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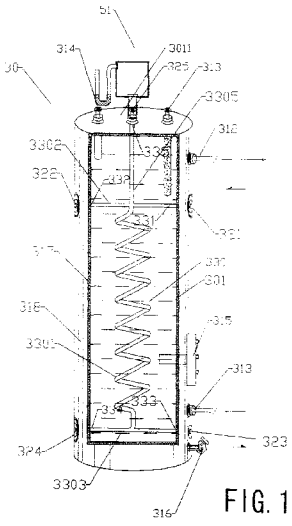

FIG. 1

(57) Abstract: A fluid heating and storage tank with interior-installed heat exchanger is provided. The tank includes two couples of inlets and outlets for second fluid, which is a liquid. The tank further includes at least one breathing port, which connected to the heat exchanger and one apparatus for condensing and reclaiming of the liquid vapor is mounted at the breathing port. A heat driven and self-circulating fluid heating and storage system incorporating the fluid heating and storage tank may be provided with one or two heaters. The heaters may use the same or different energy resources. The system can have the double solar heat collectors orientated in any angle, especially in 90 degree and 180 degree. These solar heating systems may be used to form the module units of the building roofs, fences and verandas etc.

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FLUID HEATING AND STORAGE TANK AND SYSTEM

FIELD OF TECHNOLOGY

The present disclosure relates to fluid heating and storage tanks, especially relates to the fluid heating and storage tanks having an interior-installed heat exchanger. It also relates to heat driven and self-circulating fluid heating and storage systems using the tanks and having multiple energy sources, especially the solar heat collectors.

BACKGROUND

At present the solar heat application is becoming more and more popular. To reduce the hardware, software, installation, operation and maintenance costs, the applicant of this application disclosed a self-powered pump and liquid heat drive and self-circulation technology in the patent applications No. CA2628605 and PCT 2009000531. In another patent application CA2678584, the applicant of this application further disclosed several liquid heat driven and self-circulating systems. All these systems need the basic equipment—fluid heating and storage tank. The tanks described in above-mentioned patent applications are different in construction in the above mentioned systems. It is not convenient for manufacture and installation. One purpose of this application is to develop tanks for the heat driven self-circulating solar heating and storage systems by standard and modularization manufacture.

The solar energy varies in different seasons, locations and weather. Thus the solar energy in the solar heat collected in a solar heating system is not steady. It is expected by solar energy customers that a fluid heating and storage tank can be used not only for solar energy, but also for other energy sources.

Many efforts have been made to integrate the solar heating system with the building in last few decades. The liquid heat driven and self-circulating technology has made the integration of the solar heating system with the buildings much easier. It is the third purpose of this invention to make the solar heating systems an integral structure part of the module units of the building.

The fluid heating and storage tanks with an interior-installed heat exchanger have been used for long time. However the existing tank can't be used for heat driven and self-circulation system when the tank is not located higher than the heater. The existing tank for multi-energy sources also can't be used in a heat driven and self-circulation system.

The liquid vaporizing and escaping of the heating liquid is a risk for the continue safety operation of a heat driven and self-circulation liquid heating and storage system. Some solutions to solve such problem have been developed in above-mentioned patent applications. This disclosure provides an improved and more efficient liquid vapor condensing and reclaiming apparatus.

SUMMERY:

The present disclosure aims at the new requirements of solar heat applications and also includes the improvement to our pending patent technologies.

In one aspect, the present disclosure is to provide the fluid heating and storage tank with interior installed heat exchanger for the heat driven self-circulating solar heating and storage systems by standard and modularization manufacture.

In another aspect, the present disclosure is to provide the heat driven self-circulating fluid heating and storage systems employing above-mentioned fluid heating and storage tank.

In third aspects, the present disclosure is to provide the solar heat driven self-circulating solar heating and storage system that can be used for the units of the building walls, fences and verandas selectively.

Following are the detailed summery of present disclosure.

1, A fluid heating and storage tank with interior-installed heat exchanger, comprising:

a storage container for a primary fluid; said storage container having an inlet and a outlet for the primary fluid and a first inlet fitting, a first outlet fitting and a second inlet fitting and a second outlet fitting for the secondary fluid; said storage tank further having at least one breathing fitting ; and

a heat exchanger disposed within said fluid heating and storage tank for flowing secondary fluid which is a liquid through said storage tank in isolation from said primary fluid; said heat exchanger having a first inlet, a first outlet, a second inlet and a second outlet for said secondary fluid and at least one breathing port; each of said inlets, outlets and breathing port connected to one of the corresponding fitting of said storage tank respectively; said two secondary fluid inlet fittings being located not lower than two said outlet fittings; said breathing fitting being located not lower than said inlet fitting;

at least one apparatus for condensing and reclaiming said secondary fluid vapor having a breathing and condensing pine and a breathing pipe which connected to said breathing fitting of said fluid heating and storage tank;

2. The fluid heating and storage tank of claim 1 is a tank with a heat exchanger having a separable space, comprising:

a storage container for a primary fluid; said storage container having an inlet and a outlet for primary fluid and first inlet fitting, first outlet fitting and second inlet fitting and second outlet fitting for secondary fluid; said storage tank further having at least one breathing fitting ; and

a heat exchanger disposed within said fluid heating and storage tank for flowing secondary fluid which is a liquid through said storage tank in isolation from said primary fluid, said heat

exchanger having first inlet, first outlet, second inlet and second outlet for secondary fluid and at least one breathing port; each of said inlets, outlets and breathing ports connected to one of the corresponding fitting of said storage tank respectively; said two secondary fluid inlet fittings being located not lower than two said outlet fittings; said breathing fitting being located not lower than said inlet fittings;

said heat exchanger comprising an inner liquid separating tool, e.g. two removable stopples, which separated the liquid space into two sub-spaces wherein the liquid is isolated; said first couple of inlet and outlet are connected to first sub-space and second couple of inlet and out are connected to the second sub-space; said heat exchanger having one breathing port at least;

at least one apparatus for condensing and reclaiming said secondary fluid vapor having a breathing and condensing pine and a breathing pipe which connected to said breathing fitting of said fluid heating and storage tank;

3. The fluid heating and storage tank according to claim 1, wherein said an apparatus for condensing and reclaiming fluid vapor, comprising:

an airtight container for containing any escaped heated liquid and vapor, which is the heated secondary liquid and vapor from a fluid vapor source, which is the fluid heating and storage tank; and said airtight container having a base and a top; said airtight container further having a inner tool for condensing the liquid vapor, e.g. having a inner heat conductive wall and a set of condensing pieces installed therein selectively;

a breathing pipe having one end extending upwardly into said airtight container and being mounted at the bottom therein to said airtight container and having an opposite end connected to said fluid vapor source, which is breathing fitting at said fluid heating and storage tank;

a flexural breathing and condensing pipe e.g. selectively in the form of a U shaped pipe and W shaped pipe, extending upwardly into said airtight container and having an end therein located within the airtight container and being lower than the interior top side of said airtight container and also having an opposite end located outside of said airtight container for condensing the escaped vapor and temporally storing the liquid of condensed vapor for reclaiming.

4. The fluid heating and storage tank according to claim 1, 2 further comprising a release valve, a drain valve, a protective anode and at lest one electric heater selectively.

5 . The fluid heating and storage tank according to claim 1, 2 wherein said heat exchanger is made of a material selected from the group including ceramic, metal e.g. copper, stainless steel and steel plated by porcelain enamel and glass selectively;

6 . The fluid heating and storage tank according to claim 1, 2 wherein said two outlets are arranged at said wall of storage container in 180 degree; and said two inlets are also arranged at said wall of storage container in 180 degree; and each couple of said inlet and said outlet may be oriented at a perpendicular manner selectively.

7. The fluid heating and storage tank according to claim 1, 2 wherein said two outlets are arranged at said wall of storage container in 90 degree; and said two inlets are also arranged at said wall of storage container in 90 degree; and each couple of said inlet and said outlet may be oriented at a perpendicular manner selectively.

8. The fluid heating and storage tank according to claim 1, 2 further comprising two back up bolt caps for capping said inlet and outlet fittings and one back up bolt caps for capping said breathing fittings when said fittings are not being used;

9. The fluid heating and storage tank of claim 1, 2wherein said heat exchanger is selected from the group including a tube heat exchanger, a plate heat exchanger, a coil heat exchanger, a fin tube heat exchanger, a helix tube heat exchanger and a heat exchanger that combined by above mentioned heat exchangers selectively.

1 0. The fluid heating and storage tank of claim2 wherein said heat exchanger is a plate heat exchanger and said liquid separating structure in the heat exchanger is a separator installed in the chamber of the heat exchanger which separated the secondary fluid space into two sub-spaces for isolating the liquid therein in two sub-spaces; said two couples of the inlet and the outlet being arranged at the wall of two said sub-spaces; at least one said sub-space having a breathing fitting and said breathing fitting being arranged at a top wall of said sub-spaces..

1 1 . The fluid heating and storage tank of claim 2 wherein said heat exchanger is selected from the group including a tube heat exchanger, a plate heat exchanger, a coil heat exchanger, a fin tube heat exchanger, a helix tube heat exchanger and a heat exchanger that combined by above mentioned heat exchangers selectively; said heat exchanger having two separable sub-spaces liquidly isolated by two removable stopples at two joint points of the tubes.

1 2 . A heat driven self-circulated fluid heating and storage system, comprising:

A fluid heating and storage tank with interior-installed heat exchanger, comprising:

a storage container for a primary fluid; said storage container having an inlet and a outlet for the primary fluid and a first inlet fitting, a first outlet fitting and a second inlet fitting and a second outlet fitting for the secondary fluid; said storage tank further having at least one breathing fitting ; and

a heat exchanger disposed within said fluid heating and storage tank for flowing secondary fluid which is a liquid through said storage tank in isolation from said primary fluid; said heat exchanger having a first inlet, a first outlet, a second inlet and a second outlet for said secondary fluid and at least one breathing port; each of said inlets, outlets and breathing port connected to one of the corresponding fitting of said storage tank respectively; said two secondary fluid inlet fittings being located not lower than two said outlet fittings; said breathing fitting being located not lower than said inlet fitting;

at least one apparatus for condensing and reclaiming said secondary fluid vapor having a breathing and condensing pine and a breathing pipe which connected to said breathing fitting of said fluid heating and storage tank;

a heater for heating secondary fluid which is a liquid having a inlet and a outlet, said inlet being located not lower than said outlet;

a first conduit having its one end connected to said outlet of said heater and an opposite end connected to said first inlet of said fluid heating and storage tank located not lower than said outlet of said heater;

a second conduit having one end connected to said inlet of said heater and an opposite end connected to said first outlet of said fluid heating and storage tank;

two caps being located for closing a couple of said inlet and outlet of said fluid heating and storage tank;

1 3 . A heat driven self-circulated fluid heating and storage system, comprising:

A fluid heating and storage tank with interior-installed heat exchanger, comprising:

a storage container for a primary fluid; said storage container having an inlet and a outlet for the primary fluid and a first inlet fitting, a first outlet fitting and a second inlet fitting and a second outlet fitting for the secondary fluid; said storage tank further having at least one breathing fitting ; and

a heat exchanger disposed within said fluid heating and storage tank for flowing secondary fluid which is a liquid through said storage tank in isolation from said primary fluid; said heat exchanger having a first inlet, a first outlet, a second inlet and a second outlet for said secondary fluid and at least one breathing port; each of said inlets, outlets and breathing port connected to one of the corresponding fitting of said storage tank respectively; said two secondary fluid inlet fittings being located not lower than two said outlet fittings; said breathing fitting being located not lower than said inlet fitting;

at least one apparatus for condensing and reclaiming said secondary fluid vapor having a breathing and condensing pine and a breathing pipe which connected to said breathing fitting of said fluid heating and storage tank;

a first heater for a secondary fluid which is a liquid; said first heater having a secondary liquid inlet and an outlet;

a second heater for secondary fluid which is a liquid; said second heater having a secondary liquid inlet and a outlet;

said inlets of said two heaters being located not higher than said outlets;

a first conduit having one end connected to said outlet of first said heater and an opposite end connected to said first inlet fitting of fluid heating and storage tank being located not lower than said outlet of first heater;

a second conduit having one end connected to said inlet of first heater and an opposite end connected to said first outlet of said fluid heating and storage tank;

a third conduit having one end connected to said outlet of said second heater and an opposite end connected to said second inlet of said fluid heating and storage tank being located not lower than said outlet of said second heater;

a forth conduit having its one end connected to said inlet of the second heater and its opposite end connected to said second outlet of fluid heating and storage tank;

1 4 . A heat driven and self-circulating fluid heating and storage system, comprising:

A fluid heating and storage tank with interior-installed heat exchanger, comprising:

a storage container for a primary fluid; said storage container having an inlet and a outlet for the primary fluid and a first inlet fitting, a first outlet fitting and a second inlet fitting and a second outlet fitting for the secondary fluid; said storage tank further having at least one breathing fitting ; and

a heat exchanger disposed within said fluid heating and storage tank for flowing secondary fluid which is a liquid through said storage tank in isolation from said primary fluid; said heat exchanger having a first inlet, a first outlet, a second inlet and a second outlet for said secondary fluid and at least one breathing port; each of said inlets, outlets and breathing port connected to one of the corresponding fitting of said storage tank respectively; said two secondary fluid inlet fittings being located not lower than two said outlet fittings; said breathing fitting being located not lower than said inlet fitting;

at least one apparatus for condensing and reclaiming said secondary fluid vapor having a breathing and condensing pine and a breathing pipe which connected to said breathing fitting of said fluid heating and storage tank;

a heater for heating secondary fluid which is liquid having a inlet and a outlet, said inlet being located not higher than outlet;

a heat appliance, e.g. a heat radiator, having a inlet and a outlet for said secondary fluid connected to the outlet and inlet of said fluid heating and storage tank;

a first conduit having one end connected to said outlet of said heater and an opposite end connected to said first inlet of said fluid heating and storage tank located not lower than said outlet of said first heater;

a second conduit having one end connected to said inlet of said heater and an opposite end connected to said first outlet of said fluid heating and storage tank;

a third conduit having one end connected to said inlet of said heat appliance and an opposite end connected to said second outlet of said fluid heating and storage tank;

a forth conduit having one end connected to said outlet of heat appliance and an opposite end connected to said second inlet of fluid heating and storage tank; said second inlet located not higher than said outlet of said fluid heating and storage tank.

1 5 . The heat driven self-circulated fluid heating and storage system according to claim 13, 14 or 15 wherein said heater for heating secondary fluid is a solar heat collector chosen from the group consisting a plate solar heat collector, a plate solar heat collector with heat tubes, a vacuumed tube solar heat collector, a vacuumed tube solar heat collector with heat tubes, and a U shaped pipe solar heat collector;

1 6 . The heat driven self-circulated fluid heating and storage system according to claim 13, 14 or 15 wherein said heater is a heater using another energy source except solar energy, said heater comprising:

an airtight container for a secondary fluid which is a liquid having an lower inlet and an upper outlet for said secondary fluid located in a heat insulator; said container having said another energy heating source located at the lower and inner part of the heat insulator for heating the liquid in said airtight container;

Said airtight container being made of a heat conductive material chosen from the group consisting a ceramic, a glass and a metal e.g. cooper, steel selectively; said container being in a cylindraceous shape and tubiform shape selectively;

said another energy source including the energy of fossil fuel, biomes, nature gas, earth, air and electricity selectively.

17. The heat driven self-circulated fluid heating and storage system according to claim 13, 14, 15 16 or 17 wherein said heater for heating secondary fluid having a power pump for pumping the secondary liquid; said second container for secondary liquid having at least one space being connected to said heater; said space having no breathing function e.g. no breathing port and the breathing fitting is selectively closed by a cap,.

18. The heat driven self-circulated fluid heating and storage system with at least one solar heat collector in claim 13, 14, 15 or claim 16 are used to form solar heating module units for various building elements including selectively building walls, fences and verandas; wherein said module units formed with two said solar heat collectors being arranged in 180 degree are the plane unit of the building walls, fences and verandas selectively; and the units with two said solar heat collectors arranged in less than 180 degree are the corner units of the building walls, fences and verandas selectively.

19. The heat driven and self-circulated fluid heating and storage system according to claim 15 wherein said heat appliance is a heat radiator, comprising:

a heated air generator having a fluid radiator having a set of tubes and an inlet and an outlet for said secondary fluid with at least one control valve; said radiator having a crust with a window for directing the heated air to a certain direction; said radiator further having one or more fans with controller for transmission of the heated air directionally; said outlet and inlet of said radiator connected to the inlet and the outlet of said fluid heating and storage tank respectively.

Other aspects and features of present disclosure will become apparent to those ordinarily skilled in the art upon review of following description of specific embodiments of the invention in conjunction with the accompanying figures.

20. The fluid heating and storage tank according to claim 1, wherein said an apparatus for condensing and reclaiming fluid vapor, comprising:

an airtight container for containing any escaped heated liquid and vapor, which is the heated secondary liquid and vapor from a fluid vapor source, which is the fluid heating and storage tank; and said airtight container having a base and a top; said airtight container further having a inner tool for condensing the liquid vapor, e.g. having a inner heat conductive wall and a set of condensing pieces installed therein selectively;

a breathing pipe having one end extending upwardly into said airtight container and being mounted at the bottom therein to said airtight container and having an opposite end connected to said fluid vapor source, which is breathing fitting at said fluid heating and storage tank;

a flexural breathing and condensing pipe e.g. selectively in the form of a U shaped pipe and W shaped pipe, extending upwardly into said airtight container and having an end therein located within the airtight container and being lower than the interior top side of said airtight container and also having an opposite end located outside of said airtight container for condensing the escaped vapor and temporally storing the liquid of condensed vapor for reclaiming.

While the present invention has been shown and described in the preferred embodiments thereof, it will be apparent that various modifications can be made therein without departing from the spirit or essential attributes thereof, and it is desired therefore that only such limitations be placed thereon as are imposed by the appended claims.

BRIEF DISCRIPTION OF THE DRAWINGS:

In the figures which illustrate exemplary embodiments of this invention:

Fig.1 is a schematic diagram illustrating the fluid heating and storage tank with an interior-installed coil heat exchanger;

Fig.2 is a schematic diagram illustrating the fluid heating and storage tank with an interior-installed double fin tube heat exchanger;

Fig.3 is a schematic diagram illustrating an apparatus for the liquid vapor condensing and reclaiming;

Fig.4 is a schematic diagram illustrating another kind of apparatus for the liquid vapor condensing and reclaiming;

Fig.5 is a schematic diagram illustrating a heat driven and self-circulating fluid heating and storage system employing one solar heat collector and a fluid heating and storage tank with an interior-installed heat exchanger;

Fig.6 is a schematic diagram illustrating the heat driven and self-circulating fluid heating and storage system employing two solar heat collectors and a fluid heating and storage tank with an interior-installed heat exchanger;

Fig.7 is a schematic diagram illustrating the heat driven and self-circulating fluid heating and storage system employing a solar heater, a liquid heaters and a fluid heating and storage thank with an interior-installed heat exchanger;

Fig.8 is a schematic diagram illustrating the heat driven and self-circulation fluid heating and storage system employing one solar heat collector and a radiator and a fluid heating and storage tank with an interior-installed heat exchanger;

DETAILED DESCRIPTION

Fig. 1 illustrates a fluid heating and storage tank, which is a hot water tank 30. The tank has a container 301 for store water. There are an inlet 313 for cold water and a outlet 312 for hot water. On the top wall, there are a protective anode 313, release valve 314. At the side wall there is a drain valve and electric heater. Outside of the container there are a heat insulation and a crust 318.

At the wall 301 of the tank 30, there are two inlet fittings 321 and 322, two outlet fittings 323 and 324 are arranged. Further more there is a breathing port 325 at the top of the tank.

A heat exchanger 330 is disposed within the fluid heating and storage tank 30 for flowing secondary fluid which is a liquid through the storage tank in isolation from the water. The heat exchanger having first inlet 3210, first outlet 3220, second inlet 3230 and second outlet 3240 for secondary fluid and at least one breathing port 3250.Each port of inlet, outlet and breathing ports mounted on one of corresponding connecting fitting, i.e. 321/3210, 322/3220,323/3230/324/3240. 325/3250 respectively, so that 3210, 3220, 3230 and 3240 did not shown in the figure.the figure did not, ; The two secondary fluid inlets 321 and 322 are located higher than two outlets 323, 324.The breathing fitting is located not lower than said the inlet fittings.

The heat exchanger 330 is combined with a coil tube 3301 and some straight tubes. Of cause the coil tube can be a fin tube, a helix tube, or a straight tube. The heat exchanger also can be a box, so called as flat plate heat exchanger having square shape or ellipse shape etc. The key point is

that two inlets 3310 and 3320 connect (or mounted) to the corresponding inlet fitting 321 and 322 respectively, other two outlets 3330 and 3340 connect (or mounted) to the corresponding outlet fittings 323 and 324. One breathing port 3250 connects (mounts) to the corresponding breathing fitting 325. The ports 331, 332, 333, 334, 335 are liquidly communicated. The inlets 331 and 332 are not lower than outlets 333 and 334 to sure the self-circulating of the heated liquid.

A second fluid condensing and reclaim apparatus 51 is connected at the fitting 325. Fig.3 is a schematic diagram illustrating the apparatus 51.

The apparatus 51 is an airtight container. It has a top 511 and a bottom 512 and sidewall 513. An inlet pipe 52 having its one end extending upwardly from the bottom into the container and is mounted to the bottom of the container. In Fig. 3, the inlet pipe 52 is a hollow bolt. Its opposite end 522 can be revolved directly into the breathing fitting at the top of the tank.

A flexural U-shaped pipe 53 (it may be many other shape pipes, e.g. W-shaped etc.) extends its one end 531 from the sidewall of the container 51 into the container and under the tope wall 511. Its upper end is spaced from the top wall. The other parts including its lower part of the pipe are located outside of the tank. The pipe extents its opposite end downwardly first and then upwardly. So that the opposite end of pipe 53 is facing upwardly and its lower part 533 is located near to the bottom of the container.

Referring to Fig. 4, an alternative fluid vapor condensing and reclaiming apparatus is illustrated. Except U-shaped tube 63, other parts of this second embodiment are similar to apparatus 51 described above. The reference numerals in this drawing are changed from the first digital 5 to 6. Otherwise the construction is similar to apparatus 51 described above.

A U-shaped tube 63 extends upwardly its one end 634 from the bottom 612 of the container 61 into the container and under the top wall 611. There is a gap between the end and the top wall. In Figure 6, the apparatus provides the breathing for the liquid due to expension and contraction. A small amount of condensed liquid is retained at the bottom part of the apparatus 61, which prevents further vapor from escaping into the atmosphere throughthe U-shaped tube 63.

Fig.4 is a schematic diagram illustrating another kind of apparatus for liquid vapor condensing and reclaiming;

An U-shaped tube 63 extends upwardly its one end 634 from the bottom 612 of the container 61 into the container and under the tope wall 611. There is a gap between the end and the top wall.

The feature of above mentioned container is to condense the liquid vapor in the container and let the condensed liquid returns to the heater. Usually any inside wall of a container at the temperature less than 100 degree can make the vapor condensing. Usually any metal, e.g. plastic, glass or polymeric material, can be used for making the container. When the system and environment temperature is high, in order to speed up the condensing processing, some condensing pieces may be installed in the container (did not shown in the Fig.3 and 4). The flexural pipe 63 also needs to make the vapor condense in the tube. Furthermore, at the U shaped

lower part of the pipe a few condensed liquid can be stored temporary to block the escaping of the escaped vapor. The flexural pipe can be made of many different materials e.g. glass, metal, plastic, polymeric material etc. The shapes of the pipe are flexible, e.g. U shaped, W shaped or the like in which the bottom part of the pipe can store some condensed liquid. Transparent pipes may be used to provide visible monitoring of the condensed liquid.

One of the main concerns for an operating heat driven self-circulating fluid heating and storage tank e.g. solar heating system is the fluid vaporizing and the vapor escaping through the breathing port. It may result a fail of the system operation. The application of the above introduced apparatus for fluid condensing and reclaiming resolves this problem completely. Usually the container of the apparatus are made of transparency materials, e.g. transparent glass, plastic or polymeric materials, thus the liquid level of the heat exchanger can be visually monitored, and the more liquid can be added through the breathing port if it is necessary.

There are two spare bolt caps for closing the unused inlet and outlet and one spare bolt cap for closing the unused breathing fitting. If necessary, all the breathing ports can be closed. In this case, the tank can be used as a regular tank with heat exchanger or used with self-power pump or electric pump.

Fig.2 illustrates another kind of fluid heating and storage tank, which is a hot water tank 40, as in Fig.1.

The fluid heating and storage tank 40 in Fig.1 is a water tank. It has a water container 401 comprising a cold water's inlet 413 and a hot water outlet 412, at the top of the tank, there is an release valve 414 (it may at the sidewall too), a drain valve 416 and one electric power heater 415. Of cause two electric power heaters can be added if it is necessary. The tank further includes the heat insulation layer 417 and a crust 418. On the sidewall 401 of the tank two inlets 421 and 422, two outlets 423 and 424 and a breathing fitting 425 are arranged.

Fig 2 lists different components of the tank in details. They are not all necessary. For example, the crust may or may not need, if the heat insulation is ceramic. The number of the electric heater may be one, two or zero. The release valve can be installed on the top or sidewall of the tank.

A heat exchanger 430 is disposed within the fluid heating and storage tank 40 for flowing secondary fluid which is a liquid through the storage tank in isolation from the water. Said heat exchanger having first inlet, first outlet, second inlet and second outlet for secondary fluid and at least one breathing port; said each port of inlet, outlet and breathing ports mounted on one of relative to connecting fitting , i.e. the first inlet fitting, first outlet fitting and second inlet fitting and second outlet fitting and at least one breathing fittings of the said storage tank respectively; said two secondary fluid inlets not lower than two said outlets; said breathing fitting not lower than said inlet fittings;
Comparing to Fig.1, the heat exchanger in Fig.2 can be separated into to liquidly isolating sub-system 4310 and 4320 by a volitant isolation structure. This structure is a removable isolation plug 4309 located between tubes 4306 and 4307 and second isolation plug 4308 located between tubes 4303 and 4304. The diameters at these two places are a little smaller than the diameters of the tubes. The two plugs are inserted through the ports 421 and 423. The plugs may also the pre-

welded isolation caps. Here the sub-system 4310 is formed by across tubes 4303, 4306 and fin tube 4301. The sub-system 4302 is formed by across tubes 4304, 4307 fin tube 4302 and breathing pipe 4305.

A second fluid condensing and reclaim apparatus 51 is connected at the fitting 126. Fig.3 is schematic diagram illustrating the apparatus 51.

The apparatus 51 is an airtight container. It has a top 511 and a bottom 512 and sidewall 513. An inlet pipe 52 has its one end extends upwardly from the bottom into the container and mounts on the bottom of the container. In Fig. 3, the inlet pipe 52 is a hollow bolt. Its opposite end 522 can be revolved directly into the breathing fitting at the top of the tank.

A flexural U-shaped pipe 53 (it may be many other shape pipes, e.g. W-shaped etc.) extends its one end 531 from the sidewall of the container 51 into the container and under the tope wall 511. There is a gap between the end and the top wall. The other parts including its lower part of the pipe stay outside of the tank. The pipe extents its opposite end downwardly first and then upwardly. So that the opposite end of pipe 53 is face upwardly and its lower part 533 is near to the bottom of the container.

Referring to Fig. 4, an alternative fluid vapor condensing and reclaiming apparatus is illustrated. Except U-shaped tube 63, other parts in Fig 4 are the same as in Fig.3. For each part's number, to change the first digital from 5 to 6, all the names of the parts in Fig 4. are the same as in Fig.3.

An U-shaped tube 63 extends upwardly its one end 634 from the bottom 612 of the container 61 into the container and under the tope wall 611. There is a gap between the end and the top wall.

The feature of above mentioned container is to condense the liquid vapor in the container and let the condensed liquid returns to the heater. Usually any inside wall of a container at the temperature less than 100 degree can make the vapor condensing. Usually any metal, e.g. plastic, glass or polymeric material, can be used for the container material. When the system and environment temperature is high, to speed up the condensing processing, some condensing pieces may be installed in the container (did not shown in the Fig.xx) . The flexural pipe xx also needs to make the vapor condense in the tupe. Further more at the lower part xx of the pipe a few condensed liquid can be stored temporary to block the escaping of the escaped vapor. The flexural pipe can be made of many different materials e.g. glass, metal, plastic, polymeric material etc. The shapes of the pipe are flexible, e.g. U shaped, W shaped or others, when the bottom part of the pipe is possible to store some condensed liquid. Of cause the transparent pipes are more welcomed.

Fig.6 is a schematic diagram illustrating the heat driven and self-circulation fluid heating and storage system employing a fluid heating and storage tank 40 with interior installed heat exchanger 430 and two solar heat collectors. Even both solar heat collectors in Fig.6 are plate solar heat collectors. But each of them can be any kind of the solar heat collector, for example, the plate solar heat collector (with or without the heat tube), Vacuumed tube solar heat collector (with or without the heat tube) and U-shaped solar heat collector etc.

The solar heat collector 760 in Fig.6 has a secondary fluid inlet 7611 and outlet 7612. The first conduit 762 is connected its one end to inlet 422 of the tank and an opposite end to the outlet 7611 of the solar heat collector 761. The one end of second conduit 763 is connected to the outlet of the tank and the opposite end 7632 to the inlet of solar heat collector 760. The solar heat collector 780 has similar connection arrangement.
Based on the application requirement, two couple inlet and outlet, 721/722 and 723/724 may be arranged at the sidewall in any angle from 90-180 degree. When the heat driven self-circulated liquid heating system is used as building elements, for example as a unit element of the roof, fence, veranda etc, the units with two solar heat collectors arranged in 180 degree are the plane unit of building walls, fences and verandas. The units with two solar heat collectors arranged in 90 degree are the corner units.

As a building component unit, the heat driven and self-circulating solar heating and storage system should be and can be a compacted component. In Fig. 6, when the solar heat collectors 780 and 760 are moved close to the fluid heating and storage tank and make the solar heat collector's sizes larger, a compacted solar heating and storage system will be find.

Similar to those shown in Fig. 5, each of the two couple of inlet/outlet ports is in a plumb line. However, the angle of the solar heat collector may be oriented to an obliquity (i.e. not 90 degree) angle to the surface of the earth. Even if the inlet and out ports are in a plumb line, we still can adjust the arrangement of connecting conduits 762, 763,782and 783 to let the solar heat collector to be at an obliquity angle (not 90 degree) to the surface of the earth for receiving a point-black amount of sun light. It is also possible to arrange the entire unit of the solar heat collector and the tank to stay at an oblique angle to the earth. In this case the tank is catty-cornered. To protect the fall, the support of the system needs a special design.

After installation, the heat driven self-circulating solar heating and storage system 100 comes into being two fluidly separated but heat connected liquid spaces. The first space is the interior space within tank 40 which may be filled with the liquid to be heated e.g. water, air or other fluids. The second space is the space formed by the heat exchanger xxx, two conflux tubes 761 and 781 of the two solar heat collectors 760, 780, connecting conduits 762 763, 782, 783 and the inner space of the apparatus for fluid condensing and reclaiming 61. (the stopples 4307 and 4308 are removed). This close-loop system connects to the atmosphere indirectly through the U-shaped tube 63. After the system is installed, the system will be filled with the heat conductive liquid, e.g. water or glycol etc. The liquid level in the tank will be lower than the breathing fitting.

When the sunlight irradiation heats the liquid in the solar heat collectors 760 and 780, the liquid in the conflux tubes 761 and 781 (within the heat insulation which is not shown in the Figure) is heated and tends to flow upwardly. The heated liquid flows through the connecting conduit 762 and 782 into the heat exchanger 430, and the heated liquid transfers its heat to the liquid in the tank. Then the liquid temperature drops and the volume of the liquid also drops too. Through the outlet 424 and the conduit pipe 763, the cooled liquid flows back into solar heat collector 760 again for being heated. This processing continues in circles to heat the water in the tank by the solar heater. In this process, the solar heat is the only energy source to drive the circulating liquid and to complete the energy exchange. Therefore, no other energy source, e.g. electric power, is required except the solar heat. In this process, when the sunlight is stronger, the heat circulation

will be faster, whereas the heat circulating is slower, when the sunlight is weaker. When there is no sunlight, the heat circulating will terminate completely. It is not necessary to provide additional controller for controlling the liquid circulation. This head driven system has the functions of self-driven, self-control and self-circulating.

When the system is in operation, the breathing port 425 serves several important functions. First it releases the pressure in the system caused by the heated liquid expansion for keeping the system pressure closes to the atmospheric pressure. It also provides a space for the liquid's breathing (namely, expansion and contraction) so as to facilitate the self –circulating operation. When the heater is in operation, the heated liquid causes some liquid and vapor to flow into the container 51. The part of the vapor is cooled and condensed in the container 51, and then is returned to the heat exchanger. Some vapor may escape into the U-Shaped tube and then change into liquid, which will stay in the lower part of the tube. The gathered liquid in the tube blocks the further escape of vapor and would enhance further vapor to condense in the tube. When the heater stops working, the liquid in the container 51 and heat exchanger cools down and contracts, so that the system generates a negative pressure to reclaim all the liquid gathered in the U-shaped tube to be drawn back into the heat exchanger. Even though the space storing the heat liquid is connected to the atmosphere directly or indirectly, the system working temperature is high, but the loss of the secondary liquid through vaporizing is not significant. Accordingly the system operates continuously and safely.

For the space or other reasons, sometimes the solar heating system may be equipped with single solar heat collector only. In this case, the solar heat collector 780 may be removed and the spare inlet and outlet ports 421 and 423 are closed as shown in Fig.5. In another alternative, we can also replace the single solar heat collector by another type of heater operated with another energy source.

Fig. 7 illustrates a heat driven self-circulating liquid heating and storage system 11 using a tank 40 with a interior installed heat exchanger. Comparing to Fig. 6, in Fig.7, a solar hear collector 760 is replaced by a other energy source heater. The system illustrated shows a coal water heater.

Fig. 7 illustrates a heat driven self-circulating liquid heating and storage system 120 using a tank 40 with an interior installed heat exchanger. Comparing to Fig. 6, a solar hear collector 760 and a other energy source heater. The figure shows that it is a fossil fuel heater 1200.

In Fig. 7, the tank 40, solar heat collector 760 and the connections between them are similar as as mentioned in Fig.6. Here the coal heater 1200 comprises a central vacant cylinder (or other shaped e.g. taper, square etc) metal (or ceramic etc) tank 1201. The tank 1201 further comprises an inner wall 1202 and an outer wall 1204. One metal coil tube 1203 located in the heat insulation material. One end of the tube is at the bottom of the tank 1201. The opposite end of the tube is at the upper part1205 of the tank. The bottom of the heater is a hearth for coal burning in side. When the system is in operation, the coal burns in the hearth 1210 to heat the water tube 1203. The water in the tube is heated and expended to move upwardly to the heat exchanger 430 through tube1207. In the heat exchanger the water give up the heat and returns to the tube 1203, through outlet 424 and tube 1206, for heating again. The above mentioned processing is continued in cycle, the water in the tank will be heated. The processing in this heater system is

similar with the processing of the solar heat collector system. A valve 1109 series connected to the tube 1207 for turn off the connection with heater when the heater is out of service. The same valve may be connected to the bottom conduit 1208 for same reason.

For a heat driven self-circulating fluid heating and storage system with a solar heat collector and an another energy source, its other parts have similar working processing that mentioned in the system with two solar heat collectors.

Even though the second heater shown in Gig. 7 is a coal heater, it can also be any alternative kind of non-solar heaters, e.g. fossil fuel (e.g. coal) heater, nature gas heater, biomass energy heater, (including biomass gasification heater), earth energy and air energy heater etc. The difference of this kind of the liquid heater is that the heating liquid storage space of this kind of heater is much smaller than any other kind of liquid heater. For example, one metal tube can be the storage container of the liquid to be heated in the heater. For the reason such as heat insulation and corrosion protection e.g. a firebrick or a ceramic protective layer may be provided. Further more, this heater can be a heater of earth or air heat energy. Because these kinds of the heaters usually need the forced circulation, so the heaters need a separator (e.g. separators 4308 and 4309 in Fig.2) to separate the liquid into two sub-systems. In this case, only the sub-system connected to the solar heat collector has a breathing port. Another sub-system either has no breathing port or the port is closed with a spare cap.

Fig. 8 illustrates the heat driven self-circulating fluid heating and storage system 140 with a heat appliance (here is a radiator 970, but not necessary). The system includes a solar heater 760, a radiator 970 and a liquid heating and storage tank 30 with an interior installed heat exchanger 330. In Fig. 8, the tank 10 and radiator and their connections are same as the embodiment shown in Fig.7. The radiator includes a fin pipe 771 (it also can be a coil tube, helix tube, straight tube or a flat heat exchanger etc). Two pipes connect inlet 773 and outlet 774 of the radiator to the inlet 123 and the outlet 124 of the tank respectively. Two valves 777 and 778 are for separating the radiator with the tank when necessary.

Solar heat collector 760 receives solar energy and transfers it to the tank 30, so the temperature in the tank is higher than the temperature of the surrounding air. When heated air is required, the valve 777 and 778 of the tank are opened, so that the hot water circulates into valve 777 and go through fin tube 771 to emit warm air there from. After the emission of warm air, the cold water then goes through valve 778 to returns to the bottom of the tank 30. In order to increase the amount of heated air generating and to send the air to a planned direction, a cover 721 with an active window 770 may be provided. (as shown in the figure 8, the window is opened upwardly). In fact the direction of the window can be varied. One or more fans may be provided in the cover to speed up the heat pervasion from the fin tube. (the fans did not show in the figure). If a canal is added to the window of cover 721, the heated air can be transferred to a desire location (the canal did not show in the figure).

It can be note that the fitting 322 of the tank is an inlet when it is connected to a heater, but when it is connected to a radiator, it becomes an outlet, while the fitting 324 is an outlet when it is connected to a heater, but it becomes an inlet when it is connected to a radiator,.

It is also possible to install the radiator or other heat appliances in a heat driven and self-circulating system with two solar heat collectors or with one solar hear and one other heat source. In this case, the fluid heating and storage tank need three couple inlets and outlets.

Other aspects and features of present disclosure will become apparent to those ordinarily skilled in the art upon review of following description of specific embodiments of the invention in conjunction with the accompanying figures.

WHAT IS CLAIMED IS:

1, A fluid heating and storage tank with interior-installed heat exchanger, comprising:

a storage container for a primary fluid; said storage container having an inlet and a outlet for the primary fluid and a first inlet fitting, a first outlet fitting and a second inlet fitting and a second outlet fitting for the secondary fluid; said storage tank further having at least one breathing fitting ; and

a heat exchanger disposed within said fluid heating and storage tank for flowing secondary fluid which is a liquid through said storage tank in isolation from said primary fluid; said heat exchanger having a first inlet, a first outlet, a second inlet and a second outlet for said secondary fluid and at least one breathing port; each of said inlets, outlets and breathing port connected to one of the corresponding fitting of said storage tank respectively; said two secondary fluid inlet fittings being located not lower than two said outlet fittings; said breathing fitting being located not lower than said inlet fitting;

at least one apparatus for condensing and reclaiming said secondary fluid vapor having a breathing and condensing pipe and a breathing pipe which connected to said breathing fitting of said fluid heating and storage tank;

2. The fluid heating and storage tank of claim 1 is a tank with a heat exchanger having a separable space, comprising:

a storage container for a primary fluid; said storage container having an inlet and a outlet for primary fluid and first inlet fitting, first outlet fitting and second inlet fitting and second outlet fitting for secondary fluid; said storage tank further having at least one breathing fitting ; and

a heat exchanger disposed within said fluid heating and storage tank for flowing secondary fluid which is a liquid through said storage tank in isolation from said primary fluid, said heat exchanger having first inlet, first outlet, second inlet and second outlet for secondary fluid and at least one breathing port; each of said inlets, outlets and breathing ports connected to one of the corresponding fitting of said storage tank respectively; said two secondary fluid inlet fittings being located not lower than two said outlet fittings; said breathing fitting being located not lower than said inlet fittings;

said heat exchanger comprising an inner liquid separating tool, e.g. two removable stopples, which separated the liquid space into two sub-spaces wherein the liquid is isolated; said first couple of inlet and outlet are connected to first sub-space and second couple of inlet and out are connected to the second sub-space; said heat exchanger having one breathing port at least;

at least one apparatus for condensing and reclaiming said secondary fluid vapor having a breathing and condensing pipe and a breathing pipe; said breathing pipe connected to said breathing fitting of said fluid heating and storage tank;

3. The fluid heating and storage tank according to claim 1, wherein said an apparatus for condensing and reclaiming fluid vapor, comprising:

an airtight container for containing any escaped heated liquid and vapor from a fluid vapor source which is the fluid heating and storage tank; and said airtight container having a base and a top; said airtight container further having a inner tool for condensing the liquid vapor, e.g. having a inner heat conductive wall and a set of condensing pieces installed therein selectively;

a breathing pipe having one end extending upwardly into said airtight container and being mounted at the bottom therein to said airtight container and having an opposite end connected to said fluid vapor source which is breathing fitting at said fluid heating and storage tank;

a flexural breathing and condensing pipe e.g. selectively in the form of a U shaped pipe and W shaped pipe, extending upwardly into said airtight container and having an end therein located within the airtight container and being lower than the interior top side of said airtight container and also having an opposite end located outside of said airtight container for condensing the escaped vapor and temporally storing the liquid of condensed vapor for reclaiming.

4. The fluid heating and storage tank according to claim 1, 2 further comprising a release valve, a drain valve, a protective anode and at lest one electric heater selectively.

5 . The fluid heating and storage tank according to claim 1, 2 wherein said heat exchanger is made of a material selected from the group including ceramic, metal e.g. copper, stainless steel and steel plated by porcelain enamel and glass selectively;

6. The fluid heating and storage tank according to claim 1, 2 wherein said two outlets are arranged at said wall of storage container in 180 degree; and said two inlets are also arranged at said wall of storage container in 180 degree; and each couple of said inlet and said outlet may be oriented at a perpendicular manner selectively.

7. The fluid heating and storage tank according to claim 1, 2 wherein said two outlets are arranged at said wall of storage container in 90 degree; and said two inlets are also arranged at said wall of storage container in 90 degree; and each couple of said inlet and said outlet may be oriented at a perpendicular manner selectively.

8. The fluid heating and storage tank according to claim 1, 2 further comprising two back up bolt caps for capping said inlet and outlet fittings and one back up bolt caps for capping said breathing fittings when said fittings are not being used;

9. The fluid heating and storage tank of claim 1, 2 wherein said heat exchanger is selected from the group including a tube heat exchanger, a plate heat exchanger, a coil heat exchanger, a fin

tube heat exchanger, a helix tube heat exchanger and a heat exchanger that combined by above mentioned heat exchangers selectively.

10. The fluid heating and storage tank of claim 2 wherein said heat exchanger is a plate heat exchanger and said liquid separating structure in the heat exchanger is a separator installed in the chamber of the heat exchanger which separated the secondary fluid space into two sub-spaces for isolating the liquid therein in two sub-spaces; said two couples of the inlet and the outlet being arranged at the wall of two said sub-spaces respectively; at least one said sub-space having a breathing fitting and said breathing fitting being arranged at a top wall of said sub-spaces..

11. The fluid heating and storage tank of claim 2 wherein said heat exchanger is selected from the group including a tube heat exchanger, a plate heat exchanger, a coil heat exchanger, a fin tube heat exchanger, a helix tube heat exchanger and a heat exchanger that combined by above mentioned heat exchangers selectively; said heat exchanger having two separable sub-spaces liquidly isolated by two removable stopples at two joint points of the tubes.

12. A heat driven self-circulated fluid heating and storage system, comprising:

A fluid heating and storage tank with interior-installed heat exchanger, comprising:

a storage container for a primary fluid; said storage container having an inlet and a outlet for the primary fluid and a first inlet fitting, a first outlet fitting and a second inlet fitting and a second outlet fitting for the secondary fluid; said storage tank further having at least one breathing fitting ; and

a heat exchanger disposed within said fluid heating and storage tank for flowing secondary fluid which is a liquid through said storage tank in isolation from said primary fluid;- said heat exchanger having a first inlet, a first outlet, a second inlet and a second outlet for said secondary fluid and at least one breathing port; each of said inlets, outlets and breathing port connected to one of the corresponding fitting of said storage tank respectively; said two secondary fluid inlet fittings being located not lower than two said outlet fittings; said breathing fitting being located not lower than said inlet fitting;

at least one apparatus for condensing and reclaiming said secondary fluid vapor having a breathing and condensing pipe and a breathing pipe which connected to said breathing fitting of said fluid heating and storage tank;

a heater for heating secondary fluid which is a liquid having a inlet and a outlet, said inlet being located not lower than said outlet;

a first conduit having its one end connected to said outlet of said heater and an opposite end connected to said first inlet of said fluid heating and storage tank located not lower than said outlet of said heater;

a second conduit having one end connected to said inlet of said heater and an opposite end connected to said first outlet of said fluid heating and storage tank;

two caps being located for closing a couple of said inlet and outlet of said fluid heating and storage tank;

13. A heat driven self-circulated fluid heating and storage system, comprising:

A fluid heating and storage tank with interior-installed heat exchanger, comprising:

a storage container for a primary fluid; said storage container having an inlet and a outlet for the primary fluid and a first inlet fitting, a first outlet fitting and a second inlet fitting and a second outlet fitting for the secondary fluid; said storage tank further having at least one breathing fitting ; and

a heat exchanger disposed within said fluid heating and storage tank for flowing secondary fluid which is a liquid through said storage tank in isolation from said primary fluid; said heat exchanger having a first inlet, a first outlet, a second inlet and a second outlet for said secondary fluid and at least one breathing port; each of said inlets, outlets and breathing port connected to one of the corresponding fitting of said storage tank respectively; said two secondary fluid inlet fittings being located not lower than two said outlet fittings; said breathing fitting being located not lower than said inlet fitting;

at least one apparatus for condensing and reclaiming said secondary fluid vapor having a breathing and condensing pipe and a breathing pipe which connected to said breathing fitting of said fluid heating and storage tank;

a first heater for a secondary fluid which is a liquid; said first heater having an inlet and an outlet for secondary liquid;

a second heater for secondary fluid which is a liquid; said second heater having a secondary liquid inlet and an outlet;

said inlets of said two heaters being located not higher than said outlets;

a first conduit having one end connected to said outlet of said first heater and an opposite end connected to said first inlet fitting of fluid heating and storage tank being located not lower than said outlet of first heater;

a second conduit having one end connected to said inlet of the first heater and an opposite end connected to said first outlet of said fluid heating and storage tank;

a third conduit having one end connected to said outlet of said second heater and an opposite end connected to said second inlet of said fluid heating and storage tank being located not lower than said outlet of said second heater;

a forth conduit having its one end connected to said inlet of the second heater and its opposite end connected to said second outlet of fluid heating and storage tank;

14. A heat driven and self-circulating fluid heating and storage system, comprising:

A fluid heating and storage tank with interior-installed heat exchanger, comprising:

a storage container for a primary fluid; said storage container having an inlet and a outlet for the primary fluid and a first inlet fitting, a first outlet fitting and a second inlet fitting and a second outlet fitting for the secondary fluid; said storage tank further having at least one breathing fitting ; and

a heat exchanger disposed within said fluid heating and storage tank for flowing secondary fluid which is a liquid through said storage tank in isolation from said primary fluid; said heat exchanger having a first inlet, a first outlet, a second inlet and a second outlet for said secondary fluid and at least one breathing port; each of said inlets, outlets and breathing port connected to one of the corresponding fitting of said storage tank respectively; said two secondary fluid inlet fittings being located not lower than two said outlet fittings; said breathing fitting being located not lower than said inlet fitting;

at least one apparatus for condensing and reclaiming said secondary fluid vapor having a breathing and condensing pipe and a breathing pipe which connected to said breathing fitting of said fluid heating and storage tank;

a heater for heating secondary fluid which is liquid having a inlet and a outlet, said inlet being located not higher than outlet;

a heat appliance, e.g. a heat radiator, having a inlet and a outlet for said secondary fluid connected to the outlet and inlet of said fluid heating and storage tank;

a first conduit having one end connected to said outlet of said heater and an opposite end connected to said first inlet of said fluid heating and storage tank located not lower than said outlet of said first heater;

a second conduit having one end connected to said inlet of said heater and an opposite end connected to said first outlet of said fluid heating and storage tank;

a third conduit having one end connected to said inlet of said heat appliance and an opposite end connected to said second outlet of said fluid heating and storage tank;

a forth conduit having one end connected to said outlet of heat appliance and an opposite end connected to said second inlet of fluid heating and storage tank;

15. The heat driven self-circulated fluid heating and storage system according to claim 13, 14 or 15 wherein said heater for heating secondary fluid is a solar heat collector chosen from the group consisting a plate solar heat collector, a plate solar heat collector with heat tubes, a vacuumed tube solar heat collector, a vacuumed tube solar heat collector with heat tubes, and a U shaped pipe solar heat collector;

1 6 . The heat driven self-circulated fluid heating and storage system according to claim 13, 14 or 15 wherein said heater is a heater using another energy source except solar energy, said heater comprising:

an airtight container for a secondary fluid which is a liquid having an lower inlet and an upper outlet for said secondary fluid located in a heat insulator; said container having said another energy heating source located at the lower and inner part of the heat insulator for heating the liquid in said airtight container;

Said airtight container being made of a heat conductive material chosen from the group consisting a ceramic, a glass and a metal e.g. cooper, steel selectively; said container being in a cylindraceous shape and tubiform shape selectively;

said another energy source including the energy of fossil fuel, biomes, nature gas, earth, air and electricity selectively.

1 7 . The heat driven self-circulated fluid heating and storage system according to claim 13, 14, 15 16 or 17 wherein said heater for heating secondary fluid having a power pump for pumping the secondary liquid; said second container for secondary liquid having at least one space being connected to said heater; said space having no breathing function e.g. no breathing port and the breathing fitting is selectively closed by a cap,.

18. The heat driven self-circulated fluid heating and storage system with at least one solar heat collector in claim 13, 14, 15 or claim 16 are used to form solar heating module units for various building elements including selectively building walls, fences and verandas; wherein said module units formed with two said solar heat collectors being arranged in 180 degree are the plane unit of the building walls, fences and verandas selectively; and the units with two said solar heat collectors arranged in less than 180 degree are the corner units of the building walls, fences and verandas selectively.

19. The heat driven and self-circulated fluid heating and storage system according to claim 15 wherein said heat appliance is a heat radiator, comprising:

a heated air generator having a fluid radiator having a set of tubes and an inlet and an outlet for said secondary fluid with at least one control valve; said radiator having a crust with a window for directing the heated air to a certain direction; said radiator further having one or more fans with controller for transmission of the heated air directionally; said outlet and inlet of said radiator connected to the inlet and the outlet of said fluid heating and storage tank respectively.

20. The fluid heating and storage tank according to claim 1, wherein said an apparatus for condensing and reclaiming fluid vapor, comprising:

an airtight container for containing any escaped heated liquid and vapor from a fluid vapor source which is the fluid heating and storage tank; and said airtight container having a base and a top; said airtight container further having a inner tool for condensing

the liquid vapor, e.g. having a inner heat conductive wall and a set of condensing pieces installed therein selectively;

a breathing pipe having one end extending upwardly into said airtight container and being mounted at the bottom therein to said airtight container and having an opposite end connected to said fluid vapor source which is breathing fitting at said fluid heating and storage tank;

a flexural breathing and condensing pipe e.g. selectively in the form of a U shaped pipe and W shaped pipe, extending upwardly into said airtight container and having an end therein located within the airtight container and being lower than the interior top side of said airtight container and also having an opposite end located outside of said airtight container for condensing the escaped vapor and temporally storing the liquid of condensed vapor for reclaiming.

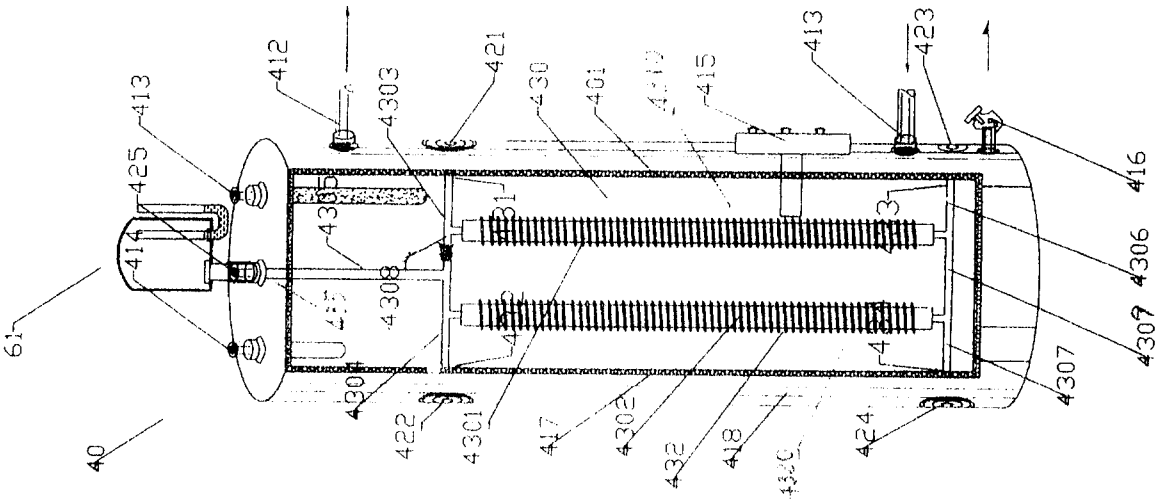
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FIG. 2

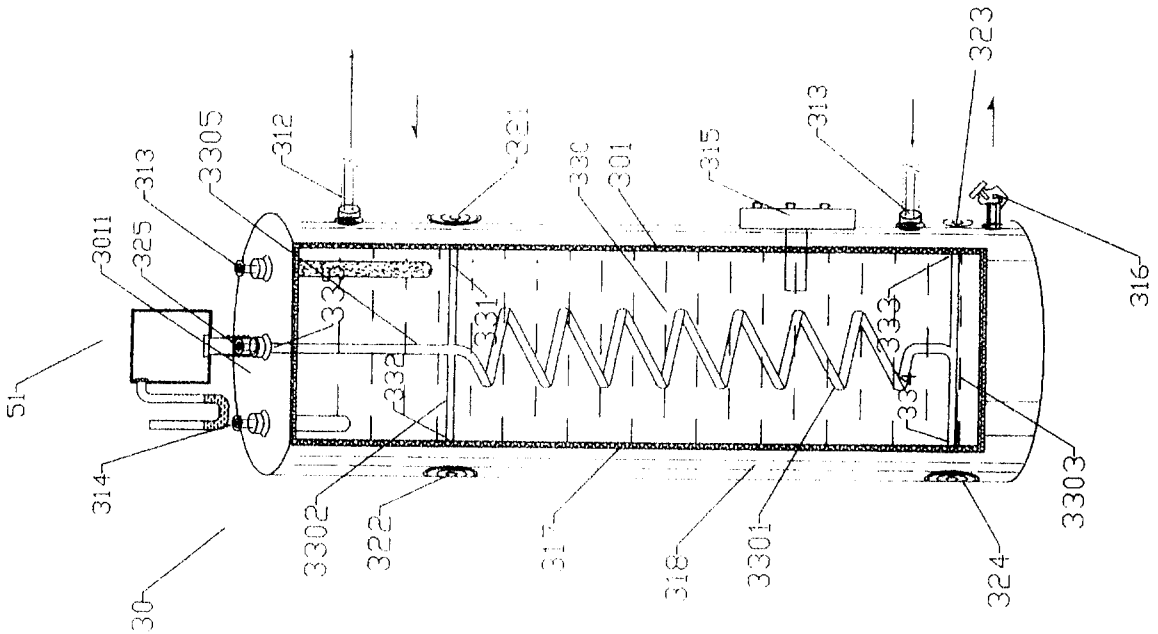
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FIG. 1

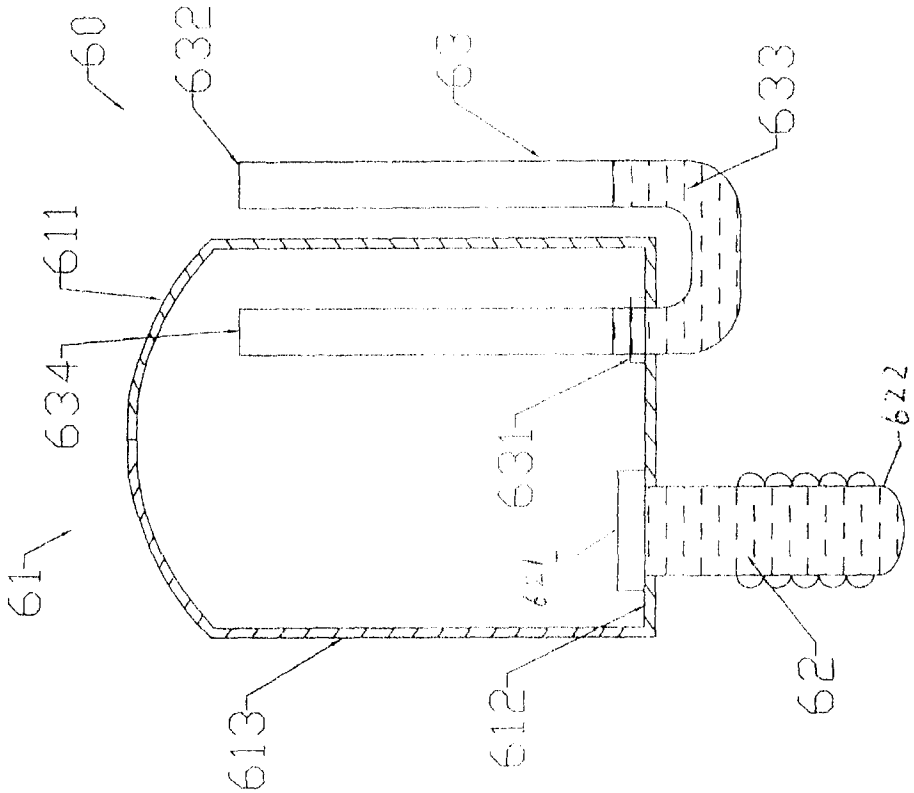
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FIG. 4

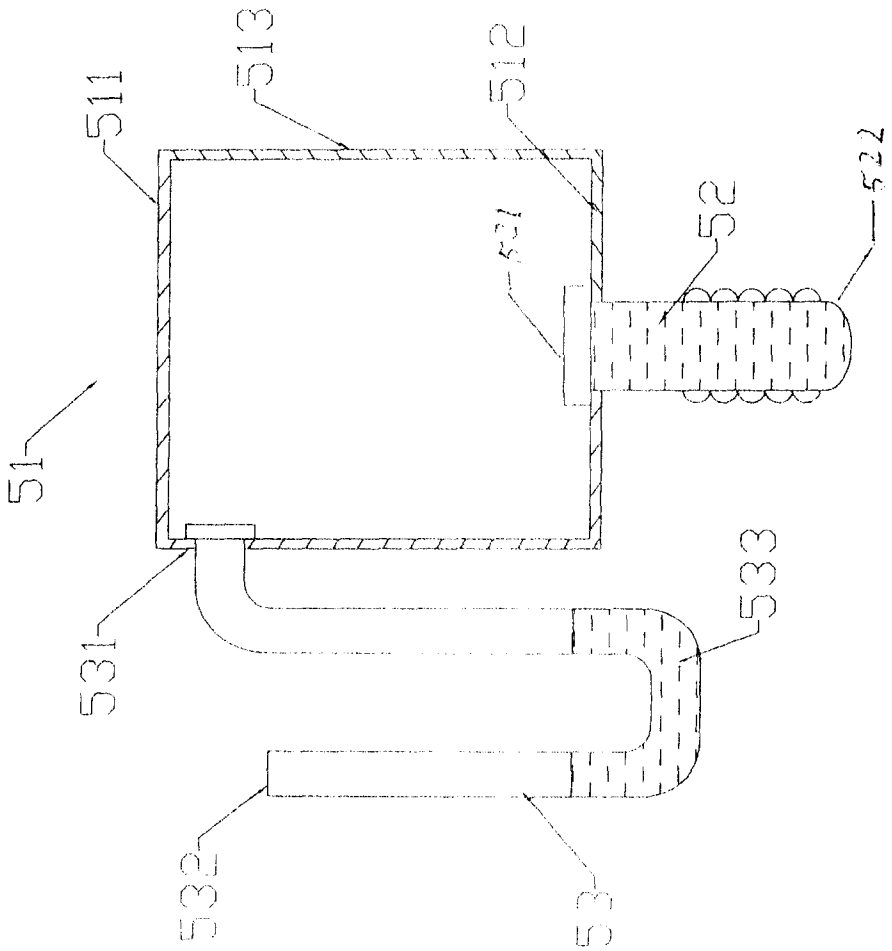
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FIG. 3

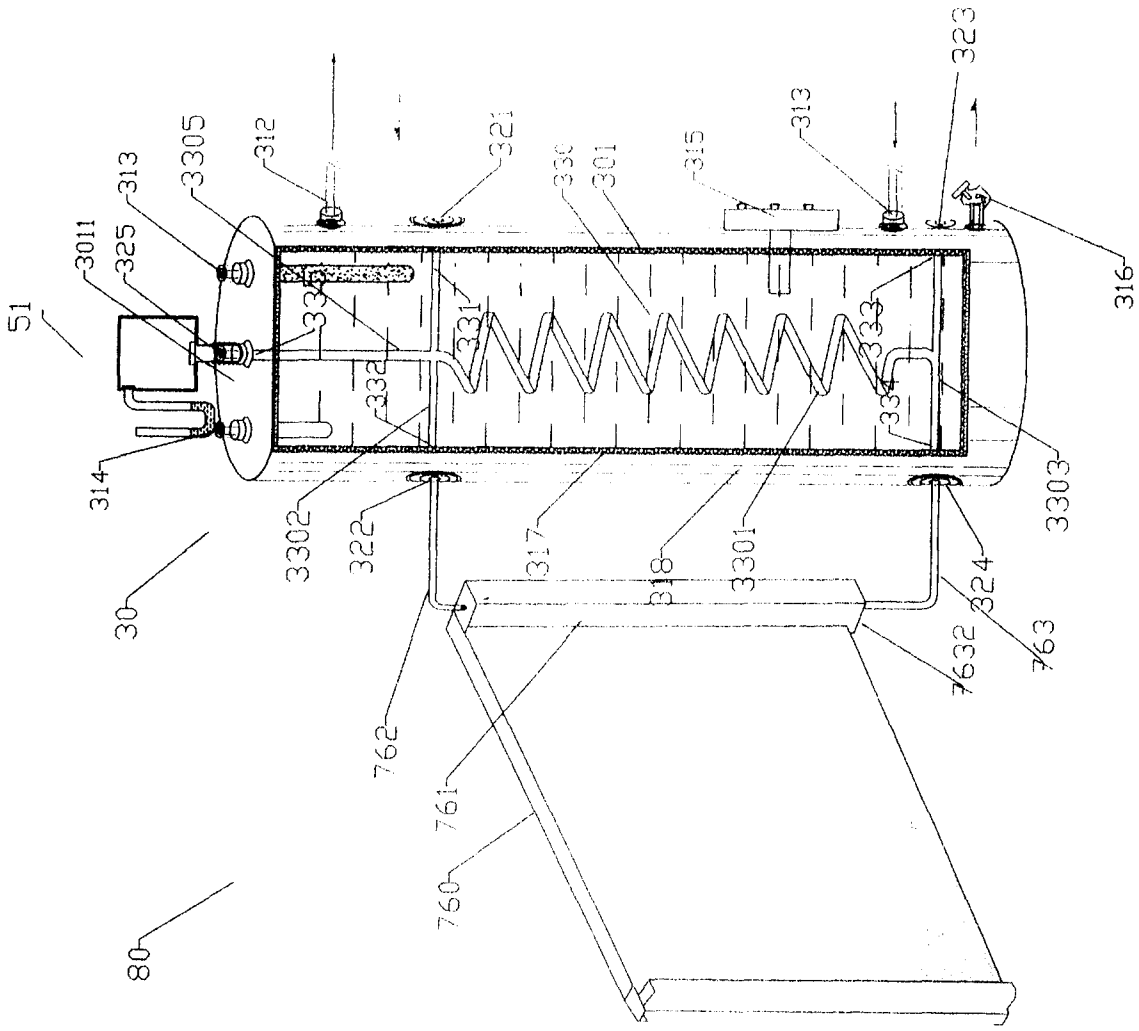
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FIG. 5

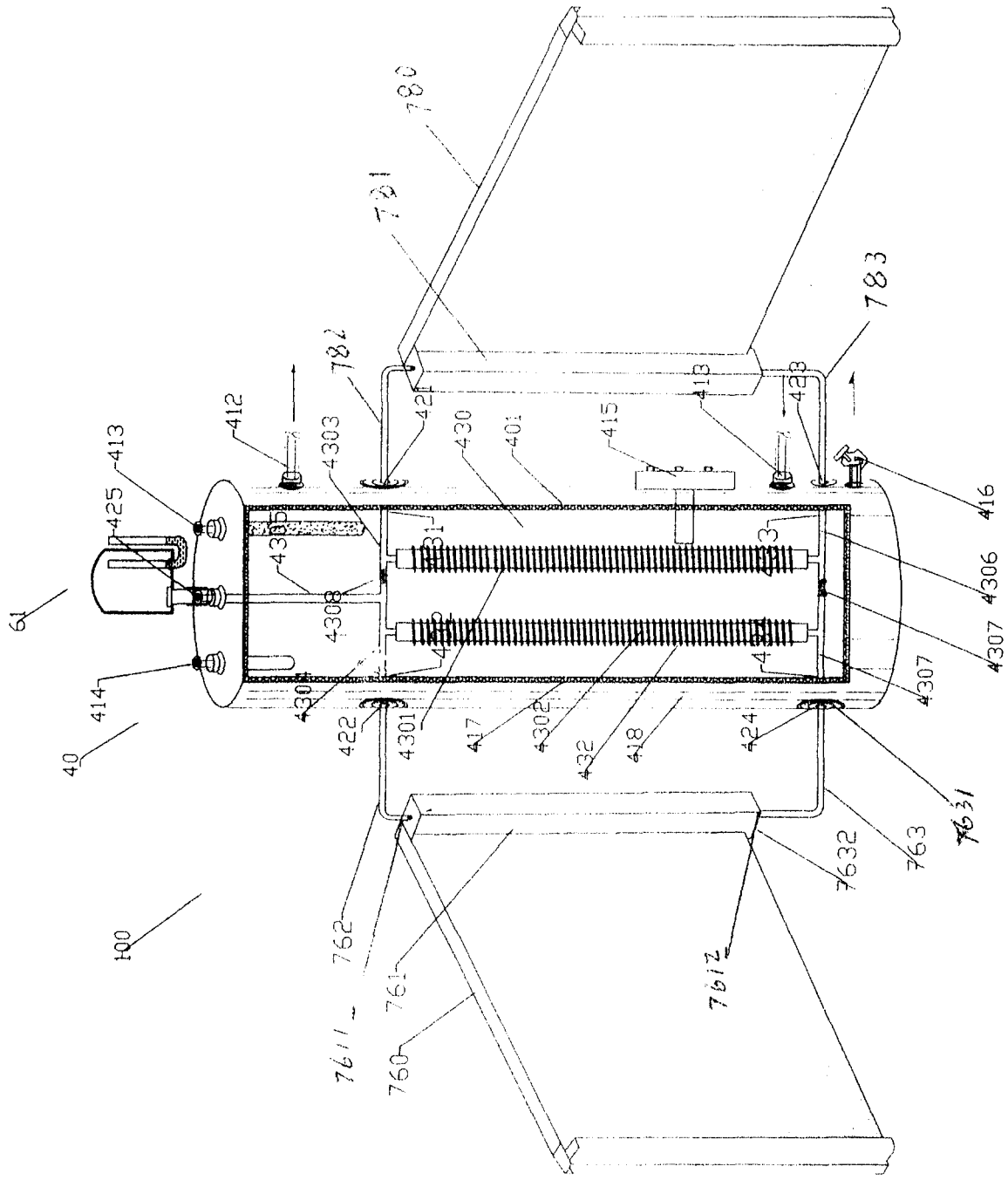
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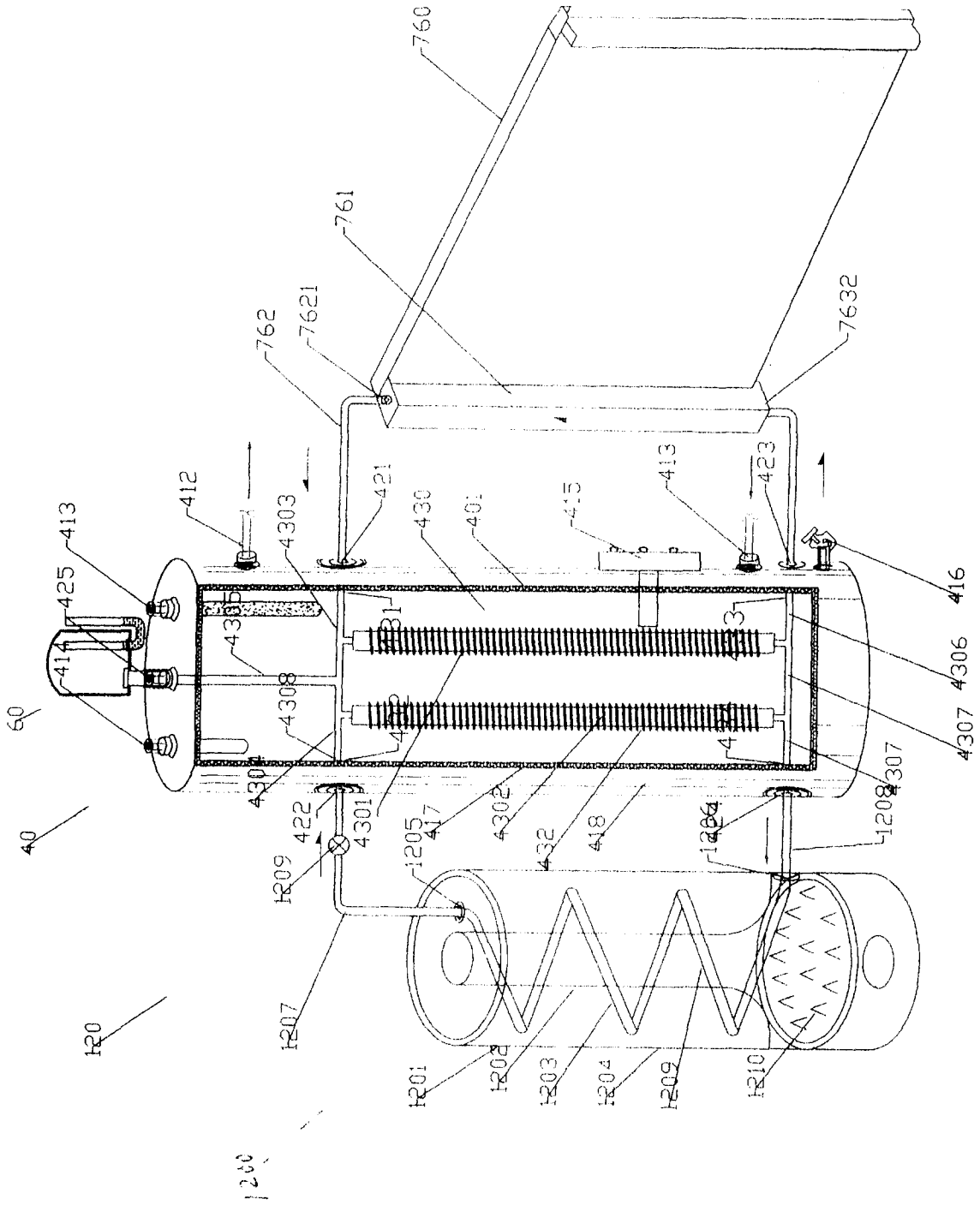
FIG. 6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40
422
4301
1205
417
4302
432
418
1206
1208
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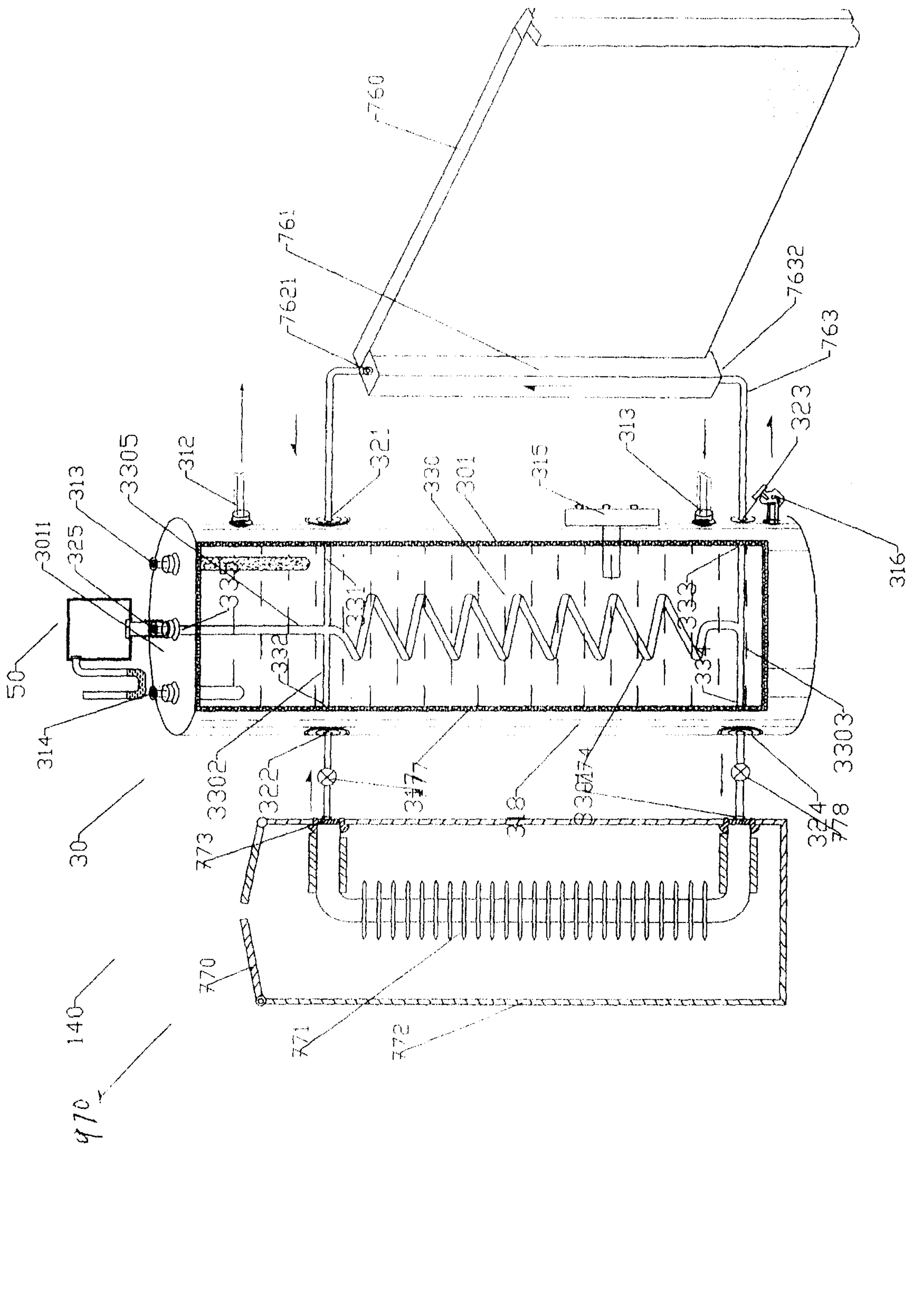
1207
1201
1202
1203
1204
1209
1210
1200

FIG. 7


760
761
7621
7632
763
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3305
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3011
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FIG. 8

INTERNATIONAL SEARCH REPORT

International application No.
PCT/CA2010/001296

A. CLASSIFICATION OF SUBJECT MATTER
IPC: ***F24H 1/18*** (2006.01) , ***F04F 1/14*** (2006.01) , ***F04F 10/02*** (2006.01) , ***F24H 9/02*** (2006.01) , ***F24H 9/12*** (2006.01) , ***F28D 7/10*** (2006.01)
According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
IPC: **F24H 1/18**, **F04F 1/14**, **F04F 10/02**, **F24H 9/02**, **F24H 9/12**, **F28D 7/10**. CPC: 126/109-111; 309/39-41+60; 103/123-137, 158 ; 137/6; 126/110,111;190/*;309/36; 126/105;309/24;189; 257/19,20. USCL:122/20R,126/345-349,392/400-445,450,458-460;

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic database(s) consulted during the international search (name of database(s) and, where practicable, search terms used)
Data Bases: Canada Patent Database , West/CIPO2 , Epoque/epodoc, Google scholar. **Search terms used:** tank, heat, exchanger, vent, condens+, valve, electric, co-generation, solar, breathe+.

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	CA2628605 A1 (W&E INTERNATIONAL (CANADA) CORP.) 9 November 2009 (09-11-2009) (See whole document,particularly figures 8 and 9.	1-20
A	GB0671012 A (BROWN FINTUBE COMPANY) 30 April 1952 (30-04-1952) (See figures 1 and 2).	1-20
A	US7377307 B1 (NIPPON SHOKUBAI CO. LTD.) 27 MAY 2008 (27-05-2008).	1-20
A	US6435420 B1 (HONDA GIKEN KOGYO KABUSHIKI KAISHA) 20 August 2002 (20-08-2002).	1-20
A	US4898152 A (KAHL) 6 February 1990 (06-02-1990).	1-20

[ ] Further documents are listed in the continuation of Box C.

[X] See patent family annex.

* Special categories of cited documents :

"A" document defining the general state of the art which is not considered to be of particular relevance

"E" earlier application or patent but published on or after the international filing date

"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)

"O" document referring to an oral disclosure, use, exhibition or other means

"P" document published prior to the international filing date but later than the priority date claimed

"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art

"&" document member of the same patent family

Date of the actual completion of the international search	Date of mailing of the international search report
24 November 2010 (24-11-2010)	15 December 2010 (15-12-2010)

Name and mailing address of the ISA/CA	Authorized officer
Canadian Intellectual Property Office Place du Portage I, C114 - 1st Floor, Box PCT 50 Victoria Street Gatineau, Quebec K1A 0C9 Facsimile No.: 001-819-953-2476	Charles W. Wootton (819) 997-2763

INTERNATIONAL SEARCH REPORT
Information on patent family members

International application No.
PCT/CA2010/001296

Patent Document Cited in Search Report	Publication Date	Patent Family Member(s)	Publication Date
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		EP2228605A2	15 September 2010 (15-09-2010)
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		WO2009135310A1	12 November 2009 (12-11-2009)
		WO2009135310A8	02 September 2010 (02-09-2010)
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US7377307B1	27 May 2008 (27-05-2008)	JP2001133170A	18 May 2001 (18-05-2001)
		JP4451520B2	14 April 2010 (14-04-2010)
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		CN1167871C	22 September 2004 (22-09-2004)
		DE60020484D1	07 July 2005 (07-07-2005)
		DE60020484T2	16 March 2006 (16-03-2006)
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		EP1096120A3	24 April 2002 (24-04-2002)
		EP1096120B1	01 June 2005 (01-06-2005)
		JP2001132539A	15 May 2001 (15-05-2001)
US4898152A	06 February 1990 (06-02-1990)	None	