(12) INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

(19) World Intellectual Property Organization
International Bureau

(43) International Publication Date
25 September 2014 (25.09.2014)

WIPO | PCT

(10) International Publication Number
WO 2014/146836 A2

(51) International Patent Classification:
B60L 11/00 (2006.01)

(21) International Application Number:
PCT/EP2014/052961

(22) International Filing Date:
14 February 2014 (14.02.2014)

(25) Filing Language: English

(26) Publication Language: English

(30) Priority Data:
13/848,888 22 March 2013 (22.03.2013) US

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(81) Designated States *(unless otherwise indicated, for every kind of national protection available)*: AE, AG, AL, AM, AO, AT, AU, AZ, BA, BB, BG, BH, BN, BR, BW, BY, BZ, CA, CH, CL, CN, CO, CR, CU, CZ, DE, DK, DM, DO, DZ, EC, EE, EG, ES, FI, GB, GD, GE, GH, GM, GT, HN, HR, HU, ID, IL, IN, IR, IS, JP, KE, KG, KN, KP, KR, KZ, LA, LC, LK, LR, LS, LT, LU, LY, MA, MD, ME, MG, MK, MN, MW, MX, MY, MZ, NA, NG, NI, NO, NZ, OM, PA, PE, PG, PH, PL, PT, QA, RO, RS, RU, RW, SA, SC, SD, SE, SG, SK, SL, SM, ST, SV, SY, TH, TJ, TM, TN, TR, TT, TZ, UA, UG, US, UZ, VC, VN, ZA, ZM, ZW.

(84) Designated States *(unless otherwise indicated, for every kind of regional protection available)*: ARIPO (BW, GH, GM, KE, LR, LS, MW, MZ, NA, RW, SD, SL, SZ, TZ, UG, ZM, ZW), Eurasian (AM, AZ, BY, KG, KZ, RU, TJ, TM), European (AL, AT, BE, BG, CH, CY, CZ, DE, DK, EE, ES, FI, FR, GB, GR, HR, HU, IE, IS, IT, LT, LU, LV, MC, MK, MT, NL, NO, PL, PT, RO, RS, SE, SI, SK, SM, TR), OAPI (BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, KM, ML, MR, NE, SN, TD, TG).

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(54) Title: LOW ENERGY NUCLEAR THERMOELECTRIC SYSTEM

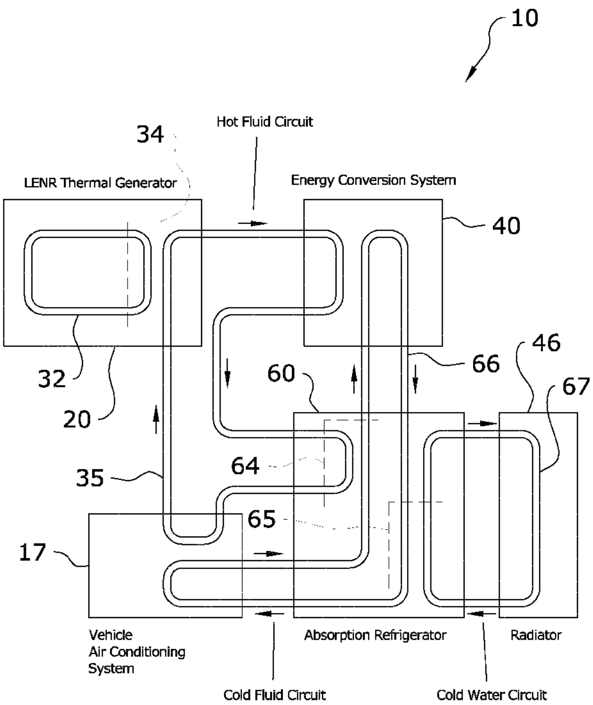

FIG. 1

(57) Abstract: A low energy nuclear thermoelectric system for a vehicle which provides a cost-effective and sustainable means of transportation for long operation range with zero emission using an onboard low energy nuclear reaction thermal generator. The present invention generally includes a thermal generator within a thermal enclosure case, an energy conversion system linked with the thermal generator, an energy storage system linked with the energy conversion system, a cooling system and a central control system. The thermal generator reacts nickel powder with hydrogen within a reactor chamber to produce heat. The heat is then transferred to the energy conversion system to be converted into electricity for storage in the energy storage system. The cooling system provides cooling for the various components of the present invention and the control system regulates its overall operation. The present invention may be utilized to power a vehicle in an efficient, sustainable and cost-effective manner.

WO 2014/146836 A2

Published:

— *without international search report and to be republished upon receipt of that report (Rule 48.2(g))*

LOW ENERGY NUCLEAR THERMOELECTRIC SYSTEM

Field of the Invention

The present invention relates generally to a low energy nuclear system and more specifically it relates to a low energy nuclear thermoelectric system for a vehicle which provides a cost-effective and sustainable means of transportation for long operation range with zero emission using an onboard low energy nuclear reaction thermal generator.

Description of the Related Art

Any discussion of the related art throughout the specification should in no way be considered as an admission that such related art is widely known or forms part of common general knowledge in the field.

The present invention relates to a system which utilizes thermal energy to power an electric vehicle, such as an electric car, electric motorbike, electric bus, electric train, electric boat, electric plane and the like. The market for electric vehicles has soared in recent years, with current estimates projecting over 5 million electric automobiles being sold each year by 2017.

Currently-produced electric vehicles are generally considered to be sustainable as they do not rely on fossil fuels which are in increasingly high demand in the world market. These electric vehicles are also considered environmentally safe as they do not generate any emissions such as greenhouse gasses.

However, even these sustainable electric vehicles currently being produced suffer from a number of shortcomings. Many of these vehicles are required to periodically be directly connected to the electric grid or require the usage of batteries for energy storage. When such batteries are utilized as the sole source of power, the range of the electric vehicle is severely limited by the storage capacity of the batteries and thus require repeated recharging. Increasing battery capacity, and thus vehicle range, increases both the price and the weight of the vehicle which, in many cases, can be suboptimal for different applications.

One solution to the problem of limited range of electric vehicles has been to develop a network of charging stations for use in recharging the battery systems on such vehicles. Another solution to increase range has been to use fuel cells instead of a large battery capacity. However, such systems often must rely on a complex hydrogen infrastructure and a network of hydrogen stations to provide points of delivery of hydrogen to refill the vehicles (much like gas stations). The necessary hydrogen infrastructure to support widely-used fuel cell vehicles is estimated to take several decades.

Another solution to the range problem with electric vehicles is to use directly sustainable energy such as solar energy to power the vehicles. Nonetheless, all of these solutions suffer many drawbacks compared to standard thermal engine vehicles, including range, usability, comfort and cost.

Because of the inherent problems with the related art, there is a need for a new and improved low energy nuclear thermoelectric system for a vehicle which provides a cost-effective and sustainable means of transportation for long operation range with zero emission using an onboard low energy nuclear reaction thermal generator.

Brief Summary of the Invention

The invention generally relates to a low energy nuclear thermoelectric system for a vehicle. In an aspect, the low energy nuclear thermoelectric system includes a thermal generator within a thermal enclosure case, an energy conversion system linked with the thermal generator, an energy storage system linked with the energy conversion system, a cooling system and a central control system.

In an aspect of the invention, the thermal generator reacts nickel powder with hydrogen within a reactor chamber to produce heat. The heat is then transferred to the energy conversion system to be converted into electricity for storage in the energy storage system. The cooling system provides cooling for the various components of the present invention and the control system regulates its overall operation. The present invention may be utilized to power a vehicle in an efficient, sustainable and cost-effective manner.

In an aspect, the invention relates to a vehicle comprising the low energy nuclear thermoelectric system of the invention.

There has thus been outlined, rather broadly, some of the features of the invention in order that the detailed description thereof may be better understood, and in order that the present contribution to the art may be better appreciated. There are additional features of the invention that will be described hereinafter and that will form the subject matter of the claims appended hereto. In this respect, before explaining at least one embodiment of the invention in detail, it is to be understood that the invention is not limited in its application to the details of construction or to the arrangements of the components set forth in the following description or illustrated in the drawings. The invention is capable of other embodiments and of being practiced and carried out in various ways. Also, it is to be understood that the phraseology and terminology employed herein are for the purpose of the description and should not be regarded as limiting.

Brief Description of the Drawings

Various other objects, features and attendant advantages of the present invention will become fully appreciated as the same becomes better understood when considered in conjunction with the accompanying drawings, in which like reference characters designate the same or similar parts throughout the several views, and wherein:

FIG. 1 is a first block diagram illustrating the overall components of a main embodiment of the present invention.

FIG. 2 is a second block diagram illustrating the overall components of a main embodiment of the present invention.

FIG. 3 is a block diagram illustrating a cross-sectional view of an exemplary thermal generator for use with the present invention.

FIG. 4 is a block diagram illustrating the thermal generator and energy conversion systems of the present invention.

FIG. 5 is a block diagram illustrating a cooling system based on an absorption refrigerator.

FIG. 6a is a top internal view of the various components of the present invention in use with an electrical automobile.

FIG. 6b is a side internal view of the various components of the present invention in use with an electrical automobile.

FIG. 7 is a side internal view of the various components of the present invention in use with an electrical aircraft.

FIG. 8 is a block diagram illustrating an alternate embodiment of the present invention which utilizes a supercritical carbon dioxide turbogenerator.

Detailed Description of the Invention

A. Overview.

Turning now descriptively to the drawings, in which similar reference characters denote similar elements throughout the several views, FIGS. 1 through 7 illustrate a low energy nuclear thermoelectric system **10**, which comprises a thermal generator **20** within a thermal enclosure case **30**, an energy conversion system **40** linked with the thermal generator **20**, an energy storage system **50** linked with the energy conversion system **40**, a cooling system **60** and a central control system **70**. The thermal generator **20** reacts nickel powder **23** with hydrogen within a reactor chamber **22** to produce heat. The heat is then transferred to the energy conversion system **40** to be converted into electricity for storage in the energy storage system **50**. The cooling system **60** provides cooling for the various components of the present invention and the control system **70** regulates its overall operation.

FIGS. 1 and 2 show block diagrams illustrating the overall structure and operation of the present invention. As seen in FIG. 1, the present invention comprises a thermal generator **20** having an internal fluid loop **32** driven by an internal hydraulic system **33**. A hot fluid circuit **35** transfers heat from the thermal generator **20** to an energy conversion system **40**, where heat is converted into energy and through a cooling system **60** before returning to the thermal generator **20**. A cooling circuit **66** transfers through the energy conversion system **40**, cooling system **60** and, optionally, through the vehicle's **16** A/C system **17**. A cooling transfer circuit **67** also connects the cooling system **60** with a separate radiator **46**. By utilizing low energy nuclear thermoelectric generation of the thermal generator **20**, the present invention may be utilized to power a vehicle in an efficient, sustainable and cost-effective manner.

B. Thermal Generator.

The present invention utilizes a thermal generator **20** to produce power to be converted within the energy conversion system **40** and stored for use in the energy storage system **50**. An exemplary thermal generator **20** is shown in FIG. 3. It is appreciated that this is merely an exemplary embodiment and it should thus be appreciated that various other embodiments may be utilized with the present invention. Thus, the configuration of the exemplary thermal generator **20** shown in the figures should not be construed as limiting the scope of the present invention thereto.

A wide range of thermal generators **20** may be utilized with the present invention. One such thermal generator **20** is disclosed within U.S. Patent Publication No. 2011/0005506 covering a "Method and Apparatus for Carrying out Nickel and Hydrogen Exothermal Reaction", which is hereby incorporated by reference. Another such thermal generator **20** is disclosed within U.S. Patent Publication No. 2011/0249783 covering a "Method for Producing Energy and Apparatus Therefor", which is hereby incorporated by reference.

As shown in FIG. 3, the thermal generator **20** generally comprises a reactor chamber **22** storing a quantity of a reactant such a nickel powder **23** which is used as a main fuel of the reaction. A hydrogen storage tank **24** is provided such that the stored hydrogen may be injected into the reactor chamber **22** via a hydrogen injector **27**. A gas pressurizer **25** is provided which is capable of pressurizing the hydrogen into the nickel powder **23** to enable and control the reaction. A heater **28** and radio frequency generator **29**, such as a microwave generator **29**, are also provided for initiating and controlling the reaction.

The thermal generator **20** utilizes low energy nuclear reactions to produce heat for use in producing energy. The heat is produced based on the transmutation reactions of non-radioactive isotopes of the nickel powder **23** with gaseous hydrogen, which results in stable copper and non-radioactive copper isotopes. Thus, the present invention does not require use of any radioactive fuel and produces no radioactive byproducts.

The thermal generator **20** is preferably encased within a thermal enclosure case **30** as shown in FIG. 3. A high density shield **31** is included within the case **30** which encloses the various components of the thermal generator **20** for safety purposes. The shield **31** is preferably comprised of a material capable of blocking any gamma rays emitted by the transmutations, as well as any inert gasses used for safety reasons.

The thermal generator **20** is generally comprised of a reactor chamber **22**. The reactor chamber **22** is adapted to store a quantity of nickel powder **23** comprised of small particles of nickel **23**. A hydrogen storage tank **24** is connected to the reactor chamber **22** via an injector **27** having a valve **26** therein. The hydrogen storage tank **24** stores hydrogen gas either in a pressurized form, such as within a bottle, or in a solid state such as in the form of magnesium hydride.

A gas pressurizer **25** controls the pressure and quantity of the hydrogen injected through the injector **27** into the reactor chamber **22** through use of a valve **26**. Such a configuration allows for regulation of the activation and the quantity of transmutation reactions, thus allowing control of the amount of heat energy produced from the reactions within the chamber **22**.

A heater **28**, preferably comprised of an electric heater **28** is utilized in combination with a radio frequency generator **29** to initiate the reaction by increasing the temperature within the chamber **22** during the generator starting phase and to assist with regulating the amount of heat produced therein.

A control unit **37** is provided for specifically controlling the various components of the thermal generator **20** and thus its overall operation. The control unit **37** is preferably adapted to control the hydrogen input flow through the injector **27** (such as by control of the valve **26**) as well as the radio frequency generator **29**. The control unit **37** is also preferably adapted to measure the kernel **21** temperature through usage of an integrated temperature sensor **38**.

Heat from the thermal generator **20** is transferred to the energy conversion system **40** of the present invention through usage of an internal fluid loop **32** powered by an internal hydraulic system **33**, a heat exchanger **34** and an external fluid loop **35** powered by an external hydraulic system **36**. The internal fluid loop **32** is comprised of a closed-cycle coolant fluid loop fully enclosed within the thermal enclosure case **30**. The internal fluid loop **32** traverses through the casing of the reactor chamber **22** such that heat from the thermal reactions therein is transferred to the cooling fluid therein.

The heated cooling fluid is transferred within the internal fluid loop **32** through a heat exchanger **34** which is positioned within the enclosure case **30** as shown in FIG. 3. The heat exchanger **34** transfers the heat to the external fluid loop **35**, comprised of a hot fluid circuit **35**, to heat working fluid therein for conversion within the energy conversion system **40**. Because all operations of the thermal generator **20** are worked in closed cycles, no emissions of any sort are produced other than negligible levels of gamma radiation which is on the same order of magnitude of natural background radiation.

It is appreciated that, in some embodiments, the thermal generator **20** and energy conversion system **40**, which is described in more detail below, may be integrated into a single assembly wherein the heat from the thermal generator **20** is directly transferred to the energy conversion system **40** without need of any working or cooling fluids.

C. Energy Conversion System.

The present invention utilizes an energy conversion system **40** to convert the heat generated from the thermal generator **20** to energy. The energy conversion system **40** may be comprised of various configurations, such as a thermoelectric converter working in a closed cycle to transform the heat produced by the thermal generator **20** into electricity that can be stored in an energy storage system **50**. In other embodiments, the energy conversion system **40** may be comprised of a thermo-kinetic converter which works in a closed cycle to transform the heat produced from the thermal generator into rotational motion that can be stored in the energy storage system **50**.

The energy conversion system **40** of the present invention will generally comprise at least one Stirling engine **41** for producing linear motion from heat, at least one single-action piston compressor **42** or blower increasing the pressure of a working fluid from the linear motion of the Stirling engine **41**, a turbine **48** producing a rotation motion from the pressurized fluid and a rotary electric generator **49** producing electricity from the turbine **48** rotation.

In a preferred embodiment as shown in FIG. 4, the energy conversion system **40** is comprised of a first Stirling engine **41**a and a second Stirling engine **41**b which are configured as dynamically balanced and opposed pairs to reduce vibrations and noise. The Stirling engines **41**(a,b) receive heated working fluid from the external fluid loop **35** of the thermal enclosure case **30** which is driven by the external hydraulic system **36**.

A first compressor **42**a is connected to the first Stirling engine **41**a and a second compressor **42**b is connected to the second Stirling engine **41**b as shown in FIG. 4. The compressors **42** are preferably comprised of single-acting piston compressors or blowers which are coupled to a turbogenerator **47** which itself includes a turbine **48** and rotary generator **49**.

Heat from the thermal generator **20**, transferred via the hot fluid circuit **35**, powers each of the Stirling engines **41** by maintaining the expansion cylinder of both engines at a high temperature, while cooling fluid is transferred to the engines **41** via a cold hydraulic system **45** to maintain each compression cylinder at low temperature.

Stirling engines **41** are well known in the art and various configurations of the same known to be efficient in usage may be utilized with the present invention. Preferably, each Stirling engine **41** is comprised of a conventional, displacer type, free-piston engine **41** wherein a power piston drives a single-action piston compressor **42**. The Stirling engines **41**, compressors **42** and turbogenerator **47** all utilize the same working fluid, typically comprised of helium gas. The hydraulic systems **36**, **45** regulate and control the temperature of the operation, and thus the efficiency of the energy conversion.

A radiator **46** is linked with the external hydraulic system **36** to evacuate all the remaining unused heat outside the electric vehicle. All operations of the energy conversion system are worked in a closed cycle to thus prevent any emissions of any type.

Multiple alternate embodiments have been considered by the inventor hereof with regard to the energy conversion system **40**. For example, in one such alternate embodiment, the energy conversion system **40** could be comprised of a free-piston Stirling engine **41** producing linear motion from heat and a linear alternator producing electricity from the linear motion of the Stirling engine **41**.

In another embodiment, the energy conversion system **40** may be comprised of a thermo-kinetic converter working in a closed cycle to transform heat produced by the thermal generator **20** into kinetic energy for storage in the energy storage system **50**. Such a configuration would be comprised of a Stirling engine **41**, a single compressor **42** increasing the pressure of a working fluid from the linear motion of the engine **41** and a turbine **48** producing a rotational motion from the pressurized fluid such that kinetic energy may be stored in a flywheel energy storage system **50**.

In yet another embodiment, the energy conversion system **40** may be comprised of a steam turbogenerator including an evaporator transforming liquid water into high pressure steam using heat from working fluid, a turbine **48** producing a rotational motion from the high pressure steam, a rotary electric generator **49** producing electricity from the turbine rotation and a condenser using the cooling fluid to transform low pressure team exiting the turbine **48** back into liquid water to start the cycle back into the evaporator. Alternatively, the steam and liquid water may be replaced by supercritical carbon dioxide as working fluid as shown in FIG. 8.

In another alternate embodiment, the energy conversion system **40** may be comprised of a thermoelectric converter comprised of a waste heat Rankine cycle steam engine working in a closed cycle, such as is commonly known as a “Schoell Cycle” engine, which converts heat into a rotation motion which can be stored into the energy storage system **50** or converted into electricity.

Another alternate embodiment utilizes a thermoelectric converter comprised of a thermopile assembly using the “Seebeck” or “Peltier” effect to convert temperature differences between the heated transfer fluid and the cooling fluid into electric voltage.

A final alternate embodiment utilizes a Johnson thermoelectric energy converter comprised of a solid-state heat engine which relies on photodecomposition and recombination of hydrogen in a fuel cell using an approximate Ericsson cycle, thus producing electricity from heat.

D. Energy Storage System.

The present invention utilizes an energy storage system **50** to store the energy produced by the energy conversion system **40**. Various types of energy storage systems **50** may be utilized with the present invention, including electric batteries, fly-wheel kinetic energy storage systems or combinations thereof.

In a preferred embodiment, the energy storage system **50** is comprised of an assembly of electric batteries adapted to store electricity produced by the conversion system **40**. The working temperature of the batteries may be monitored with a thermometer and regulated with a battery temperature system which utilizes heat from heated working fluid and cooling from cooling fluid produced by the thermal generator **20** and cooling system **60**, respectively.

E. Cooling System.

FIG. 5 illustrates an exemplary embodiment of a cooling system **60** for use with the present invention. The cooling system **60** is preferably comprised of an absorption refrigerator which is used to produce useful cooling from the extra heat of the thermal generator **20** to improve the efficiency of the energy conversion system **40** and to provide a cooling source for regulation of temperature of the energy storage system **50** and, in some cases, an air conditioning system for the vehicle.

The cooling system **60** generally includes an evaporator **61** in which refrigerant fluid evaporates within a low partial pressure environment, thus extracting heat from its surroundings and refrigerating the cooling fluid. The gaseous refrigerant fluid is absorbed and dissolved into a liquid absorbing solution within an absorber **62**, thus reducing its partial pressure within the evaporator **61** and allowing more liquid refrigerant fluid to evaporate.

The liquid absorbent solution is transferred via a pump **63** to a heat exchange boiler **64** where it is heated, causing the dissolved refrigerant fluid to evaporate out as shown in FIG. 5. The evaporated fluid is then condensed through a condenser **65** using cooling water to replenish the supply of liquid refrigerant fluid in the evaporator. The cooling system **60** utilizes both a cooling circuit **66** and cooling transfer circuit **67** to transfer fluid, and thus heat and cooling, into and out of the cooling system **60**.

In an alternate embodiment, the cooling system **60** may be comprised of a passive or active water-air radiator. In the active embodiment, an electric fan may be used to improve the cooling performance of the cooling system **60**.

In another alternate embodiment, the cooling system **60** may be comprised of a passive or active heat sink based on a heat exchanger using air or water available outside the electric vehicle as a cooling source.

F. Central Control System.

The present invention includes a central cooling system **70** for regulating the overall operation of the entire system **10**. The control system **70** is capable of turning on the thermal generator **20** when the vehicle is being run or when the storage system **50** is below its maximum storage capacity. The control system **70** is also adapted to turn off the thermal generator **20** when the energy storage system **50** has reached its maximum storage capacity.

The control system **70** may be comprised of various embodiments. It will preferably be adapted to send commands to the thermal generator's **20** control unit **37** to turn on/off the thermal generator **20** to regulate the amount of produced heat. It will further be adapted to control the hydraulic systems **33**, **36**, **45** to organize the flows of heat transfer and cooling fluids throughout the present invention.

The control system **70** will also act to interact with the temperature regulation systems, such as that of the energy storage system **50**, to increase or decrease battery temperature on demand. Finally, the control system **70** will interact with the air conditioning system of the vehicle to increase or decrease the air temperature within the vehicle.

G. Vehicles.

The present invention may be utilized with a wide range of types of vehicles **16**, such as busses, trucks, boats, trains, airplanes, helicopters, other aircraft and the like. The present invention is preferably adapted for use with an electric automobile **16**, which hallows an extended operational range of several thousand miles per refueling. The weight of the vehicle **16** may be reduced by reducing the size and capacity of the batteries **19** needed to achieve the desired range, thus improving maneuverability and the relative performance of the vehicle. FIGS. 6a and 6b illustrate an exemplary embodiment of the present invention in use within an automobile. FIG. 7 illustrates an exemplary embodiment of the present invention in use within an aircraft.

The vehicle **16** will be designed to store the thermal generator **20**, energy conversion system **40**, energy storage system **50**, cooling system **60** and central control system **70** within its cargo area. The present invention may be utilized to drive the vehicle's **16** electric motor **18** and to provide energy to be stored in the vehicle's **16** electric battery **19**.

The present invention may also be utilized to increase efficiency of the vehicle's **16** air conditioning system **17** and/or regulate the temperature of the vehicle's **16** electric batteries **19**. By utilizing excess heat generated by the thermal generator **20** in combination with extra cooling fluid, the temperature of the electric batteries **19** and/or air conditioning system **17** of the vehicle **16** may be regulated, often in combination with the central control system **70**. Significant drawbacks to the operation of electric vehicles **16** may thus be reduced or eliminated entirely.

H. Operation of Alternate Embodiment.

FIG. 8 illustrates an alternate embodiment of the present invention in which a supercritical carbon dioxide turbogenerator **80** working as a closed Brayton cycle is utilized for the energy conversion functionality of the present invention. The Brayton cycle is well known in the art as a thermodynamic cycle used in connection with heat engines and closed-cycle gas turbines.

In the alternate embodiment of the present invention, the turbogenerator **80** is thermally linked with the thermal generator **20** of the present invention via a hot fluid circuit **35**, **88** which, in combination with a heat exchanger **34**, **87**, transfers heat from the thermal generator **20** to the turbogenerator **80** to be converted to energy.

Various types of turbogenerators **80** may be utilized. A preferred embodiment is shown in FIG. 8, which comprises a pump **81**, a recuperator **82**, a turbine **86** and a condenser **83** all linked via the same hot fluid circuit **88** which is itself thermally linked via a heat exchanger **87** with the thermal generator **20** of the present invention. The pump **81** acts to force the supercritical fluid through the circuit **88**.

The recuperator **82** is utilized to pre-heat the fluid before it enters the heat exchanger **34**, **87** with the thermal generator **20**. The recuperator **82** also pre-cools the fluid before it enters the condenser **83**, which is linked via a cooling circuit **89** with a cooling water supply and cooling water return.

A gear **85** and generator **84** are connected to the turbine **86** to produce energy which may then be transferred to the energy storage system **50**, electric motor **18**, electric battery **19** and/or as supplemental power for the thermal generator **20**.

Unless otherwise defined, all technical and scientific terms used herein have the same meaning as commonly understood by one of ordinary skill in the art to which this invention belongs. Although methods and materials similar to or equivalent to those described herein can be used in the practice or testing of the present invention, suitable methods and materials are described above. All publications, patent applications, patents, and other references mentioned herein are incorporated by reference in their entirety to the extent allowed by applicable law and regulations. In case of conflict, the present specification, including definitions, will control. The present invention may be embodied in other specific forms without departing from the spirit or essential attributes thereof, and it is therefore desired that the present embodiment be considered in all respects as illustrative and not restrictive. Any headings utilized within the description are for convenience only and have no legal or limiting effect.

Table 1: Index of Elements for Low Energy Nuclear Thermoelectric System

10. Low Energy Nuclear Thermoelectric	**50. Energy Storage System**
11. Liquid Refrigerant	51.
12. Cooling Fluid	52.
13.	53.
14.	54.
15. Electrical Conduit	55.
16. Vehicle	56.
17. A/C System	57.
18. Electric Motor	58.
19. Electric Battery	59.
20. Thermal Generator	**60. Cooling System**
21. Reactor Core	61. Evaporator
22. Reactor Chamber	62. Absorber
23. Nickel Powder	63. Pump
24. Hydrogen Storage Tank	64. Boiler
25. Gas Pressurizer	65. Condensor
26. Valve	66. Cooling Circuit
27. Hydrogen Injector	67. Cooling Transfer
28. Heater	68.
29. Radio Frequency Generator	69.

30. Thermal Enclosure Case
31. High Density Shield
32. Internal Fluid Loop
33. Internal Hydraulic System
34. Heat Exchanger
35. Hot Fluid Circuit
36. External Hydraulic System
37. Control Unit
38. Temperature Sensor
39.

40. Energy Conversion System
41. Stirling Engines (a,b)
42. Compressors (a,b)
43.
44. Cold Fluid Circuit
45. Cold Hydraulic System
46. Radiator
47. Turbogenerator
48. Turbine
49. Rotary Generator

70. Central Control System
71.
72.
73.
74.
75.
76.
77.
78.
79.

80.CO2 Turbogenerator
81.Pump
82.Recuperator
83.Condenser
84.Generator
85.Gear
86.Turbine
87.Heat Exchanger
88.Hot Fluid Circuit
89.Cooling Circuit

Claims

1. A low energy nuclear thermoelectric system for a vehicle, comprising:

a thermal generator adapted to produce heat through a low energy nuclear reaction;

an energy conversion system adapted to convert heat generated by said thermal generator into electricity;

a hot fluid circuit for transferring heat from said thermal generator to said energy conversion system;

an energy storage system for storing said electricity for powering said vehicle;

a cooling system for cooling said energy conversion system and said energy storage system; and

a central control system.

2. The low energy nuclear thermoelectric system for a vehicle of Claim 1, wherein said low energy nuclear reaction comprises a reaction of nickel powder with hydrogen.

3. The low energy nuclear thermoelectric system for a vehicle of Claim 1 or Claim 2, wherein said thermal generator comprises a reactor chamber, a hydrogen storage tank and a hydrogen injector linking said reactor chamber with said hydrogen storage tank.

4. The low energy nuclear thermoelectric system for a vehicle of Claim 3, wherein said thermal generator comprises a gas pressurizer connected between said hydrogen storage tank and said hydrogen injector.

5. The low energy nuclear thermoelectric system for a vehicle of any one of the preceding claims, wherein said thermal generator comprises a heater and a radio frequency generator.

6. The low energy nuclear thermoelectric system for a vehicle of any one of the preceding claims, wherein said energy conversion system comprises a supercritical carbon dioxide turbogenerator adapted to operate on a Brayton cycle.

7. The low energy nuclear thermoelectric system for a vehicle of any one of the preceding claims, wherein said energy conversion system comprises a steam turbine and an alternator adapted to convert heat into energy based on a Rankine cycle.

8. The low energy nuclear thermoelectric system for a vehicle of any one of the preceding claims, wherein said energy conversion system comprises a thermoelectric generator adapted to convert heat into energy based on a Seebeck effect.

9. The low energy nuclear thermoelectric system for a vehicle of any one of the preceding claims, further comprising a cooling circuit linked between said energy conversion system and said cooling system.

10. A low energy nuclear thermoelectric system for a vehicle, comprising:

a thermal generator adapted to produce heat through a low energy nuclear reaction;

an energy conversion system adapted to convert heat generated by said thermal generator into electricity, said energy conversion system being comprised of at least one heat engine for producing linear motion from heat, at least one compressor for increasing the pressure of a working fluid, a turbine and a rotary electric generator;

an energy storage system for storing said electricity for powering said vehicle;

a cooling system for cooling said energy conversion system and said energy storage system; and

a central control system.

11. The low energy nuclear thermoelectric system for a vehicle of Claim 10, wherein said at least one heat engine comprises a first Stirling engine and a second Stirling engine.

12. The low energy nuclear thermoelectric system for a vehicle of Claim 10 or Claim 11, wherein said at least one compressor comprises a first single-action piston compressor and a second single-action piston compressor.

13. The low energy nuclear thermoelectric system for a vehicle of Claim 12, wherein said first single-action piston compressor comprises said first Stirling engine and wherein said second single-action piston compressor is connected to said second Stirling engine.

14. The low energy nuclear thermoelectric system for a vehicle of any one of Claims 11-13, further comprising a hot fluid circuit connecting said thermal generator with said first Stirling engine and said second Stirling engine.

15. The low energy nuclear thermoelectric system for a vehicle of any one of Claims 10 to 14, wherein said at least one heat engine is selected from the group consisting of a Stirling generator comprising a Stirling engine and a linear alternator and a free-piston Stirling engine.

16. The low energy nuclear thermoelectric system for a vehicle of any one of Claims 10 to 15, wherein said thermal generator comprises a reactor chamber, a hydrogen storage tank and a hydrogen injector linking said reactor chamber with said hydrogen storage tank.

17. The low energy nuclear thermoelectric system for a vehicle of Claim 16, wherein said thermal generator further comprises a gas pressurizer connected between said hydrogen storage tank and said hydrogen injector and wherein said thermal generator further comprises a heater and a radio frequency generator.

18. The low energy nuclear thermoelectric system for a vehicle of any one of Claims 10 to 17, further comprising a cooling circuit linked between said energy conversion system and said cooling system.

19. A low energy nuclear thermoelectric system for a vehicle, comprising:

a vehicle, wherein said vehicle includes one or more electric batteries and wherein said vehicle includes an air conditioning system;

a thermal generator adapted to produce heat through a reaction of nickel powder with hydrogen, wherein said thermal generator is comprised of a reactor chamber, a hydrogen storage tank and a hydrogen injector linking said reactor chamber with said hydrogen storage tank, wherein said thermal generator is further comprised of a gas pressurizer connected between said hydrogen storage tank and said hydrogen injector, wherein said thermal generator is further comprised of a heater and a radio frequency generator, wherein said thermal generator is encased within a thermal enclosure case, said thermal enclosure case including a high density shield, wherein said thermal generator includes an internal fluid loop for transferring heat within said thermal generator;

a central control system;

an energy conversion system adapted to convert heat generated by said thermal generator into electricity, said energy conversion system being comprised of a first Stirling engine and a second Stirling engine for producing linear motion from heat, a first single-action piston compressor and a second single-action piston compressor for increasing the pressure of a working fluid, a turbine and a rotary electric generator, wherein said first single-action piston compressor is connected to said first Stirling engine and wherein said second single-action piston compressor is connected to said second Stirling engine;

a hot fluid circuit for transferring heat from said thermal generator to said energy conversion system;

an energy storage system for storing said electricity for powering said vehicle;

a cooling system for cooling said energy conversion system and said energy storage system; and

a cooling circuit linked between said energy conversion system and said cooling system;

wherein said thermal generator is thermally linked with said air conditioning system, wherein said cooling circuit is thermally linked with said air conditioning system and wherein said central control system is adapted to direct transfer of at least a first portion of said heat produced by said thermal generator to said air conditioning system for providing hot air to said air conditioning system;

wherein said thermal generator is thermally linked with said one or more electric batteries, wherein said cooling circuit is thermally linked with said one or more electric batteries, wherein said central control system is adapted to condition a temperature of said one or more electric batteries using at least a second portion of said heat produced by said thermal generator and at least a portion of a cooling fluid of said cooling circuit to regulate said temperature of said one or more electric batteries..

20. The low energy nuclear thermoelectric system for a vehicle of Claim 19, wherein said vehicle is selected from the group consisting of an electric automobile, an electric airplane, an electric boat and an electric train.

21. A vehicle comprising the low energy nuclear thermoelectric system of any one of claims 1-20.

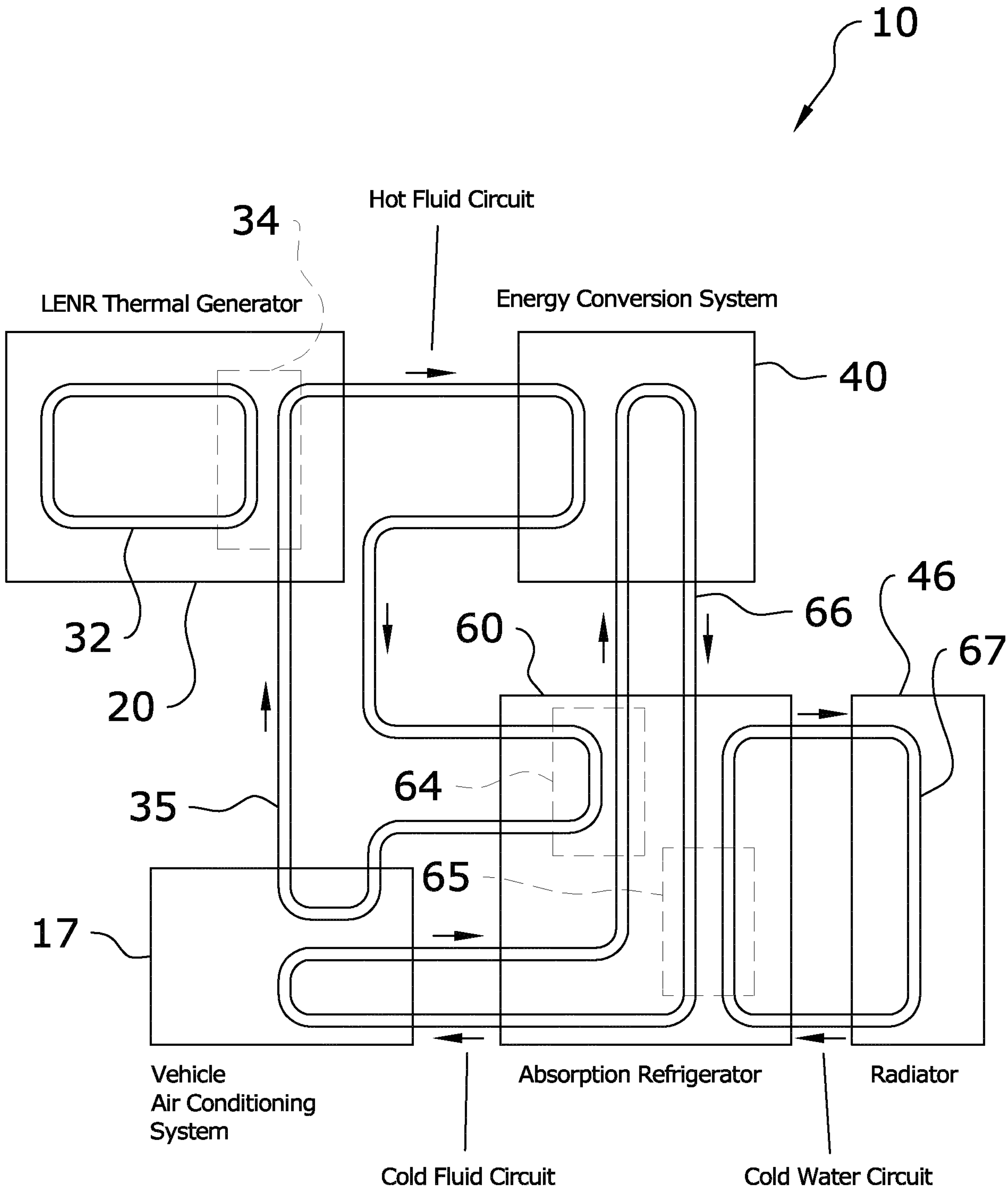
10
34
Hot Fluid Circuit
LENR Thermal Generator
Energy Conversion System
40
32
20
60
66
46
67
35
64
65
17
Vehicle
Air Conditioning
System
Absorption Refrigerator
Radiator
Cold Fluid Circuit
Cold Water Circuit

FIG. 1

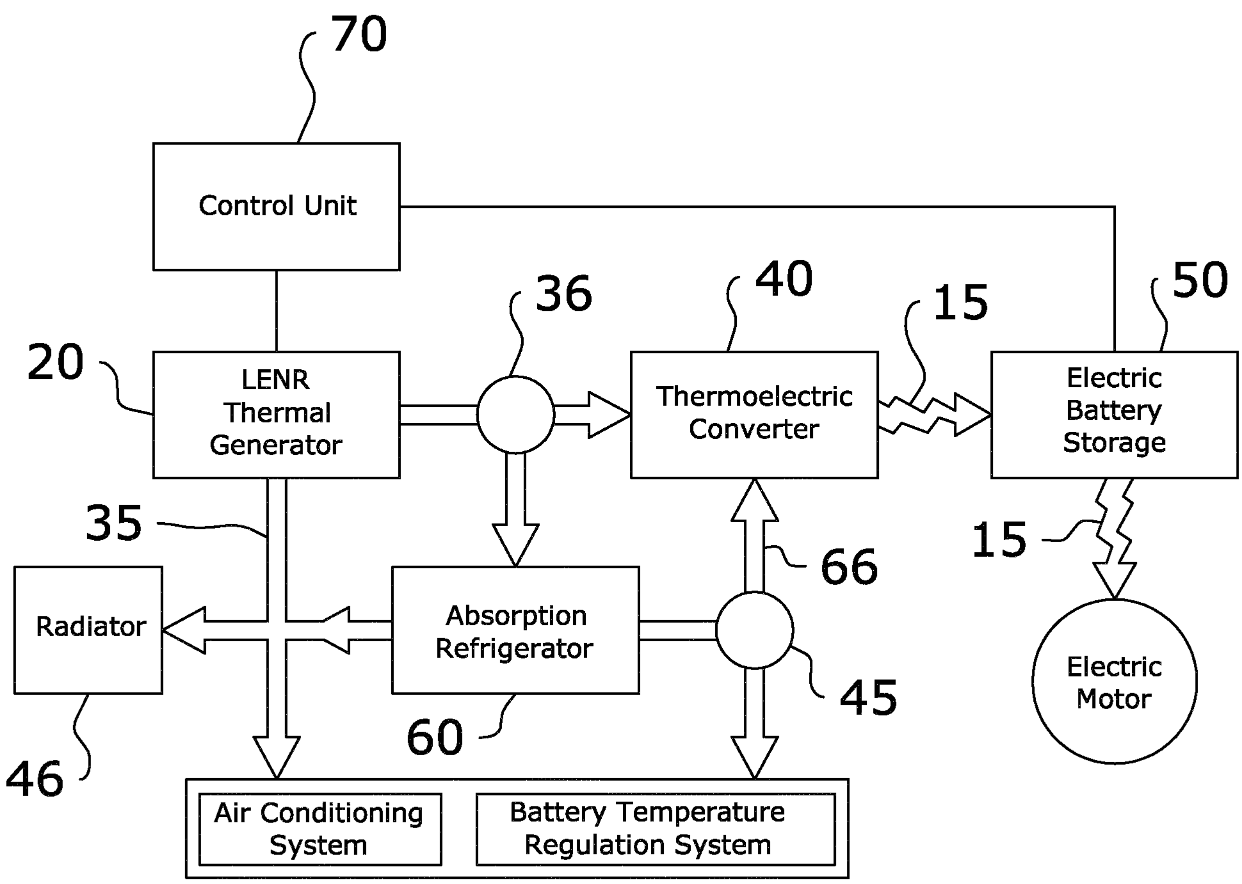
70
Control Unit
36
40
15
50
20
LENR Thermal Generator
Thermoelectric Converter
Electric Battery Storage
35
15
66
Radiator
Absorption Refrigerator
45
Electric Motor
60
46
Air Conditioning System
Battery Temperature Regulation System

FIG. 2

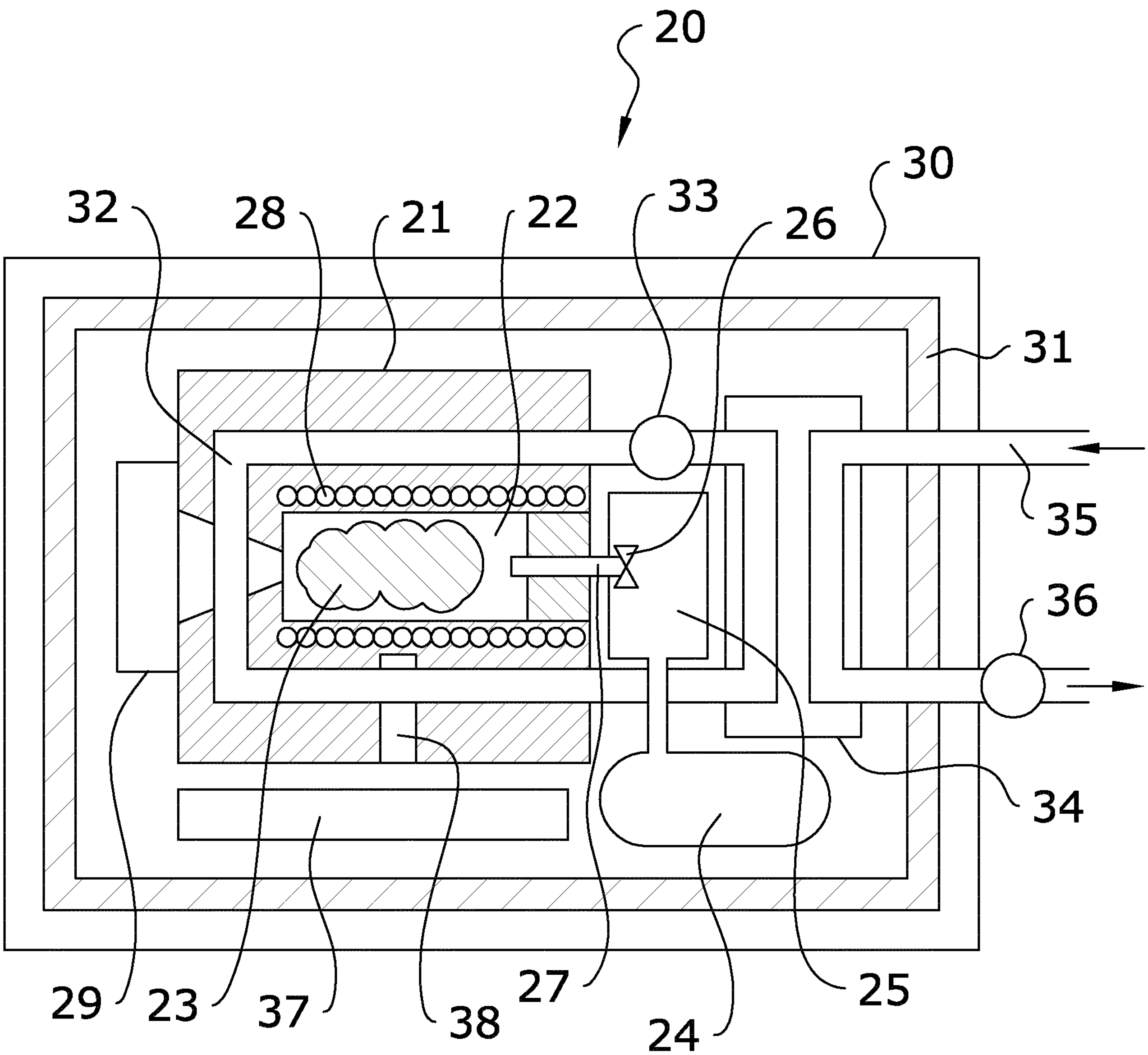

FIG. 3

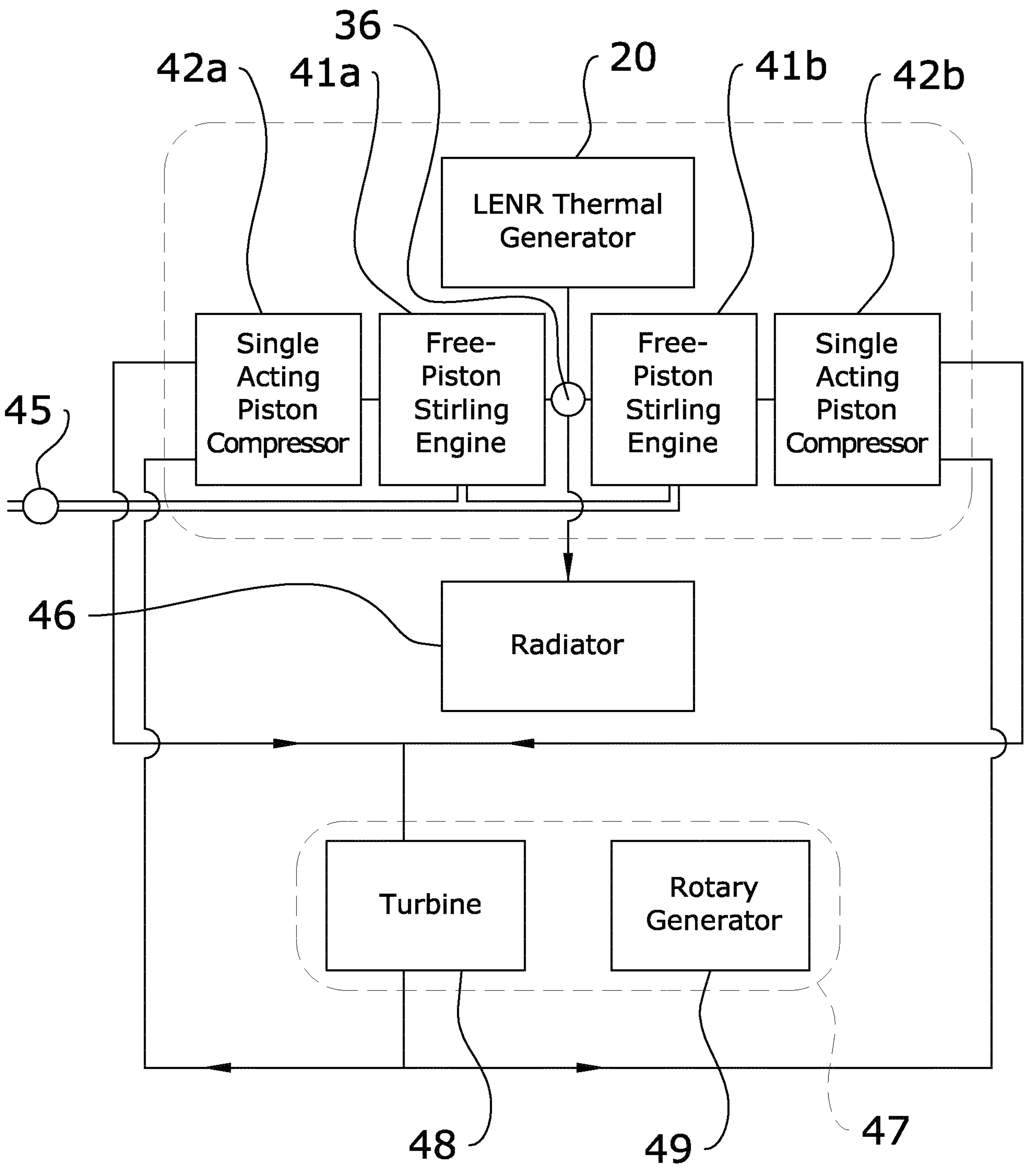
36
42a
41a
20
41b
42b
LENR Thermal Generator
Single Acting Piston Compressor
Free-Piston Stirling Engine
Free-Piston Stirling Engine
Single Acting Piston Compressor
45
46
Radiator
Turbine
Rotary Generator
48
49
47

FIG. 4

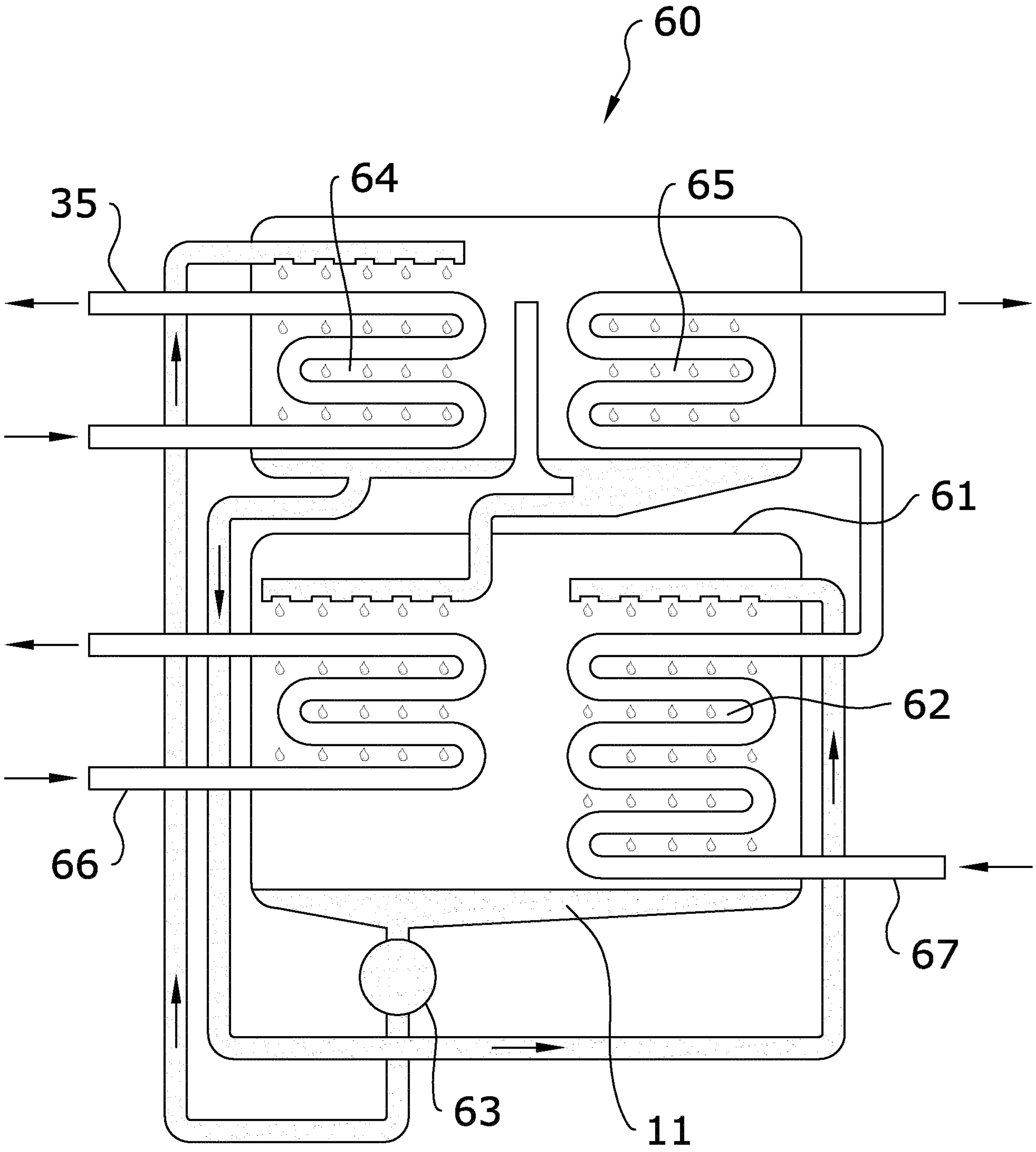

FIG. 5

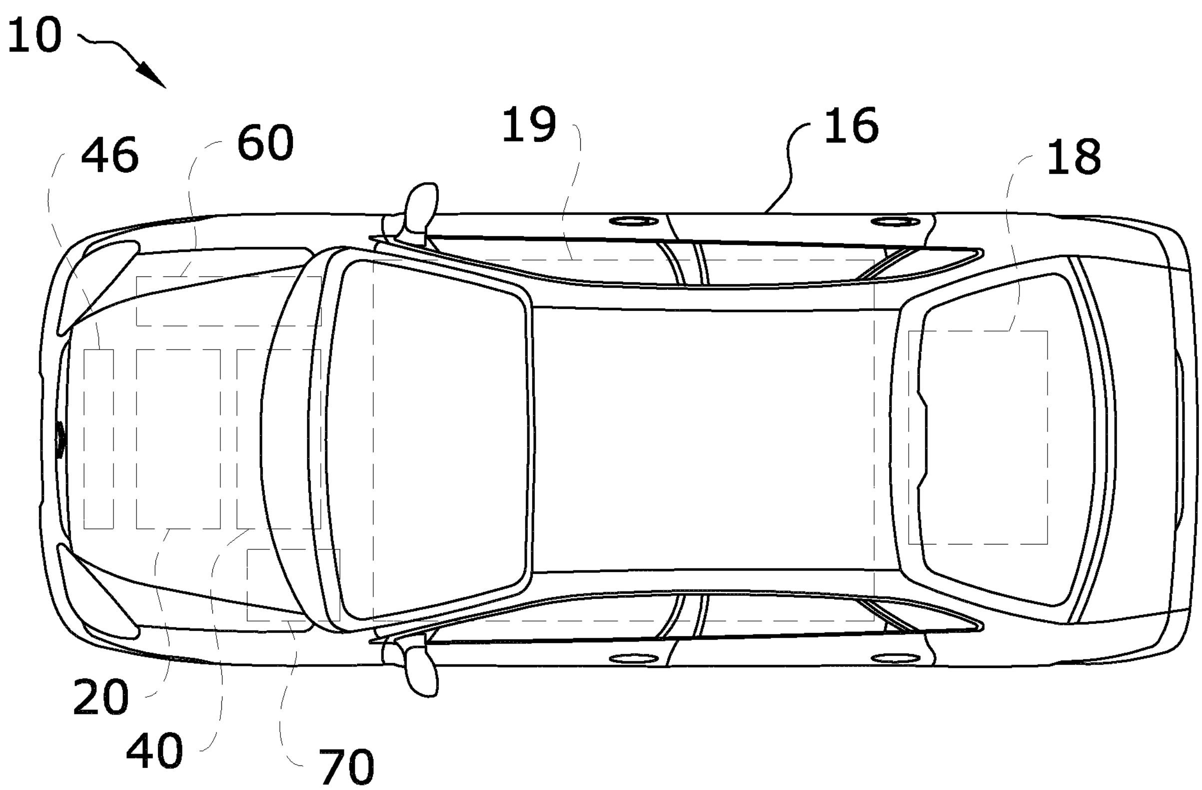

FIG. 6a

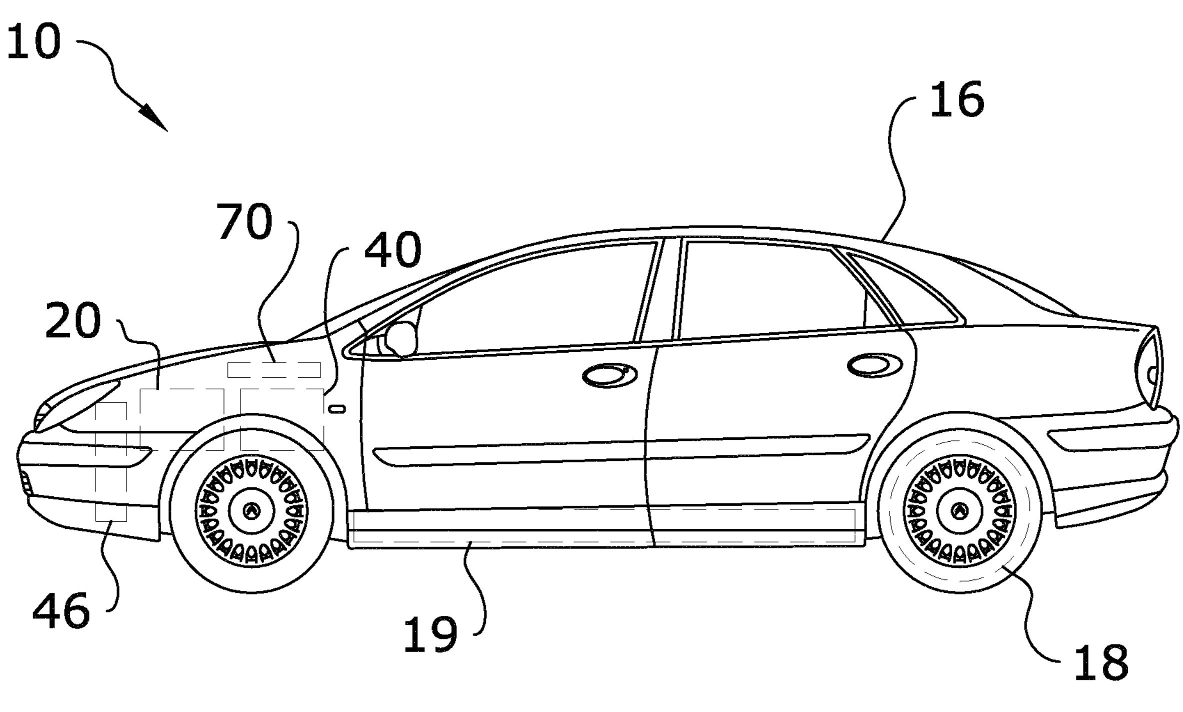

FIG. 6b

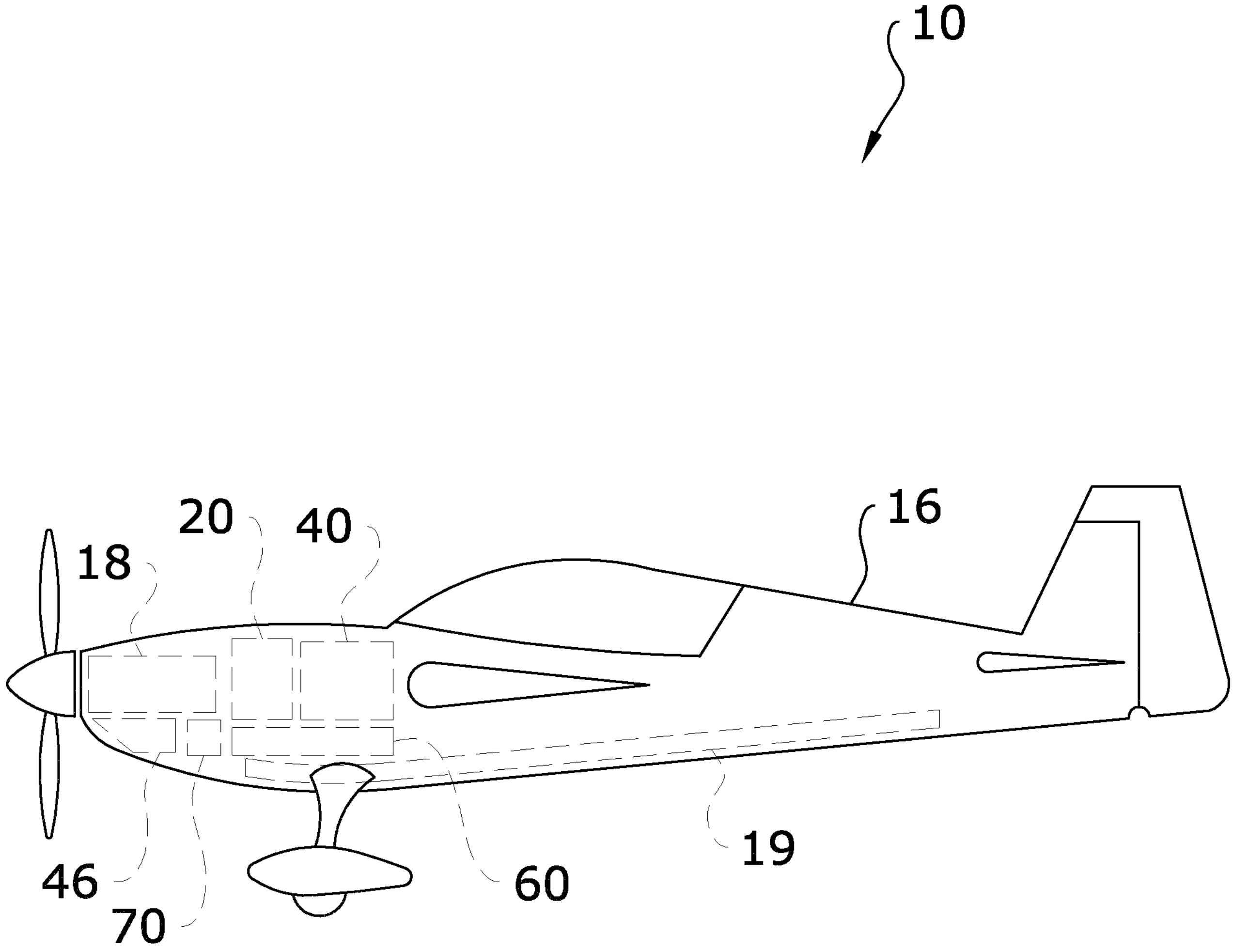

FIG. 7

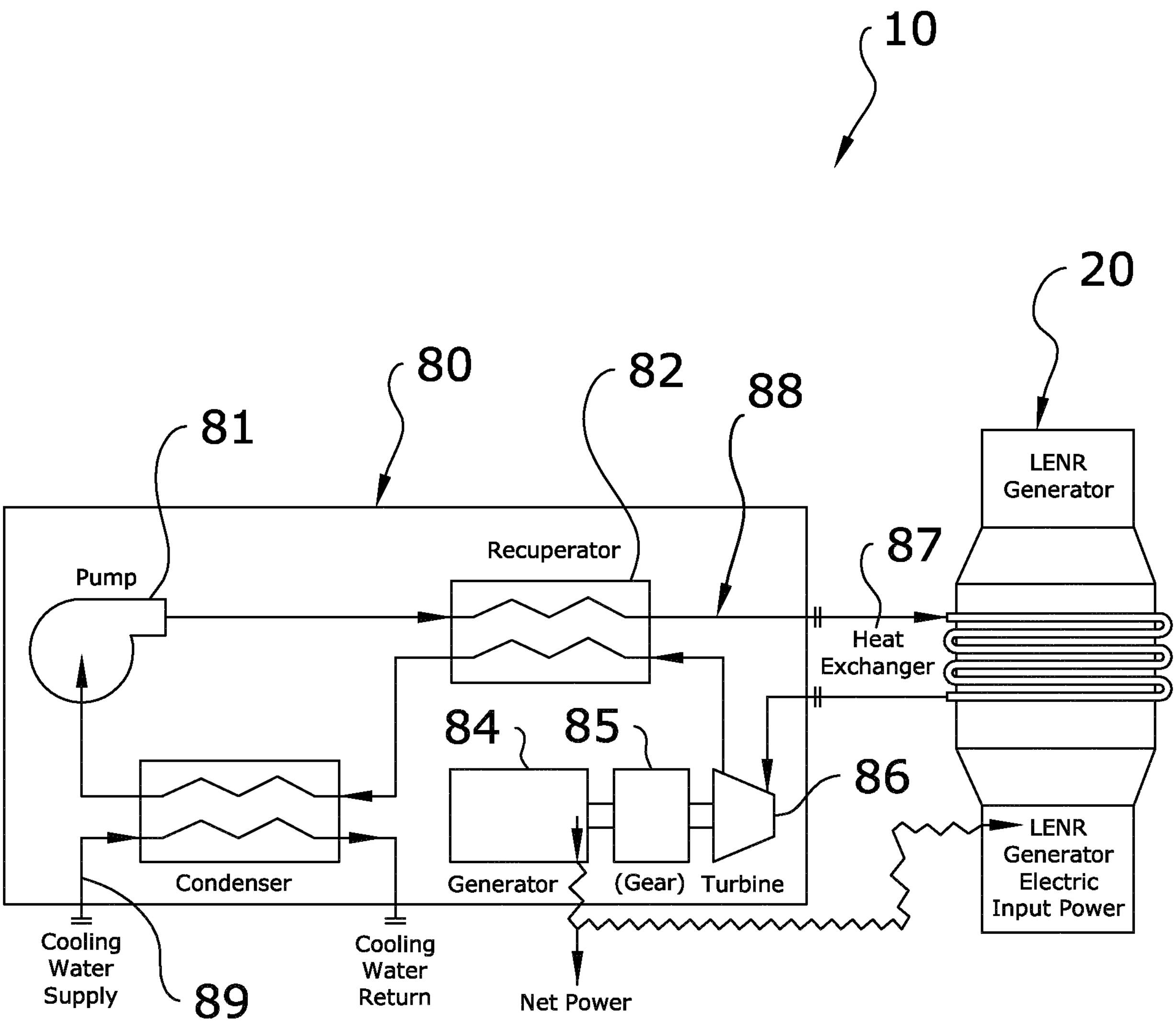
10
20
80
82
88
81
LENR
Generator
87
Recuperator
Pump
Heat
Exchanger
84
85
86
LENR
Generator
Electric
Input Power
Condenser
Generator
(Gear)
Turbine
Cooling
Water
Supply
Cooling
Water
Return
89
Net Power

FIG. 8