing the stators **502**, **504**. The rotor **506** may spin on an axle **508**. The turbine assembly **500** may be similar to the turbine **102** of FIG. **1**. The turbine assembly **400** may include a rotor **402** mounted on an axle **408**. Blades **404** may be attached to the rotor **402**. Magnets **406** may be positioned on one or both flat surfaces of the rotor **402**. Of note, a crank or other human powered/mechanical actuation mechanism may be made to be in mechanical connection with either the axle **505** or the rotor **506**, or both, for translating physical force into manual rotation.

[0042] FIG. **6** shows an embodiment of a blade **600** that includes a fan blade **602** that is connected to a shaft **604**. The shaft **604** may detachably connect to a rotor **606**. For example, the shaft **604** may fit or screw into a socket of the rotor **606**. The blade **600** may be similar to the blade **404** shown in FIG. **4**. The fan blade **602** may comprise a wire frame that is covered in a cloth-like, weatherproof sleeve.

[0043] FIG. **7** shows an embodiment of a large dwelling structure **700** that includes multiple renewable power sources. The structure **700** may utilize the constant temperature of the earth (geothermal heat energy) to maintain a desired interior temperature. An outer portion **704** of the structure **700** may include transparent glass having a thin film layer applied. The film layer may lighten or darken between transparent and opaque (and all shades between) in response to a small electric current. This feature may provide additional heating and cooling of the interior of the structure **700** using solar energy/light with the flip of a switch or automatically according to a sensor. The opaque setting may block the entry of light for cooling, and more transparent settings may allow light and heat to enter. Additionally, a heat pump may be used to further achieve a specific temperature.

[0044] Electricity may be provided by solar panels, wind, and hydropower. The site location may use gravity and the natural decline of a hill, mountain, or graded area to direct and control the flow of water to a storage area. After a rain, all water from the top of the mount on down to the site location may be directed into a water storage area **706**. The larger the surface area of the land, the more water may be collected, and the quicker the storage area **706** may fill. Water may be released at any time to spin turbines **708**, **710** to produce current. At least one of the turbines **710** may be situated below the water level of the stored water. The turbines **708**, **710** may spin with wind and the water to produce current. Interior plumbing may utilize gravity and the stored water for use and/or filtration.

[0045] A roof **712** of the structure **700** may be tilted so that the entire surface area may direct any rainfall into gutters and the into a combination hydropower and wind power-operated turbine on its way to the water storage area **706**. Water may be pumped from a lower water storage area **714** to the higher water storage area **706** for release as needed. A water pump may be operated using electricity generated by movement of the turbine.

[0046] FIG. **8** shows a block diagram of an electricity producing system **800** that selectively incorporates wind power (not shown), hydropower **802**, solar power **804**, and mechanical power sources **806**. The system **800** additionally may include a transport mechanism **808**, such as a handle or cargo lift, and USB or other power outlet **810**. A water purifier **812** may be included, as well. An illustrative solar power **804** may incorporate film and sheet sized technology, and the frame **816** may range in size from a hand carried structure to grid framework for a network of buildings.

[0047] An embodiment of the system **800** may be modular in that the different modules **802**, **804**, **806**, **808**, **810**, **812**, **814** may be selectively attached to or removed from a frame **816** in a modular fashion, e.g., using screws, bolts, slide and groove, and or other known fasteners). For example, an embodiment of the system **800** may include plug and play modularity in that power source modules **802**, **804**, **806**, **808**, **810**, **812**, **814**, **816** may be added without significant wiring or assembly. For instance, modules **802**, **804**, **806**, **808**, **810**, **812**, **814** may be added without having to add an additional inverter (e.g., in addition to the inverter **816** that is shared by the modules **802**, **804**, **806**, **808**, **810**, **812**, **814**). The turbine **814** may be connected to a standard **120** volt or **240** volt outdoor AC outlet, as opposed to connecting to the power meter of a structure and relying on a utility company and/or the assistance of an electrician. The modularity may further enable aftermarket sales opportunities where a consumer may selectively add and replace modules **802**, **804**, **806**, **808**, **810**, **812**, **814** as prompted by changing circumstances.

[0048] FIG. **9** is a flowchart illustrating an embodiment of a method of producing electrical power. At **902**, a rotor may be configured to rotate in response to force produced using at least two of wind power, hydropower, and mechanical power. Electricity may be generated at 094 through rotation of the rotor.

[0049] A turbine blade may be attached to the rotor at **906**. The turbine blade may be configured to translate the force to the rotor and may be responsive to at least one of the wind power and the hydropower. At least one of the turbine blade and the rotor may include a hollow portion.

[0050] At **908**, the turbine blade may be configured to be detachable. Water may be directed at **910** to the turbine blade. The turbine blade may be in mechanical communication with the rotor. According to a particular embodiment, a water storage reservoir may be used to direct water to the turbine blade. The electricity may be used at **912** to run a water pump that pumps water to the water storage mechanism. At **914**, water associated with the hydropower may be purified. The rotor, a solar panel, and a turbine blade may be attached at **916** to a portable frame. Energy generated by the solar panel may be used to supply a water pump. As discussed herein, another embodiment of a method may allow a mechanically driven power source, such as a hand crank or bicycle pedal contraption, to be attached to the frame.

[0051] FIG. **10** is a flowchart illustrating an embodiment of another method of producing electrical power. At **1002**, at least three power sources may be attached to a circuit associated with a frame. The plurality of power sources may include: a wind power source, a hydropower source, a mechanical power source, and a solar power source. Electricity may be generated at **1004** using the circuit.

[0052] At **1006**, at least two of the wind power source, the hydropower source, and the mechanical power source may be attached to a rotor. A turbine blade may be attached to the rotor at **1008**. The turbine blade may be responsive to both the wind power source and to the hydropower source. A carrying mechanism may be attached to the frame at **1010**.

[0053] FIG. **11** is a flowchart illustrating an embodiment of another method of producing electrical power. At **1102**, a rotor may be configured to rotate in response to force produced using multiple power sources that include at least two of wind power, hydropower, and mechanical power. At least two of the multiple power sources may be detachably connected to the rotor. Electricity may be generated at **1104** through rotation of the rotor.

[0054] At **1106**, a detachable solar power source may be attached to a frame housing the rotor. A turbine blade may be attached at **1108** to the rotor. The turbine blade may be configured to translate the force to the rotor. At **110**, a mechanical power source may be detachably attached to be in mechanical communication with the rotor. The mechanical power source may include a mechanical structure manipulated by the physical efforts of a human operator.

[0055] While the present embodiments have been described in detail, it is not the intention of the Applicant to restrict, or any way limit the scope of the appended claims to such detail. The embodiments in their broader aspects are therefore not limited to the specific details, representative apparatus, methods, and illustrative examples shown and described. Accordingly, departures may be made from such details without departing from the scope of Applicant's general inventive concept.

1. A method of producing electrical power, the method including:
- configuring a rotor to rotate in response to force produced using at least two of wind power, hydropower, and mechanical power; and
- generating electricity through rotation of the rotor.

2. The method of claim **1**, further comprising attaching a turbine blade to the rotor, wherein the turbine blade is configured to translate the force to the rotor, and wherein the turbine blade is responsive to at least one of the wind power and the hydropower.

3. The method of claim **2**, wherein at least one of the turbine blade and the rotor includes a hollow portion.

4. The method of claim **2**, wherein the turbine blade is detachable.

5. The method of claim **1**, further comprising enabling manually generated power to be communicated to the rotor.

6. The method of claim **1**, further comprising directing water to a turbine blade in mechanical communication with the rotor.

7. The method of claim **1**, further comprising positioning a water storage reservoir to direct water to a turbine blade in mechanical communication with the rotor.

8. The method of claim **7**, further comprising using the electricity to run a water pump that pumps water to the water storage mechanism.

9. The method of claim **1**, further comprising attaching the rotor and a turbine blade to a portable frame.

10. The method of claim **1**, further comprising purifying water associated with the hydropower.

11. The method of claim **1**, further comprising using inverter circuitry configured to perform at least one of: converting direct current to alternating current, receiving external power from an external power source, and providing the electricity to a battery.

12. The method of claim **1**, further comprising connecting a solar panel to a frame, wherein energy by the solar panel supplies a water pump.

13. A method of producing electrical power, the method including:
- attaching at least three power sources to a circuit associated with a frame, wherein the plurality of power sources include: a wind power source, a hydropower source, a mechanical power source, and a solar power source; and
- generating electricity using the circuit.

14. The method of claim **13**, further comprising attaching at least two of the wind power source, the hydropower source, and the mechanical power source to a rotor.

15. The method of claim **14**, further comprising attaching a turbine blade to the rotor, wherein the turbine blade is responsive to both the wind power source and to the hydropower source.

16. The method of claim **13**, further comprising attaching a carrying mechanism to the frame.

17. A method of producing electrical power, the method including:
- configuring a rotor to rotate in response to force produced using multiple power sources that include at least two of wind power, hydropower, and mechanical power,

wherein at least two of the multiple power sources are detachably connected to the rotor; and

generating electricity through rotation of the rotor.

18. The method of claim **17**, further comprising attaching a detachable solar power source to a frame housing the rotor.

19. The method of claim **17**, further comprising attaching a turbine blade to the rotor, wherein the turbine blade is configured to translate the force to the rotor.

20. The method of claim **19**, wherein the mechanical power source is detachably attached to be in mechanical communication with the rotor.

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