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(54) ELECTROSTATIC MOTOR

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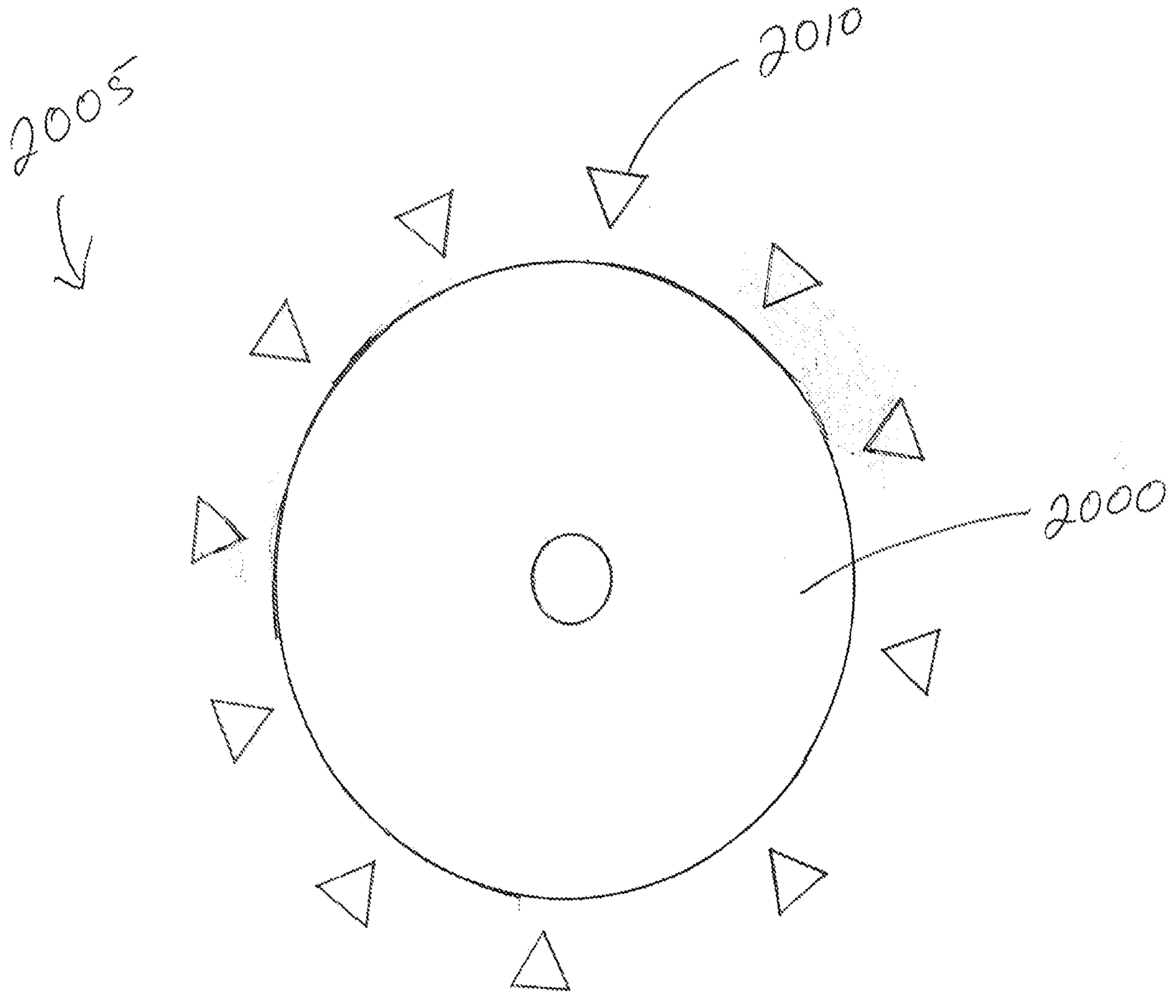
(57) **ABSTRACT**

In example embodiments, an electrostatic motor is enclosed in an hermetically sealed container in which the internal air environment can be stabilized and controlled to enhance the performance of the electrostatic motor. Performance can be greatly enhanced in terms of motor efficiency, performance, longevity, reduced electrical input power and/or input voltage with improved kinetic power output. The hermetically sealed container may preserve parameters of the gas condition inside the container, such as, for example, to a specified humidity level, and/or gas pressure, and other parameters associated with gaseous environments. In an example embodiment, a gas may be added into the enclosure to enhance the performance.



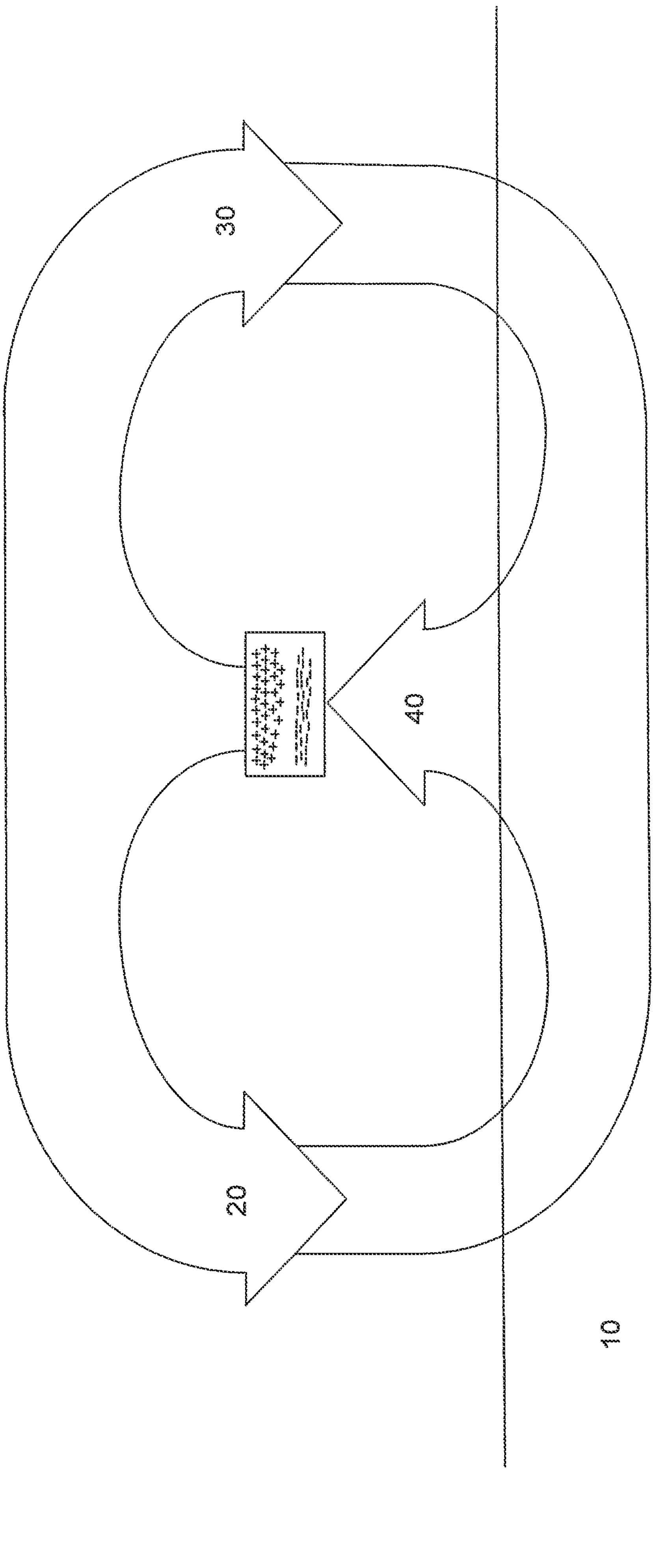


FIGURE 1

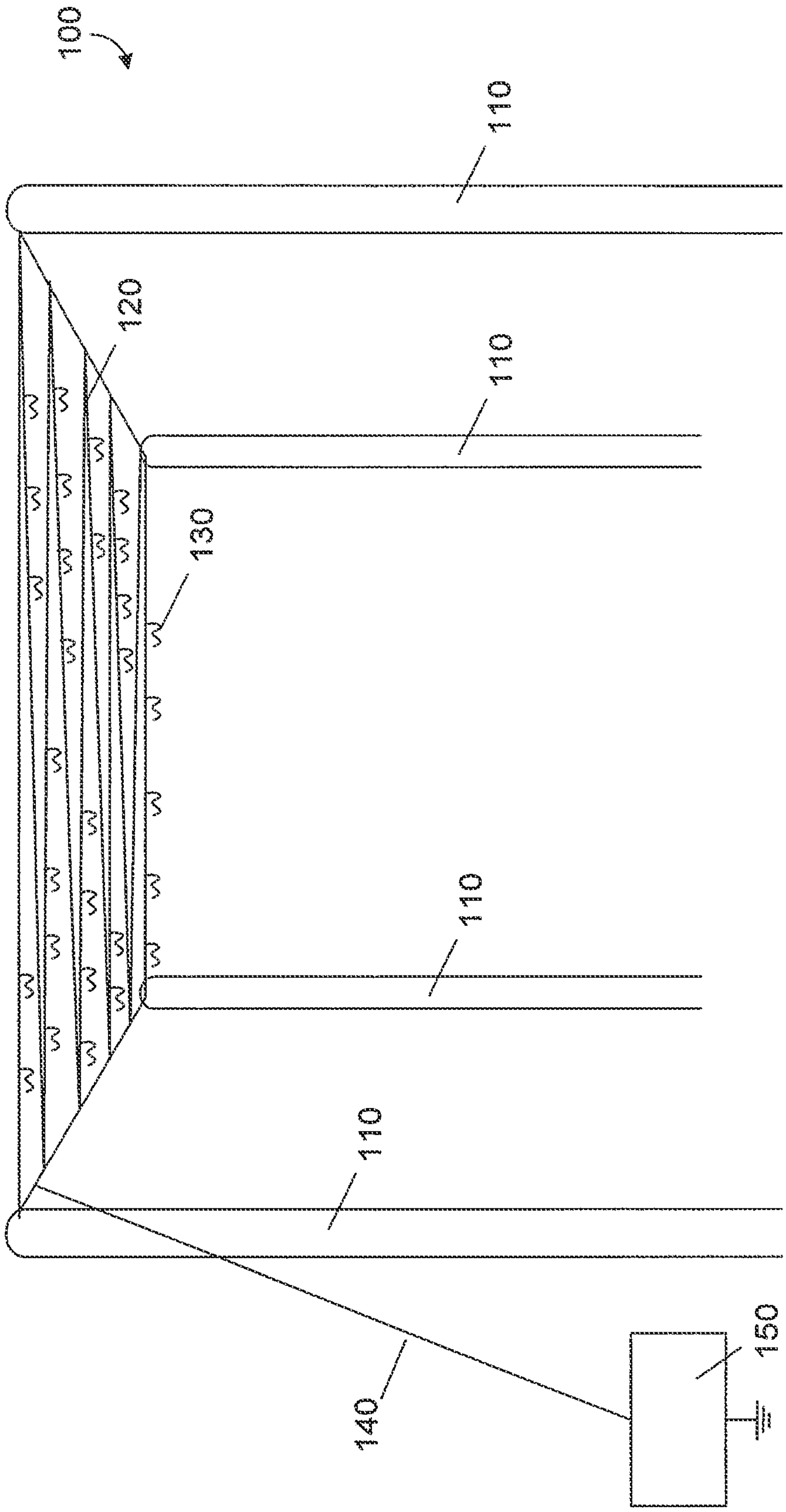


FIGURE 2

FIGURE 2A

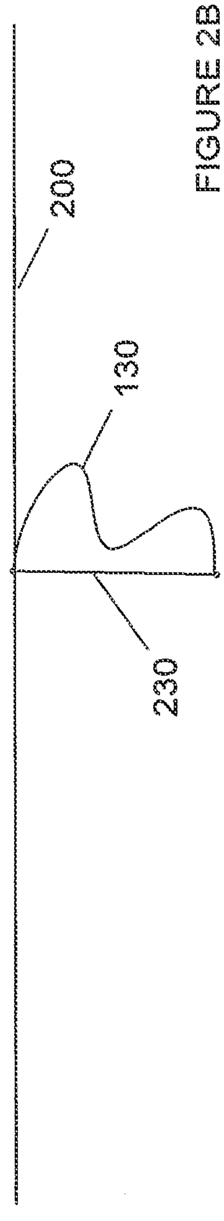


FIGURE 2B

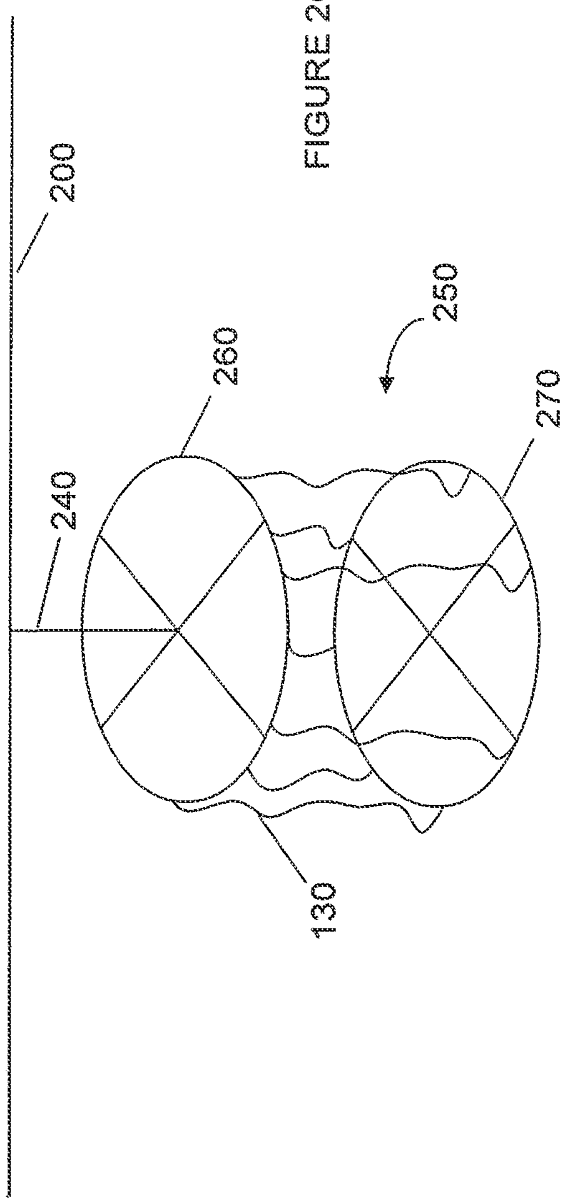


FIGURE 2C

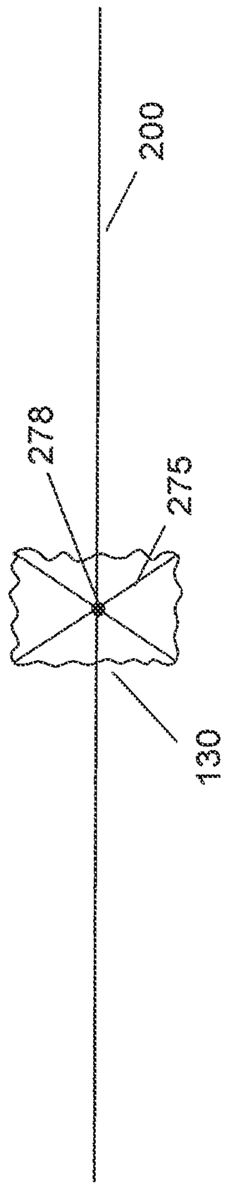


FIGURE 2D

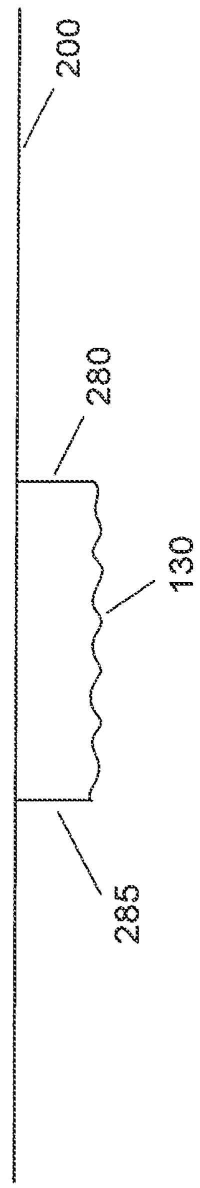


FIGURE 2E

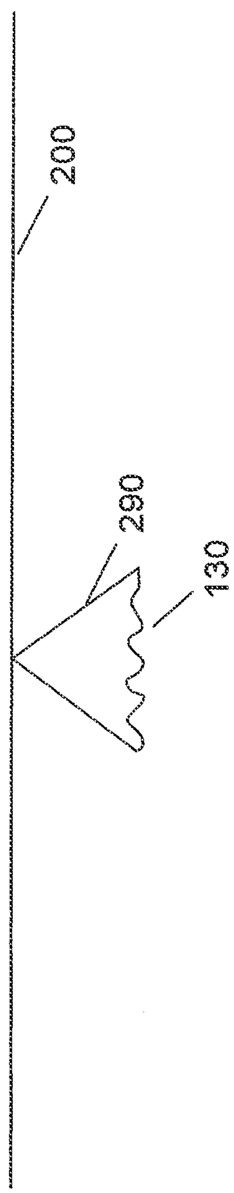


FIGURE 2F

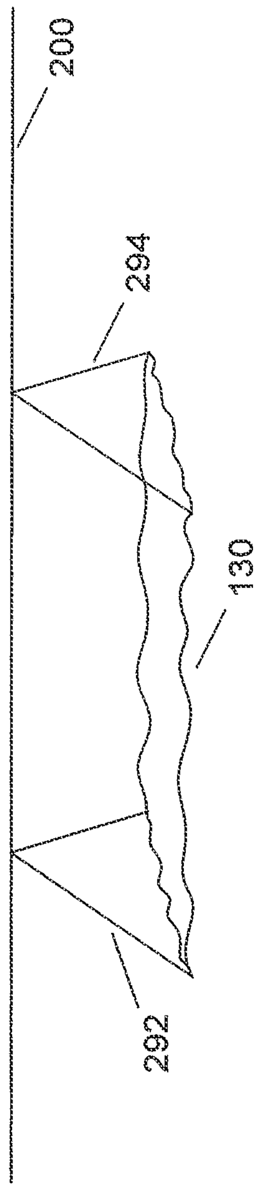


FIGURE 2G

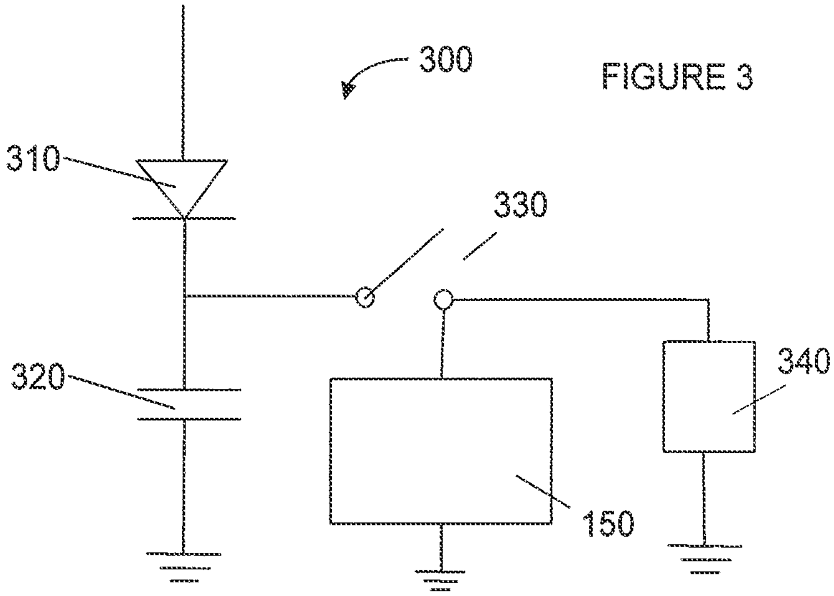


FIGURE 3

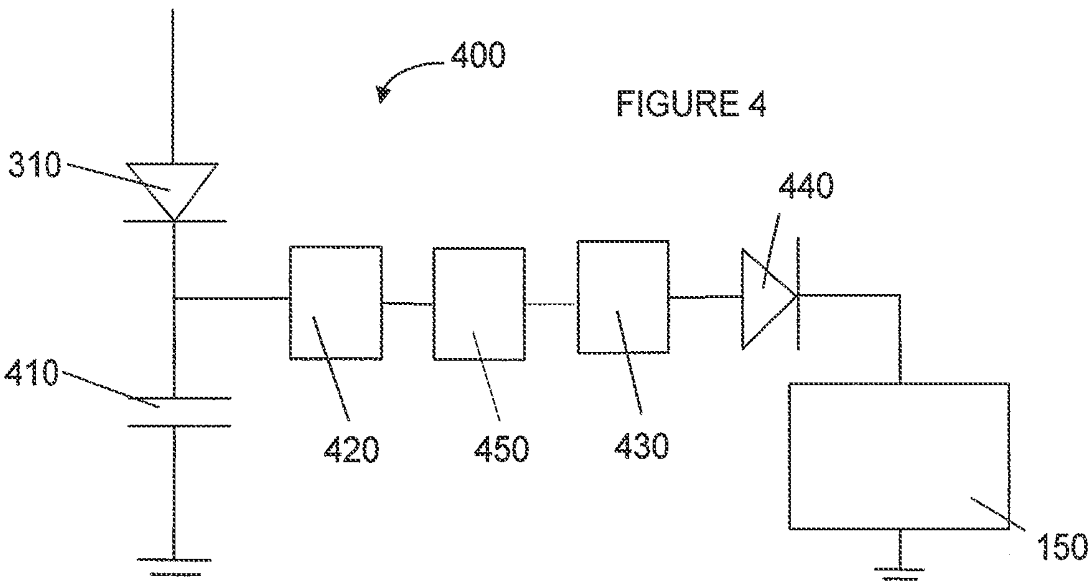


FIGURE 4

FIGURE 5

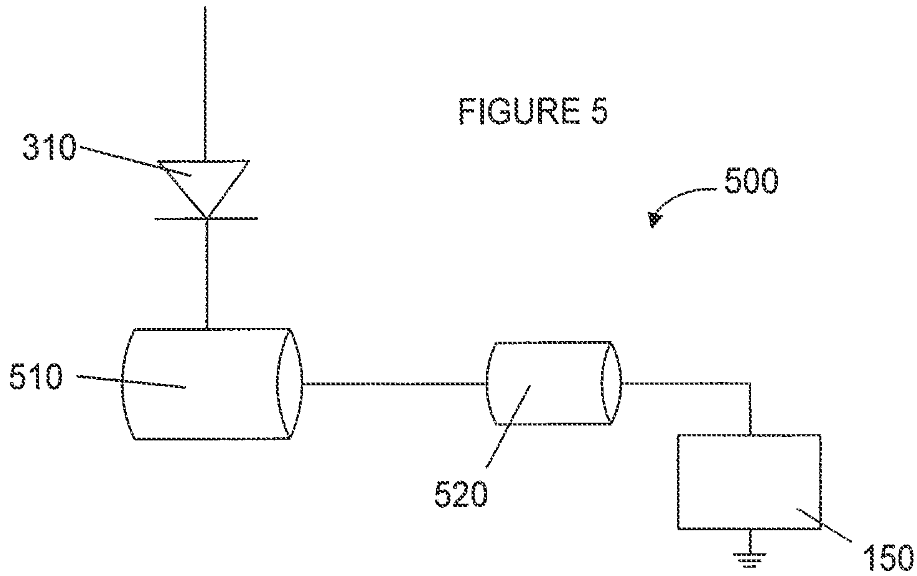


FIGURE 6

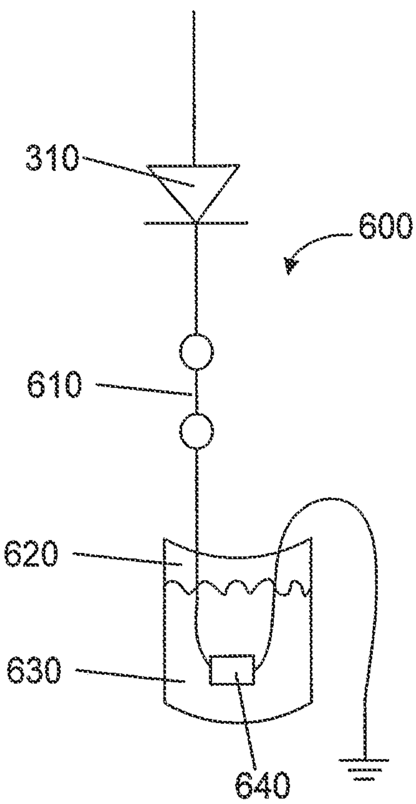
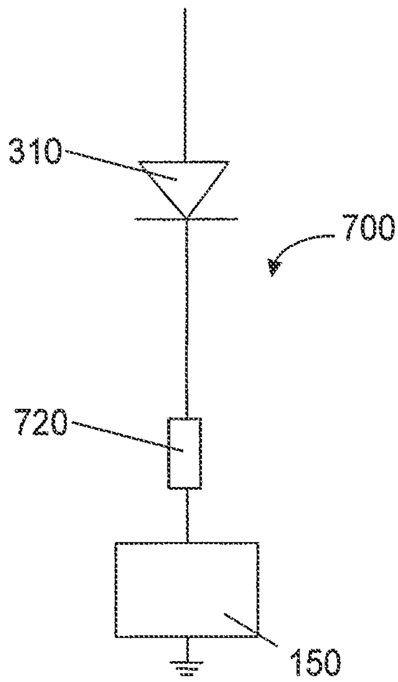


FIGURE 7



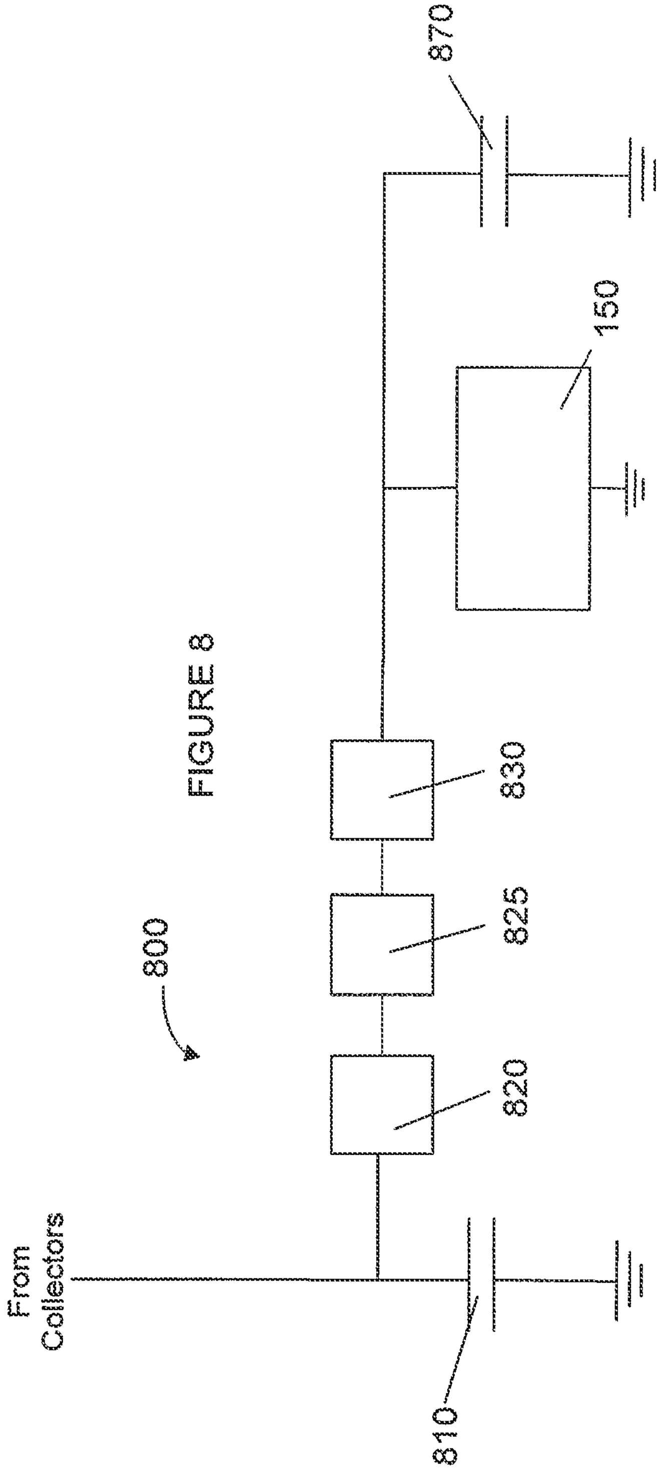


FIGURE 8

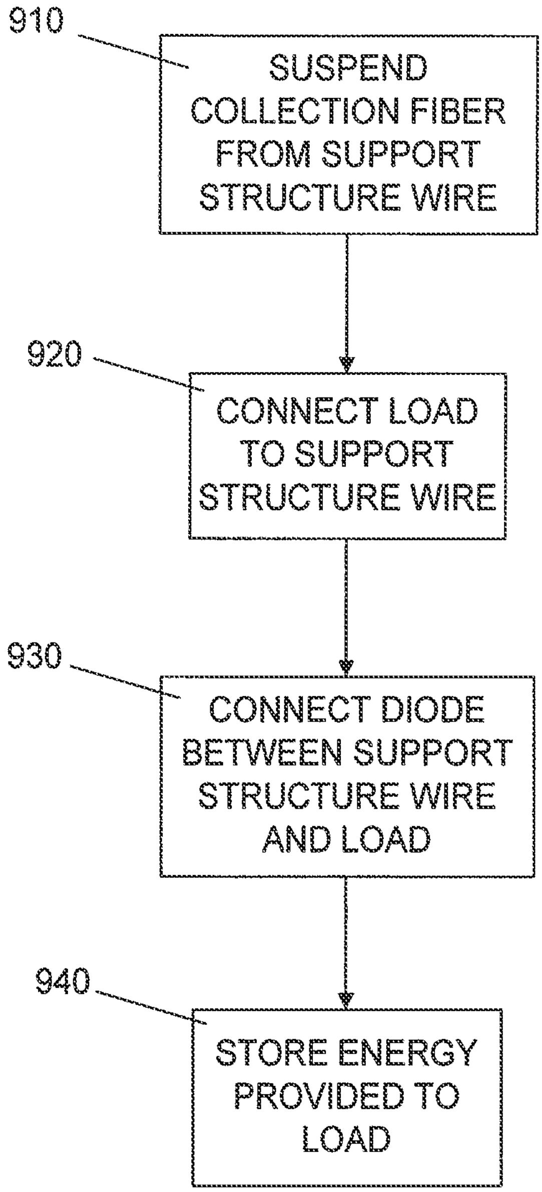

910
SUSPEND COLLECTION FIBER FROM SUPPORT STRUCTURE WIRE
920
CONNECT LOAD TO SUPPORT STRUCTURE WIRE
930
CONNECT DIODE BETWEEN SUPPORT STRUCTURE WIRE AND LOAD
940
STORE ENERGY PROVIDED TO LOAD

FIGURE 9

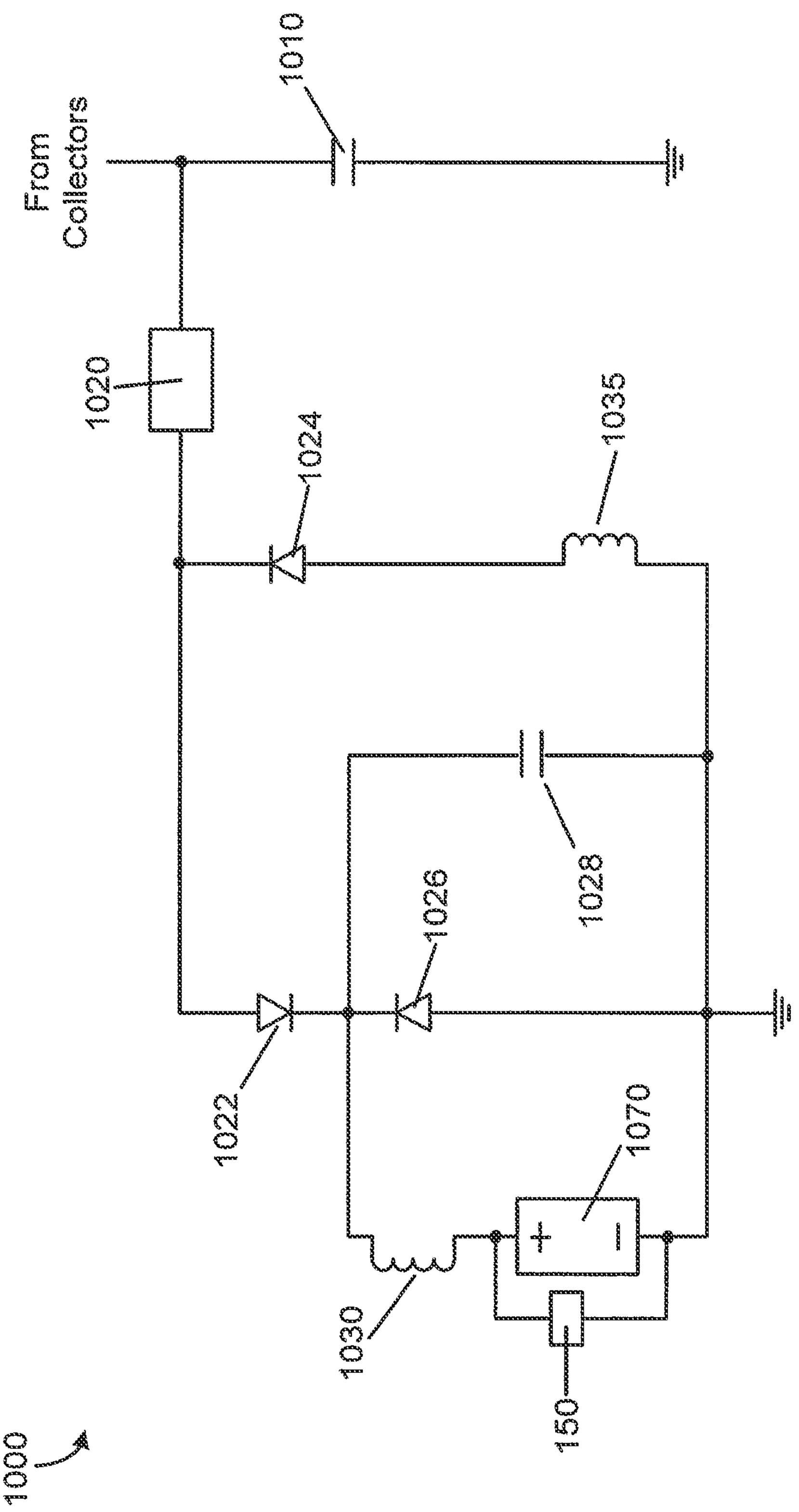

From Collectors
1010
1020
1024
1035
1028
1026
1022
1070
+
−
1030
150
1000

FIGURE 10

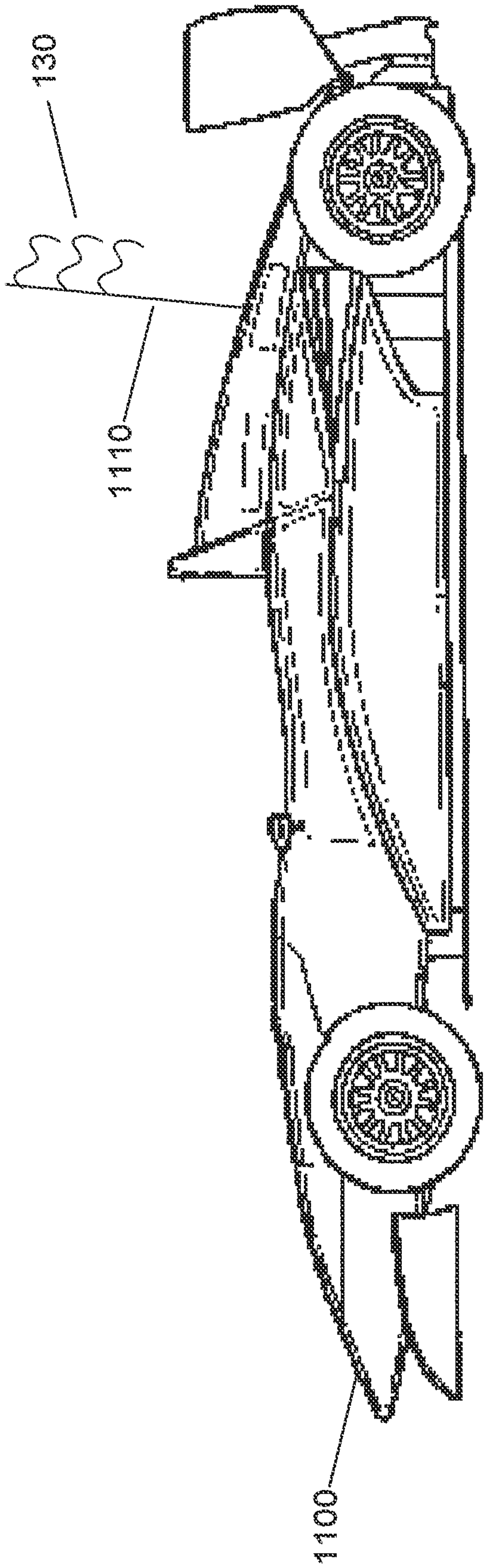


FIGURE 11

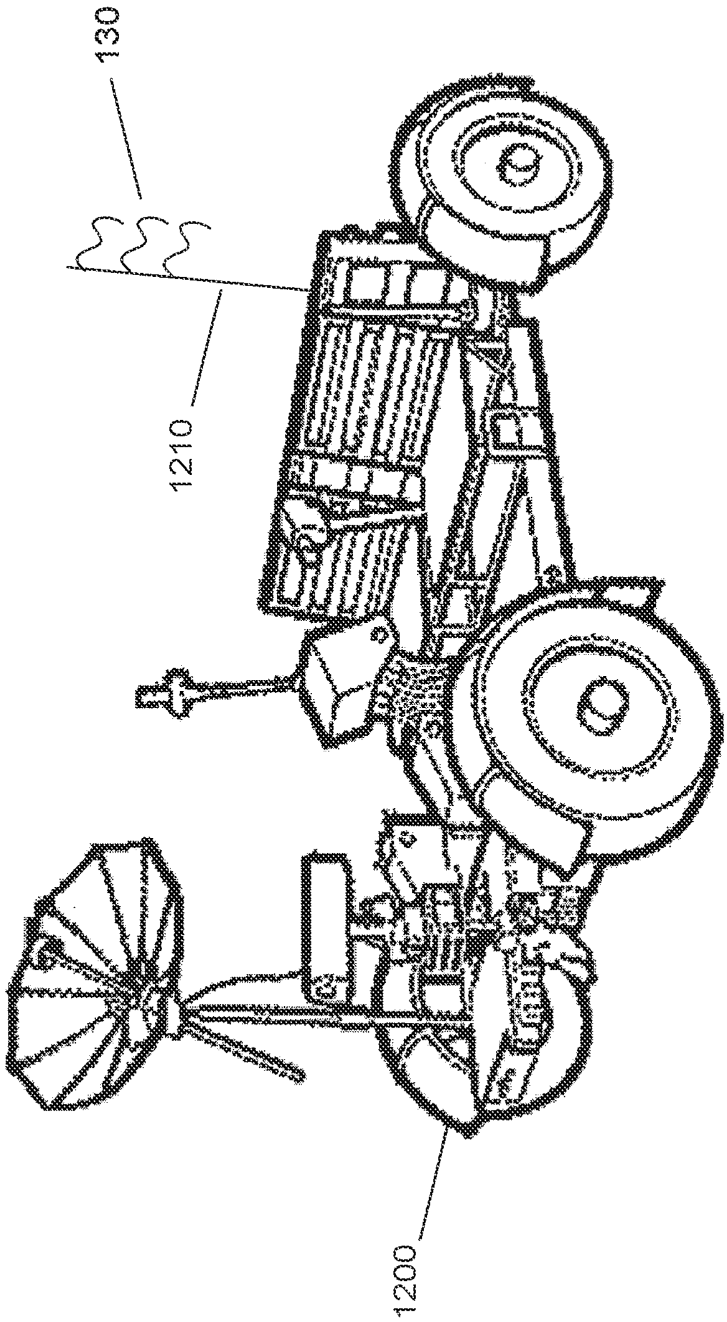


FIGURE 12

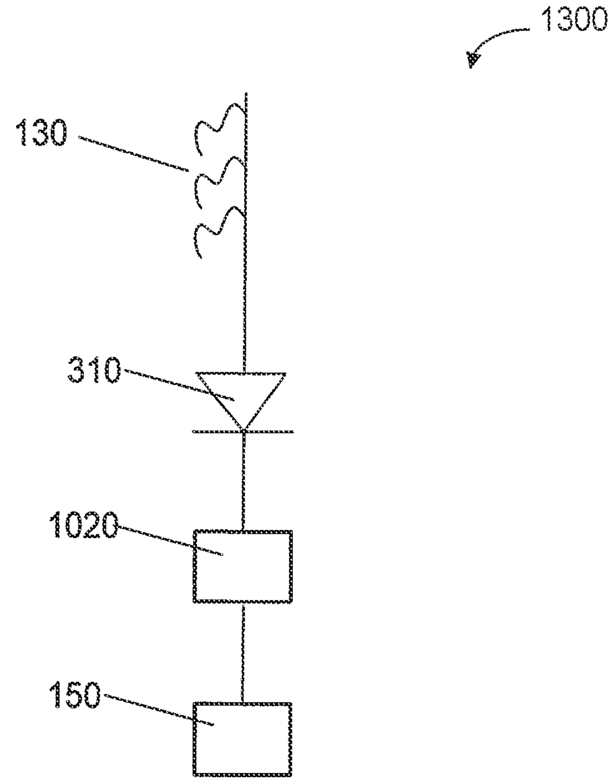


FIGURE 13

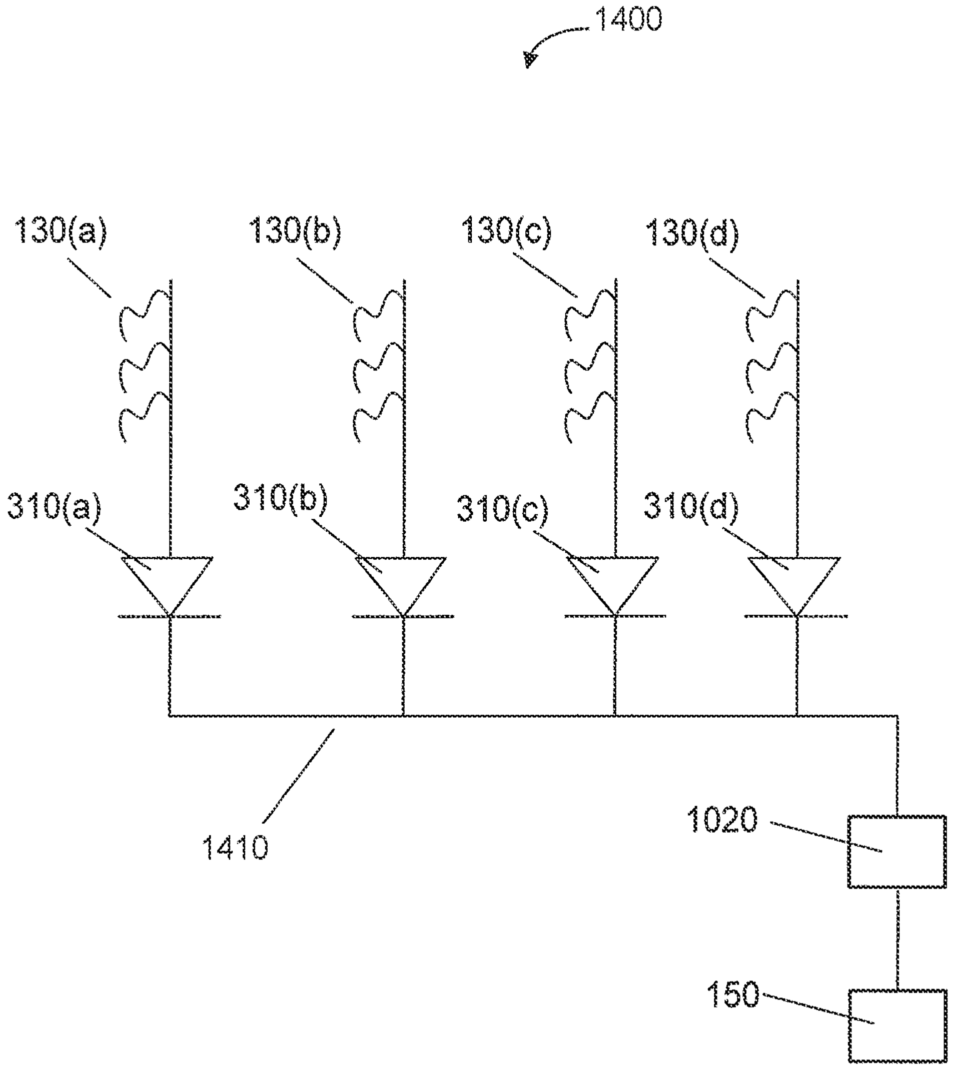


FIGURE 14

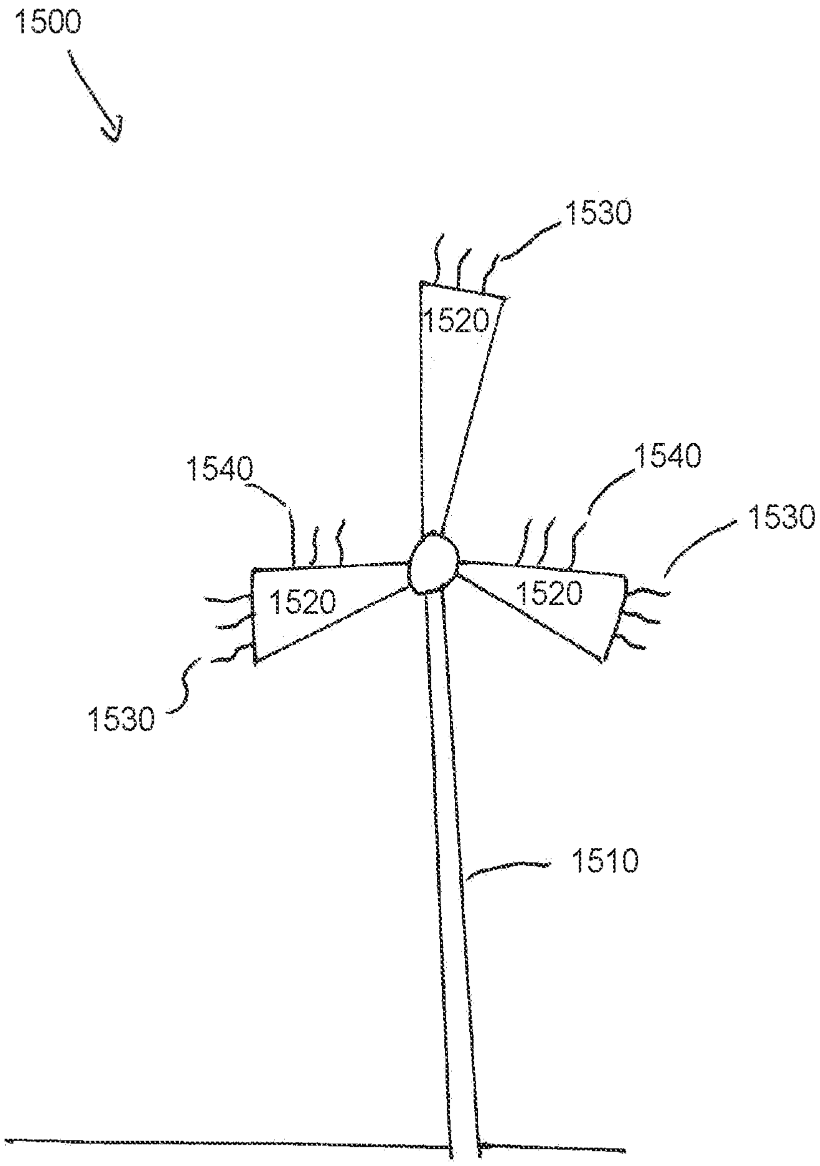


FIGURE 15

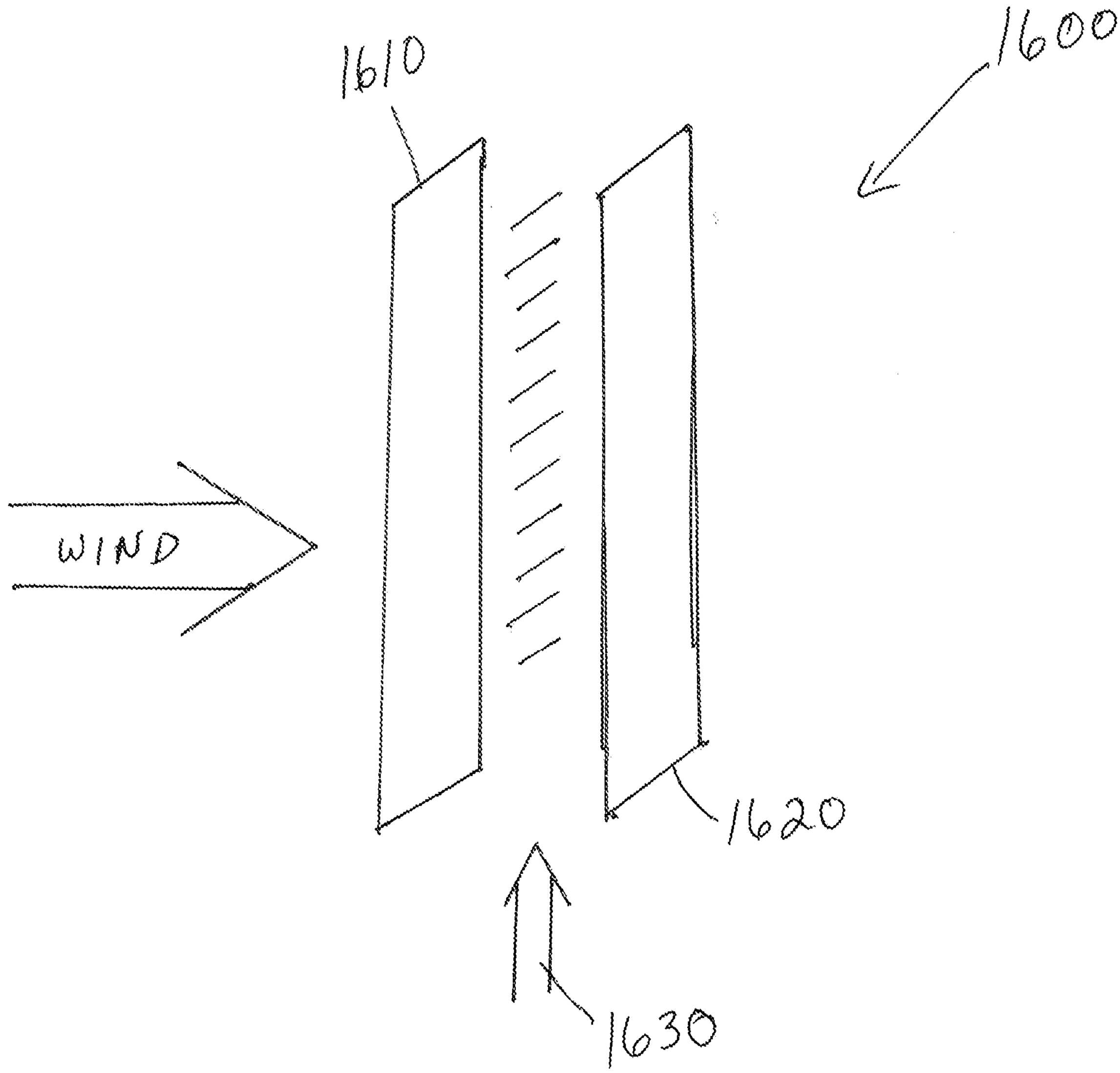


FIG. 16

FIG. 17

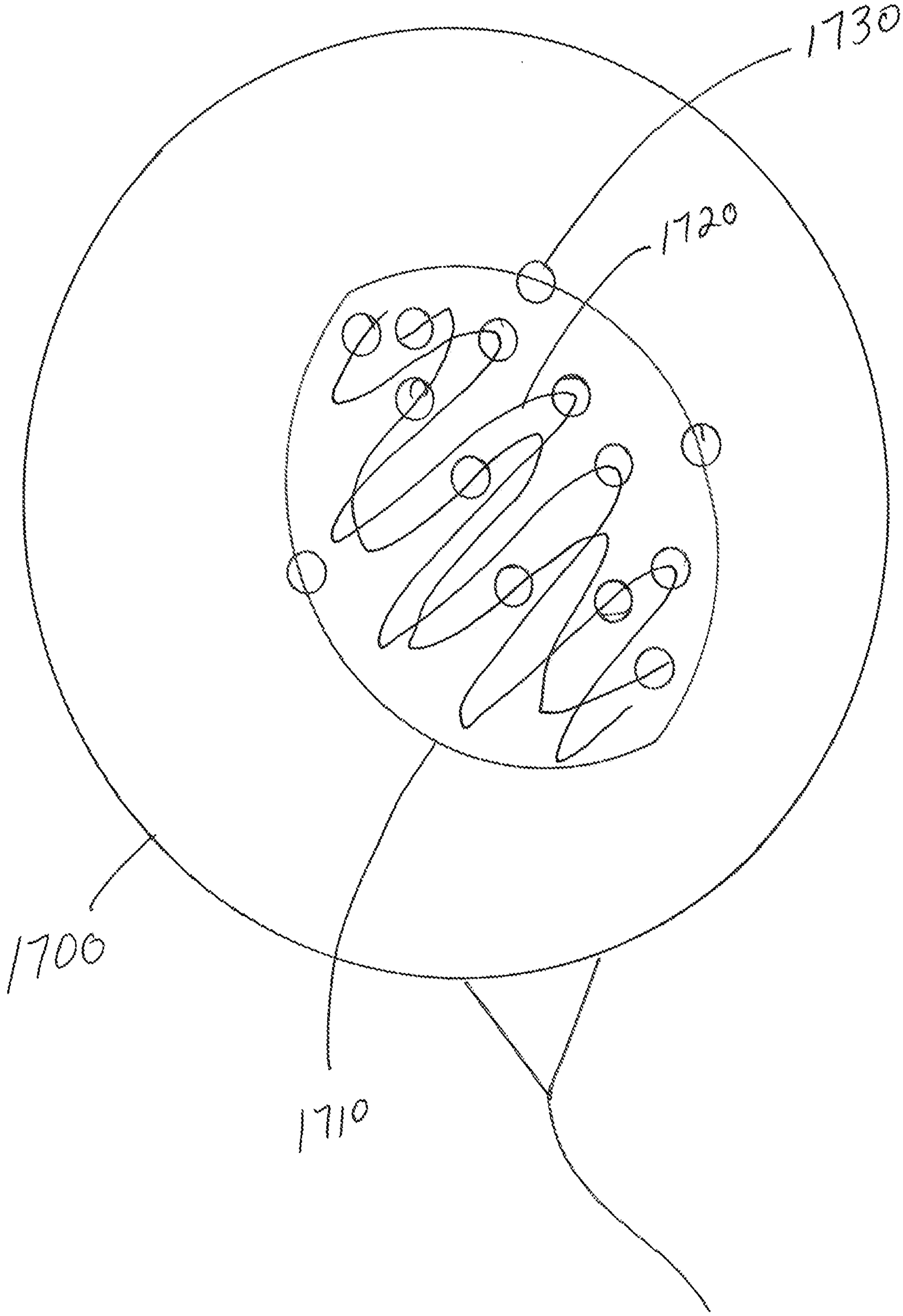


FIG. 18

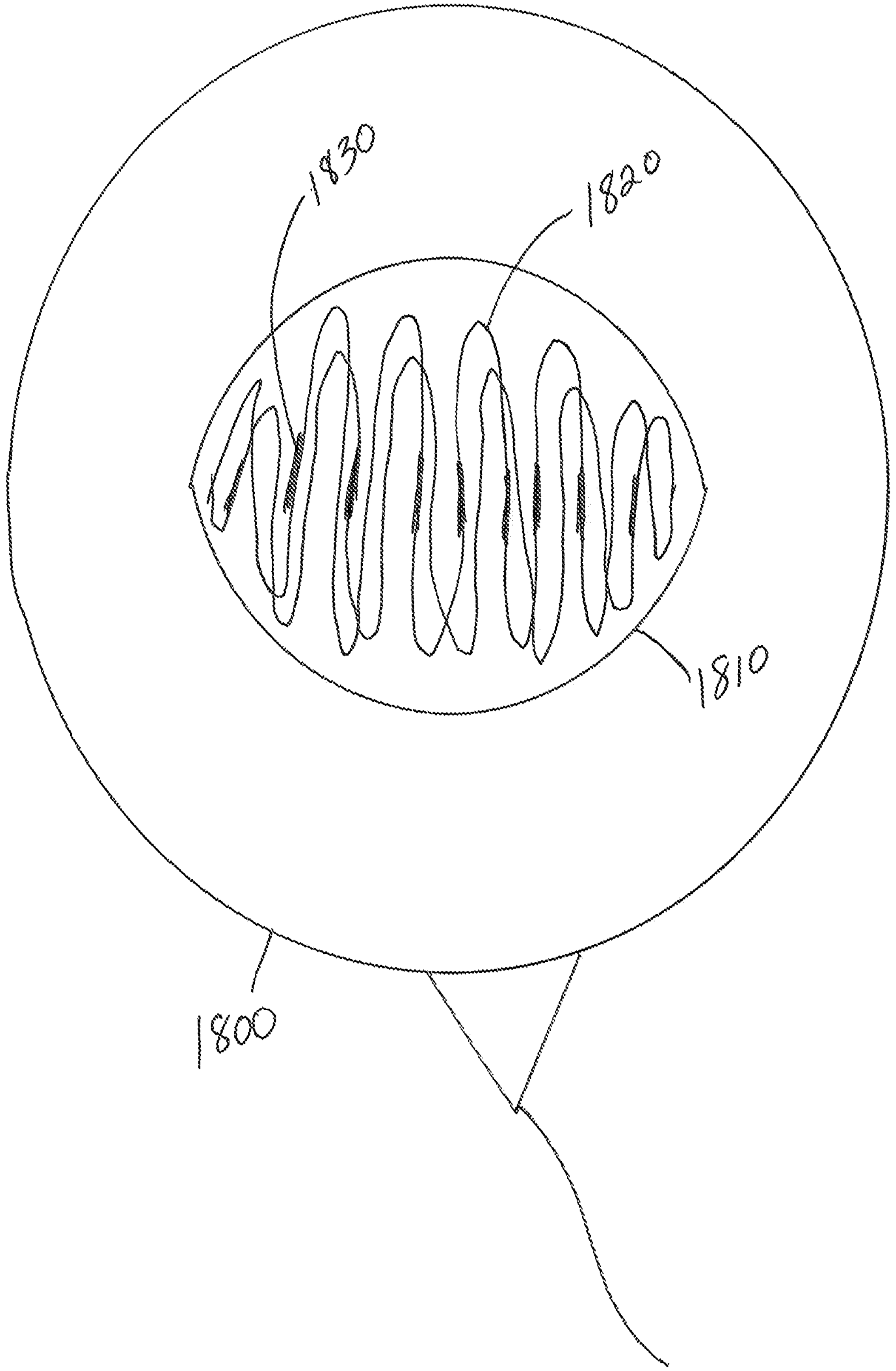


FIG. 19

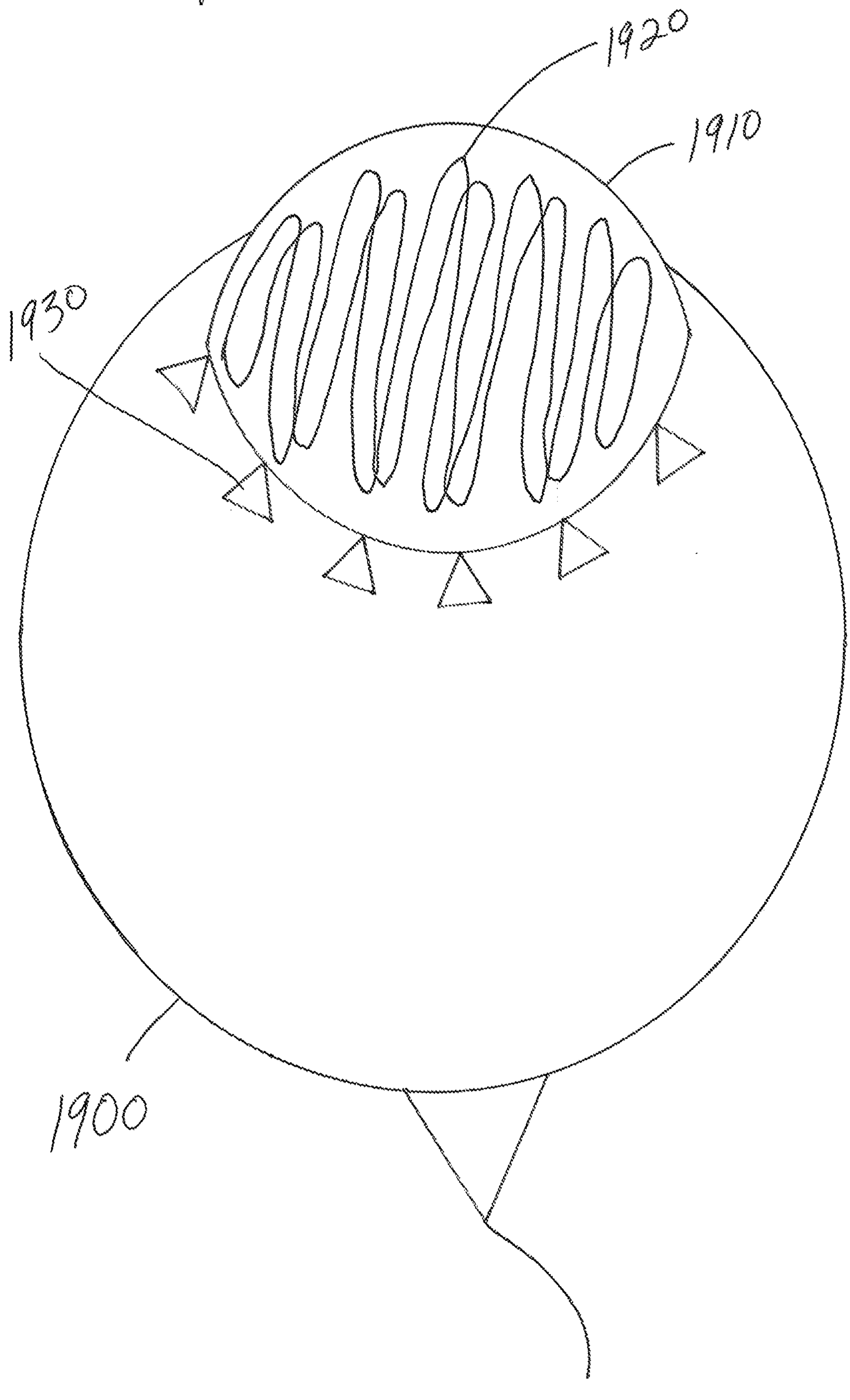
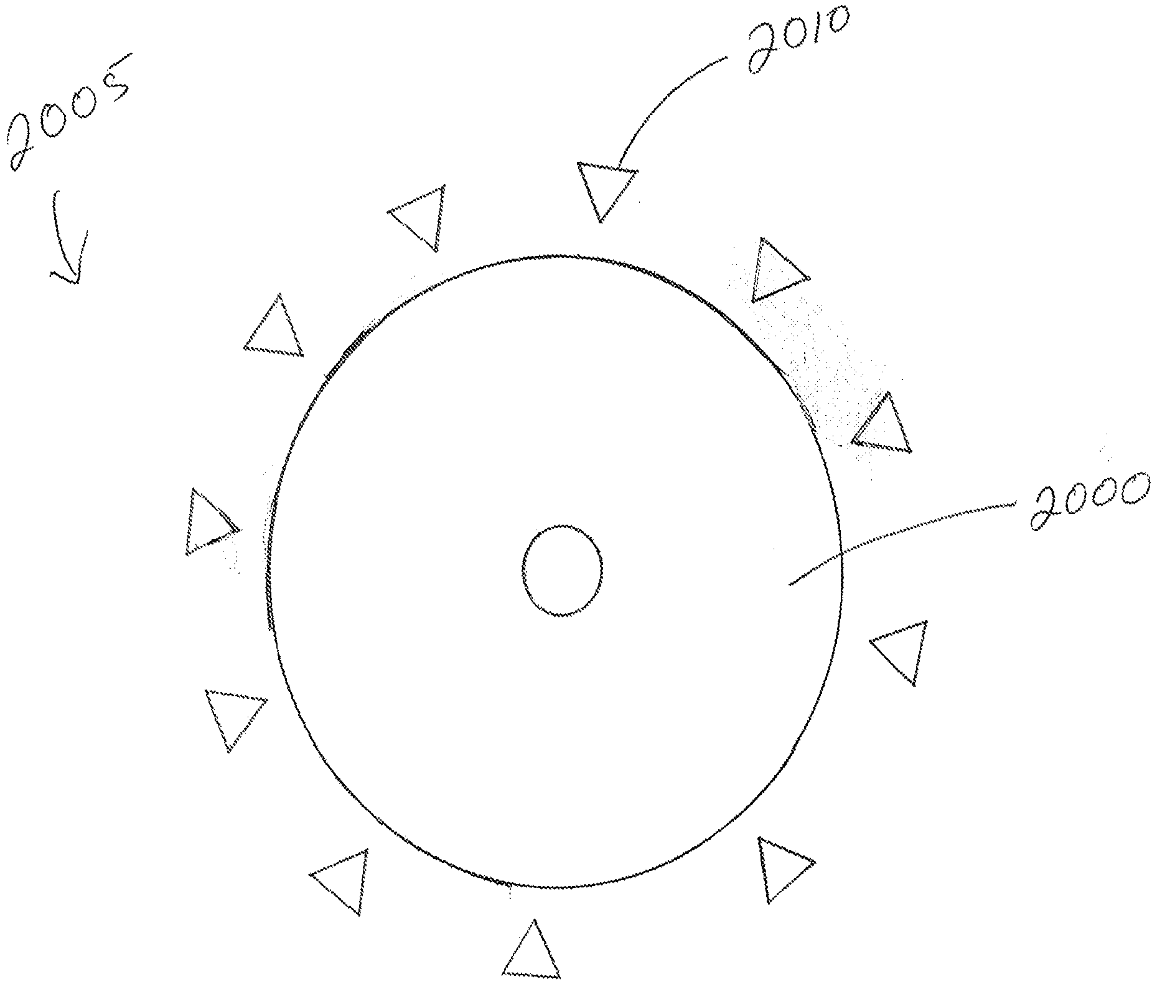


FIG. 20



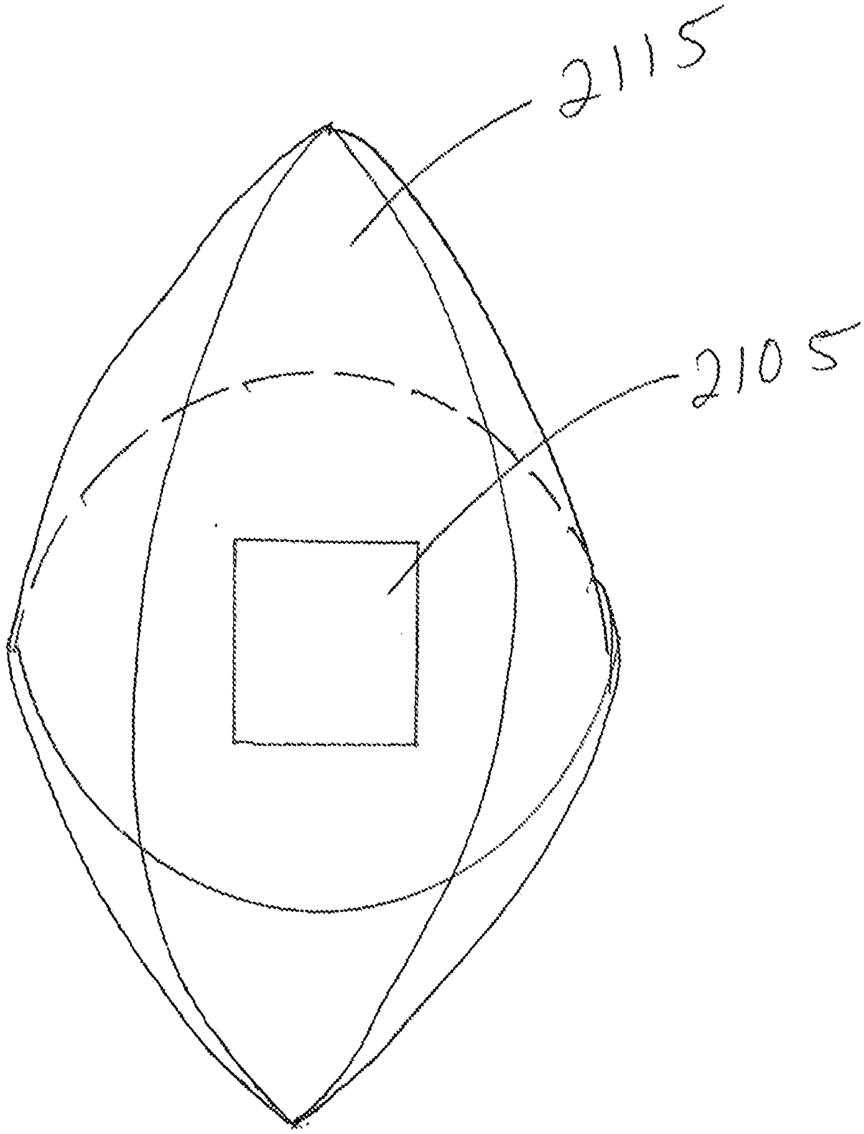


FIG. 21

ELECTROSTATIC MOTOR

TECHNICAL FIELD

[0001] The present disclosure is generally related to energy and, more particularly, is related to systems and methods for improving electrostatic motor efficiency.

BACKGROUND

[0002] The concept of fair weather electricity deals with the electric field and the electric current in the atmosphere propagated by the conductivity of the air. Clear, calm air carries an electrical current, which is the return path for thousands of lightning storms simultaneously occurring at any given moment around the earth. For simplicity, this energy may be referred to as static electricity or static energy. FIG. **1** illustrates a weather circuit for returning the current from lightning, for example, back to ground **10**. Weather currents **20**, **30** return the cloud to ground current **40**.

[0003] In a lightning storm, an electrical charge is built up, and electrons arc across a gas, ionizing it and producing the lightening flash. As one of ordinary skill in the art understands, the complete circuit requires a return path for the lightning flash. The atmosphere is the return path for the circuit. The electric field due to the atmospheric return path is relatively weak at any given point because the energy of thousands of electrical storms across the planet are diffused over the atmosphere of the entire Earth during both fair and stormy weather. Other contributing factors to electric current being present in the atmosphere may include cosmic rays penetrating and interacting with the earth's atmosphere, and also the migration of ions, as well as other effects yet to be fully studied.

[0004] Some of the ionization in the lower atmosphere is caused by airborne radioactive substances, primarily radon. In most places of the world, ions are formed at a rate of 5-10 pairs per cubic centimeter per second at sea level. With increasing altitude, cosmic radiation causes the ion production rate to increase. In areas with high radon exhalation from the soil (or building materials), the rate may be much higher.

[0005] Alpha-active materials are primarily responsible for the atmospheric ionization. Each alpha particle (for instance, from a decaying radon atom) will, over its range of some centimeters, create approximately 150,000-200,000 ion pairs.

[0006] This energy can be used to power an electrostatic motor, but electrostatic motors may be inefficient. Therefore, a heretofore unaddressed need exists in the industry to address the aforementioned deficiencies and inadequacies.

SUMMARY

[0007] Embodiments of the present disclosure provide systems and methods for collecting energy. Briefly described in architecture, one embodiment of the system, among others, can be implemented by a support structure, the support structure comprising at least one of an airplane, drone, blimp, balloon, kite, satellite, train, motorcycle, bike, skateboard, scooter, hovercraft, electronic device, electronic device case, billboard, cell tower, radio tower, camera tower, flag pole, telescopic pole, light pole, utility pole, water tower, building, sky scraper, coliseum, roof top, solar panel and a fixed or mobile structure exceeding 1 inch in height above ground or sea level; at least one collection device with, in operation, microscopic points of a cross-section of the collection device exposed to the environment electrically connected to the support structure; and a load electrically connected to the at least one collection device.

[0008] Embodiments of the present disclosure can also be viewed as providing methods for collecting energy. In this regard, one embodiment of such a method, among others, can be broadly summarized by the following steps: suspending at least one collection device with, in operation, microscopic points of a cross-section of the collection device exposed to the environment from a support structure, the at least one collection device electrically connected to the support structure, the support structure comprising at least one of an airplane, drone, blimp, balloon, kite, satellite, train, motorcycle, bike, skateboard, scooter, hovercraft, electronic device, electronic device case, billboard, cell tower, radio tower, camera tower, flag pole, telescopic pole, light pole, utility pole, water tower, building, sky scraper, coliseum, roof top, solar panel and a fixed or mobile structure exceeding 1 inch in height above ground or sea level; and providing a load with an electrical connection to the at least one collection device to draw current.

[0009] Other systems, methods, features, and advantages of the present disclosure will be or become apparent to one with skill in the art upon examination of the following drawings and detailed description. It is intended that all such additional systems, methods, features, and advantages be included within this description, be within the scope of the present disclosure, and be protected by the accompanying claims.

BRIEF DESCRIPTION OF THE DRAWINGS

[0010] Many aspects of the disclosure can be better understood with reference to the following drawings. The components in the drawings are not necessarily to scale, emphasis instead being placed upon clearly illustrating the principles of the present disclosure. Moreover, in the drawings, like reference numerals designate corresponding parts throughout the several views.

[0011] FIG. **1** is a circuit diagram of a weather energy circuit.

[0012] FIG. **2** is a perspective view of an example embodiment of many energy collectors elevated above ground by a structure.

[0013] FIG. **2**A is a side view of an energy collection fiber suspended from a support wire.

[0014] FIG. **2**B is a side view of an example embodiment of an energy collection fiber suspended from a support wire and with an additional support member.

[0015] FIG. **2**C is a perspective view of a support structure for multiple energy collection fibers.

[0016] FIG. **2**D is a side view of an example embodiment of a support structure for multiple energy collection fibers.

[0017] FIG. **2**E is a side view of a support structure for an energy collection fiber.

[0018] FIG. **2**F is a side view of an example embodiment of a support structure for an energy collection fiber.

[0019] FIG. **2**G is a side view of a support structure for multiple energy collection fibers.

[0020] FIG. **3** is a circuit diagram of an example embodiment of a circuit for the collection of energy.

[0021] FIG. **4** is a circuit diagram of an example embodiment of a circuit for the collection of energy.

[0022] FIG. **5** is a circuit diagram of an example embodiment of an energy collection circuit for powering a generator and motor.

[0023] FIG. **6** is a circuit diagram of an example embodiment of a circuit for collecting energy and using it for the production of hydrogen and oxygen.

[0024] FIG. **7** is a circuit diagram of an example embodiment of a circuit for collecting energy, and using it for driving a fuel cell.

[0025] FIG. **8** is a circuit diagram of an example embodiment of a circuit for collecting energy.

[0026] FIG. **9** is a flow diagram of an example embodiment of collecting energy with a collection fiber.

[0027] FIG. **10** is a circuit diagram of an example embodiment of a circuit for collecting energy from a dual polarity source.

[0028] FIG. **11** is a system diagram of an example embodiment of an energy collection system connected to an automobile vehicle.

[0029] FIG. **12** is a system diagram of an example embodiment of an energy collection system connected to a lunar rover vehicle.

[0030] FIG. **13** is a system diagram of an example embodiment of an energy collection system comprising collection devices with a diode.

[0031] FIG. **14** is a system diagram of an example embodiment of an energy collection system comprising multiple legs of the system of FIG. **13**.

[0032] FIG. **15** is a system diagram of an example embodiment of a windmill with energy collectors.

[0033] FIG. **16** provides a system diagram of an example embodiment of the ion collectors used in electro-hydrodynamic (EH) system of energy collection.

[0034] FIG. **17** provides a system diagram of an example embodiment of a system of utilizing encapsulated radioactive or other ionizing radiation sources in collecting energy.

[0035] FIG. **18** provides a system diagram of an example embodiment of utilizing unencapsulated radioactive or other ionizing radiation sources in collecting energy.

[0036] FIG. **19** provides a system diagram of an example embodiment of utilizing a panel of collection devices for collecting energy.

[0037] FIG. **20** is a system diagram of an example embodiment of an electrostatic motor.

[0038] FIG. **21** is a system diagram of the example embodiment of the electrostatic motor in an hermetically sealed chamber.

DETAILED DESCRIPTION

[0039] Electric charges on conductors reside entirely on the external surface of the conductors, and tend to concentrate more around sharp points and edges than on flat surfaces. Therefore, an electric field received by a sharp conductive point may be much stronger than a field received by the same charge residing on a large smooth conductive shell. An example embodiment of this disclosure takes advantage of this property, among others, to collect and use the energy generated by an electric field in the atmosphere. Referring to collection system **100** presented in FIG. **2**, at least one collection device **130** may be suspended from a support wire system **120** supported by poles **110**. Collection device **130** may comprise a diode or a collection fiber individually, or the combination of a diode and a collection fiber. Support wire system **120** may be electrically connected to load **150** by connecting wire **140**. Supporting wire system **120** may be any shape or pattern. Also, conducting wire **140** may be one wire or multiple wires. The collection device **130** in the form of a fiber may comprise any conducting or non-conducting material, including carbon, graphite, Teflon, boron, twisted graphene, carbon-14, and metal. In an example embodiment, the boron collection device may be stabilized by hydrogen. An example embodiment utilizes carbon or graphite fibers for static electricity collection. Support wire system **120** and connecting wire **140** can be made of any conducting material, including aluminum or steel, but most notably, copper. Teflon may be added to said conductor as well, such as non-limiting examples of a Teflon impregnated wire, a wire with a Teflon coating, or Teflon strips hanging from a wire. Conducting wire **120**, **140**, and **200** may be bare wire, or coated with insulation as a non-limiting example. Wires **120** and **140** are a means of transporting the energy collected by collection device **130**.

[0040] An example embodiment of the collection fibers as collection device **130** includes graphite or carbon fibers. Graphite and carbon fibers, at a microscopic level, can have hundreds of thousands of points. Atmospheric electricity may be attracted to these points. If atmospheric electricity can follow two paths where one is a flat surface and the other is a pointy, conductive surface, the electrical charge will be attracted to the pointy, conductive surface. Generally, the more points that are present, the higher energy that can be gathered. Therefore, carbon, or graphite fibers are examples that demonstrate collection ability.

[0041] In at least one example embodiment, the height of support wire **120** may be an important factor. The higher that collection device **130** is from ground, the larger the voltage potential between collection device **130** and electrical ground. The electric field may be more than 100 volts per meter under some conditions. When support wire **120** is suspended in the air at a particular altitude, wire **120** will itself collect a very small charge from ambient voltage. When collection device **130** is connected to support wire **120**, collection device **130** becomes energized and transfers the energy to support wire **120**.

[0042] A diode, not shown in FIG. **2**, may be connected in several positions in collection system **100**. A diode is a component that restricts the direction of movement of charge carriers. It allows an electric current to flow in one direction, but essentially blocks it in the opposite direction. A diode can be thought of as the electrical version of a check valve. The diode may be used to prevent the collected energy from discharging into the atmosphere through the collection fiber embodiment of collection device **130**. An example embodiment of the collection device comprises the diode with no collection fiber. A preferred embodiment, however, includes a diode at the connection point of a collection fiber to support system **120** such that the diode is elevated above ground. Multiple diodes may be used between collection device **130** and load **150**. Additionally, in an embodiment with multiple fibers, the diodes restricts energy that may be collected through one fiber from escaping through another fiber.

[0043] Collection device **130** may be connected and arranged in relation to support wire system **120** by many means. Some non-limiting examples are provided in FIGS. **2**A-**2**G using a collection fiber embodiment. FIG. **2**A presents support wire **200** with connecting member **210** for collection device **130**. Connection member **210** may be any conducting material allowing for the flow of electricity from connection device **130** to support wire **200**. Then, as shown in FIG. **2**, the support wire **200** of support system **120** may be electrically connected through conducting wire **140** to load **150**. A plurality of diodes may be placed at any position on the support structure wire. A preferred embodiment places a diode at an elevated position at the connection point between a collection fiber embodiment of collection device **130** and connection member **210**.

[0044] Likewise, FIG. **2**B shows collection fiber **130** electrically connected to support wire **200** and also connected to support member **230**. Support member **230** may be connected to collection fiber **130** on either side. Support member **230** holds the fiber steady on both ends instead of letting it move freely. Support member **230** may be conducting or non-conducting. A plurality of diodes may be placed at any position on the support structure wire. A preferred embodiment places a diode at elevated position at the connection point between collection fiber **130** and support wire **200** or between fiber **130**, support member **230**, and support wire **200**.

[0045] FIG. **2**C presents multiple collection fibers in a squirrel cage arrangement with top and bottom support members. Support structure **250** may be connected to support structure wire **200** by support member **240**. Structure **250** has a top **260** and a bottom **270** and each of the multiple collection fibers **130** are connected on one end to top **260** and on the other end to bottom **270**. A plurality of diodes may be placed at any position on support structure **250**. A preferred embodiment places a diode at an elevated position at the connection point between collection fiber **130** and support structure wire **200**.

[0046] FIG. **2**D presents another example embodiment of a support structure with support members **275** in an x-shape connected to support structure wire **200** at intersection **278** with collection fibers **130** connected between ends of support members **275**. A plurality of diodes may be placed at any position on the support structure. A preferred embodiment places a diode at an elevated position at the connection point between collection fiber **130** and support wire **200**.

[0047] FIG. **2**E provides another example embodiment for supporting collection fiber **130**. Collection fiber **130** may be connected on one side to support member **285**, which may be connected to support structure wire **200** in a first location and on the other side to support member **280**, which may be connected to support structure wire **200** in a second location on support structure wire **200**. The first and second locations may be the same location, or they may be different locations, even on different support wires. A plurality of diodes may be placed at any position on the support structure. A preferred embodiment places one or more diodes at elevated positions at the connection point(s) between collection fiber **130** and support wire **200**.

[0048] FIG. **2**F presents another example embodiment of a support for a collection fiber. Two support members **290** may support either side of a collection fiber and are connected to support wire **200** in a single point. A plurality of diodes may be placed at any position on the support structure. A preferred embodiment places a diode at an elevated position at the connection point between collection fiber **130** and support wire **200**.

[0049] FIG. **2**G provides two supports as provided in FIG. **2**F such that at least two support members **292**, **294** may be connected to support structure wire **200** in multiple locations and collection fibers **130** may be connected between each end of the support structures. Collection fibers **130** may be connected between each end of a single support structure and between multiple support structures. A plurality of diodes may be placed at any position on the support structure. A preferred embodiment places one or more diodes at elevated positions at the connection point(s) between collection fiber **130** and support structure wire **200**.

[0050] FIG. **3** provides a schematic diagram of storing circuit **300** for storing energy collected by one or more collection devices (**130** from FIG. **2**). Load **150** induces current flow. Diode **310** may be electrically connected in series between one or more collection devices (**130** from FIG. **2**) and load **150**. A plurality of diodes may be placed at any position in the circuit. Switch **330** may be electrically connected between load **150** and at least one collection device (**130** from FIG. **2**) to connect and disconnect the load. Capacitor **320** maybe connected in parallel to the switch **330** and load **150** to store energy when switch **330** is open for delivery to load **150** when switch **330** is closed. Rectifier **340** may be electrically connected in parallel to load **150**, between the receiving end of switch **330** and ground. Rectifier **340** may be a full-wave or a half-wave rectifier. Rectifier **340** may include a diode electrically connected in parallel to load **150**, between the receiving end of switch **330** and ground. The direction of the diode of rectifier **340** is optional.

[0051] In an example embodiment provided in FIG. **4**, storage circuit **400** stores energy from one or more collection devices (**130** from FIG. **2**) by charging capacitor **410**. If charging capacitor **410** is not used, then the connection to ground shown at capacitor **410** is eliminated. A plurality of diodes may be placed at any position in the circuit. Diode **310** may be electrically connected in series between one or more collection devices (**130** from FIG. **2**) and load **150**. Diode **440** may be placed in series with load **150**. The voltage from capacitor **410** can be used to charge spark gap **420** when it reaches sufficient voltage. Spark gap **420** may comprise one or more spark gaps in parallel. Non-limiting examples of spark gap **420** include mercury-reed switches and mercury-wetted reed switches. When spark gap **420** arcs, energy will arc from one end of the spark gap **420** to the receiving end of the spark gap **420**. The output of spark gap **420** may be electrically connected in series to rectifier **450**. Rectifier **450** may be a full-wave or a half-wave rectifier. Rectifier **450** may include a diode electrically connected in parallel to transformer **430** and load **150**, between the receiving end of spark gap **420** and ground. The direction of the diode of rectifier **450** is optional. The output of rectifier **450** is connected to transformer **430** to drive load **150**.

[0052] FIG. **5** presents motor driver circuit **500**. One or more collection devices (**130** from FIG. **2**) are electrically connected to static electricity motor **510**, which powers generator **520** to drive load **150**. A plurality of diodes may be placed at any position in the circuit. Motor **510** may also be directly connected to load **150** to drive it directly.

[0053] FIG. **6** demonstrates a circuit **600** for producing hydrogen. A plurality of diodes maybe placed at any position in the circuit. One or more collection devices (**130** from FIG. **2**) are electrically connected to primary spark gap **610**, which may be connected to secondary spark gap **640**. Non-limiting examples of spark gaps **610**, **640** include mercury-reed switches and mercury-wetted reed switches. Secondary spark gap **640** may be immersed in water **630** within container **620**. When secondary spark gap **640** immersed in water **630** is energized, spark gap **640** may produce bubbles of hydrogen and oxygen, which may be collected to be used as fuel.

[0054] FIG. **7** presents circuit **700** for driving a fuel cell. A plurality of diodes may be placed at any position in the circuit. Collection devices (**130** from FIG. **2**) provide energy to fuel cell **720** which drives load **150**. Fuel cell **720** may produce hydrogen and oxygen.

[0055] FIG. **8** presents example circuit **800** for the collection of energy. Storage circuit **800** stores energy from one or more collection devices (**130** from FIG. **2**) by charging capacitor **810**. If charging capacitor **810** is not used, then the connection to ground shown at capacitor **810** is eliminated. A plurality of diodes may be placed at any position in the circuit. The voltage from capacitor **810** can be used to charge spark gap **820** when it reaches sufficient voltage. Spark gap **820** may comprise one or more spark gaps in parallel or in series. Non-limiting examples of spark gap **820** include mercury-reed switches and mercury-wetted reed switches. When spark gap **820** arcs, energy will arc from one end of spark gap **820** to the receiving end of spark gap **820**. The output of spark gap **820** may be electrically connected in series to rectifier **825**. Rectifier **825** may be a full-wave or a half-wave rectifier. Rectifier **825** may include a diode electrically connected in parallel to inductor **830** and load **150**, between the receiving end of spark gap **820** and ground. The direction of the diode of rectifier **825** is optional. The output of rectifier **825** is connected to inductor **830**. Inductor **830** may be a fixed value inductor or a variable inductor. Capacitor **870** may be placed in parallel with load **150**.

[0056] FIG. **9** presents a flow diagram of a method for collecting energy. In block **910**, one or more collection devices may be suspended from a support structure wire. In block **920**, a load may be electrically connected to the support structure wire to draw current. In block **930** a diode may be electrically connected between the support structure wire and the electrical connection to the load. In block **940**, energy provided to the load may be stored or otherwise utilized.

[0057] FIG. **10** presents circuit **1000** as an example embodiment for the collection of energy from a dual polarity source. This may be used, for example, to collect atmospheric energy that reverses in polarity compared with the ground. Such polarity reversal has been discovered as occurring occasionally on Earth during, for example, thunderstorms and bad weather, but has also been observed during good weather. Such polarity reversal may occur on other planetary bodies, including Mars and Venus, as well. Energy polarity on other planets, in deep space, or on other heavenly bodies, may be predominantly negative or predominantly positive. Collector fibers (**130** from FIG. **2**), which may comprise graphene, silicene, and/or other like materials, are capable of collecting positive energy and/or negative energy, and circuit **1000** is capable of processing positive and/or negative energy, providing an output which is always positive. Circuit **1000** may collect energy from one or more collection devices (**130** from FIG. **2**). Charging capacitor **1010** may be used to store a charge until the voltage at spark gap **1020** achieves the spark voltage. Capacitor **1010** is optional.

[0058] A plurality of diodes may be placed in a plurality of positions in circuit **1000**. The voltage from capacitor **1010** may be used to charge spark gap **1020** to a sufficient voltage. Spark gap **1020** may comprise one or more spark gaps in parallel or in series. Non-limiting examples of spark gap **1020** include mercury-reed switches, mercury-wetted reed switches, open-gap spark gaps, and electronic switches. When spark gap **1020** arcs, energy will arc from an emitting end of spark gap **1020** to a receiving end of spark gap **1020**. The output of spark gap **1020** is electrically connected to the anode of diode **1022** and the cathode of diode **1024**. The cathode of diode **1022** is electrically connected to the cathode of diode **1026** and inductor **1030**. Inductor **1030** may be a fixed value inductor or a variable inductor. The anode of diode **1026** is electrically connected to ground. Capacitor **1028** is electrically connected between ground and the junction of the cathodes of diode **1022** and diode **1026**. Inductor **1035** is electrically connected between ground and the anode of diode **1024**. Inductor **1035** may be a fixed value inductor or a variable inductor. Capacitor **1070**, the anode of diode **1026**, inductor **1035**, and load **1050** are electrically connected to ground. Capacitor **1070** may be placed in parallel with load **150**.

[0059] FIGS. **11** and **12** provide example embodiments of vehicle **1110**, which utilizes electricity, the vehicle employing systems of energy collection provided herein. Vehicle **1100** in FIG. **11** is shown as an automobile vehicle, but could be any means of locomotion that utilizes electricity, including a car, a train, a motorcycle, a boat, an airplane, robotic rovers, space craft, etc. Vehicle **1200** in FIG. **12** is shown as a lunar rover vehicle. In FIGS. **11** and **12**, support rod **1110**, **1210** is electrically connected to an electrical system in vehicle **1100**, **1200**. Energy collectors **130**, which may comprise graphene, silicene, and/or other like materials, are electrically connected to support rod **1110**, **1210** and may be used to supply energy to electrical circuits within the vehicle. A non-limiting use includes a top-off charge for a battery system, on-board hydrogen production, and/or assisting in the same. Energy collectors **130** may be used to augment the efficiency of the locomotion that utilizes electrical energy as well.

[0060] FIG. **13** provides an example embodiment of energy collection system **1200** in which diode **310** is used to isolate collection devices **130** from spark gap **1020** and load **150**. Collection devices **130** may comprise graphite, carbon fibers, carbon/carbon fibers, graphene, silicene, and/or other like materials, or a mixture thereof.

[0061] FIG. **14** provides an example embodiment of energy collection system **1400** in which a plurality of energy collection systems, such as that provided in FIG. **13**, are combined. Each leg consisting of collection devices **130**, which may comprise graphene, silicene, and/or other like materials, and diode **310** are connected in parallel with other legs, each leg electrically connected to trunk wire **1410**. The legs could also be connected serially. Trunk wire **1410** is electrically connected to a collection circuit, which may comprise load **150** and spark gap **1020** in any configuration that has been previously discussed. Each leg may comprise one or more collection devices **130** and at least one diode electrically connected between the collection devices and the collection circuit. Although three collection devices **130** are shown on each leg, any number of collection devices may be used. Although four legs are shown, any number of legs may be used.

[0062] FIG. **15** presents a system diagram of an example embodiment of a windmill with energy collectors, which may comprise graphene, silicene, and/or other like materials in an example embodiment. A windmill is an engine powered by the energy of wind to produce alternative forms of energy. They may, for example, be implemented as small tower mounted wind engines used to pump water on farms. The modern wind power machines used for generating electricity are more properly called wind turbines. Common applications of windmills are grain milling, water pumping, threshing, and saw mills. Over the ages, windmills have evolved into more sophisticated and efficient wind-powered water pumps and electric power generators. In an example embodiment, as provided in FIG. **10**, windmill tower **1500** of suitable height and/or propeller **1520** of windmill tower **1500** may be equipped with energy collecting fibers **1530**, **1540**, which may comprise graphene, silicene, and/or other like materials in an example embodiment. Collecting fibers **1530**, **1540** may turn windmill **1500** into a power producing asset even when there is not enough wind to turn propellers **1520**. During periods when there is enough wind to turn propellers **1520**, collecting fibers **1530**, **1540** may supplement/boost the amount of energy the windmill produces.

[0063] A windmill is an engine powered by the energy of wind to produce alternative forms of energy. They may, for example, be implemented as small tower mounted wind engines used to pump water on farms. The modern wind power machines used for generating electricity are more properly called wind turbines. Common applications of windmills are grain milling, water pumping, threshing, and saw mills. Over the ages, windmills have evolved into more sophisticated and efficient wind-powered water pumps and electric power generators. In an example embodiment, as provided in FIG. **15**, windmill tower **1500** of suitable height and/or propeller **1520** of windmill tower **1500** may be equipped with energy collecting fibers **1530**, **1540**. Collecting fibers **1530**, **1540** may turn windmill **1500** into a power producing asset even when there is not enough wind to turn propellers **1520**. During periods when there is enough wind to turn propellers **1520**, collecting fibers **1530**, **1540** may supplement/boost the amount of energy the windmill produces.

[0064] Windmill **1500**, properly equipped with ion collectors **1530**, **1540**, such as a non-limiting example of fibers with graphene, silicene, and/or other like materials, can produce electricity: 1) by virtue of providing altitude to the fiber to harvest ions, and 2) while the propeller is turning, by virtue of wind blowing over the fiber producing electricity, among other reasons, via the triboelectric effect (however, it is also possible for the triboelectric effect to occur, producing electricity, in winds too weak to turn the propeller).

[0065] There are at least two ways that energy collectors may be employed on or in a windmill propeller to harvest energy. Propellers **1520** may be equipped with energy collectors **1530**, **1540** attached to, or supported by, propeller **1520** with wires (or metal embedded in, or on propeller **1520**) electrically connecting energy collectors **1530**, **1540**, which may comprise graphene, silicene, and/or other like materials, to a load or power conversion circuit. There may be a requirement to electrically isolate energy collectors **1530**, **1540**, which are added to propeller **1520**, from electrical ground, so that the energy collected does not short to ground through propeller **1520** itself or through support tower **1510**, but rather is conveyed to the load or power conversion circuit. Energy collectors may be connected to the end of propellers **1520** such as collectors **1530**. Alternatively, energy collectors may be connected to the sides of propellers **1520** such as collectors **1540**.

[0066] Alternatively, propeller **1520** may be constructed of carbon fiber or other suitable material, with wires (or the structural metal supporting propeller **1520** may be used) electrically connecting to a load or power conversion circuit. In the case of propeller **1520** itself being constructed of carbon fiber, for example, the fiber may be ‘rough finished’ in selected areas so that the fiber is “fuzzy.” For example, small portions of it may protrude into the air as a means of enhancing collection efficiency. The fuzzy parts of collectors **1530**, **1540** may do much of the collecting. There may be a requirement to electrically isolate carbon fiber propeller **1520** from electrical ground, so that the energy it collects does not short to ground through metal support tower **1510**, but rather is conveyed to the load or power conversion circuit. Diodes may be implemented within the circuit to prevent the backflow of energy, although diodes may not be necessary in some applications.

[0067] In an alternative embodiment, windmill **1500** may be used as a base on which to secure an even higher extension tower to support the energy collectors and/or horizontal supports extending out from tower **1510** to support the energy collectors. Electrical energy may be generated via ion collection due to altitude and also when a breeze or wind blows over the collectors supported by tower **1510**.

[0068] In alternative embodiments to windmill **1500**, other non-limiting example support structures include airplanes, drones, blimps, balloons, kites, satellites, cars, boats, trucks, (including automobile and other transportation conveyance tires), trains, motorcycles, bikes, skateboards, scooters, hovercraft (automobiles and conveyance of any kind), billboards, cell towers, radio towers, camera towers, flag poles, towers of any kind including telescopic, light poles, utility poles, water towers, buildings, sky scrapers, coliseums, roof tops, solar panel and all fixed or mobile structures exceeding 1 inch in height above ground or sea level.

[0069] An example embodiment of a support structure may also include cell phones and other electronic devices and their cases, including cases containing rechargeable batteries. For example, someone may set her cell phone or other electronic device or battery pack on the window ledge of a tall apartment building to help charge it. Other example support structures may include space stations, moon and Mars structures, rockets, planetary rovers and drones including robots and artificial intelligence entities.

[0070] Under some conditions, ambient voltage may be found to be 180-400 volts at around 6 ft, with low current. With the new generation of low current devices being developed, a hat containing ion harvesting material may provide enough charge, or supplemental charge, collected over time to help power low current devices such as future cell phones, tracking devices, GPS, audio devices, smart glasses, etc. Clothes may also be included as examples of support structures. Friction of the ion collection material (such as non-limiting examples of carbon, graphite, silicene and graphene) against unlike materials, such as wool, polyester, cotton, etc (used in clothes) may cause a voltage to be generated when rubbed together. Additionally, wind passing over the ion collection material has been demonstrated to generate voltage, even at low altitude. In an additional example embodiment, embedding collection devices into automobile tires (for example, in a particular pattern) could generate collectible voltage.

[0071] FIG. **16** provides an example embodiment of the ion collectors used in electro-hydrodynamic (EH) system **1600** of energy collection. In an EH system, wind energy is used to produce electrical energy. In an example system, upstream collector **1610** and downstream collector **1620** are used to create an electric field between them. Injector **1630** is then used to inject particles into the electric field to carry the electrical charge between the upstream and downstream collectors **1610**, **1620**. Injector **1630** may inject a fine mist between collectors **1610**, **1620**. The injection source may be naturally created or man-made. Depending on the conditions, either of upstream and downstream collectors **1610**, **1620** may be optional. Injector **1630** may be used to generate the electric field, and as upstream and/or downstream collector **1610**, **1620**. In an example embodiment, collectors **1610**, **1620** comprise a material, as provided above, that includes, in operation, microscopic points of a cross section of the collection device exposed to the environment, such as with carbon, graphite, silicene, and graphene. Collectors **1610**, **1620** may be formed in many arrangements, as provided above, such as free strands or in a mesh arrangement, among others. EH system **1600** may be attached to any support structure, such as airplane, rocket, drone, blimp, balloon, kite, satellite, train, motorcycle, bike, skateboard, scooter, hovercraft, electronic device, electronic device case, billboard, cell tower, radio tower, camera tower, flag pole, telescopic pole, light pole, utility pole, water tower, building, sky scraper, coliseum, roof top, solar panel and a fixed or mobile structure exceeding 1 inch in height above ground or sea level.

[0072] FIG. **17** provides an example embodiment of a system of utilizing radioactive or other ionizing radiation sources in collecting energy. The utilization of radioactive or other ionizing radiation sources may provide benefits, including a) increasing the level of energy produced by ion harvesting methods, b) increasing the electrical conductivity of the localized atmosphere around or near ion harvesting systems, c) decreasing the electrical resistivity of the localized atmosphere around or near ion harvesting systems, and d) increasing the ionization of the local atmosphere around or near ion harvesting systems. In example embodiments, the radioactive or ionizing source may be exposed openly to the atmosphere, enclosed in a sealed container, or contained in a partially sealed container.

[0073] Examples of radioactive or ionizing radiation sources include carbon-14, uranium, thorium, tritium, americium-241, radium, radon, cobalt-60, cesium-137, potassium-40, lead-210, iodine-131, technetium, and iridium-192 among others.

[0074] In an example embodiment, panel **1710** of collectors **1720** are attached to support platform **1700**, such as an aerostat. An electrical source may be connected to collectors **1720** (including carbon, carbon-14, or metal, for example) in a manner that the electric current discharges from collectors **1720** to the atmosphere, or from the atmosphere to collector **1720**, in that the atmosphere's electric current discharges to the carbon fiber (or other electrical conductor including metal).

[0075] In an example embodiment, capsules **1730** are attached directly to aerostat **1700** by methods including, but not limited to hook and loop, adhesive, sewing, and/or pouches attached to anchor points on support structure **1700** or by any mechanical means to support structure **1700**. In an example embodiment, magnetic means are implemented to attach the radioactive material **1730** to the collection devices **1720** or support structure **1700**.

[0076] In an example embodiment, radioactive capsules **1730** are attached to the collection material **1720**. In an example implementation, the collection material **1720** is threaded through a passageway in capsule **1730** and attached by methods including, but not limited to hook and loop, adhesive, sewing, and/or pouches attached to anchor points on support structure **1700** or by any mechanical means to support structure **1700**. Capsules **1730** may be attached to points of structured panel **1710** of collectors **1720**. Capsules **1730** may be attached to loops in collectors **1720**. Collectors **1720** may be tied in knots or other cable structures/configurations around capsules **1730**.

[0077] In the example embodiment of FIG. **18**, panel **1810** of collectors **1820** are attached to support platform **1800**, such as an aerostat. Radioactive material **1830** may be incorporated into a paste, viscous liquid/material, or other spreadable substrate and applied to support platform **1800**, collectors **1820**, and/or structured support **1800** for one or more collectors **1820**. Radioactive material **1830** may have magnetic properties and may be applied to platform **1800**, collectors **1820**, panel **1810**, or other points using the magnetic properties.

[0078] In an example embodiment, radioactive material/powder is combined with a magnetic material such as ferrofluid, as a non-limiting example, to apply to panel **1810**, collectors **1820**, support structure **1800**, and other points. In the manufacturing process of collectors **1820**, the radioactive material may be embedded in the collector material, such as a resin as a non-limiting example.

[0079] In the example embodiment of FIG. **19**, collection devices **1920** are structured into panel type configuration **1910**. Panel **1910** may be attached to support structure **1900** such as an aerostat, as a non-limiting example. Panel **1910** may be attached to support structure **1900** and may be spaced a distance from support structure **1900** for safety reasons, for example. Theoretically, the larger the surface area of panel **1910** of collection devices **1920** that is exposed to the atmosphere, the more energy may be collected by collection devices **1920**. If panel **1910** is attached directly to support structure **1900**, there may be airflow on only one side of the panel and that side is the only side that is exposed for collection of ions. However, if panel **1910** is separated from support structure **1900** by an appropriate amount, such that airflow is achieved on both sides of panel **1910**, twice the surface area is accessible to the airflow and to the ions to be collected by collection devices **1920**. In an example embodiment, panel **1910** of collection devices **1920** is separated from support structure **1900** with pillars **1930**. The amount of distance between the collection devices **1920** and support structure **1900** may be increased by utilizing larger anchors points or pillars or spacers, or cables, etc. to secure the collection devices **1920** to support structure **1900**. The anchor points, pillars, spacers, or cables **1930** may range in size from zero inches (i.e.: flush against the aerial platform) up to 500 ft. or greater, arranged in a manner that the distance between collection devices **1920** and support structure **1900** is from 0 inches up to 500 ft. or greater.

[0080] FIG. **20** provides a diagram of electrostatic motor **2005** the operation of which is based on the attraction and repulsion of electric charge. Usually, electrostatic motors are the dual of conventional coil-based motors. They typically require a high voltage power supply, although very small motors employ lower voltages. Conventional electric motors, instead, employ magnetic attraction and repulsion, and require high current at low voltages. Andrew Gordon and Benjamin Franklin are often credited with designing and building the first electrostatic motors in the mid-18th century. Franklin's electrostatic motors rotated when provided with high voltage electricity based on the principle of attraction and repulsion of electrostatic charges. Franklin's electrostatic motors did not utilize magnets or coils of wire as is generally required for low voltage motors.

[0081] Over 100 years later, improvements to Franklin's electrostatic motor designs were accomplished by Oleg D. Jefimenko. Jefimenko constructed and operated electrostatic generators run by atmospheric electricity.

[0082] Rotor **2000** may be a conductive barrel that is allowed to rotate within the device. The internal drum that is free to spin is the rotor. The outside ribs of the motor are stators **2010**. In an example embodiment, each stator **2010** is connected to a power source, alternatively. So, one is connected to the positive side, the next is connected to the negative side, the next to positive, then negative, and so on.

[0083] In many electrostatic motor designs, the input electricity is of sufficiently high voltage specified to exceed the electrical breakdown voltage of the air-gap between the stator **2010** and rotor **2000**. The air-gap performs similar to a spark-gap and the terms are used interchangeably herein. A spark gap consists of an arrangement of two conducting electrodes separated by a gap usually filled with a gas such as air, designed to allow an electric spark to pass between the conductors. When the potential difference between the conductors exceeds the breakdown voltage of the gas within the gap, a spark forms, ionizing the gas and drastically reducing its electrical resistance. An electric current then flows until the path of ionized gas is broken or the current reduces below a minimum value called the "holding current". This usually happens when the voltage drops, but in some cases occurs when the heated gas rises, stretching out and then breaking the filament of ionized gas. Usually, the action of ionizing the gas is violent and disruptive, often leading to sound (ranging from a snap for a spark plug to thunder for a lightning discharge), light and heat.

[0084] The light emitted by a spark does not come from the current of electrons itself, but from the material medium fluorescing in response to collisions from the electrons. When electrons collide with molecules of air in the gap, they excite their orbital electrons to higher energy levels. When these excited electrons fall back to their original energy levels, they emit energy as light. A visible spark will not form in a vacuum. Without intervening matter capable of electromagnetic transitions, the spark will be invisible.

[0085] The electrical breakdown voltage of the air-gap is influenced by humidity, pressure, temperature, light, radiation and other atmospheric variables. For example, increased humidity can alter the electrical breakdown voltage of the air-gap, in some cases, requiring the input voltage to be significantly increased in order for satisfactory operation to be achieved. Natural fluctuation of atmospheric air pressure can increase or reduce the air-gap's effectiveness at conveying electric charge between stator **2010** and rotor **2000**.

[0086] As provided in FIG. **21**, by enclosing electrostatic motor **2105** in hermetically sealed enclosure **2115** in which the internal air environment can be stabilized and controlled, performance of electrostatic motor **2105** can be greatly enhanced in terms of motor efficiency, performance, longevity, reduced electrical input power and/or input voltage with improved kinetic power output.

[0087] Hermetically sealed enclosure **2115** may preserve parameters of the gas condition inside the container, such as, for example, to a specified humidity level, and/or gas pressure, and other parameters associated with gaseous environments.

[0088] It has been observed that high humidity can be particularly disruptive to the performance of electrostatic motor **2105**. The internal humidity conditions of the sealed enclosure **2115** may be reduced and stabilized through the use of desiccants, powered dehumidifiers, or other means that decrease or increase humidity. The same applies to decreasing, or increasing, and maintaining desired gas pressure (or vacuum, or partial vacuum), temperature, dew point, among other parameters.

[0089] It has been noted that adding certain gaseous elements into the hermetically sealed enclosure **2115** can enhance electrostatic motor efficiency, performance, longevity, reduced electrical input power and/or input voltage with improved kinetic power output. Gases include but are not limited to neon, helium, argon, xenon, nitrogen, oxygen, difluoroethane. In an alternative embodiment, material may be added to enclosure **2115** that includes solids, semi-solids, liquids, or other materials that contribute one or more of these gases.

[0090] In the gap between ribs **2010** and drum **2000** (the stators and the rotor) in a typical electrostatic motor, there is open air. As the humidity of the gas between the stators **2010** and rotor **2000** increases, the efficiency of electrostatic motor **2005** decreases. The lower the humidity in the separation gas, the more efficiently electrostatic motor **2005** operates. In an example embodiment, as provided in FIG. **21**, electrostatic motor **2105** is enclosed in low pressure or negative pressure enclosure **2115** so that the gaseous environment parameters inside can be controlled. In an example embodiment, the humidity and the content of the gas mixture in enclosure **2115** can be controlled. An example gas that may be injected in enclosure **2115** is difluoroethane. The difluoroethane increases the conductivity between stator **2010** and rotor **2000**. Neon and other gases may increase the conductivity as well.

[0091] In an example embodiment, air is pulled out of enclosure **2115** with a vacuum pump and replaced with a gas. In an example embodiment, the atmospheric pressure in enclosure **2115** is controllable. In an example embodiment, a desiccant may be introduced into the enclosure to reduce the humidity in enclosure **2115**. By increasing the amount of oxygen and nitrogen over what naturally occurs in the atmosphere, the conductivity increases. Ways to reduce the humidity are both passive (chemical agent such as a desiccant) and active (such as a powered dehumidifier).

[0092] Any process descriptions or blocks in flow charts should be understood as representing modules, segments, or portions of code which include one or more executable instructions for implementing specific logical functions or steps in the process, and alternate implementations are included within the scope of the preferred embodiment of the present disclosure in which functions may be executed out of order from that shown or discussed, including substantially concurrently or in reverse order, depending on the functionality involved, as would be understood by those reasonably skilled in the art of the present disclosure.

[0093] It should be emphasized that the above-described embodiments of the present disclosure, particularly, any "preferred" embodiments, are merely possible examples of implementations, merely set forth for a clear understanding of the principles of the disclosure. Many variations and modifications may be made to the above-described embodiment(s) of the disclosure without departing substantially from the spirit and principles of the disclosure. All such modifications and variations are intended to be included herein within the scope of this disclosure and the present disclosure and protected by the following claims.

Therefore, at least the following is claimed:

1. A system of converting electrical energy into mechanical energy comprising:

a rotor;

at least one stator separated from the rotor by a spark gap;

an hermetically sealed enclosure configured to enclose the rotor and the at least one stator; and

means for controlling the humidity within the hermetically sealed enclosure.

2. The system of claim **1**, wherein the means for controlling the humidity is a passive desiccant.

3. The system of claim **1**, wherein the means for controlling the humidity is an active dehumidifier.

4. The system of claim **1**, further comprising a vacuum configured to reduce the atmospheric pressure in the enclosure.

5. The system of claim **1**, further comprising a gas introduced into the enclosure.

6. The system of claim **5**, wherein the gas is difluoroethane.

7. The system of claim **5**, wherein the gas comprises at least one of neon, helium, argon, xenon, nitrogen, and oxygen.

8. The system of claim **5**, wherein the gas is introduced from a material comprising at least one of a solid, semi-solid, liquid, or other material that provides the gas.

9. A system of converting electrical energy into mechanical energy comprising:

a rotor;

at least one stator separated from the rotor by a spark gap;

an hermetically sealed enclosure configured to enclose the rotor and the at least one stator; and

means for providing a gas within the hermetically sealed enclosure.

10. The system of claim **9**, wherein the gas is difluoroethane.

11. The system of claim **9**, wherein the gas comprises at least one of neon, helium, argon, xenon, nitrogen, and oxygen.

12. The system of claim **9**, wherein the gas is introduced from a material comprising at least one of a solid, semi-solid, liquid, or other material that provides the gas.

13. The system of claim **9**, further comprising a vacuum configured to reduce the atmospheric pressure in the enclosure.

14. The system of claim **9**, further comprising means for controlling the humidity within the hermetically sealed enclosure.

15. The system of claim **14**, wherein the means for controlling the humidity is a passive desiccant.

16. The system of claim **14**, wherein the means for controlling the humidity is an active dehumidifier.

17. A method of converting electrical energy into mechanical energy comprising:

hermetically sealing a rotor and at least one stator in an enclosure, the at least one stator separated from a rotor by a spark gap;

providing a voltage to the at least one stator, the voltage providing potential energy to arc across the spark gap; and

providing a gas within the hermetically sealed enclosure.

18. The method of claim **17**, wherein the gas comprises at least one of difluoroethane, neon, helium, argon, xenon, nitrogen, and oxygen.

19. The method of claim **17**, further comprising controlling the humidity within the hermetically sealed enclosure.

20. The method of claim **19**, wherein humidity is controlled with at least one of a passive desiccant and an active dehumidifier.

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