

A COOLING SYSTEM FOR DATA CENTER SYSTEM AND DATA CENTER SYSTEM

TECHNICAL FIELD

[0001] The present disclosure relates to the field of refrigeration technologies, in particular, to a cooling system for a data center system, and a data center system.

BACKGROUND

[0002] Refrigerating apparatuses are increasingly widely used in life, where the temperature of the indoor air is adjusted by refrigerating apparatuses. However, mechanical refrigeration alone has high energy consumption and low energy efficiency ratio. Fresh air direct evaporative cooling has high energy efficiency, but the temperature and humidity cannot be stably controlled, and the temperature can only be adjusted in a small range. Moreover, it uses natural cooling which cannot reduce the indoor temperature as desired in hot seasons, especially in areas like a machine room of a data center whose indoor temperature to be dissipated is high and in need of cooling all the year round to maintain a certain temperature. As such, the demands cannot be satisfied with merely natural cooling. In addition, since heat exchange only utilizes the temperature difference between indoor and outdoor air, indoor environmental pollution tends to occur when the outdoor air quality is unsatisfactory.

[0003] Airflow distribution modes within a machine room of a data center mainly include the up-return down-supply mode, the up-return up-supply mode, etc. In the up-return down-supply mode, on one hand, the air supply vents mainly include the following forms: raised floor air vents, grille air vents with adjustable multi-bladed valves, etc.; on the other hand, the air returning vents mainly include the following forms: grille air vents, louver air vents, net plate air vents, etc. This air supply mode is the mainstream design in the machine room of the data center. Generally, it adopts an overhead floor and uses a space thereunder as a hydrostatic chamber, sends cold air at a certain pressure into the hydrostatic chamber through the air supply vent, and uniformly discharges the air

through louvers or raised floor vents of the air outlet. As such, the discharged air is inhaled by the server for heat exchange, and the hot air is inhaled by the air conditioner fan from above through the hot channel.

[0004] The above air supply and return modes all use small fans, which supply air at high pressure and high airflow speed through the hydrostatic chamber, and exhaust air with axial fans and high-power mechanical air returning fans to achieve the circulation of airflow. This kind of airflow distribution uses fans to achieve the forced flow of air, which consumes a lot of electric power, and is an energy-inefficient airflow distribution.

[0005] In a data center with high power density, such as one with a single cabinet with a power density of 7KW or above, a traditional solution of airflow distribution scheme is usually to increase air supply volume, that is, to increase air supply pressure and air supply speed. With the increase of air supply speed and air supply pressure, negative pressure occurs at one end of the cabinet near the air supply vent, making it difficult for the fan of the server cabinet to intake cold air. On the other hand, in the other end of the cabinet far from the air supply vent, the air supply pressure is greatly weakened and the airflow volume is insufficient, resulting in insufficient intake of cold air volume.

SUMMARY

[0006] Therefore, the technical problem to be solved by the present disclosure lies in that the existing air supply and return modes of the data center are not energy-saving, and when the air supply speed is too high during the use process, it is easy to cause airflow disorder within the data center, resulting in mixed cold and hot air and low refrigeration efficiency.

[0007] Accordingly, the present disclosure provides a diffusion type air supply cooling system for a data center, the cooling system is disposed inside a machine room of the data center system, and the machine room has, on a side thereof close to the cooling system, a hot air returning layer arranged above a cold pool layer and in communication therewith;

[0008] The cooling system includes an air mixing cavity, an air supply cavity in

communication with an air outlet of the air mixing cavity, and a refrigerating apparatus disposed in the air mixing cavity;

[0009] The air mixing cavity and the hot air returning layer are in communication with each other through an air returning vent and are disposed at the same level; the air supply cavity and the cold pool layer are in communication with each other through an air supply vent and are disposed at the same level; and

[0010] A diffusion type air supply end, disposed on the air supply vent.

[0011] Preferably, for the above cooling system for a data center system, the refrigerating apparatus includes:

[0012] A spraying apparatus disposed within the air mixing cavity and located at an intersection between an air inlet path and an air returning path;

[0013] A water tank disposed below the spraying apparatus and having a water level control system;

[0014] A circulating apparatus disposed between the spraying apparatus and the water tank and adapted to circularly pumping water in the water tank into the spraying apparatus.

[0015] Preferably, for the above cooling system for a data center system, the water level control system includes a water level controller disposed in the water tank;

[0016] A temperature sensor electrically connected with the water level controller and adapted to monitoring outdoor temperature in real time, wherein

[0017] The water level controller controls opening or closing of a water inlet valve in the water tank, or the opening or closing of a water outlet valve in the water tank according to a temperature signal of the temperature sensor.

[0018] Preferably, for the above cooling system for a data center system, the water level controller is a dry reed tube water level controller.

[0019] Preferably, for the above cooling system for a data center system, the refrigerating apparatus further includes:

[0020] A heat exchanger disposed at an intersection between a spraying path from the spraying apparatus towards the water tank and the air returning path; and/or

- [0021] A condenser located between the spraying apparatus and the air exhaust vent.
- [0022] Preferably, for the above cooling system for a data center system, the refrigerating apparatus further includes:
- [0023] A cold coil disposed in the air mixing cavity and being close to the air outlet.
- [0024] Preferably, the above cooling system for a data center system further includes:
- [0025] An air inlet cavity separated from and disposed at the same level with the air supply cavity; the air mixing cavity is disposed above the air inlet cavity and the air supply cavity, and is in communication with the air inlet cavity and the air supply cavity respectively.
- [0026] Preferably, for the above cooling system for a data center system, circulating fans are disposed between the hot air returning layer and the air mixing cavity, between the air mixing cavity and the air supply cavity, and between the air supply cavity and the cold pool layer.
- [0027] The present disclosure provides a data center system, which includes:
- [0028] A machine room and a plurality of machine cabinets;
- [0029] The cooling system for a data center system described above;
- [0030] The machine cabinets are disposed in the cold pool layer side by side.
- [0031] Preferably, the above data center system further includes:
- [0032] A mezzanine ceiling disposed between the hot air returning layer and the cold pool layer, wherein channels are uniformly distributed in the mezzanine ceiling to enable communication between the hot air returning layer and the cold pool layer;
- [0033] The machine cabinets and the mezzanine ceiling are spaced by a required distance;
- [0034] A thermal insulation layer disposed on the top of the hot air returning layer, wherein
- [0035] The height of the top of the hot air returning layer gradually increases from a side of the machine room close to the cooling system toward the middle of the machine room or a side of the machine room facing away from the cooling system.

[0036] Technical solutions of the present disclosure have the following advantages:

[0037] 1. A cooling system for a data center system provided by the present disclosure, which is disposed inside a machine room of the data center system, wherein the machine room has, on one side thereof close to the cooling system, a hot air returning layer arranged above a cold pool layer and in communication therewith, and a plurality of machine cabinets are disposed side by side inside the cold pool layer; the air mixing cavity and the hot air returning layer are in communication with each other through an air returning vent and are disposed at the same level; the air supply cavity and the cold pool layer are in communication with each other through an air supply vent and are disposed at the same level, the lower air supply cavity formed between the cooling system and the machine room flows to the cold pool layer, the cold pool layer flows to the hot air returning layer from bottom to top, and the upper hot air returning layer flows to the air mixing cavity, circulating cooling system in which the air mixing cavity exchanges heat and cools on the indoor return air and then flows from top to bottom to the air supply cavity, makes full use of the air automatic convection mode of cold air naturally sinking and hot air naturally rising to achieve airflow circulation, reducing the mixing of cold and hot air and improving refrigeration efficiency.

[0038] 2. The cooling system for the data center system provided by the present disclosure is disposed with a diffusion type air supply end on the air supply vent, so that the cold air diffuses to the whole cold pool layer in a diffusion manner, thus solving the negative pressure problem caused by excessive wind speed of the machine cabinets at the near end of the air supply vent and the problem of insufficient cooling air volume of the machine cabinets at the far end of the air supply vent.

[0039] 3. The cooling system for the data center system provided by the present disclosure is disposed with a circulating apparatus in the spray heat exchange system for natural cooling, which pumps water prestored in the water tank into the spraying apparatus, and the sprayed water falls into the water tank for recycling using after heat exchange, thus reducing resource waste; setting water level control system in the water tank first, can ensure that the circulating water pump in the circulating apparatus operates normally at a

safe water level, second, the total amount of water entering the water tank can be controlled by the water level control system, and the heat exchange amount of indoor air can be controlled to a certain extent by controlling the total amount of water; in addition, under the environment of low indoor temperature in winter, the water in the water tank and the pipeline connected with the water tank can be discharged through the water level control system, which can effectively avoid the freezing phenomenon and prolong the service life of the refrigeration system.

[0040] 4. The data center system provided by the present disclosure adopts the cooling system for the data center system, and channels are uniformly distributed in the mezzanine ceiling to enable communication between the hot air returning layer and the cold pool layer, so that stack effect is formed during the air circulation process, airflow is enhanced, and refrigeration efficiency is improved. The height of the top of the hot air returning layer gradually increases from a side close to the cooling system toward the middle of the machine room or a side of the machine room facing away from the cooling system, and the hot air returning layer is in a similar bell mouth shape towards the communication with the air mixing cavity, so that the indoor hot air in the hot air returning layer guides flowing into the air mixing cavity along the bell mouth shape with a single flow direction, which reduces the collision between indoor hot air and the wall surface and enhances the circulation rate.

BRIEF DESCRIPTION OF THE DRAWINGS

[0041] To describe the technical solutions in the specific embodiments of the disclosure or in the prior art more clearly, accompanying drawings required to describe the embodiments or the prior art are briefly described below. It is obvious that the accompanying drawings described below are some embodiments of the disclosure. It is apparent to those of ordinary skill in the art that other drawings may be further obtained based on the accompanying drawings without inventive effort.

[0042] Fig. 1 is a schematic structural diagram 1 of a cooling system for a data center system of the present disclosure;

[0043] Fig. 2 is a schematic structural diagram 2 of a cooling system for a data center system of the present disclosure;

[0044] Fig. 3 is a partial schematic diagram of a data center system of the present disclosure (it is shown that the data center system is rotated 90 degrees counterclockwise).

DESCRIPTION OF REFERENCE NUMERALS:

[0045] 1-Air inlet cavity; 10-Cold coil; 11-Fresh air vent; 2-Air mixing cavity; 21-Air returning vent; 22-Air exhaust outlet; 3-Air supply cavity; 31-Air supply vent; 32-First air vent; 320-Fan; 4-Spraying apparatus; 5-Water tank; 61-Circulating water pump; 62-Circulation tube; 7-Water level controller; 8-Heat exchanger; 91-Condenser; 92-Compressor; 93-Connecting pipe; 100-Upper housing; 200-Lower housing; 301-Hot air returning layer; 302-Cold pool layer; 303-Mezzanine ceiling; 304-Machine cabinet; 305-Thermal insulation layer.

DETAILED DESCRIPTION

[0046] The technical solutions of the disclosure will be described below clearly and comprehensively in conjunction with accompanying drawings. Apparently, the embodiments described are some embodiments rather than all embodiments of the disclosure. Based on the embodiments of the disclosure, all other embodiments obtained by those of ordinary skill in the art without creative efforts shall fall within the protection scope of the disclosure.

[0047] In the description of the present disclosure, it should be noted that the orientation or position relationships indicated by the terms "center", "upper", "lower", "left", "right", "vertical", "horizontal", "inner" and "outer" are based on the orientation or position relationships shown in the drawings, which are only for the convenience of describing the present disclosure and simplifying the disclosure, and do not indicate or imply that the referred apparatus or element must have a specific orientation, be constructed and operated in a specific orientation, so it cannot be understood as limiting the disclosure. In addition, the terms "first", "second" and "third" are only used for descriptive purposes

and cannot be understood as indicating or implying relative importance.

[0048] In the description of the present disclosure, it should be noted that, unless otherwise clearly specified and limited, meanings of terms "install", "connected with", and "connected to" should be understood in a broad sense. For example, the connection may be a fixed connection, a removable connection, or an integral connection; may be a mechanical connection or an electrical connection; may be a direct connection or an indirect connection by using an intermediate medium; or may be intercommunication between two components. For those of ordinary skill in the art, the specific meanings of the above terms in the present disclosure can be understood in specific situations.

Embodiment 1

[0049] This embodiment provides a cooling system for a data center system, as shown in Fig. 3, the cooling system for the data center system is disposed inside a machine room of the data center system (not shown in the Fig.), on a side of the machine room close to the cooling system there is a hot air returning layer 301 arranged above a cold pool layer 302 and in communication therewith, wherein, a plurality of machine cabinets 304 are disposed side by side in the cold pool layer 302. As shown in Fig. 1, the cooling system for the data center system includes an upper and lower housings 100 and 200, in this embodiment, the upper and lower housings 100 and 200 respectively adopt a container housing, and the inner cavity of the lower housing 200 is separated by an air inlet cavity 1 and an air supply cavity 3 on the left and right sides, and the air inlet cavity 1 is located on the side wall surface of the lower housing 200 and is opened with a fresh air vent 11, wherein the fresh air vent 11 can adopt a square hole or grid, etc.; an air mixing cavity 2 is formed in the inner cavity of the upper housing 100, and the air mixing cavity 2 and the air supply cavity 3 are in communication with each other through fan 320, wherein the fan 320 is disposed in rows along the length direction of the housing, for example, five or six fans 320 are disposed. The air mixing cavity 2 and the air inlet cavity 1 are in communication with each other, and the top of the air mixing cavity 2 has air exhaust outlets 22, wherein the air exhaust outlets 22 are disposed in rows along the length direction of the housing, as

shown in Fig. 2, in this embodiment, there are five air exhaust outlets 22 disposed, and a fan 320 is disposed on each air exhaust outlet 22, in this embodiment, the fan 320 is a high-efficiency EC centrifugal fan, which can adjust the air volume according to the load change. As shown in Fig. 2, the air mixing cavity 2 is located on the side wall surface of the upper housing 100 near the air supply vent 31 and is disposed with an air returning vent 21, and the hot air returning layer 301 and the air mixing cavity 2 are disposed at the same level, and the hot air returning layer 301 and the air mixing cavity 2 are in communication with each other through the air returning vent 21, and the refrigerating apparatus is disposed in the air inlet cavity 1 and the air mixing cavity 2 between the fresh air vent 11 and the air exhaust outlet 22.

[0050] As shown in Fig. 1, the upper and lower housings 100 and 200 form an air inlet path that enters the air inlet cavity 1 from the fresh air inlet 11 and cools down by the air mixing cavity 2 and then reaches the first air vent 32, and the hot air in the hot air returning layer 301 enters the air mixing cavity 2 from the air returning vent 21 and cools down and then reaches the air returning path at the first air vent 32, and is discharged from the air mixing cavity 2 to the air exhaust path outside the upper housing 100 through the air exhaust outlet 22, and the cooled air is transferred from the air mixing cavity 2 to the air supply cavity 3 through the fan 320 at the first air vent 32 and supplied air to the air supply path of the indoor cold pool layer 302 from the air supply vent 31, thus forming an indoor air cooling circulation system composed of the cold pool layer 302, the hot air returning layer 301, the air mixing cavity 2 and the air supply cavity 3. A diffusion type air supply end (not shown in the Fig.) is disposed on the air supply vent 31, which is a conventional diffused port. Through the diffusion type air supply end, the cooled air is infused into the cold pool layer 302 of the machine room to a certain extent, forming a cold air-filled environment, increasing the partial pressure of cold air in the cold pool layer 302 of the machine room and improving the refrigeration environment.

[0051] As shown in Fig. 1, the refrigerating apparatus includes a spraying apparatus 4, a water tank 5, a circulating apparatus, a heat exchanger 8, a condenser 91 and a cold coil 10. Wherein, the water tank 5 is disposed at the bottom of the air inlet cavity 1, and a water

inlet valve (not shown in the Fig.) and a water outlet valve (not shown in the Fig.) are disposed on the water tank 5; the spraying apparatus 4 is disposed within the air mixing cavity 2 and located directly above the water tank 5 and located at an intersection between an air inlet path and an air returning path; and a sprayer on the spraying apparatus 4 is disposed towards the water tank 5, forming a vertical spraying path from the sprayer toward the water tank 5, which is convenient for the sprayed water to fall into the water tank 5 for recycling using. A circulating apparatus is disposed between the water tank 5 and the spraying apparatus 4, the circulating apparatus includes a circulating water pump 61 and a circulating pipe 62. The circulating water pump 61 is disposed below the water surface within the water tank 5, and one end of the circulating pipe 62 is connected to the circulating water pump 61 and the other end thereof is connected to the spraying apparatus 4. The circulating water pump 61 pumps water in the water tank 5 into the spraying apparatus 4 through the circulating pipe 62, and sprays it out of the sprayer. The sprayed water falls vertically into the water tank 5 through air heat exchange in the air mixing cavity 2, and the spraying takes place circularly.

[0052] A water level control system is also disposed within the water tank 5, the water level control system includes a water level controller 7 and a temperature sensor (not shown in the Fig.), wherein the water level controller 7 is disposed in the water tank 5. In this embodiment, the water level controller 7 is a dry reed tube water level controller, or a floating ball magnetic switch liquid level controller or an electrode type water level controller etc. may be adopted, depending on specific needs, the water level controller 7 controls the opening and closing of a water inlet valve or a water outlet valve in the water tank according to the temperature signal fed back by the temperature sensor and can carry out water inlet and water outlet on the water tank 5 according to the temperature value to maintain a certain level of water. When the temperature of heat exchange is high, water can be fed into the water tank 5 to maintain a high water level, increase the amount of heat exchange water, and effectively compensate for the evaporation of water at higher temperature; when the heat exchange temperature is low, the water discharge in the water tank 5 can be reduced to a low water level, and a small amount of water can meet the heat

exchange requirements and save resources. The temperature sensor is disposed outside the housing and electrically connected with the water level controller 7. The temperature controller monitors the external temperature in real time and feeds back the temperature value to the water level controller 7. When the outdoor temperature is low and the water is likely to freeze, the water level controller 7 drains the water in the water tank 5 according to a preset temperature value, for example, the preset temperature value is 0-3 degrees Celsius. A temperature sensor can also be disposed in the water tank 5 to detect the water temperature in real time. When the water temperature approaches freezing point, that is, 0 degrees Celsius, a temperature signal is fed back to the water level controller 7 to drain the water in the water tank 5, so as to prevent the water tank 5 and the pipeline communicating with the water tank 5 from being damaged by icing.

[0053] As shown in Fig. 1, a heat exchanger 8 is also disposed in the air mixing cavity 2 below the spraying apparatus 4 to improve the air heat exchange efficiency. In this embodiment, the heat exchanger 8 is a plate heat exchanger, and the heat exchange sheets of the heat exchanger 8 are made of polymer plastic materials, which have good heat exchange and mechanical properties, and strong corrosion resistance, and can adapt to long-term harsh working conditions.

[0054] As shown in Fig. 1, a condenser 91 is disposed between the fan 320 on the air exhaust outlet 22 and the spraying apparatus 4, and the condenser 91 is connected with the compressor 92 located at the bottom of the air inlet cavity 1 through a connecting pipe 93. When the temperature is too high, the temperature requirement can no longer be met only through spray heat exchange, and then the compressor 92 is started to be combined with mechanical refrigeration to provide a lower temperature. A cold coil 10 is disposed on the air supply path between the heat exchanger 8 and the first air vent 32 within the air mixing cavity 2.

[0055] The refrigeration process of the cooling system in this embodiment is as follows:

[0056] When the outdoor dry bulb temperature is lower than the first temperature value (for example, 17.5°C), the indoor air returning and outdoor fresh air exchange heat

through the heat exchanger 8 to reach the air supply temperature value;

[0057] When the outdoor wet bulb temperature is lower than the second temperature value (for example, 19.5°C), the circulating water pump 61 operates, and the spraying apparatus 4 sprays water to absorb air heat and cool it to the air supply temperature value;

[0058] When the outdoor wet bulb temperature is higher than the second temperature value (for example, 19.5°C), the cooling system will spray water from the spraying apparatus 4 to absorb air heat, and at the same time, start the compressor 92 to supplement mechanical refrigeration, and combine evaporation and heat exchange to reach the air supply temperature value.

[0059] As the first alternative implementation of embodiment 1, only a temperature sensor instead of the water level controller 7 may be disposed within the water level control system, and the temperature sensor is electrically connected with the water inlet and water outlet controller of the water tank 5. The water level control system only needs to receive the feedback signal of the temperature sensor to drain the water in the water tank 5 when the outside temperature is low.

Embodiment 2

[0060] This embodiment provides a data center system, as shown in Fig. 3, which includes a machine room (not shown in the Fig.), a plurality of machine cabinets 304 and the cooling system for the data center system in embodiment 1. Wherein, the machine room is covered outside the machine cabinets 304 and the cooling system. A mezzanine ceiling 303 is disposed between the hot air returning layer 301 and the cold pool layer 302 within the machine room. The mezzanine ceiling 303 is spaced apart from the machine cabinets 304. A plurality of channels (not shown in the Fig.) are uniformly distributed in the mezzanine ceiling 303, and the hot air emitted by the machine cabinets 304 naturally rises into the hot air returning layer 301 through the channels. As shown in Fig. 3, when the cooling system is only disposed on one side within the machine room, the height of the top of the hot air returning layer 301 gradually increases from the side close to the cooling system toward the other side of the machine room facing away from the cooling system;

when two cooling systems are oppositely disposed on both sides within the machine room, the height of the top of the hot air returning layer 301 gradually increases from the side of the machine room located on the cooling systems on both sides towards the middle of the machine room, which is an integral structure formed by mirroring the sidewall surface shown on the rightmost side of Fig. 3.

[0061] For example, in this embodiment, the height of the cold pool layer 302 from the bottom to the horizontally disposed mezzanine ceiling 303 is 5 meters. By using the cold pool layer 302 with a height of 5 meters, the cool-storage time can be prolonged under the condition of power failure of the commercial power, and the loss of cold quantity during the storage process of the long-distance transport box with additional cold source can be avoided. The height of the hot air returning layer 301 from the mezzanine ceiling 303 to the top of the hot air returning layer 301 at the air returning vent 21 is 3 meters, and the height from the mezzanine ceiling 303 to the highest point in the hot air returning layer 301 is 6 meters. The whole top of the hot air returning layer 301 shows a height gradual changing trend from 3 meters to 6 meters, thus forming an air returning chimney with micro module from a height of 8 meters to 11 meters in the machine room, which accelerates the air circulation rate between the cold pool layer 302 and the hot air returning layer 301.

[0062] A thermal insulation layer 305 is laid on the top of the hot air returning layer 301 to reduce the leakage of cold air, and an air outlet can be appropriately set on the top of the hot air returning layer 301 to facilitate partial discharge of hot air in the hot air returning layer 301.

[0063] As the first alternative implementation of embodiment 2, the mezzanine ceiling 303 may not be disposed, and the circulation of airflow within the machine room can be achieved by using the principle that hot air naturally rises and cold air naturally falls.

[0064] Apparently, the above embodiments are merely examples to describe the examples made and are not intended to limit the implementation manners. A person of ordinary skill in the art may further make other changes or variations in a different form on the basis of the above description. Herein, examples are unnecessarily provided for all implementation manners. The obvious changes or modifications derived therefrom still

within the protection scope created by the disclosure.

CLAIMS

1. A cooling system suitable for a data center system, wherein the cooling system is disposed inside a machine room of the data center system, and the machine room has, on a side thereof close to the cooling system, a hot air returning layer (301) arranged above a cold pool layer (302) and in communication therewith;

the cooling system comprises: an air mixing cavity (2), an air supply cavity (3) in communication with a first air vent (32) of the air mixing cavity (2), and a refrigerating apparatus disposed in the air mixing cavity (2);

the air mixing cavity (2) comprises an air returning vent (21) and an air supply vent (31), the air mixing cavity (2) and the hot air returning layer (301) are in communication with each other through the air returning vent (21) and are disposed at the same level; the air supply cavity (3) and the cold pool layer (302) are in communication with each other through the air supply vent (31) and are disposed at the same level; and

the air mixing cavity (2) comprises a diffusion type air supply end, disposed on the air supply vent (31),

wherein the refrigerating apparatus comprises:

a spraying apparatus (4) disposed within the air mixing cavity (2) and located at an intersection between an air inlet path and an air returning path;

a water tank (5) disposed below the spraying apparatus (4) and having a water level control system; and

a circulating apparatus disposed between the spraying apparatus (4) and the water tank (5) and adapted to circularly pumping water in the water tank (5) into the spraying apparatus (4),

wherein the water level control system comprises:

a water level controller (7) disposed in the water tank (5); and

a temperature sensor electrically connected with the water level controller (7) and adapted to monitoring outdoor temperature in real time,

wherein the water level controller (7) controls opening or closing of a water inlet valve in the water tank (5) or opening or closing of a water outlet valve in the water tank (5) according to a temperature signal of the temperature sensor, and

wherein when temperature of heat exchange is high, the water level controller (7) controls water to be fed into the water tank (5) to maintain a high water level, and when temperature of heat exchange is low, the water level controller (7) controls the water tank (5) to discharge water to be reduced to a low water level.

2. The cooling system of claim 1 for the data center system, wherein the water level controller (7) is a dry reed tube water level controller.

3. The cooling system of claim 2 for the data center system, wherein the refrigerating apparatus further comprises:

a heat exchanger (8) disposed at an intersection between a spraying path from the spraying apparatus (4) towards the water tank (5) and the air returning path; and/or
a condenser (91) located above the spraying apparatus (4).

4. The cooling system of claim 2 for the data center system, wherein the refrigerating apparatus further comprises:

a cold coil (10) disposed in the air mixing cavity (2) and being close to the air supply cavity (3).

5. The cooling system of any one of claims 1-4 for the data center system, wherein the cooling system further comprises:

an air inlet cavity separated from and disposed at the same level with the air supply cavity (3),

wherein the air mixing cavity (2) is disposed above the air inlet cavity (1) and the air supply cavity (3) and is in communication with the air inlet cavity (1) and the air supply cavity (3), respectively.

6. The cooling system of claim 7 for the data center system, wherein circulating fans are disposed between the hot air returning layer (301) and the air mixing cavity (2), between the air mixing cavity (2) and the air supply cavity (3), and between the air supply cavity (3) and the cold pool layer (302).

7. A data center system, comprising:
a machine room and a plurality of machine cabinets (304); and
the cooling system of any one of claims 1 to 6 for the data center system,
wherein the machine cabinets (304) are disposed side by side in the cold pool layer (302).

8. The data center system of claim 7, wherein the data center system further comprises:
a mezzanine ceiling (303) disposed between the hot air returning layer (301) and the cold pool layer (302), wherein channels are uniformly distributed in the mezzanine ceiling (303) to enable communication between the hot air returning layer (301) and the cold pool layer (302), and

the machine cabinets (304) and the mezzanine ceiling (303) are spaced by a required distance;

a thermal insulation layer (305) disposed on the top of the hot air returning layer (301), wherein the height of the top of the hot air returning layer (301) gradually increases from a side of the machine room close to the cooling system toward the middle of the machine room or a side of the machine room facing away from the cooling system.