CLAIMS

1. A rotary type heat exchange apparatus comprising:

a heat exchange rotary disk (100, 200);

a fluid pump (120a, 120b) arranged to pump fluid through the heat exchange rotary disk (100, 200);

a detector disposed within the heat exchange apparatus arranged to detect conditions of the passing fluid through the heat exchange apparatus, the detector comprising a gaseous or liquid state fluid composition detecting device (31), a temperature detector (11) and/or a humidity detector (21); and

a control device (250) arranged to receive a detection signal from the detector and automatically control a speed of rotation of the heat exchange rotary disk (100,200) depending on the conditions sensed by the detector.

2. A rotary type heat exchange apparatus according to claim 1, wherein two fluid pumps (120a, 120b) are respectively installed among fluid port (a), fluid port (b), fluid port (c), and fluid port (d) of the rotary type heat exchange apparatus (1000)to constitute a double flow circuit fluid pumping device (123), wherein the fluid pumps (120a)(120b) are integrally combined or separately installed to constitute the double flow circuit fluid pumping device (123) function, and when the two fluid pumps (120a)(120b) are respectively installed to the fluid port (b) and the fluid port (d) so as to pump the fluid in different pumping flow directions; said two fluid pumps (120a)(120b) capable of producing negative pressure or positive pressure are respectively driven by an electric motor individually or are commonly driven by the same motor, wherein they are operatively controlled by the operative control device (250) to operate in one or more than one functional modes of the following, including: 1) the two fluid pumps (120a)(120b) are pumped in negative pressure for pumping the two fluid streams in different pumping

flow directions; 2) the two fluid pumps (120a)(120b) are pumped in positive pressure for pumping the two fluid streams in different pumping flow directions; in said two functional mode operations of said 1) and 2), the two fluid streams are pumped to pass through different areas of the rotary type heat exchange rotating disk (100, 200), the flow circuits of the two fluid streams are mutually isolated, and the flow directions of the two fluid streams are contrary to each other; and

the heat exchange apparatus further comprising a power source (300) to provide power for the operation of the rotary type heat exchange apparatus with automatic exchange flow rate modulation.

3. A rotary type heat exchange apparatus according to claim 1 or 2, wherein the fluid pump (120a) and fluid pump (120b) can also be installed to the fluid ports (a)(d) or installed to the fluid ports (b)(c), wherein one fluid pump is pumped in positive pressure while the other fluid pump is pumped in negative pressure so as to allow the two fluid streams to pass through the rotary type heat exchange rotating disk (100, 200) in different pumping flow directions.

4. A rotary type heat exchange apparatus according to claim 3, wherein the temperature detecting device (11) is installed at the position capable of directly or indirectly detecting the temperature variation of the pumping exchange fluid, wherein the detected signal is referred as the operative control timing for the operative control device (250); including: 1) operatively controlling the flow rate of the exchange fluid pumped by the double flow circuit fluid pumping device (123); or 2) operatively controlling the rotating speed of the rotary type heat exchange rotating disk (100, 200) driven by a rotating disk rotationally driving device (110); or 3) operatively

controlling said items 1) and 2) simultaneously.

5. A rotary type heat exchange apparatus according to any one of the preceding claims, further comprises installing a heater (130) in the fluid exchange flow circuit of the rotary type heat exchange rotating disk (200) to enhance the dehumidification performance, wherein the heater is actuated by electric energy or other temperature controllable heat generating sources.

6. A rotary type heat exchange apparatus according to any one of the preceding claims, wherein the rotary type heat exchange rotating disk or the rotary type total heat exchange rotating disk include one or more than one characteristic of the following: 1) the tubular structure in linear or other geometric shape; or 2) the multi-layer structure constituted by the gaseous or liquid state liquid fluid circuits; or 3) one or more than one fluid circuit in series connection, parallel connection, or series and parallel connection.

7. A rotary type heat exchange apparatus according to any one of claims 2-6, 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:

a) operatively controlling the pumping rotating speed of the double flow circuit fluid pumping device (123) comprising two fluid pumps (120a)(120b) within the range from cease of transportation to maximum transportation rate to further operatively control the fluid flow rate;

b) adopting the double flow circuit fluid pumping device (123) being installed with operatively controllable fluid inlet/outlet valves to operatively control the opening of the fluid inlet/outlet valves of the

double flow circuit fluid pumping device (123) to further operatively control the fluid flow rate;

c) operatively controlling any one device of items a)~b) to pump the fluid intermittently so as to modulate the average flow rate by the time ratio of pumping on/off.

8. A rotary type heat exchange apparatus according to claim 7, wherein the flow rate ratio between the two fluid streams for passing through the rotary type heat exchange apparatus (1000) during operation include one or more than one ratio mode of the following:

a) The flow rate of fluid in one flow circuit is greater than the one in the other flow circuit;

b) The flow rates of the fluids in both flow circuits are the same;

c) Two fluid pumps in different pumping flow directions are alternatively operated to alternatively pump the two fluid streams in opposite flow directions.

CLAIMS:

1. A heat exchange system with automatic flow rate exchange modulation, comprising:

a heat exchange apparatus (1000) including a heat exchange rotating disk (100, 200) and two mutually isolated internal flow paths through which at least a first heat exchange fluid is respectively pumped in a first direction and at least a second heat exchange fluid is respectively pumped in a second direction, so that the heat exchange apparatus has four fluid ports (a,b,c,d) through which the first and second heat exchange fluids are pumped into and out of the heat exchange apparatus,

wherein said rotating disk (100, 200) is driven by a rotating disk driving device (110),

said rotating disk (100, 200) includes two porous fluid areas through which said first and second heat exchange fluids in the internal flow paths flow respectively in said first and second directions, and

said rotating disk (100, 200) is made of a heat absorbing or dissipating material that absorbs or dissipates heat carried by said first and second heat exchange fluids as they pass through the rotating disk (100, 200), said rotating disk thereby causing heat exchange between said first and second heat exchange fluids;

at least two fluid pumps (120a,120b) for respectively pumping the first and second heat exchange fluids in said first direction through the heat exchange apparatus and in said second direction through the heat exchange apparatus (1000);

a power source (300) for supplying power to the at least two fluid pumps (120a,120b);

an operative control device (250) for controlling said heat exchange between the first and second heat exchange fluids by operatively controlling at least one of a (a) a flow rate of at least one of the first and second heat exchange fluids, and (b) a rotating speed of the rotating disk (100, 200); and

at least one gaseous or liquid state fluid composition detecting device (31) installed at a position to detect a fluid composition variation within the heat exchange apparatus, wherein the gaseous or liquid state fluid composition detecting device (31) provides fluid composition detecting signals to said operative control device (250) for use as a reference to operatively control an inflow status of one of said first and second heat exchange fluids.

2. The heat exchange system according to claim 1, further comprising at least one temperature detecting device (11) installed at a position to detect a temperature variation of a respective one of said first and second heat exchange fluids, wherein the at least one temperature detecting device provides temperature detecting signals to said operative control device (250) to control said at least one of said flow rate and rotating speed by using said temperature detecting signals as a reference.

3. The heat exchange system according to claim 2, further comprising at least one humidity detecting device (21) installed at a position to detect a humidity variation of a respective one of said first and second heat exchange fluids when a state of said respective one of said first and second heat exchange fluids at said position is gaseous, wherein the at least one humidity detecting device provides humidity detecting signals to said operative control device (250) to control said at least one of said flow rate and rotating speed by using said humidity detecting signals as a reference.

4. The heat exchange system according to claim 3, wherein said operative control device (250) controls said at least one of said flow rate and rotating speed by operatively controlling said at least two fluid pumps.

5. The heat exchange system according to claim 3, wherein said at least two fluid pumps are unidirectional pumps and are operated in one of three modes: a mode in which said unidirectional pumps are operated to generate positive pressure, a mode in which said unidirectional pumps are operated to generate negative pressure, and a mode in which at least one of said unidirectional pumps is operated to generate positive pressure and at least one of said unidirectional pumps is operated to generate negative pressure.

6. The heat exchange system according to claim 3, wherein the at least two fluid pumps (111,112 or 120a,120b,120c,120d) are operatively controlled by the operative control device (250) according to at least one of the following operative control modes:

(a) a mode in which adjustment or setting of the flow rate is manually controlled;

(b) a mode in which the flow rate is operatively controlled by referring to a signal detected by said at least one temperature detecting device;

(c) a mode in which the flow rate is operatively controlled by referring to a signal detected by said at least one humidity detecting device;

(d) a mode in which the flow rate is operatively controlled by referring to a signal detected by said at least one gaseous or liquid state fluid composition detecting device; and

(e) a mode which is a combination of at least two of said modes (a) to (d).

7. The heat exchange system according to claim 3, wherein said rotating disk driving device (110) supplies power to said rotating disk (100, 200) under control of said operative control device (250).

8. The heat exchange system according to claim 3, wherein said two porous fluid areas of said rotating disk (100, 200) include respective apertures for passage of said first and second heat exchange fluids.

9. The heat exchange system according to claim 3, wherein said rotating disk (100, 200) has one of a humidity absorbing property for absorbing humidity and a humidity dissipating property for dissipating humidity when a respective one of said first and second heat exchange fluids is in a gaseous state.

10. The heat exchange system according to claim 1, further comprising at least one humidity detecting device (21) installed at a position to detect a humidity variation of a respective one of said first and second heat exchange fluids when a state of said respective one of said first and second heat exchange fluids at said position is gaseous, wherein the at least one humidity detecting device provides humidity detecting signals to said operative control device (250) to control said at least one of said flow rate and rotating speed by using said humidity detecting signals as a reference.

11. The heat exchange system according to claim 1, wherein said operative control device (250) controls said at least one of said flow rate and rotating speed by operatively controlling at least one of said at least two fluid pumps.

12. The heat exchange system according to claim 1, wherein said rotating disk (100, 200) has one of a humidity absorbing property for absorbing humidity and a humidity dissipating property for dissipating humidity when a respective one of said first and second heat exchange fluids is in a gaseous state.

13. The heat exchange system according to claim 1, wherein said rotating disk driving device (110) supplies power to said rotating disk (100, 200) under control of said operative control device (250).

14. The heat exchange system according to claim 1, wherein said two porous fluid areas of said rotating disk (100, 200) include respective apertures for passage of said first and second heat exchange fluids.

15. The heat exchange system according to claim 1, wherein the flow rate of a respective one of said first and second heat exchange fluids in one of said fluid flow paths is controlled to be greater than the flow rate of the other one of said first and second heat exchange fluids in the other of said fluid flow paths in a first mode; and the flow rate of the respective one of said heat exchange fluids is controlled to be the same as the flow rate of the other one of said heat exchange fluids in a second mode.

16. The heat exchange system according to claim 1, wherein said at least two fluid pumps are arranged to operate in at least one of the following modes: a mode in which said first and second fluids are pumped into said heat exchange apparatus, a mode in which said first and second fluids are reversely pumped out of said heat exchange apparatus, and a mode in which said first and second fluids are periodically pumped into and out of said heat exchange apparatus in respectively reversed flow directions.