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Forney

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(54) **METHOD AND APPARATUS FOR GENERATING ELECTRICITY AND POTABLE WATER**

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(52) U.S. Cl. **60/641.11; 60/641.15**

(58) Field of Search 60/641.8, 641.9, 60/641.11, 641.15

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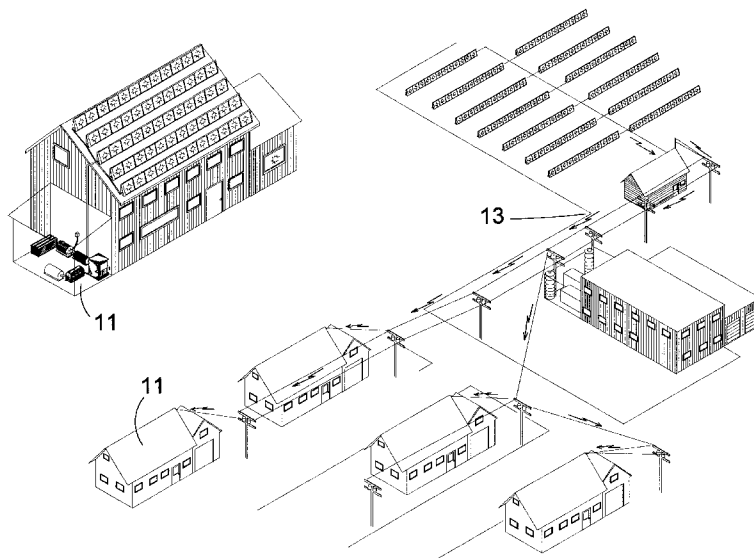
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(57) **ABSTRACT**

The present invention **10** discloses a system for generating electricity and potable water **42**. The system comprises an array of solar cells **12** which produce an amount of current. The solar cells have electrical connection means **14** to a bank of batteries **18**. The batteries are connected by electrical connection means to an electrolytic device **20**. The positive pole of the battery is connected to the cathode electrode **46** and the negative pole is connected to the anode electrode **48** which induces the electric current to pass through the liquid electrolyte **24**. The current dissociates the water into its collectable gaseous component parts, oxygen and hydrogen. The oxygen is released into the atmospheric air but could be collected for some further process. A compressor **26** having electrical connection means to the batteries **18** and connection means to the electrolytic device **20** collects the hydrogen gas. A storage tank **28** having ingress connection means with the compressor stores the compressed hydrogen gas for use by additional components of the system. The storage tank further has egress control means for supplying a regulated amount of hydrogen gas to a boiler **34**. The boiler **34** has electrical connection means **14** to the batteries **18** for energizing control devices, such as electronic firing, and thermal control devices and has ingress connection means **32** with the hydrogen storage tank **28** and steam egress connection means **36** with the steam turbine **38**. The steam turbine **28** has electrical connection means **14** to the batteries **18** for energizing the necessary components of the turbine, as well as, ingress water connection means **50** with the boiler **34** which produces the steam which turns the turbine blades and the steam turbine has egress connection means **52** with a water vapor storage tank wherein the steam, which was used to rotate the turbine blades, is collected through the condenser **40** unit providing a source of potable water **42**. The electrical output of the steam turbine can be used as an alternate or primary source of electricity for a structure **44** and can additionally feed any residual electrical output into the municipal power grid **13**.

2 Claims, 9 Drawing Sheets



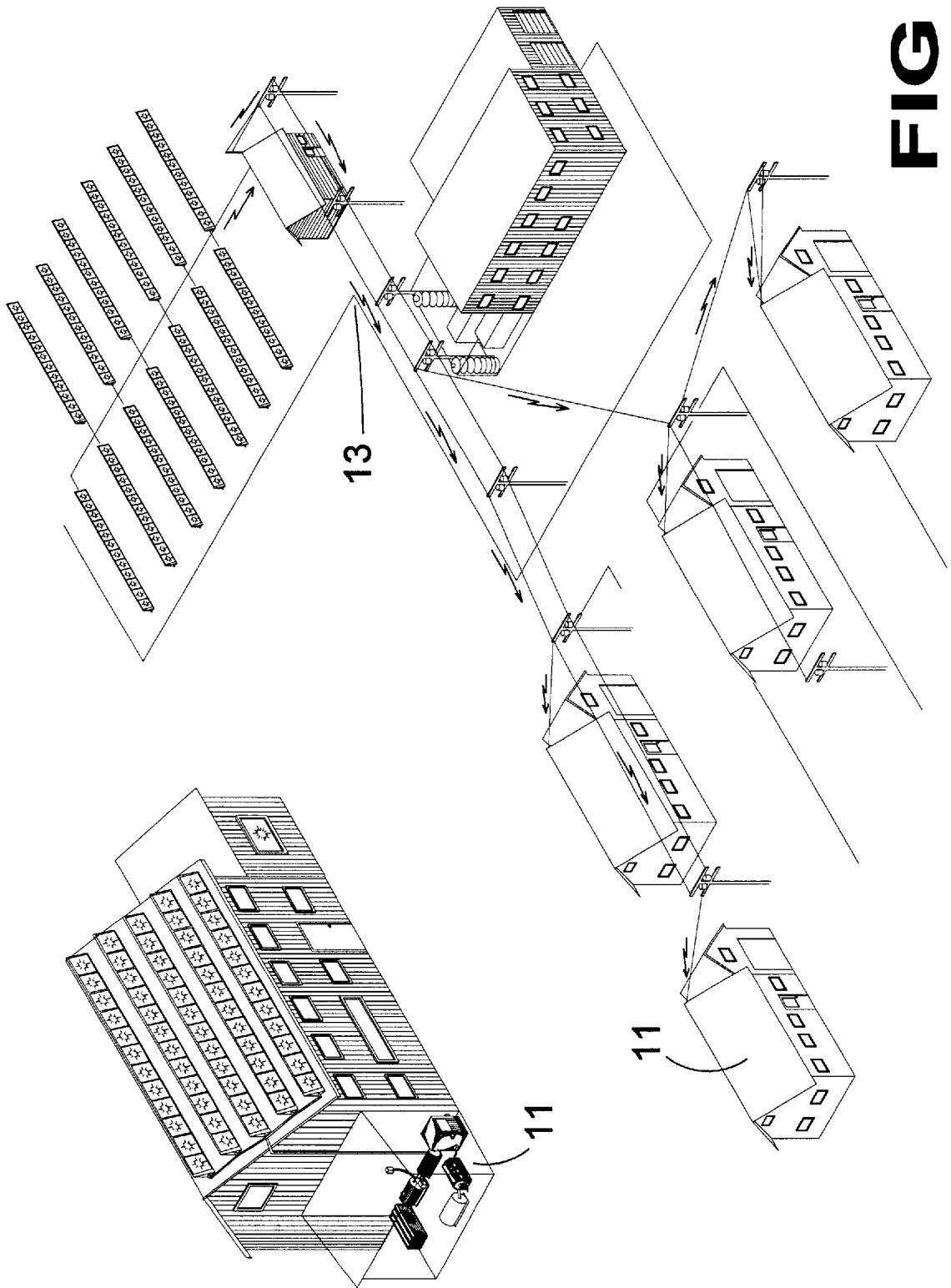


FIG 1

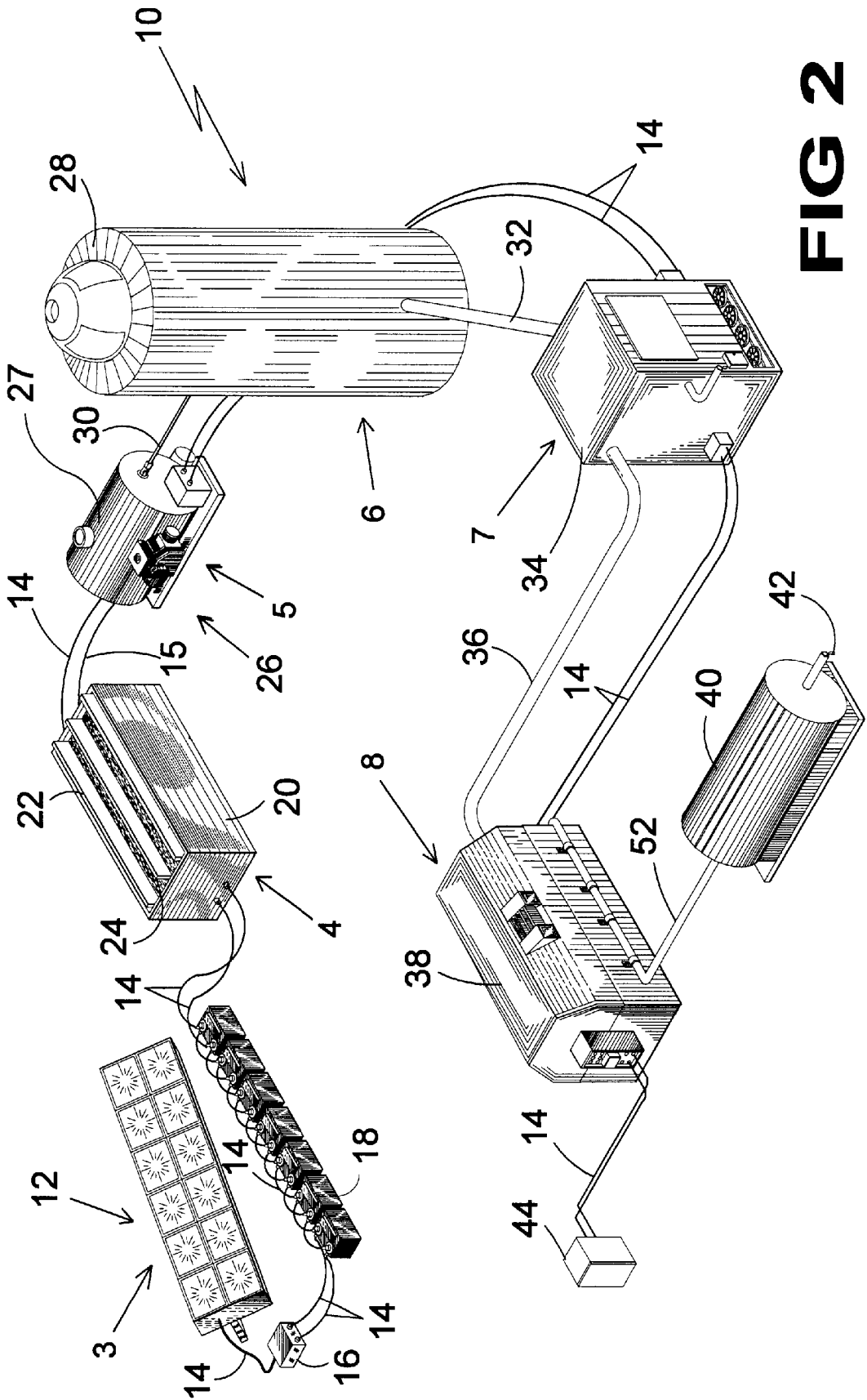


FIG 2

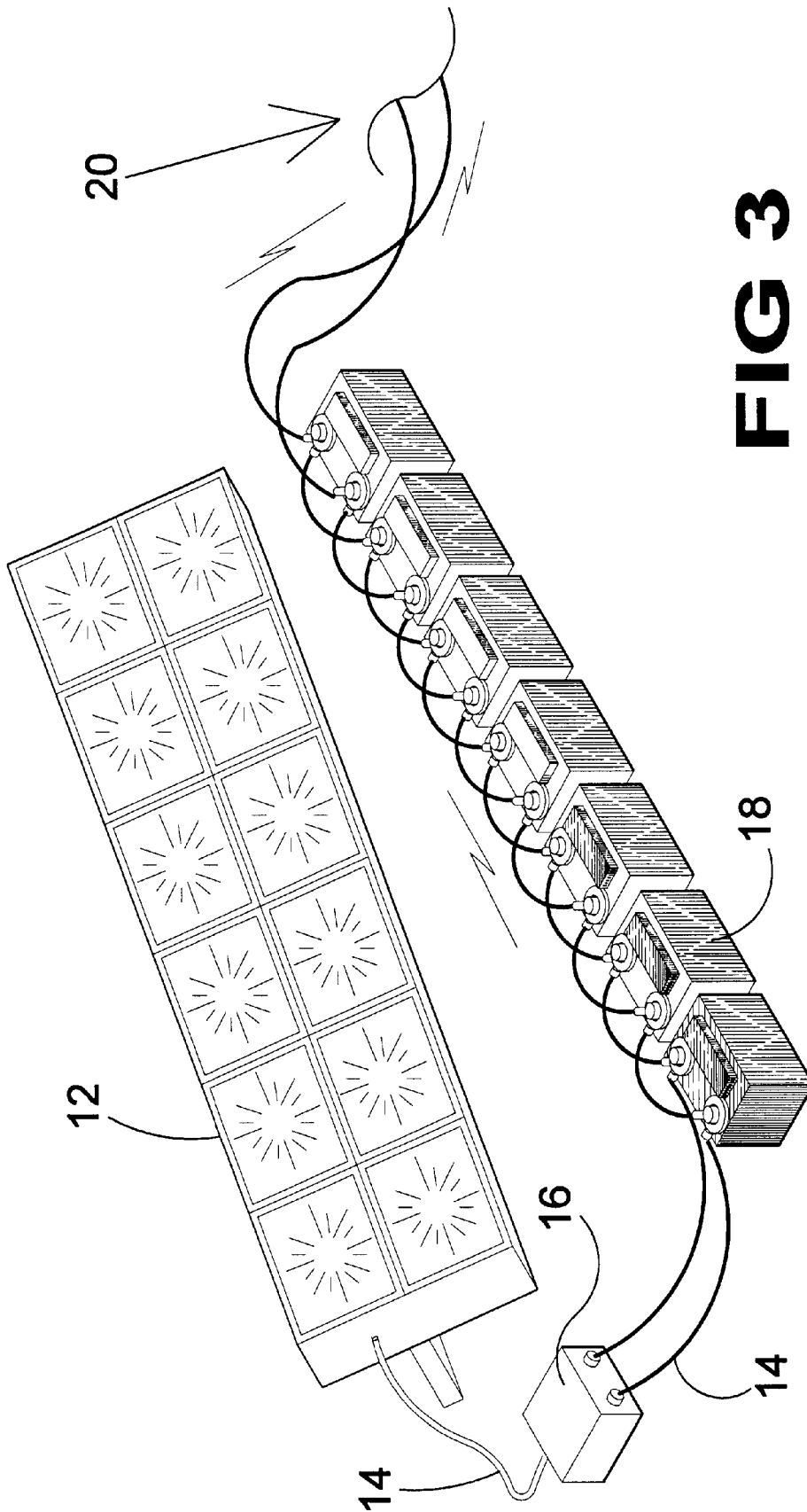


FIG 3

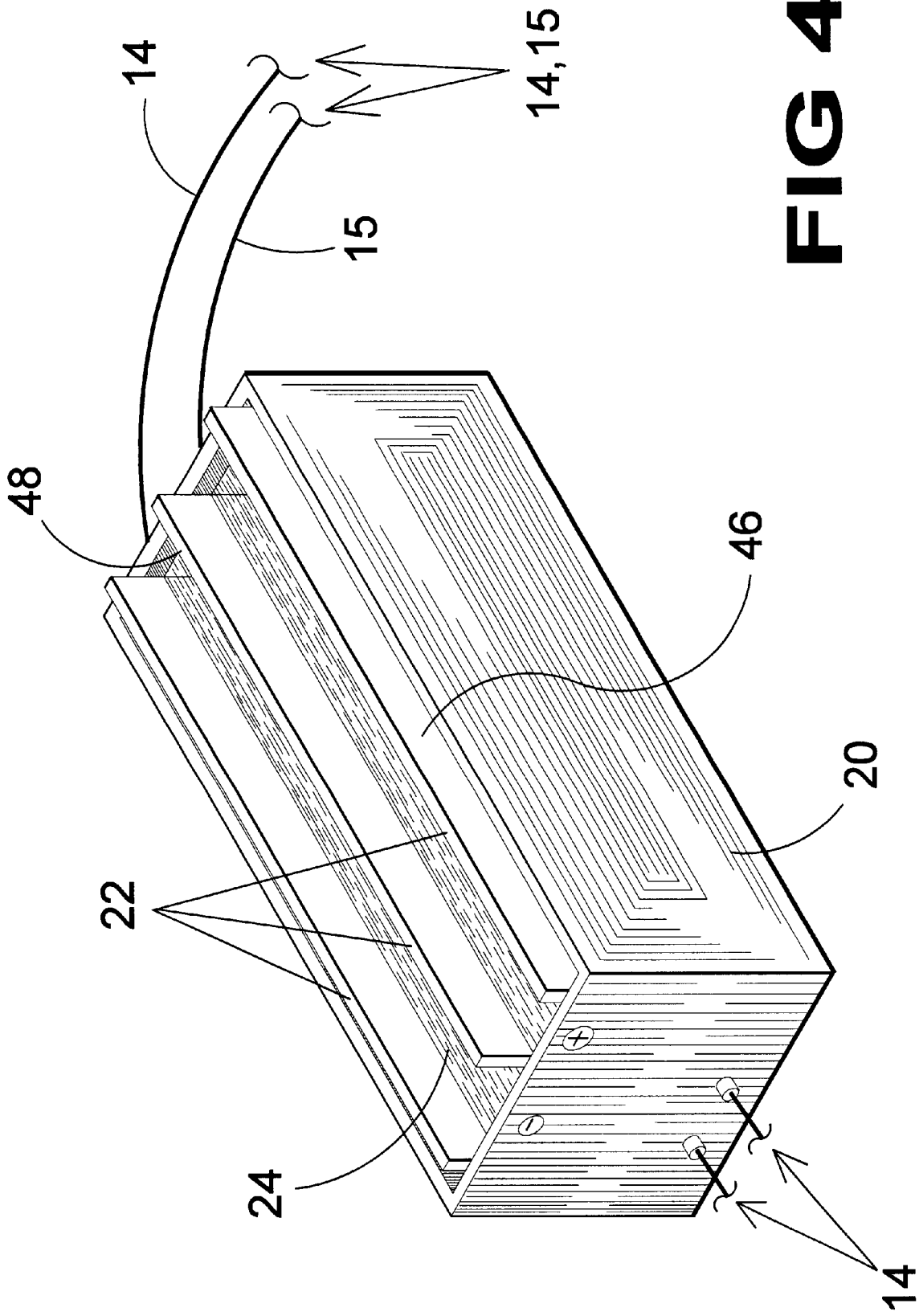


FIG 4

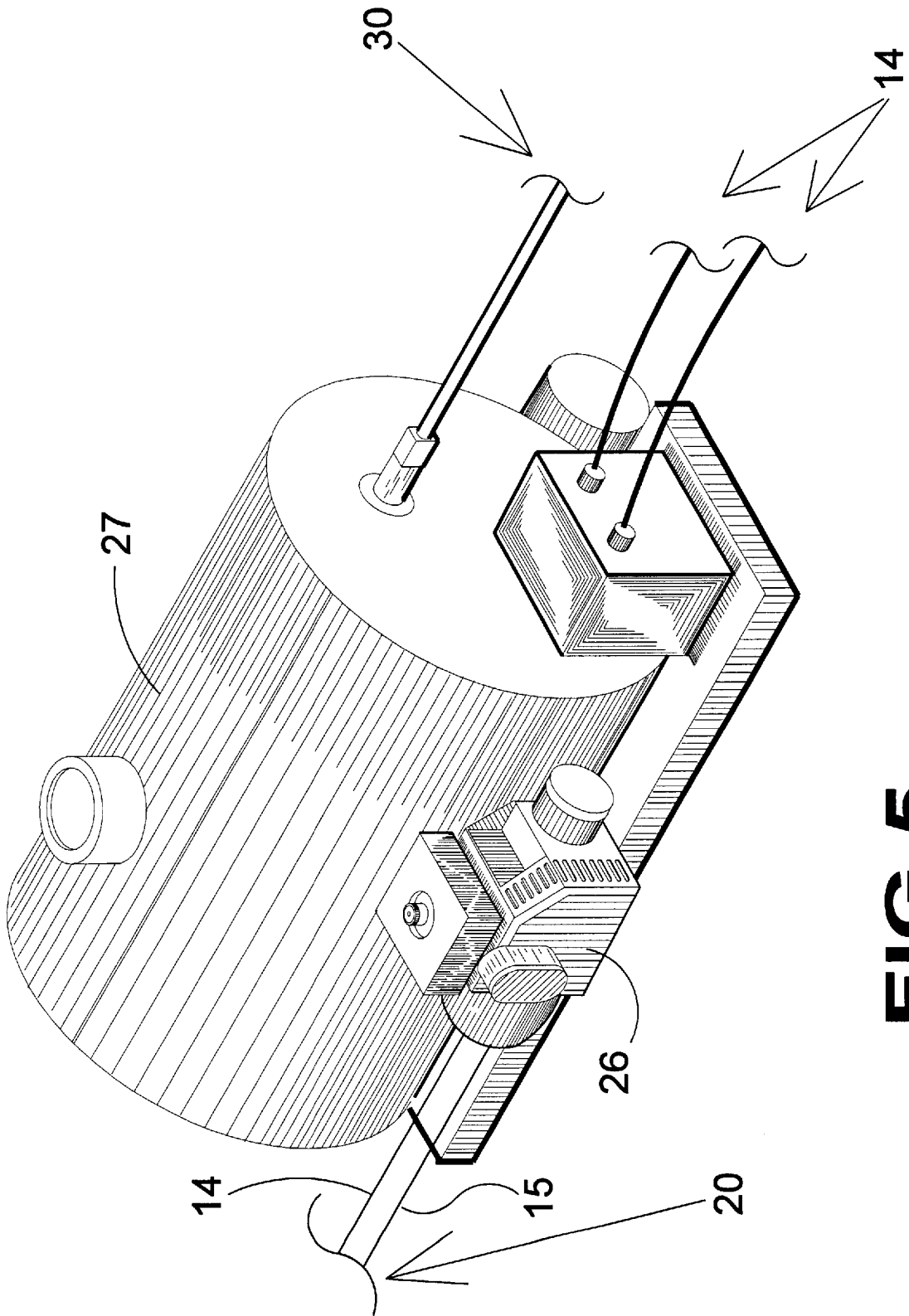


FIG 5

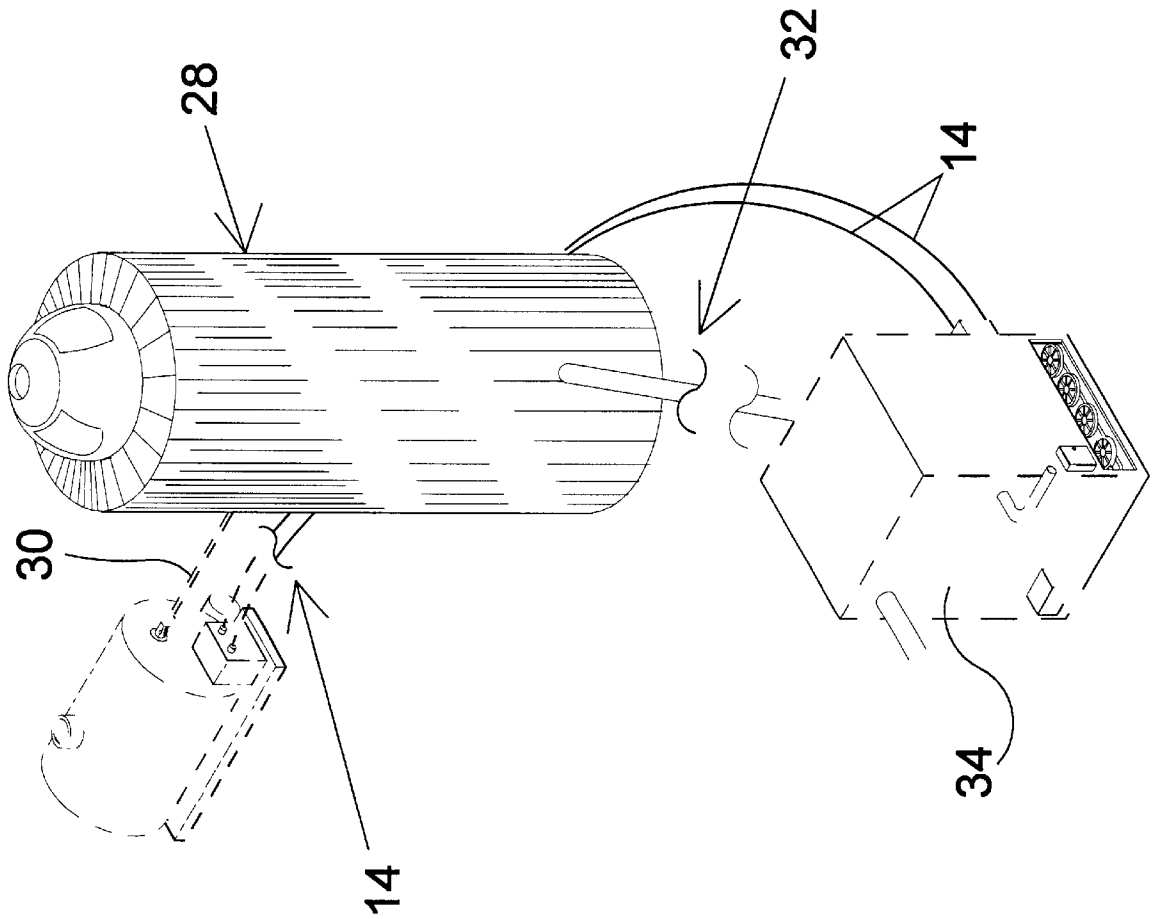


FIG 6

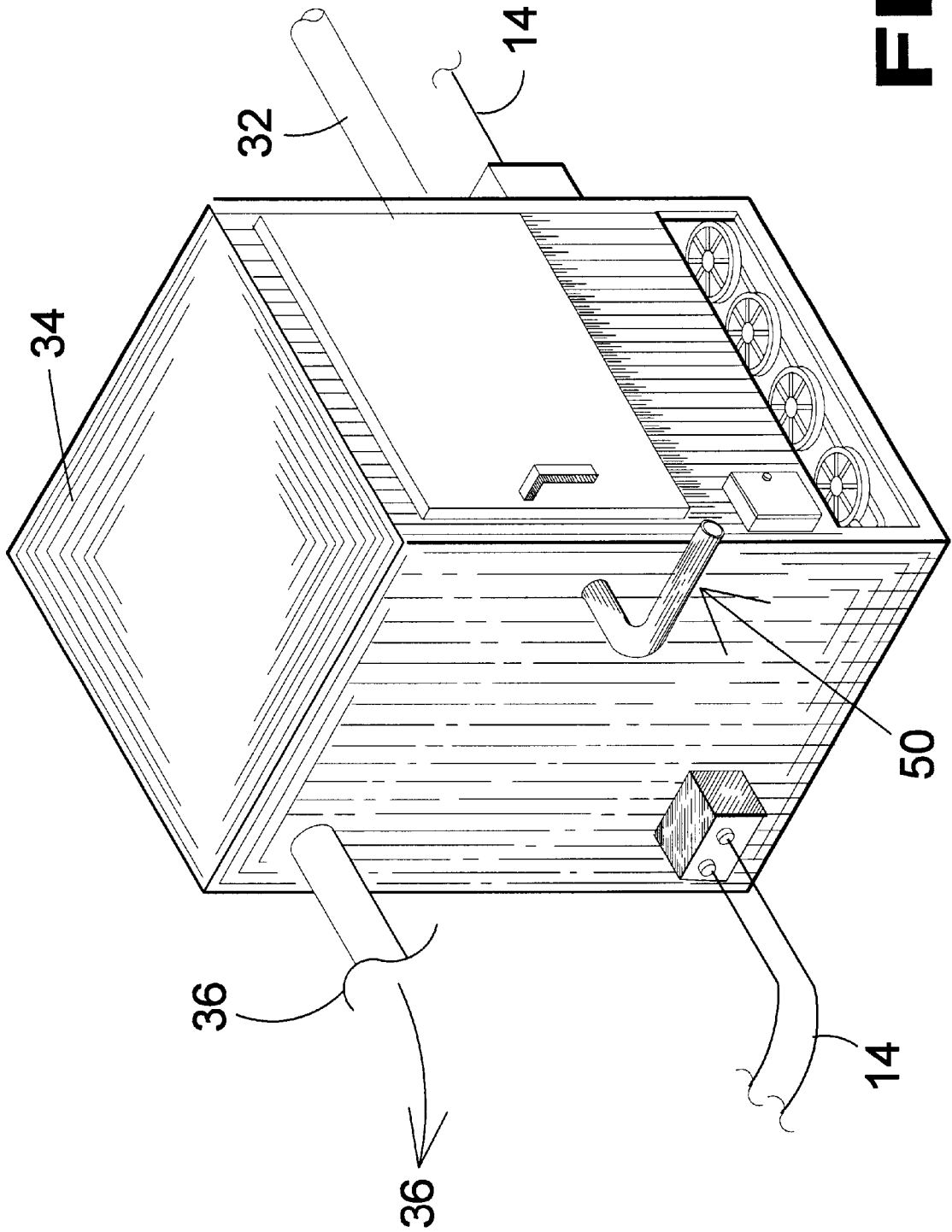


FIG 7

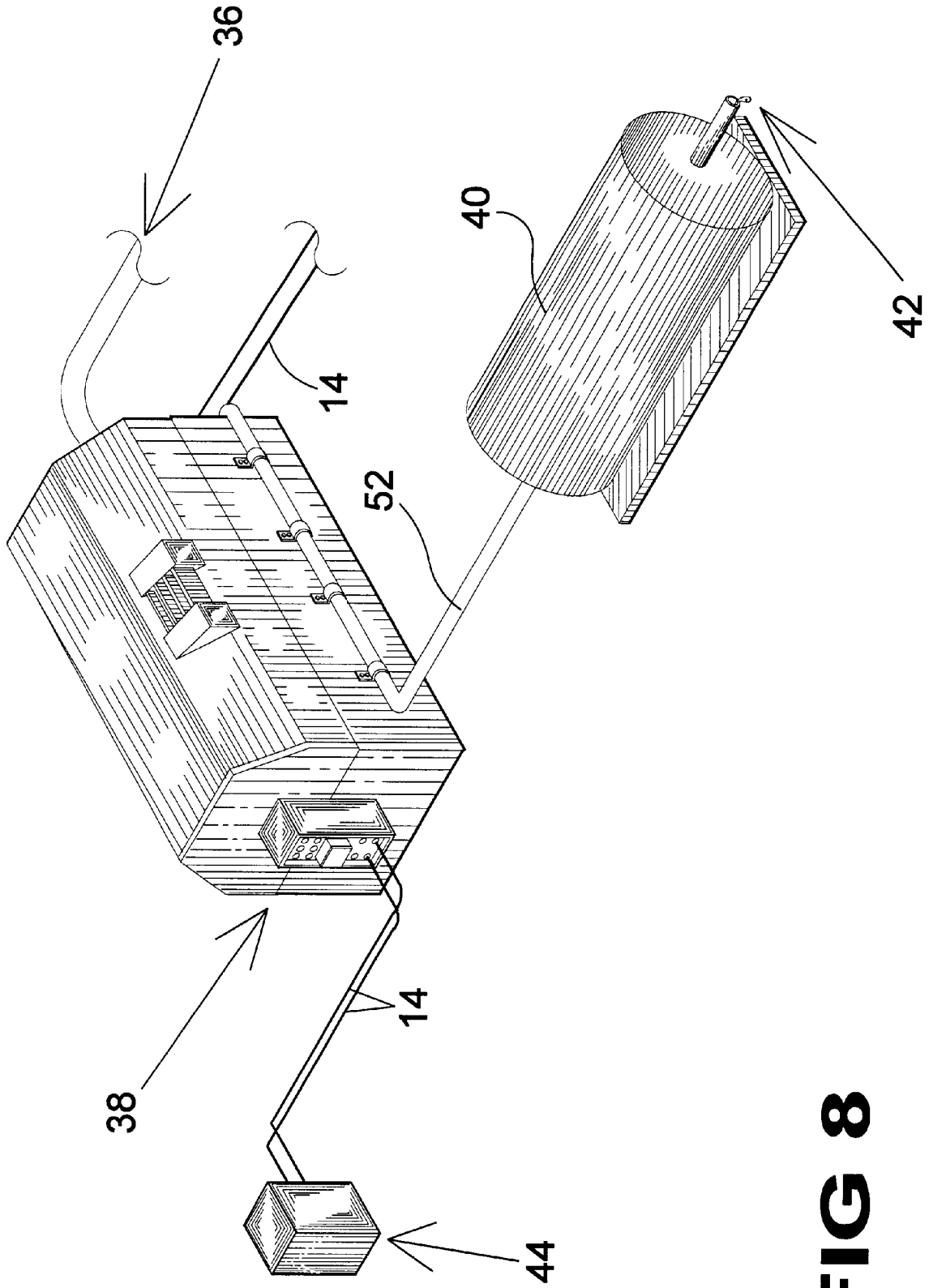


FIG 8

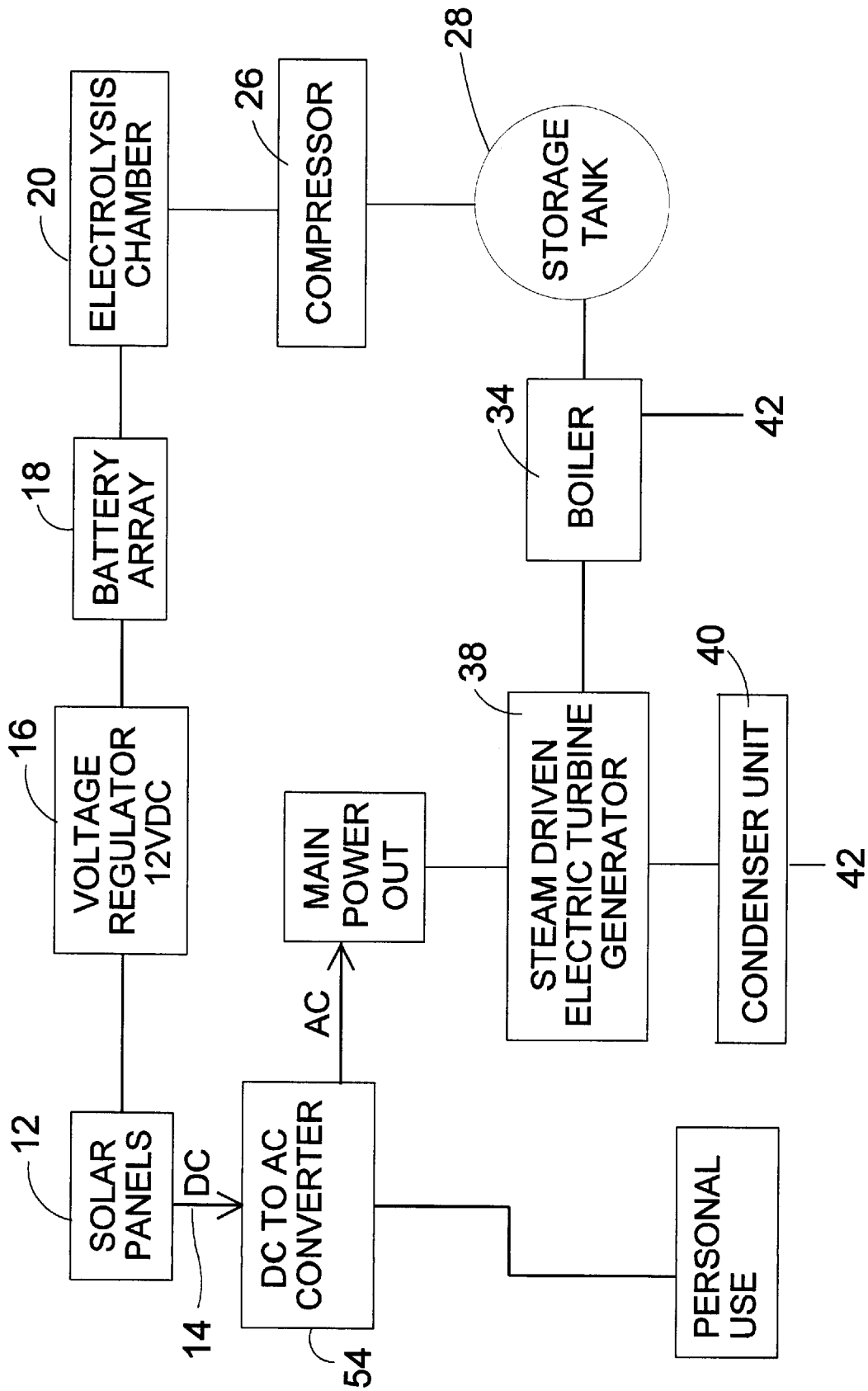


FIG 9

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METHOD AND APPARATUS FOR GENERATING ELECTRICITY AND POTABLE WATER

BACKGROUND OF THE INVENTION

1. Field of the Invention

The present invention relates generally to electrical generation systems and, more specifically, to a system combining several discrete components whereby sunlight is the catalyst energy form used to create electricity which can be used to energize a structure, home, and/or building with the surplus electricity being fed into the municipal power grid. In addition said system can produce a quantity of potable water.

Said system comprises an array of solar cells which produce an amount of current. The solar cells have electrical connection means to a DC converter that converts the current into AC current and having electrical connection means to a bank of batteries. The plurality of batteries stores the DC current and having electrical connection means, supplies DC current to additional components within the system. The batteries are connected by electrical connection means to an electrolytic device. The electrolytic device consisting electrodes and an amount of liquid electrolyte, preferably water. The positive pole of the battery is connected to the cathode electrode and the negative pole is connected to the anode electrode which induces the electric current to pass through the liquid electrolyte, water. The current dissociates the water into its collectable gaseous component parts, oxygen and hydrogen. The oxygen is released into the atmospheric air but could be collected for some further process. A compressor having electrical connection means to the batteries and connection means to the electrolytic device collects the hydrogen gas. A storage tank having ingress connection means with the compressor stores the compressed hydrogen gas for use by additional components of the system. Said storage tank, further, has egress control means for supplying a regulated amount of hydrogen gas to a boiler. The boiler has electrical connection means to the batteries for energizing control devices, such as electronic firing, and thermal control devices. Further having ingress connection means with the hydrogen storage tank and steam egress connection means with a steam turbine. The steam turbine has electrical connection means to the batteries for energizing the necessary components of the turbine, as well as, ingress water connection means with the boiler which produces the steam which turns the turbine blades and said steam turbine has egress connection means with a water vapor storage tank wherein the steam, which was used to rotate the turbine blades, is collected through the condenser unit providing a source of potable water. The electrical output of the steam turbine can be used as an alternate or primary source of electricity for a structure and can additional feed any residual electrical output into the municipal power grid.

2. Description of the Prior Art

There are other solar powered device designed for producing electricity. Typical of these is U.S. Pat. No. 5,658,448 issued to Lasich on Aug. 19, 1997.

Another patent was issued to Cordy on Sep. 20, 1994 as U.S. Pat. No. 5,347,986. Yet another U.S. Pat. No. 5,672,250 was issued to Ambadar et al. on Sep. 30, 1997 and still yet another was issued on Jul. 15, 1986 to Dalal as U.S. Pat. No. 4,599,865.

U.S. Pat. No. 5,658,448

Inventor: John Beavis Lasich

Issued: Aug. 19, 1997

Method and apparatus for producing hydrogen by conversion of solar energy into thermal and electrical energy for electrolysis of steam.

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U.S. Pat. No. 5,347,986

Inventor: Clifford B. Cordy

Issued: Sep. 20, 1994

A point focus distributed receiver system for generating high-pressure steam by means of solar energy collection is disclosed. The cradle within which a gimbal mounted concentrator dish rotates is designed to withstand high wind forces by delivering all forces along the polar axis to the equatorial end of the cradle, requires only one structural member to withstand flexural forces and provides an unobstructed volume behind the axis of rotation for the concentrator dish to rotate in. The concentrator dish comprises a plurality of segments whose bracing forms a tee-pee-like structure behind the dish. The receiver of the present invention further discloses a receiver cavity which achieves maximum blackness in a minimum depth and volume, a combined heat shield/secondary reflector and a plumbing system which permits the receiver system to operate successfully when the concentrator dish is nearly perpendicular to the ground.

U.S. Pat. No. 5,672,250

Inventor: Husein Ambadar et. Al.

Issued: Sep. 30, 1997

A solar seawater desalination system is designed to operate in a self-sustaining manner without the need for any moving parts. Seawater is converted to steam in a solar heat collector panel and the steam is led in a steam pipe through a series of cooling chambers where it is condensed by incoming seawater in tanks jacketing the steam tube. The tanks are connected in series between an inlet air-lock regulator and the solar collector panel so that the seawater is caused to flow successively through the tanks from the inlet to the collector panel as make-up water, solely by pressure differentials created in the system by the steam generation. Excessively saline seawater which collects in the collector panel is dumped from the system in a similar manner through an outlet air-lock regulator. Secondary cooling chambers may be provided to condense steam generated from the seawater in the primary cooling chambers by heat received from the steam pipe.

U.S. Pat. No. 4,599,865

Inventor: Rajendra P. Dalai

Issued: Jul. 15, 1986

A method and apparatus for combustion of hydrogen to produce heat, for example to generate steam for power generation. Water is electrolyzed and the hydrogen and a fraction of the oxygen products of electrolysis are passed immediately to a first combustion zone where the immediate combustion of the oxygen products and a function of the hydrogen products is effected. The products from this first combustion zone are immediately passed to a second combustion zone where combustion is again effected with the remaining fraction of the oxygen products of the electrolysis and the remaining hydrogen products from the first combustion zone. The heat generated is thereafter applied to the desired use, for example by passing the products of combustion from the second combustion zone through water to boil the water, the steam thereby produced being used for power generation. Apparatus to carry out this method is also described.

While these electricity-generating devices may be suitable for the purposes for which they were designed, they would not be as suitable for the purposes of the present invention, as hereinafter described.

SUMMARY OF THE PRESENT INVENTION

The present invention discloses a system for generating electricity and potable water. The system comprises an array of solar cells which produce an amount of current. The solar cells have electrical connection means to a bank of batteries. The batteries are connected by electrical connection means to an electrolytic device. The current dissociates the water into its collectable gaseous component parts, oxygen and hydrogen. The oxygen is released into the atmospheric air but could be collected for some further process. A compressor having electrical connection means to the batteries and connection means to the electrolytic device collects the hydrogen gas. A storage tank having ingress connection means with the compressor stores the compressed hydrogen gas for use by additional components of the system. The storage tank further has egress control means for supplying a regulated amount of hydrogen gas to a boiler. The boiler has electrical connection means to the batteries for energizing control devices, such as electronic firing, and thermal control devices and has ingress connection means with the hydrogen storage tank and steam egress connection means with the steam turbine. The steam turbine has electrical connection means to the batteries for energizing the necessary components of the turbine, as well as, ingress water connection means with the boiler which produces the steam which turns the turbine blades and steam turbine has egress connection means with a water vapor storage tank wherein the steam, which was used to rotate the turbine blades, is collected through the condenser unit providing a source of potable water. The electrical output of the steam turbine can be used as an alternate or primary source of electricity for a structure and can additionally feed any residual electrical output into the municipal power grid.

A primary object of the present invention is to provide a standalone system for generating electricity.

Another object of the present invention is to provide a standalone electrical generating system using sunlight as the catalyst energy form to create electricity which can be used to energize a structure, home, and/or building.

Yet another object of the present invention is to provide a standalone electrical generating system using sunlight as the catalyst energy form to create electricity which can be fed into the municipal power grid.

Still yet another object of the present invention is to provide a standalone electrical generating system which can additionally produce a quantity of potable water.

Yet another object of the present invention is to provide a standalone electrical generating system using sunlight as the catalyst energy form to create electricity which is stored in batteries to be used by an electrolytic device to produce hydrogen which is collected and compressed for use by a boiler to generated steam which powers a steam turbine that produces electricity.

Additional objects of the present invention will appear as the description proceeds.

The present invention overcomes the shortcomings of the prior art by providing an electrical generation systems comprising discrete components utilizing sunlight as the catalyst energy form to generate electricity which can be used to energize a structure, home, and/or building with the surplus electricity being fed into the municipal power grid. In addition said system can produce a quantity of potable water.

Said system comprises an array of photovoltaic cells which produce current. The solar cells have electrical connection means to a voltage regulator having electrical connection means to a bank of batteries for charging said batteries. The bank of batteries stores the current and having electrical connection means, supplies said current to additional components within the system. The batteries are connected by electrical connection means to an electrolytic device. The electrolytic device consisting electrodes and an amount of liquid electrolyte, preferably water. The positive pole of the battery is connected to the cathode electrode and the negative pole is connected to the anode electrode which induces the electric current to pass through the liquid electrolyte, water. The current dissociates the water into its collectable gaseous component parts, oxygen on the negative side and hydrogen on the positive. The oxygen is released into the atmospheric air but could be collected for some further process. A compressor having electrical connection means to the batteries and connection means to the electrolytic device collects the hydrogen gas. A storage tank having ingress water connection means with the compressor stores the compressed hydrogen gas for use by additional components of the system. Said storage tank, further, has egress control means for supplying a regulated amount of hydrogen gas to a boiler. The boiler has electrical connection means to the batteries for energizing control devices, such as electronic firing, and thermal control devices. Further having ingress connection means with the hydrogen storage tank and steam egress connection means with a steam turbine. The steam turbine has electrical connection means to the batteries for energizing the necessary components of the turbine, as well as, ingress water connection means with the boiler which produces the steam which turns the turbine blades and said steam turbine has egress connection means with a water vapor condenser wherein the steam, which was used to rotate the turbine blades, is collected and cooled therein providing a source of potable water. The electrical output of the steam turbine can be used as an alternate or primary source of electricity for a structure and can additionally feed any residual electrical output into the municipal power grid.

The foregoing and other objects and advantages will appear from the description to follow. In the description reference is made to the accompanying drawings, which form a part hereof, and in which is shown by way of illustration specific embodiments in which the invention may be practiced. These embodiments will be described in sufficient detail to enable those skilled in the art to practice the invention, and it is to be understood that other embodiments may be utilized and that structural changes may be made without departing from the scope of the invention. In the accompanying drawings, like reference characters designate the same or similar parts throughout the several views.

The following detailed description is, therefore, not to be taken in a limiting sense, and the scope of the present invention is best defined by the appended claims.

BRIEF DESCRIPTION OF THE DRAWINGS

In order that the invention may be more fully understood, it will now be described, by way of example, with reference to the accompanying drawings in which:

FIG. 1 is an illustrative view of the present invention in use. Shown is a standalone system wherein sunlight is the catalyst energy form used to create electricity which can be used to energize a structure, home, and/or building with the

surplus electricity being fed into the municipal power grid. In addition said system can produce a quantity of potable water.

FIG. 2 is an illustrative view of the components of the present invention and interrelationship therein for generating electricity and potable water. Shown is a system combining several discrete components whereby sunlight is the catalyst energy form used to create electricity which can be used to energize a structure, home, and/or building with the surplus electricity being fed into the municipal power grid. In addition said system can produce a quantity of potable water.

FIG. 3 is a perspective view of the solar panels, DC converter and bank of batteries of the present invention. The solar panels are comprised of a array of photovoltaic cells which convert the rays of the sun to an amount of DC current which is fed into a DC regulator and stored in a bank of batteries for use by various components of the present invention.

FIG. 4 is a perspective view of the electrolytic device of the present invention. The electrolytic device has electrical connection means to the plurality of batteries. The electrolytic device consisting of electrodes and an amount of liquid electrolyte, preferably water. The positive pole of the battery is connected to the cathode electrode and the negative pole is connected to the anode electrode which induces the electric current to pass through the liquid electrolyte, water. The current dissociates the water into its collectable gaseous component parts, oxygen and hydrogen. The oxygen is released into the atmospheric air but could be collected for some further process. The hydrogen is collected by a compressor and stored for future use by other components within the system.

FIG. 5 is a perspective view of the compressor of the present invention. The compressor having electrical connection means to the batteries and connection means to the electrolytic device collects and compresses the hydrogen gas. A storage tank having ingress connection means with the compressor stores the compressed hydrogen gas for use by additional components of the system.

FIG. 6 is a perspective view of the hydrogen storage tank of the present invention. The compressor having electrical connection means to the batteries and connection means to the electrolytic device collects and compresses the hydrogen gas. The storage tank having ingress connection means with the compressor stores the compressed hydrogen gas for use by additional components of the system. Said storage tank, further, has egress control means for supplying a regulated amount of hydrogen gas to a boiler.

FIG. 7 is a perspective view of the boiler component of the present invention. The boiler has electrical connection means to the batteries for energizing control devices, such as electronic firing, and thermal control devices. Further having ingress connection means with the hydrogen storage tank and steam egress connection means with a steam turbine. The boiler uses the hydrogen gas as a fuel source to generate steam which is used to generate electricity by the steam turbine.

FIG. 8 is a perspective view of the steam driven electric turbine generator. The steam turbine has electrical connection means to the battery components for energizing the necessary circuits of the turbine, as well as, ingress connection means with the boiler which produces the steam which turns the turbine blades. Said steam turbine has egress connection means with a condenser unit wherein the steam which was used to power the turbine is coalesced into water

vapor and stored as a source for potable water. The electrical output of the steam turbine can be used as an alternate or primary source of electricity for a structure and can additional feed any residual electrical output into the municipal power grid.

FIG. 9 is a diagrammatic view of the components and interrelationship therein.

LIST OF REFERENCE NUMERALS

- With regard to reference numerals used, the following numbering is used throughout
- 10 present invention
- 11 home or building
- 12 solar cells
- 13 power grid
- 14 electrical connection means
- 15 hydrogen line
- 16 DC voltage regulator
- 18 batteries
- 20 electrolytic device
- 22 electrodes
- 24 electrolyte
- 26 compressor
- 27 compressor storage tank
- 28 storage tank
- 30 ingress connection means to storage tank
- 32 egress connection means from storage tank
- 34 boiler
- 36 steam egress connection means
- 38 steam turbine
- 40 condenser
- 42 potable water
- 44 structure
- 46 cathode
- 48 anode
- 50 water inlet
- 52 connection means
- 54 DC converter

DESCRIPTION OF THE PREFERRED EMBODIMENT(S)

In order that the invention may be more fully understood, it will now be described, by way of example, with reference to the accompanying drawings in which FIGS. 1 through 9 illustrate the present invention being a device for generating electricity and potable water.

Turning to FIG. 1, shown therein is an overall illustrative view of the present invention in use. Shown is a self-contained system wherein sunlight is the catalyst energy form used to create electricity which can be used to energize a structure, home, and/or building 11 with the surplus electricity being fed into the municipal power grid 13. In addition the system can produce a quantity of potable water as hereinafter disclosed.

Turning to FIG. 2, shown therein is an illustrative view of the components of the present invention 10 and interrelationship therein for generating electricity and potable water. Shown is a system combining several discrete components whereby sunlight is the catalyst energy form used to create electricity which can be used to energize a structure, home, and/or building with the surplus electricity being fed into the municipal power grid

The system comprises an array of solar cells 12 which produce an amount of current. The solar cells have electrical connection means 14 to a DC voltage regulator 16 that regulates the current and has electrical connection means 14

to a bank of batteries **18**. The bank of batteries stores the DC current and having electrical connection means **14**, supplies DC current to additional components within the system. The batteries are connected by electrical connection means **14** to an electrolytic device **20**. The electrolytic device consists of electrodes **22** and an amount of liquid electrolyte **24**, preferably water. The current dissociates the water into its collectable gaseous component parts, oxygen and hydrogen. The oxygen is released into the atmospheric air but could be collected for some further process. A compressor **26** having electrical connection means **14** to the batteries and connection means **15** to the electrolytic device collects the hydrogen gas in storage tank **27**. A second storage tank **28** having ingress connection means **30** with the compressor storage tank **27** stores the compressed hydrogen gas for use by additional components of the system. The storage tank **28**, further, has egress control means **32** for supplying a regulated amount of hydrogen gas to a boiler **34**. The boiler **34** has electrical connection means **14** to the batteries for energizing control devices, such as electronic firing, and thermal control devices and has ingress connection means **32** with the hydrogen storage tank and steam egress connection means **36** with a steam turbine **38**. The steam turbine **38** has electrical connection means **14** to the batteries for energizing the necessary components of the turbine, as well as, ingress steam connection means **36** with the boiler **34** which produces the steam which turns the turbine blades and the steam turbine has egress connection means **52** with a condenser **40** wherein the steam, which was used to rotate the turbine blades, is collected therein providing a source of potable water **42**. The electrical output of the steam turbine can be used as an alternate or primary source of electricity for a structure **44** and can additionally feed any residual electrical output into the municipal power grid using electrical connection **14**.

Turning to FIG. **3**, shown therein is a perspective view of the multiple solar panels **12**, DC regulator **16** and bank of batteries **18** of the present invention along with connections **14**. The solar panels **12** are comprised of an array of photovoltaic cells which convert the rays of the sun to an amount of DC current which is fed into a DC regulator **16** and stored in a bank of batteries **18** for use by various components of the present invention; e.g., an electrolytic device **20**.

Turning to FIG. **4**, shown therein is a perspective view of the electrolytic device **20** of the present invention. The electrolytic device **20** has electrical connection means **14** to the plurality of batteries. The electrolytic device consists of electrodes **22** and an amount of liquid electrolyte **24**, preferably water. The positive pole of the battery is connected to the cathode electrode **46** and the negative pole is connected to the anode electrode **48** which induces the electric current to pass through the liquid electrolyte **24**, water. The current dissociates the water into its collectable gaseous component parts, oxygen and hydrogen. The oxygen is released into the atmospheric air but could be collected for some further process. The hydrogen is transmitted through line **15** and is collected by a compressor **26** (not shown) and stored for future use by other components within the system.

Turning to FIG. **5**, shown therein is a perspective view of the compressor **26** of the present invention. The compressor **26** has electrical connection means **14** to the batteries and connection means **15** to the electrolytic device and collects and compresses the hydrogen gas. A first storage tank **27** having ingress connection means with the compressor stores the compressed hydrogen gas for use by additional components of the system. Outlet conduit **30** carries hydrogen to a storage tank **28** (not shown).

Turning to FIG. **6**, shown therein is a perspective view of the hydrogen storage tank **28** of the present invention. The storage tank **28** having ingress connection means **30** with the compressor stores the compressed hydrogen gas for use by additional components of the system. The storage tank **28**, further, has egress control means **32** for supplying a regulated amount of hydrogen gas to a boiler **34**. Electrical connection means **14** are also shown.

Turning to FIG. **7**, shown therein is a perspective view of the boiler **34** component of the present invention. The boiler has electrical connection means **14** to the batteries for energizing control devices, such as electronic firing, and thermal control devices. Also shown is a water inlet **50**. Further having ingress connection means **32** with the hydrogen storage tank and steam egress connection means **36** with a steam turbine. The boiler uses the hydrogen gas as a fuel source to generate steam which is used to generate electricity by the steam turbine.

Turning to FIG. **8**, shown therein is a perspective view of the steam driven electric turbine generator **38**. The steam turbine has electrical connection means **14** to the battery components for energizing the necessary circuits of the turbine, as well as, ingress connection means **36** with the boiler which produces the steam which turns the turbine blades. The steam turbine has egress connection means **52** with a condenser unit **40** wherein the steam which was used to power the turbine is coalesced into water vapor and stored as a source for potable water **42**. The electrical output of the steam turbine can be used as an alternate or primary source of electricity for a structure **44** and can additionally feed any residual electrical output into the municipal power grid using electrical connection means **14**.

Turning to FIG. **9**, shown therein is a diagrammatic view of the components and interrelationship therein. Shown is a DC converter **54** which converts the current into AC current. Certain elements previously disclosed are also shown. The present invention thus discloses a process for generating electricity and potable water, comprising the steps of: generating **12** electricity from the sun; regulating **16** the electricity generated from the sun; storing said electricity generated from the sun; electrolytically **20** separating oxygen and hydrogen from an electrolyte using said stored electricity; collecting **27** said hydrogen; compressing **26** said collected hydrogen; storing **28** said compressed hydrogen; generating steam in a boiler **34** using said hydrogen as the fuel; generating electricity from said steam using a steam driven turbine **38**; condensing **40** water from said steam driven turbine; and, connecting electrically **14** the components of the process.

What is claimed to be new and desired to be protected by letters patent is set forth in the appended claims:

1. An apparatus for generating electricity and potable water, comprising:

- a) a means comprising solar panels for generating electricity from the sun;
- b) means for regulating the voltage of said electricity;
- c) means for storing said electricity in a battery bank;
- d) means utilizing electricity stored in said battery bank having a water electrolyte in a chamber for electrolyzing oxygen gas and hydrogen gas;
- e) means for collecting said hydrogen gas and means for compressing said collected hydrogen gas;
- f) means for storing said compressed hydrogen gas;
- g) boiler means fired by said hydrogen gas for generating steam;

- h) means comprising a steam driven turbine for generating electricity, said turbine receiving steam from said boiler means;
 - i) means for electrically connecting said means for generating electricity, said voltage regulating means, said battery bank, said electrolyzing means, said boiler means, and said steam driven turbine; and
 - j) means for condensing steam discharged from said steam driven turbine for producing potable water.
2. A process for generating electricity and potable water, comprising the steps of:
- a) generating electricity from the sun using solar panels;
 - b) regulating the electricity generated from the sun;
 - c) storing said electricity generated from the sun;
 - d) electrolytically separating oxygen and hydrogen from a water electrolyte using said stored electricity;

- e) collecting said hydrogen;
- f) compressing said collected hydrogen;
- g) storing said compressed hydrogen;
- h) generating steam in a boiler using said hydrogen as the fuel;
- i) generating electricity from said steam using a steam driven turbine and using said electricity in a structure with any surplus electricity being fed into a municipal power grid;
- j) condensing waster from said steam driven turbine for producing potable water; and,
- k) connecting electrically the components of the process.

* * * * *