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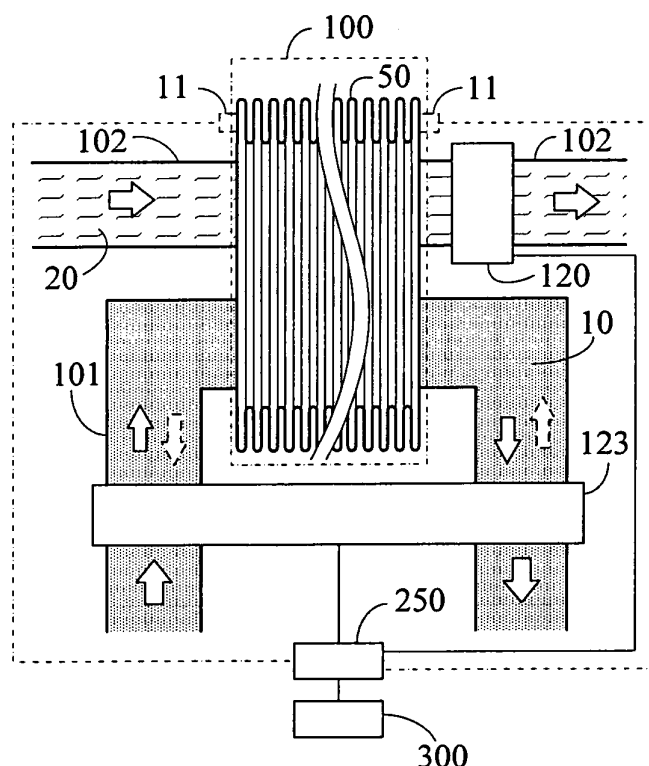
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(54) **Heat pump or heat exchange device with periodic positive and reverse pumping**

(57) The present invention discloses that the conventional applications for heat pump or heat exchange devices are further made to be the functional structure having periodic positive and reverse directional pumping, wherein either one of the pumping flow directions of the primary side fluid piping for passing by primary side fluid

or secondary side fluid piping for passing by secondary side fluid are driven by the periodic positive and reverse flow directional pump to timely improve the temperature distribution status between the primary side fluid and secondary side fluid as well as reduce the defects of impurity accumulations in fixed flow directions.

FIG. 2



Description

BACKGROUND OF THE INVENTION

(a) Field of the invention

[0001] The present invention discloses that either one of the primary side piping for passing by primary side fluid or the secondary side piping for passing by secondary side fluid in the conventional heat pump or heat exchange device are further made to the structure capable of making periodic positive and reverse pumping functions by the bidirectional fluid pumping device, and at least one temperature detecting device is made at the position to directly or indirectly detect the temperature change and transmit the detected temperature signal to the periodic fluid direction-change operative control device so as to periodically change the periodic positive and reverse directions of the fluid in the heat exchange portion of the piping circuit pumped by the bidirectional fluid pumping device thereby relatively changing the temperature distribution status of the flow direction-exchanged fluid in the heat pump or heat exchange device.

(b) Description of the Prior Art

[0002] Fig. 1 is a main block schematic view showing the main structure principles of conventional heat pump or heat exchange device in fixed flow directions; as shown in Fig. 1, the unidirectional fluid pump (120) is usually used as a fixed flow directional pump to pump in the primary side fluid (10) through primary side fluid piping (101) via the piping port at the side of different temperature and is discharged via the piping port at another side of different temperature, while the unidirectional fluid pump (120) is also used as a fixed flow directional pump to pump in the secondary side fluid (20) through secondary side fluid piping (102) to perform warm energy transfer with primary fluid (10) passing through primary side fluid piping via the solid, liquid or gaseous state thermal conductor of the heat pump or heat exchange device (100), and as primary side fluid (10) passing through primary side fluid piping (101) and secondary side fluid (20) passing through secondary side fluid piping (102) are in fixed flow directions, the relative temperature difference distribution gradient between the two input and output ends of the primary side fluid piping (101) and secondary side fluid piping (102) for warm energy transfer inside the heat pump or heat exchange device (100) also appear stably unchanged but they do not have the active operative control functions.

SUMMARY OF THE INVENTION

[0003] The present invention discloses the improvements for the conventional heat pump or heat exchange device (100) having fixed flow directional pump for pump-

ing the primary side fluid (10) to pass through primary side fluid piping (101) and secondary side fluid (20) to pass through secondary side fluid piping (102), wherein it is further improved to that the primary side fluid piping (101) is series connected with the bidirectional fluid pumping device (123) being operatively controlled by the periodic fluid direction-change operative control device (250) for pumping primary side fluid (10) in periodic positive and reverse flow directions, while the secondary side fluid piping (102) is series connected with the unidirectional fluid pump (120) as a fixed flow directional pump to pump the secondary side fluid (20) for mutual warm energy transfer via the solid, liquid or gaseous state thermal conductor (50); or the secondary side fluid piping (102) is series connected with the bidirectional fluid pumping device (123) being operatively controlled by the periodic fluid direction-change operative control device (250) for pumping secondary side fluid (20) in periodic positive and reverse flow directions, and the primary side fluid piping (101) is series connected with the unidirectional fluid pump (120) being used as a fixed flow directional pump to pump primary side fluid (10) for mutual warm energy transfer via the solid, liquid or gaseous state thermal conductor (50);

[0004] Through the two aforesaid embodiments, the following operating functions are obtained: **1)** the primary side fluid (10) is pumped by bidirectional fluid pumping device (123) in periodic positive and reverse flow directions to pass through primary side fluid piping (101), and the secondary side fluid (20) is pumped by the unidirectional fluid pump (120) to pass through secondary side fluid piping (102) thereby changing the temperature difference distribution status at the two relative positions of the primary side fluid piping (101) and secondary side fluid piping (102) being in fixed structural positional relationship during the operation of the heat pump or heat exchange device; **2)** the impurities or pollutants brought in by primary side fluid (10) passing through primary side fluid piping (101) or secondary side fluid (20) passing through secondary side fluid piping (102) in previous flow direction are discharged during periodic positive and reverse flow directional fluid pumping thereby reducing the defects of impurity or pollutant accumulations in fixed flow directions;

[0005] The primary side fluid (10) being pumped by the different flow directional pump to pass through primary side fluid piping (101) in periodic positive and reverse flow directions and the secondary side fluid (20) being pumped by the fixed flow directional pump to pass through secondary side fluid piping (102) can be reversely arranged to be the secondary side fluid (20) being pumped by the different flow directional pump to pass through secondary side fluid piping (102) in periodic positive and reverse flow directions while the primary side fluid (10) being pumped by the fixed flow directional pump to pass through primary side fluid piping (101).

BRIEF DESCRIPTION OF THE DRAWINGS

[0006]

Fig. 1 is a main block schematic view showing the main structure principles of conventional heat pump or heat exchange device in fixed flow directions.

Fig. 2 is a block schematic view showing the structural principles of the present invention, wherein primary side fluid piping and secondary side fluid piping being commonly installed on the thermal conductor to constitute the heat pump or heat exchange device functions are driven by the bidirectional fluid pumping device.

Fig. 3 is a block schematic view showing the structural principle of the present invention, wherein the primary side fluid piping and secondary side fluid piping being mutually sleeveably combined to constitute the heat pump or heat exchange device function are driven by the bidirectional fluid pumping device to periodically exchange the flow directions of the primary side fluid.

Fig. 4 is a schematic view showing the embodiment of that at least one unidirectional fluid pump and the bidirectional fluid valve set comprising by four controllable switch type fluid valves commonly constitute the bidirectional fluid pumping device, while the primary side fluid piping and the secondary side fluid piping are commonly installed on the heat pump or heat exchange device constituted by the thermal conductor, and said bidirectional fluid pumping device is installed between at least one end of the primary side fluid piping and the primary side fluid source.

Fig. 5 is a schematic view showing the embodiment of that at least one unidirectional fluid pump and the bidirectional fluid valve set comprising by four controllable switch type fluid valves commonly constitute the bidirectional fluid pumping device and are installed between at least one end of the primary side fluid piping of the sleeveably combined heat pump or heat exchange device and the primary side fluid source.

Fig. 6 is a block schematic view showing the structural principles of that the primary side fluid piping is sleeveably combined with the spiral shaped secondary side fluid piping inside the enclosed hollow casing, wherein it is through thermal conducting fluid driven by bidirectional fluid pumping device inside the enclosed hollow casing to transfer warm energy thereby constituting the heat pump or heat exchange device function.

Fig. 7 is a schematic view showing the embodiment of the present invention, wherein the bidirectional fluid pumping device is constituted by at least one unidirectional fluid pump and the bidirectional fluid valve set comprising by four controllable switch type fluid valves, and the primary side fluid piping and

spiral shaped secondary side fluid piping are sleeveably combined inside the enclosed hollow casing to allow the thermal conducting fluid inside the enclosed hollow casing to transfer warm energy thereby constituting the heat pump or heat exchange device, while the unidirectional fluid pump is installed between the primary side fluid piping and the primary side fluid source.

Fig. 8 is a block schematic view showing the structural principles of the invention, wherein the primary side fluid inside primary side fluid piping is pumped to pass through enclosed hollow casing, while the spiral shaped secondary side fluid piping is installed inside the enclosed hollow casing, wherein it is through the primary side fluid inside the enclosed hollow casing being the thermal conducting fluid to transfer warm energy thereby constituting the heat pump or heat exchange device function, and it is driven by the bidirectional fluid pumping device.

Fig. 9 is a schematic view showing the embodiment of the present invention, wherein the bidirectional fluid pumping device is constituted by at least one unidirectional fluid pump and four controllable switch type fluid valves, and the primary side fluid in the primary side fluid piping is pumped to pass through the enclosed hollow casing, while the spiral shaped secondary side fluid piping is installed inside the enclosed hollow casing, wherein the primary side fluid inside the enclosed hollow casing is used as the conducting fluid for warm energy transfer thereby constituting the heat pump or heat exchange device function, and the unidirectional fluid pump is installed between the primary side fluid piping and the primary side fluid source.

Fig. 10 is a schematic view showing the embodiment of the invention, wherein spiral shaped primary side fluid piping and spiral shaped secondary side fluid piping are spirally combined inside the enclosed hollow casing and is through thermal conducting fluid in the enclosed hollow casing to transfer warm energy thereby constituting the heat pump or heat exchange device functions, and it is pumped by the bidirectional fluid pumping device.

Fig. 11 is a schematic view of the embodiment of the present invention showing that the bidirectional fluid pumping device is constituted by at least one unidirectional fluid pump and the bidirectional fluid valve set constituted by four controllable switch type fluid valves, while the spiral shaped primary side fluid piping and spiral shaped secondary side fluid piping are commonly installed in the enclosed hollow casing for transfer warm energy through the thermal conducting fluid inside the enclosed hollow structure, wherein the unidirectional fluid pump is installed between at least one end of the primary side fluid piping and the primary side fluid source.

Fig. 12 is a schematic view of the embodiment of the present invention showing that bidirectional fluid

pumping device is series connected with one of the two fluid ports of the primary side fluid piping of the heat pump or heat exchange device.

Fig. 13 is a schematic view of the embodiment of the present invention showing that two bidirectional fluid pumping devices are respectively series connected with the two ends of fluid ports of primary side fluid piping of the heat pump or heat exchange device.

Fig. 14 is a schematic view of the embodiment of the present invention showing that the bidirectional fluid pumping device constituted by at least two series connected unidirectional fluid pumps in different pumping flow directions is series connected with one end of the two fluid ports of primary side fluid piping of the heat pump or heat exchange device.

Fig. 15 is a schematic view of the embodiment of the present invention showing that the two bidirectional fluid pumping devices individually constituted by at least two series connected unidirectional fluid pumps in different pumping flow direction are respectively installed to the two ends of fluid ports of primary side fluid piping of the heat pump or heat exchange device.

Fig. 16 is a schematic view of the embodiment of the present invention showing that the bidirectional fluid pumping device comprising at least two parallel connected unidirectional fluid pumps in different pumping flow directions is series connected with either one end of the fluid ports of primary side fluid piping of the heat pump or heat exchange device.

Fig. 17 is a schematic view of the embodiment showing that the present invention is installed with two bidirectional fluid pumping devices individually comprising at least two series connected unidirectional fluid pumps are respectively series connected with the two ends of fluid ports of primary side fluid piping of the heat pump or heat exchange device.

Fig. 18 is a schematic view of the embodiment of the present invention showing that at least one unidirectional fluid pump and the bidirectional fluid valve set constituted by four controllable switch type fluid valves in bridge type assembly are series connected to one end of the two fluid ports of primary side fluid piping of the heat pump or heat exchange device.

Fig. 19 is a schematic view of the embodiment of the present invention showing that the two bidirectional fluid pumping devices individually comprising at least one unidirectional fluid pump and four controllable switch type fluid valves in bridge type assembly are respectively series connected with the two individual ends of fluid ports of the two flow circuits being respectively series connected with the heat pump or heat exchange device.

Fig. 20 is a schematic view of the embodiment of the present invention showing that bidirectional fluid pumping device is series connected with one of the two fluid ports of the secondary side fluid piping of the heat pump or heat exchange device.

Fig. 21 is a schematic view of the embodiment of the present invention showing that two bidirectional fluid pumping devices are respectively series connected with the two ends of fluid ports of secondary side fluid piping of the heat pump or heat exchange device.

Fig. 22 is a schematic view of the embodiment of the present invention showing that the bidirectional fluid pumping device constituted by at least two series connected unidirectional fluid pumps in different pumping flow directions is series connected with one end of the two fluid ports of secondary side fluid piping of the heat pump or heat exchange device.

Fig. 23 is a schematic view of the embodiment of the present invention showing that the two bidirectional fluid pumping devices individually constituted by at least two series connected unidirectional fluid pumps in different pumping flow direction are respectively installed to the two ends of fluid ports of secondary side fluid piping of the heat pump or heat exchange device.

Fig. 24 is a schematic view of the embodiment of the present invention showing that the bidirectional fluid pumping device comprising at least two parallel connected unidirectional fluid pumps in different pumping flow directions is series connected with either one end of the fluid ports of secondary side fluid piping of the heat pump or heat exchange device.

Fig. 25 is a schematic view of the embodiment showing that the present invention is installed with two bidirectional fluid pumping devices individually comprising at least two series connected unidirectional fluid pumps are respectively series connected with the two ends of fluid ports of secondary side fluid piping of the heat pump or heat exchange device.

Fig. 26 is a schematic view of the embodiment of the present invention showing that at least one unidirectional fluid pump and the bidirectional fluid valve set constituted by four controllable switch type fluid valves in bridge type assembly are series connected to one end of the two fluid ports of secondary side fluid piping of the heat pump or heat exchange device.

Fig. 27 is a schematic view of the embodiment of the present invention showing that the two bidirectional fluid pumping devices individually comprising at least one unidirectional fluid pump and four controllable switch type fluid valves in bridge type assembly are respectively series connected with the two individual ends of fluid ports of the two flow circuits being respectively series connected with the heat pump or heat exchange device.

DESCRIPTION OF MAIN COMPONENT SYMBOLS

[0007]

10: Primary side fluid

20: Secondary side fluid
 30: Thermal conducting fluid
 11: Temperature detecting device
 50: Thermal conductor
 100: Heat pump or heat exchange device 5
 101: Primary side fluid piping
 102: Secondary side fluid piping
 120, 120': Unidirectional fluid pump
 123: Bidirectional fluid pumping device
 124: Bidirectional fluid pump 10
 126: Unidirectional valve
 129a, 129b, 129c, 129d: Fluid valve
 200: Enclosed hollow casing
 250: Periodic fluid direction-change operative control device 15
 300: Power source
 1000: Heat exchange device

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

[0008] Fig. 2 is a block schematic view showing the structural principles of the present invention, wherein primary side fluid piping and secondary side fluid piping being commonly installed on the thermal conductor to constitute the heat pump or heat exchange device functions are driven by the bidirectional fluid pumping device;

[0009] As shown in Fig. 2, the heat pump or heat exchange device (100) with positive and reverse directional pumping of the present invention is series connected with the bidirectional fluid pumping device (123) being driven by power source (300) and operatively controlled by the periodic fluid direction-change operative control device (250) for pumping the primary side fluid (10) to appear flow direction-change in positive and reverse flow directions to pass through the heat pump or heat exchange device (100) via primary side fluid piping (101); wherein:

-- The primary side fluid piping (101): It is for passing by the primary side fluid (10) being pumped by the bidirectional fluid pumping device (123) to further pass through the heat pump or heat exchange device (100) for heat exchange with secondary side fluid (20);

-- The secondary side fluid piping (102): It is for passing by the secondary side fluid (20) being pumped by the unidirectional fluid pump (120) to further pass through heat pump or heat exchange device (100) for heat exchange with primary side fluid (10);

-- Said primary side fluid piping (101) and secondary side fluid piping (102) can be made to straight piping, plane extended or 3-D shaped curved piping, labyrinth piping, spiral piping or piping of other various geometric shapes, wherein part of primary side fluid piping (101) is commonly combined with secondary side fluid piping (102) on thermal conductor (50) for mutual warm energy transfer to constitute the functional structure of the heat pump or heat exchange

device (100);

-- The bidirectional fluid pumping device (123): It is constituted by the fluid pumping device having both or one of the operatively controllable pumping functions of positive pressure or negative pressure for pumping the gaseous or liquid state primary side fluid (10), wherein the bidirectional fluid pumping device (123) is driven by electric motor being driven by electric power source (300), engine power, or mechanical or electric power converted from other wind power, thermal energy, temperature-difference energy, or solar energy, etc;

-- The unidirectional fluid pump (120): It is constituted by the fluid pumping device capable of producing positive pressure to push fluid, or producing negative pressure to attract fluid for unidirectionally pumping secondary side fluid (20) inside secondary side fluid piping (102); unidirectional fluid pump (120) is driven by electric motor being driven by electric power source (300), engine power, or mechanical or electric power converted from other wind power, thermal energy, temperature-difference energy, or solar energy, etc; the unidirectional fluid pump (120) can be operatively controlled independently or by the periodic fluid direction-change operative control device (250);

-- The primary side fluid (10): It comprises one or more than one kind of same or different liquid or gaseous state, liquid to gaseous state, or gaseous to liquid state fluid;

-- The secondary side fluid (20): It comprises one or more than one kind of same or different liquid or gaseous state, liquid to gaseous state, or gaseous to liquid state fluid;

-- The power source (300): It is the device including AC or DC city power system or independent power to provide power source for the operations;

-- The periodic fluid direction-change operative control device (250): It is constituted by electromechanical components, solid state electronic components, or microprocessors and relevant software and operative control interfaces to operatively control the bidirectional fluid pumping device (123) and/or unidirectional fluid pump (120) simultaneously for periodically changing the flow direction of the primary side fluid (10) passing through heat pump or heat exchange device (100) thereby operatively controlling the temperature difference distribution status between primary side fluid (10) passing through primary side fluid piping (101) inside the heat pump or heat exchange device (100) and the heat pump or heat exchange device (100);

[0010] The timing for bidirectional fluid pumping device (123) to periodically change the pumping flow direction of primary side fluid (10) is **1**) the pumping flow direction of the bidirectional fluid pumping device (123) is manually operatively controlled; or **2**) the direction-change time pe-

riod is set by periodic fluid direction-change operative control device (250) to operatively control the pumping flow direction of bidirectional fluid pumping device (123) to further change the flow direction of the primary side fluid (10) passing through primary side fluid piping (101);

[0011] At least one temperature detecting device (11) is further installed at a position capable of directly or indirectly detecting the temperature change of the exchange pumping fluid in the embodiment of Fig. 2 to transmit the detected temperature signal back to the periodic fluid direction-change operative control device (250); wherein:

-- The periodic fluid direction-change operative control device (250): It is constituted by electromechanical components, solid state electronic components, or microprocessors and relevant software and operative control interfaces to operatively control the bidirectional fluid pumping device (123) for periodically changing the flow direction of the fluid passing through heat pump or heat exchange device (100) thereby operatively controlling the temperature difference distribution status between primary side fluid (10) passing through primary side fluid piping (101) and heat pump or heat exchange device (100) inside the heat pump or heat exchange device (100); the operative control methods include one or more than one of the following: **1)** the pumping flow direction of the bidirectional fluid pumping device (123) is manually operatively controlled; or **2)** the pumping flow direction of the bidirectional fluid pumping device (123) is operatively controlled by the periodic fluid direction-change operative control device (250) via setting time period or setting time period by referring to temperature variation detected by the temperature detecting device (11); or **3)** at least one temperature detecting device (11) is installed at a position capable of directly or indirectly detecting the temperature change of the exchange pumping fluid and to transmit the temperature detected signal by the temperature detecting device (11) back to the periodic fluid direction-change operative control device (250), so that when the temperature detecting device (11) is reached the setting temperature, the pumping flow direction of the bidirectional fluid pumping device (123) is operatively controlled to pump the primary side fluid (10) to pass through the primary side fluid piping (101) in positive and reverse flow directions thereby changing the temperature distribution status of the thermal conductor (50) of the heat pump or heat exchange device (100) accordingly.

[0012] Fig. 3 is a block schematic view showing the structural principle of the present invention, wherein the primary side fluid piping and secondary side fluid piping being mutually sleeveably combined to constitute the heat pump or heat exchange device function are driven by the bidirectional fluid pumping device to periodically ex-

change the flow directions of the primary side fluid;

[0013] As shown in Fig. 3, the heat pump or heat exchange device (100) with periodic positive and reverse pumping of present invention is further series connected with the bidirectional fluid pumping device (123) driven by power source (300) and operatively controlled by the periodic fluid direction-change operative control device (250) for pumping the primary side fluid (10) to pass through the heat pump or heat exchange device (100) via primary side fluid piping (101) to periodically exchange flow directions; wherein:

-- The primary side fluid piping (101): It is for passing by the primary side fluid (10) being pumped by the bidirectional fluid pumping device (123) to further pass through the heat pump or heat exchange device (100), thereby via the thermal conductor (50) to transfer thermal energy for heat exchange with secondary side fluid (20);

-- The secondary side fluid piping (102): It is for passing by the secondary side fluid (20) being pumped by the unidirectional fluid pump (120) to further pass through the heat pump or heat exchange device (100) for heat exchange with primary side fluid (10);

-- Said primary side fluid piping (101) and secondary side fluid piping (102) can be made to straight piping, plane extended or 3-D shaped curved piping, labyrinth piping, spiral piping or piping of other various geometric shapes, wherein part of primary side fluid piping (101) is sleeveably combined with secondary side fluid piping (102) of different sizes to form the fluid path for passing fluids, wherein the function of thermal conductor (50) is constituted by the fluid piping walls between primary side fluid (10) and secondary side fluid (20) to execute the warm energy transfer function thereby further constituting the functional structure of the heat pump or heat exchange device (100);

-- The bidirectional fluid pumping device (123): It is constituted by both or either one of the fluid pumping devices capable of producing positive pressure or negative pressure for pumping gaseous or liquid state primary side fluid (10), wherein the bidirectional fluid pumping device (123) is driven by electric motor being driven by electric power source (300), engine power, or mechanical or electric power converted from other wind power, thermal energy, temperature-difference energy, or solar energy, etc;

-- The unidirectional fluid pump (120): It is constituted by the fluid pumping device capable of producing positive pressure to push fluid, or producing negative pressure to attract fluid for unidirectionally pumping secondary side fluid (20) inside secondary side fluid piping (102); the unidirectional fluid pump (120) is driven by electric motor being driven by electric power source (300), engine power, or mechanical or electric power converted from other wind power, thermal energy, temperature-difference energy, or

solar energy, etc; the unidirectional fluid pump (120) can be operatively controlled independently or by the periodic fluid direction-change operative control device (250);

-- The primary side fluid (10): It comprises one or more than one kind of same or different liquid or gaseous state, liquid to gaseous state, or gaseous to liquid state fluid;

-- The secondary side fluid (20): It comprises one or more than one kind of same or different liquid or gaseous state, liquid to gaseous state, or gaseous to liquid state fluid;

-- The power source (300): It is the device including AC or DC city power system or independent power to provide power source for the operations;

-- The periodic fluid direction-change operative control device (250): It is constituted by electromechanical components, solid state electronic components, or microprocessors and relevant software and operative control interfaces to operatively control the bidirectional fluid pumping device (123) and/or fixed unidirectional fluid pump (120) simultaneously for periodically changing the flow direction of the primary side fluid (10) passing through heat pump or heat exchange device (100) thereby operatively controlling the temperature difference distribution status between primary side fluid (10) passing through primary side fluid piping (101) inside the heat pump or heat exchange device (100) and the heat pump or heat exchange device (100);

[0014] The timing for bidirectional fluid pumping device (123) to periodically change the pumping flow direction of primary side fluid (10) is **1)** the pumping flow direction of the bidirectional fluid pumping device (123) is manually operatively controlled; or **2)** the direction-change time period is set by periodic fluid direction-change operative control device (250) to operatively control the pumping flow direction of bidirectional fluid pumping device (123) to further change the flow direction of the primary side fluid (10) passing through primary side fluid piping (101);

[0015] At least one temperature detecting device (11) is further installed at a position capable of directly or indirectly detecting the temperature change of the exchange pumping fluid in the embodiment of Fig. 3 to transmit the detected temperature signal back to the periodic fluid direction-change operative control device (250); wherein:

-- The periodic fluid direction-change operative control device (250): It is constituted by electromechanical components, solid state electronic components, or microprocessors and relevant software and operative control interfaces to operatively control the bidirectional fluid pumping device (123) for periodically changing the flow direction of the fluid passing through heat pump or heat exchange device (100) thereby operatively controlling the temperature dif-

ference distribution status between the primary side fluid (10) passing through primary side fluid piping (101) inside the heat pump or heat exchange device (100) and the heat pump or heat exchange device (100); the operative control methods include one or more than one of the following: **1)** the pumping flow direction of the bidirectional fluid pumping device (123) is manually operatively controlled, or **2)** the pumping flow direction of the bidirectional fluid pumping device (123) is operatively controlled by the periodic fluid direction-change operative control device (250) via setting time period or setting time period by referring to temperature variation detected by the temperature detecting device (11), or **3)** at least one temperature detecting device (11) is installed at a position capable of directly or indirectly detecting the temperature change of the exchange pumping fluid and to transmit the detected temperature signal by the temperature detecting device (11) back to the periodic fluid direction-change operative control device (250), so that when the temperature detecting device (11) is reached the setting temperature, the pumping flow direction of the bidirectional fluid pumping device (123) is operatively controlled to pump the primary side fluid (10) to pass through the primary side fluid piping (101) in positive and reverse flow directions thereby changing the temperature distribution status of the thermal conductor (50) of the heat pump or heat exchange device (100) accordingly;

[0016] The heat pump or heat exchange device with periodic positive and reverse pumping of present invention is further made to that the unidirectional fluid pump and four controllable switch type fluid valves being connected for positive and reverse flow directional operative control have two input ends and two output ends, wherein the unidirectional fluid pump (120) is installed between at least one of the two input ends and respectively connected fluid source of primary side fluid piping (101), while the two output ends is arranged for connecting the two ends of the piping ports (a), (b) of the primary side fluid piping (101) installed to the heat pump or heat exchange device (100) thereby constituting the function of the bidirectional fluid pumping device (123) to pump the primary side fluid (10) in primary side fluid piping (101) of the heat pump or heat exchange device (100) in periodic positive and reverse flow directions so as to perform warm energy transfer with secondary side fluid (20) pumped by the unidirectional fluid pump (120) to pass through secondary side fluid piping (102) via the convection of the thermal conductor (50).

[0017] Fig. 4 is a schematic view showing the embodiment of that at least one unidirectional fluid pump and the bidirectional fluid valve set comprising by four controllable switch type fluid valves commonly constitute the bidirectional fluid pumping device, while the primary side fluid piping and the secondary side fluid piping are com-

monly installed on the heat pump or heat exchange device constituted by the thermal conductor, and said bidirectional fluid pumping device is installed between at least one end of the primary side fluid piping and the primary side fluid source;

[0018] As shown in Fig. 4, the flow circuit passing through the fluid valves (129a, 129b, 129c, 129d) and the unidirectional fluid pump (120) being connected with the primary side fluid piping (101) inside the heat pump or heat exchange device (100) include:

- One end of the fluid valve (129a) is interconnected with the fluid valve (129c) and the output end of the unidirectional fluid pump (120), while the input end of the unidirectional fluid pump (120) is interconnected with the piping port (A) of primary side fluid piping (101);
- The other end of the fluid valve (129a) is interconnected with the piping port (A) of primary side fluid piping (101) installed in the heat pump or heat exchange device (100) and one end of the fluid valve (129b);
- One end of the fluid valve (129d) is interconnected with one end of fluid valve (129b) and further directly connected with the piping port (B) of the primary side fluid piping (101);
- The other end of fluid valve (129d) is interconnected with the piping port (B) of primary side fluid piping (101) installed in the heat pump or heat exchange device (100) and fluid valve (129c), while the other end of fluid valve (129c) is interconnected with fluid valve (129a), and they are commonly interconnected with the output end of the unidirectional fluid pump (120);

[0019] During the operation of bidirectional fluid pumping device (123) being operatively controlled by the periodic fluid direction-change operative control device (250), in the bidirectional fluid pumping device (123) being constituted by the unidirectional fluid pump (120) and fluid valves (129a, 129b, 129c, 129d), the fluid valve (129a) and fluid valve (129d) are one group, the fluid valve (129c) and fluid valve (129b) are another group, and they are opened or closed alternatively thereby via the pump of the unidirectional fluid pump (120) forming the periodic alternative flow direction exchange function on the heat pump or heat exchange device (100);

- The said unidirectional fluid pump (120) can be constituted by one fluid pump to pump unidirectionally or constituted by more than one fluid pumps to be installed to the same end of the primary side fluid piping (101) or respectively installed to both ends of the primary side fluid piping (101) as the auxiliary pumps in the same pumping flow directions;

[0020] The embodiment of Fig. 4 is further installed with at least one temperature detecting device (11) at a

position capable of directly or indirectly detecting the temperature change of the exchange pumping fluid to transmit the detected temperature signal back to the periodic fluid direction-change operative control device (250); wherein:

- The periodic fluid direction-change operative control device (250): It is constituted by electromechanical components, solid state electronic components, or microprocessors and relevant software and operative control interfaces to operatively control the bidirectional fluid pumping device (123) for periodically changing the flow direction of the fluid passing through heat pump or heat exchange device (100) thereby operatively controlling the temperature difference distribution status between primary side fluid (10) passing through primary side fluid piping (101) inside the heat pump or heat exchange device (100) and the heat pump or heat exchange device (100); the operative control methods include one or more than one of the following: **1)** the pumping flow direction of the bidirectional fluid pumping device (123) is manually operatively controlled; or **2)** the pumping flow direction of the bidirectional fluid pumping device (123) is operatively controlled by the periodic fluid direction-change operative control device (250) via setting time period or setting time period by referring to temperature variation detected by the temperature detecting device (11); or **3)** at least one temperature detecting device (11) is installed at a position capable of directly or indirectly detecting the temperature change of the exchange pumping fluid to transmit the detected temperature signal by the temperature detecting device (11) back to the periodic fluid direction-change operative control device (250), so that when the temperature detecting device (11) is reached the setting temperature, the pumping flow direction of the bidirectional fluid pumping device (123) is operatively controlled to pump the primary side fluid (10) to pass through the primary side fluid piping (101) in positive and reverse flow directions thereby changing the temperature distribution status of the thermal conductor (50) inside the heat pump or heat exchange device (100) accordingly.

[0021] For the heat pump or heat exchange device with periodic positive and reverse pumping of present invention, at least one unidirectional fluid pump is further series connected with the four controllable switch type fluid valves to constitute the bidirectional fluid pumping device (123) for pumping the primary side fluid (10) in the primary side fluid piping (101) of the heat pump or heat exchange device (100) in periodic positive and reverse flow directions, while the secondary side fluid piping (102) is sleeveably combined inside the primary side fluid piping (101), wherein a fluid channel is reserved between said two fluid piping for passing primary side fluid (10) thereby allowing the primary side fluid (10) to perform warm en-

ergy transfer to the secondary side fluid (20) passing through secondary side fluid piping (102) being unidirectionally pumped by the unidirectional fluid pump (120);

[0022] Fig. 5 is a schematic view showing the embodiment of that at least one unidirectional fluid pump and the bidirectional fluid valve set comprising by four controllable switch type fluid valves commonly constitute the bidirectional fluid pumping device and are installed between at least one end of the primary side fluid piping of the sleeve combined heat pump or heat exchange device and the primary side fluid source.

[0023] As shown in Fig. 5, the flow circuit passing through the fluid valves (129a, 129b, 129c, 129d) and the unidirectional fluid pump (120) being connected with the heat pump or heat exchange device (100) include the following:

- One end of the fluid valve (129a) is interconnected with the fluid valve (129c) and the output end of the unidirectional fluid pump (120), while the input end of the unidirectional fluid pump (120) is interconnected with the piping port (A) of primary side fluid piping (101);
- The other end of the fluid valve (129a) is interconnected with the piping port (A) of the heat pump or heat exchange device (100) and one end of the fluid valve (129b);
- One end of the fluid valve (129d) is interconnected with one end of fluid valve (129b) and further connected with the piping port (B) of the primary side fluid piping (101);
- The other end of fluid valve (129d) is interconnected with the piping port (B) of the heat pump or heat exchange device (100) and the fluid valve (129c), while the other end of fluid valve (129c) is interconnected with fluid valve (129a), and they are commonly interconnected with the output end of the unidirectional fluid pump (120);

[0024] During the operation of bidirectional fluid pumping device (123) being operatively controlled by the periodic fluid direction-change operative control device (250), in the bidirectional fluid pumping device (123) being constituted by the unidirectional fluid pump (120) and fluid valves (129a, 129b, 129c, 129d), the fluid valve (129a) and fluid valve (129d) are one group, the fluid valve (129c) and fluid valve (129b) are another group, and they are opened or closed alternatively thereby forming the periodic alternative flow direction exchange function on the heat pump or heat exchange device (100);

- Said unidirectional fluid pump (120) is constituted by one fluid pump to pump unidirectionally or constituted by more than one fluid pumps to be installed to the same end of the primary side fluid piping (101) or respectively installed to both ends of the primary side fluid piping (101) so as to provide the auxiliary pumping in the same pumping actions and same

pumping flow directions.

[0025] The embodiment of Fig. 5 is further installed with at least one temperature detecting device (11) at a position capable of directly or indirectly detecting the temperature change of the exchange pumping fluid to transmit the detected temperature signal back to the periodic fluid direction-change operative control device (250); wherein :

- The periodic fluid direction-change operative control device (250): It is constituted by electromechanical components, solid state electronic components, or microprocessors and relevant software and operative control interfaces to operatively control the bidirectional fluid pumping device (123) for periodically changing the flow direction of the fluid passing through heat pump or heat exchange device (100) thereby operatively controlling the temperature difference distribution status between primary side fluid (10) passing through primary side fluid piping (101) inside the heat pump or heat exchange device (100) and the heat pump or heat exchange device (100); the operative control methods include one or more than one of the following: **1)** the pumping flow direction of the bidirectional fluid pumping device (123) is manually operatively controlled, or **2)** the pumping flow direction of the bidirectional fluid pumping device (123) is operatively controlled by the periodic fluid direction-change operative control device (250) via setting time period or setting time period by referring to temperature variation detected by the temperature detecting device (11), or **3)** at least one temperature detecting device (11) is installed at a position capable of directly or indirectly detecting the temperature change of the exchange pumping fluid transmit the detected temperature signal by the temperature detecting device (11) back to the periodic fluid direction-change operative control device (250), so that when the temperature detecting device (11) is reached the setting temperature, the pumping flow direction of the bidirectional fluid pumping device (123) is operatively controlled to pump the primary side fluid (10) to pass through the primary side fluid piping (101) in positive and reverse flow directions thereby changing the temperature distribution status of the thermal conductor (50) inside the heat pump or heat exchange device (100) accordingly.

[0026] Fig. 6 is a block schematic view showing the structural principles of that the primary side fluid piping is sleeve combined with the spiral shaped secondary side fluid piping inside the enclosed hollow casing, wherein it is through thermal conducting fluid driven by bidirectional fluid pumping device inside the enclosed hollow casing to transfer warm energy thereby constituting the heat pump or heat exchange device function;

[0027] As shown in Fig. 6: the bidirectional fluid pump-

ing device (123) being driven by the power source (300) and operatively controlled by the periodic fluid direction-change operative control device (250) for periodic positive and reverse flow pumping is used to pump primary side fluid (10) to pass through primary side fluid piping (101) for periodic flow directional change; wherein:

-- The primary side fluid piping (101): It is for passing by the primary side fluid (10) being pumped by the bidirectional fluid pumping device (123) to further pass through the primary side fluid piping (101) inside the enclosed hollow casing (200), wherein the primary side fluid (10) is through the thermal conducting fluid (30) to transfer warm energy and exchange heat with the secondary side fluid (20);

-- The secondary side fluid piping (102): It is for passing by the secondary side fluid (20) being pumped by the unidirectional fluid pump (120) to further pass through the secondary side fluid piping (102) inside the enclosed hollow casing (200) and is through the thermal conducting fluid (30) to exchange heat with the primary side fluid (10);

-- Said primary side fluid piping (101) and spiral shaped secondary side fluid piping (102) are sleeveably combined inside the enclosed hollow casing (200) and is through the thermal conducting fluid (30) in the enclosed hollow casing (200) to transfer warm energy thereby constituting the heat pump or heat exchange device functions, wherein the primary side fluid (10) inside primary side fluid piping (101) is pumped by the bidirectional fluid pumping device (123) to periodically exchange flow directions;

-- The bidirectional fluid pumping device (123): It is constituted by the fluid pumping device having both or one of the operatively controllable pumping functions of positive pressure or negative pressure for pumping the gaseous or liquid state primary fluid (10), wherein the bidirectional fluid pumping device (123) is driven by electric motor being driven by electric power source (300), engine power, or mechanical or electric power converted from other wind power, thermal energy, temperature-difference energy, or solar energy, etc;

-- The unidirectional fluid pump (120): It is constituted by the fluid pumping device capable of producing positive pressure to push fluid, or producing negative pressure to attract fluid for unidirectionally pumping secondary side fluid (20) inside secondary side fluid piping (102);

-- Said unidirectional fluid pump (120) is driven by electric motor being driven by electric power source (300), engine power, or mechanical or electric power converted from other wind power, thermal energy, temperature-difference energy, or solar energy, etc; the unidirectional fluid pump (120) can be operatively controlled independently or by the periodic fluid direction-change operative control device (250);

-- The primary side fluid (10): It comprises one or

more than one kind of same or different liquid or gaseous state, liquid to gaseous state, or gaseous to liquid state fluid;

-- The secondary side fluid (20): It comprises one or more than one kind of same or different liquid or gaseous state, liquid to gaseous state, or gaseous to liquid state fluid;

-- The thermal conducting fluid (30): It comprises one or more than one kind of same or different liquid or gaseous state, liquid to gaseous state, or gaseous to liquid state fluid;

-- The power source (300): It is the device including AC or DC city power system or independent power to provide power source for the operations;

-- The periodic fluid direction-change operative control device (250): It is constituted by electromechanical components, solid state electronic components, or microprocessors and relevant software and operative control interfaces to operatively control the bidirectional fluid pumping device (123) and/or unidirectional fluid pump (120) simultaneously for periodically changing the flow direction of the primary side fluid (10) passing through the primary side fluid piping (101);

[0028] The timing for bidirectional fluid pumping device (123) to periodically change the pumping flow direction of primary side fluid (10) is **1)** the pumping flow direction of the bidirectional fluid pumping device (123) is manually operatively controlled, or **2)** the pumping flow direction of the bidirectional fluid pumping device (123) is operatively controlled by the periodic fluid direction-change operative control device (250) via setting time period or setting time period by referring to temperature variation detected by the temperature detecting device (11), or **3)** at least one temperature detecting device (11) is installed at a position capable of directly or indirectly detecting the temperature change of the exchange pumping fluid to transmit the detected temperature signal by the temperature detecting device (11) back to the periodic fluid direction-change operative control device (250), so that when the temperature detecting device (11) is reached the setting temperature, the pumping flow direction of the bidirectional fluid pumping device (123) is operatively controlled to pump the primary side fluid (10) to pass through the primary side fluid piping (101) in positive and reverse flow directions.

[0029] Fig. 7 is a schematic view showing the embodiment of the present invention, wherein the bidirectional fluid pumping device is constituted by at least one unidirectional fluid pump and the bidirectional fluid valve set comprising by four controllable switch type fluid valves, and the primary side fluid piping and spiral shaped secondary side fluid piping are sleeveably combined inside the enclosed hollow casing to allow the thermal conducting fluid inside the enclosed hollow casing to transfer warm energy thereby constituting the heat pump or heat exchange device, while the unidirectional fluid pump is in-

stalled between the primary side fluid piping and the primary side fluid source;

[0030] As shown in Fig. 7, the bidirectional fluid pumping device (123) is further constituted by the fluid valves (129a, 129b, 129c, 129d) being connected with the primary side fluid piping (101) and the unidirectional fluid pump (120), wherein the pumping flow circuits comprise the following:

-- One end of the fluid valve (129a) is interconnected with the fluid valve (129c) and the output end of the unidirectional fluid pump (120), while the input end of the unidirectional fluid pump (120) is interconnected with the piping port (A) of primary side fluid piping (101);

-- The other end of fluid valve (129a) is interconnected with the piping port (A) of the primary side fluid piping (101) installed in the enclosed hollow casing (200) and one end of fluid valve (129b);

-- One end of the fluid valve (129d) is interconnected with one end of fluid valve (129b) and further connected with the fluid inlet end of the unidirectional fluid pump (120), while the fluid outlet end of the unidirectional fluid pump (120) is interconnected with the piping port (B) of the primary side fluid piping (101);

-- The other end of fluid valve (129d) is interconnected with the piping port (B) of primary side fluid piping (101) installed in the enclosed hollow casing (200) and the fluid valve (129c), while the other end of fluid valve (129c) is interconnected with fluid valve (129a), and they are commonly interconnected with the output end of the unidirectional fluid pump (120);

[0031] The bidirectional fluid pumping device (123) being operatively controlled by the periodic fluid direction-change operative control device (250) is constituted by the unidirectional fluid pump (120) and fluid valves (129a, 129b, 129c, 129d), wherein the fluid valve (129a) and fluid valve (129d) are one group, the fluid valve (129c) and fluid valve (129b) are another group, and they are opened or closed alternatively thereby forming the periodic alternative flow direction exchange function on the primary side fluid (10) of the primary side fluid piping (101) installed in the enclosed hollow casing (200);

-- Said unidirectional fluid pump (120) is constituted by one fluid pump to pump unidirectionally or constituted by more than one fluid pumps to be installed to the same end of the primary side fluid piping (101) or respectively installed to both ends of the primary side fluid piping (101) so as to provide the auxiliary pumping in the same pumping flow directions;

-- Said primary side fluid piping (101) and spiral shaped secondary side fluid piping (102) are sleeveably combined inside the enclosed hollow casing (200) and is through the thermal conducting fluid (30) in the enclosed hollow casing (200) to transfer warm

energy thereby constituting the heat pump or heat exchange device function;

-- At least one unidirectional fluid pump (120) is installed between at least one end of secondary side fluid piping (102) and the secondary side fluid source for unidirectionally pumping secondary side fluid (20);

[0032] In the embodiment of Fig. 7, at least one temperature detecting device (11) is installed at a position capable of directly or indirectly detecting the temperature change of the exchange pumping fluid to transmit the detected temperature signal back to the periodic fluid direction-change operative control device (250); wherein:

-- The periodic fluid direction-change operative control device (250): It is constituted by electromechanical components, solid state electronic components, or microprocessors and relevant software and operative control interfaces to operatively control the bidirectional fluid pumping device (123) constituted by one unidirectional fluid pump and its connected four controllable switch type fluid valves for periodically changing the flow direction of the fluid passing through primary side fluid piping (101) thereby operatively controlling the temperature difference distribution status of the primary side fluid (10) inside primary side fluid piping (101) of the enclosed hollow casing (200); the operative control methods include one or more than one of the following: **1)** the pumping flow direction of the bidirectional fluid pumping device (123) is manually operatively controlled; or **2)** the pumping flow direction of the bidirectional fluid pumping device (123) is operatively controlled by the periodic fluid direction-change operative control device (250) via setting time period or setting time period by referring to temperature variation detected by the temperature detecting device (11); or **3)** at least one temperature detecting device (11) is installed at a position capable of directly or indirectly detecting the temperature change of the exchange pumping fluid to transmit the detected temperature signal by the temperature detecting device (11) back to the periodic fluid direction-change operative control device (250), so that when the temperature detecting device (11) is reached the setting temperature, the pumping flow direction of the bidirectional fluid pumping device (123) is operatively controlled to pump the primary side fluid (10) to pass through the primary side fluid piping (101) in positive and reverse flow directions thereby changing the temperature distribution status of primary side fluid (10) inside primary side fluid piping (101) of the enclosed hollow casing (200) accordingly.

[0033] Fig. 8 is a block schematic view showing the structural principles of the present invention, wherein the

primary side fluid inside primary side fluid piping is pumped to pass through enclosed hollow casing, while the spiral shaped secondary side fluid piping is installed inside the enclosed hollow casing, wherein it is through the primary side fluid inside the enclosed hollow casing being the thermal conducting fluid to transfer warm energy thereby constituting the heat pump or heat exchange device function, and it is driven by the bidirectional fluid pumping device;

[0034] As shown in Fig. 8, the bidirectional fluid pumping device (123) is driven by the power source (300) and operatively controlled by the periodic fluid direction-change operative control device (250) for pumping primary side fluid (10) to pass through enclosed hollow casing (200) to periodically exchange flow directions; wherein:

-- The primary side fluid piping (101): It is for passing by the primary side fluid (10) being pumped by the bidirectional fluid pumping device (123) to further pass through the enclosed hollow casing (200), wherein the warm energy is directly transferred by the primary side fluid (10) inside the enclosed hollow casing (200) to exchange heat with the secondary side fluid (20);

-- The secondary side fluid piping (102): It is for passing by the secondary side fluid (20) being pumped by the unidirectional fluid pump (120) to further pass through spiral shaped secondary side fluid piping (102) inside the enclosed hollow casing (200), wherein the secondary side fluid (20) directly transfer warm energy to the primary side fluid (10);

-- Said primary side fluid (10) inside primary side fluid piping (101) is pumped to pass through enclosed hollow casing (200), while the spiral shaped secondary side fluid piping (102) is installed inside the enclosed hollow casing (200), wherein the primary side fluid (10) inside the enclosed hollow casing (200) is directly used as the thermal conducting fluid for transfer warm energy to the secondary side fluid (20) inside secondary side fluid piping (102) thereby constituting the heat pump or heat exchange device function, and the primary side fluid (10) inside the enclosed hollow casing (200) is pumped by the bidirectional fluid pumping device (123) to periodically exchange the flow directions;

-- The bidirectional fluid pumping device (123): It is constituted by the fluid pumping device having both or one of the operatively controllable pumping functions of positive pressure or negative pressure for pumping the gaseous or liquid state primary side fluid (10), wherein the bidirectional fluid pumping device (123) is driven by electric motor being driven by electric power source (300), engine power, or mechanical or electric power converted from other wind power, thermal energy, temperature-difference energy, or solar energy, etc;

-- The unidirectional fluid pump (120): It is constituted

by the fluid pumping device capable of producing positive pressure to push fluid, or producing negative pressure to attract fluid for unidirectionally pumping secondary side fluid (20) inside secondary side fluid piping (102);

-- Said unidirectional fluid pump (120) is driven by electric motor being driven by electric power source (300), engine power, or mechanical or electric power converted from other wind power, thermal energy, temperature-difference energy, or solar energy, etc; the unidirectional fluid pump (120) can be operatively controlled independently or by the periodic fluid direction-change operative control device (250);

-- The primary side fluid (10): It comprises one or more than one kind of same or different liquid or gaseous state, liquid to gaseous state, or gaseous to liquid state fluid;

-- The secondary side fluid (20): It comprises one or more than one kind of same or different liquid or gaseous state, liquid to gaseous state, or gaseous to liquid state fluid;

-- The power source (300): It is the device including AC or DC city power system or independent power to provide power source for the operations;

-- The periodic fluid direction-change operative control device (250): It is constituted by electromechanical components, solid state electronic components, or microprocessors and relevant software and operative control interfaces to operatively control the bidirectional fluid pumping device (123) and/or unidirectional fluid pump (120) simultaneously for periodically changing the flow direction of the primary side fluid (10) passing through the interior of the enclosed hollow casing (200);

[0035] The timing for bidirectional fluid pumping device (123) to periodically change the pumping flow direction of primary side fluid (10) is: **1)** the pumping flow direction of the bidirectional fluid pumping device (123) is manually operatively controlled, or **2)** the pumping flow direction of the bidirectional fluid pumping device (123) is operatively controlled by the periodic fluid direction-change operative control device (250) via setting time period or setting time period by referring to temperature variation detected by the temperature detecting device (11), or **3)** at least one temperature detecting device (11) is installed at a position capable of directly or indirectly detecting the temperature change of the exchange pumping fluid to transmit the detected temperature signal by the temperature detecting device (11) back to the periodic fluid direction-change operative control device (250), so that when the temperature detecting device (11) is reached the setting temperature, the pumping flow direction of the bidirectional fluid pumping device (123) is operatively controlled to pump the primary side fluid (10) to pass through the interior of the enclosed hollow casing (200) in positive and reverse flow directions.

[0036] Fig. 9 is a schematic view showing the embod-

iment of the present invention, wherein the bidirectional fluid pumping device is constituted by at least one unidirectional fluid pump and four controllable switch type fluid valves, and the primary side fluid in the primary side fluid piping is pumped to pass through the enclosed hollow casing, while the spiral shaped secondary side fluid piping is installed inside the enclosed hollow casing, wherein the primary side fluid inside the enclosed hollow casing is used as the conducting fluid for warm energy transfer thereby constituting the heat pump or heat exchange device function, and the unidirectional fluid pump is installed between the primary side fluid piping and the primary side fluid source;

[0037] As shown in Fig. 9, the bidirectional fluid pumping device (123) is constituted by the fluid valves (129a, 129b, 129c, 129d) being connected with the primary side fluid piping (101) and the unidirectional fluid pump (120); wherein the pumping flow circuit comprises:

- One end of fluid valve (129a) is interconnected with the fluid valve (129c) and the output end of the unidirectional fluid pump (120), while the input end of the unidirectional fluid pump (120) is interconnected with the piping port (A) of primary side fluid piping (101);
- The other end of fluid valve (129a) is interconnected with the piping port (A) of the primary side fluid piping (101) installed in the enclosed hollow casing (200) and one end of fluid valve (129b);
- One end of the fluid valve (129d) is interconnected with one end of fluid valve (129b) and further connected with the piping port (B) of the primary side fluid piping (101);
- The other end of fluid valve (129d) is interconnected with the piping port (B) of primary side fluid piping (101) installed inside the enclosed hollow casing (200) and the fluid valve (129c), while the other end of fluid valve (129c) is interconnected with fluid valve (129a), and they are commonly interconnected with the output end of the unidirectional fluid pump (120);

[0038] The bidirectional fluid pumping device (123) being operatively controlled by the periodic fluid direction-change operative control device (250) is constituted by fluid valves (129a, 129b, 129c, 129d) and the unidirectional fluid pump (120), wherein the fluid valve (129a) and fluid valve (129d) are one group, the fluid valve (129c) and fluid valve (129b) are another group, and they are opened or closed alternatively thereby forming the periodic alternative flow direction exchange function inside the primary side fluid piping (101);

- Said unidirectional fluid pump (120) is constituted by one fluid pump to pump unidirectionally or constituted by more than one fluid pumps to be installed to the same end of the primary side fluid piping (101) or respectively installed to both ends of the primary side fluid piping (101) so as to provide the auxiliary

pumping in the same pumping flow directions;

- Said primary side fluid (10) inside primary side fluid piping (101) is pumped to pass through the enclosed hollow casing (200), while the spiral shaped secondary side fluid piping (102) installed inside the enclosed hollow casing (200) is through the thermal conducting fluid (30) in the enclosed hollow casing (200) to transfer warm energy thereby constituting the heat pump or heat exchange device function;
- At least one unidirectional fluid pump (120) is installed between at least one end of secondary side fluid piping (102) and the secondary side fluid source for unidirectionally pumping secondary side fluid (20);

[0039] The embodiment of Fig. 9 is further optionally installed with at least one temperature detecting device (11) at a position capable of directly or indirectly detecting the temperature change of the exchange pumping fluid to transmit the detected temperature signal back to the periodic fluid direction-change operative control device (250); wherein:

- The periodic fluid direction-change operative control device (250): It is constituted by electromechanical components, solid state electronic components, or microprocessors and relevant software and operative control interfaces to operatively control the bidirectional fluid pumping device (123) for periodically changing the flow direction of the fluid passing through heat pump or heat exchange device (100) thereby operatively controlling the temperature difference distribution status between primary side fluid (10) passing through primary side fluid piping (101) inside the heat pump or heat exchange device (100) and the heat pump or heat exchange device (100); the operative control methods include one or more than one of the following: **1)** the pumping flow direction of the bidirectional fluid pumping device (123) is manually operatively controlled; or **2)** the pumping flow direction of the bidirectional fluid pumping device (123) is operatively controlled by the periodic fluid direction-change operative control device (250) via setting time period or setting time period by referring to temperature variation detected by the temperature detecting device (11); or **3)** at least one temperature detecting device (11) is installed at a position capable of directly or indirectly detecting the temperature change of the exchange pumping fluid to transmit the detected temperature signal by the temperature detecting device (11) back to the periodic fluid direction-change operative control device (250), so that when the temperature detecting device (11) is reached the setting temperature, the pumping flow direction of the bidirectional fluid pumping device (123) is operatively controlled to pump the primary side fluid (10) to pass through the primary side fluid piping (101) in positive and reverse flow directions

thereby changing the temperature distribution status of the thermal conductor (50) of the heat pump or heat exchange device (100) accordingly.

[0040] Fig. 10 is a schematic view showing the embodiment of the present invention, wherein the spiral shaped primary side fluid piping and the spiral shaped secondary side fluid piping are spirally combined inside the enclosed hollow casing and is through the thermal conducting fluid in the enclosed hollow casing to transfer warm energy thereby constituting the heat pump or heat exchange device functions, and it is pumped by the bi-directional fluid pumping device (123);

[0041] As shown in Fig. 10, the bidirectional fluid pumping device (123) is driven by the power source (300) and operatively controlled by the periodic fluid direction-change operative control device (250) to pump the primary side fluid (10) to pass through primary side fluid piping (101) in positive and reverse flow directions; wherein:

-- The primary side fluid piping (101): It is for passing by the primary side fluid (10) being pumped by the bidirectional fluid pumping device (123) to further pass through primary side fluid piping (101) inside the enclosed hollow casing (200), wherein the primary side fluid (10) is through the thermal conducting fluid (30) to transfer warm energy and exchange heat with the secondary side fluid (20);

-- The secondary side fluid piping (102): It is for passing by the secondary side fluid (20) being pumped by the unidirectional fluid pump (120) to further pass through the secondary side fluid piping (102) inside the enclosed hollow casing (200) and is through the thermal conducting fluid (30) to exchange heat with the primary side fluid (10);

-- Said spiral shaped primary side fluid piping (101) and spiral shaped secondary side fluid piping (102) are commonly installed inside the enclosed hollow casing (200) and is through the thermal conducting fluid (30) in the enclosed hollow casing (200) to transfer warm energy thereby constituting the heat pump or heat exchange device functions, wherein the primary side fluid (10) inside primary side fluid piping (101) is pumped by the bidirectional fluid pumping device (123) to periodically exchange flow directions;

-- The bidirectional fluid pumping device (123): It is constituted by the fluid pumping device having both or one of the operatively controllable pumping functions of positive pressure or negative pressure for pumping the gaseous or liquid state primary fluid (10), wherein the bidirectional fluid pumping device (123) is driven by electric motor being driven by electric power source (300), engine power, or mechanical or electric power converted from other wind power, thermal energy, temperature-difference energy, or solar energy, etc;

-- The unidirectional fluid pump (120): It is constituted by the fluid pumping device capable of producing positive pressure to push fluid, or producing negative pressure to attract fluid for unidirectionally pumping secondary side fluid (20) inside secondary side fluid piping (102); the unidirectional fluid pump (120) is driven by electric motor being driven by electric power source (300), engine power, or mechanical or electric power converted from other wind power, thermal energy, temperature-difference energy, or solar energy, etc; the unidirectional fluid pump (120) can be operatively controlled independently or by the periodic fluid direction-change operative control device (250);

-- The primary side fluid (10): It comprises one or more than one kind of same or different liquid or gaseous state, liquid to gaseous state, or gaseous to liquid state fluid;

-- The secondary side fluid (20): It comprises one or more than one kind of same or different liquid or gaseous state, liquid to gaseous state, or gaseous to liquid state fluid;

-- The thermal conducting fluid (30): It comprises one or more than one kind of same or different liquid or gaseous state, liquid to gaseous state, or gaseous to liquid state fluid;

-- The power source (300): It is the device including AC or DC city power system or independent power to provide power source for the operations;

-- The periodic fluid direction-change operative control device (250): It is constituted by electromechanical components, solid state electronic components, or microprocessors and relevant software and operative control interfaces to operatively control the bidirectional fluid pumping device (123) and/or unidirectional fluid pump (120) simultaneously for periodically changing the flow direction of the primary side fluid (10) passing through primary side fluid piping (101);

[0042] The timing for bidirectional fluid pumping device (123) to periodically change the pumping flow direction of primary side fluid (10) is **1)** the pumping flow direction of the bidirectional fluid pumping device (123) is manually operatively controlled, or **2)** the pumping flow direction of the bidirectional fluid pumping device (123) is operatively controlled by the periodic fluid direction-change operative control device (250) via setting time period or setting time period by referring to temperature variation detected by the temperature detecting device (11), or **3)** at least one temperature detecting device (11) is installed at a position capable of directly or indirectly detecting the temperature change of the exchange pumping fluid to transmit the detected temperature signal by the temperature detecting device (11) back to the periodic fluid direction-change operative control device (250), so that when the temperature detecting device (11) is reached the setting temperature, the pumping flow direction of the

bidirectional fluid pumping device (123) is operatively controlled to pump the primary side fluid (10) to pass through the primary side fluid piping (101) in positive and reverse flow directions.

[0043] Fig. 11 is a schematic view of the embodiment of the present invention showing that the bidirectional fluid pumping device is constituted by at least one unidirectional fluid pump and the bidirectional fluid valve set constituted by four controllable switch type fluid valves, while the spiral shaped primary side fluid piping and spiral shaped secondary side fluid piping are commonly installed in the enclosed hollow casing for transfer warm energy through the thermal conducting fluid inside the enclosed hollow structure, wherein the unidirectional fluid pump is installed between at least one end of the primary side fluid piping and the primary side fluid source;

[0044] As shown in Fig. 11, the bidirectional fluid pumping device (123) is constituted by the fluid valves (129a, 129b, 129c, 129d) and the unidirectional fluid pump (120) being connected with the primary side fluid piping (101), wherein the pumping flow circuit includes:

-- One end of the fluid valve (129a) is interconnected with fluid valve (129c) and the output end of the unidirectional fluid pump (120), while the input end of the unidirectional fluid pump (120) is interconnected with the piping port (A) of primary side fluid piping (101);

-- The other end of the fluid valve (129a) is interconnected with the piping port (A) of primary side fluid piping (101) installed in the enclosed hollow casing (200) and one end of the fluid valve (129b);

-- One end of the fluid valve (129d) is interconnected with one end of fluid valve (129b) and further connected with the fluid inlet end of the unidirectional fluid pump (120), while the fluid outlet end of the unidirectional fluid pump (120) is interconnected with the piping port (B) of the primary side fluid piping (101);

-- The other end of fluid valve (129d) is interconnected with the piping port (B) of primary side fluid piping (101) installed in the enclosed hollow casing (200) and the fluid valve (129c), while the other end of fluid valve (129c) is interconnected with the fluid valve (129a), and they are commonly interconnected with the output end of the unidirectional fluid pump (120);

[0045] The bidirectional fluid pumping device (123) being operatively controlled by the periodic fluid direction-change operative control device (250) is constituted by the unidirectional fluid pump (120) and fluid valves (129a, 129b, 129c, 129d), wherein the fluid valve (129a) and fluid valve (129d) are one group, the fluid valve (129c) and fluid valve (129b) are another group, and they are opened or closed alternatively thereby forming the periodic alternative flow direction exchange function of the primary side fluid (10) inside the primary side fluid piping (101) of the enclosed hollow casing (200);

-- Said unidirectional fluid pump (120) is constituted by one fluid pump to pump unidirectionally or constituted by more than one fluid pumps to be installed to the same end of the primary side fluid piping (101) or respectively installed to both ends of the primary side fluid piping (101) so as to provide the auxiliary pumping in the same pumping flow directions;

-- Said spiral shaped primary side fluid piping (101) and spiral shaped secondary side fluid piping (102) are commonly installed inside the enclosed hollow casing (200) and is through the thermal conducting fluid (30) in the enclosed hollow casing (200) to transfer warm energy thereby constituting the heat pump or heat exchange device function;

-- At least one unidirectional fluid pump (120) is installed between at least one end of secondary side fluid piping (102) and the primary side fluid source for unidirectionally pumping secondary side fluid (20);

[0046] The embodiment of Fig. 11 is further optionally installed with at least one temperature detecting device (11) at a position capable of directly or indirectly detecting the temperature change of the exchange pumping fluid to transmit the detected temperature signal back to the periodic fluid direction-change operative control device (250); wherein:

-- The periodic fluid direction-change operative control device (250): It is constituted by electromechanical components, solid state electronic components, or microprocessors and relevant software and operative control interfaces to operatively control the periodically exchanged pumping flow directions of the fluid in the primary side fluid piping (101) installed in the enclosed hollow casing (200); the operative control methods include one or more than one of the following: **1)** the pumping flow direction of the bidirectional fluid pumping device (123) is manually operatively controlled; or **2)** the pumping flow direction of the bidirectional fluid pumping device (123) is operatively controlled by the periodic fluid direction-change operative control device (250) via setting time period or setting time period by referring to temperature variation detected by the temperature detecting device (11); or **3)** at least one temperature detecting device (11) is installed at a position capable of directly or indirectly detecting the temperature change of the exchange pumping fluid to transmit the detected temperature signal by the temperature detecting device (11) back to the periodic fluid direction-change operative control device (250), so that when the temperature detecting device (11) is reached the setting temperature, the pumping flow direction of the bidirectional fluid pumping device (123) is operatively controlled to pump the primary side fluid (10) inside the primary side fluid piping (101) of the enclosed hollow casing (200) in positive

and reverse flow pumping thereby changing the temperature distribution status of primary side fluid (10) inside primary side fluid piping (101) of the enclosed hollow casing (200) accordingly.

[0047] In practical applications, the basic structure of the heat pump or heat exchange device with periodic positive and reverse pumping of present invention include the flowing mode A, mode B, or the mixture of the two modes, wherein:

Mode A: The bidirectional fluid pumping device (123) is installed between the primary side fluid piping (101) and the fluid source of primary side fluid (10) to periodically pump fluid (10) in positive and reverse flow directions, while secondary side fluid (20) is pumped by the unidirectional fluid pump (120) to perform the heat pump or heat exchange device functions;

Mode B: The bidirectional fluid pumping device (123) is installed between the secondary side fluid piping (102) and the fluid source of secondary side fluid (20) to periodically pump fluid (20) in positive and reverse flow directions, while primary side fluid (10) is pumped by the unidirectional fluid pump (120) to perform the heat pump or heat exchange device functions.

[0048] Said mode A includes one or more than one structural modes of the following, including:

-- For the heat pump or heat exchange device with periodic positive and reverse pumping, the bidirectional fluid pumping device (123) constituted by at least one bidirectional fluid pump (124) being series connected with one of the two fluid ports of the primary side fluid piping (101) of the heat pump or heat exchange device (100) is operatively controlled by the periodic fluid direction-change operative control device (250) for periodic positive and reverse flow pumping to periodically exchange the flow directions; (such as that Fig. 12 is a schematic view of the embodiment of the present invention showing that the bidirectional fluid pumping device (123) is series connected with one of the two fluid ports of the primary side fluid piping (101) of the heat pump or heat exchange device);

-- For the heat pump or heat exchange device with periodic positive and reverse pumping, the at least two bidirectional fluid pumping devices (123) comprising by at least two bidirectional fluid pumps (124) being respectively series connected with the two fluid ports of the primary side fluid piping (101) of the heat pump or heat exchange device (100) is operatively controlled by the periodic fluid direction-change operative control device (250) to periodically perform at least one operating functions of the following: **1)** the bidirectional fluid pumps (124) installed at the

two ends of the fluid ports of the primary side fluid piping (101) are alternatively pumped in reverse flow direction; **2)** the bidirectional fluid pumps (124) installed at the two ends of the fluid ports of the primary side fluid piping (101) are alternatively pumped in positive flow direction; **3)** the bidirectional fluid pumps (124) installed at the two ends of the fluid ports of the primary side fluid piping (101) are auxilarily pumped in the same positive flow directions and the same reverse flow directions; (such as that Fig. 13 is a schematic view of the embodiment of the present invention showing that two bidirectional fluid pumping devices are respectively series connected with the two ends of fluid ports of primary side fluid piping (101) of the heat pump or heat exchange device);

-- The heat pump or heat exchange device with periodic positive and reverse pumping is further made to that the bidirectional fluid pumping device (123) constituted by at least two series connected unidirectional fluid pumps (120, 120') in different pumping flow directions being installed to one of the two fluid ports of primary side fluid piping (101) of the heat pump or heat exchange device (100) is operatively controlled by the periodic fluid direction-change operative control device (250) to allow either one of the unidirectional fluid pumps to be periodically alternatively pumped,, thereby periodically switching the flow direction of fluids, wherein if the unidirectional fluid pumps (120, 120') constituting the bidirectional fluid pumping device (123) are irreversible, then each unidirectional fluid pump (120) or (120') is respectively parallel connected with the reversible unidirectional valve (126); (such as that Fig. 14 is a schematic view of the embodiment of the present invention showing that the bidirectional fluid pumping device constituted by at least two series connected unidirectional fluid pumps in different pumping flow directions is series connected with one end of the two fluid ports of primary side fluid piping (101) of the heat pump or heat exchange device);

-- The heat pump or heat exchange device with periodic positive and reverse pumping is further made to that the two bidirectional fluid pumping devices (123) individually constituted by at least two series connected unidirectional fluid pumps (120, 120') in different pumping flow directions being respectively series connected with the two ends of fluid ports of primary side fluid piping (101) of the heat pump or heat exchange device (100) are operatively controlled by the periodic fluid direction-change operative control device (250) to have one or more than one operating functions of the following: **1)** the two unidirectional fluid pumps (120) or (120') of each of the two said bidirectional fluid pumping devices (123) being respectively series connected with the two ends of the heat pump or heat exchange device (100) are auxilarily pumped in the same pumping flow di-

rections and periodically simultaneously pumped for switching pumping directions at one time; or **2**) the two unidirectional fluid pumps (120, 120') in different flow pumping directions being respectively series connected with the fluid port (a) and fluid port (b) are operatively controlled by the periodic fluid direction-change operative control device (250) to allow either one of the unidirectional fluid pumps (120, 120') to be periodically alternatively pumped, thereby periodically switching the flow direction of fluid, wherein if the unidirectional fluid pumps (120, 120') constituting the bidirectional fluid pumping device (123) are irreversible, then each unidirectional fluid pump is respectively parallel connected with the reversible unidirectional valve (126); (such as that Fig. 15 is a schematic view of the embodiment of the present invention showing that the two bidirectional fluid pumping devices individually constituted by at least two series connected unidirectional fluid pumps in different pumping flow direction are respectively installed to the two ends of fluid ports of primary side fluid piping (101) of the heat pump or heat exchange device);

-- The heat pump or heat exchange device with periodic positive and reverse pumping is further made to that the bidirectional fluid pumping device comprising at least two parallel connected unidirectional fluid pumps (120, 120') in different pumping flow directions being series connected with one end of the two fluid ports of primary side fluid piping (101) of the heat pump or heat exchange device (100) is operatively controlled by the periodic fluid direction-change operative control device (250) to allow either one of the unidirectional fluid pumps (120, 120') to be periodically alternatively pumped, thereby periodically switching the flow direction of fluids,

wherein if structures of the unidirectional fluid pumps (120, 120') have no anti-reverse flow functions, then each individual fluid pump is first respectively forwardly series connected with the unidirectional valve (126) and then parallel connected to prevent reverse flows; (such as that Fig. 16 is a schematic view of the embodiment of the present invention showing that the bidirectional fluid pumping device (123) comprising at least two parallel connected unidirectional fluid pumps in different pumping flow directions is series connected with either one end of the fluid ports of primary side fluid piping (101) of the heat pump or heat exchange device);

-- The heat pump or heat exchange device with periodic positive and reverse pumping is further made to that the two bidirectional fluid pumping devices (123) individually comprising at least two parallel connected unidirectional fluid pumps (120, 120') in different flow directions being respectively series connected with the two ends of fluid ports of primary side fluid piping (101) of the heat pump or heat ex-

change device (100) are operatively controlled by the periodic fluid direction-change operative control device (250) to have one or more than one operating function of the following: **1**) the unidirectional fluid pumps (120, 120') of the two said bidirectional fluid pumping devices (123) being respectively series connected with the two ends of the heat pump or heat exchange device (100) are auxiliarily pumped in the same pumping flow directions and periodically simultaneously pumped for switching pumping direction at one time; or **2**) the unidirectional fluid pump (120) or (120') of the two said bidirectional fluid pumping devices (123) being respectively series connected with the two ends of the heat pump or heat exchange device (100) are operatively controlled by the periodic fluid direction-change operative control device (250) to allow either one of the unidirectional fluid pumps (120, 120') to be periodically alternatively pumped, thereby periodically switching the flow direction of the fluid, wherein if the unidirectional fluid pumps (120, 120') are irreversible, then each unidirectional fluid pump is respectively parallel connected with the reversible unidirectional valve (126); (such as that Fig. 17 is a schematic view of the embodiment showing that the present invention is installed with two bidirectional fluid pumping devices individually comprising at least two series connected unidirectional fluid pumps are respectively series connected with the two ends of fluid ports of primary side fluid piping (101) of the heat pump or heat exchange device);

-- The heat pump or heat exchange device with periodic positive and reverse pumping is further made to that the bidirectional fluid pumping device (123) comprising at least one unidirectional fluid pump (120) and four controllable switch type fluid valves (129a, 129b, 129c, 129d) in bridge type assembly being series connected with one end of the two fluid ports of primary side fluid piping (101) of the heat pump or heat exchange device (100) is operatively controlled by the periodic fluid direction-change operative control device (250), wherein during the operation of unidirectional fluid pump (120) of the above said bidirectional fluid pumping device, the two fluid valves (129a)(129b) are operatively controlled to be opened, while the other two fluid valves (129c)(129d) are operatively controlled to be closed, or the two fluid valves (129a)(129b) are alternatively operatively controlled to be closed, while the other two fluid valves (129c)(129d) are alternatively operatively controlled to be opened thereby periodically switching the flow direction of the fluid; (such as that Fig. 18 is a schematic view of the embodiment of the present invention showing that at least one unidirectional fluid pump and the bidirectional fluid valve set constituted by four controllable switch type fluid valves in bridge type assembly are series connected to one end of the two fluid ports of primary side fluid

pipings (101) of the heat pump or heat exchange device);

-- The heat pump or heat exchange device with periodic positive and reverse pumping is further made to that the two bidirectional fluid pumping devices (123) individually comprising at least one unidirectional fluid pump (120) and four controllable switch type fluid valves (129a, 129b, 129c, 129d) in bridge type assembly being respectively series connected with the two ends of fluid ports of primary side fluid piping (101) of the heat pump or heat exchange device (100) are operatively controlled by the periodic fluid direction-change operative control device (250), wherein during the operation of the unidirectional fluid pump (120) of the above said two bidirectional fluid pumping devices, the two fluid valves (129a)(129b) are operatively controlled to be opened, while the other two fluid valves (129c)(129d) are operatively controlled to be closed, or the two fluid valves (129a) (129b) are alternatively operatively controlled to be closed, while the other two fluid valves (129c)(129d) are alternatively operatively controlled to be opened, thereby periodically switching the flow direction of the fluid; (such as that Fig. 19 is a schematic view of the embodiment of the present invention showing that the two bidirectional fluid pumping devices individually comprising at least one unidirectional fluid pump and four controllable switch type fluid valves in bridge type assembly are respectively series connected with the two individual ends of fluid ports of the two flow circuits being respectively series connected with the heat pump or heat exchange device);

[0049] Said mode B includes one or more than one structural modes of the following, including:

-- For the heat pump or heat exchange device with periodic positive and reverse pumping, the bidirectional fluid pumping device (123) constituted by at least one bidirectional fluid pump (124) being series connected with one of the two fluid ports of the secondary side fluid piping (102) of the heat pump or heat exchange device (100) is operatively controlled by the periodic fluid direction-change operative control device (250) for periodic positive and reverse flow pumping to periodically exchange the flow directions; (such as that Fig. 20 is a schematic view of the embodiment of the present invention showing that the bidirectional fluid pumping device (123) is series connected with one of the two fluid ports of the secondary side fluid piping (102) of the heat pump or heat exchange device);

-- For the heat pump or heat exchange device with periodic positive and reverse pumping, the at least two bidirectional fluid pumping devices (123) comprising at least two bidirectional fluid pumps (124) being respectively series connected with the two fluid ports of the secondary side fluid piping (102) of the

heat pump or heat exchange device (100) is operatively controlled by the periodic fluid direction-change operative control device (250) to periodically perform at least one operating functions of the following: **1)** the bidirectional fluid pumps (124) installed at the two ends of the fluid ports of the primary side fluid piping (101) are alternatively pumped in reverse flow direction; **2)** the bidirectional fluid pumps (124) installed at the two ends of the fluid ports of the primary side fluid piping (101) are alternatively pumped in positive flow direction; **3)** the bidirectional fluid pumps (124) installed at the two ends of the fluid ports of the primary side fluid piping (101) are auxilarily pumped in the same positive flow directions and the same reverse flow directions; (such as that Fig. 21 is a schematic view of the embodiment of the present invention showing that two bidirectional fluid pumping devices are respectively series connected with the two ends of fluid ports of secondary side fluid piping (102) of the heat pump or heat exchange device);

-- The heat pump or heat exchange device with periodic positive and reverse pumping is further made to that the bidirectional fluid pumping device (123) constituted by at least two series connected unidirectional fluid pumps (120, 120') in different pumping flow directions being installed to one of the two fluid ports of secondary side fluid piping (102) of the heat pump or heat exchange device (100) is operatively controlled by the periodic fluid direction-change operative control device (250) to allow either one of the unidirectional fluid pumps to be periodically alternatively pumped, thereby periodically switching the flow direction of fluids, wherein if the unidirectional fluid pumps (120, 120') constituting the bidirectional fluid pumping device (123) are irreversible, then each unidirectional fluid pump (120) or (120') is respectively parallel connected with the reversible unidirectional valve (126); (such as that Fig. 22 is a schematic view of the embodiment of the present invention showing that the bidirectional fluid pumping device constituted by at least two series connected unidirectional fluid pumps in different pumping flow directions is series connected with one end of the two fluid ports of secondary side fluid piping (102) of the heat pump or heat exchange device);

-- The heat pump or heat exchange device with periodic positive and reverse pumping is further made to that the two bidirectional fluid pumping devices (123) individually comprising at least two series connected unidirectional fluid pumps (120, 120') in different pumping flow directions being respectively series connected with the two ends of fluid ports of secondary side fluid piping (102) of the heat pump or heat exchange device (100) are operatively controlled by the periodic fluid direction-change operative control device (250) to have one or more than one operating functions of the following: **1)** the two

unidirectional fluid pumps (120) or (120') of each of the two said bidirectional fluid pumping devices (123) being respectively series connected with the two ends of the heat pump or heat exchange device (100) are auxiliarily pumped in the same pumping flow directions and periodically simultaneously pumped for switching pumping directions at one time; or **2)** the two unidirectional fluid pumps (120, 120') in different flow pumping directions being respectively series connected with the fluid port (a) and fluid port (b) are operatively controlled by the periodic fluid direction-change operative control device (250) to allow either one of the unidirectional fluid pumps (120, 120') to be periodically alternatively pumped, thereby periodically switching the flow direction of fluid, wherein if the unidirectional fluid pumps (120, 120') constituting the bidirectional fluid pumping device (123) are irreversible, then each unidirectional fluid pump is respectively parallel connected with the reversible unidirectional valve (126); (such as that Fig. 23 is a schematic view of the embodiment of the present invention showing that the two bidirectional fluid pumping devices individually constituted by at least two series connected unidirectional fluid pumps in different pumping flow direction are respectively installed to the two ends of fluid ports of secondary side fluid piping (102) of the heat pump or heat exchange device);

-- The heat pump or heat exchange device with periodic positive and reverse pumping is further made to that the bidirectional fluid pumping device comprising at least two parallel connected unidirectional fluid pumps (120, 120') in different pumping flow directions being series connected with one end of the two fluid ports of secondary side fluid piping (102) of the heat pump or heat exchange device (100) is operatively controlled by the periodic fluid direction-change operative control device (250) to allow either one of the unidirectional fluid pumps (120, 120') to be periodically alternatively pumped, thereby periodically switching the flow direction of fluids, wherein if structures of the unidirectional fluid pumps (120, 120') have no anti-reverse flow functions, then each individual fluid pump is first respectively forwardly series connected with the unidirectional valve (126) and then parallel connected to prevent reverse flows; (such as that Fig. 24 is a schematic view of the embodiment of the present invention showing that the bidirectional fluid pumping device (123) comprising at least two parallel connected unidirectional fluid pumps in different pumping flow directions is series connected with either one end of the fluid ports of secondary side fluid piping (102) of the heat pump or heat exchange device);

-- The heat pump or heat exchange device with periodic positive and reverse pumping is further made to that the two bidirectional fluid pumping devices (123) individually comprising at least two parallel

connected unidirectional fluid pumps (120, 120') in different flow directions being respectively series connected with the two ends of fluid ports of secondary side fluid piping (102) of the heat pump or heat exchange device (100) are operatively controlled by the periodic fluid direction-change operative control device (250) to have one or more than one operating function of the following: **1)** the unidirectional fluid pumps (120, 120') of the two said bidirectional fluid pumping devices (123) being respectively series connected with the two ends of heat pump or heat exchange device (100) are auxiliarily pumped in the same pumping flow directions and periodically simultaneously pumped for switching pumping direction at one time; or **2)** the unidirectional fluid pump (120) or (120') of the two said bidirectional fluid pumping devices (123) being respectively series connected with the two ends of the heat pump or heat exchange device (100) are operatively controlled by the periodic fluid direction-change operative control device (250) to allow either one of the unidirectional fluid pumps (120, 120') to be periodically alternatively pumped, thereby periodically switching the flow direction of the fluid, wherein if the unidirectional fluid pumps (120, 120') are irreversible, then each unidirectional fluid pump is respectively parallel connected with the reversible unidirectional valve (126); (such as that Fig. 25 is a schematic view of the embodiment showing that the present invention is installed with two bidirectional fluid pumping devices individually comprising at least two series connected unidirectional fluid pumps are respectively series connected with the two ends of fluid ports of secondary side fluid piping (102) of the heat pump or heat exchange device);

-- The heat pump or heat exchange device with periodic positive and reverse pumping is further made to that the bidirectional fluid pumping device (123) comprising at least one unidirectional fluid pump (120) and four controllable switch type fluid valves (129a, 129b, 129c, 129d) in bridge type assembly being series connected with one end of the two fluid ports of secondary side fluid piping (102) of the heat pump or heat exchange device (100) is operatively controlled by the periodic fluid direction-change operative control device (250), wherein during the operation of unidirectional fluid pump (120) of the above said bidirectional fluid pump group, the two fluid valves (129a)(129b) are operatively controlled to be opened, while the other two fluid valves (129c)(129d) are operatively controlled to be closed, or the two fluid valves (129a)(129b) are alternatively operatively controlled to be closed, while the other two fluid valves (129c)(129d) are alternatively operatively controlled to be opened thereby periodically switching the flow direction of the fluid; (such as that Fig. 26 is a schematic view of the embodiment of the present invention showing that at least one unidirectional

tional fluid pump and the bidirectional fluid valve set constituted by four controllable switch type fluid valves in bridge type assembly are series connected to one end of the two fluid ports of secondary side fluid piping (102) of the heat pump or heat exchange device);

-- The heat pump or heat exchange device with periodic positive and reverse pumping is further made to that the two bidirectional fluid pumping devices (123) individually comprising at least one unidirectional fluid pump (120) and four controllable switch type fluid valves (129a, 129b, 129c, 129d) in bridge type assembly being respectively series connected with the two ends of fluid ports of secondary side fluid piping (102) of the heat pump or heat exchange device (100) are operatively controlled by the periodic fluid direction-change operative control device (250), wherein during the operation of the unidirectional fluid pump (120) of the above said two bidirectional fluid pumping devices, the two fluid valves (129a)(129b) are operatively controlled to be opened, while the other two fluid valves (129c)(129d) are operatively controlled to be closed, or the two fluid valves (129a)(129b) are alternatively operatively controlled to be closed, while the other two fluid valves (129c)(129d) are alternatively operatively controlled to be opened thereby periodically switching the flow direction of the fluid; (such as that Fig. 27 is a schematic view of the embodiment of the present invention showing that the two bidirectional fluid pumping devices individually comprising at least one unidirectional fluid pump and four controllable switch type fluid valves in bridge type assembly are respectively series connected with the two individual ends of fluid ports of the two flow circuits being respectively series connected with the heat pump or heat exchange device);

[0050] The above periodic positive and reverse flow directional pumping examples of the modes A and B are provided for application selections, and are not for limitations; hence, all conventional exchange structures and operating methods of the fluid flow direction can be applied in the present invention.

[0051] For the heat pump or heat exchange device with periodic positive and reverse pumping of present invention, the structure types of the heat pump or heat exchange device (100) include the following: **1)** the linear or other geometric shaped piping; **2)** the multi-layer structure having fluid flow paths for passing by gaseous or liquid state fluid; or **3)** the multiple circuits comprising one or more than one fluid flow circuits in series connection, parallel connection, or series and parallel connection.

[0052] For the heat pump or heat exchange device with periodic positive and reverse pumping of present invention, beside of that the fluid pumping device provided for pumping gaseous or liquid state fluid is driven by the

individual electric motors or at least two fluid pumps are driven by a common electric motor, they can be also driven by engine power, or mechanical or electric power converted from other wind power, thermal energy, temperature-difference energy, or solar energy, etc..

[0053] The periodic fluid direction-change operative control device (250) of the heat pump or heat exchange device with periodic positive and reverse pumping of present invention is equipped with electric motor, or controllable engine power, or mechanical or electric power generated or converted from other wind energy, thermal energy, temperature-difference energy, or solar energy for controlling various fluid pumps for driven, or controlling the operation timing of the fluid pumps or fluid valves, thereby changing the direction of the two circuits passing through the the heat pump or heat exchange device (100) and further to operatively control partial or all regulations of rotational speed, flow rate, fluid pressure of various fluid pumps thereof.

[0054] In the positive and reverse flow directional fluid pumping operation of the heat pump or heat exchange device with periodic positive and reverse pumping of present invention, it is further through the periodic fluid direction-change operative control device (250) to manipulate the flow rate of fluid pumped by the bidirectional fluid pumping device (123), wherein the operational modes include one or more than one types as follows, including:

- 1)** The adjustment or setting of the pumping fluid flow rate is manually operatively controlled;
- 2)** The fluid flow rate is operatively controlled by the detected signal of the at least one temperature detecting device being installed;
- 3)** The fluid flow rate is operatively controlled by combining the two or more than two methods of items 1) ~2).

[0055] In setting up the flow rate operative control function of the heat pump or heat exchange device with periodic positive and reverse pumping, the fluid flow rate operative control range including the stepped or stepless fluid flow rate modulations from cease of transportation to maximum transportation rate is relied on one or more than one of the following devices to change the fluid flow rate, wherein it includes:

- 1)** The speed control of the pumping rotational speed of the bidirectional fluid pumping device (123) is operatively controlled within the range from shutdown to maximum speed in order to further operatively control the fluid flow rate;
- 2)** It is through adopting the bidirectional fluid pumping device (123) being installed with operatively controllable fluid inlet/outlet valves to operatively control the piping port of the fluid inlet/outlet valves of the bidirectional fluid pumping device (123) to further control its fluid flow rate;

3) It is through adopting the unidirectional valve (126) capable of operatively controlling the fluid flow valves to operatively control the piping port of the fluid flow valves of the unidirectional valve (126) so as to further operatively control the fluid flow rate;

4) It is through adopting the fluid valve (129) and fluid valve (129') capable of operatively controlling the fluid flow valves of the fluid valve (129) and fluid valve (129') to operatively control the piping port of the fluid flow valves so as to further operatively control the fluid flow rate;

5) It is through operatively controlling any one device of items 1)–4) to pump the fluid intermittently so as to modulate the average flow rate by the time ratio of pumping on/off.

[0056] The periodic pumping modes of the said heat pump or heat exchange device with periodic positive and reverse pumping of present invention in periodic positive and reverse flow directional pumping fluid operation include one or more than one of the following:

1) In the positive and reverse flow directional fluid pumping operation, the positive and reverse flow directional operating time lengths are the same;

2) In the positive and reverse flow directional fluid pumping operation, the positive and reverse flow directional operating time lengths are different;

3) The operation is a mixed mode of items 1) and 2).

[0057] To alleviate the impact effect of gaseous or liquid state pumping fluid caused by sudden fluid interruption during flow direction exchange of the heat pump or heat exchange device with periodic positive and reverse pumping of present invention, such as the liquid hammer caused by sudden interruption of liquid state pumping fluid, the flow direction exchange operating mode is further operatively controlled to additionally include one or more than one of the following operating methods:

1) To operatively control the flow directional exchange, the fluid pump or fluid valve is first operatively controlled to gradually reduce the flow rate of fluid which is then switched to another flow direction to increase the flow rate gradually to the maximum setting value.

2) To operatively control the flow directional exchange, the fluid pump or fluid valve is first operatively controlled to gradually reduce the flow rate of fluid which is driven to stop pump for the setting time stage and then switched to another flow direction to increase the flow rate gradually to the maximum setting value.

[0058] The present invention also provides a heat pump/heat exchange device (100) having a unidirectional fluid pump (120), a bidirectional fluid pump (123), and a control device (250), the pumps being arranged to

pump primary side fluid (10) through primary side fluid piping (101), and to pump secondary side fluid (20) through secondary side fluid piping (102), wherein one of the primary side fluid piping and the secondary side fluid piping (101 or 102) is series connected with the bidirectional fluid pumping device (123) and is operatively controlled by the control device (250) for pumping primary side or secondary side fluid (10 or 20) in periodic positive and reverse flow directions, while the other of the primary side fluid piping and the secondary side fluid piping (102 or 101) is series connected with the unidirectional fluid pump (120) being used as a fixed flow directional pump to pump the primary or secondary side fluid (10 or 20) for mutual warm energy transfer via a solid, liquid or gaseous state thermal conductor (50).

Claims

1. A heat pump or heat exchange device with periodic positive and reverse pumping, which discloses a heat pump or heat exchange device (100) having fixed flow directional pump for pumping the primary side fluid (10) to pass through primary side fluid piping (101) and secondary side fluid (20) to pass through secondary side fluid piping (102), wherein it is further improved to that the primary side fluid piping (101) is series connected with the bidirectional fluid pumping device (123) being operatively controlled by the periodic fluid direction-change operative control device (250) for pumping primary side fluid (10) in periodic positive and reverse flow directions, while the secondary side fluid piping (102) is series connected with the unidirectional fluid pump (120) as a fixed flow directional pump to pump the secondary side fluid (20) for mutual warm energy transfer via the solid, liquid or gaseous state thermal conductor (50); or the secondary side fluid piping (102) is series connected with the bidirectional fluid pumping device (123) being operatively controlled by the periodic fluid direction-change operative control device (250) for pumping secondary side fluid (20) in periodic positive and reverse flow directions, and the primary side fluid piping (101) is series connected with the unidirectional fluid pump (120) being used as a fixed flow directional pump to pump primary side fluid (10) for mutual warm energy transfer via the solid, liquid or gaseous state thermal conductor (50);
Through the two aforesaid embodiments, the following operating functions are obtained: 1) the primary side fluid (10) is pumped by bidirectional fluid pumping device (123) in periodic positive and reverse flow directions to pass through primary side fluid piping (101), and the secondary side fluid (20) is pumped by the unidirectional fluid pump (120) to pass through secondary side fluid piping (102) thereby changing the temperature difference distribution status at the two relative positions of the primary side fluid piping

(101) and secondary side fluid piping (102) being in fixed structural positional relationship during the operation of the heat pump or heat exchange device; **2)** the impurities or pollutants brought in by primary side fluid (10) passing through primary side fluid piping (101) or secondary side fluid (20) passing through secondary side fluid piping (102) in previous flow direction are discharged during periodic positive and reverse flow directional fluid pumping thereby reducing the defects of impurity or pollutant accumulations in fixed flow directions; The primary side fluid (10) being pumped by the different flow directional pump to pass through primary side fluid piping (101) in periodic positive and reverse flow directions and the secondary side fluid (20) being pumped by the fixed flow directional pump to pass through secondary side fluid piping (102) can be reversely arranged to be the secondary side fluid (20) being pumped by the different flow directional pump to pass through secondary side fluid piping (102) in periodic positive and reverse flow directions while the primary side fluid (10) being pumped by the fixed flow directional pump to pass through primary side fluid piping (101).

2. A heat pump or heat exchange device with periodic positive and reverse pumping as claimed in claim 1, wherein it includes further series connected with the bidirectional fluid pumping device (123) being driven by power source (300) and operatively controlled by the periodic fluid direction-change operative control device (250) for pumping the primary side fluid (10) to appear flow direction-change in positive and reverse flow directions to pass through the heat pump or heat exchange device (100) via primary side fluid piping (101); wherein:
 - The primary side fluid piping (101): It is for passing by the primary side fluid (10) being pumped by the bidirectional fluid pumping device (123) to further pass through the heat pump or heat exchange device (100) for heat exchange with secondary side fluid (20);
 - The secondary side fluid piping (102): It is for passing by the secondary side fluid (20) being pumped by the unidirectional fluid pump (120) to further pass through heat pump or heat exchange device (100) for heat exchange with primary side fluid (10);
 - Said primary side fluid piping (101) and secondary side fluid piping (102) can be made to straight piping, plane extended or 3-D shaped curved piping, labyrinth piping, spiral piping or piping of other various geometric shapes, wherein part of primary side fluid piping (101) is commonly combined with secondary side fluid piping (102) on thermal conductor (50) for mutual warm energy transfer to constitute the func-

tional structure of the heat pump or heat exchange device (100);

-- The bidirectional fluid pumping device (123): It is constituted by the fluid pumping device having both or one of the operatively controllable pumping functions of positive pressure or negative pressure for pumping the gaseous or liquid state primary side fluid (10), wherein the bidirectional fluid pumping device (123) is driven by electric motor being driven by electric power source (300), engine power, or mechanical or electric power converted from other wind power, thermal energy, temperature-difference energy, or solar energy, etc;

-- The unidirectional fluid pump (120): It is constituted by the fluid pumping device capable of producing positive pressure to push fluid, or producing negative pressure to attract fluid for unidirectionally pumping secondary side fluid (20) inside secondary side fluid piping (102); unidirectional fluid pump (120) is driven by electric motor being driven by electric power source (300), engine power, or mechanical or electric power converted from other wind power, thermal energy, temperature-difference energy, or solar energy, etc; the unidirectional fluid pump (120) can be operatively controlled independently or by the periodic fluid direction-change operative control device (250);

-- The primary side fluid (10): It comprises one or more than one kind of same or different liquid or gaseous state, liquid to gaseous state, or gaseous to liquid state fluid;

-- The secondary side fluid (20): It comprises one or more than one kind of same or different liquid or gaseous state, liquid to gaseous state, or gaseous to liquid state fluid;

-- The power source (300): It is the device including AC or DC city power system or independent power to provide power source for the operations;

-- The periodic fluid direction-change operative control device (250): It is constituted by electromechanical components, solid state electronic components, or microprocessors and relevant software and operative control interfaces to operatively control the bidirectional fluid pumping device (123) and/or unidirectional fluid pump (120) simultaneously for periodically changing the flow direction of the primary side fluid (10) passing through heat pump or heat exchange device (100) thereby operatively controlling the temperature difference distribution status between primary side fluid (10) passing through primary side fluid piping (101) inside the heat pump or heat exchange device (100) and the heat pump or heat exchange device (100);

The timing for bidirectional fluid pumping device (123) to periodically change the pumping flow direction of primary side fluid (10) is **1)** the pumping flow direction of the bidirectional fluid pumping device (123) is manually operatively controlled; or **2)** the direction-change time period is set by periodic fluid direction-change operative control device (250) to operatively control the pumping flow direction of bidirectional fluid pumping device (123) to further change the flow direction of the primary side fluid (10) passing through primary side fluid piping (101); At least one temperature detecting device (11) is further installed at a position capable of directly or indirectly detecting the temperature change of the exchange pumping fluid to transmit the detected temperature signal back to the periodic fluid direction-change operative control device (250); wherein:

-- The periodic fluid direction-change operative control device (250): It is constituted by electro-mechanical components, solid state electronic components, or microprocessors and relevant software and operative control interfaces to operatively control the bidirectional fluid pumping device (123) for periodically changing the flow direction of the fluid passing through heat pump or heat exchange device (100) thereby operatively controlling the temperature difference distribution status between primary side fluid (10) passing through primary side fluid piping (101) and heat pump or heat exchange device (100) inside the heat pump or heat exchange device (100); the operative control methods include one or more than one of the following: **1)** the pumping flow direction of the bidirectional fluid pumping device (123) is manually operatively controlled; or **2)** the pumping flow direction of the bidirectional fluid pumping device (123) is operatively controlled by the periodic fluid direction-change operative control device (250) via setting time period or setting time period by referring to temperature variation detected by the temperature detecting device (11); or **3)** at least one temperature detecting device (11) is installed at a position capable of directly or indirectly detecting the temperature change of the exchange pumping fluid to transmit the temperature detected signal by the temperature detecting device (11) back to the periodic fluid direction-change operative control device (250), so that when the temperature detecting device (11) is reached the setting temperature, the pumping flow direction of the bidirectional fluid pumping device (123) is operatively controlled to pump the primary side fluid (10) to pass through the primary side fluid piping (101) in positive and reverse flow directions thereby changing the temperature distribution status of the thermal conductor (50) of

the heat pump or heat exchange device (100) accordingly.

3. A heat pump or heat exchange device with periodic positive and reverse pumping as claimed in claim 1, wherein it includes further series connected with the bidirectional fluid pumping device (123) driven by power source (300) and operatively controlled by the periodic fluid direction-change operative control device (250) for pumping the primary side fluid (10) to pass through the heat pump or heat exchange device (100) via primary side fluid piping (101) to periodically exchange flow directions; wherein:

-- The primary side fluid piping (101): It is for passing by the primary side fluid (10) being pumped by the bidirectional fluid pumping device (123) to further pass through the heat pump or heat exchange device (100), thereby via the thermal conductor (50) to transfer thermal energy for heat exchange with secondary side fluid (20);

-- The secondary side fluid piping (102): It is for passing by the secondary side fluid (20) being pumped by the unidirectional fluid pump (120) to further pass through the heat pump or heat exchange device (100) for heat exchange with primary side fluid (10);

-- Said primary side fluid piping (101) and secondary side fluid piping (102) can be made to straight piping, plane extended or 3-D shaped curved piping, labyrinth piping, spiral piping or piping of other various geometric shapes, wherein part of primary side fluid piping (101) is sleeveably combined with secondary side fluid piping (102) of different sizes to form the fluid path for passing fluids, wherein the function of thermal conductor (50) is constituted by the fluid piping walls between primary side fluid (10) and secondary side fluid (20) to execute the warm energy transfer function thereby further constituting the functional structure of the heat pump or heat exchange device (100);

-- The bidirectional fluid pumping device (123): It is constituted by both or either one of the fluid pumping devices capable of producing positive pressure or negative pressure for pumping gaseous or liquid state primary side fluid (10), wherein the bidirectional fluid pumping device (123) is driven by electric motor being driven by electric power source (300), engine power, or mechanical or electric power converted from other wind power, thermal energy, temperature-difference energy, or solar energy, etc;

-- The unidirectional fluid pump (120): It is constituted by the fluid pumping device capable of producing positive pressure to push fluid, or producing negative pressure to attract fluid for uni-

directionally pumping secondary side fluid (20) inside secondary side fluid piping (102); the unidirectional fluid pump (120) is driven by electric motor being driven by electric power source (300), engine power, or mechanical or electric power converted from other wind power, thermal energy, temperature-difference energy, or solar energy, etc; the unidirectional fluid pump (120) can be operatively controlled independently or by the periodic fluid direction-change operative control device (250);

-- The primary side fluid (10): It comprises one or more than one kind of same or different liquid or gaseous state, liquid to gaseous state, or gaseous to liquid state fluid;

-- The secondary side fluid (20): It comprises one or more than one kind of same or different liquid or gaseous state, liquid to gaseous state, or gaseous to liquid state fluid;

-- The power source (300): It is the device including AC or DC city power system or independent power to provide power source for the operations;

-- The periodic fluid direction-change operative control device (250): It is constituted by electro-mechanical components, solid state electronic components, or microprocessors and relevant software and operative control interfaces to operatively control the bidirectional fluid pumping device (123) and/or fixed unidirectional fluid pump (120) simultaneously for periodically changing the flow direction of the primary side fluid (10) passing through heat pump or heat exchange device (100) thereby operatively controlling the temperature difference distribution status between primary side fluid (10) passing through primary side fluid piping (101) inside the heat pump or heat exchange device (100) and the the heat pump or heat exchange device (100);

The timing for bidirectional fluid pumping device (123) to periodically change the pumping flow direction of primary side fluid (10) is **1)** the pumping flow direction of the bidirectional fluid pumping device (123) is manually operatively controlled; or **2)** the direction-change time period is set by periodic fluid direction-change operative control device (250) to operatively control the pumping flow direction of bidirectional fluid pumping device (123) to further change the flow direction of the primary side fluid (10) passing through primary side fluid piping (101);

At least one temperature detecting device (11) is further installed at a position capable of directly or indirectly detecting the temperature change of the exchange pumping fluid to transmit the detected temperature signal back to the periodic fluid direction-change operative control device

(250); wherein:

-- The periodic fluid direction-change operative control device (250): It is constituted by electro-mechanical components, solid state electronic components, or microprocessors and relevant software and operative control interfaces to operatively control the bidirectional fluid pumping device (123) for periodically changing the flow direction of the fluid passing through heat pump or heat exchange device (100) thereby operatively controlling the temperature difference distribution status between the primary side fluid (10) passing through primary side fluid piping (101) inside the heat pump or heat exchange device (100) and the heat pump or heat exchange device (100); the operative control methods include one or more than one of the following: **1)** the pumping flow direction of the bidirectional fluid pumping device (123) is manually operatively controlled, or **2)** the pumping flow direction of the bidirectional fluid pumping device (123) is operatively controlled by the periodic fluid direction-change operative control device (250) via setting time period or setting time period by referring to temperature variation detected by the temperature detecting device (11), or **3)** at least one temperature detecting device (11) is installed at a position capable of directly or indirectly detecting the temperature change of the exchange pumping fluid to transmit the detected temperature signal by the temperature detecting device (11) back to the periodic fluid direction-change operative control device (250), so that when the temperature detecting device(11) is reached the setting temperature, the pumping flow direction of the bidirectional fluid pumping device (123) is operatively controlled to pump the primary side fluid (10) to pass through the primary side fluid piping (101) in positive and reverse flow directions thereby changing the temperature distribution status of the thermal conductor (50) of the heat pump or heat exchange device (100) accordingly.

4. A heat pump or heat exchange device with periodic positive and reverse pumping as claimed in claim 1, wherein it includes to install the unidirectional fluid pump and four controllable switch type fluid valves being connected for positive and reverse flow directional operative control and having two input ends and two output ends, wherein the unidirectional fluid pump (120) is installed between at least one of the two input ends and respectively connected fluid source of primary side fluid piping (101), while the two output ends is arranged for connecting the two ends of the piping ports (a)(b) of the primary side fluid piping (101) installed to the heat pump or heat exchange device (100) thereby constituting the func-

tion of the bidirectional fluid pumping device (123) to pump the primary side fluid (10) in primary side fluid piping (101) of the heat pump or heat exchange device (100) in periodic positive and reverse flow directions so as to perform warm energy transfer with secondary side fluid (20) pumped by the unidirectional fluid pump (120) to pass through secondary side fluid piping (102) via the convection of the thermal conductor (50); wherein the flow circuit passing through the fluid valves (129a, 129b, 129c, 129d) and the unidirectional fluid pump (120) being connected with the primary side fluid piping (101) inside the heat pump or heat exchange device (100) include:

- One end of the fluid valve (129a) is interconnected with the fluid valve (129c) and the output end of the unidirectional fluid pump (120), while the input end of the unidirectional fluid pump (120) is interconnected with the piping port (A) of primary side fluid piping (101);
- The other end of the fluid valve (129a) is interconnected with the piping port (A) of primary side fluid piping (101) installed in the heat pump or heat exchange device (100) and one end of the fluid valve (129b);
- One end of the fluid valve (129d) is interconnected with one end of fluid valve (129b) and further directly connected with the piping port (B) of the primary side fluid piping (101);
- The other end of fluid valve (129d) is interconnected with the piping port (B) of primary side fluid piping (101) installed in the heat pump or heat exchange device (100) and fluid valve (129c), while the other end of fluid valve (129c) is interconnected with fluid valve (129a), and they are commonly interconnected with the output end of the unidirectional fluid pump (120); During the operation of bidirectional fluid pumping device (123) being operatively controlled by the periodic fluid direction-change operative control device (250), in the bidirectional fluid pumping device (123) being constituted by the unidirectional fluid pump (120) and fluid valves (129a, 129b, 129c, 129d), the fluid valve (129a) and fluid valve (129d) are one group, the fluid valve (129c) and fluid valve (129b) are another group, and they are opened or closed alternatively thereby via the pump of the unidirectional fluid pump (120) forming the periodic alternative flow direction exchange function on the heat pump or heat exchange device (100);
- The said unidirectional fluid pump (120) can be constituted by one fluid pump to pump unidirectionally or constituted by more than one fluid pumps to be installed to the same end of the primary side fluid piping (101) or respectively installed to both ends of the primary side fluid

piping (101) as the auxiliary pumps in the same pumping flow directions; and wherein it is further installed with at least one temperature detecting device (11) at a position capable of directly or indirectly detecting the temperature change of the exchange pumping fluid to transmit the detected temperature signal back to the periodic fluid direction-change operative control device (250); wherein:

-- The periodic fluid direction-change operative control device (250): It is constituted by electro-mechanical components, solid state electronic components, or microprocessors and relevant software and operative control interfaces to operatively control the bidirectional fluid pumping device (123) for periodically changing the flow direction of the fluid passing through heat pump or heat exchange device (100) thereby operatively controlling the temperature difference distribution status between primary side fluid (10) passing through primary side fluid piping (101) inside the heat pump or heat exchange device (100) and the heat pump or heat exchange device (100); the operative control methods include one or more than one of the following: **1)** the pumping flow direction of the bidirectional fluid pumping device (123) is manually operatively controlled; or **2)** the pumping flow direction of the bidirectional fluid pumping device (123) is operatively controlled by the periodic fluid direction-change operative control device (250) via setting time period or setting time period by referring to temperature variation detected by the temperature detecting device (11); or **3)** at least one temperature detecting device (11) is installed at a position capable of directly or indirectly detecting the temperature change of the exchange pumping fluid to transmit the detected temperature signal by the temperature detecting device (11) back to the periodic fluid direction-change operative control device (250), so that when the temperature detecting device (11) is reached the setting temperature, the pumping flow direction of the bidirectional fluid pumping device (123) is operatively controlled to pump the primary side fluid (10) to pass through the primary side fluid piping (101) in positive and reverse flow directions thereby changing the temperature distribution status of the thermal conductor (50) inside the heat pump or heat exchange device (100) accordingly.

5. A heat pump or heat exchange device with periodic positive and reverse pumping as claimed in claim 1, wherein it includes adopting at least one unidirectional fluid pump to further series connect with four controllable switch type fluid valves to constitute the bidirectional fluid pumping device (123) for pumping

the primary side fluid (10) in the primary side fluid piping (101) of the heat pump or heat exchange device (100) in periodic positive and reverse flow directions, while the secondary side fluid piping (102) is sleeveably combined inside the primary side fluid piping (101), wherein a fluid channel is reserved between said two fluid piping for passing primary side fluid (10) thereby allowing the primary side fluid (10) to perform warm energy transfer to the secondary side fluid (20) passing through secondary side fluid piping (102) being unidirectionally pumped by the unidirectional fluid pump (120); wherein the flow circuit passing through the fluid valves (129a, 129b, 129c, 129d) and the unidirectional fluid pump (120) being connected with the heat pump or heat exchange device (100) include the following:

- One end of the fluid valve (129a) is interconnected with the fluid valve (129c) and the output end of the unidirectional fluid pump (120), while the input end of the unidirectional fluid pump (120) is interconnected with the piping port (A) of primary side fluid piping (101);
- The other end of the fluid valve (129a) is interconnected with the piping port (A) of the heat pump or heat exchange device (100) and one end of the fluid valve (129b);
- One end of the fluid valve (129d) is interconnected with one end of fluid valve (129b) and further connected with the piping port (B) of the primary side fluid piping (101);
- The other end of fluid valve (129d) is interconnected with the piping port (B) of the heat pump or heat exchange device (100) and the fluid valve (129c), while the other end of fluid valve (129c) is interconnected with fluid valve (129a), and they are commonly interconnected with the output end of the unidirectional fluid pump (120); During the operation of bidirectional fluid pumping device (123) being operatively controlled by the periodic fluid direction-change operative control device (250), in the bidirectional fluid pumping device (123) being constituted by the unidirectional fluid pump (120) and fluid valves (129a, 129b, 129c, 129d), the fluid valve (129a) and fluid valve (129d) are one group, the fluid valve (129c) and fluid valve (129b) are another group, and they are opened or closed alternatively thereby forming the periodic alternative flow direction exchange function on the heat pump or heat exchange device (100);
- Said unidirectional fluid pump (120) is constituted by one fluid pump to pump unidirectionally or constituted by more than one fluid pumps to be installed to the same end of the primary side fluid piping (101) or respectively installed to both ends of the primary side fluid piping (101) so as to provide the auxiliary pumping in the same

pumping actions and same pumping flow directions; and

wherein it is further installed with at least one temperature detecting device (11) at a position capable of directly or indirectly detecting the temperature change of the exchange pumping fluid to transmit the detected temperature signal back to the periodic fluid direction-change operative control device (250); wherein

-- The periodic fluid direction-change operative control device (250): It is constituted by electro-mechanical components, solid state electronic components, or microprocessors and relevant software and operative control interfaces to operatively control the bidirectional fluid pumping device (123) for periodically changing the flow direction of the fluid passing through heat pump or heat exchange device (100) thereby operatively controlling the temperature difference distribution status between primary side fluid (10) passing through primary side fluid piping (101) inside the heat pump or heat exchange device (100) and the heat pump or heat exchange device (100); the operative control methods include one or more than one of the following: **1)** the pumping flow direction of the bidirectional fluid pumping device (123) is manually operatively controlled, or **2)** the pumping flow direction of the bidirectional fluid pumping device (123) is operatively controlled by the periodic fluid direction-change operative control device (250) via setting time period or setting time period by referring to temperature variation detected by the temperature detecting device (11), or **3)** at least one temperature detecting device (11) is installed at a position capable of directly or indirectly detecting the temperature change of the exchange pumping fluid transmit the detected temperature signal by the temperature detecting device (11) back to the periodic fluid direction-change operative control device (250), so that when the temperature detecting device (11) is reached the setting temperature, the pumping flow direction of the bidirectional fluid pumping device (123) is operatively controlled to pump the primary side fluid (10) to pass through the primary side fluid piping (101) in positive and reverse flow directions thereby changing the temperature distribution status of the thermal conductor (50) inside the heat pump or heat exchange device (100) accordingly.

6. A heat pump or heat exchange device with periodic positive and reverse pumping as claimed in claim 1, wherein it includes that the primary side fluid piping is sleeveably combined with the spiral shaped secondary side fluid piping inside the enclosed hollow casing, wherein it is through thermal conducting fluid

driven by bidirectional fluid pumping device inside the enclosed hollow casing to transfer warm energy thereby constituting the heat pump or heat exchange device function, wherein in its main constitution, it is further installed with the bidirectional fluid pumping device (123) being driven by the power source (300) and operatively controlled by the periodic fluid direction-change operative control device (250) for periodic positive and reverse flow pumping for pumping primary side fluid (10) to pass through primary side fluid piping (101) for periodic flow direction change; wherein:

- The primary side fluid piping (101): It is for passing by the primary side fluid (10) being pumped by the bidirectional fluid pumping device (123) to further pass through the primary side fluid piping (101) inside the enclosed hollow casing (200), wherein the primary side fluid (10) is through the thermal conducting fluid (30) to transfer warm energy and exchange heat with the secondary side fluid (20);
- The secondary side fluid piping (102): It is for passing by the secondary side fluid (20) being pumped by the unidirectional fluid pump (120) to further pass through the secondary side fluid piping (102) inside the enclosed hollow casing (200) and is through the thermal conducting fluid (30) to exchange heat with the primary side fluid (10);
- Said primary side fluid piping (101) and spiral shaped secondary side fluid piping (102) are sleeveably combined inside the enclosed hollow casing (200) and is through the thermal conducting fluid (30) in the enclosed hollow casing (200) to transfer warm energy thereby constituting the heat pump or heat exchange device functions, wherein the primary side fluid (10) inside primary side fluid piping (101) is pumped by the bidirectional fluid pumping device (123) to periodically exchange flow directions;
- The bidirectional fluid pumping device (123): It is constituted by the fluid pumping device having both or one of the operatively controllable pumping functions of positive pressure or negative pressure for pumping the gaseous or liquid state primary fluid (10), wherein the bidirectional fluid pumping device (123) is driven by electric motor being driven by electric power source (300), engine power, or mechanical or electric power converted from other wind power, thermal energy, temperature-difference energy, or solar energy, etc;
- The unidirectional fluid pump (120): It is constituted by the fluid pumping device capable of producing positive pressure to push fluid, or producing negative pressure to attract fluid for unidirectionally pumping secondary side fluid (20)

inside secondary side fluid piping (102);

- Said unidirectional fluid pump (120) is driven by electric motor being driven by electric power source (300), engine power, or mechanical or electric power converted from other wind power, thermal energy, temperature-difference energy, or solar energy, etc; the unidirectional fluid pump (120) can be operatively controlled independently or by the periodic fluid direction-change operative control device (250);
 - The primary side fluid (10): It comprises one or more than one kind of same or different liquid or gaseous state, liquid to gaseous state, or gaseous to liquid state fluid;
 - The secondary side fluid (20): It comprises one or more than one kind of same or different liquid or gaseous state, liquid to gaseous state, or gaseous to liquid state fluid;
 - The thermal conducting fluid (30): It comprises one or more than one kind of same or different liquid or gaseous state, liquid to gaseous state, or gaseous to liquid state fluid;
 - The power source (300): It is the device including AC or DC city power system or independent power to provide power source for the operations;
 - The periodic fluid direction-change operative control device (250): It is constituted by electromechanical components, solid state electronic components, or microprocessors and relevant software and operative control interfaces to operatively control the bidirectional fluid pumping device (123) and/or unidirectional fluid pump (120) simultaneously for periodically changing the flow direction of the primary side fluid (10) passing through the primary side fluid piping (101);
- The timing for bidirectional fluid pumping device (123) to periodically change the pumping flow direction of primary side fluid (10) is **1)** the pumping flow direction of the bidirectional fluid pumping device (123) is manually operatively controlled, or **2)** the pumping flow direction of the bidirectional fluid pumping device (123) is operatively controlled by the periodic fluid direction-change operative control device (250) via setting time period or setting time period by referring to temperature variation detected by the temperature detecting device (11), or **3)** at least one temperature detecting device (11) is installed at a position capable of directly or indirectly detecting the temperature change of the exchange pumping fluid to transmit the detected temperature signal by the temperature detecting device (11) back to the periodic fluid direction-change operative control device (250), so that when the temperature detecting device (11) is reached the setting temperature, the pumping

flow direction of the bidirectional fluid pumping device (123) is operatively controlled to pump the primary side fluid (10) to pass through the primary side fluid piping (101) in positive and reverse flow directions.

7. A heat pump or heat exchange device with periodic positive and reverse pumping as claimed in claim 1, wherein it includes adopting at least one unidirectional fluid pump and the bidirectional fluid valve set comprising by four controllable switch type fluid valves to constitute the bidirectional fluid pumping device, and the primary side fluid piping and spiral shaped secondary side fluid piping are sleeveably combined inside the enclosed hollow casing to allow the thermal conducting fluid inside the enclosed hollow casing to transfer warm energy thereby constituting the heat pump or heat exchange device, while the unidirectional fluid pump is installed between the primary side fluid piping and the primary side fluid source; wherein in its main constitution, the bidirectional fluid pumping device (123) is further constituted by the fluid valves (129a, 129b, 129c, 129d) being connected with the primary side fluid piping (101) and the unidirectional fluid pump (120), wherein the pumping flow circuits comprise the following:

-- One end of the fluid valve (129a) is interconnected with the fluid valve (129c) and the output end of the unidirectional fluid pump (120), while the input end of the unidirectional fluid pump (120) is interconnected with the piping port (A) of primary side fluid piping (101);

-- The other end of fluid valve (129a) is interconnected with the piping port (A) of the primary side fluid piping (101) installed in the enclosed hollow casing (200) and one end of fluid valve (129b);

-- One end of the fluid valve (129d) is interconnected with one end of fluid valve (129b) and further connected with the fluid inlet end of the unidirectional fluid pump (120), while the fluid outlet end of the unidirectional fluid pump (120) is interconnected with the piping port (B) of the primary side fluid piping (101);

-- The other end of fluid valve (129d) is interconnected with the piping port (B) of primary side fluid piping (101) installed in the enclosed hollow casing (200) and the fluid valve (129c), while the other end of fluid valve (129c) is interconnected with fluid valve (129a), and they are commonly interconnected with the output end of the unidirectional fluid pump (120);

The bidirectional fluid pumping device (123) being operatively controlled by the periodic fluid direction-change operative control device (250) is constituted by the unidirectional fluid pump (120) and fluid valves (129a, 129b, 129c, 129d),

wherein the fluid valve (129a) and fluid valve (129d) are one group, the fluid valve (129c) and fluid valve (129b) are another group, and they are opened or closed alternatively thereby forming the periodic alternative flow direction exchange function on the primary side fluid (10) of the primary side fluid piping (101) installed in the enclosed hollow casing (200);

-- Said unidirectional fluid pump (120) is constituted by one fluid pump to pump unidirectionally or constituted by more than one fluid pumps to be installed to the same end of the primary side fluid piping (101) or respectively installed to both ends of the primary side fluid piping (101) so as to provide the auxiliary pumping in the same pumping flow directions;

-- Said primary side fluid piping (101) and spiral shaped secondary side fluid piping (102) are sleeveably combined inside the enclosed hollow casing (200) and is through the thermal conducting fluid (30) in the enclosed hollow casing (200) to transfer warm energy thereby constituting the heat pump or heat exchange device function;

-- At least one unidirectional fluid pump (120) is installed between at least one end of secondary side fluid piping (102) and the secondary side fluid source for unidirectionally pumping secondary side fluid (20); and wherein

At least one temperature detecting device (11) is installed at a position capable of directly or indirectly detecting the temperature change of the exchange pumping fluid to transmit the detected temperature signal back to the periodic fluid direction-change operative control device (250); wherein:

-- The periodic fluid direction-change operative control device (250): It is constituted by electromechanical components, solid state electronic components, or microprocessors and relevant software and operative control interfaces to operatively control the bidirectional fluid pumping device (123) constituted by one unidirectional fluid pump and its connected four controllable switch type fluid valves for periodically changing the flow direction of the fluid passing through primary side fluid piping (101) thereby operatively controlling the temperature difference distribution status of the primary side fluid (10) inside primary side fluid piping (101) of the enclosed hollow casing (200); the operative control methods include one or more than one of the following: **1)** the pumping flow direction of the bidirectional fluid pumping device (123) is manually operatively controlled; or **2)** the pumping flow direction of the bidirectional fluid pumping device (123) is operatively controlled by the periodic fluid direction-change operative control device (250) via setting time period or setting

- time period by referring to temperature variation detected by the temperature detecting device (11); or **3)** at least one temperature detecting device (11) is installed at a position capable of directly or indirectly detecting the temperature change of the exchange pumping fluid to transmit the detected temperature signal by the temperature detecting device (11) back to the periodic fluid direction-change operative control device (250), so that when the temperature detecting device (11) is reached the setting temperature, the pumping flow direction of the bidirectional fluid pumping device (123) is operatively controlled to pump the primary side fluid (10) to pass through the primary side fluid piping (101) in positive and reverse flow directions thereby changing the temperature distribution status of primary side fluid (10) inside primary side fluid piping (101) of the enclosed hollow casing (200) accordingly.
8. A heat pump or heat exchange device with periodic positive and reverse pumping as claimed in claim 1, wherein it includes that the primary side fluid inside primary side fluid piping is pumped to pass through enclosed hollow casing, while the spiral shaped secondary side fluid piping is installed inside the enclosed hollow casing, wherein it is through the primary side fluid inside the enclosed hollow casing being the thermal conducting fluid to transfer warm energy thereby constituting the heat pump or heat exchange device function, and is driven by the bidirectional fluid pumping device, wherein in its main constitution, it is installed with the bidirectional fluid pumping device (123) being driven by the power source (300) and operatively controlled by the periodic fluid direction-change operative control device (250) for pumping primary side fluid (10) to pass through enclosed hollow casing (200) to periodically exchange flow directions; wherein:
- The primary side fluid piping (101): It is for passing by the primary side fluid (10) being pumped by the bidirectional fluid pumping device (123) to further pass through the enclosed hollow casing (200), wherein the warm energy is directly transferred by the primary side fluid (10) inside the enclosed hollow casing (200) to exchange heat with the secondary side fluid (20);
 - The secondary side fluid piping (102): It is for passing by the secondary side fluid (20) being pumped by the unidirectional fluid pump (120) to further pass through spiral shaped secondary side fluid piping (102) inside the enclosed hollow casing (200), wherein the secondary side fluid (20) directly transfer warm energy to the primary side fluid (10);

- Said primary side fluid (10) inside primary side fluid piping (101) is pumped to pass through enclosed hollow casing (200), while the spiral shaped secondary side fluid piping (102) is installed inside the enclosed hollow casing (200), wherein the primary side fluid (10) inside the enclosed hollow casing (200) is directly used as the thermal conducting fluid for transfer warm energy to the secondary side fluid (20) inside secondary side fluid piping (102) thereby constituting the heat pump or heat exchange device function, and the primary side fluid (10) inside the enclosed hollow casing (200) is pumped by the bidirectional fluid pumping device (123) to periodically exchange the flow directions;
- The bidirectional fluid pumping device (123): It is constituted by the fluid pumping device having both or one of the operatively controllable pumping functions of positive pressure or negative pressure for pumping the gaseous or liquid state primary side fluid (10), wherein the bidirectional fluid pumping device (123) is driven by electric motor being driven by electric power source (300), engine power, or mechanical or electric power converted from other wind power, thermal energy, temperature-difference energy, or solar energy, etc;
- The unidirectional fluid pump (120): It is constituted by the fluid pumping device capable of producing positive pressure to push fluid, or producing negative pressure to attract fluid for unidirectionally pumping secondary side fluid (20) inside secondary side fluid piping (102);
- Said unidirectional fluid pump (120) is driven by electric motor being driven by electric power source (300), engine power, or mechanical or electric power converted from other wind power, thermal energy, temperature-difference energy, or solar energy, etc; the unidirectional fluid pump (120) can be operatively controlled independently or by the periodic fluid direction-change operative control device (250);
- The primary side fluid (10): It comprises one or more than one kind of same or different liquid or gaseous state, liquid to gaseous state, or gaseous to liquid state fluid;
- The secondary side fluid (20): It comprises one or more than one kind of same or different liquid or gaseous state, liquid to gaseous state, or gaseous to liquid state fluid;
- The power source (300): It is the device including AC or DC city power system or independent power to provide power source for the operations;
- The periodic fluid direction-change operative control device (250): It is constituted by electro-mechanical components, solid state electronic components, or microprocessors and relevant

software and operative control interfaces to operatively control the bidirectional fluid pumping device (123) and/or unidirectional fluid pump (120) simultaneously for periodically changing the flow direction of the primary side fluid (10) passing through the interior of the enclosed hollow casing (200);

The timing for bidirectional fluid pumping device (123) to periodically change the pumping flow direction of primary side fluid (10) is: **1)** the pumping flow direction of the bidirectional fluid pumping device (123) is manually operatively controlled, or **2)** the pumping flow direction of the bidirectional fluid pumping device (123) is operatively controlled by the periodic fluid direction-change operative control device (250) via setting time period or setting time period by referring to temperature variation detected by the temperature detecting device (11), or **3)** at least one temperature detecting device (11) is installed at a position capable of directly or indirectly detecting the temperature change of the exchange pumping fluid to transmit the detected temperature signal by the temperature detecting device (11) back to the periodic fluid direction-change operative control device (250), so that when the temperature detecting device (11) is reached the setting temperature, the pumping flow direction of the bidirectional fluid pumping device (123) is operatively controlled to pump the primary side fluid (10) to pass through the interior of the enclosed hollow casing (200) in positive and reverse flow directions.

9. A heat pump or heat exchange device with periodic positive and reverse pumping as claimed in claim 1, wherein it includes that the bidirectional fluid pumping device is constituted by at least one unidirectional fluid pump and four controllable switch type fluid valves, and the primary side fluid in the primary side fluid piping is pumped to pass through the enclosed hollow casing, while the spiral shaped secondary side fluid piping is installed inside the enclosed hollow casing, wherein the primary side fluid inside the enclosed hollow casing is used as the conducting fluid for warm energy transfer thereby constituting the heat pump or heat exchange device function, and the unidirectional fluid pump is installed between the primary side fluid piping and the primary side fluid source, wherein in its main constitution, the bidirectional fluid pumping device (123) is constituted by the fluid valves (129a, 129b, 129c, 129d) being connected with the primary side fluid piping (101) and the unidirectional fluid pump (120); wherein the pumping flow circuit comprises:

-- One end of fluid valve (129a) is interconnected with the fluid valve (129c) and the output end of

the unidirectional fluid pump (120), while the input end of the unidirectional fluid pump (120) is interconnected with the piping port (A) of primary side fluid piping (101);

-- The other end of fluid valve (129a) is interconnected with the piping port (A) of the primary side fluid piping (101) installed in the enclosed hollow casing (200) and one end of fluid valve (129b);

-- One end of the fluid valve (129d) is interconnected with one end of fluid valve (129b) and further connected with the piping port (B) of the primary side fluid piping (101);

-- The other end of fluid valve (129d) is interconnected with the piping port (B) of primary side fluid piping (101) installed inside the enclosed hollow casing (200) and the fluid valve (129c), while the other end of fluid valve (129c) is interconnected with fluid valve (129a), and they are commonly interconnected with the output end of the unidirectional fluid pump (120);

The bidirectional fluid pumping device (123) being operatively controlled by the periodic fluid direction-change operative control device (250) is constituted by fluid valves (129a, 129b, 129c, 129d) and the unidirectional fluid pump (120), wherein the fluid valve (129a) and fluid valve (129d) are one group, the fluid valve (129c) and fluid valve (129b) are another group, and they are opened or closed alternatively thereby forming the periodic alternative flow direction exchange function inside the primary side fluid piping (101);

-- Said unidirectional fluid pump (120) is constituted by one fluid pump to pump unidirectionally or constituted by more than one fluid pumps to be installed to the same end of the primary side fluid piping (101) or respectively installed to both ends of the primary side fluid piping (101) so as to provide the auxiliary pumping in the same pumping flow directions;

-- Said primary side fluid (10) inside primary side fluid piping (101) is pumped to pass through the enclosed hollow casing (200), while the spiral shaped secondary side fluid piping (102) installed inside the enclosed hollow casing (200) is through the thermal conducting fluid (30) in the enclosed hollow casing (200) to transfer warm energy thereby constituting the heat pump or heat exchange device function;

-- At least one unidirectional fluid pump (120) is installed between at least one end of secondary side fluid piping (102) and the secondary side fluid source for unidirectionally pumping secondary side fluid (20); and

It is further optionally installed with at least one temperature detecting device (11) at a position capable of directly or indirectly detecting the

temperature change of the exchange pumping fluid to transmit the detected temperature signal back to the periodic fluid direction-change operative control device (250); wherein:

-- The periodic fluid direction-change operative control device (250): It is constituted by electro-mechanical components, solid state electronic components, or microprocessors and relevant software and operative control interfaces to operatively control the bidirectional fluid pumping device (123) for periodically changing the flow direction of the fluid passing through heat pump or heat exchange device (100) thereby operatively controlling the temperature difference distribution status between primary side fluid (10) passing through primary side fluid piping (101) inside the heat pump or heat exchange device (100) and the heat pump or heat exchange device (100); the operative control methods include one or more than one of the following: **1)** the pumping flow direction of the bidirectional fluid pumping device (123) is manually operatively controlled; or **2)** the pumping flow direction of the bidirectional fluid pumping device (123) is operatively controlled by the periodic fluid direction-change operative control device (250) via setting time period or setting time period by referring to temperature variation detected by the temperature detecting device (11); or **3)** at least one temperature detecting device (11) is installed at a position capable of directly or indirectly detecting the temperature change of the exchange pumping fluid to transmit the detected temperature signal by the temperature detecting device (11) back to the periodic fluid direction-change operative control device (250), so that when the temperature detecting device (11) is reached the setting temperature, the pumping flow direction of the bidirectional fluid pumping device (123) is operatively controlled to pump the primary side fluid (10) to pass through the primary side fluid piping (101) in positive and reverse flow directions thereby changing the temperature distribution status of the thermal conductor (50) of the heat pump or heat exchange device (100) accordingly.

- 10.** A heat pump or heat exchange device with periodic positive and reverse pumping as claimed in claim 1, wherein it includes that the spiral shaped primary side fluid piping and the spiral shaped secondary side fluid piping are spirally combined inside the enclosed hollow casing and is through the thermal conducting fluid in the enclosed hollow casing to transfer warm energy thereby constituting the heat pump or heat exchange device functions, and it is pumped by the bidirectional fluid pumping device (123), wherein in its main constitution, it is installed with the

bidirectional fluid pumping device (123) being driven by the power source (300) and operatively controlled by the periodic fluid direction-change operative control device (250) to pump the primary side fluid (10) to pass through primary side fluid piping (101) in positive and reverse flow directions; wherein:

-- The primary side fluid piping (101): It is for passing by the primary side fluid (10) being pumped by the bidirectional fluid pumping device (123) to further pass through primary side fluid piping (101) inside the enclosed hollow casing (200), wherein the primary side fluid (10) is through the thermal conducting fluid (30) to transfer warm energy and exchange heat with the secondary side fluid (20);

-- The secondary side fluid piping (102): It is for passing by the secondary side fluid (20) being pumped by the unidirectional fluid pump (120) to further pass through the secondary side fluid piping (102) inside the enclosed hollow casing (200) and is through the thermal conducting fluid (30) to exchange heat with the primary side fluid (10);

-- Said spiral shaped primary side fluid piping (101) and spiral shaped secondary side fluid piping (102) are commonly installed inside the enclosed hollow casing (200) and is through the thermal conducting fluid (30) in the enclosed hollow casing (200) to transfer warm energy thereby constituting the heat pump or heat exchange device functions, wherein the primary side fluid (10) inside primary side fluid piping (101) is pumped by the bidirectional fluid pumping device (123) to periodically exchange flow directions;

-- The bidirectional fluid pumping device (123): It is constituted by the fluid pumping device having both or one of the operatively controllable pumping functions of positive pressure or negative pressure for pumping the gaseous or liquid state primary fluid (10), wherein the bidirectional fluid pumping device (123) is driven by electric motor being driven by electric power source (300), engine power, or mechanical or electric power converted from other wind power, thermal energy, temperature-difference energy, or solar energy, etc;

-- The unidirectional fluid pump (120): It is constituted by the fluid pumping device capable of producing positive pressure to push fluid, or producing negative pressure to attract fluid for unidirectionally pumping secondary side fluid (20) inside secondary side fluid piping (102); the unidirectional fluid pump (120) is driven by electric motor being driven by electric power source (300), engine power, or mechanical or electric power converted from other wind power, thermal

energy, temperature-difference energy, or solar energy, etc; the unidirectional fluid pump (120) can be operatively controlled independently or by the periodic fluid direction-change operative control device (250);

-- The primary side fluid (10): It comprises one or more than one kind of same or different liquid or gaseous state, liquid to gaseous state, or gaseous to liquid state fluid;

-- The secondary side fluid (20): It comprises one or more than one kind of same or different liquid or gaseous state, liquid to gaseous state, or gaseous to liquid state fluid;

-- The thermal conducting fluid (30): It comprises one or more than one kind of same or different liquid or gaseous state, liquid to gaseous state, or gaseous to liquid state fluid;

-- The power source (300): It is the device including AC or DC city power system or independent power to provide power source for the operations;

-- The periodic fluid direction-change operative control device (250): It is constituted by electro-mechanical components, solid state electronic components, or microprocessors and relevant software and operative control interfaces to operatively control the bidirectional fluid pumping device (123) and/or unidirectional fluid pump (120) simultaneously for periodically changing the flow direction of the primary side fluid (10) passing through primary side fluid piping (101); The timing for bidirectional fluid pumping device (123) to periodically change the pumping flow direction of primary side fluid (10) is **1**) the pumping flow direction of the bidirectional fluid pumping device (123) is manually operatively controlled, or **2**) the pumping flow direction of the bidirectional fluid pumping device (123) is operatively controlled by the periodic fluid direction-change operative control device (250) via setting time period or setting time period by referring to temperature variation detected by the temperature detecting device (11), or **3**) at least one temperature detecting device (11) is installed at a position capable of directly or indirectly detecting the temperature change of the exchange pumping fluid to transmit the detected temperature signal by the temperature detecting device (11) back to the periodic fluid direction-change operative control device (250), so that when the temperature detecting device (11) is reached the setting temperature, the pumping flow direction of the bidirectional fluid pumping device (123) is operatively controlled to pump the primary side fluid (10) to pass through the primary side fluid piping (101) in positive and reverse flow directions.

11. A heat pump or heat exchange device with periodic positive and reverse pumping as claimed in claim 1, wherein it includes that the bidirectional fluid pumping device is constituted by at least one unidirectional fluid pump and the bidirectional fluid valve set constituted by four controllable switch type fluid valves, while the spiral shaped primary side fluid piping and spiral shaped secondary side fluid piping are commonly installed in the enclosed hollow casing for transfer warm energy through the thermal conducting fluid inside the enclosed hollow structure, wherein the unidirectional fluid pump is installed between at least one end of the primary side fluid piping and the primary side fluid source, wherein in its main constitution, the bidirectional fluid pumping device (123) is constituted by the fluid valves (129a, 129b, 129c, 129d) and the unidirectional fluid pump (120) being connected with the primary side fluid piping (101), wherein the pumping flow circuit includes:

-- One end of the fluid valve (129a) is interconnected with fluid valve (129c) and the output end of the unidirectional fluid pump (120), while the input end of the unidirectional fluid pump (120) is interconnected with the piping port (A) of primary side fluid piping (101);

-- The other end of the fluid valve (129a) is interconnected with the piping port (A) of primary side fluid piping (101) installed in the enclosed hollow casing (200) and one end of the fluid valve (129b);

-- One end of the fluid valve (129d) is interconnected with one end of fluid valve (129b) and further connected with the fluid inlet end of the unidirectional fluid pump (120), while the fluid outlet end of the unidirectional fluid pump (120) is interconnected with the piping port (B) of the primary side fluid piping (101);

-- The other end of fluid valve (129d) is interconnected with the piping port (B) of primary side fluid piping (101) installed in the enclosed hollow casing (200) and the fluid valve (129c), while the other end of fluid valve (129c) is interconnected with the fluid valve (129a), and they are commonly interconnected with the output end of the unidirectional fluid pump (120);

The bidirectional fluid pumping device (123) being operatively controlled by the periodic fluid direction-change operative control device (250) is constituted by the unidirectional fluid pump (120) and fluid valves (129a, 129b, 129c, 129d), wherein the fluid valve (129a) and fluid valve (129d) are one group, the fluid valve (129c) and fluid valve (129b) are another group, and they are opened or closed alternatively thereby forming the periodic alternative flow direction exchange function of the primary side fluid (10) inside the primary side fluid piping (101) of the

enclosed hollow casing (200);

-- Said unidirectional fluid pump (120) is constituted by one fluid pump to pump unidirectionally or constituted by more than one fluid pumps to be installed to the same end of the primary side fluid piping (101) or respectively installed to both ends of the primary side fluid pumping (101) so as to provide the auxiliary pumping in the same pumping flow directions;

-- Said spiral shaped primary side fluid piping (101) and spiral shaped secondary side fluid piping (102) are commonly installed inside the enclosed hollow casing (200) and is through the thermal conducting fluid (30) in the enclosed hollow casing (200) to transfer warm energy thereby constituting the heat pump or heat exchange device function;

-- At least one unidirectional fluid pump (120) is installed between at least one end of secondary side fluid piping (102) and the primary side fluid source for unidirectionally pumping secondary side fluid (20); and

It is further optionally installed with at least one temperature detecting device (11) at a position capable of directly or indirectly detecting the temperature change of the exchange pumping fluid to transmit the detected temperature signal back to the periodic fluid direction-change operative control device (250); wherein:

-- The periodic fluid direction-change operative control device (250): It is constituted by electro-mechanical components, solid state electronic components, or microprocessors and relevant software and operative control interfaces to operatively control the periodically exchanged pumping flow directions of the fluid in the primary side fluid piping (101) installed in the enclosed hollow casing (200); the operative control methods include one or more than one of the following: **1)** the pumping flow direction of the bidirectional fluid pumping device (123) is manually operatively controlled; or **2)** the pumping flow direction of the bidirectional fluid pumping device (123) is operatively controlled by the periodic fluid direction-change operative control device (250) via setting time period or setting time period by referring to temperature variation detected by the temperature detecting device (11); or **3)** at least one temperature detecting device (11) is installed at a position capable of directly or indirectly detecting the temperature change of the exchange pumping fluid to transmit the detected temperature signal by the temperature detecting device (11) back to the periodic fluid direction-change operative control device (250), so that when the temperature detecting device (11) is reached the setting temperature, the pumping flow direction of the bidirectional fluid

pumping device (123) is operatively controlled to pump the primary side fluid (10) inside the primary side fluid piping (101) of the enclosed hollow casing (200) in positive and reverse flow pumping thereby changing the temperature distribution status of primary side fluid (10) inside primary side fluid piping (101) of the enclosed hollow casing (200) accordingly.

12. A heat pump or heat exchange device with periodic positive and reverse pumping as claimed in claim 1, wherein the basic structure include the flowing mode A, mode B, or the mixture of the two modes, wherein:

Mode A: The bidirectional fluid pumping device (123) is installed between the primary side fluid piping (101) and the fluid source of primary side fluid (10) to periodically pump fluid (10) in positive and reverse flow directions, while secondary side fluid (20) is pumped by the unidirectional fluid pump (120) to perform the heat pump or heat exchange device functions;

Mode B: The bidirectional fluid pumping device (123) is installed between the secondary side fluid piping (102) and the fluid source of secondary side fluid (20) to periodically pump fluid (20) in positive and reverse flow directions, while primary side fluid (10) is pumped by the unidirectional fluid pump (120) to perform the heat pump or heat exchange device functions.

13. A heat pump or heat exchange device with periodic positive and reverse pumping as claimed in claim 1, wherein said mode A includes one or more than one structural modes of the following, including:

-- For the heat pump or heat exchange device with periodic positive and reverse pumping, the bidirectional fluid pumping device (123) constituted by at least one bidirectional fluid pump (124) being series connected with one of the two fluid ports of the primary side fluid piping (101) of the heat pump or heat exchange device (100) is operatively controlled by the periodic fluid direction-change operative control device (250) for periodic positive and reverse flow pumping to periodically exchange the flow directions;

-- For the heat pump or heat exchange device with periodic positive and reverse pumping, the at least two bidirectional fluid pumping devices (123) comprising by at least two bidirectional fluid pumps (124) being respectively series connected with the two fluid ports of the primary side fluid piping (101) of the heat pump or heat exchange device (100) is operatively controlled by the periodic fluid direction-change operative control device (250) to periodically perform at least one operating functions of the following: **1)**

the bidirectional fluid pumps (124) installed at the two ends of the fluid ports of the primary side fluid piping (101) are alternatively pumped in reverse flow direction; **2)** the bidirectional fluid pumps (124) installed at the two ends of the fluid ports of the primary side fluid piping (101) are alternatively pumped in positive flow direction; **3)** the bidirectional fluid pumps (124) installed at the two ends of the fluid ports of the primary side fluid piping (101) are auxilarily pumped in the same positive flow directions and the same reverse flow directions;

-- The heat pump or heat exchange device with periodic positive and reverse pumping is further made to that the bidirectional fluid pumping device (123) constituted by at least two series connected unidirectional fluid pumps (120, 120') in different pumping flow directions being installed to one of the two fluid ports of primary side fluid piping (101) of the heat pump or heat exchange device (100) is operatively controlled by the periodic fluid direction-change operative control device (250) to allow either one of the unidirectional fluid pumps to be periodically alternatively pumped,, thereby periodically switching the flow direction of fluids, wherein if the unidirectional fluid pumps (120, 120') constituting the bidirectional fluid pumping device (123) are irreversible, then each unidirectional fluid pump (120) or (120') is respectively parallel connected with the reversible unidirectional valve (126);

-- The heat pump or heat exchange device with periodic positive and reverse pumping is further made to that the two bidirectional fluid pumping devices (123) individually constituted by at least two series connected unidirectional fluid pumps (120, 120') in different pumping flow directions being respectively series connected with the two ends of fluid ports of primary side fluid piping (101) of the heat pump or heat exchange device (100) are operatively controlled by the periodic fluid direction-change operative control device (250) to have one or more than one operating functions of the following: **1)** the two unidirectional fluid pumps (120) or (120') of each of the two said bidirectional fluid pumping devices (123) being respectively series connected with the two ends of the heat pump or heat exchange device (100) are auxilarily pumped in the same pumping flow directions and periodically simultaneously pumped for switching pumping directions at one time; or **2)** the two unidirectional fluid pumps (120, 120') in different flow pumping directions being respectively series connected with the fluid port (a) and fluid port (b) are operatively controlled by the periodic fluid direction-change operative control device (250) to allow either one of the unidirectional fluid pumps (120,

120') to be periodically alternatively pumped, thereby periodically switching the flow direction of fluid, wherein if the unidirectional fluid pumps (120, 120') constituting the bidirectional fluid pumping device (123) are irreversible, then each unidirectional fluid pump is respectively parallel connected with the reversible unidirectional valve (126);

-- The heat pump or heat exchange device with periodic positive and reverse pumping is further made to that the bidirectional fluid pumping device comprising at least two parallel connected unidirectional fluid pumps (120, 120') in different pumping flow directions being series connected with one end of the two fluid ports of primary side fluid piping (101) of the heat pump or heat exchange device (100) is operatively controlled by the periodic fluid direction-change operative control device (250) to allow either one of the unidirectional fluid pumps (120, 120') to be periodically alternatively pumped, thereby periodically switching the flow direction of fluids, wherein if structures of the unidirectional fluid pumps (120, 120') have no anti-reverse flow functions, then each individual fluid pump is first respectively forwardly series connected with the unidirectional valve (126) and then parallel connected to prevent reverse flows;

-- The heat pump or heat exchange device with periodic positive and reverse pumping is further made to that the two bidirectional fluid pumping devices (123) individually comprising at least two parallel connected unidirectional fluid pumps (120, 120') in different flow directions being respectively series connected with the two ends of fluid ports of primary side fluid piping (101) of the heat pump or heat exchange device (100) are operatively controlled by the periodic fluid direction-change operative control device (250) to have one or more than one operating function of the following: **1)** the unidirectional fluid pumps (120, 120') of the two said bidirectional fluid pumping devices (123) being respectively series connected with the two ends of the heat pump or heat exchange device (100) are auxilarily pumped in the same pumping flow directions and periodically simultaneously pumped for switching pumping direction at one time; or **2)** the unidirectional fluid pump (120) or (120') of the two said bidirectional fluid pumping devices (123) being respectively series connected with the two ends of the heat pump or heat exchange device (100) are operatively controlled by the periodic fluid direction-change operative control device (250) to allow either one of the unidirectional fluid pumps (120, 120') to be periodically alternatively pumped, thereby periodically switching the flow direction of the fluid, wherein

if the unidirectional fluid pumps (120, 120') are irreversible, then each unidirectional fluid pump is respectively parallel connected with the reversible unidirectional valve (126);

-- The heat pump or heat exchange device with periodic positive and reverse pumping is further made to that the bidirectional fluid pumping device (123) comprising at least one unidirectional fluid pump (120) and four controllable switch type fluid valves (129a, 129b, 129c, 129d) in bridge type assembly being series connected with one end of the two fluid ports of primary side fluid piping (101) of the heat pump or heat exchange device (100) is operatively controlled by the periodic fluid direction-change operative control device (250), wherein during the operation of unidirectional fluid pump (120) of the above said bidirectional fluid pumping device, the two fluid valves (129a)(129b) are operatively controlled to be opened, while the other two fluid valves (129c)(129d) are operatively controlled to be closed, or the two fluid valves (129a)(129b) are alternatively operatively controlled to be closed, while the other two fluid valves (129c)(129d) are alternatively operatively controlled to be opened thereby periodically switching the flow direction of the fluid;

-- The heat pump or heat exchange device with periodic positive and reverse pumping is further made to that the two bidirectional fluid pumping devices (123) individually comprising at least one unidirectional fluid pump (120) and four controllable switch type fluid valves (129a, 129b, 129c, 129d) in bridge type assembly being respectively series connected with the two ends of fluid ports of primary side fluid piping (101) of the heat pump or heat exchange device (100) are operatively controlled by the periodic fluid direction-change operative control device (250), wherein during the operation of the unidirectional fluid pump (120) of the above said two bidirectional fluid pumping devices, the two fluid valves (129a)(129b) are operatively controlled to be opened, while the other two fluid valves (129c)(129d) are operatively controlled to be closed, or the two fluid valves (129a)(129b) are alternatively operatively controlled to be closed, while the other two fluid valves (129c)(129d) are alternatively operatively controlled to be opened, thereby periodically switching the flow direction of the fluid.

- 14.** A heat pump or heat exchange device with periodic positive and reverse pumping as claimed in claim 1, wherein said mode B includes one or more than one structural modes of the following, including:

-- For the heat pump or heat exchange device

with periodic positive and reverse pumping, the bidirectional fluid pumping device (123) constituted by at least one bidirectional fluid pump (124) being series connected with one of the two fluid ports of the secondary side fluid piping (102) of the heat pump or heat exchange device (100) is operatively controlled by the periodic fluid direction-change operative control device (250) for periodic positive and reverse flow pumping to periodically exchange the flow directions;

-- For the heat pump or heat exchange device with periodic positive and reverse pumping, the at least two bidirectional fluid pumping devices (123) comprising at least two bidirectional fluid pumps (124) being respectively series connected with the two fluid ports of the secondary side fluid piping (102) of the heat pump or heat exchange device (100) is operatively controlled by the periodic fluid direction-change operative control device (250) to periodically perform at least one operating functions of the following: **1)** One of the two bidirectional fluid pumping devices (123) is alternatively pumped in reverse flow direction; **2)** One of the two bidirectional fluid pumping devices (123) is alternatively pumped in positive flow direction; **3)** both of the two bidirectional fluid pumping devices (123) are auxilarily pumped in the same positive flow directions and the same reverse flow directions;

-- The heat pump or heat exchange device with periodic positive and reverse pumping is further made to that the bidirectional fluid pumping device (123) constituted by at least two series connected unidirectional fluid pumps (120, 120') in different pumping flow directions being installed to one of the two fluid ports of secondary side fluid piping (102) of the heat pump or heat exchange device (100) is operatively controlled by the periodic fluid direction-change operative control device (250) to allow either one of the unidirectional fluid pumps to be periodically alternatively pumped, thereby periodically switching the flow direction of fluids, wherein if the unidirectional fluid pumps (120, 120') constituting the bidirectional fluid pumping device (123) are irreversible, then each unidirectional fluid pump (120) or (120') is respectively parallel connected with the reversible unidirectional valve (126);

-- The heat pump or heat exchange device with periodic positive and reverse pumping is further made to that the two bidirectional fluid pumping devices (123) individually comprising at least two series connected unidirectional fluid pumps (120, 120') in different pumping flow directions being respectively series connected with the two ends of fluid ports of secondary side fluid piping (102) of the heat pump or heat exchange device

(100) are operatively controlled by the periodic fluid direction-change operative control device (250) to have one or more than one operating functions of the following: **1)** the two unidirectional fluid pumps (120) or (120') of each of the two said bidirectional fluid pumping devices (123) being respectively series connected with the two ends of the heat pump or heat exchange device (100) are auxiliarily pumped in the same pumping flow directions and periodically simultaneously pumped for switching pumping directions at one time; or **2)** the two unidirectional fluid pumps (120, 120') in different flow pumping directions being respectively series connected with the fluid port (a) and fluid port (b) are operatively controlled by the periodic fluid direction-change operative control device (250) to allow either one of the unidirectional fluid pumps (120, 120') to be periodically alternatively pumped, thereby periodically switching the flow direction of fluid, wherein if the unidirectional fluid pumps (120, 120') constituting the bidirectional fluid pumping device (123) are irreversible, then each unidirectional fluid pump is respectively parallel connected with the reversible unidirectional valve (126);

-- The heat pump or heat exchange device with periodic positive and reverse pumping is further made to that the bidirectional fluid pumping device comprising at least two parallel connected unidirectional fluid pumps (120, 120') in different pumping flow directions being series connected with one end of the two fluid ports of secondary side fluid piping (102) of the heat pump or heat exchange device (100) is operatively controlled by the periodic fluid direction-change operative control device (250) to allow either one of the unidirectional fluid pumps (120, 120') to be periodically alternatively pumped, thereby periodically switching the flow direction of fluids, wherein if structures of the unidirectional fluid pumps (120, 120') have no anti-reverse flow functions, then each individual fluid pump is first respectively forwardly series connected with the unidirectional valve (126) and then parallel connected to prevent reverse flows;

-- The heat pump or heat exchange device with periodic positive and reverse pumping is further made to that the two bidirectional fluid pumping devices (123) individually comprising at least two parallel connected unidirectional fluid pumps (120, 120') in different flow directions being respectively series connected with the two ends of fluid ports of secondary side fluid piping (102) of the heat pump or heat exchange device (100) are operatively controlled by the periodic fluid direction-change operative control device (250) to have one or more than one operating function

of the following: **1)** the unidirectional fluid pumps (120, 120') of the two said bidirectional fluid pumping devices (123) being respectively series connected with the two ends of heat pump or heat exchange device (100) are auxiliarily pumped in the same pumping flow directions and periodically simultaneously pumped for switching pumping direction at one time; or **2)** the unidirectional fluid pump (120) or (120') of the two said bidirectional fluid pumping devices (123) being respectively series connected with the two ends of the heat pump or heat exchange device (100) are operatively controlled by the periodic fluid direction-change operative control device (250) to allow either one of the unidirectional fluid pumps (120, 120') to be periodically alternatively pumped, thereby periodically switching the flow direction of the fluid, wherein if the unidirectional fluid pumps (120, 120') are irreversible, then each unidirectional fluid pump is respectively parallel connected with the reversible unidirectional valve (126);

-- The heat pump or heat exchange device with periodic positive and reverse pumping is further made to that the bidirectional fluid pumping device (123) comprising at least one unidirectional fluid pump (120) and four controllable switch type fluid valves (129a, 129b, 129c, 129d) in bridge type assembly being series connected with one end of the two fluid ports of secondary side fluid piping (102) of the heat pump or heat exchange device (100) is operatively controlled by the periodic fluid direction-change operative control device (250), wherein during the operation of unidirectional fluid pump (120) of the above said bidirectional fluid pump group, the two fluid valves (129a)(129b) are operatively controlled to be opened, while the other two fluid valves (129c)(129d) are operatively controlled to be closed, or the two fluid valves (129a)(129b) are alternatively operatively controlled to be closed, while the other two fluid valves (129c)(129d) are alternatively operatively controlled to be opened thereby periodically switching the flow direction of the fluid;

-- The heat pump or heat exchange device with periodic positive and reverse pumping is further made to that the two bidirectional fluid pumping devices (123) individually comprising at least one unidirectional fluid pump (120) and four controllable switch type fluid valves (129a, 129b, 129c, 129d) in bridge type assembly being respectively series connected with the two ends of fluid ports of secondary side fluid piping (102) of the heat pump or heat exchange device (100) are operatively controlled by the periodic fluid direction-change operative control device (250), wherein during the operation of the unidirectional

fluid pump (120) of the above said two bidirectional fluid pumping devices, the two fluid valves (129a)(129b) are operatively controlled to be opened, while the other two fluid valves (129c) (129d) are operatively controlled to be closed, or the two fluid valves (129a)(129b) are alternatively operatively controlled to be closed, while the other two fluid valves (129c)(129d) are alternatively operatively controlled to be opened thereby periodically switching the flow direction of the fluid.

15. A heat pump or heat exchange device with periodic positive and reverse pumping as claimed in claim 1, wherein the structure types of the heat pump or heat exchange device (100) include the following: **1)** the linear or other geometric shaped piping ; **2)** the multi-layer structure having fluid flow paths for passing by gaseous or liquid state fluid; or **3)** the multiple circuits comprising one or more than one fluid flow circuits in series connection, parallel connection, or series and parallel connection.
16. A heat pump or heat exchange device with periodic positive and reverse pumping as claimed in claim 1, wherein beside of that the fluid pumping device provided for pumping gaseous or liquid state fluid is driven by the individual electric motors or at least two fluid pumps are driven by a common electric motor, they can be also driven by engine power, or mechanical or electric power converted from other wind power, thermal energy, temperature-difference energy, or solar energy, etc..
17. A heat pump or heat exchange device with periodic positive and reverse pumping as claimed in claim 1, wherein the periodic fluid direction-change operative control device (250) is equipped with electric motor, or controllable engine power, or mechanical or electric power generated or converted from other wind energy, thermal energy, temperature-difference energy, or solar energy for controlling various fluid pumps for driven, or controlling the operation timing of the fluid pumps or fluid valves, thereby changing the direction of the two circuits passing through the the heat pump or heat exchange device (100) and further to operatively control partial or all regulations of rotational speed, flow rate, fluid pressure of various fluid pumps thereof.
18. A heat pump or heat exchange device with periodic positive and reverse pumping as claimed in claim 1, wherein in the positive and reverse flow directional fluid pumping operation, it is further through the periodic fluid direction-change operative control device (250) to manipulate the flow rate of fluid pumped by the bidirectional fluid pumping device (123), wherein the operational modes include one or more than one

types as follows, including:

- 1)** The adjustment or setting of the pumping fluid flow rate is manually operatively controlled;
- 2)** The fluid flow rate is operatively controlled by the detected signal of the at least one temperature detecting device being installed;
- 3)** The fluid flow rate is operatively controlled by combining the two or more than two methods of items 1)~2).

19. A heat pump or heat exchange device with periodic positive and reverse pumping as claimed in claim 1, wherein in setting up the flow rate operative control function, the fluid flow rate operative control range including the stepped or stepless fluid flow rate modulations from cease of transportation to maximum transportation rate is relied on one or more than one of the following devices to change the fluid flow rate, wherein it includes:

- 1)** The speed control of the pumping rotational speed of the bidirectional fluid pumping device (123) is operatively controlled within the range from shutdown to maximum speed in order to further operatively control the fluid flow rate;
- 2)** It is through adopting the bidirectional fluid pumping device (123) being installed with operatively controllable fluid inlet/outlet valves to operatively control the piping port of the fluid inlet/outlet valves of the bidirectional fluid pumping device (123) to further control its fluid flow rate;
- 3)** It is through adopting the unidirectional valve (126) capable of operatively controlling the fluid flow valves to operatively control the piping port of the fluid flow valves of the unidirectional valve (126) so as to further operatively control the fluid flow rate;
- 4)** It is through adopting the fluid valve (129) and fluid valve (129') capable of operatively controlling the fluid flow valves of the the fluid valve (129) and fluid valve (129') to operatively control the piping port of the fluid flow valves so as to further operatively control the fluid flow rate;
- 5)** It is through operatively controlling any one device of items 1)~4) to pump the fluid intermittently so as to modulate the average flow rate by the time ratio of pumping on/off.

20. A heat pump or heat exchange device with periodic positive and reverse pumping as claimed in claim 1, wherein the periodic pumping modes in periodic positive and reverse flow directional pumping fluid operation include one or more than one of the following:

- 1)** In the positive and reverse flow directional fluid pumping operation, the positive and reverse flow directional operating time lengths are

the same;

2) In the positive and reverse flow directional fluid pumping operation, the positive and reverse flow directional operating time lengths are different;

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3) The operation is a mixed mode of items 1) and 2).

21. A heat pump or heat exchange device with periodic positive and reverse pumping as claimed in claim 1, wherein to alleviate the impact effect of gaseous or liquid state pumping fluid caused by sudden fluid interruption during flow direction exchange, such as the liquid hammer caused by sudden interruption of liquid state pumping fluid, the flow direction exchange operating mode is further operatively controlled to additionally include one or more than one of the following operating methods:

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1) To operatively control the flow directional exchange, the fluid pump or fluid valve is first operatively controlled to gradually reduce the flow rate of fluid which is then switched to another flow direction to increase the flow rate gradually to the maximum setting value;

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2) To operatively control the flow directional exchange, the fluid pump or fluid valve is first operatively controlled to gradually reduce the flow rate of fluid which is driven to stop pump for the setting time stage and then switched to another flow direction to increase the flow rate gradually to the maximum setting value.

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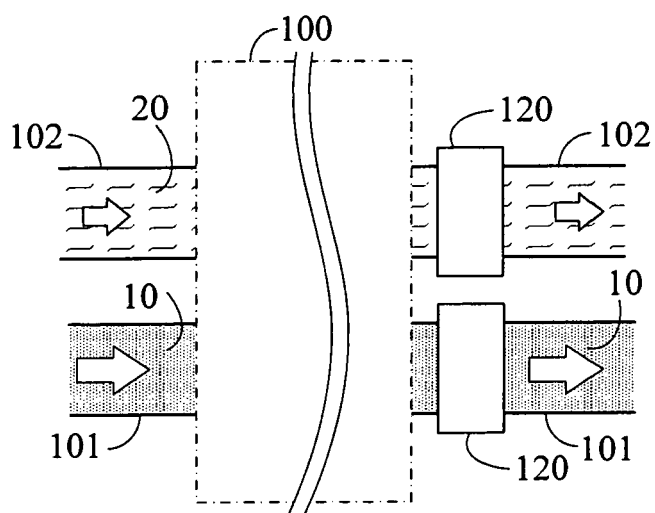


FIG. 1 (Prior Art)

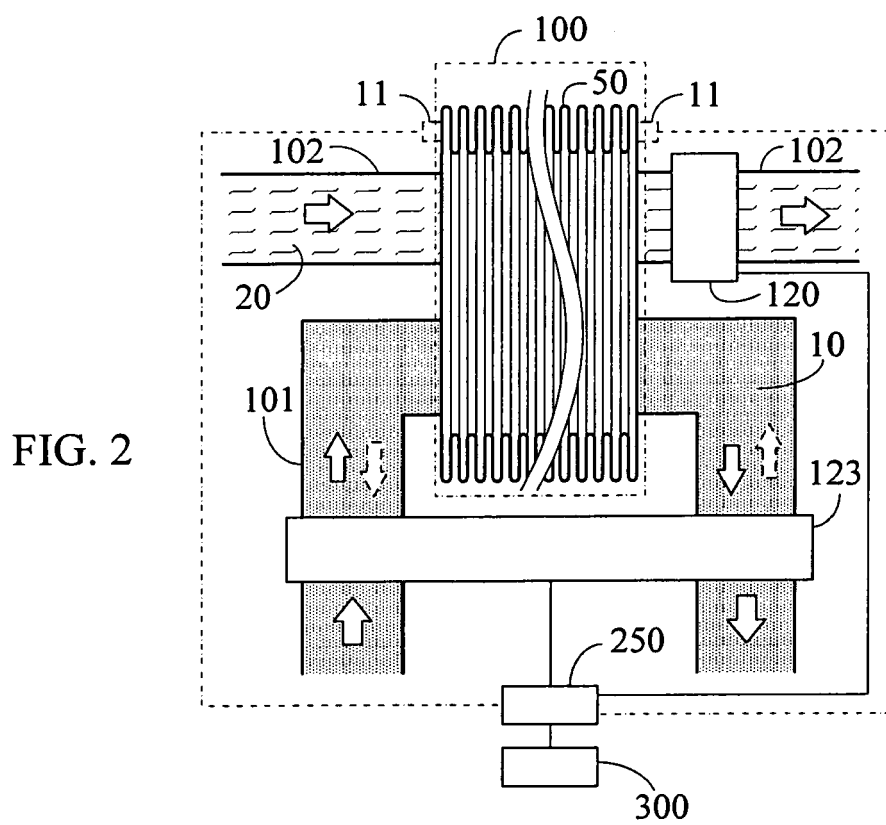


FIG. 2

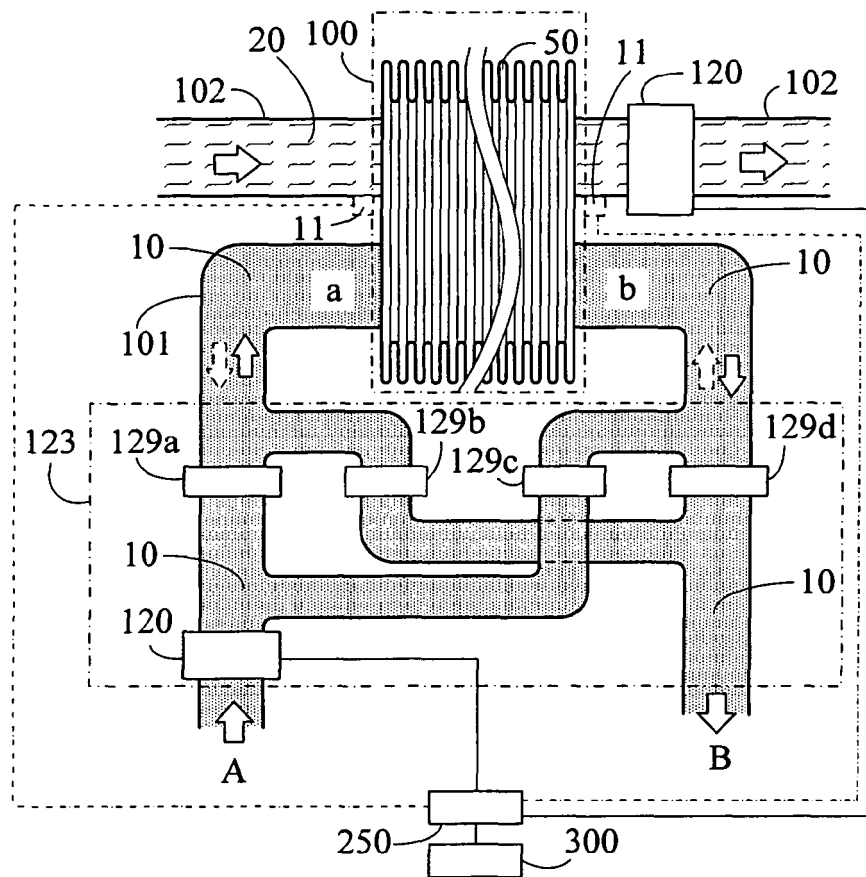
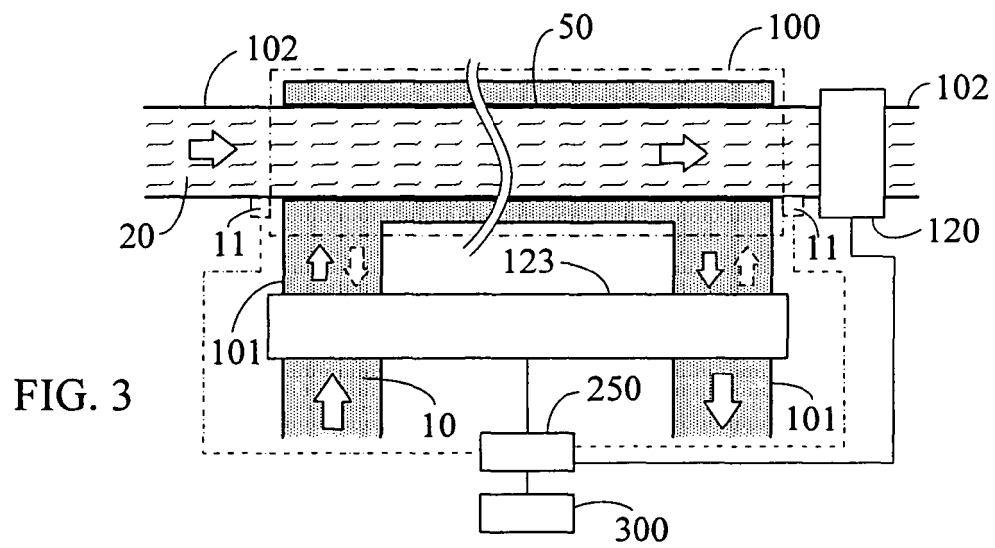


FIG. 4

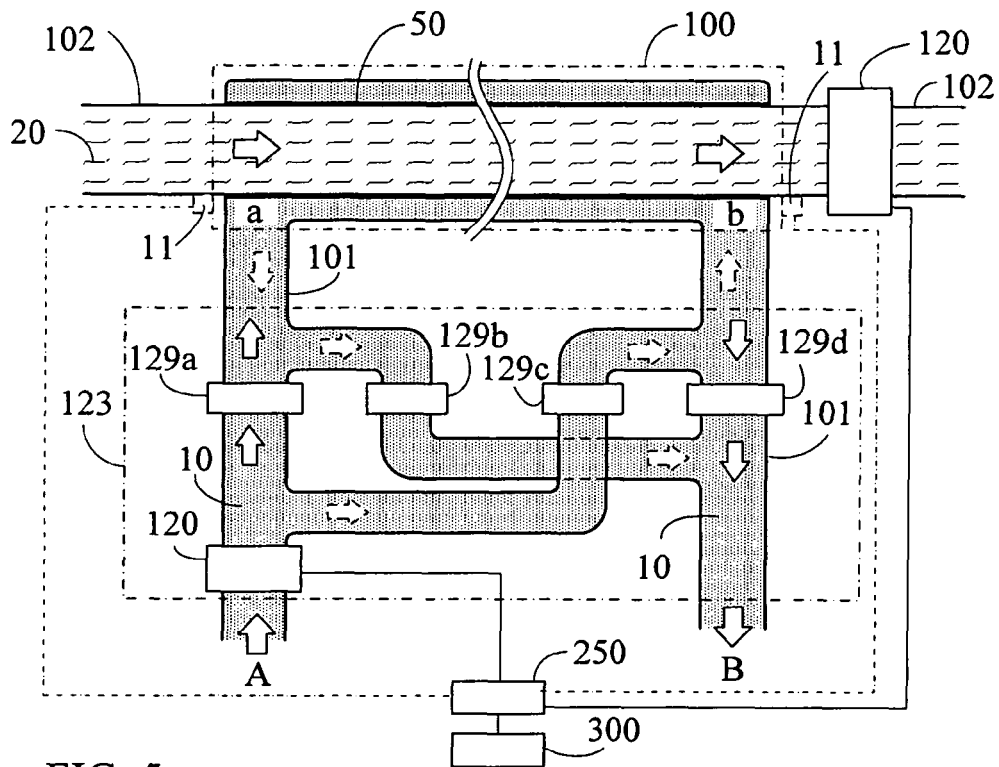


FIG. 5

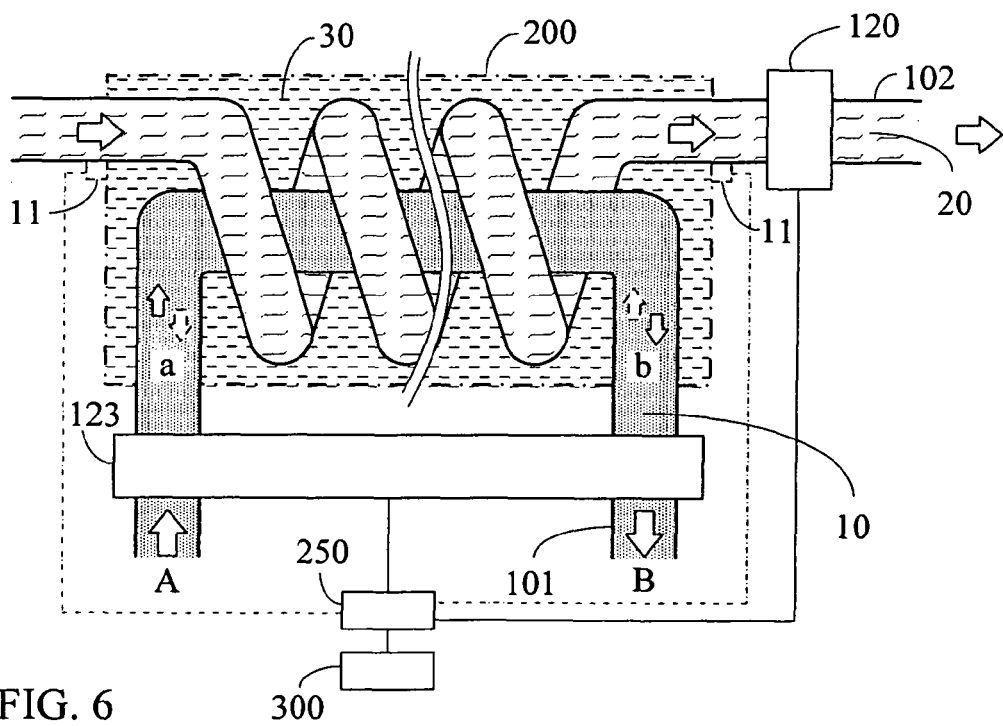


FIG. 6

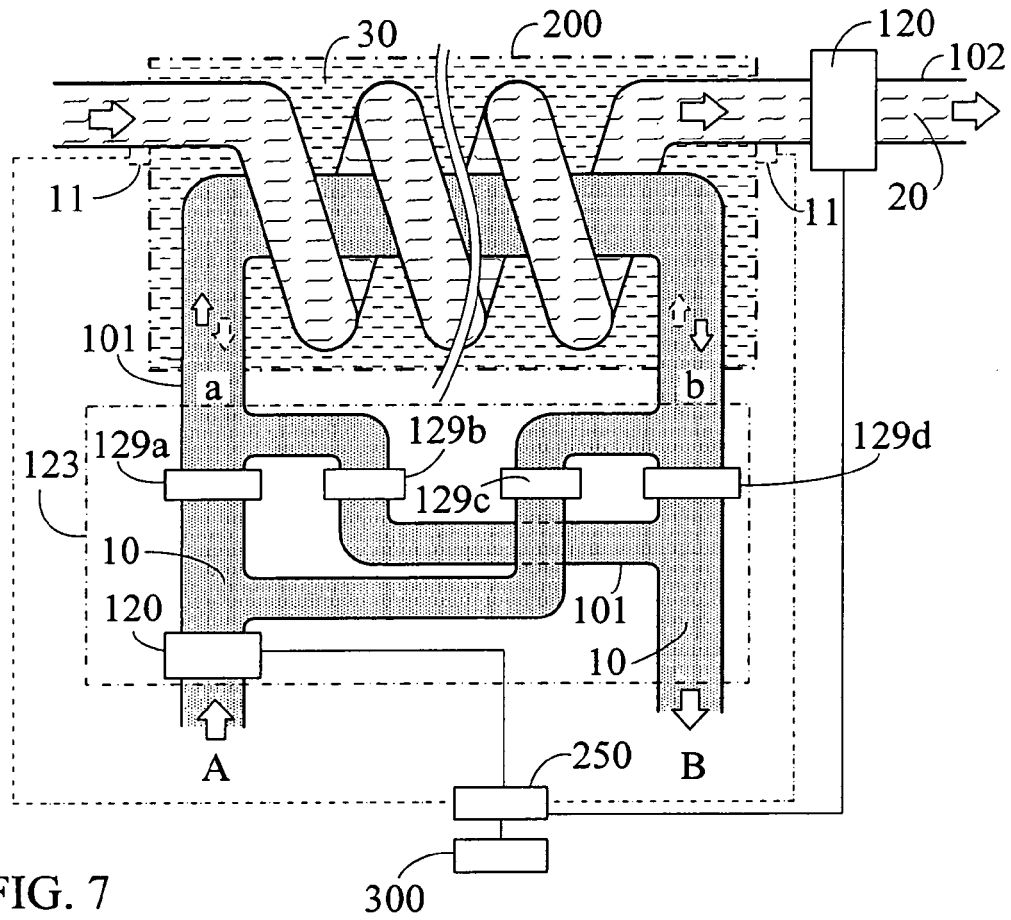


FIG. 7

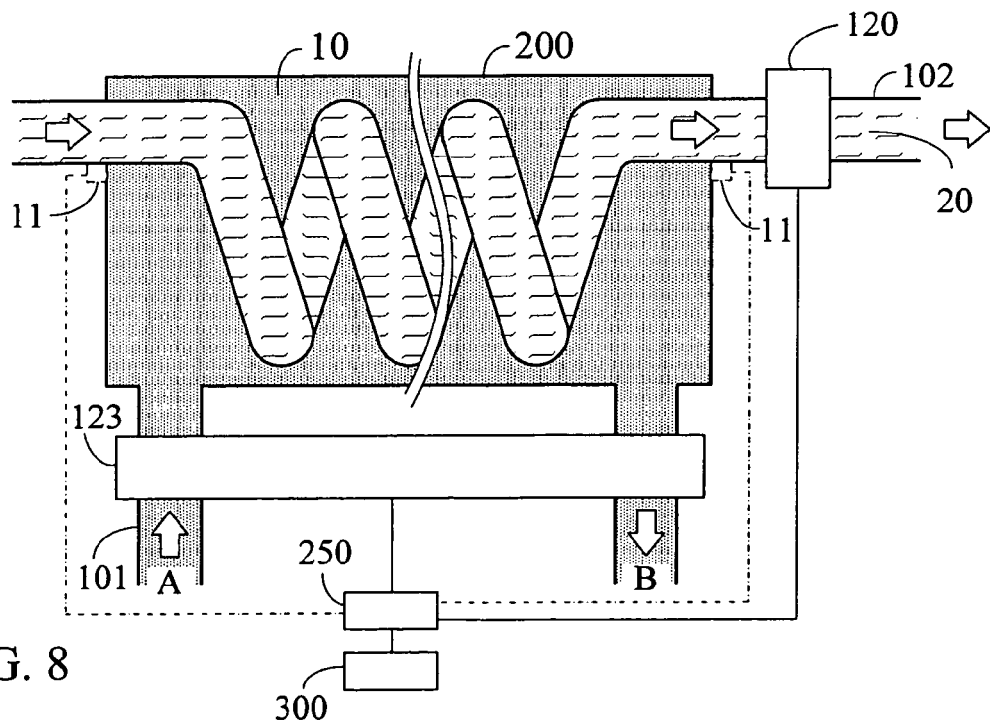
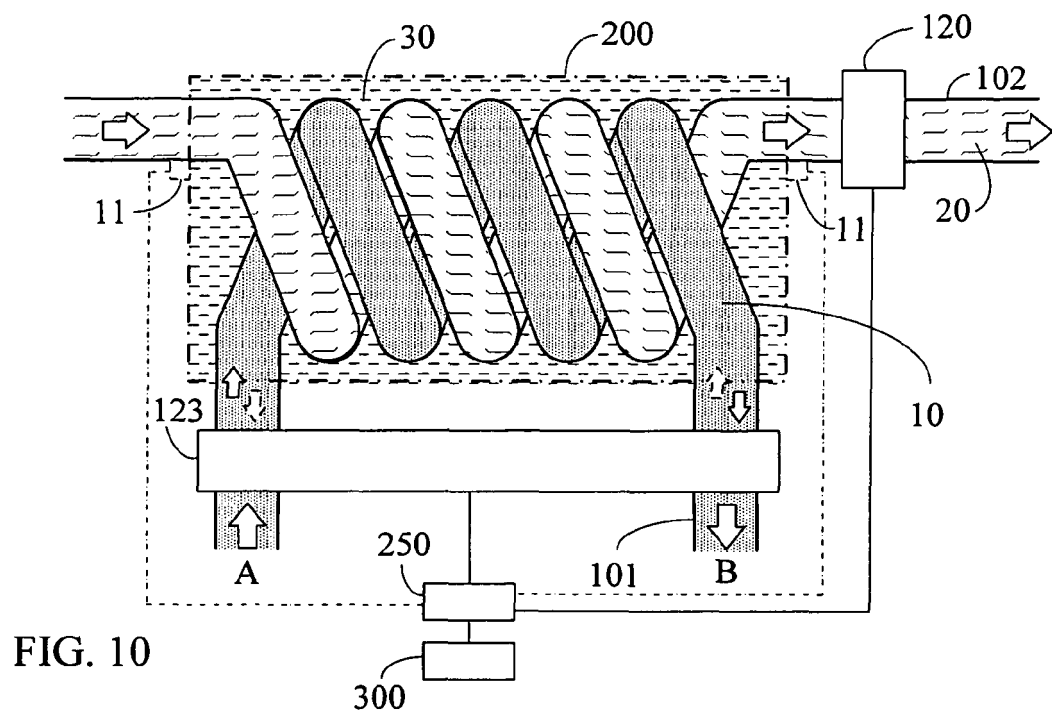
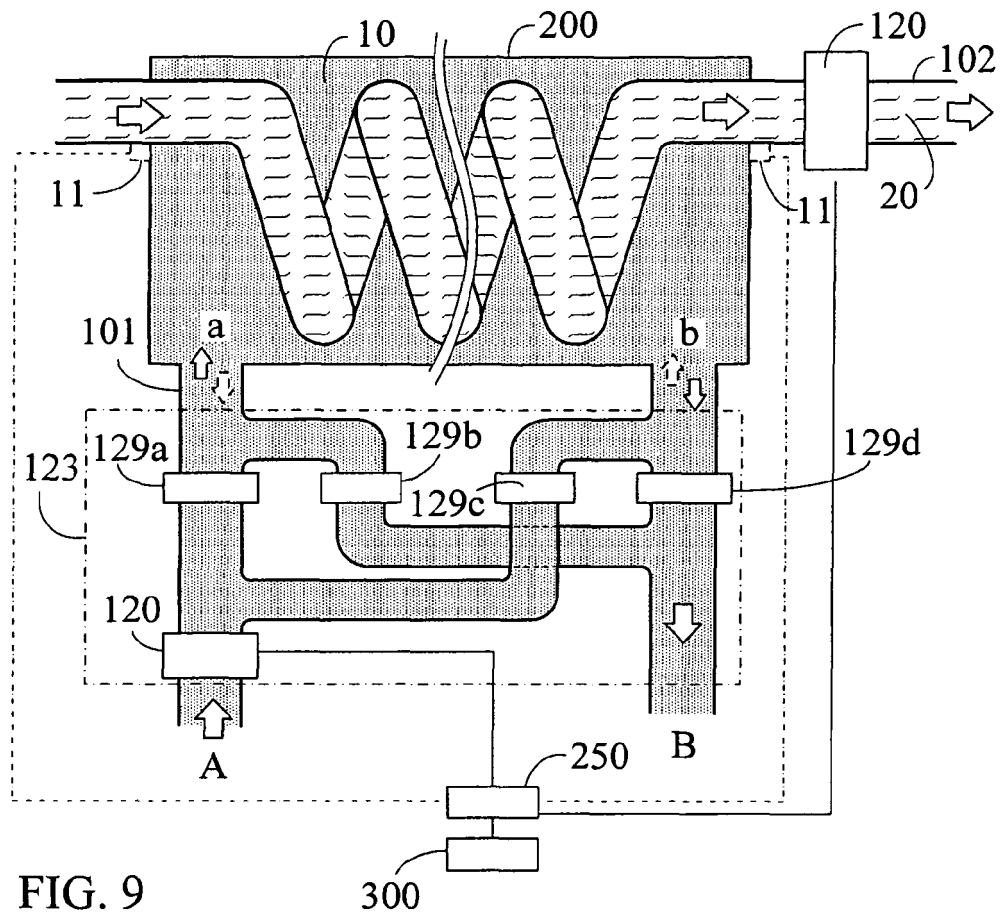


FIG. 8



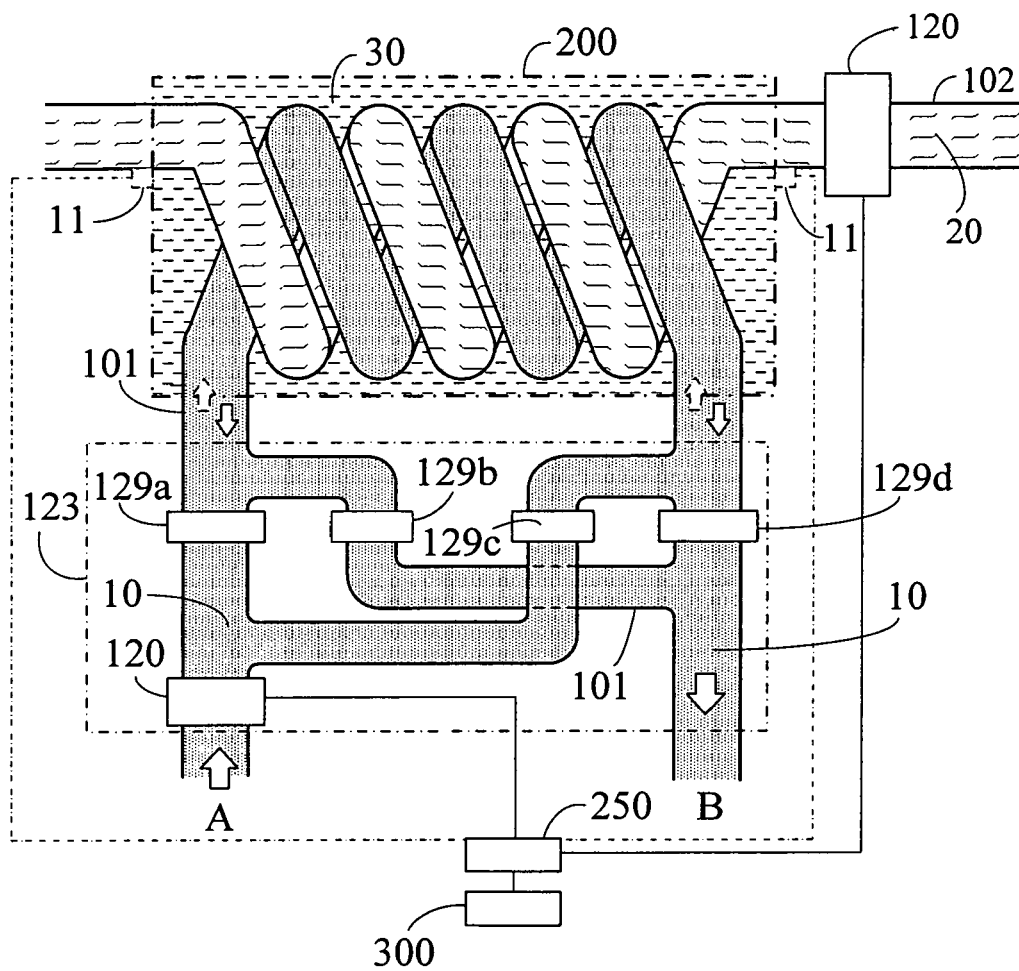
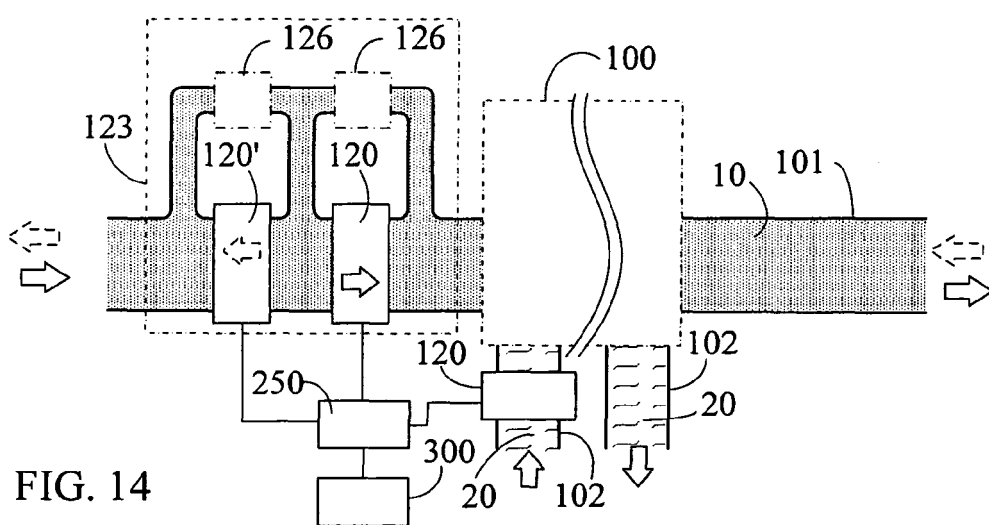
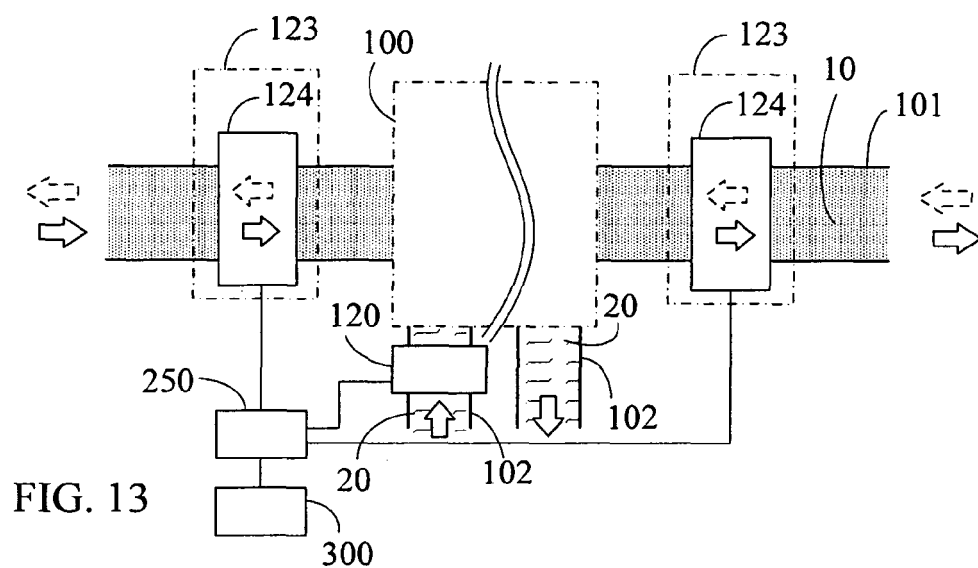
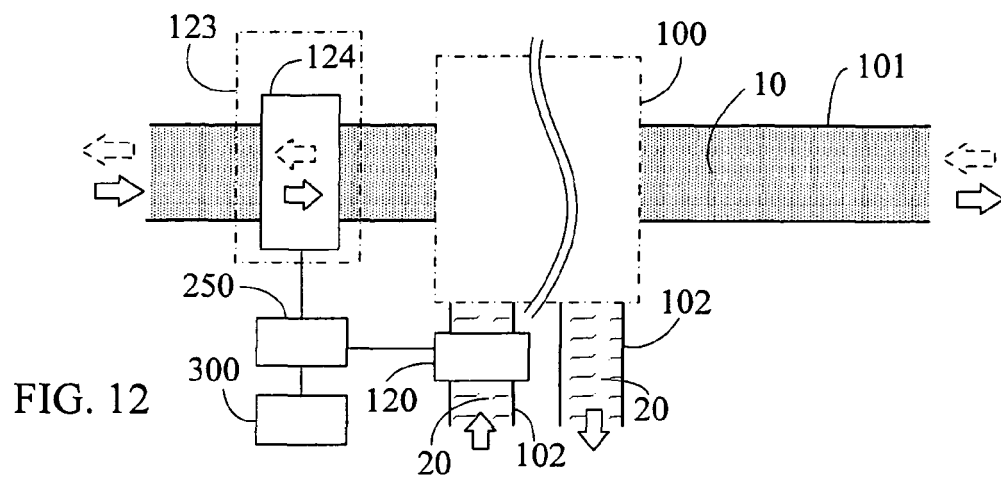
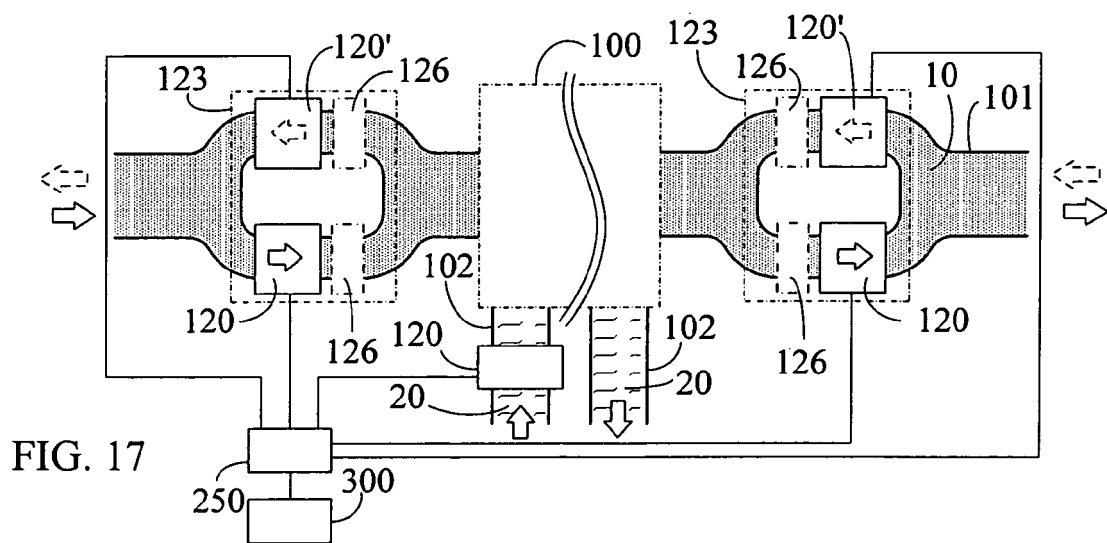
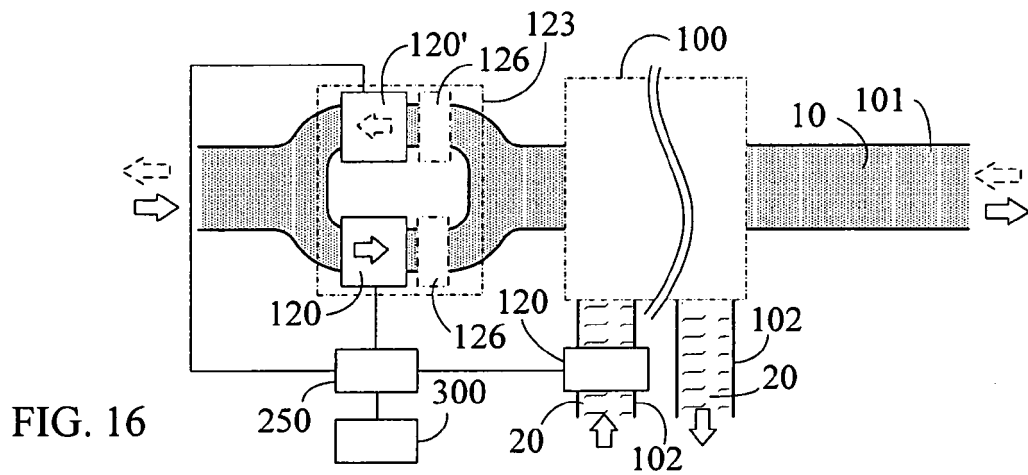
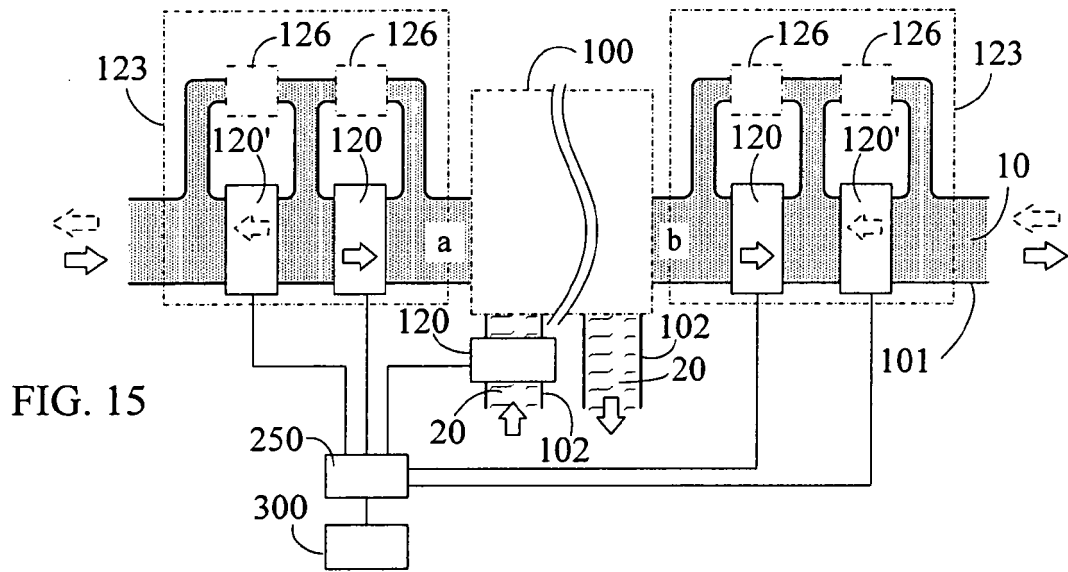
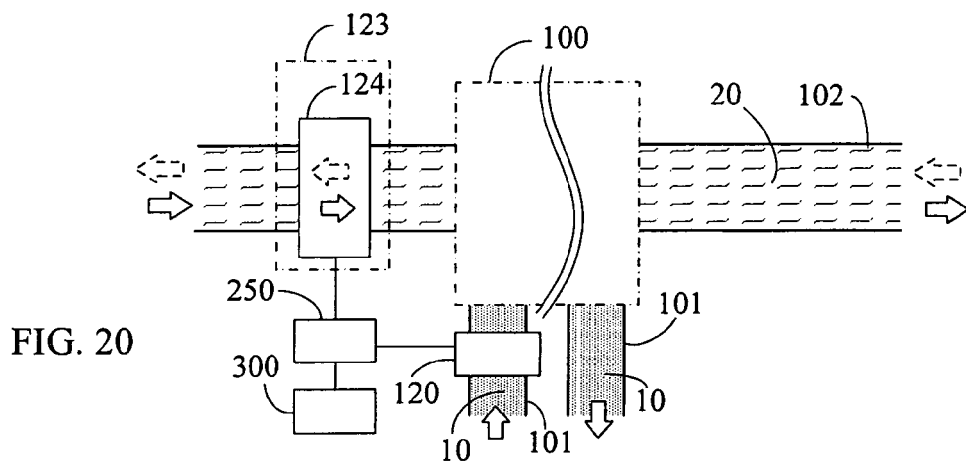
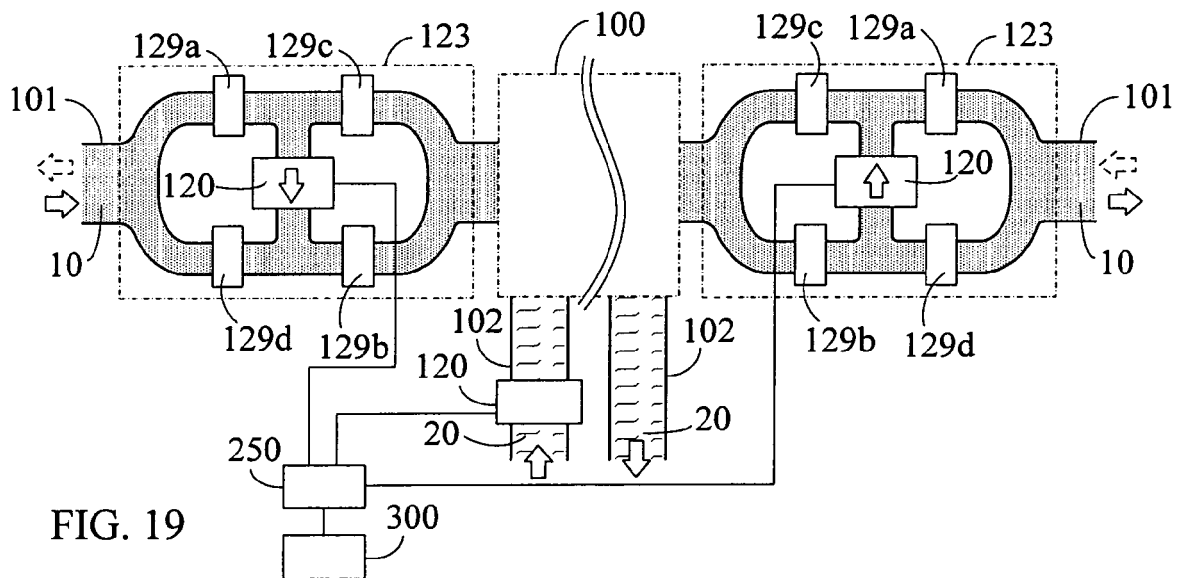
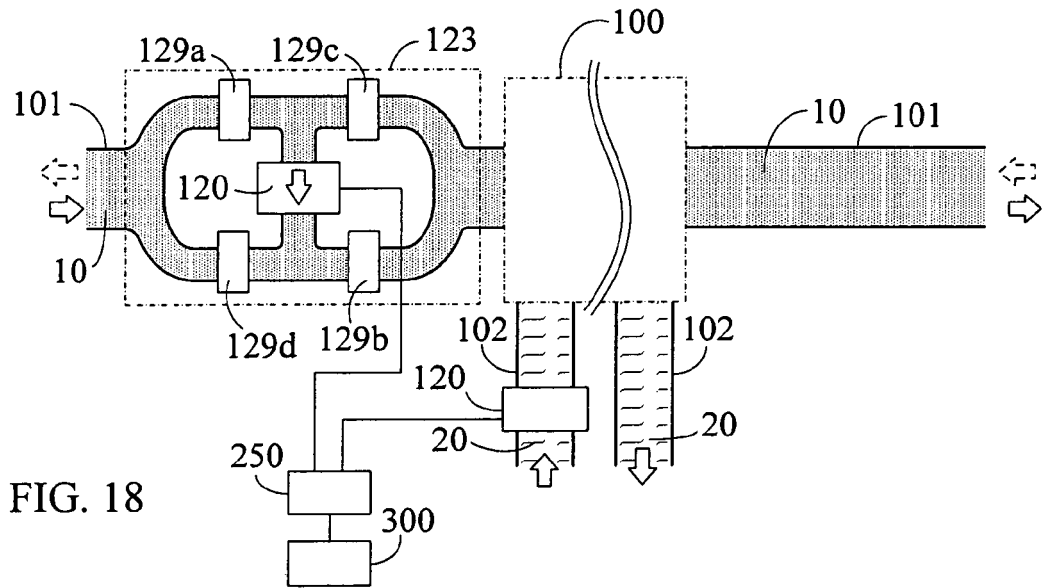


FIG. 11







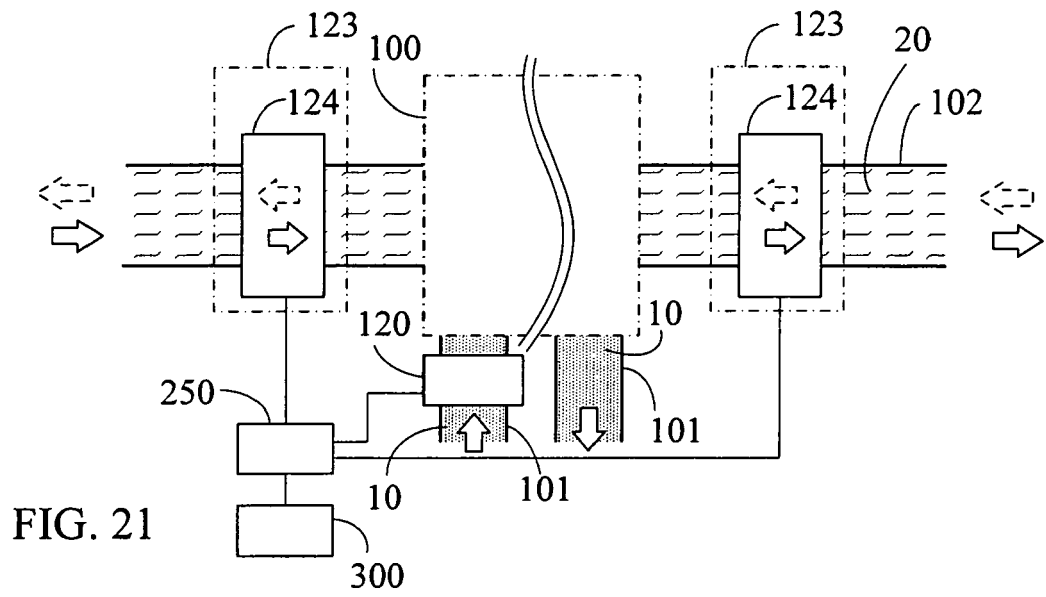


FIG. 21

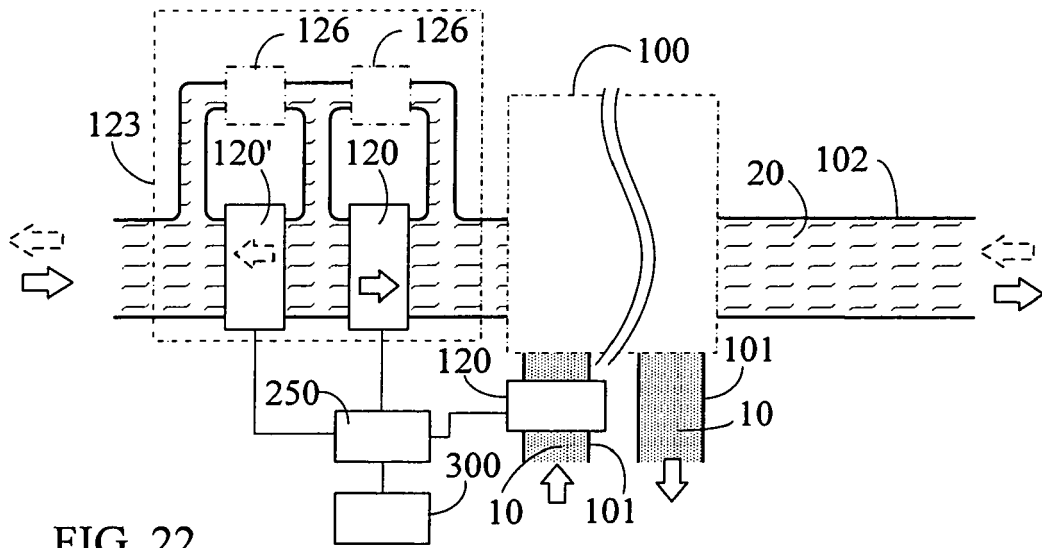
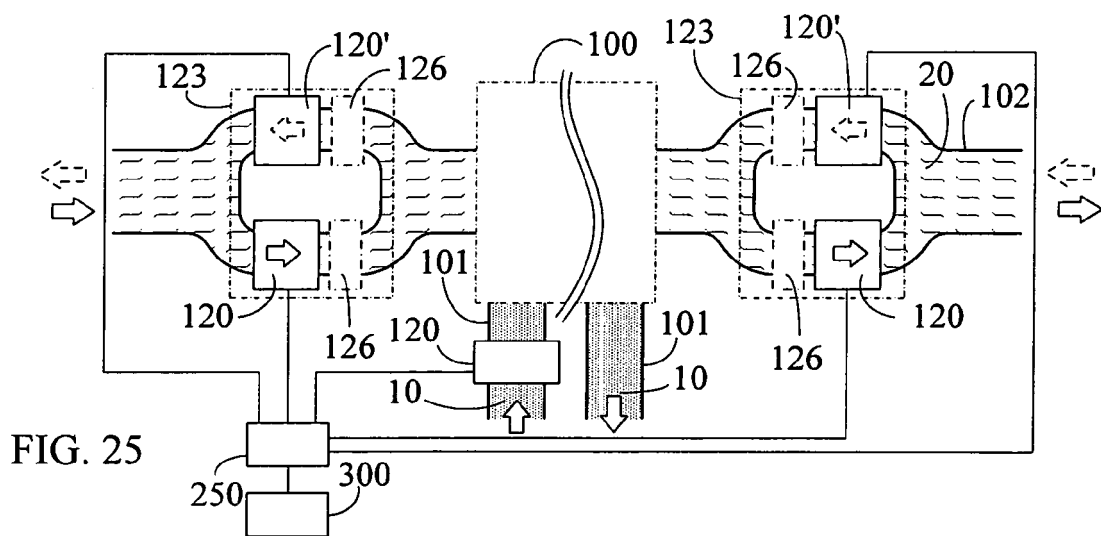
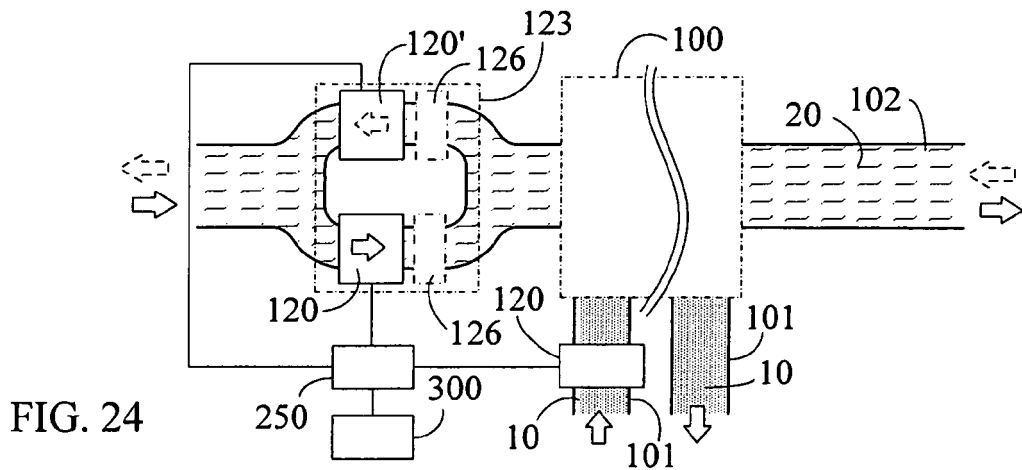
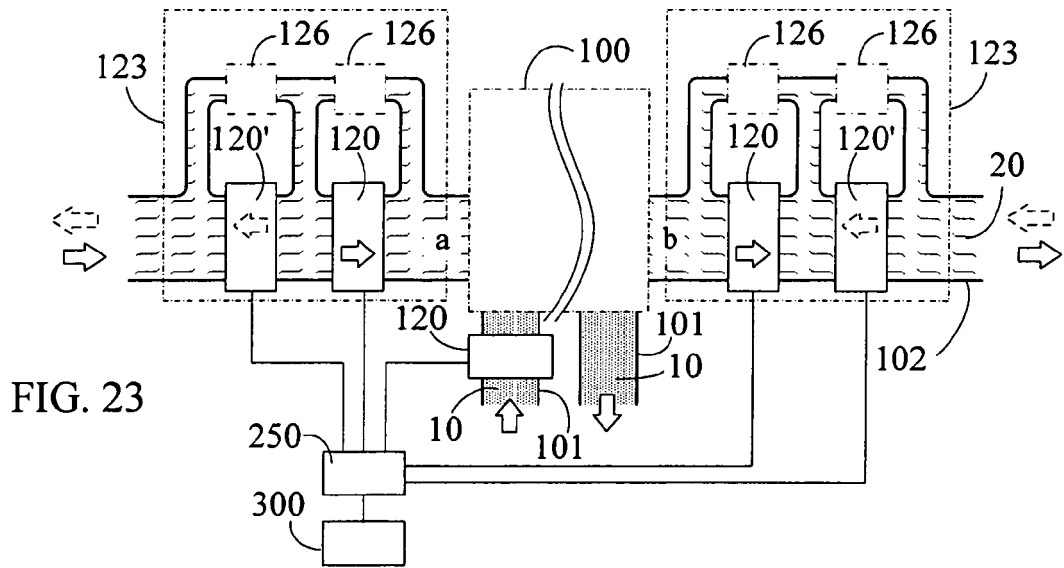


FIG. 22



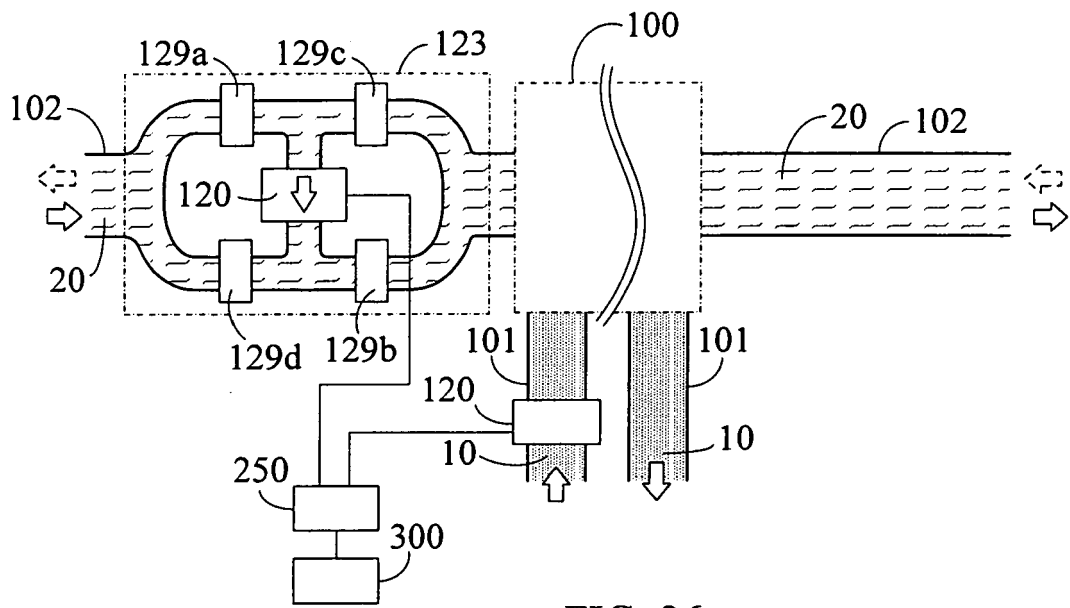


FIG. 26

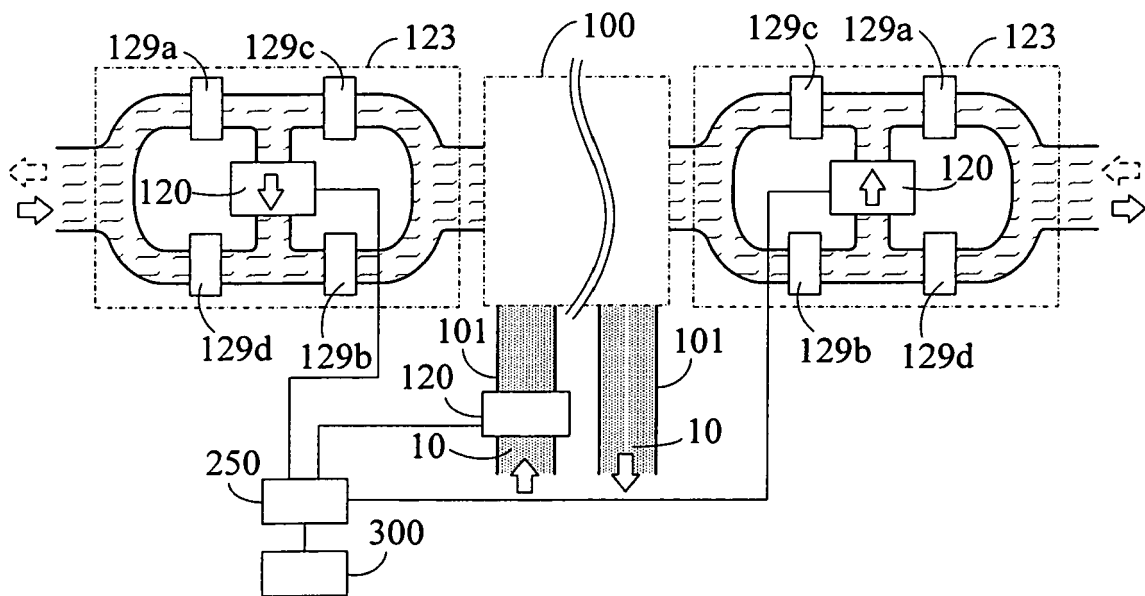


FIG. 27