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(54) **Title:** WAVE DRIVEN ELECTRICAL GENERATOR

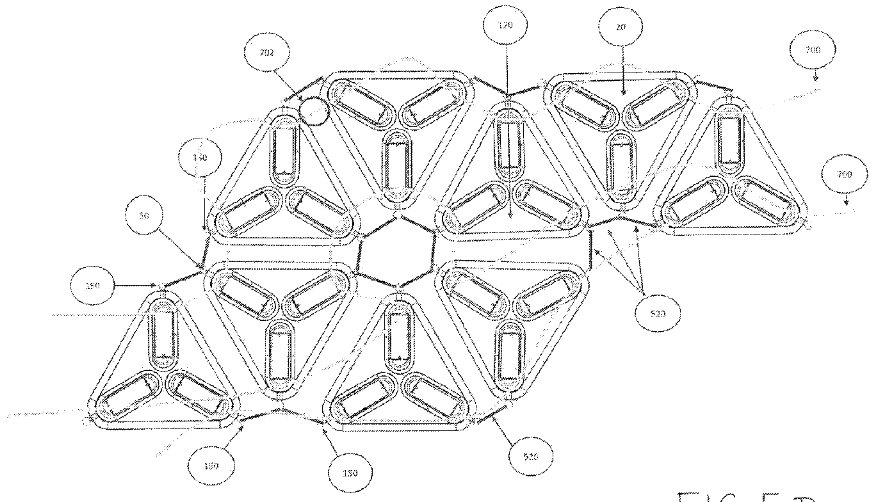

FIG. 5B

(57) **Abstract:** The invention relates to a wave driven electrical generator having a single panel, or an array of panels that may be triangular in shape or may have another shape. A movable connection is provided between the panels to allow relative movement in two dimension or three dimensions. The movable connection may include at least one panel link has a length that is at least as long as the width of the panels to facilitate stacking of the panels for storage. One or multiple generators may be mounted on each panel and may be housed in a cavity where it is protected from damage and/or exposure to water. The area of coverage of a panel array includes open areas within the array of panels that define less than 20% of the area of coverage thereby facilitating the generation of maximum amount of power with a relatively small footprint.

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WAVE DRIVEN ELECTRICAL GENERATOR

CROSS REFERENCE TO RELATED APPLICATIONS

This application claims the priority of U.S. Provisional Patent Application No. 63/415,545 titled "WAVE DRIVEN ELECTRICAL GENERATOR," filed October 12, 2022, the contents of which are hereby incorporated by reference.

FIELD OF THE INVENTION

The invention relates to an electrical generator that produces power from the motion of waves. In particular, the invention relates to a buoyant panel or an array of buoyant panels for producing power from the motion of waves.

BACKGROUND OF THE INVENTION

The development of renewable energy has become more of a global priority in recent years. Renewable energy includes sources such as sunlight, wind, the movement of water, and geothermal heat. In one aspect, renewable energy provides energy for electricity generation to a grid, for storage in batteries, or to provide power of electrically powered devices. One example of renewable energy is a wave driven electrical generator.

SUMMARY OF THE INVENTION

A wave driven electrical generator of the invention includes multiple floating panels, such as triangularly shaped panels, that are joined together to form an interconnected sheet or array of panels. Each panel may carry multiple, e.g., three, cavities or channels in which magnetic members, e.g., spheres, cylinders, or other shapes, travel back and forth as the panel is rocked by waves. In one embodiment, the cavity or channel is surrounded by a coil wrapped stator, e.g., wrapped with copper wire, such that repeated back and forth travel of the magnetic member through the coil will produce electricity. In another embodiment, a coil wrapped cylinder travels back and forth over a magnet carrying rod as the panel is rocked by waves. Other generator configurations are possible.

The interconnected panels form a floating sheet or array on the surface of water. As waves pass under the floating sheet of interconnected panels, each panel is tilted back and forth, thereby providing motive force for the movable members in the generator. As can be appreciated, many interconnected panels, each tilting and oscillating in reaction to, e.g., ocean waves, can be used to produce electricity, which can be stored or delivered onshore via a single cable or by other methods.

Each panel is preferably sealed to facilitate flotation and to prevent water from entering the interior and from making contact with the coil or magnetic member.

Other embodiments are possible including the use of alternative panel shapes. In another embodiment, a floating battery may be provided to store the generated electricity rather than transmitting the electricity to shore.

In particular, the invention relates to a wave driven electrical generator having a single panel, or an array of panels that include a first buoyant panel having a first side, a second side and at least three perimeter sides, the perimeter sides having a height that defines a width of the first buoyant panel, said array of panels further including a second buoyant panel having a first side, a second side and at least three perimeter sides, the perimeter sides having a height that defines a width of the second buoyant panel.

The panels may be triangular in shape or may have another shape.

A movable connection is provided between the first buoyant panel and the second buoyant panel to allow relative movement of the panels in two dimension or three dimensions. The movable connection may include at least one panel link has a length that is at least as long as the width of the panels to facilitate stacking of the first buoyant panel and the second buoyant panel, e.g., for storage.

A generator is mounted on at least one of the first buoyant panel and the second buoyant panel. Multiple generators may be mounted on each panel of the array. Each generator may be housed in a cavity where it is protected from damage and may be protected from exposure to water. In one embodiment, e.g., an embodiment wherein the panel has a triangular shape, three cavities, each being elongate in shape and oriented with a first end proximate one of the corner regions and extending towards a center of the first buoyant panel such that a longitudinal axis of the cavity is normal to a side of the triangle shape opposite the corner region.

The array of panels define an area of coverage. The area of coverage includes open areas within the array of panels. The open areas define less than 20% of the area of coverage thereby facilitating the generation of maximum amount of power with a relatively small footprint.

BRIEF DESCRIPTION OF THE DRAWINGS

Figure 1 is a perspective view of a buoyant panel of the invention;

Figure 2 is a plan view of the buoyant panel of Figure 1;

Figure 3 is a cross-sectional perspective view of the buoyant panel of Figure 1 and an exploded view of cover embodiments;

Figure 4A is a plan view of an example electrical generator of the invention;

Figure 4B is a schematic view of an example electrical generator of the invention;

Figure 5A is a plan view of an assembled array of buoyant panels;

Figure 5B is a plan view of a second embodiment of an assembled array of buoyant panels showing electrical interconnectedness of generators on the panels;

Figure 5C is an enlarged plan view of a portion of the assembled array having a schematic of power generating components and showing an alternative movable connection;

Figure 5D is a schematic of power generating components of Figure 5C;

Figure 6 is a plan view of the assembled array of Figure 5A shown partially stacked;

Figure 7 is a plan view of the assembled array of Figure 5A shown in a stacked configuration;

Figure 8 is an elevation view of the assembled array of Figure 5A shown in a stacked configuration;

Figure 9 is a photograph of the assembled array of Figure 5A shown floating in water;

Figure 10 is a photograph of the assembled array of Figure 5A shown floating in water;

Figure 11 is a diagram showing a method to generate power utilizing a buoyant panel of the invention;

Figure 12 is a diagram showing electrical components for a control system for generating and storing electricity generated by the buoyant panel of the invention;

Figure 13 is a schematic of electrical components for storing electricity generated and stored by the wave powered generator of the invention;

Figure 14 is a plan view of an alternate embodiment of a buoyant panel having a round shape;

Figure 15 is a plan view of an alternate embodiment of a buoyant panel having a hexagonal shape;

Figure 16 is a plan view of an alternate embodiment of a buoyant panel having a square shape;

Figure 17 is a perspective view of the panel having a square shape of Figure 16.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

Referring now to Figures 1-3, shown is first buoyant panel, designated generally **20**. First buoyant panel **20** has a first side **22**, a second side **24**, and at least three perimeter sides **26**. Perimeter sides **26** have a height that defines a width **30** (FIG. 3) of first buoyant panel **20**. In a preferred embodiment, at least three perimeter sides **26** forming a shape approximating a triangle. First buoyant panel **20** having a shape approximating a triangle defines three corner regions **32**. In one embodiment, corner regions **32** each define a corner. In one embodiment, corner regions **32** define a soft corner **36**. In one embodiment, soft corner **36** includes a flat surface. In one embodiment (e.g., FIGS. 1-3, 5B) soft corner **36** includes a rounded surface **40**. Other shapes for first buoyant panel **20** are contemplated, including square shapes having four sides **26** with corner regions **32**, which may be soft corners **36** with a flat surface (e.g., FIG. 5A) Round shapes (e.g., FIG. 14), pentagon shapes, hexagon shapes (e.g., FIG. 15), octagon shapes, square shapes (e.g., FIGS. 16, 17), etc., are also contemplated.

First panel connector **50** extends from first buoyant panel **20**. In one embodiment, first panel connector **50** extends from each corner region **32** of the first buoyant panel **20**, see e.g., FIGS. 1-3, 5A, 5B. In another embodiment, first panel connector **50** may extend from side **26** (see, e.g., FIG. 5C) of first buoyant panel **20**, such as from a mid point of side **26**.

Referring now to Figures 5A, 5B, shown is wave powered generator **10** having an array **100** of panels designated generally **110**. Panels **110** include first buoyant panel **20** and also include a second buoyant panel **120**.

All of panels **110**, including second buoyant panel **120**, are preferably constructed similarly to first buoyant panel **20** and preferably share the same features and elements as discussed with respect to first buoyant panel **20**. For purposes of clarity, similar elements will retain first panel numbering.

Second buoyant panel **120** has second panel connectors **150** that are similar to first panel connectors **50**. However, the connectors extending from second buoyant panel **120** will be referred to as second panel connectors **150**. In one embodiment, second panel connectors **150** extend from one of corner regions **32** of the second buoyant panel **120**. As will be discussed below, first panel connectors **250** and second panel connectors **150** may be movably connected by movable connection **500**, such as rigid link **502** (FIG. 5A), e.g., a carabiner or other rigid member. In another embodiment, movable connection **500** may be a flexible link **504** (FIG. 5B), e.g., a cord, a cable, a chain, or other flexible member.

At least one of panels **110**, e.g., first buoyant panel **20** or second buoyant panel **120**, define at least one cavity **200**. In one embodiment, panels **110** define three cavities **200**. Cavities **200** are preferably elongated in shape and oriented with a first end **202** proximate to one of corner regions **32**. Elongate cavity **202** extends toward a center of a panel, e.g., panel **20**, **120**, such that a longitudinal axis of cavity **200** is normal to a side of triangular panel **110** opposite to corner region **32**.

Referring now to Figures 4A and 4B, an electrical generator, designated generally **300**, is received in cavity **200**. In one embodiment (e.g., shown in FIG. 4A), electrical generator **300** is comprised of rod **310** having a plurality of spaced magnets **312**. In one embodiment, magnets **312** are spaced apart an equal distance to a width of magnets **312**. Rod **310** slidably carries a traveling cylinder **320**. Traveling cylinder **320** has conductive windings **322**. Sliding movement of traveling cylinder **320** along rod **310**, e.g., as a result of tilting of buoyant panel **20**, facilitates interaction between conductive windings **322** and a magnetic field generated by the plurality of spaced magnets **312** on rod **310** for generating electricity.

In another embodiment (e.g., shown in FIG. 4B), electrical generator **300** includes traveling slider **330** that carries a plurality of spaced magnets **312** or a single magnet **312**. Traveling slider **330** is for traveling within stationary cylinder **334** that is surrounded by conductive windings **322**. Sliding movement of traveling slider **330** within stationary cylinder **334**, e.g., as a result of tilting buoyant panel **20**, facilitates interaction between conductive windings **322** and a magnetic field generated by single or plurality of magnets **312** in traveling slider **330** for generating electricity.

Panels **110** are preferably provided with at least one cover **400** (FIG. 3) for securing electric generator **300** within cavity **200** and for keeping water from entering cavity **200**. In one embodiment, three separate covers **402** are provided (FIG. 3), i.e., one for each of cavities **200**. In another embodiment, single cover **400** covers multiple cavities **200**.

First panel connector **50** and second panel connector **150** are for facilitating movable connection **500** between adjacent panels **110** of array **100**, e.g., between first buoyant panel **20** and second buoyant panel **120**. In one embodiment, movable connection **500** facilitates relative movement of adjacent panels **110**, e.g., first buoyant panel **20** and second buoyant panel **120**, in two dimensions, such as may be found in hinged connection **510** (FIG. 5C). In another embodiment, movable connection **500** facilitates movement of adjacent panels in three dimensions, such as might be found in movable connection **500** formed by panel connectors **50**, **150** and/or links **520** (see, e.g., FIG. 6), such as rigid link **502** or flexible link **504**. As discussed above, flexible link **504** may be a cord that passes through panel connectors **50, 150** to form a movable connection (FIG. 6B).

Movable connection **500** is a connection between first panel connector **50** and second panel connector **150**. In one embodiment, movable connection **500** further includes at least one panel link **520** between first panel connector **50** and second panel connector **150**. In one embodiment, panel link **520** is a single link **520**. In another embodiment, panel link **520** is comprised of multiple links. In one embodiment, panel link **520** is at least as long as width **30** of first buoyant panel **20** to facilitate sufficient movement of first buoyant panel **20** and second buoyant panel **120** such that stacking of panels **110** is made possible, as can be seen in Figures 6-8.

Referring now to Figures 5A, 5C, and 6-10, multiple panels **110** are shown interconnected with other panels **110** to form a sheet or array of panels **100**.

In an embodiment where panels are triangular in shape, array of panels **100** form at least one unit having a shape approximating a hexagon **600** (e.g. as visible in FIGS. 5A, 5B). In one embodiment, panel connectors **50**, **150** of six adjacent panels **100** are located in close proximity to one another wherein each of the panel connectors **50**, **150** are connected to panel connectors of adjacent panels, either directly or via panel links **520** as can best be seen in Figure 6.

Referring to Figure 15, shown is a sheet or array of panels **100** that are interconnected with wires **700** such that the plurality of electrical generators **300** are connected in series.

It can be seen in Figure 15 that each wire **700** communicates either with a single electrical generator **300** in a first panel **110** and/or communicates with two electrical generators **300** in an adjacent one of panels **110**. In one embodiment, wire **700** is 20 gage magnet wire. In one embodiment, wires that communicate adjacent panels **110** are divided by plug connectors **702** that facilitate removable connection between adjacent panels **110**.

One advantage associated with triangular shaped panels **110** is that the resulting array **110** is tightly spaced, thereby promoting a high density of panels **110** as compared to the overall size or array **110**. Further, tight packing minimizes lengths of wires **700** required to connect generators **300**. Tight packing minimizes water surface coverage, which could be an issue when deploying array **100** adjacent a city or harbor. Utilizing tightly packed array **100** can result in open or unoccupied areas within array **100** of 0% to 20%, 3% to 18%, 5% to 15%, 8% to 12%, or approximately 10% of the total area covered by array **100**. In a preferred embodiment, spacing between adjacent panels is between 1 to 3 times, 1.5 to 2.5 times, or 1.7

to 2.5 times thickness **30** of panels **110** to facilitate tight packing and to facilitate the folding of array **100** for storage.

In use, array **100** may be used to power cities and coastal communities. Additionally, array **100** of the invention may be used to provide power to ships and to power offshore platforms such as oil rigs, or may be mounted to structures of an offshore wind farm.

In an example embodiment, a line normal to a first side **26** and extending to an opposite corner has a dimension of 12". An example thickness or width **30** of panels **110** is 2".

In a preferred embodiment, electric generators **300** are placed at a midline of width **30** of panels **110** to facilitate ease of handling and folding for storage as shown in Figures 6-8.

Referring now to Figure 11, shown is a power flow diagram that depicts steps for wave power generator **10** during a power cycle. Block **710** represents an instance of a given wave approaching a singular panel **110**. Once a wave interacts with panel **110**, a displacement of panel **110** from horizontal takes place as indicated in block **712**, as the surface-floating panel **110** is tilted from horizontal by the oncoming wave. As panel **110** is tilted by the wave, traveling cylinder **320** or traveling slider **330** will travel down a path as indicated in block **714**, e.g., traveling cylinder **320** will travel over rod **310** or traveling slider **330** will pass through cylinder **334** and will pass coiled copper wire **322**. Through the electromagnetic interaction of magnets **312** with a changing magnetic field relative to coiled copper wire **322**, i.e., conductors, an electromotive force is induced within copper coils **322** as indicated in block **716**.

To effectively charge a battery, the power output of electrical generator **300** must first undergo an alternating current (AC) to direct current (DC) conversion as indicated in block **718**. Next, the DC power must travel through a control system, as indicated by block **720**, to combine outputs for each of, e.g., three generators **300**, and to safely charge the battery as indicated by block **722**. The control system may operate differently depending on the characteristics of the battery as is known in the art. Finally, the battery charged with the wave powered generator **10** of the invention will supply power to a load of the consumer, as indicated in block **724**, via a transmission line, where power is received by a consumer as indicated by block **726**. The, "end" block represents the completion of one cycle of this process. This cycle will ideally repeat twice for a given oncoming wave, as panel **110** will be tilted by the both the front and back sides of the wave.

Referring now to Figure 12, shown is a basic control system (referred to in blocks **718** and **720** of Figure 11) for safely delivering the power produced from two linear generators **300** to a battery. The "start" block represents an instance from which power is generated (as referenced in block **716** of Figure 11) from a singular Panel **110** containing two linear generators **300** (represented as "GENERATOR 1" and "GENERATOR 2" in boxes **810a** and **810b** in the block diagram). As previously mentioned, the power outputs from each linear generator **300** must first individually undergo an AC/DC conversion (see, e.g., block **718** of Figure 11). The AC/DC conversion can be obtained by means of full wave bridge rectifier **812a**, **812b**, which generally consists of four diodes to change negative pulse cycles of sinusoidal output of generators **810a** and **810b** to positive pulse cycles. Next, the waveform travels through smoothing capacitor **814a**, **814b** to effectively "flatten" the full wave bridge rectifier output to a stable DC voltage level. Next, buck converter **816a**, **816b** is used to step down the output voltage of generators **810a**, **810b** to a suitable level for efficient charging of the battery in use. Finally, the signal passes through an N-Channel MOSFET **818a**, **818b** combined with an ideal diode controller to ensure that the battery is safely being charged, as well as preventing current from travelling back into the circuit components within the control system from the battery. The outputs from generators **810a**, **810b** are combined and supplied to the battery in a parallel connection. The specific parts for each individual component will vary depending on the output range of each generator **810a**, **810b** and the battery being used.

Figure 13 represents an example of a basic control system (referred to in block **720** of FIG. 11) for safely delivering the power produced from linear generator **300** to a given battery **912**, e.g., a lead acid battery. Source **902** represents the induced AC voltage delivered from linear generator **300**. "Source_Impedance" **904** represents the impedance from generator **300** itself. Impedance will be directly dependent on the specific wire configuration of copper coils **322**, such as the wire gauge and number of turns, within linear generator **300**. Following these components, the signal travels through FWBR (full wave bridge rectifier) **905**, consisting of four 1N4007G diodes (**906a**, **906b**, **906c**, **906d**), which will effectively convert all negative cycles of the signal to positive values. Capacitor **908** is placed in parallel from the output of FWBR **905** for smoothing out the signal to approach a DC voltage value. The capacitance value and voltage rating of capacitor **908** is chosen based on the voltage/current levels of the output of generator **300**. Following capacitor **908**, the positive voltage is connected to a "LINE VOLTAGE" input of linear regulator **910**, and negative (GND) voltage is connected to a "COMMON" input of linear regulator **910**. "LM7815CT" indicates that linear regulator **910** is a 15V linear regulator. This component value may vary depending on the voltage value of the battery **912**, e.g., of a lead acid battery that is in use. Next, a positive output of linear regulator **910** is connected to switching diode **914** to ensure that current does not flow back into generator **300** while charging battery **912**. Switching diode **914** is labeled as "D1 1N4148", but the specific value of switch diode **914** will vary depending on the specifications of generator **300** that is in use. After the signal has travelled through switching diode **914**, the output of switching diode **914** is connected to positive terminal (1V+) of battery charging regulator **918**, and the output of the "Common" gate of linear regulator **910** is connected to negative terminal (1V-) of battery charging regulator **918**. Following this connection, positive terminal (3V+) of a battery **912**, e.g., a lead acid battery, is connected to the positive "Battery" terminal (2V+) of the battery charger regulator **918**, while negative terminal (3V-) of battery **912** is connected to negative “Battery” terminal (2V-) of battery charge regulator **918**. The final connection to be made is from battery charge regulator **918** to a user specified load **920** to be provided to load power. Power delivery will be achieved by connecting “Vout+” and “Vout-“ terminals of battery charge regulator **918** to corresponding terminals of load **920** (represented as “Vin+” and “Vin-“) through means of a transmission line. This circuit can be applied to each of linear generators **300** contained within a Panel **110**.

It will be appreciated that a system operating in accordance with the above description can readily be adapted by one of skill in the art to utilize other battery chemistries (e.g.,. lithium, nickel-cadmium, nickel-metal hydride, etc.).

* * * * *

Although particular embodiments have been described herein, it will be appreciated that the invention is not limited thereto and that many modifications and additions thereto may be made within the scope of the invention. For example, various combinations of the features of the following dependent claims can be made with the features of the independent claims without departing from the scope of the present invention.

It is to be understood that the terms "including", "comprising", "consisting" and grammatical variants thereof do not preclude the addition of one or more components, features, steps, or integers or groups thereof and that the terms are to be construed as specifying components, features, steps or integers.

If the specification or claims refer to "an additional" element, that does not preclude there being more than one of the additional element.

It is to be understood that where the claims or specification refer to "a" or "an" element, such reference is not be construed that there is only one of that element.

It is to be understood that where the specification states that a component, feature, structure, or characteristic "may", "might", "can" or "could" be included, that particular component, feature, structure, or characteristic is not required to be included.

Methods of the present invention may be implemented by performing or completing manually, automatically, or a combination thereof, selected steps or tasks.

The term "method" may refer to manners, means, techniques and procedures for accomplishing a given task including, but not limited to, those manners, means, techniques and procedures either known to, or readily developed from known manners, means, techniques and procedures by practitioners of the art to which the invention belongs.

The term “at least” followed by a number is used herein to denote the start of a range beginning with that number (which may be a ranger having an upper limit or no upper limit, depending on the variable being defined). For example, “at least 1” means 1 or more than 1. The term “at most” followed by a number is used herein to denote the end of a range ending with that number (which may be a range having 1 or 0 as its lower limit, or a range having no lower limit, depending upon the variable being defined). For example, “at most 4” means 4 or less than 4, and “at most 40%” means 40% or less than 40%.

When, in this document, a range is given as “(a first number) to (a second number)” or “(a first number) – (a second number)”, this means a range whose lower limit is the first number and whose upper limit is the second number. For example, 25 to 100 should be interpreted to mean a range whose lower limit is 25 and whose upper limit is 100. Additionally, it should be noted that where a range is given, every possible subrange or interval within that range is also specifically intended unless the context indicates to the contrary. For example, if the specification indicates a range of 25 to 100 such range is also intended to include subranges such as 26 -100, 27-100, etc., 25-99, 25-98, etc., as well as any other possible combination of lower and upper values within the stated range, e.g., 33-47, 60-97, 41-45, 28-96, etc. Note that integer range values have been used in this paragraph for purposes of illustration only and decimal and fractional values (e.g., 46.7 – 91.3) should also be understood to be intended as possible subrange endpoints unless specifically excluded.

It should be noted that where reference is made herein to a method comprising two or more defined steps, the defined steps can be carried out in any order or simultaneously (except where context excludes that possibility), and the method can also include one or more other steps which are carried out before any of the defined steps, between two of the defined steps, or after all of the defined steps (except where context excludes that possibility).

Further, it should be noted that terms of approximation (e.g., “about”, “substantially”, “approximately”, etc.) are to be interpreted according to their ordinary and customary meanings as used in the associated art unless indicated otherwise herein. Absent a specific definition within this disclosure, and absent ordinary and customary usage in the associated art, such terms should be interpreted to be plus or minus 10% of the base value.

Thus, the present invention is well adapted to carry out the objects and attain the ends and advantages mentioned above as well as those inherent therein. While the inventive device has been described and illustrated herein by reference to certain preferred embodiments in relation to the drawings attached thereto, various changes and further modifications, apart from those shown or suggested herein, may be made therein by those of ordinary skill in the art, without departing from the spirit of the inventive concept the scope of which is to be determined by the following claims.

CLAIMS

What is claimed is:

1. A wave driven electrical generator comprising:

a first buoyant panel having a first side, a second side and at least three perimeter sides, said perimeter sides having a height that defines a width of said first buoyant panel;

a second buoyant panel having a first side, a second side and at least three perimeter sides, said perimeter sides having a height that defines a width of said second buoyant panel;

a movable connection between said first buoyant panel and said second buoyant panel;

a generator mounted on at least one of said first buoyant panel and said second buoyant panel.

2. The wave driven electrical generator of claim 1 further comprising:

wherein said at least three perimeter sides of said first buoyant panel is three perimeter sides for forming a shape approximating a triangle.

3. The wave driven electrical generator of claim 1 wherein:

said first buoyant panel defines at least one cavity, said cavity for receiving said generator.

4. The wave driven electrical generator of claim 3 wherein:

said at least three perimeter sides of said first buoyant panel is three perimeter sides forming a shape approximating a triangle, said shape defining corner regions;

said at least one cavity is three cavities;

said three cavities each being elongate in shape and oriented with a first end proximate one of said corner regions and extending towards a center of said first buoyant panel such that a longitudinal axis of said cavity is normal to a side of said triangle shape opposite said corner region.

5. The wave driven electrical generator of claim 3 comprising:

at least one cover for protecting said electrical generator within said cavity.

6. The wave driven electrical generator of claim 5 wherein:

said at least one cover is three covers; and

said at least one cavity is three cavities.

7. The wave driven electrical generator of claim 1 wherein:

said perimeter sides defining corner regions;

said movable connection comprises a first panel connector extending from one of said corner regions of said first buoyant panel.

8. The wave driven electrical generator of claim 1 wherein:

said movable connection facilitates relative movement of adjacent panels in two dimensions.

9. The wave driven electrical generator of claim 1 wherein:

said movable connection facilitates movement of said adjacent panels in three dimensions.

10. The wave driven electrical generator of claim 1 further comprising:

a first panel connector extending from said first buoyant panel;

a second panel connector extending from said second buoyant panel;

said first panel connector and said second panel connector comprising said moveable connection between said first buoyant panel and said second buoyant panel.

11. The wave driven electrical generator of claim 10 wherein:

said movable connection is further comprised of at least one panel link between said first panel connector and said second panel connector, wherein said at least one panel link is a single link.

12. The wave driven electrical generator of claim 11 wherein:

said at least one panel link is comprised of multiple links.

13. The wave driven electrical generator of claim 11 wherein:

said at least one panel link is a rigid link.

14. The wave driven electrical generator of claim 11 wherein:

said at least one panel link is a flexible link.

15. The wave driven electrical generator of claim 11 wherein:

said at least one panel link has a length that is at least as long as said width of said first buoyant panel to facilitate stacking of said first buoyant panel and said second buoyant panel.

16. The wave driven electrical generator of claim 1 wherein:

said generator has a rod having a plurality of spaced magnets, said rod slidably carrying a traveling cylinder, said travelling cylinder having conductive windings;

wherein sliding movement of said travelling cylinder along said rod facilitates interaction between said conductive windings and a magnetic field generated by said plurality of spaced magnets of said rod.

17. The wave driven electrical generator of claim 1 wherein:

said generator is comprised of a traveling slider carrying a magnet;

wherein said travelling slider for travelling within a stationary cylinder surrounded by conductive windings, wherein sliding movement of said travelling slider within said stationary cylinder facilitates interaction between said conductive windings and a magnetic field generated by said magnet in said travelling slider.

18. The wave driven electrical generator of claim 1 further comprising:

at least one additional panel connected with said first buoyant panel and said second buoyant panel to form an array of panels.

19. The wave driven electrical generator of claim 18 comprising:

wherein panel connectors of six adjacent panels are located in close proximity to one another and wherein each of said panel connectors is connected to panel connectors of two adjacent panels.

20. The wave driven electrical generator of claim 18 wherein:

said array of panels provides an area of coverage, said area of coverage comprising open areas within said array of panels, said open areas define less than 20% of said area of coverage.

21. The wave driven electrical generator of claim 20 wherein:

said open areas define 5% to 15% of said area of coverage.

22. The wave driven electrical generator of claim 21 wherein:

said open areas define approximately 10% of said area of coverage.

23. A buoyant panel for a wave driven electrical generator comprising:

a body having a first side, a second side and at least three perimeter sides, said perimeter sides having a height that defines a width of said body;

a generator mounted on said body for activation by tilting of said body.

24. The wave driven electrical generator of claim 23 wherein:

said body defines at least one cavity, said cavity for receiving said generator.

25. The wave driven electrical generator of claim 23 wherein:

said at least three perimeter sides of said body is three perimeter sides forming a shape approximating a triangle, said shape defining corner regions;

said at least one cavity is three cavities;

said three cavities each being elongate in shape and oriented with a first end proximate one of said corner regions and extending towards a center of said body such that a longitudinal axis of said cavity is normal to a side of said triangle shape opposite said corner region.

26. The wave driven electrical generator of claim 23 wherein:

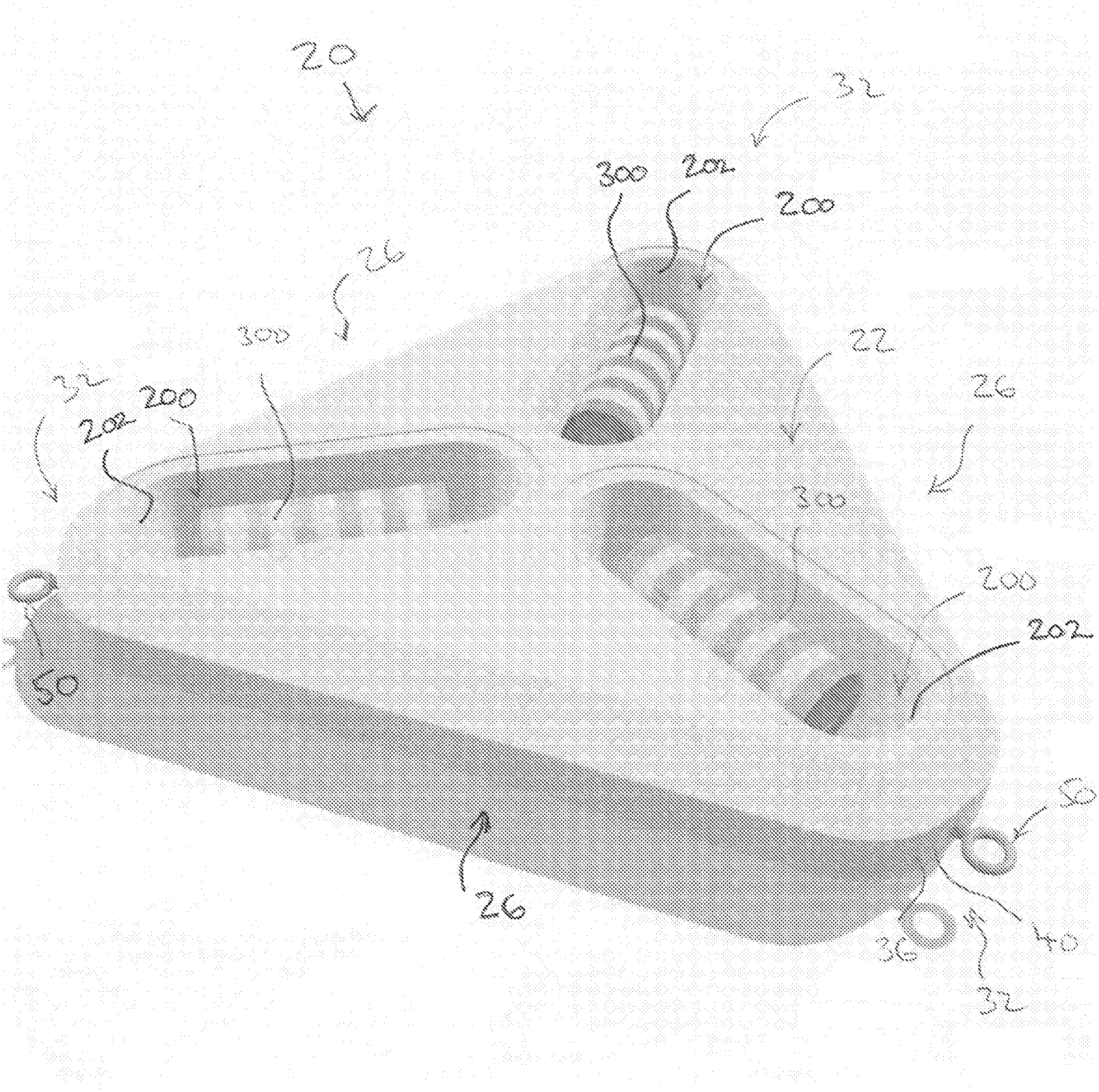
said generator has a rod having a plurality of spaced magnets, said rod slidably carrying a traveling cylinder, said travelling cylinder having conductive windings;

wherein sliding movement of said travelling cylinder along said rod facilitates interaction between said conductive windings and a magnetic field generated by said plurality of spaced magnets of said rod.

27. The wave driven electrical generator of claim 23 wherein:

said generator is comprised of a traveling slider carrying a magnet;

wherein said travelling slider for travelling within a stationary cylinder surrounded by conductive windings, wherein sliding movement of said travelling slider within said stationary cylinder facilitates interaction between said conductive windings and a magnetic field generated by said magnet in said travelling slider.


20
32
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32

Fig 1

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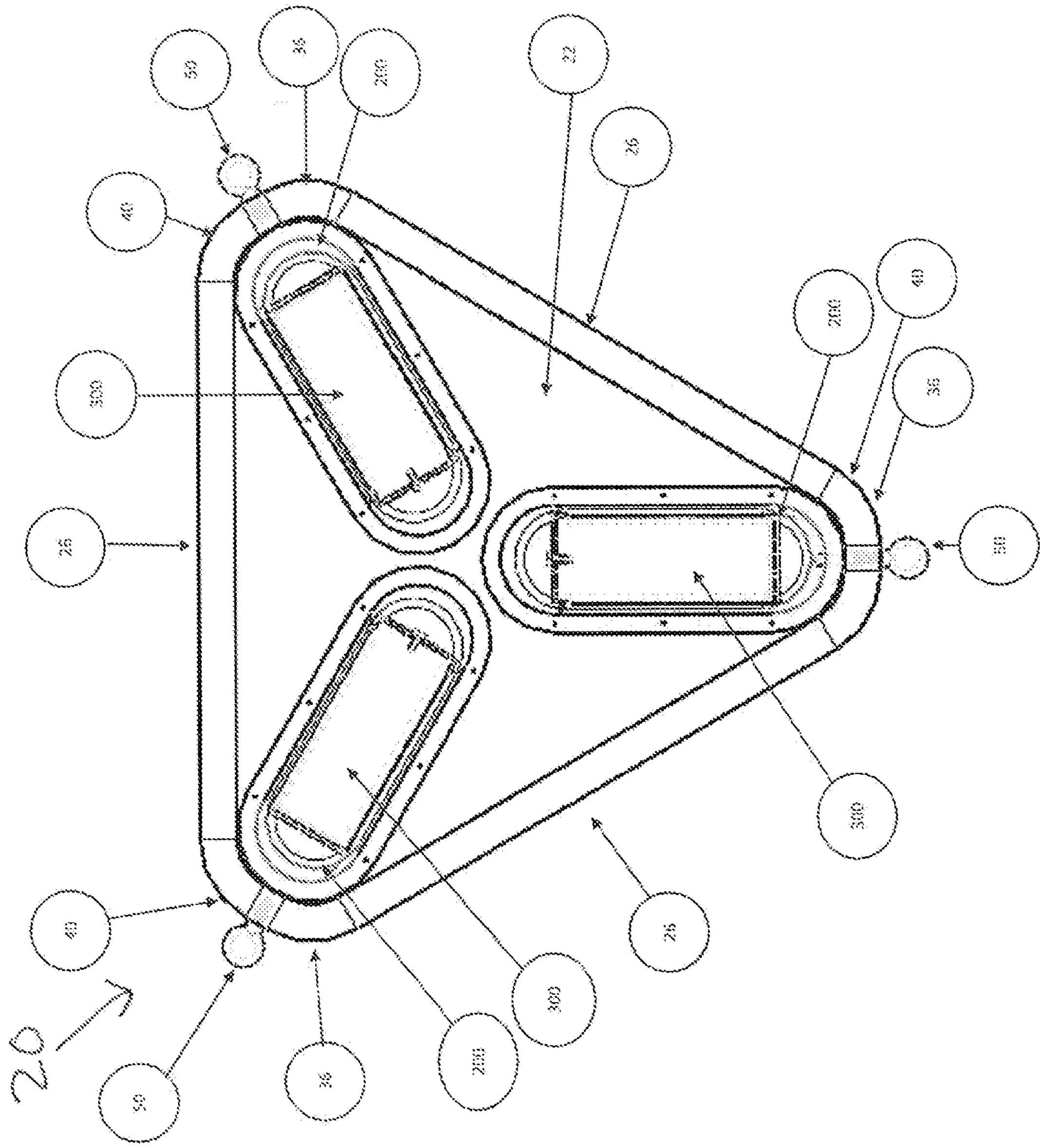

FIG.2

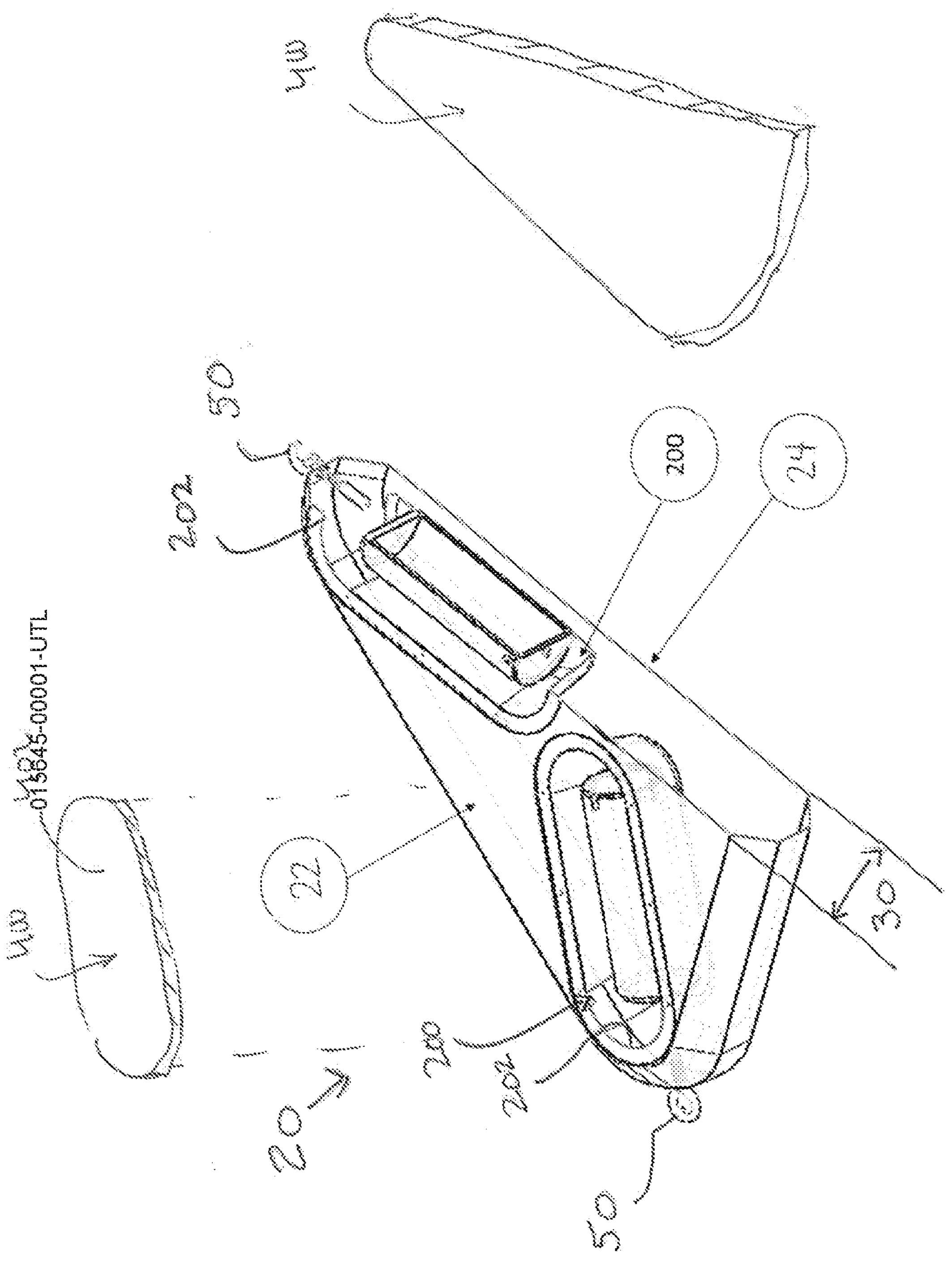

FIG. 3

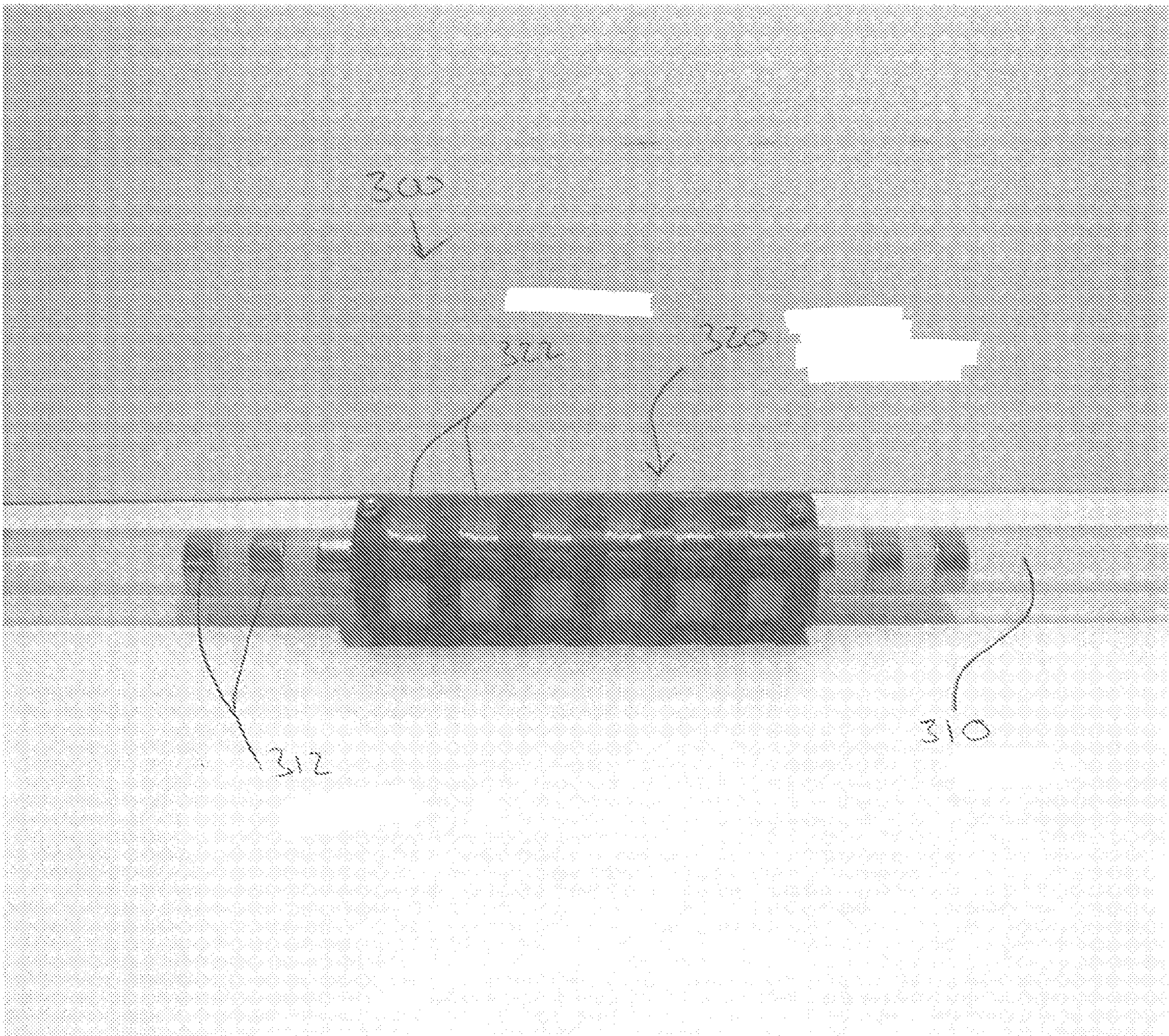

Fig. 4A

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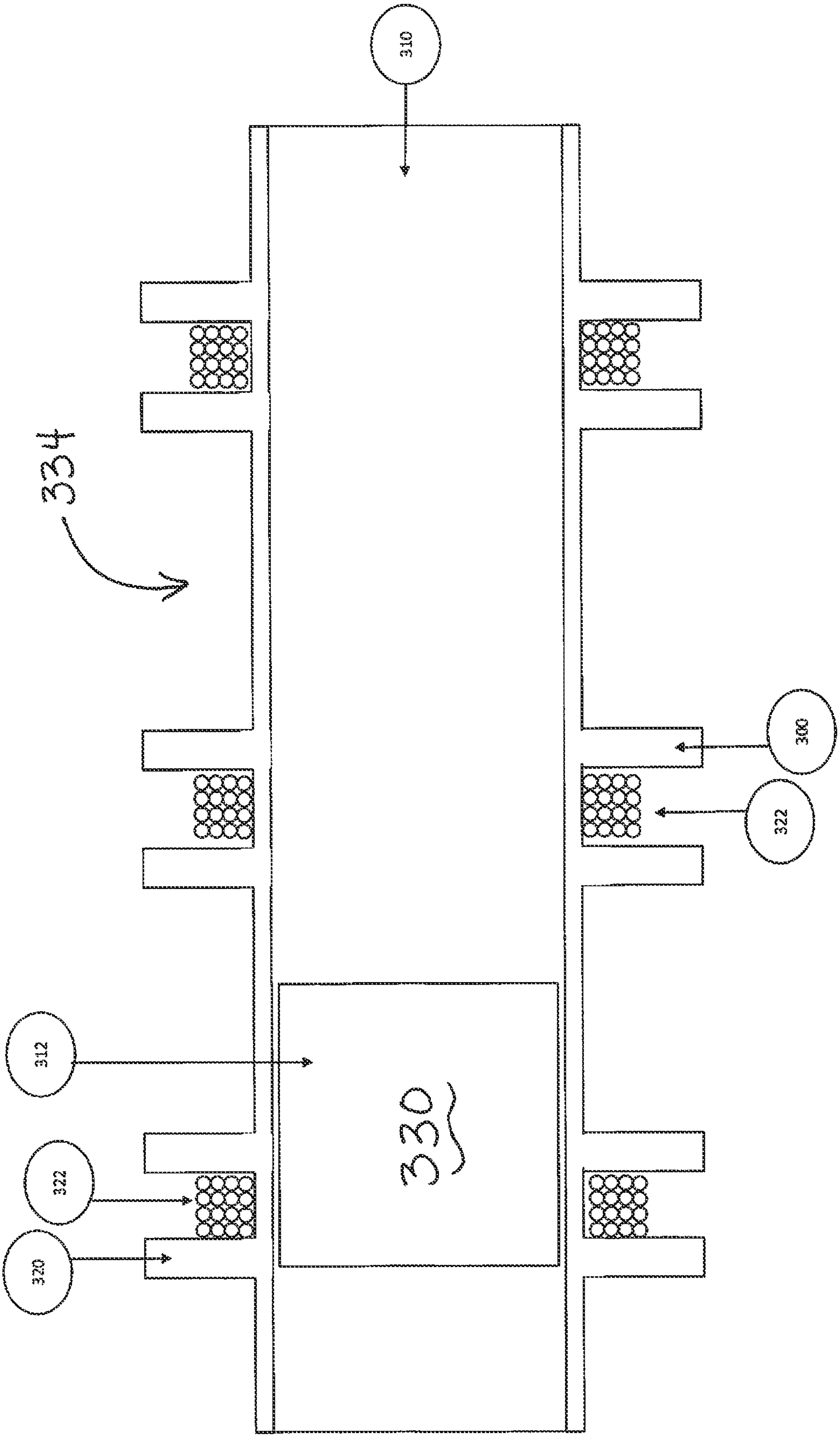

FIG 4B

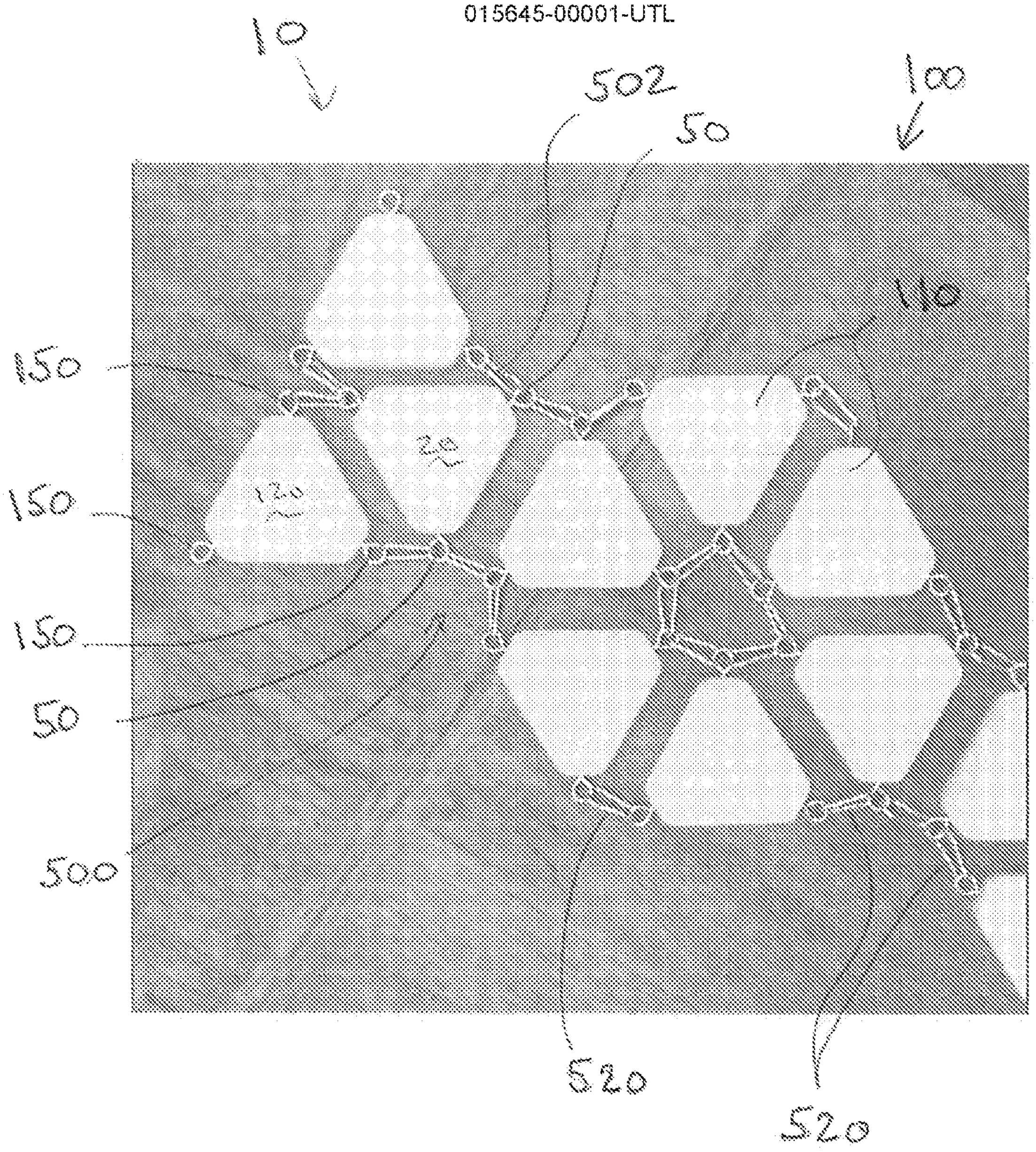

Fig. 5A

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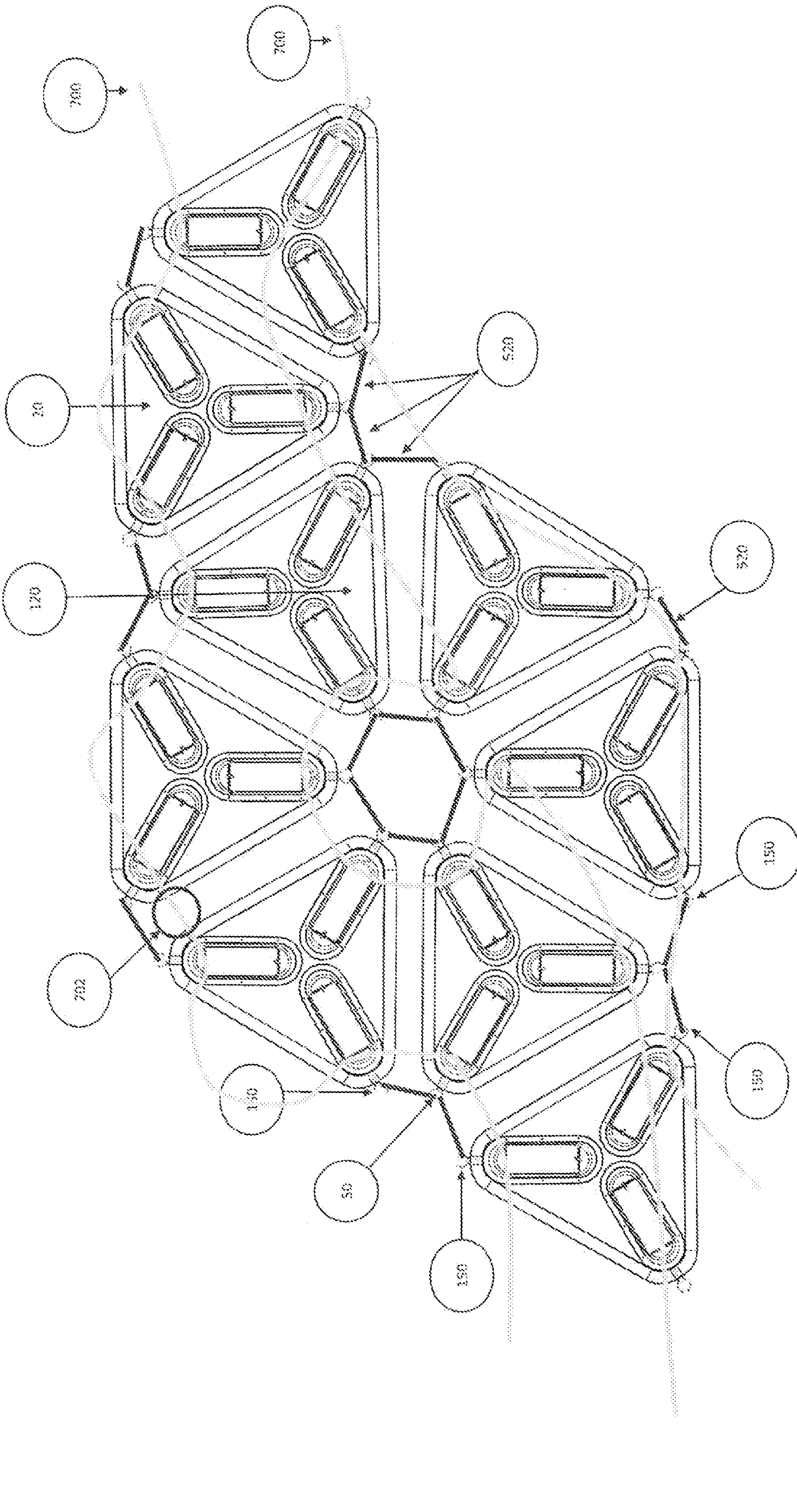

FIG. 5B

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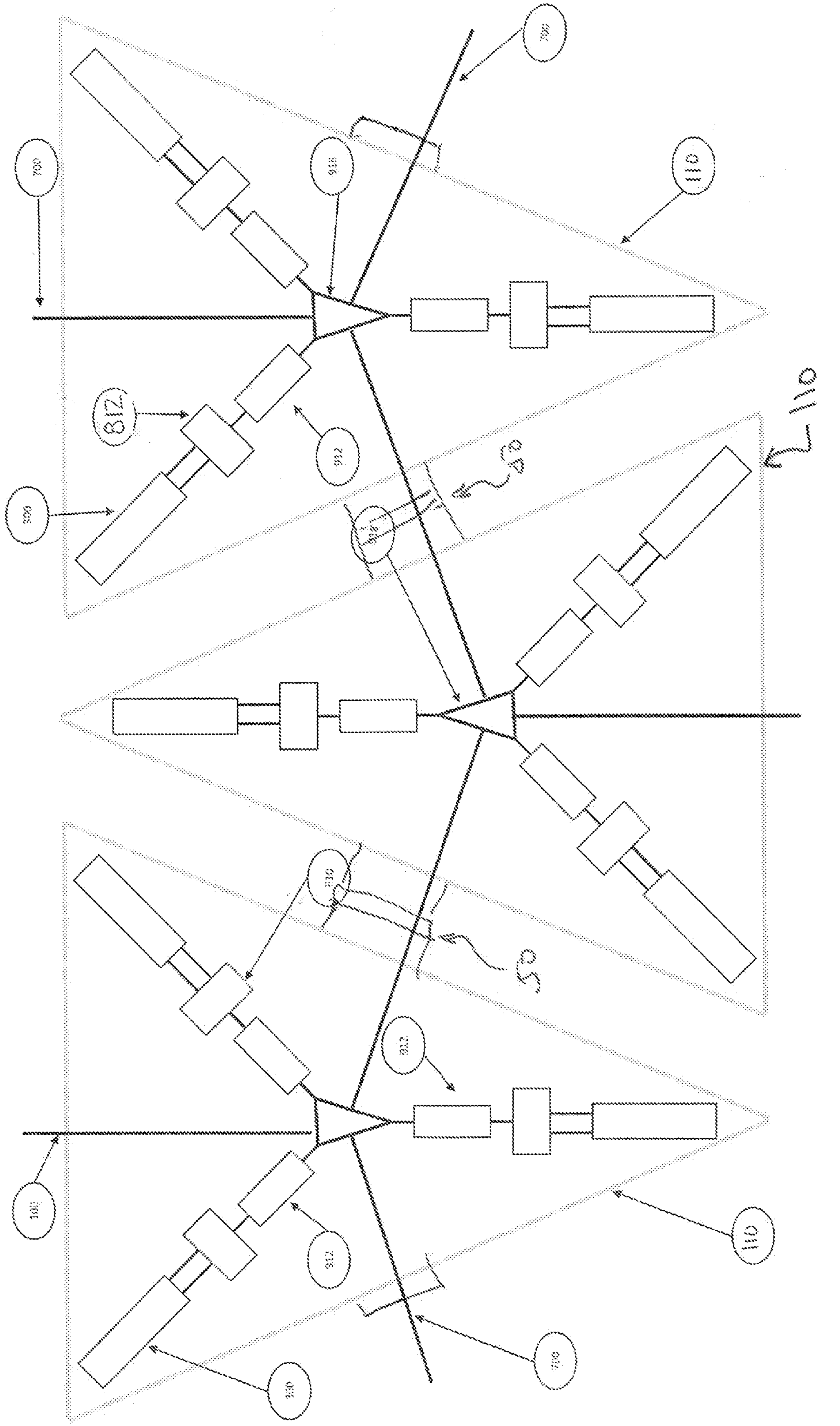

FIG. 5C

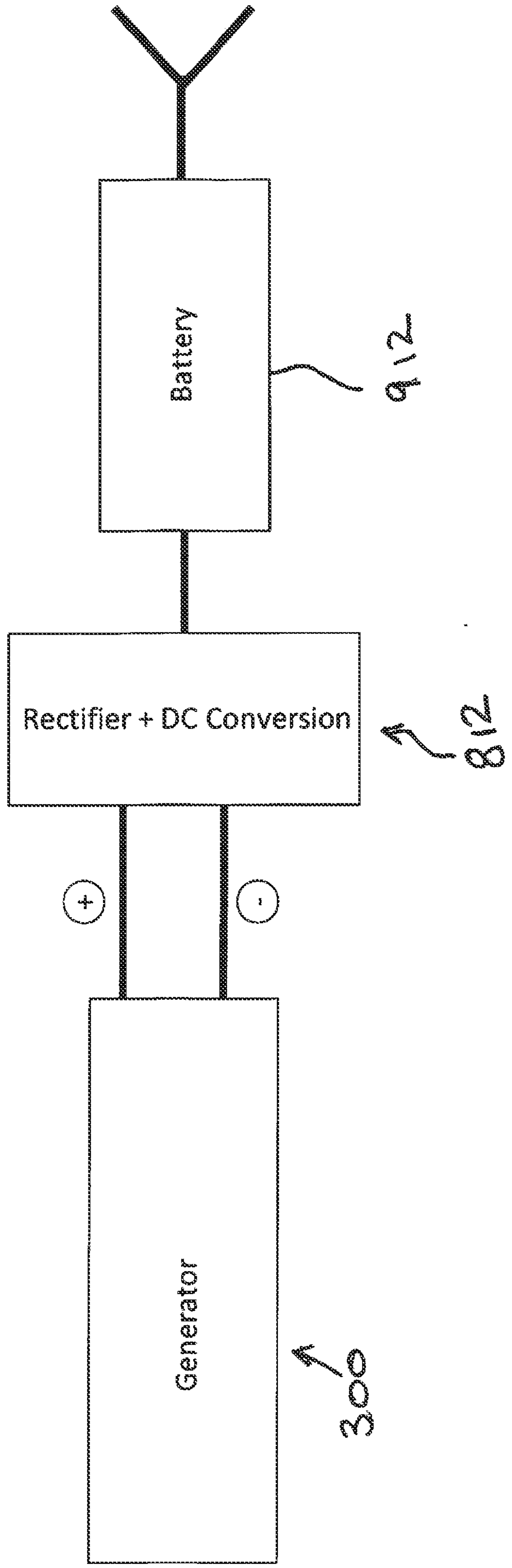

FIG. 5D

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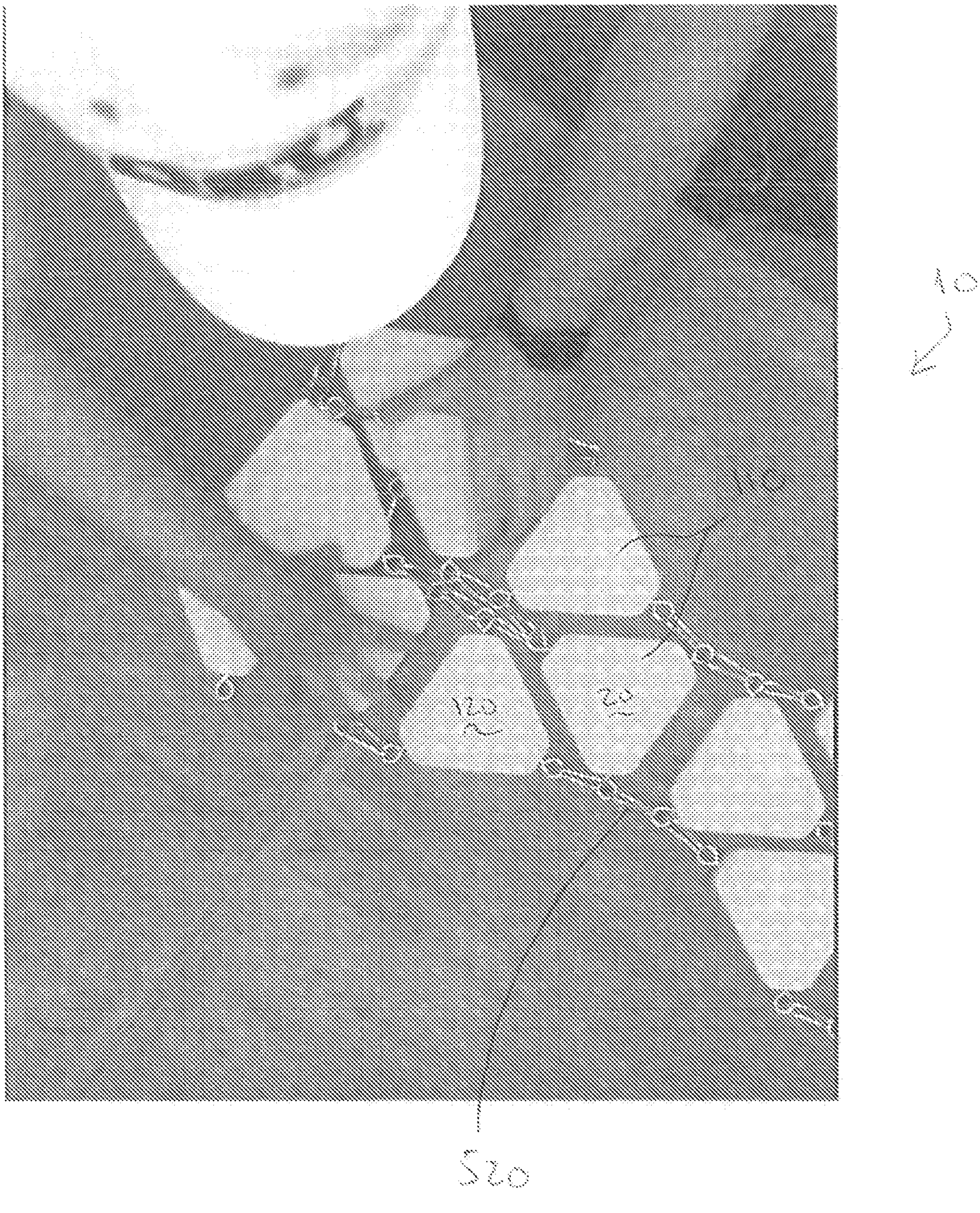

Fig. 6

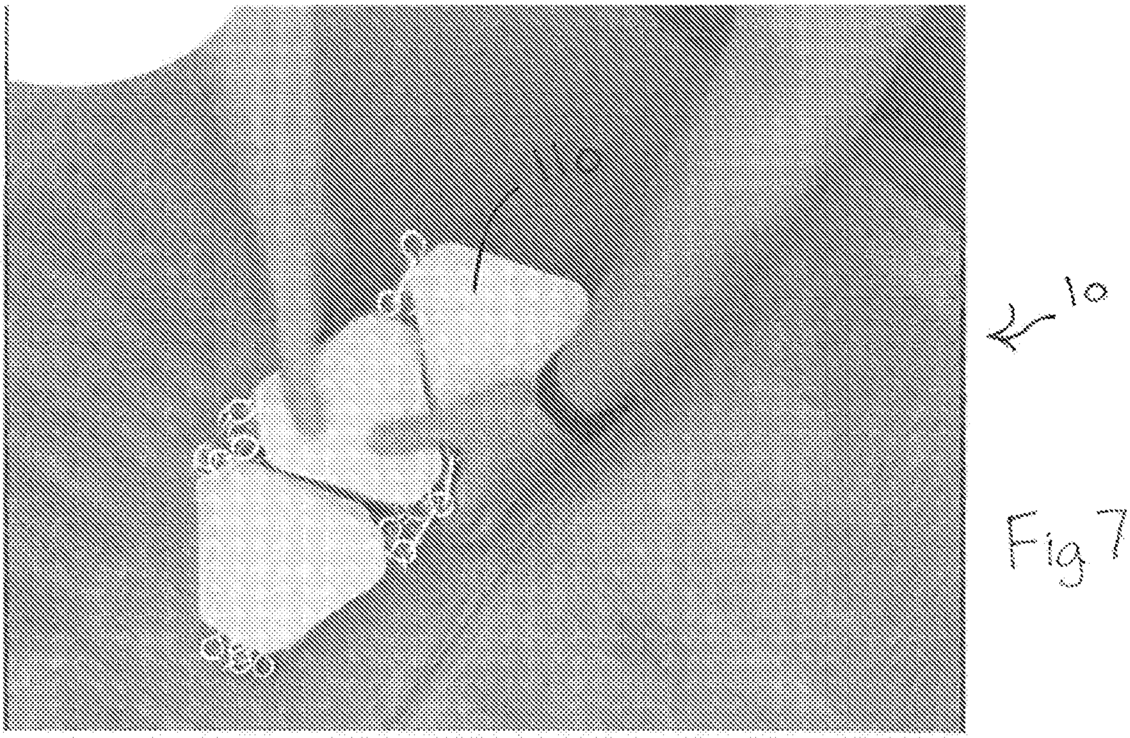

Fig 7

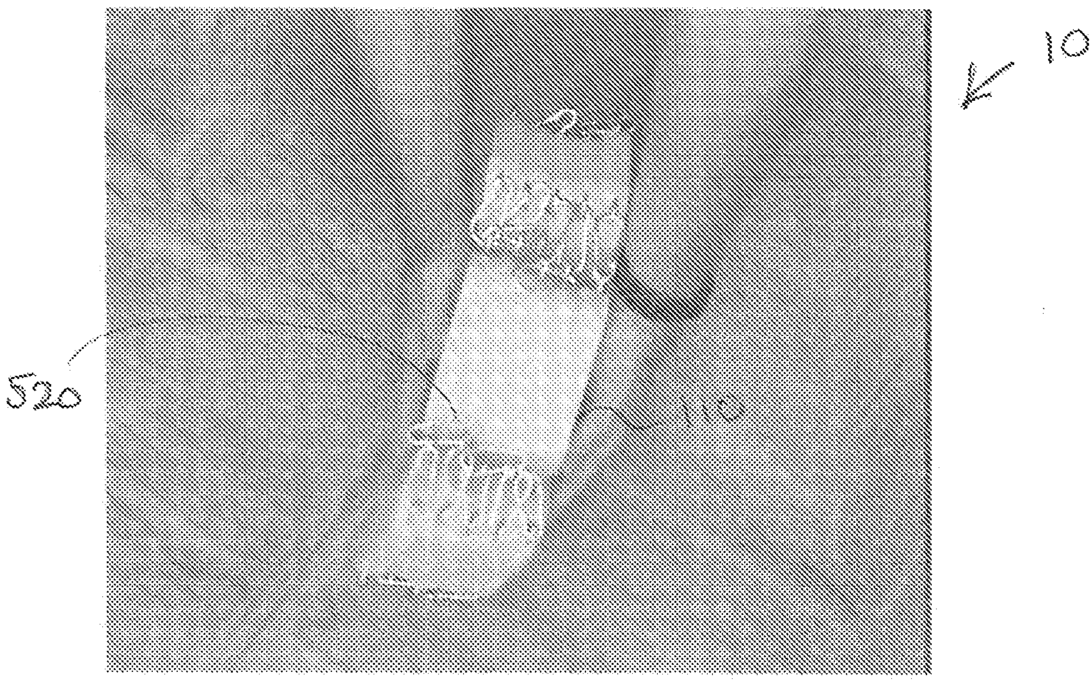

Fig. 8

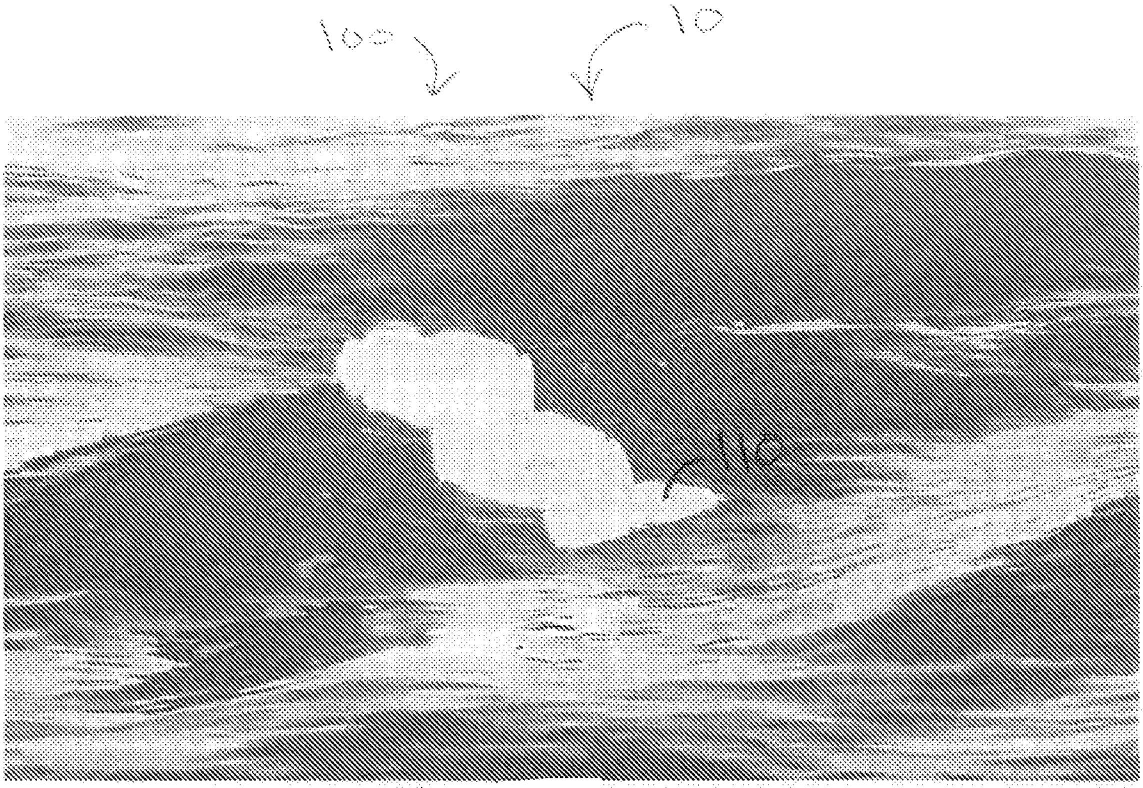

Fig. 9

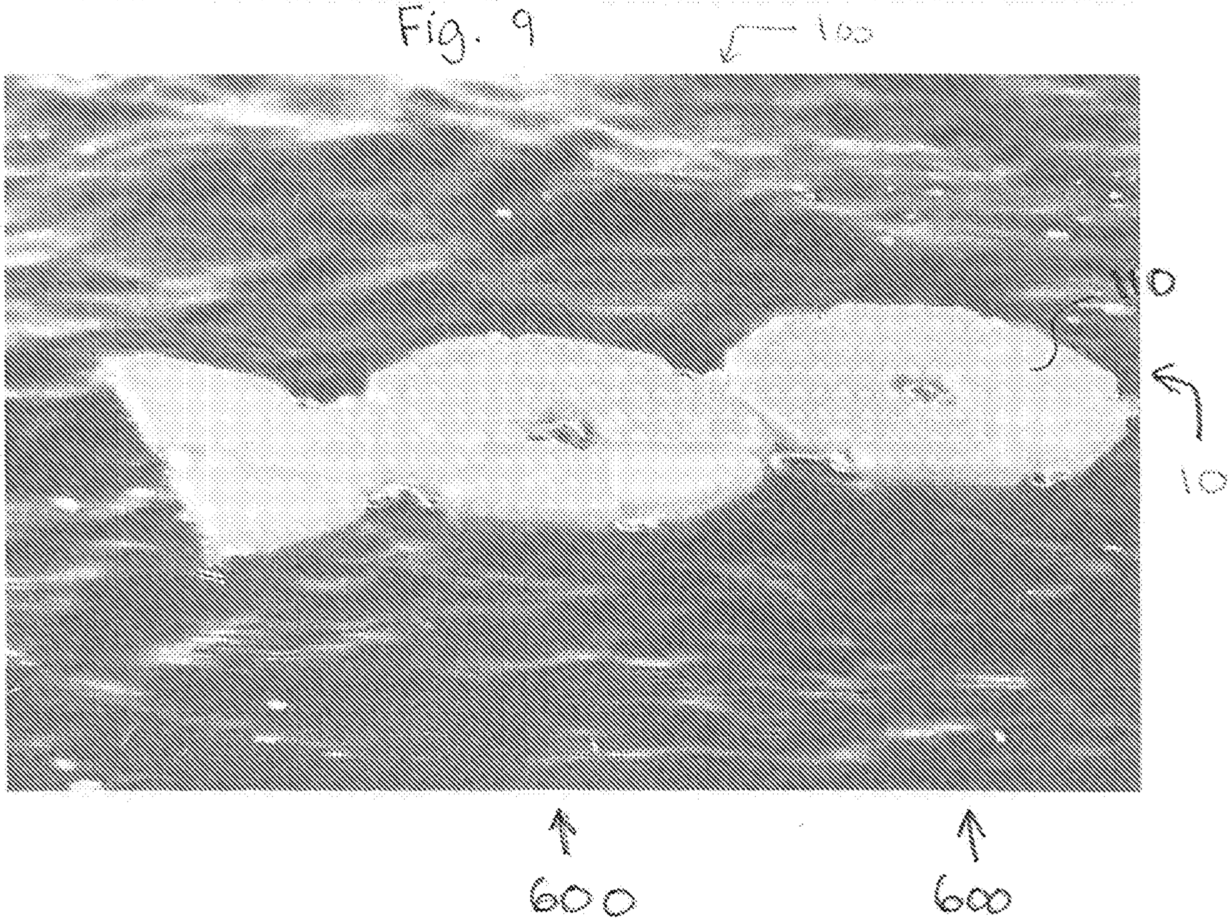

Fig. 10

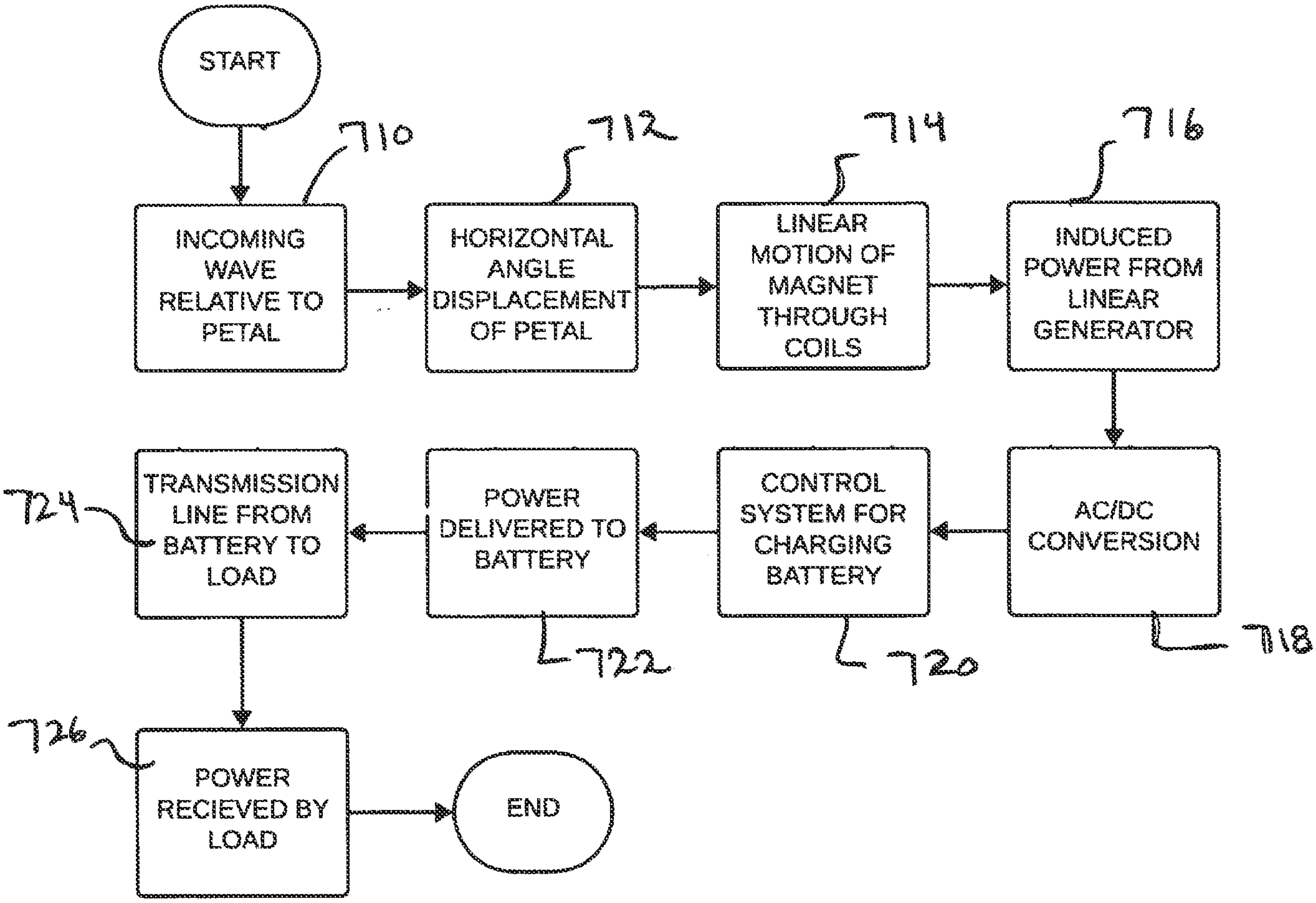
START
710
INCOMING WAVE RELATIVE TO PETAL
712
HORIZONTAL ANGLE DISPLACEMENT OF PETAL
714
LINEAR MOTION OF MAGNET THROUGH COILS
716
INDUCED POWER FROM LINEAR GENERATOR
718
AC/DC CONVERSION
720
CONTROL SYSTEM FOR CHARGING BATTERY
722
POWER DELIVERED TO BATTERY
724
TRANSMISSION LINE FROM BATTERY TO LOAD
726
POWER RECIEVED BY LOAD
END

FIG. 11

015645-00001-UTL

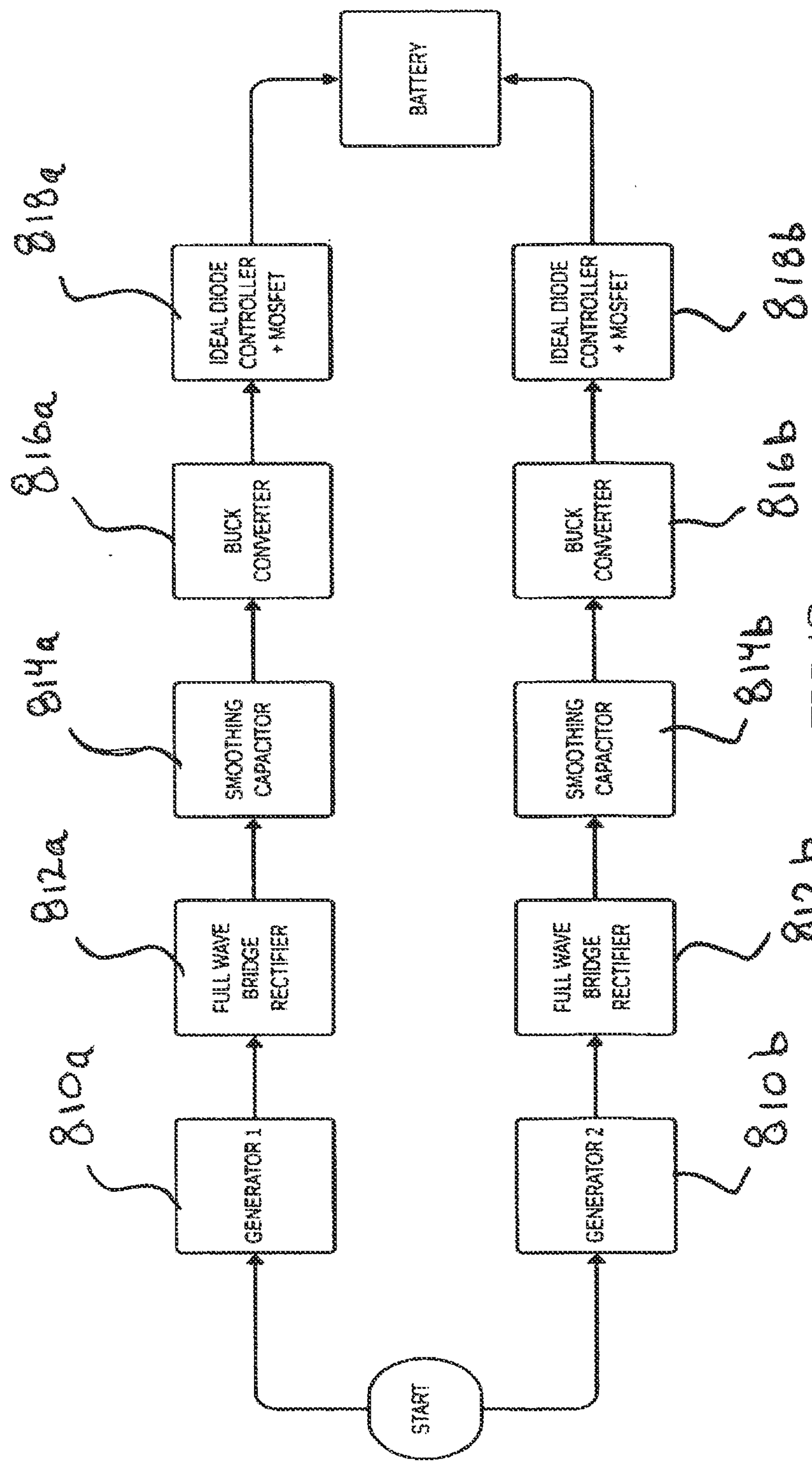

FIG. 12

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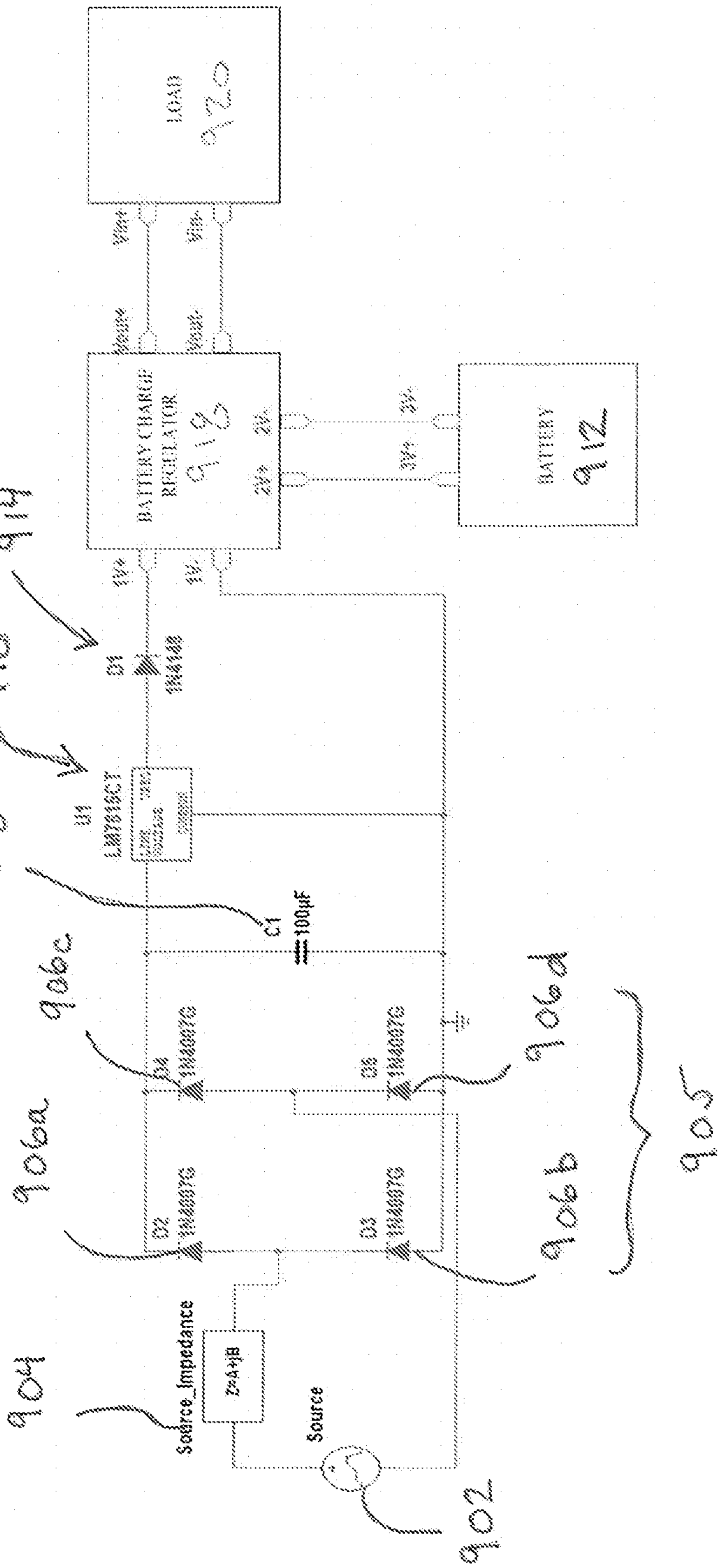

FIG. 13

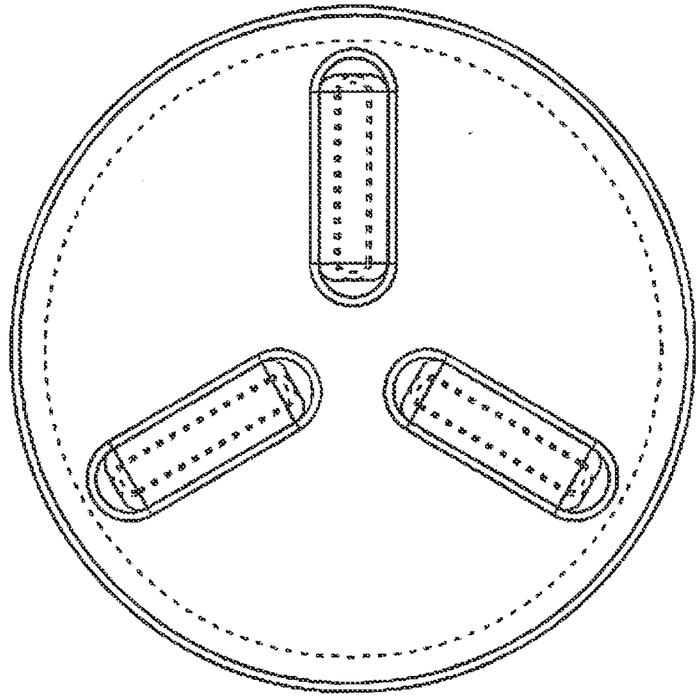

FIG. 14

015645-00001-UTL

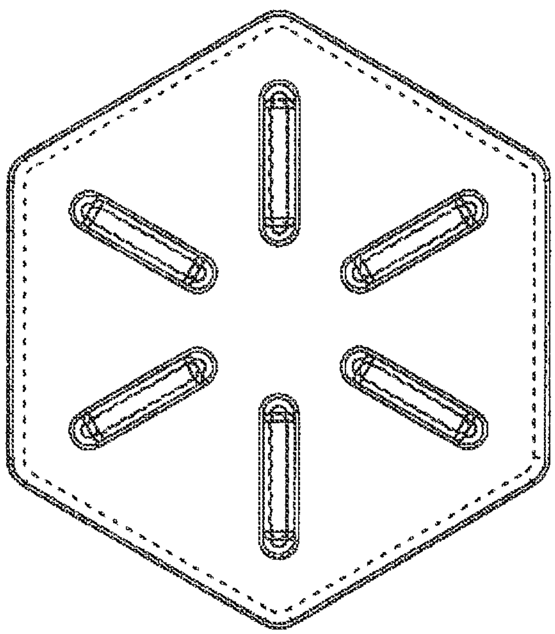

FIG. 15

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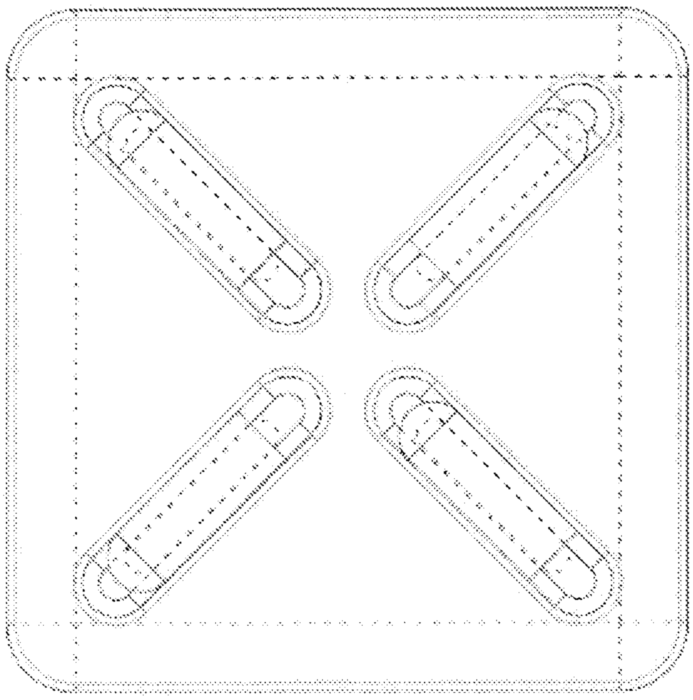

FIG. 16

015645-00001-UTL

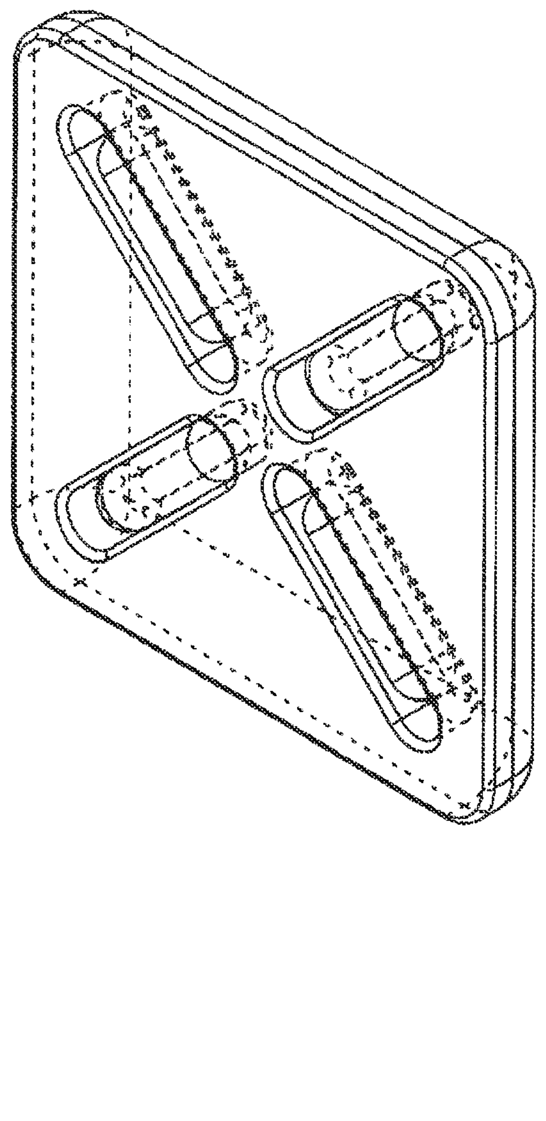

FIG.17