

PRIMARY AND STANDBY FAN ASSEMBLY FOR PROTECTION, PRIMARY AND
STANDBY CHASSIS FOR PROTECTION, AND CONTROL METHOD THEREFOR

TECHNICAL FIELD

[0001] The present invention relates to the field of electronic and communication technologies, and in particular to a primary and standby fan assembly for protection, a primary and standby chassis for protection, and a control method therefor.

BACKGROUND

[0002] With the continuous development of electronic information technology, uninterrupted operation of electronic devices has become a standard requirement, especially for computing centers and data centers. At the same time, uninterrupted operation will also involve backup design of the electronic devices. When a primary working assembly fails, a backup working assembly will replace the primary working assembly, thereby maintaining the uninterrupted operation of the electronic device. Due to the heat continuously generated by the electronic devices during uninterrupted operation, such heat may impair the operation of service disk in electronic devices, therefore necessitating a fan tray for dissipating heat from the chassis. If the fan tray fails, the electronic device may experience malfunction. In order to improve the operational reliability of the electronic devices, redundant fan trays have gradually become standard practice to enhance operational reliability.

[0003] In the existing technologies, redundant fan trays often employ symmetrical designs. When one side of the fan tray fails, the other side of the fan tray is activated, or three or more fan trays are redundantly designed, such that even if more than one fan tray fails, due to the normal operation of other fan trays, the normal heat dissipation of the chassis can be guaranteed. However, the prior art solutions suffer from the following technical disadvantages: (a). symmetrical designs typically require distinct structural configurations for fan trays on opposite sides, necessitating productions of different specifications of fan trays and increasing design and manufacturing costs of the fan trays and associated chassis components; (b). additional spare inventory is required, necessitating the use of backup fan trays for replacements upon failure; (c). both symmetrical and multi-fan configurations occupy increased space, impeding miniaturization of the chassis or resulting in reduced space for the

service disk.

SUMMARY

[0004]The present invention provides a primary and standby fan assembly for protection, a primary and standby chassis for protection, and a control method for the fan assembly, to solve the technical problems in the prior art of high manufacturing costs, excessive inventory requirements, and the excessive space occupation by fan trays in fan tray or chassis designs, while achieving at least the advantages of high interchangeability, low cost, and compact size.

[0005]In accordance with the first aspect, the present invention provides a primary and standby fan assembly for protection, comprising two or more sets of interchangeable fan trays;

[0006]wherein each fan tray comprises: a first interface, a control unit connected to the first interface, a second interface, a third interface connected to the second interface, and at least one set of fans connected to the control unit.

[0007]Specifically, one of the primary technical concepts of the present invention is to modularize the fan trays, so that they can be replaced with each other, reducing the structural design and production costs of fan trays as well as the backup costs of fan trays.

[0008]Furthermore, the first interface is externally connected to the chassis or internally connected to the third interface.

[0009]Optionally, the first interface comprises: a first tray bit port, an address port, and a first communication port;

[0010]the second interface comprises a second tray bit port, an address port, and a second communication port;

[0011]the third interface comprises a third tray bit port, an address port, and a third communication port.

[0012]Specifically, another technical concept of the present invention is to separate the fan control function of the control unit from the information exchange function between the fan trays, so that the fan control and information exchange of the fan trays can be independently controlled, enhancing the operational independence and reliability of each fan tray.

[0013]Furthermore, the first interface, second interface, and third interface all comprise other

communication ports.

[0014] Optionally, the fan trays described above are spliced in a flat pattern, comprising square splicing, triangular splicing, L-shaped splicing, or trapezoidal splicing. By designing the structure of the fan tray, the air supply during the operation of a single fan tray is optimized.

[0015] Optionally, the fan assembly is arranged on either side of the chassis.

[0016] In accordance with the second aspect, the present invention provides a primary and standby chassis for protection, comprising a primary and standby fan assembly for protection as provided in any embodiment of the first aspect, and further comprising: a chassis, wherein the chassis comprises a back panel at one side thereof, and an air inlet at an opposite side thereof; and

[0017] the back panel comprises a first fan interface and a second fan interface, wherein the first fan interface is used to connect the first interface, and the second fan interface is used to connect the second interface.

[0018] Furthermore, the chassis comprises a service disk, which is located between the back panel and the air inlet.

[0019] In accordance with the third aspect, the present invention provides a method for controlling a primary and backup protection fan, which is used for the primary and standby fan assembly for protection as described in any possible embodiment of the first aspect, comprising:

[0020] controlling at least one set of fan trays to be in a working condition;

[0021] controlling one or more sets of fan trays to be in a working condition based on an amount of generated heat;

[0022] when a status of any of the fan trays is abnormal, issuing an abnormal alarm and putting it in a stopped state.

[0023] In summary, the present invention provides a primary and standby fan assembly for protection, chassis, and control method for the fan assembly, which have at least the following advantages:

[0024] (a). the present invention modularizes the fan trays, allowing them to be interchangeable with each other, thereby reducing the structural design and production costs

of fan trays, as well as the backup costs of fan trays;

[0025](b). the present invention separates the fan control function of the control unit from the information exchange function between the fan trays, enabling independent control of the fan control and information exchange of the fan trays, thereby improving the operational independence and reliability of each fan tray.

BRIEF DESCRIPTION OF THE DRAWINGS

[0026] The present invention will be further described in detail with reference to the accompanying drawings and preferred embodiments. However, it is clear to those skilled in the art that these drawings are only drawn for the purpose of explaining the preferred embodiments and should not be construed as limiting the scope of the present invention. In addition, unless otherwise specified, the drawings only illustrate conceptually the composition or construction of the described objects and may contain exaggerated displays, and the drawings are not necessarily drawn to scale.

[0027] Figure 1 shows a schematic diagram of the structure of a primary and standby fan assembly for protection provided by an embodiment of the present invention;

[0028] Figure 2 shows a schematic diagram of the structure of a primary and standby fan assembly for protection provided by another embodiment of the present invention;

[0029] Figure 3 is a schematic diagram of the structure of a primary and standby chassis for protection provided by an embodiment of the present invention;

[0030] Figure 4 shows a schematic diagram of the structure of a primary and standby chassis for protection provided by another embodiment of the present invention;

[0031] Figure 5 shows a schematic diagram of the combination of fan trays provided by an embodiment of the present invention.

DETAILED DESCRIPTION

[0032] The present invention will be described in detail with reference to Figures 1 to 5.

[0033] In order to further clarify the purpose, technical solution, and advantages of the present invention, the following will provide a detailed explanation of the present invention in conjunction with the accompanying drawings and embodiments. It should be appreciated that

the specific embodiments described herein are only for explaining the present invention and are not intended to limit the present invention.

[0034] The primary technical concept of the present invention is to design the structure and combination manner of the primary and standby fan assembly for protection, so that the fan tray has the advantages of high interchangeability, high modularity, small volume occupation, and low maintenance cost.

[0035] Furthermore, please refer to Figure 1 showing a schematic diagram of the structure of a primary and standby fan assembly for protection provided in an embodiment of the present invention.

[0036] Embodiment 1

[0037] The fan assembly provided by the present invention comprises two or more sets of interchangeable fan trays, each of which comprises: a first interface, a control unit connected to the first interface, a second interface, a third interface connected to the second interface, and at least one set of fans connected to the control unit. Here, the control unit is configured to control the operation of the fans, thereby providing air cooling to the chassis; the first interface and the second interface are both used to receive transmission signals from the upper layer, and the third interface is used to exchange information with the first interface and the second interface, respectively. The synchronous or asynchronous driving of any two of the fan trays can be achieved through the first interface, second interface, and third interface. It is worth explaining that the interchangeability of the fan trays means that the fan trays can be mutually replaced irrespective of their installed positions. That is, the fan tray used to connect to the chassis can be connected to the end of other fan trays, and the fan tray connected to the end of other fan trays can also be connected to the chassis. In other words, regardless of whether any fan tray is damaged, it can be directly removed and replaced by another fan tray, achieving the goal of reducing inventory costs and simplifying maintenance processes.

[0038] Optionally, the first interface is externally connected to the chassis or internally connected to the third interface. It is worth explaining that the first interface of the first set of fan trays is used for its communication with the chassis, for electronic devices to issue commands and collect data; the second set of fan trays is connected to the second interface of

the first set of fan trays through a third interface, thereby using the first fan tray as a communication bridge to communicate with the chassis.

[0039] Optionally, when multiple fans are controlled by the control unit, the fans can be connected in parallel or series.

[0040] Furthermore, please refer to Figure 2 showing a schematic diagram of the structure of a primary and standby fan assembly for protection provided by another embodiment of the present invention.

[0041] Embodiment 2

[0042] On the basis of Embodiment 1, the first interface comprises a first tray bit port, an address port, and a first communication port; the second interface comprises a second tray bit port, an address port, and a second communication port; and the third interface comprises a third tray bit port, an address port, and a third communication port. Here, the first tray bit port, the second tray bit port, and the third tray bit port are used to confirm bit port status information of the fan tray; the address ports are used to confirm address information of the fan tray; and the first communication port, the second communication port, and the third communication port are used for communication interaction.

[0043] Optionally, the first interface, the second interface, and the third interface all comprise other signal ports to enhance the scalability of the fan tray.

[0044] Furthermore, please refer to Figure 3 showing a schematic diagram of the structure of a primary and standby chassis for protection provided by an embodiment of the present invention.

[0045] Embodiment 3

[0046] On the basis of either Embodiment 1 or 2, Embodiment 3 provides a primary and standby chassis for protection, and the fan assembly is managed through the fan interface provided on a back panel of the chassis. Here, the first fan interface and the second fan interface both comprise other signal ports, tray bit ports, address ports, and communication ports, which are used to correspond to the first interface and the second interface respectively.

[0047] Furthermore, please refer to Figure 4 showing a schematic diagram of the structure of a primary and standby chassis for protection provided by another embodiment of the present invention.

[0048] Specifically, the fan assembly is located on either side of the chassis and achieves air cooling circulation through the air outlet on the other side.

[0049] Furthermore, please refer to Figure 5 showing a schematic diagram of the combination of fan trays provided by an embodiment of the present invention.

[0050] Embodiment 4

[0051] On the basis of any one of Embodiments 1-3, the side view of the fan assembly is in a spliced style; that is, each fan tray in the fan assembly forms a sheet-like structure, so that the fan assembly can achieve the backup function of the fan tray by only occupying one side of the chassis space, which could in turn reduce the size of the chassis. Here, the fan tray comprises various forms such as square splicing, triangular splicing, L-shaped splicing, or trapezoidal splicing. Triangle splicing, L-shaped splicing, or T-shaped splicing can simultaneously optimize the heat dissipation of the space.

[0052] The present invention has been described in detail above, and specific examples have been used to illustrate the principles and embodiments of the present invention. The above embodiments are only used to help understand the present invention and its core ideas. It should be pointed out that for ordinary technicians in this technical field, several improvements and modifications can be made to the present invention without departing from the principles of the present invention, and these improvements and modifications also fall within the scope of protection of the claims of the present invention.

WHAT IS CLAIMED IS:

1. A primary and standby fan assembly for protection, comprising two or more sets of interchangeable fan trays;

wherein each fan tray comprises:

- a first interface,
- a control unit connected to the first interface,
- a second interface,
- a third interface connected to the second interface, and
- at least one set of fans connected to the control unit.

2. The primary and standby fan assembly for protection of claim 1, wherein the first interface is configured to be externally connected to the chassis or internally connected to the third interface.

3. The primary and standby fan assembly for protection of claim 1 or 2, wherein the first interface comprises a first tray bit port, an address port, and a first communication port;

the second interface comprises a second tray bit port, an address port, and a second communication port; and

the third interface comprises a third tray bit port, an address port, and a third communication port.

4. The primary and standby fan assembly for protection of claim 3, wherein the first interface, the second interface, and the third interface all comprise other communication ports.

5. The primary and standby fan assembly for protection of claim 1, wherein the fan trays are spliced together in a flat pattern, comprising square splicing, triangular splicing, L-shaped splicing, or trapezoidal splicing.

6. The primary and standby fan assembly for protection of claim 2, wherein the fan assembly is provided on either side of the chassis.

7. A primary and standby chassis for protection, comprising the primary and standby fan assembly for protection as claimed in any one of claims 1-6, and further comprising a chassis, wherein one side of the chassis comprises a back panel, and an opposite side of the chassis comprises an air inlet; and

wherein the back panel comprises a first fan interface configured to connect to the first interface, and a second fan interface configured to connect to the second interface.

8. The primary and standby chassis for protection of claim 7, wherein the chassis comprises a service disk, which is provided between the back panel and the air inlet.

9. A control method for a primary and standby fan assembly for protection, which is configured to control the primary and standby fan assembly for protection as claimed in any one of claims 1-6, wherein the control method comprises:

controlling at least one set of fan trays to be in a working condition;

based on an amount of generated heat, controlling one or more sets of fan trays to be in a working condition;

when a status of any of the fan trays is abnormal, issuing an abnormal alarm and putting them in a stopped state.