

# **COMPUTING DEVICE**

## **TECHNICAL FIELD**

This application relates to the technical field of data computing, and in particular, to a computing device with greater safety.

## **BACKGROUND**

A computing device is an electronic device for high-speed computing, such as an electronic device configured to run a specific algorithm and communicate with a remote server to obtain corresponding virtual currency. The progress of the existing industry has promoted the development of automation and intelligence of computing devices, and various replacement products have emerged one after another. However, many designs of existing computing devices still have exposed connecting wires, which not only affect the safety, but also affect the appearance.

## **SUMMARY**

An objective of this application is to provide a computing device with higher safety.

To achieve the foregoing objective, the computing device in this application includes a frame, a computing module, a control module, a power source module, and a heat dissipation module, where the computing module is arranged in the frame, the power source module, the control module, and the heat dissipation module are connected outside the frame, the computing module includes a power source interface, and the power source module includes a power source connection end. The computing device further includes a connection box arranged on top of the frame and the power source module, where the power source interface extends into the connection box from a top end of the frame, the power source connection end extends into the connection box, and the power source interface and the power source connection end are connected in the connection box via conducting bar.

In an implementation of the computing device described above, the computing module includes a signal interface, the control module includes a signal connection end, the control module is arranged in the connection box, and the signal interface and the signal connection end are connected in the connection box via signal wire.

In an implementation of the computing device described above, the connection box includes an upper cover plate and a bottom cover body, and the upper cover plate covers the

bottom cover body to seal the connection box.

In an implementation of the computing device described above, the frame is an integrally formed aluminum piece.

In an implementation of the computing device described above, the frame includes a first side wall, a second side wall, a top wall, and a bottom wall. The first side wall and the second side wall are supported between the top wall and the bottom wall.

In an implementation of the computing device described above, an outer portion of the first side wall is provided with a power source slide rail transversely arranged, a power source module bracket is connected to the first side wall through the power source slide rail, and the power source module is attached to the power source module bracket.

In an implementation of the computing device described above, the bottom wall is provided with a computing board bottom slide rail transversely arranged, and the computing module is configured to slide into the frame or slide out of the frame through the computing board bottom slide rail.

In an implementation of the computing device described above, the computing module includes a heat sink, and the heat sink is provided with a groove configured to engage with the computing board bottom slide rail.

In an implementation of the computing device described above, the top wall is provided with a notch transversely arranged, the power source interface of the computing module protrudes above the frame through the notch and extends into the connection box, and the signal interface of the computing module protrudes above the frame through the notch and extends into the connection box.

In an implementation of the computing device described above, the top wall is provided with a computing board top slide rail corresponding to the computing board bottom slide rail, and the computing board top slide rail is formed by extrusion of an aluminum material at a side of the notch.

In an implementation of the computing device described above, a plurality of computing modules are arranged in parallel, and the conducting bar is configured to connect the plurality of computing modules in sequence.

In an implementation of the computing device described above, the heat dissipation module includes a first fan and a second fan. The frame is hollowed out at a front end and a rear end. The first fan and the second fan are connected to the front end and the rear end of the frame respectively to block the front end and the rear end of the frame.

This application further provides a computing device, including a frame, a computing

module, a control module, a power source module, and a heat dissipation module, where the computing module is arranged in the frame and includes a power source interface, and the power source module includes a power source connection end. The computing device further includes a connection box connected to the frame, where the power source interface extends into the connection box from the frame, the power source connection end extends into the connection box, the power source interface and the power source connection end are connected in the connection box via conducting bar, and the connection box is provided with an access in communication with the frame.

In an implementation of the computing device described above, the frame is provided with an access side for the computing module to slide out or slide in as a whole, and the connection box is arranged at the access side or at another side of the frame that is different from the access side.

In an implementation of the computing device described above, the power source module, the control module, and the heat dissipation module are arranged in the frame, or at least one of the power source module, the control module, and the heat dissipation module forms a part of the frame.

This application is described in detail below with reference to the accompanying drawings and specific embodiments, which should not be construed as a limitation on this application.

## **BRIEF DESCRIPTION OF THE DRAWINGS**

FIG. 1 is a three-dimensional structural diagram of a computing device according to an embodiment of this application.

FIG. 2 is an exploded view of FIG. 1.

FIG. 3 is a three-dimensional structural diagram of a computing device with an upper cover plate of a connection box being opened according to an embodiment of this application.

FIG. 4 is a three-dimensional structural diagram of a computing device with an upper cover plate of a connection box being removed according to an embodiment of this application.

FIG. 5 is a three-dimensional structural diagram of a frame of a computing device according to an embodiment of this application.

FIG. 6 is a three-dimensional structural diagram of a computing module of a computing device connected to a frame according to an embodiment of this application.

FIG. 7 is a three-dimensional structural diagram of a computing device according to an embodiment of this application.

FIG. 8 is a three-dimensional structural diagram of a computing module of a computing device connected to a frame according to an embodiment of this application.

Reference numerals:

100: Frame

110: First side wall

111: Power source slide rail

120: Second side wall

130: Top wall

131: Notch

132: Computing board top slide rail

140: Bottom wall

141: Computing board bottom slide rail

200: Computing module

210: Power source interface

220: Signal interface

230: Heat sink

231: Groove

232: Groove

240: Computing board

300: Control module

310: Signal connection end

400: Power source module

410: Power source connection end

500: Heat dissipation module

510: First fan

520: Second fan

600: Connection box

600S: Access

610: Upper cover plate

620: Bottom cover body

700: Conducting bar

800: Power source module bracket

900: Signal wire

X: Transverse direction

S1, S2, S3, S4: Side

## **DETAILED DESCRIPTION**

The technical solutions of this application are described in detail below with reference to the accompanying drawings and specific embodiments to provide a further understanding of the objectives, solutions, and effects of this application, but are not intended to limit the protection scope of the appended claims of this application.

References in this specification to “an embodiment,” “another embodiment,” “this embodiment,” and the like mean that the described embodiment may include particular features, structures, or characteristics, but not every embodiment necessarily includes those particular features, structures, or characteristics. In addition, such expressions are not referring to the same embodiment. Further, when a particular feature, structure, or characteristic is described in conjunction with an embodiment, whether or not explicitly described, it has been shown that it is within the knowledge of a person skilled in the art to incorporate such feature, structure, or characteristic into other embodiments.

Certain terms are used in the description and the following claims to refer to particular assemblies or components, and a person of ordinary skill in the art should understand that technical users or manufacturers may refer to the same assembly or component by different terms. This specification and the following claims do not use the difference in name as a way of distinguishing assemblies or components, but use the difference in function of the assemblies or components as a criterion for distinction. The terms “include” and “comprise” mentioned throughout this specification and the following claims are open terms and therefore should be explained as “include but not limited to.” In addition, the term “connection” herein includes any direct or indirect means of connection.

It should be noted that, in the description of this application, a direction or location relationship indicated by a term such as “transverse,” “longitudinal,” “on,” “under,” “front,” “rear,” “left,” “right,” “vertical,” “horizontal,” “top,” “bottom,” “inner,” “outer,” or the like is a direction or location relationship shown based on the accompanying drawings, and is intended only to conveniently describe this application and simplify the description, but is not intended to indicate or imply that a mentioned apparatus or element needs to have a particular direction and is constructed and operated in the particular direction. Therefore, the direction or location relationship cannot be understood as a limitation on this application. For the convenience of clear description, the order terms “first,” “second,” “third,” “fourth,” and the

like mentioned herein are used for setting apart an element, a region, or a component from another identical or similar element, region, or component, rather than limiting the element, region, or component.

As shown in FIG. 1 and FIG. 2, FIG. 1 and FIG. 2 are respectively a three-dimensional structural diagram and an exploded view of a computing device according to an embodiment of this application. The computing device of this application includes a frame 100, a computing module 200, a control module 300, a power source module 400, and a heat dissipation module 500. The computing module 200 is arranged in the frame 100. The power source module 400, the control module 300, and the heat dissipation module 500 are connected outside the frame 100. For example, the power source module 400 is attached to a side of the frame 100; the heat dissipation module 500 is connected to a front end and a rear end or one of the ends of the frame 100; the control module 300 is arranged in a sealed box at an upper side of the frame 100.

The computing device of this application further includes a connection box 600, and the connection box 600 is arranged on the frame 100 and at an upper side of the power source module 400.

Preferably, an upper portion of the frame 100 is even with an upper portion of the power source module 400 to facilitate the arrangement of the connection box 600.

Preferably, as shown in FIG. 1, a left side S1 and a right side S2 of the connection box 600 are even with a left side of the frame 100 and a right side of the power source module 400 respectively. A front side S3 and a rear side S4 of the connection box 600 are even with a front side and a rear side of the power source module 400 respectively. The overall structure of the computing device is well-defined.

As shown in FIG. 2 and FIG. 3, FIG. 3 is a three-dimensional structural diagram of a computing device with an upper cover plate of a connection box being opened according to an embodiment of this application. The control module 300 is arranged in the connection box 600 of the frame 100. The computing module 200 includes a power source interface 210, and the power source interface 210 extends into the connection box 600 from a top end of the frame 100. The power source module 400 includes a power source connection end 410, and the power source connection end 410 extends into the connection box 600 at an upper side. The power source connection end 410 of the power source module 400 and the power source interface 210 of the computing module 200 are connected in the connection box 600 via conducting bar 700.

As shown in FIG. 3 and FIG. 4, FIG. 4 is a three-dimensional structural diagram of a computing device with an upper cover plate of a connection box being removed to display a

signal connection structure between a control module and a computing module according to an embodiment of this application. The connection box 600 includes an access 600S, and the access 600S is in communication with the frame 100. When needed, the computing module 200 can be pulled out from the frame 100 by detaching the conducting bar 700 and related signal wires without detaching other frame structures such as the connection box 600. As shown in FIG. 2 to FIG. 4, the computing module 200 includes a signal interface 220, and the signal interface 220 extends into the connection box 600 from the top end of the frame 100. The control module 300 includes a signal connection end 310, and the signal connection end 310 extends into the connection box 600 at the upper side. The signal connection end 310 of the signal module 30 and the signal interface 220 of the computing module 200 are in electrical connection in the connection box 600 via signal wire 900.

The computing device of this application is provided with a sealable connection box. A control board and a control interface between the control board and a computing board are connected in the connection box, and a power source and a power source wire of the computing board are connected in the connection box. Thus, power source connection wires and signal wires are prevented from being exposed, which improves safety and appearance; moreover, the connection box is arranged at a top end of a device, so as to facilitate operations.

As shown in FIG. 2, the connection box 600 includes an upper cover plate 610 and a bottom cover body 620, and the upper cover plate 610 covers the bottom cover body 620 to seal the connection box 600.

FIG. 5 is a three-dimensional structural diagram of a frame of a computing device according to an embodiment of this application. The frame 100 of the computing device of this application is an integrally formed aluminum piece that does not need mounting, and is low in cost and high in strength. The frame 100 includes a first side wall 110, a second side wall 120, a top wall 130, and a bottom wall 140. The first side wall 110 and the second side wall 120 are supported between the top wall 130 and the bottom wall 140.

The first side wall 110, the second side wall 120, the top wall 130, and the bottom wall 140 form a circumferential wall of the frame 100, and the frame 100 is hollowed out at a front end and a rear end. With reference to FIG. 2, the heat dissipation module 500 includes a first fan 510 and a second fan 520. The first fan 510 and the second fan 520 are connected to the front end and the rear end of the frame 100 respectively to block the front end and the rear end of the frame 100.

An outer portion of the first side wall 110 is provided with a power source slide rail 111 arranged along a transverse direction X. With reference to FIG. 2, a power source module

bracket 800 is connected to the first side wall 110 through the power source slide rail 111, and the power source module 400 is attached to the power source module bracket 800.

With reference to FIG. 5 and FIG. 6, FIG. 6 is a three-dimensional structural diagram of a computing module of a computing device connected to a frame according to an embodiment of this application. The bottom wall 140 includes a computing board bottom slide rail 141 arranged along the transverse direction X, and the computing module 200 is configured to slide into the frame 100 or slide out of the frame 100 through the computing board bottom slide rail 141.

The computing module 200 includes a heat sink 230 and a computing board 240. The heat sink 230 is attached to the computing board 240 to dissipate heat from the computing board 240. The heat sink 230 may be attached to one side or two sides of the computing board 240. In this embodiment, the heat sink 230 is attached to two sides of the computing board 240, that is, the computing board 240 is sandwiched between two heat sinks 230. A bottom of the heat sink 230 is provided with a groove 231 configured to engage with the computing board bottom slide rail 141. The groove 231 and the computing board bottom slide rail 141 are configured to engage with each other to allow the computing module 200 to enter or move out of the frame 100. In addition, two ends of the slide rail are provided with positioning and fixing structures, such as positioning strips and positioning protrusions. The positioning and fixing structures may alternatively be heat dissipation modules.

The groove 231 may be provided only at a bottom portion of one heat sink 230, or may be provided at bottom portions of two heat sinks 230.

In this application, the slide rail is provided on the heat sink, that is, the heat sink is used for supporting and sliding, which can effectively prevent the computing board from being deformed and damaged.

The top wall 130 is provided with a notch 131 arranged transversely. The power source interface 210 and the signal interface 220 on the computing board 240 of the computing module 200 protrude above the frame 100 through the notch 131. With reference to FIG. 2, when the connection box 600 is connected to the top end of the frame 100, the power source interface 210 and the signal interface 220 are in the connection box 600.

The top wall 130 is provided with a computing board top slide rail 132 corresponding to the computing board bottom slide rail 141 on the bottom wall 140, and the computing board top slide rail 132 is formed by extrusion of an aluminum material at a side of the notch 131. Correspondingly, a top end of the heat sink 230 is provided with a groove 232 configured to engage with the computing board top slide rail 132. The top slide rail and bottom slide rail

work together to provide precise and stable sliding.

A direction or location relationship indicated by the term “top end” or “upper side” described above is a direction or location relationship shown based on the accompanying drawings, which also includes an outermost end of a side surface. As shown in FIG. 7, in a three-dimensional structural diagram of a computing device according to an embodiment of this application, when the computing device shown in FIG. 1 is placed sideways, the connection box 600 is arranged on one side of the frame 100. As shown in FIG. 8, in a three-dimensional structural diagram of a computing module of a computing device connected to a frame according to an embodiment of this application, the computing module 200 moves in or out via the top portion of the frame 100. In addition, in order to simplify a chassis structure, the control module 300, the power source module 400, and the heat dissipation module 500 may all be arranged in the frame 100 to improve the integrity and cleanliness of the frame structure.

Referring to FIG. 2 and FIG. 6 again, a plurality of computing modules 200 are arranged in parallel along the transverse direction X, and the control module 300 includes a plurality of control connection ends, each of which is connected to a signal interface of a corresponding computing module 200. In addition, the conducting bar 700 is configured to connect the plurality of computing modules 200 in sequence for the computing modules 200 to be connected with the power source module 400.

Certainly, this application may further have a plurality of other embodiments. A person skilled in the art may make various corresponding changes and variations according to this application without departing from the spirit and essence of this application. However, such corresponding changes and variations shall fall within the protection scope of the claims appended to this application.

### **Industrial applicability**

The computing device of this application is provided with a sealable connection box; a power source and a power source wire of a computing board are connected in the connection box. Thus, various power source connection wires are sealed inside the connection box and are prevented from being exposed, which not only improves the safety and appearance, but also facilitates operations. The connection box is provided with an access in communication with the frame. The computing module may slide out of or slide into the frame as a whole from the access without detaching other frame structures such as the connection box, which saves time and effort for maintenance.

## CLAIMS

### What is claimed is:

1. A computing device, comprising a frame, a computing module, a control module, a power source module, and a heat dissipation module, wherein the computing module is arranged in the frame, the power source module, the control module, and the heat dissipation module are connected outside the frame, the computing module comprises a power source interface, and the power source module comprises a power source connection end, wherein the computing device further comprises a connection box arranged on top of the frame and the power source module, wherein the power source interface extends into the connection box from a top end of the frame, the power source connection end extends into the connection box, and the power source interface and the power source connection end are connected in the connection box via conducting bar.

2. The computing device according to claim 1, wherein the computing module comprises a signal interface, the control module comprises a signal connection end, the control module is arranged in the connection box, and the signal interface and the signal connection end are connected in the connection box via signal wire.

3. The computing device according to claim 1, wherein the connection box comprises an upper cover plate and a bottom cover body, and the upper cover plate covers the bottom cover body to seal the connection box.

4. The computing device according to claim 2, wherein the frame is an integrally formed aluminum piece.

5. The computing device according to claim 4, wherein the frame comprises a first side wall, a second side wall, a top wall, and a bottom wall, and the first side wall and the second side wall are supported between the top wall and the bottom wall.

6. The computing device according to claim 5, wherein an outer portion of the first side wall is provided with a power source slide rail transversely arranged, a power source module bracket is connected to the first side wall through the power source slide rail, and the power source module is attached to the power source module bracket.

7. The computing device according to claim 5, wherein the bottom wall is provided with a computing board bottom slide rail transversely arranged, and the computing module is configured to slide into the frame or slide out of the frame through the computing board bottom slide rail.

8. The computing device according to claim 7, wherein the computing module comprises a heat sink, and the heat sink is provided with a groove configured to engage with the computing board bottom slide rail.

9. The computing device according to claim 7, wherein the top wall is provided with a notch transversely arranged, the power source interface of the computing module protrudes above the frame through the notch and extends into the connection box, and the signal interface of the computing module protrudes above the frame through the notch and extends into the connection box.

10. The computing device according to claim 9, wherein the top wall is provided with a computing board top slide rail corresponding to the computing board bottom slide rail, and the computing board top slide rail is formed by extrusion of an aluminum material at a side of the notch.

11. The computing device according to any one of claims 1 to 10, wherein a plurality of computing modules are arranged in parallel, and the conducting bar is configured to connect the plurality of computing modules in sequence.

12. The computing device according to any one of claims 1 to 10, wherein the heat dissipation module comprises a first fan and a second fan, the frame is hollowed out at a front end and a rear end, the first fan and the second fan are connected to the front end and the rear end of the frame respectively to block the front end and the rear end of the frame.

13. A computing device, comprising a frame, a computing module, a control module, a power source module, and a heat dissipation module, wherein the computing module is arranged in the frame and comprises a power source interface, and the power source module comprises a power source connection end, wherein the computing device further comprises a

connection box connected to the frame, wherein the power source interface extends into the connection box from the frame, the power source connection end extends into the connection box, the power source interface and the power source connection end are connected in the connection box via conducting bar, and the connection box is provided with an access in communication with the frame.

14. The computing device according to claim 13, wherein the frame is provided with an access side for the computing module to slide out or slide in as a whole, and the connection box is arranged at the access side or at another side of the frame that is different from the access side.

15. The computing device according to claim 13, wherein the power source module, the control module, and the heat dissipation module are arranged in the frame, or at least one of the power source module, the control module, and the heat dissipation module forms a part of the frame.