(19) Europäisches Patentamt
European Patent Office
Office européen des brevets

(11) **EP 2 894 422 B1**

(12) **EUROPEAN PATENT SPECIFICATION**

(45) Date of publication and mention of the grant of the patent:
26.01.2022 Bulletin 2022/04

(21) Application number: **14197104.4**

(22) Date of filing: **10.12.2014**

(51) International Patent Classification (IPC):
F25D 21/14 *(2006.01)*

(52) Cooperative Patent Classification (CPC):
F25D 21/14; F25B 2339/041

(54) REFRIGERATING SYSTEM AND DISPLAY CABINET HAVING SAME

KÜHLSYSTEM UND SCHAUKASTEN DAMIT

SYSTÈME DE RÉFRIGÉRATION ET ARMOIRE D'AFFICHAGE COMPORTANT CELUI-CI

(84) Designated Contracting States:
AL AT BE BG CH CY CZ DE DK EE ES FI FR GB GR HR HU IE IS IT LI LT LU LV MC MK MT NL NO PL PT RO RS SE SI SK SM TR

(30) Priority: **09.01.2014 CN 201410009421**

(43) Date of publication of application:
15.07.2015 Bulletin 2015/29

(73) Proprietor: **Carrier Corporation**
Farmington, CT 06034 (US)

(72) Inventor: **Zhang, Chao Chang**
Shanghai (CN)

(74) Representative: **Schmitt-Nilson Schraud Waibel Wohlfrom**
Patentanwälte Partnerschaft mbB
Pelkovenstraße 143
80992 München (DE)

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Printed by Jouve, 75001 PARIS (FR)

Description

Technical Field

[0001] The present invention relates to a refrigerating system and a display cabinet having the same. Particularly, the present invention relates to a refrigerating system using an atomizer to remove condensate water and a display cabinet having the same.

Related Art

[0002] In the prior art, condensate water generated by a refrigerating apparatus brings about many problems during work. The condensate water affects the performance of the apparatus, and also contaminates a using environment of the apparatus, thereby greatly reducing the comfort of using the refrigerating apparatus. Using a dedicated water pan or drain device cannot well solve the problem. The water pan needs a user to continuously pour condensate water carried therein, so that it is extremely troublesome in use; and if a dedicated drain device is used, deposition and cost of the drain device become another problem.

[0003] The problem of treating condensate water is especially highlighted in a display cabinet. The display cabinet is generally used to display food or other products that need to be preserved at a constant temperature. Generally, it is difficult to dispose a drain pipe for a device used for long-term operation in a public place, and how to remove condensate water without disturbing a consumer or user in the absence of the drain pipe becomes a challenge. Generally speaking, electrical heating or manual draining is generally used to solve the problem. However, the two manners generate high operation cost or frequent manual activities, and the latter one not only is troublesome but also disturbs the consumer; therefore, the two manners actually cannot well solve the problem of condensate water.

[0004] In JP S59 71937 A, drain dropping from an evaporator is received by a drain pan and subsequently led to a place above the condenser, through which the condenser is watered.

[0005] US 2007/137239A discloses a refrigeration device which includes the evaporation of condensed water in the device. The refrigeration device is equipped with a vaporiser, which vaporiser is connected to a collection device for the condensed water to evaporate the condensed water from the collection device.

SUMMARY

[0006] According to one aspect of the present invention, a refrigerating system is provided, which includes a compressor, a condenser, a throttling element, and an evaporator that are connected in sequence; and further includes a water tank configured to receive condensate water and an atomizer disposed in the water tank. A mist removing opening of the water tank is in communication with an upwind side of the condenser.

[0007] Optionally, an opening of the water tank is disposed under the evaporator.

[0008] Optionally, the refrigerating system further includes a drain pipe, an inlet of the drain pipe being disposed under the evaporator, and an outlet of the drain pipe being in communication with the opening of the water tank.

[0009] Optionally, the refrigerating system further includes a mist removing pipe, a first end of the mist removing pipe being in communication with the mist removing opening of the water tank, and a second end of the mist removing pipe being in communication with the upwind side of the condenser.

[0010] Optionally, a mist removing opening of the water tank is in communication with a lee side of the condenser.

[0011] Optionally, the refrigerating system further includes a mist removing pipe, a first end of the mist removing pipe being in communication with the mist removing opening of the water tank, and a second end of the mist removing pipe being in communication with the lee side of the condenser.

[0012] Optionally, the atomizer is further provided with a water level control apparatus, and the water level control apparatus is configured to stop the atomizer when a water level exceeds a maximum threshold and/or a minimum threshold.

[0013] Optionally, the opening of the water tank is further provided with a waterproof cover.

[0014] Optionally, the atomizer is an ultrasonic atomizer.

[0015] According to another aspect of the present invention, a display cabinet is further provided, which includes the refrigerating system as described above.

[0016] By means of the refrigerating system of the present invention, an atomizer commonly used for humidification is disposed in a water tank for receiving condensate water, so as to mechanically vibrate the condensate water into tiny droplets and accelerate evaporation of the tiny droplets through convection with the air, thereby removing the condensate water. Compared with existing manner of removing the condensate water by manual draining or electrical heating, the present invention is simpler and more convenient, or more energy-saving. The excellent technical effects also exist in a display cabinet applying the refrigerating system of the present invention.

BRIEF DESCRIPTION OF THE DRAWINGS

[0017]

FIG. 1 is a schematic diagram of a system according to an embodiment of the present invention;

FIG. 2 is a schematic diagram of a system according to another embodiment of the present invention;

FIG. 3 is a schematic diagram of an arrangement of a water tank and a condenser according to the present invention; and

FIG. 4 is a schematic diagram of another arrangement of a water tank and a condenser according to the present invention.

DETAILED DESCRIPTION

[0018] Specific implementation manners of the present invention are described in detail with reference to the accompanying drawings.

[0019] FIG. 1 shows a refrigerating system according to an embodiment of the present invention, which includes a compressor 1, a condenser 2, a throttling element 3 and an evaporator 4 that are connection in sequence. The refrigerating system further includes a water tank 5 and an atomizer 6 disposed in the water tank 5. In this embodiment, the water tank 5 is disposed under the evaporator 4, so as to receive condensate water dripped from the evaporator 4. The condensate water, that originally requires electrical heating for evaporation or manual removing, may be treated by using the atomizer 6 disposed herein in the present invention, for example, an ultrasonic atomizer is preferably used. The atomizer 6 may atomize the condensate water into tiny droplets, deliver the droplets in some manners to the condenser 2 in the refrigerating system (see detailed description with reference to FIG. 3 and FIG. 4 hereinafter), and accelerate evaporation of the droplets by using the air of the condenser 2 having faster convection. Compared with conventional manner of manually removing condensate water, removing water with the atomizer of the present invention reduces labor cost, and also avoids inconvenience of frequently assembling and disassembling the water tank in a public place. Compared with the conventional manner of removing condensate water with electrical heating, the conventional electrical heating requires heating the condensate water to convert the condensate water from liquid phase to gas phase, and the condensate water needs to absorb a large amount of latent heat during heating; the atomizer merely explodes the condensate water into tiny droplets by means of mechanical vibration, no phase change is generated, and therefore, it does not require a large amount of latent heat. It is found through experimental comparison that, the power consumed by the present invention is merely 10%-20% of that of an electrical heating apparatus, so that not only excellent condensate water removal effect is achieved, but also energy consumption is significantly reduced.

[0020] An over-high water level in the water tank 5 will affect the atomization effect of the atomizer, and an over-low water level may result in a potential safety hazard; therefore, the atomizer 6 of the present invention is optionally further provided with a water level control apparatus, and the water level control apparatus is configured to stop the atomizer 6 when the water level exceeds a maximum threshold and/or a minimum threshold, so as to avoid potential risks. Specific numerical values of the maximum threshold and/or minimum threshold of the water level depend on parameters such as the size of the water tank 5 and a set position of the atomizer 6, and in principle, the maximum threshold should be a height that the water in the water tank 5 covers the atomizer 6, and optionally in a height range between the height that the water in the water tank 5 just covers the atomizer 6 and the height that the water in the water tank 5 exceeds the atomizer 6 for not more than 5 cm; in this case, the atomization effect of the atomizer 6 will be greatly affected. The minimum threshold should be a height that the water in the water tank 5 exposes the atomizer 6, and in this case, the atomizer will have problems such as idling, thereby causing unnecessary power consumption or even causing safety problems.

[0021] Optionally, in order to prevent the atomizer 6 from vibrating and throwing the condensate water to the inside of the device during atomization, a waterproof cover may be further disposed at an opening of the water tank, so as to improve the safety of the system.

[0022] FIG. 2 shows a refrigerating system according to another embodiment of the present invention, where basic elements of the refrigerating system may be the same as those of the embodiment shown in FIG. 1, and have a difference that, the water tank 5 may not be disposed right under the evaporator 4 in consideration of the structure design of an actual device. In this case, according to the embodiment shown in FIG. 2, a condensate water transmission apparatus is provided, which specifically is a drain pipeline 7, one end of the drain pipeline 7 is disposed under the evaporator 4, and the other end is in communication with the water tank 5, so as to ensure that the condensate water generated by the evaporator can be transmitted to the water tank in a case of limited space, thereby implementing atomization of the condensate water, and further implementing evaporation of the condensate water. Work principles of the system are the same as those in the embodiment shown in FIG. 1, and are not repeated herein.

[0023] FIG. 3 and FIG. 4 show schematic diagrams of specific disposition relationships between a water tank and a condenser.

[0024] In FIG. 3, a mist removing pipe 8 is provided, one end thereof is in communication with a mist removing opening of the water tank 5, and a second end thereof is in communication with an upwind side of the condenser 2, so as to deliver tiny droplets generated by atomization of the atomizer 6 to the upwind side of the condenser 2. Such an arrangement enables the air to contact with mist formed by the tiny droplets before the air flows through the condenser 2, and because evaporation of the mist absorbs heat to remove a part of heat from the air, the air subsequently flowing through the condenser 2 has a relatively low temperature, thereby improving the cooling effect to the condenser, and further improving the energy

efficiency of the system.

[0025] In FIG. 4, one end of the mist removing pipe 8 is in communication with the mist removing opening of the water tank 5, and the second end thereof is in communication with a lee side of the condenser 2, so as to deliver the tiny droplets generated by atomization of the atomizer 6 to the lee side of the condenser 2. Such an arrangement enables the air to contact with mist formed by the tiny droplets after the air flows through the condenser 2, and because the air flowing through the condenser 2 is heated up, the heated air will accelerate evaporation of the droplets during contact with the mist, thereby improving the efficiency of removing the condensate water.

[0026] It should be noted that, the mist removing pipe 8 is not an indispensible structure. When the atomizer 6 is close enough to the condenser 2, the mist formed by the tiny droplets may directly move to the upwind side or lee side of the condenser 2 without the auxiliary transmission of the mist removing pipe 8.

[0027] It should be also noted that, when the atomizer 6 is excessively far away from the condenser 2, not only the mist removing pipe 8 is required, an additional fan is also required, so as to provide power to ensure that the mist formed by the tiny droplets can be delivered to the upwind side or lee side of the condenser 2.

[0028] According to another aspect of the present invention, a display cabinet using the refrigerating system of the present invention is further provided, which optionally has the refrigerating systems shown in FIG. 1 to FIG. 4. The embodiment of the refrigerating system shown in FIG. 2 is more suitable for the structure of the display cabinet, this is because in a regular display cabinet design, an evaporator thereof is generally disposed in a foaming box in a cabinet of the display cabinet, and a water tank thereof is generally disposed outside the foaming box. Therefore, condensate water generated by the evaporator generally needs to flow to the water tank through a drain pipeline or an equivalent structure (for example, a drain).

[0029] The specific implementation manners of the present invention are described in detail according to the accompanying drawings. The invention is not limited to the specific embodiments of the drawings, but the scope of the invention is defined by the appended claims.

Claims

1. A refrigerating system, comprising

a compressor, a condenser, a throttling element and an evaporator that are connected in sequence; and further comprising a water tank configured to receive condensate water, and an atomizer,
characterized in that
the atomizer is disposed in the water tank; and a mist removing opening of the water tank is in communication with an upwind side of the condenser.

2. The refrigerating system according to claim 1, **characterized in that** the water tank is disposed under the evaporator.

3. The refrigerating system according to claim 1 or 2, **characterized by** further comprising a drain pipeline, an inlet of the drain pipeline being disposed under the evaporator, and an outlet of the drain pipeline being in communication with the water tank.

4. The refrigerating system according to claim 1, **characterized by** further comprising a mist removing pipe, a first end of the mist removing pipe being in communication with the mist removing opening of the water tank, and a second end of the mist removing pipe being in communication with the upwind side of the condenser.

5. The refrigerating system according to any of the preceding claims, **characterized in that** a mist removing opening of the water tank is in communication with a lee side of the condenser.

6. The refrigerating system according to claim 5, **characterized by** further comprising a mist removing pipe, a first end of the mist removing pipe being in communication with the mist removing opening of the water tank, and a second end of the mist removing pipe being in communication with the lee side of the condenser.

7. The refrigerating system according to any of the preceding claims, **characterized in that** the atomizer is further provided with a water level control apparatus, and the water level control apparatus is configured to stop the atomizer when a water level exceeds a maximum threshold and/or a minimum threshold.

8. The refrigerating system according to any of the preceding claims, **characterized in that** an opening of the water tank is further provided with a waterproof cover.

9. The refrigerating system according to any of the preceding claims, **characterized in that** the atomizer is an ultrasonic atomizer.

10. A display cabinet, **characterized by** comprising the refrigerating system according to any one of claims 1 to 9.

Patentansprüche

1. Kühlsystem, umfassend

   einen Verdichter, einen Kondensator, ein Drosselelement und einen Verdampfer, die der Reihe nach angeschlossen sind; und ferner einen Wassertank, der so konfiguriert ist, dass er Kondenswasser aufnimmt, und einen Zerstäuber umfassend,
   dadurch gekennzeichnet, dass
   der Zerstäuber in dem Wassertank angeordnet ist; und
   eine Nebelentfernungsöffnung des Wassertanks in Verbindung mit einer Aufwindseite des Kondensators steht.

2. Kühlsystem nach Anspruch 1, **dadurch gekennzeichnet, dass** der Wassertank unter dem Verdampfer angeordnet ist.

3. Kühlsystem nach Anspruch 1 oder 2, **dadurch gekennzeichnet, dass** es ferner eine Ablassleitung umfasst, wobei ein Einlass der Ablassleitung unter dem Verdampfer angeordnet ist und ein Auslass der Ablassleitung in Verbindung mit dem Wassertank steht.

4. Kühlsystem nach Anspruch 1, **dadurch gekennzeichnet, dass** es ferner eine Nebelentfernungsleitung umfasst, wobei ein erstes Ende der Nebelentfernungsleitung in Verbindung mit der Nebelentfernungsöffnung des Wassertanks steht und ein zweites Ende der Nebelentfernungsleitung in Verbindung mit der Aufwindseite des Kondensators steht.

5. Kühlsystem nach einem der vorstehenden Ansprüche, **dadurch gekennzeichnet, dass** eine Nebelentfernungsöffnung des Wassertanks in Verbindung mit einer Leeseite des Kondensators steht.

6. Kühlsystem nach Anspruch 5, **dadurch gekennzeichnet, dass** es ferner eine Nebelentfernungsleitung umfasst, wobei ein erstes Ende der Nebelentfernungsleitung in Verbindung mit der Nebelentfernungsöffnung des Wassertanks steht und ein zweites Ende der Nebelentfernungsleitung in Verbindung mit der Leeseite des Kondensators steht.

7. Kühlsystem nach einem der vorstehenden Ansprüche, **dadurch gekennzeichnet, dass** der Zerstäuber ferner mit einer Wasserstandssteuervorrichtung versehen ist, und dass die Wasserstandssteuervorrichtung so konfiguriert ist, dass sie den Zerstäuber anhält, wenn ein Wasserstand über einen maximalen Schwellenwert und/oder einen minimalen Schwellenwert hinausgeht.

8. Kühlsystem nach einem der vorstehenden Ansprüche, **dadurch gekennzeichnet, dass** eine Öffnung des Wassertanks ferner mit einer wasserdichten Abdeckung versehen ist.

9. Kühlsystem nach einem der vorstehenden Ansprüche, **dadurch gekennzeichnet, dass** der Zerstäuber ein Ultraschallzerstäuber ist.

10. Präsentationsregal, **dadurch gekennzeichnet, dass** es das Kühlsystem nach einem der Ansprüche 1 bis 9 umfasst.

Revendications

1. Système de réfrigération, comprenant

   un compresseur, un condenseur, un élément d'étranglement et un évaporateur qui sont connectés en séquence ; et comprenant en outre un réservoir d'eau conçu pour recevoir de l'eau de condensation, et un atomiseur,
   caractérisé en ce que
   l'atomiseur est disposé dans le réservoir d'eau ; et
   une ouverture de désembuage du réservoir d'eau est en communication avec un côté contre le vent du condenseur.

2. Système de réfrigération selon la revendication 1, **caractérisé en ce que** le réservoir d'eau est disposé sous l'évaporateur.

3. Système de réfrigération selon la revendication 1 ou 2, **caractérisé en ce qu'**il comprend en outre une canalisation d'évacuation, une entrée de la canalisation d'évacuation étant disposée sous l'évaporateur, et une sortie de la canalisation d'évacuation étant en communication avec le réservoir d'eau.

4. Système de réfrigération selon la revendication 1, **caractérisé en ce qu'**il comprend en outre un tuyau de désembuage, une première extrémité du tuyau de désembuage étant en communication avec l'ouverture de désembuage du réservoir d'eau, et une seconde extrémité du tuyau de désembuage étant en communication avec le côté contre le vent du condenseur.

5. Système de réfrigération selon l'une quelconque des revendications précédentes, **caractérisé en ce qu'**une ouverture de désembuage du réservoir d'eau est en communication avec un côté sous le vent du condenseur.

6. Système de réfrigération selon la revendication 5, **caractérisé en ce qu'**il comprend en outre un tuyau

de désembuage, une première extrémité du tuyau de désembuage étant en communication avec l'ouverture de désembuage du réservoir d'eau, et une seconde extrémité du tuyau de désembuage étant en communication avec le côté sous le vent du condenseur.

7. Système de réfrigération selon l'une quelconque des revendications précédentes, **caractérisé en ce que** l'atomiseur est en outre pourvu d'un appareil de commande de niveau d'eau, et l'appareil de commande de niveau d'eau est conçu pour arrêter l'atomiseur lorsqu'un niveau d'eau dépasse un seuil maximal et/ou un seuil minimal.

8. Système de réfrigération selon l'une quelconque des revendications précédentes, **caractérisé en ce qu'**une ouverture du réservoir d'eau est en outre pourvue d'un couvercle étanche.

9. Système de réfrigération selon l'une quelconque des revendications précédentes, **caractérisé en ce que** l'atomiseur est un atomiseur à ultrasons.

10. Armoire vitrée, **caractérisée en ce qu'**elle comprend le système de réfrigération selon l'une quelconque des revendications 1 à 9.

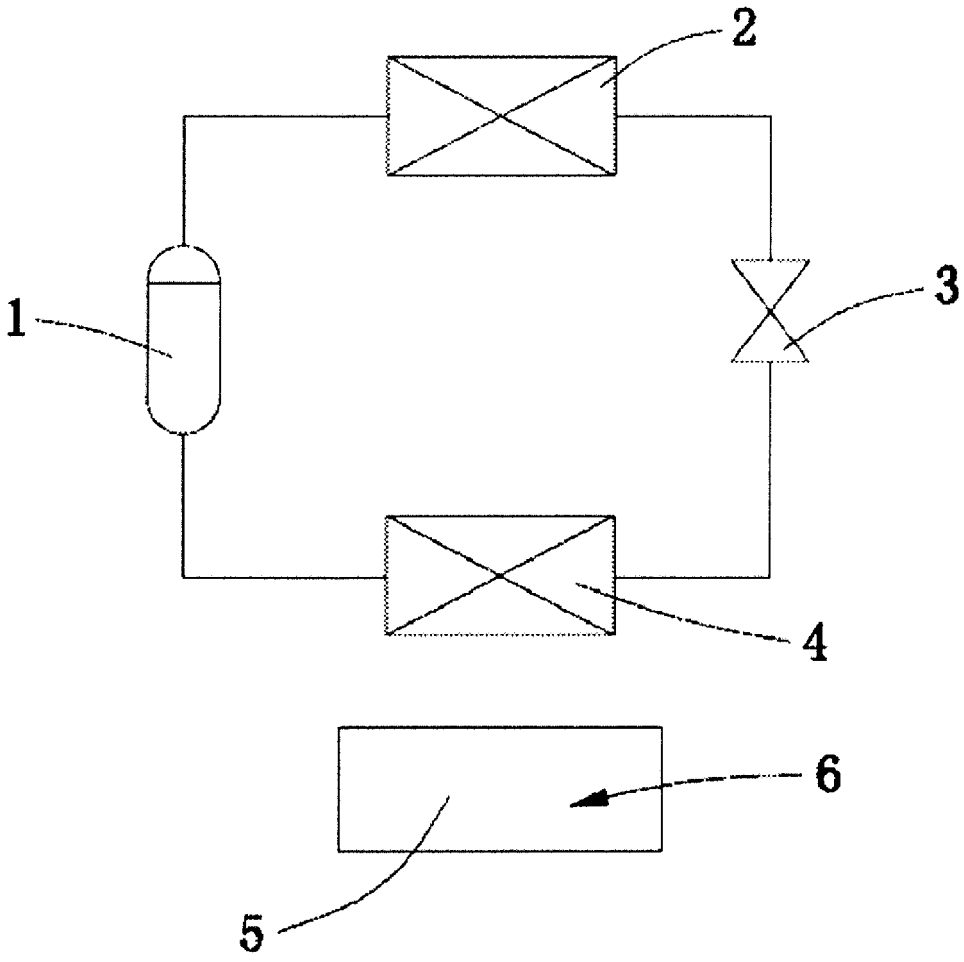


FIG. 1

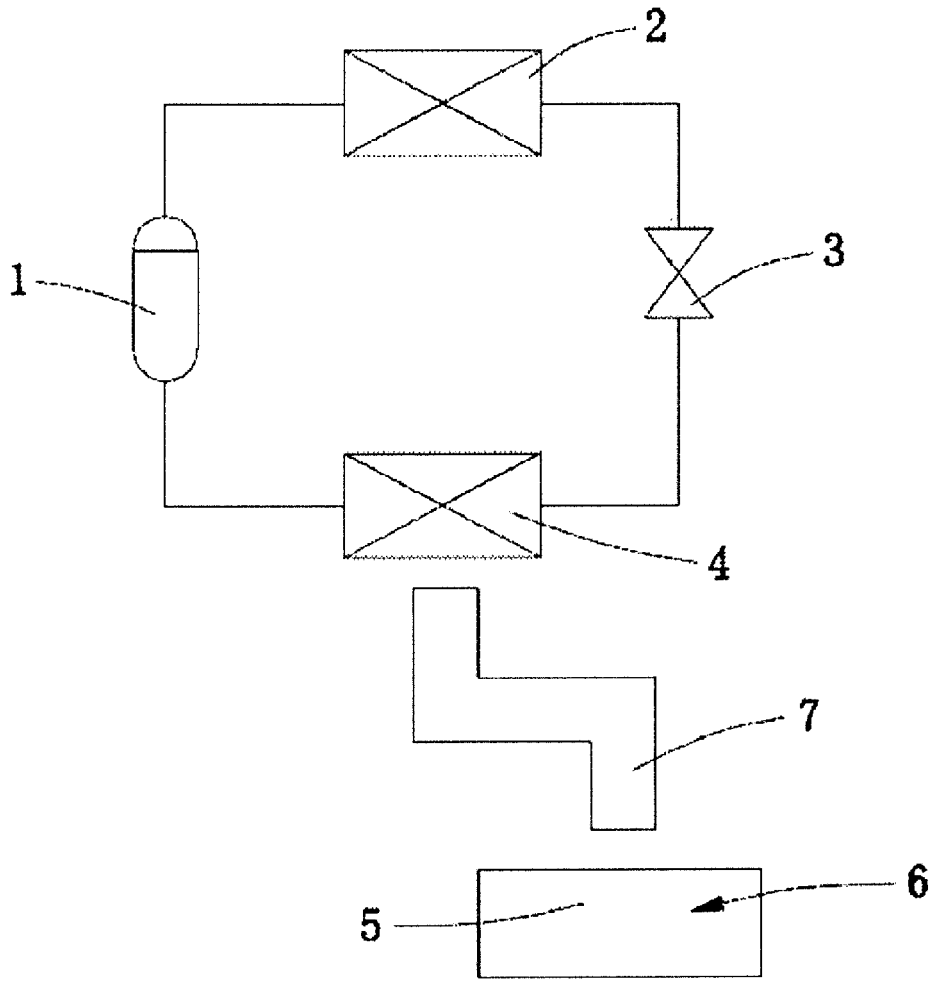


FIG. 2

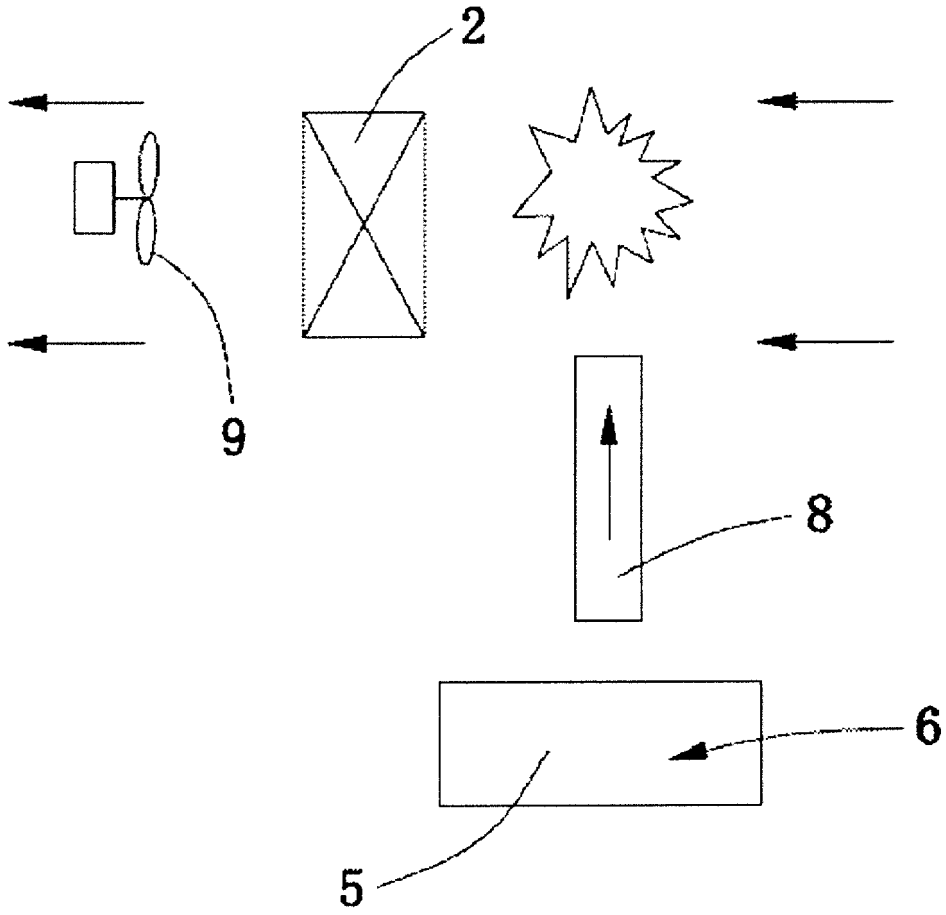


FIG. 3

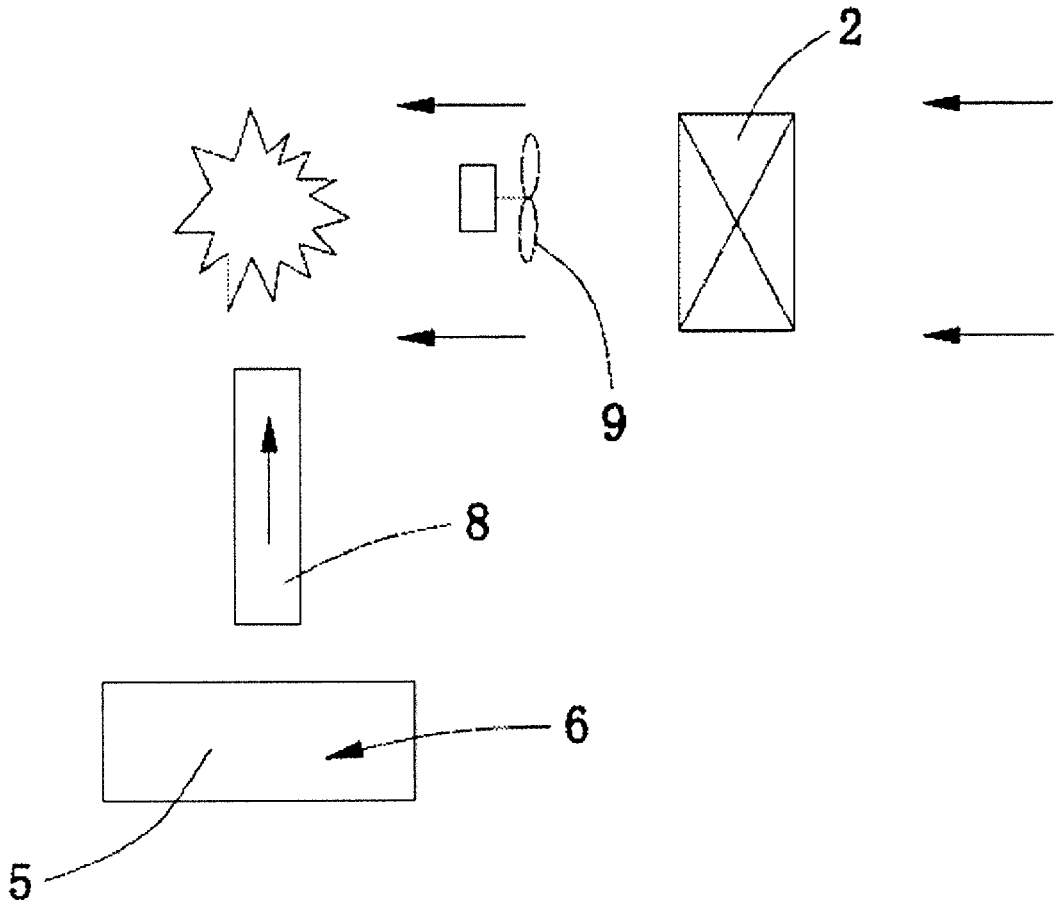


FIG. 4

REFERENCES CITED IN THE DESCRIPTION

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