A refrigeration system with pressure balancing function includes a condensing unit, a first refrigerant delivery pipeline, and a pressure balance control device including a temperature control unit, a first refrigerant control valve and a refrigerant supply switching controller. The temperature control unit determines if the temperature of the evaporator is abnormal, generates a temperature adjustment trigger signal that shifts between adjustment level and non-adjustment level. The refrigerant supply switching controller will determine, based on the level of the temperature adjustment trigger signal, whether to output the valve-open signal to the first refrigerant control valve. When the temperature adjustment trigger signal received by the refrigerant supply switching controller is at the adjustment level, the refrigerant supply switching controller will not output the valve-open signal to the first refrigerant control valve, so that the first refrigerant control valve is closed to stop delivering the refrigerant to the first refrigerant delivery pipeline.
Fig. 1
Fig. 3
REFRIGERATION SYSTEM AND ITS PRESSURE BALANCE CONTROL DEVICE

CROSS-REFERENCE TO RELATED U.S. APPLICATIONS

[0001] Not applicable.

STATEMENT REGARDING FEDERALLY SPONSORED RESEARCH OR DEVELOPMENT

[0002] Not applicable.

NAMES OF PARTIES TO A JOINT RESEARCH AGREEMENT

[0003] Not applicable.

REFERENCE TO AN APPENDIX SUBMITTED ON COMPACT DISC

[0004] Not applicable.

BACKGROUND OF THE INVENTION

[0005] 1. Field of the Invention

[0006] The present invention relates generally to a refrigeration system and its control device, and more particularly to a refrigeration system and its pressure balance control device which uses circulating fluid to maintain a constant temperature of the mechanical equipment.


[0008] In an existing refrigeration system, a compressor is used to compress low-temperature and low-pressure refrigerant and convert it to high-temperature and high-pressure gaseous refrigerant, and a condenser is used to cool the high-temperature and high-pressure gaseous refrigerant and convert it to low-temperature and high-pressure liquid refrigerant, and then, a refrigerant controller is used to depressurize the low-temperature and high-pressure liquid refrigerant and deliver it to the evaporator. Upon receiving the liquid refrigerant, the evaporator vaporizes it to low-temperature and low-pressure gaseous refrigerant. In this way, due to the heat absorption during vaporization of the liquid refrigerant, the environmental (e.g. indoor) temperature is lowered and the cooling effect is achieved. Subsequently, the low-temperature low-pressure gaseous refrigerant is returned to the compressor to repeat the above process. Thus, a closed refrigeration cycle is formed. The cycle goes on repeatedly to accomplish the purpose of cooling. However, the heat absorbed by the evaporator and the heat generated by the running compressor will also be returned to the refrigeration cycle, leading to poor heat dissipation of the condenser, and consequently excessive pressure on the high-pressure side of the compressor, or even over-load of the compressor and tripping of power supply, which will directly terminate the operation of the refrigeration system.

[0009] Thus, to overcome said problems of the prior art, it would be an advancement in the art to provide an improved structure that can significantly improve the efficacy.

[0010] Therefore, the inventors have provided the present invention of practicability after deliberate design and evaluation based on years of experience in the production, development and design of related products.

BRIEF SUMMARY OF THE INVENTION

[0011] The objective of the present invention is to provide a refrigeration system which is capable of system pressure balance control to avoid compressor overload and power supply tripping.

[0012] Another objective of the present invention is to provide a pressure balance control device which can be mounted on the refrigeration system.

[0013] Thus, the present invention of a refrigeration system with automatic pressure balancing function comprises a condensing unit, a first refrigerant delivery pipeline, and a pressure balance control device.

[0014] The condensing unit is to provide a liquid refrigerant.

[0015] The first refrigerant delivery pipeline is to receive the refrigerant from the condensing unit and deliver it to an evaporator, which vaporizes and converts the refrigerant from liquid to gaseous state.

[0016] The pressure balance control device comprises a temperature control unit, a first refrigerant control valve, and a refrigerant supply switching controller.

[0017] The temperature control unit is to judge if the temperature of the evaporator is abnormal and to generate a temperature adjustment trigger signal, and to switch between an adjustment level and a non-adjustment level.

[0018] The first refrigerant control valve is configured on the first refrigerant delivery pipeline. Based on reception of a valve-open signal or not, it determines whether or not to deliver the refrigerant from the condensing unit to the first refrigerant delivery pipeline.

[0019] The refrigerant supply switching controller is electrically connected to the temperature control unit and the first refrigerant control valve, to receive temperature adjustment trigger signals from the temperature control unit, and based on the level of the temperature adjustment trigger signal, it determines whether or not to output the valve-open signal to the first refrigerant control valve.

[0020] Efficacy of the present invention: when the temperature control unit judges an abnormal temperature of the evaporator and temperature adjustment trigger signal received by the refrigerant supply switching controller is at the adjustment level, the refrigerant supply switching controller will not output a valve-open signal to the first refrigerant control valve, and the first refrigerant control valve will be closed to block the refrigerant from the condensing unit, and the refrigerant will not be delivered to the first refrigerant delivery pipeline.

BRIEF DESCRIPTION OF THE SEVERAL VIEWS OF THE DRAWINGS

[0021] Other features and advantages of the present invention will be readily apparent from the description of embodiments when taken in conjunction with the accompanying drawings, wherein:

[0022] FIG. 1 is a block diagram to illustrate a first embodiment in accordance with the present invention of a refrigeration system.

[0023] FIG. 2 is a circuit diagram auxiliary to FIG. 1 to illustrate the refrigerant supply switching controller in the first embodiment.

[0024] FIG. 3 is a block diagram to illustrate a second embodiment in accordance with the present invention of a refrigeration system.
Fig. 4 is a circuit diagram auxiliary to Fig. 3 to illustrate the refrigerant supply switching controller in the second embodiment.

Detailed Description of the Invention

Before reading detailed description of the present invention, it is to be noted that, in the following description, like components are designated by like reference numerals.

FIG. 1 discloses a first embodiment in accordance with the present invention of a refrigeration system with a pressure balancing function, which comprises a condensing unit 1, an evaporator 2, a first refrigerant delivery pipeline 21, and a pressure balance control device 3.

The condensing unit 1 is to provide a liquid refrigerant and comprises a compressor 11, a condenser 12, and a refrigerant controller 13. The compressor 11 compresses the refrigerant and outputs it in high-temperature and high-pressure gaseous state. The condenser 12 is to cool the high-temperature and high-pressure gaseous refrigerant and convert it to low-temperature and high-pressure refrigerant, and then deliver the liquid refrigerant to the refrigerant controller 13. The refrigerant controller 13 is to depressurize the low-temperature and high-pressure liquid refrigerant and convert it to low-temperature and low-pressure liquid refrigerant and output it. The refrigerant controller 13 can be a capillary tube, an automatic expansion valve, an electronic expansion valve, etc.

The first refrigerant delivery pipeline 21 is to receive the refrigerant from the condensing unit 1 and deliver the refrigerant to the evaporator 2, for a conversion from liquid state to gaseous state inside the evaporator 2. The first refrigerant delivery pipeline 21 is connected between the refrigerant controller 13 and the evaporator 2, to receive the depressurized liquid refrigerant from the refrigerant controller 13, and deliver it to the evaporator 2. The low-temperature and low-pressure liquid refrigerant is vaporized inside the evaporator 2, where it absorbs heat and is converted to gaseous state. Then it flows back to the compressor 11 of the condensing unit 1.

The pressure balance control device 3 comprises a first refrigerant control valve 31, a temperature control unit 32, and a refrigerant supply switching controller 33.

The first refrigerant control valve 31 is configured on the first refrigerant delivery pipeline 21 between the refrigerant controller 13 of the condensing unit 1 and the evaporator 2. Based on reception of a valve-open signal or not, it determines whether or not to deliver the refrigerant from the refrigerant controller 13 to the first refrigerant delivery pipeline 21. When the first refrigerant control valve 31 receives the valve-open signal, it will allow the refrigerant to be delivered to the first refrigerant delivery pipeline 21; otherwise, if the valve-open signal is not received, it will stop the refrigerant from the refrigerant controller 13 from entering the first refrigerant delivery pipeline 21.

The temperature control unit 32 is to generate the valve-open signal, and the temperature control unit 32 is also to judge if the temperature of the evaporator 2 is abnormal or not, and to generate a temperature adjustment trigger signal. The temperature adjustment trigger signal shifts between an adjustment level and a non-adjustment level.

More specifically, the temperature control unit 32 comprises a temperature detector 321, a temperature controller 322, an electric heater 323, and a thermal switch 324. The temperature detector 321 is connected to the evaporator 2 to detect the temperature of the evaporator 2. The temperature controller 322 such as a PID controller, based on temperature of the evaporator 2 and a preset temperature of the evaporator expected by a user, generates the valve-open signal and a heat control signal. The electric heater 323, based on the level of the temperature adjustment trigger signal, starts to supply or stops supplying electrical heat energy to the evaporator 2. When the temperature adjustment trigger signal is at the adjustment level, the electric heater 323 supplies electrical heat energy, and when the temperature adjustment triggering level is at the non-adjustment level, the electric heater 323 stops supplying electrical heat energy. The thermal switch 324 such as a solid-state relay (SSR), which is electrically connected to the temperature controller 322 and the electric heater 323, based on control by the heat control signal from the temperature controller 322, and accordingly generates the signal either at the adjustment level or at the non-adjustment level, so that the electric heater 324 can accordingly start to supply or stop supplying electrical heat energy to the evaporator 2.

Referring to FIG. 1 and FIG. 2, the refrigerant supply switching controller 33 is electrically connected to the temperature control unit 32 and the first refrigerant control valve 31, to receive the temperature adjustment trigger signal from the temperature control unit 32. Based on the level of the temperature adjustment trigger signal, it determines whether or not to output the valve-open signal to the first refrigerant control valve 31. In the present embodiment, the refrigerant supply switching controller 33 comprises a first selector switch 34 (said first selector switch 34 can be a relay), and has a first contact 341, a second contact 342, a third contact 343, a control contact 344, a fourth contact 345, a power supply contact 347, and a power supply contact 348. The first contact 341 is electrically connected to the N-phase terminal of the first refrigerant control valve 31 to output the valve-open signal. The second contact 342 is electrically connected to the temperature controller 322 of the temperature control unit 32 to receive the valve-open signal from the temperature controller 322. The third contact 343 is for floating connection. The fourth contact 345 is electrically connected to the L-phase terminal of the first refrigerant control valve 31. The power supply contact 347 is electrically connected to the L-phase power supply. The power supply contact 348 is electrically connected to the N-phase power supply. The control contact 344 is electrically connected to the thermal switch 324 of the temperature control unit 32 to receive the temperature adjustment trigger signal. Based on the level of the temperature adjustment trigger signal, it selectively establishes electrical connection between the second contact 342 and the first contact 341 or the third contact 343, so that the valve-open signal is transferred through the second contact 342 or the first contact 341 or the third contact 343.

The detailed technique to achieve the pressure balancing function of the present invention of a refrigeration
system is: when the temperature controller 322 of the temperature control unit 32 judges that the temperature of the evaporator 2 is abnormal, and the temperature adjustment trigger signal received by the control contact 344 of the first selector switch 34 of the refrigerant supply switching controller 33 is at the adjustment level, the first selector switch 34 establishes an electrical connection between the second contact 342 and the third contact 343. As a result, the valve-open signal received by the second contact 342 is not output to the first refrigerant control valve 31, and the first refrigerant control valve 31 is closed to stop the refrigerant from the condensing unit 1 from entering the first refrigerant delivery pipeline 21.

[0036] More specifically, if, based on the temperature detected by the temperature detector 321, the temperature controller 322 judges that the temperature of the evaporator 2 is lower than the preset temperature expected by the user, it generates a heat control signal to control the thermal switch 324 and set the temperature adjustment trigger signal at the adjustment level. When the electric heater 323 receives the temperature adjustment trigger signal at the adjustment level, it instantly supplies electrical heat energy to the evaporator 2. Meanwhile, the first refrigerant control valve 31 stops the refrigerant from entering the first refrigerant delivery pipeline 21. As a result, during the time when the evaporator 2 receives electrical heat energy to heat up to the preset temperature, the first refrigerant delivery pipeline 21 will not deliver the refrigerant. Therefore, the evaporator 2 will not receive the electrical heat energy and the refrigerant at the same time, and can avoid reception of the refrigerant during the heating process to cause evaporation, and consequently avoid considerable waste heat returning to the refrigeration cycle to cause poor heat dissipation of the condenser 12. Thus, the pressure at the high-pressure end of the compressor 11 will not become too high, and the pressure balance of the system can be controlled so that the compressor 11 will not shut down due to overload. Similarly, if the temperature controller 322 judges that the temperature of the evaporator 2 is higher than the preset temperature, the heat control signal will control the thermal switch 324 to set the temperature adjustment trigger signal at the non-adjustment level, and the first selector switch 34 will establish an electrical connection between the second contact 342 and the first contact 341, so that the valve-open signal of the temperature controller 322 will be output from the first contact 341 to the first refrigerant control valve 31, and the first refrigerant control valve 31 will open to deliver the refrigerant. Meanwhile, the electric heater 323 will stop supplying electrical heat energy to the evaporator 2. Therefore, the evaporator 2 will not receive the refrigerant and the electrical heat energy at the same time to cause evaporation. This can also attain the object of the present invention of a refrigeration system with pressure balancing function.

[0038] The second refrigerant delivery pipeline 22 is to receive the refrigerant of a second flow from the refrigerant controller 13 of the condensing unit 1, and send it to the evaporator 2 for conversion from liquid state to gaseous state, while the first refrigerant delivery pipeline 21 is to receive the refrigerant of a first flow, and the second flow is smaller than the first flow.

[0039] The second refrigerant control valve 36 is configured inside the second refrigerant delivery pipeline 22 between the refrigerant controller 13 and the evaporator 2, which, depending on reception of the valve-open signal or not, determines whether or not to deliver the refrigerant from the refrigerant controller 13 to the second refrigerant delivery pipeline 22.

[0040] The pressure control unit 37 electrically connected to the second selector switch 35 of the refrigerant supply switching controller 33 is to judge if the system pressure of the condensing unit 1 is abnormal or not, and based on the judgment, generates a pressure triggering signal and sends it to the second selector switch 35 of the refrigerant supply switching controller 33. The pressure triggering signal shifts between an over-pressure level and a non-over-pressure level. More specifically, the pressure control unit 37 comprises a pressure detector 371 and a pressure-controlled switch 372. The pressure detector 371 is mounted between the compressor 11 and the condenser 12, such as Contact N shown in FIG. 3, to detect the pressure of the refrigerant, and to produce a detected pressure value. The pressure-controlled switch 372 is electrically connected to the pressure detector 371 and the second selector switch 35 of the refrigerant supply switching controller 33, and based on the pressure value detected by the pressure detector 371, determines the level of the pressure triggering signal. When the detected pressure value received by the pressure-controlled switch 372 reaches an upper limit, the pressure-controlled switch 372 will output the pressure triggering signal at the over-pressure level. When the detected pressure value received by the pressure-controlled switch 372 reaches a lower limit value, the pressure-controlled switch 372 will output the pressure triggering signal at the non-over-pressure level. In particular, the over-pressure level is Logic 1 for example, and the non-over-pressure level is Logic 0 for example. That is to say, the pressure-controlled switch 372 will, on the basis that the detected pressure value reaches the upper limit, 300 PSI for example, or reaches the lower limit value, 200 PSI for example, operate between connection and disconnection, and correspondingly set either the over-pressure level or the non-over-pressure level.

[0041] Referring to both FIG. 3 and FIG. 4, the first selector switch 34 of the refrigerant supply switching controller 33 has, as mentioned in the first embodiment, the first contact 341, the second contact 342, the third contact 343, the control contact 344, and the fourth contact 345. The first contact 341 is electrically connected to the N-phase terminal of the first refrigerant control valve 31 and the N-phase terminal of the second refrigerant control valve 36, the second contact 342 is electrically connected to the temperature controller 322 of the temperature control unit 32 to receive the valve-open signal from the temperature controller 322, and the fourth contact 345 is to output the valve-open signal.

[0042] The second selector switch 35 of the refrigerant supply switching controller 33 has a fifth contact 351, a sixth contact 352, a seventh contact 353, a control contact 354,
and a power supply contact 355. The fifth contact 351 is electrically connected to the fourth contact 345 of the first selector switch 34 to receive the valve-open signal. The sixth contact 352 is electrically connected to the L-phase terminal of the first refrigerant control valve 31. When electrically connected to the fifth contact 351, it outputs the valve-open signal to the first refrigerant control valve 31. The seventh contact 353 is electrically connected to the L-phase terminal of the second refrigerant control valve 36. When electrically connected to the fifth contact 351, it outputs the valve-open signal to the second refrigerant control valve 36. The power supply contact 355 is electrically connected to the L-phase power source. The control contact 354 is electrically connected to the pressure-controlled switch 372 of the pressure control unit 37. Based on the level of the pressure triggering signal, it selectively establishes electrical connection between the fifth contact 351 and either the sixth contact 352 or the seventh contact 353, so that the valve-open signal is delivered through the fifth contact 351 to either the sixth contact 352 or the seventh contact 353.

[0043] In the second embodiment, the pressure balance control device 3 of the refrigeration system is also used to control the system pressure balance. Its detailed technique is as follows: when the pressure control unit 37 judges that the pressure of the condensing unit 1 (for example, contact N shown in FIG. 3) is abnormal, and the pressure triggering signal received by the second selector switch 35 of the refrigerant supply switching controller 33 is at the overpressure level, the second selector switch 35 of the refrigerant supply switching controller 33 will not output the valve-open signal to the first refrigerant control valve 31, but will output the valve-open signal to the second refrigerant control valve 36, so that the second refrigerant control valve 36 will open to deliver the refrigerant of the second flow to the second refrigerant delivery pipeline 22. More specifically, when the temperature adjustment trigger signal output by the thermal switch 324 is at the adjustment level, the second contact 342 of the first selector switch 34 will transfer the valve-open signal to the first contact 341 and the fourth contact 345 will output the valve-open signal. At this time, if the pressure between the compressor 11 and the condenser 12 detected by the pressure detector 371 reaches the upper limit (300 PSI for example), the pressure-controlled switch 372 will set the pressure triggering signal at the overpressure level, and when the control contact 354 of the second selector switch 35 receives the pressure triggering signal at the overpressure level, the second selector switch 35 will establish electrical connection between the fifth contact 351 and the seventh contact 353, so that the second refrigerant control valve 36 can receive the valve-open signal and open to deliver the refrigerant of the second flow to the second refrigerant delivery pipeline 22. Meanwhile, as the first refrigerant control valve 31 is closed because it did not receive the valve-open signal, it will stop delivery of the refrigerant of the first flow. As a result, only the refrigerant with smaller flow is delivered to the evaporator 2, so as to minimize the system pressure increase, and avoid the problem that the evaporator 2 receives a large quantity of refrigerant and electrical heat energy at the same time for evaporation to cause a lot of waste heat and poor heat dissipation of the system, so that the system can maintain a pressure balance and the compressor 11 will not shut down due to overload. Similarly, if the pressure between the compressor 11 and the condenser 12 detected by the pressure detector 371 reaches the lower limit value (200 PSI for example), the pressure-controlled switch 372 will set the pressure triggering signal at the non-overpressure level, and when the control contact 354 of the second selector switch 35 receives the pressure triggering signal at the non-overpressure level, the second selector switch 35 will establish electrical connection between the fifth contact 351 and the sixth contact 352, so that the first refrigerant control valve 31 will receive the valve-open signal and allow delivery of the refrigerant of the first flow to the first refrigerant delivery pipeline 21. Meanwhile, as the second refrigerant control valve 36 is closed because it did not receive the valve-open signal, it will stop delivery of the refrigerant of the second flow, and allow the evaporator with bigger flow to go through the first refrigerant control valve 31 and the first refrigerant delivery pipeline 21 to the evaporator 2, so as to achieve fast cooling and enhance the refrigeration efficiency.

[0044] From the above description, it is apparent that the pressure balance control device 3 of the present invention of a refrigeration system has the following function: when the temperature controller 321 judges that the temperature of the evaporator 2 is too low (or too high), the electric heater 323 supplies (or stops supplying) electrical heat energy to increase (or decrease) the temperature of the evaporator 2 to the preset temperature expected by the user. And correspondingly, the first selector switch 34 of the refrigerant supply switching controller 33 can shift operation to open (or close) the first refrigerant control valve 31 to block (or allow) delivery of the refrigerant, so as to avoid the problem that the evaporator 2 receives refrigerant and electrical heat energy at the same time to cause evaporation. Moreover, it can be mounted with a second refrigerant delivery pipeline 22 and further a corresponding second refrigerant control valve 36 to deliver refrigerant of a smaller flow. Through the shifting operation of the second selector switch 35 of the refrigerant supply switching controller 33, the first refrigerant control valve 31 can be closed when the system is over-pressured, so as to only allow a smaller flow of refrigerant to be delivered. When, according to the detection, the pressure is not excessive, the second refrigerant control valve 36 can be closed to allow a bigger flow of refrigerant to be delivered. In this way, the refrigeration system can be controlled to obtain a pressure balance, so that the compressor 11 will not shut down due to overload. Therefore, the object of the present invention is truly attained.

[0045] Although the invention has been explained in relation to its preferred embodiment, it is to be understood that many other possible modifications and variations can be made without departing from the spirit and scope of the invention as hereinafter claimed.

We claim:

1. A refrigeration system with pressure balancing function, comprising:
   - a condensing unit, to supply a liquid refrigerant;
   - a first refrigerant delivery pipeline, to receive refrigerant from the condensing unit and deliver the refrigerant to an evaporator, for conversion of liquid state to gaseous state inside the evaporator;
   - a pressure balance control device, comprising:
     - a temperature control unit, to judge if the temperature of the evaporator is abnormal or not, and to generate a temperature adjustment trigger signal; said temperature adjustment trigger signal shifts between an adjustment level and a non-adjustment level,
a first refrigerant control valve, configured on the first refrigerant delivery pipeline; depending on reception of a valve-open signal or not, it determines whether or not to deliver the refrigerant from the condensing unit to the first refrigerant delivery pipeline; and

a refrigerant supply switching controller, electrically connected to the temperature control unit and the first refrigerant control valve, to receive temperature adjustment trigger signal from the temperature control unit, based on the level of the temperature adjustment trigger signal, it determines whether or not to output the valve-open signal to the first refrigerant control valve;

when the temperature control unit judges that the evaporator has an abnormal temperature and the temperature adjustment trigger signal received by the refrigerant supply switching controller is at the adjustment level, the refrigerant supply switching controller will not output the valve-open signal to the first refrigerant control valve, so that the first refrigerant control valve is closed to stop the refrigerant from the condensing unit from entering the first refrigerant delivery pipeline.

2. The system defined in claim 1, wherein said temperature control unit of the pressure balance control device comprises:

a temperature detector, to detect the temperature of the evaporator;

a temperature controller, to generate the valve-open signal and a heat control signal depending on the temperature of the evaporator and a preset temperature;

an electric heater, to supply or stop supplying electrical heat energy to the evaporator depending on the level of the temperature adjustment trigger signal; when the temperature adjustment trigger signal is at the adjustment level, the electric heater supplies electrical heat energy, and when the temperature adjustment triggering level is at the non-adjustment level, the electric heater stops supplying electrical heat energy; and

a thermal switch, electrically connected to the temperature controller, the electric heater and the refrigerant supply switching controller, based on control by the heat control signal of the temperature controller, it generates the temperature adjustment trigger signal either at the adjustment level or at the non-adjustment level.

3. The system defined in claim 1, wherein said refrigerant supply switching controller of the pressure balance control device comprises:

a first selector switch, having:

a first contact, electrically connected to the first refrigerant control valve, to output the valve-open signal;

a second contact, to receive the valve-open signal;

a third contact;

a control contact, electrically connected to the temperature control unit to receive the temperature adjustment trigger signal, and depending on the level of the temperature adjustment trigger signal, to selectively establish electrical connection between the second contact and either the first contact or the third contact, so that the valve-open signal can be transferred through the second contact to either the first contact or the third contact.

4. The system defined in claim 1, wherein said first refrigerant delivery pipeline is to deliver the refrigerant of a first flow from the condensing unit, and the refrigeration system also comprises:

a second refrigerant delivery pipeline, to deliver the refrigerant of a second flow from the condensing unit to the evaporator, and the second flow is smaller than the first flow;

the pressure balance control device includes:

a second refrigerant control valve, configured inside the second refrigerant delivery pipeline, which, based on reception of the valve-open signal or not, determines whether or not to deliver the refrigerant from the condensing unit to the second refrigerant delivery pipeline; and

a pressure control unit, electrically connected to the second selector switch of the refrigerant supply switching controller, to judge if the pressure of the condensing unit is abnormal and accordingly generate a pressure triggering signal and send it to the second selector switch of the refrigerant supply switching controller; the pressure triggering signal shifts between an overpressure level and a non-overpressure level;

when the pressure control unit judges that the pressure of the condensing unit is abnormal, and the pressure triggering signal received by the second selector switch of the refrigerant supply switching controller is at the overpressure level, the second selector switch of the refrigerant supply switching controller will not output the valve-open signal to the first refrigerant control valve, so that the second refrigerant control valve will open to deliver the refrigerant of the second flow to the second refrigerant delivery pipeline.

5. The system defined in claim 4, wherein the pressure control unit of the pressure balance control device comprises:

a pressure detector, to detect the pressure of the refrigerant inside the condensing unit, and generate a detected pressure value, and

a pressure-controlled switch, electrically connected to the pressure detector and the refrigerant supply switching controller, to determine the level of the pressure triggering signal based on the detected pressure value of the pressure detector;

when the detected pressure value received by the pressure-controlled switch reaches an upper limit, the pressure-controlled switch will output the pressure triggering signal at the overpressure level;

when the detected pressure value received by the pressure-controlled switch reaches a lower limit value, the pressure-controlled switch will output the pressure triggering signal at the non-overpressure level.

6. The system defined in claim 4, wherein the refrigerant supply switching controller of the pressure balance control device comprises:

a first selector switch, having:

a first contact, electrically connected to the first and the second refrigerant control valves;

a second contact to receive the valve-open signal;

a fourth contact to output the valve-open signal; and

a second selector switch, having:
a fifth contact, electrically connected to the fourth contact of the first selector switch to receive the valve-open signal;
a sixth contact, electrically connected to the first refrigerant control valve, to output the valve-open signal to the first refrigerant control valve when electrically connected to the fifth contact;
a seventh contact, electrically connected to the second refrigerant control valve, to output the valve-open signal to the second refrigerant control valve when electrically connected to the fifth contact;
a control contact, electrically connected to the pressure control unit, to selectively establish electrical connection between the fifth contact and either the sixth contact or the seventh contact based on the level of the pressure triggering signal, so that the valve-open signal is delivered through the fifth contact to either the sixth contact or the seventh contact.

7. A pressure balance control device, suitable for mounting in a refrigeration system; the refrigeration system comprises a condensing unit to supply liquid refrigerant, a first refrigerant delivery pipeline to receive the refrigerant from the condensing unit and deliver the refrigerant to the evaporator that converts the liquid state to the gaseous state; the pressure balance control device comprises:

- a temperature control unit, to judge if the temperature of the evaporator is abnormal or not, and to determine whether or not to generate a temperature adjustment trigger signal; the temperature adjustment trigger signal shifts between an adjustment level and a non-adjustment level;
- a first refrigerant control valve, configured inside the first refrigerant delivery pipeline, to determine, based on reception of a valve-open signal, whether or not to deliver the refrigerant from the condensing unit to the first refrigerant delivery pipeline; and
- a refrigerant supply switching controller, electrically connected to the temperature control unit and the first refrigerant control valve, to receive the temperature adjustment trigger signal from the temperature control unit, and to determine, based on the level of the temperature adjustment trigger signal, whether or not to output the valve-open signal to the first refrigerant control valve;

when the temperature control unit judges that the temperature of the evaporator is abnormal and the temperature adjustment trigger signal received by the refrigerant supply switching controller is at the adjustment level, the refrigerant supply switching controller will not output the valve-open signal to the first refrigerant control valve, so that the first refrigerant control valve is closed to stop delivering the refrigerant from the condensing unit to the first refrigerant delivery pipeline.

8. The device defined in claim 7, wherein the temperature control unit includes:

- a temperature detector, to detect the temperature of the evaporator;
- a temperature controller, to generate the valve-open signal and a heat control signal based on the temperature of the evaporator and a preset temperature;
- an electric heater, to supply or stop supplying electrical heat energy to the evaporator depending on the level of the temperature adjustment trigger signal; when the temperature adjustment trigger signal is at the adjustment level, the electric heater supplies electrical heat energy; and when the temperature adjustment triggering level is at the non-adjustment level, the electric heater stops supplying electrical heat energy, and
- a thermal switch, electrically connected to the temperature controller, the electric heater and the refrigerant supply switching controller; based on control by the heat control signal of the temperature controller, it generates the temperature adjustment trigger signal either at the adjustment level or at the non-adjustment level.

9. The device defined in claim 7, wherein said refrigerant supply switching controller includes:

- a first selector switch, having:
  - a first contact, electrically connected to the first refrigerant control valve, to output the valve-open signal; a second contact to receive the valve-open signal; a third contact;
  - a control contact, electrically connected to the temperature control unit, to receive the temperature adjustment trigger signal, to selectively establish electrical connection between the second contact and either the first contact or the third contact based on the level of the temperature adjustment trigger signal, so that the valve-open signal is delivered through the second contact to either the first contact or the third contact.

10. The device defined in claim 7, wherein said refrigeration system also includes a second refrigerant delivery pipeline to deliver the refrigerant from the condensing unit to the evaporator; the first refrigerant delivery pipeline of the refrigeration system is to deliver the refrigerant of a first flow, while the second refrigerant delivery pipeline is to deliver the refrigerant of a second flow; the second flow is smaller than the first flow; the pressure balance control device also comprises:

- a second refrigerant control valve, configured inside the second refrigerant delivery pipeline, to determine, depending on reception of the valve-open signal or not, whether or not to deliver the refrigerant from the condensing unit to the second refrigerant delivery pipeline; and
- a pressure control unit, electrically connected to the refrigerant supply switching controller, to judge if the pressure of the condensing unit is abnormal or not and to accordingly generate a pressure triggering signal and send it to the refrigerant supply switching controller; the pressure triggering signal shifts between an over-pressure level and a non-over-pressure level;

when the pressure control unit judges that the pressure of the condensing unit is abnormal and the pressure triggering signal received by the refrigerant supply switching controller is at the over-pressure level, the refrigerant supply switching controller will not output the valve-open signal to the first refrigerant control valve, but output the valve-open signal to the second refrigerant control valve, so that the second refrigerant control valve will open to deliver the refrigerant of the second flow to the second refrigerant delivery pipeline.

11. The device defined in claim 10, wherein said pressure control unit includes:

- a pressure detector, to detect the pressure of the refrigerant inside the condensing unit, and to generate a detected pressure value; and
a pressure-controlled switch, electrically connected to the pressure detector and the refrigerant supply switching controller, to determine the level of the pressure triggering signal based on the detected pressure value of the pressure detector;
when the detected pressure value received by the pressure-controlled switch reaches an upper limit, the pressure-controlled switch outputs the pressure triggering signal at the overpressure level;
when the detected pressure value received by the pressure-controlled switch reaches a lower limit value, the pressure-controlled switch outputs the pressure triggering signal at the non-overpressure level.

12. The device defined in claim 10, wherein said refrigerant supply switching controller includes:
a first selector switch, having:
a first contact, electrically connected to the first and the second refrigerant control valve;
a second contact to receive the valve-open signal;
a fourth contact to output the valve-open signal; and

a second selector switch, having:
a fifth contact, electrically connected to the fourth contact of the first selector switch to receive the valve-open signal;
a sixth contact, electrically connected to the first refrigerant control valve, to output the valve-open signal to the first refrigerant control valve when electrically connected to the fifth contact;
a seventh contact, electrically connected to the second refrigerant control valve, to output the valve-open signal to the second refrigerant control valve when electrically connected to the fifth contact;
a control contact, electrically connected to the pressure control unit, to selectively establish electrical connection between the fifth contact and either the sixth contact or the seventh contact based on the level of the pressure triggering signal, so that the valve-open signal is delivered through the fifth contact to either the sixth contact or the seventh contact.

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