

Device and Method for Quickly Sensing Faults of Equipment in Data Center Computer Room

Cross-Reference to Related Applications

5 The present application claims the priority of the Chinese patent application filed with the State Intellectual Property Office of the People's Republic of China on September 13, 2021, with the application number of 202111067904.2 and the title of "Device and Method for Rapidly Sensing Faults of Equipment in Data Center Computer Room", the entire contents of which are incorporated herein by reference.

10 Technical Field

The present disclosure relates to the technical field of sensing equipment faults, and in particular, to a device and method for quickly sensing faults of equipment in a data center computer room.

Background Art

15 A data center is a global collaborative network of specific devices, used to transmit, accelerate, display, calculate, and store data information on the internet network infrastructure. In recent years, with the continuous upgrading of Internet technology and industries, the services, such as the cloud computation, virtualization, etc., are rapidly developed, the scale of the data center in the
20 industry has grown rapidly, and the number and area of data center computer rooms have grown rapidly. The IT equipment running in the data center, including switches, routers, and servers, etc., needs to run uninterrupted throughout the year to provide services to Internet users, and at the same time, the auxiliary refrigeration system, such as an air conditioner and etc., is required
25 to supply the cold energy in real time to maintain its reliable operation.

The inventor found that at least the following problems have not been solved in the prior art, including: 1. the existing device has a poor inspection effect on the computer room, and the inspection on the equipment in the computer room is not comprehensive enough, which reduces the practicability of the device; 2.
30 the faults of the equipment in the computer room cannot be comprehensively sensed, and the perception speed to the faults is low, which affects the work efficiency of the device. Therefore, proposed are a device and method for rapid sensing faults of equipment in the data center computer room.

Summary

35 The main purpose of the present disclosure is to provide a device and method for quickly sensing faults of equipment in a data center computer room, which can effectively solve the problems in the background art.

To achieve the above purpose, the present disclosure adopts the technical scheme as follows.

A device for quickly sensing faults of equipment in a data center computer room may comprise a track, wherein a moving mechanism is slidably connected at a lower part of an outer surface of the track, a control box is fixedly connected to an lower end of the moving mechanism, a telescopic controller is movably connected to a middle part of an lower end of the control box through a bearing, a regulation mechanism is insertedly fixedly connected to an upper part of an outer surface of the telescopic controller, a camera is movably connected to a lower part of an outer surface of the regulation mechanism, a camera head is provided at each of a front part of a left end and a rear part of the left end of the camera, a display is fixedly connected to a middle part of a front end of the control box, a fixed support is fixedly connected to each of a front part of an upper end and a rear part of the upper end of the moving mechanism, two fixed supports are respectively located at front and rear sides of a track, an sensing mechanism is insertedly fixedly connected to a middle part of an upper frame wall of each of the two fixed supports, several mounting frames are fixedly connected to a middle part of an upper end of the track with by a bolt, several mounting holes are formed at a middle part of a upper frame wall and a middle part of a lower frame wall of each of the several mounting frames, a limit strip is fixedly connected to each of an upper part of a front end, a lower part of the front end, a lower part of a rear end and a upper part of the rear end of the track, a fixed groove is formed in each of a middle part of a front end and a middle part of a rear end of the track, a moving groove is formed in each of a middle part of an upper groove wall and a middle part of a lower groove wall of the two fixed grooves, and a limit groove is formed in a middle part of a lower end of the track; and

the moving mechanism comprises a fixed plate, and a supporting plate is fixedly connected to each of a front part of an upper end and a rear part of the upper end of the fixed plate, a protection cover is fixedly connected to each of the peripheries of opposite surfaces of the two supporting plates, a limit block is fixedly connected to each of left and right parts of surfaces of the two supporting plates facing to each other, a driving mechanism is movably connected, through insertion, to each of middle parts of opposite surfaces of the two supporting plates, a mounting groove is formed in a middle part of an upper end of the fixed plate, three connecting rods are jointly fixedly connected between an upper part of the front groove wall and an upper part of a rear groove wall of the mounting groove, a limit wheel is movably connected, through insertion by a bearing, to an upper part of an outer surface of each of the three connecting rods, and four limit blocks are respectively slidably connected with corresponding four limit strips.

As an optional improvement to the above technical solution, the driving mechanism may comprise a driver, the driver has an output end which is insertedly fixedly connected with a driving wheel, a belt is sleeved on a middle

part of an outer surface of the driving wheel, a driven wheel is sleeved on a right part of the belt, each of a middle part of a rear end of the driven wheel and a middle part of a rear end of the driving wheel is movably connected, through a bearing, to a front end of the supporting plate on the front, a driving shaft is insertedly fixedly connected to each of a middle part of a rear end of the driven wheel and a middle part of a rear end of the driving wheel, each of rear ends of the two driving shafts penetrates through the front end of the supporting plate on the front and is insertedly fixedly connected with a moving wheel, each of the two moving wheels is slidably connected with two moving grooves on the front, each of front parts of outer surfaces of the two driving shafts is movably connected to a rear end of the supporting plate on the front through a bearing, and a front end of the driver is fixedly connected with a front cover wall of the protection cover on the front.

As an optional improvement to the above technical solution, a regulation motor may be fixedly connected to a rear part of a lower box wall of the control box, a regulation gear is insertedly fixedly connected to an output end of the regulation motor, a fixed shaft is insertedly fixedly connected to a middle part of an upper end of the regulation gear, an upper end of the fixed shaft is movably connected with an upper box wall of the control box through a bearing, an middle part of a front end of the regulation gear is meshed with a large gear, a regulation shaft is insertedly fixedly connected to a middle part of an upper end of the large gear, a lower end of the regulation shaft penetrates through a lower box wall of the control box and is fixedly connected with an upper end of the telescopic controller, and an upper end and a lower part of an outer surface of the regulation shaft are each movably connected with an upper box wall and a lower box wall of the control box respectively, through a bearing.

As an optional improvement to the above technical solution, the regulation mechanism may comprise a fixed frame, a middle part of a right end of the fixed frame is movably connected with a regulation cylinder through a connecting seat, one end of the regulation cylinder away from the fixed frame is movably connected with a right part of an upper end of a camera through a connecting seat, a front part of an upper end and a rear part of an upper end of the fixed frame are each fixedly connected with a limit mechanism, a connecting plate is insertedly fixedly connected between upper parts of outer surfaces of the two limit mechanisms, a middle part of an upper end of the connecting plate and an upper part of an outer surface of the telescopic controller are insertedly fixedly connected, each of an upper part of a front end and an upper part of a rear end of the fixed frame is fixedly connected with a temperature sensor, and each of a lower part of a box frame wall and a lower part of a rear frame wall of the fixed frame is insertedly movably connected with a middle part of a front end and a middle part of a rear end of the camera through a movable shaft.

As an optional improvement to the above technical solution, the limit mechanism may comprises a limit cylinder, a multi-stage telescopic rod is insertedly movably connected to a middle part of a lower cylinder wall of the

limit cylinder, a lower end of the multi-stage telescopic rod runs through an upper end of the connecting plate and is fixedly connected with an upper end of the fixed frame, a spring is sleeved on an outer surface of the multi-stage telescopic rod, a middle part of an upper end of the limit cylinder is movably
 5 connected with a universal wheel through a bearing, and a lower end of the limit cylinder is fixedly connected with an upper end of the connecting plate.

As an optional improvement to the above technical solution, the sensing mechanism may comprise a casing, a middle part of an inner casing wall of the casing is fixedly connected with a heat insulation plate, a middle part of a lower
 10 end of the heat insulation plate is fixedly connected with a smoke sensor, a middle part of an upper end of the heat insulation plate is movably connected with an alarm device, a plurality of smoke inlet holes are formed in a lower part of an outer surface of the casing, a connection frame is fixedly connected to an upper end of the casing, each of a left part of an upper end and a right part of the
 15 upper end of the connection frame is insertedly movably connected with a screw, and the connection frame is insertedly fixedly connected with an upper frame wall of the fixed support through two screws.

As an optional improvement to the above technical solution, a lower end of the moving wheel may contact a lower groove wall of the moving groove at a lower side, a diameter length of the moving wheel is smaller than a distance
 20 from an upper groove wall of the moving groove on an upper side to the moving groove on a lower side, an upper end of the limit wheel contacts an upper groove wall of the limit groove, and a diameter length of the limit wheel is smaller than a distance from an upper groove wall of the limit groove to a lower
 25 groove wall of the mounting groove.

As an optional improvement to the above technical solution, an upper end of the universal wheel may be in contact with a lower end of the control box, a diameter length of the spring is greater than a diameter length of an upper end face of the multi-stage telescopic rod, the temperature sensor and the camera are
 30 each electrically connected with a display, and a diameter length of the regulation gear is greater than a diameter length of the large gear.

As an optional improvement to the above technical solution, the smoke sensor may be electrically connected to the alarm device, and an upper end face of the connection frame is lower than an upper end face of the mounting frame.

35 A use method of a device for quickly sensing faults of equipment in a data center computer room may comprise following steps:

Step 1. mounting a device, wherein a track may be mounted onto a roof of the data center computer room through mounting holes on a mounting frame, and an inspection trail of the device may be arranged through the track, so as to
 40 facilitate the device to move on the track fixed, which can conduct a comprehensive inspection on the equipment in the data center computer room,

and then ensure stability and smoothness of movement of the moving mechanism on the track through a limit strip and a limit groove;

5 Step 2. moving the device, wherein the driver is started, so as to drive through the driver the driving wheel to rotate, and then drive through a belt the moving wheel to rotate, thereby driving the whole device to move on the track, and then using the camera and the sensing mechanism to make inspection on the data center computer room, while moving;

10 Step 3. rotating by an angle, wherein the regulation motor is started, so as to drive through the regulation motor the regulation gear to rotate, and then make the telescopic controller to drive the regulation mechanism and the camera to rotate together, by a meshing transmission between a regulation gear and the large gear, so that a shooting angle of the camera head can be adjusted and a shooting range of the camera head can be expanded;

15 Step 4. adjusting the angle, wherein the telescopic controller is started to make the telescopic controller stretch and push the fixed frame downward, that is, a height of the camera can be adjusted, and then, by adjusting the stretching of the cylinder, a right part of an outer surface of the camera can be pushed to move down or up, that is, a tilt angle of the camera can be adjusted; and

20 Step 5. sensing a fault, wherein whether there is smoke in the data center computer room can be sensed by the smoke sensor, wherein when smoke is sensed, the smoke sensor transmits data to the alarm device, the alarm device emits a sound to carry out an alarm, and then temperature of the data center computer room can be sensed by a temperature sensor, and whether the equipment in the data center computer room has fault can be determined based on whether the sensed temperature exceeds a set value.

As an optional improvement to the above technical solution, the step of driving through a belt the moving wheel to rotate thereby driving the whole device to move on the track may comprise:

30 making, through the belt driving the driven wheel to rotate, the two driving shafts drive respectively the two moving wheels to rotate together, so that the moving wheels move in the moving groove, so as to drive the whole device to move on the track.

35 As an optional improvement to the above technical solution, while the whole device moves on the track, the limit block and the limit wheel slide respectively on the limit strip and the limit groove to limit a position of the whole device.

As an optional improvement to the above technical solution, when the regulation motor drives the regulation gear to rotate, the fixed shaft ensures stability of the regulation gear during rotation; and when the telescopic controller drives the regulation mechanism and the camera to rotate together,

stability of the camera during movement is ensured through the universal wheel moving at a lower end of the control box.

5 As an optional improvement to the above technical solution, when the telescopic controller extends and pushes the fixed frame downward, the multi-stage telescopic rod also extends to limit a position of the fixed frame, and stability of the fixed frame during movement is ensured through elasticity of a spring.

10 As an optional improvement to the above technical solution, the sensing mechanism can be disassembled from the fixed support through screws on the connection frame, to remove and replace the smoke sensor.

15 As an optional improvement to the above technical solution, when the temperature sensor senses that the temperature exceeds a set value, the camera is adjusted through the display to a position with higher sensed temperature and performs shooting, and it is determined, by cooperating with the camera, whether the equipment in the data center computer room has fault.

Compared with the prior art, the present disclosure has the following beneficial effects.

20 1. In the present disclosure, by setting the track, the moving mechanism and the driving mechanism, the inspection trail of the device can be arranged through the track, and then the moving wheel is driven to rotate by the driver, thereby driving the camera and the sensing mechanism to move on the track for inspection, realizing a comprehensive inspection on the equipment in the computer room, strengthening the inspection effect of the device for the computer room, and improving the practicability of the device.

25 2. In the present disclosure, the height of the camera can be adjusted by increasing the expansion and contraction of the telescopic controller, through setting up the control box, the regulation mechanism and the limit mechanism, and then the regulation gear is driven to rotate, through the regulation motor, and the shooting angle of the camera head may be adjusted by the meshing transmission between the regulation gear and the large gear, and then the tilt angle of the camera can be adjusted by the extension of the regulation cylinder, thereby expanding the shooting range of the camera head and making the camera head more comprehensively shoot.

35 3. In the present disclosure, by providing the sensing mechanism, the smoke sensor can sense whether there is smoke in the data center computer room. When the smoke is sensed, the alarm device will give an alarm, and at the same time, the temperature sensor can sense whether the temperature in the computer room exceeds the set value. It can be judged whether the equipment in the data center computer room is faulty, thereby enhancing the perception speed of the equipment for a fault, comprehensively perceiving the faults of the equipment in the computer room, and improving the working efficiency of the device.

Brief Description of Drawings

In order to explain the technical solutions of the embodiments of the present disclosure more clearly, the drawings used in the description of the embodiments will be briefly introduced below. Obviously, the drawings in the following description only show some embodiments of the present disclosure. For those skilled in the art, other drawings can also be obtained from these drawings without any creative efforts.

FIG. 1 is a schematic diagram of the overall structure of a device and method for quickly sensing faults of equipment in a data center computer room according to the present disclosure;

FIG. 2 is a schematic structural diagram of a track of a device for quickly sensing faults of equipment in a data center computer room according to the present disclosure;

FIG. 3 is a schematic structural diagram of a moving mechanism of a device for quickly sensing faults of equipment in a data center computer room according to the present disclosure;

FIG. 4 is a schematic structural diagram of a driving mechanism of a device for quickly sensing faults of equipment in a data center computer room according to the present disclosure;

FIG. 5 is a schematic sectional structural diagram of a control box of a device for quickly sensing faults of equipment in a data center computer room according to the present disclosure;

FIG. 6 is a schematic diagram of a combination of a regulation mechanism, a control box, a telescopic controller and a camera head of a device for quickly sensing faults of equipment in a data center computer room according to the present disclosure;

FIG. 7 is a schematic structural diagram of a limit mechanism of a device for quickly sensing faults of equipment in a data center computer room according to the present disclosure; and

FIG. 8 is a schematic structural diagram of a sensing mechanism of a device for quickly sensing faults of equipment in a data center computer room according to the present disclosure.

In the drawings: 1, track; 2, moving mechanism; 3, control box; 4, regulation mechanism; 5, camera; 6, camera head; 7, fixed support; 8, sensing mechanism; 9, mounting frame; 10, mounting hole; 11, display; 12, telescopic controller; 13, limit strip; 14, fixed groove; 15, moving groove; 16, limit groove; 21, fixed plate; 22, supporting plate; 23, protection cover; 24, limit block; 25, driving mechanism; 26, mounting groove; 27, connecting rod; 28, limit wheel; 251,

driver; 252, driving wheel; 253, belt; 254, driven wheel; 255, driving shaft; 256, moving wheel; 31, regulation motor; 32, regulation gear; 33, fixed shaft; 34, large gear; 35, regulation shaft; 41, fixed frame; 42, regulation cylinder; 43, limit mechanism; 44, connecting plate; 45, temperature sensor; 431, limit cylinder; 432, multi-stage telescopic rod; 433, spring; 434, universal wheel; 81, casing; 82, heat isolation plate; 83, smoke sensor; 84, smoke inlet hole; 85, alarm device; 86, connecting frame; 87, screw.

Detailed Description of Embodiments

In order to make the technical means, creative features, achieved goals and effects realized by the present disclosure easy to be understood, the present disclosure will be further described below with reference to specific embodiments.

In the description of the present disclosure, it should be noted that the orientation or position relationship, indicated by the terms, "upper", "lower", "inner", "outer", "front end", "rear end", "two ends", "one end", "the other end" etc., is based on the orientation or position relationship shown in the drawings, which is only for the convenience of describing the present disclosure and simplifying the description, rather than indicating or implying that the referred device or element must be at a specific orientation, or configured and operated at the specific orientation, and therefore cannot be construed as limitation on the present disclosure. Furthermore, the terms, "first" and "second", are used for descriptive purposes only and should not be construed as indicating or implying importance of the relativity.

In the description of the present disclosure, it should be noted that, unless expressly specified and limited otherwise, the terms, "installation", "provided with", "connection", etc. should be understood in a broad sense. For example, "connection" may be a fixed connection, a detachable connection or an integral connection. It can be a mechanical connection or an electrical connection. It can be a direct connection, an indirect connection through an intermediate medium, or the internal communication between the two components. For those skilled in the art, the specific meanings of the above terms in the present disclosure can be understood in specific situations.

Technical solutions of the present disclosure will be further described below with reference to the drawings.

As shown in FIGS. 1-8, a device for quickly sensing faults of equipment in a data center computer room comprises a track 1. A moving mechanism 2 is slidably connected to the lower part of the outer surface of the track 1, and a control box 3 is fixedly connected to the lower end of the moving mechanism 2. A telescopic controller 12 is movably connected to the middle part of the lower end of the control box 3 through a bearing. The regulation mechanism 4 is insertedly fixedly connected to the upper part of the outer surface of the

telescopic controller 12, and the lower part of the outer surface of the regulation mechanism 4 is movably connected with the camera 5. The front and rear parts of the left end of the camera 5 are each provided with a camera head 6. The middle part of the front end of the control box 3 is fixedly connected with a display 11. A front part of an upper side and a rear part of the upper side of the moving mechanism 2 are each fixedly connected with a fixed support 7, and the two fixed supports 7 are respectively located on the front and rear sides of the track 1. A sensing mechanism 8 is insertedly fixedly connected to each of the middle parts of the upper frame walls of the two fixed supports 7. The middle part of the upper end of the track 1 is fixedly connected with several mounting frames 9 by bolts. The middle parts of the upper frame walls and the middle parts of the lower frame walls of several mounting frames 9 are each provided with several mounting holes 10. The upper part of the front end, the lower part of the front end, the lower part of the rear end and the upper part of the rear end of the track 1 are each fixedly connected with a Limit strip 13. The middle part of the front end and the middle part of the rear end of the track 1 are each formed with a fixed groove 14. The middle part of the upper groove wall and the middle part of the lower groove wall of the two fixed grooves 14 are formed each with a moving groove 15, and the middle part of the lower end of the track 1 is formed with a limit groove 16.

The moving mechanism 2 comprises a fixed plate 21. The front part of the upper end and the rear part of the upper end of the fixed plate 21 are each fixedly connected with a supporting plate 22. The peripheries of surfaces of the two supporting plates 22 away from each other are each fixedly connected with a protection cover 23. The left part of the opposite surfaces and the right part of the opposite surfaces of the two supporting plates 22 are each fixedly connected to a limit block 24. A driving mechanism 25 is insertedly movably connected to each of the middle parts of the surfaces of the two supporting plates 22 away from each other. The middle part of the upper end of the fixed plate 21 is provided with a mounting groove 26. Three connecting rods 27 are jointly fixedly connected between the upper part of the front groove wall and the upper part of the rear groove wall of the mounting groove 26. The upper parts of the outer surfaces of the three connecting rods 27 are each insertedly movably connected with a limit wheel 28 through the bearing, and four limit blocks 24 are respectively slidably connected with the corresponding four limit strips 13.

The driving mechanism 25 comprises a driver 251, the output end of the driver 251 is insertedly fixedly connected with a driving wheel 252, a belt 253 is sleeved on the middle part of the outer surface of the driving wheel 252, and a driven wheel 254 is sleeved at the right part of the belt 253. The middle part of the rear end of the driven wheel 254 and the middle part of the rear end of the driving wheel 252 are each movably connected with the front end of the supporting plate 22 at the front, through a bearing. A driving shaft 255 is insertedly fixedly connected to each of the middle part of the rear end of the driven wheel 254 and the middle part of the rear end of the driving wheel 252.

Each of the rear ends of the two driving shafts 255 penetrates through the front end of the supporting plate 22 at the front and is insertedly fixedly connected with the moving wheel 256, and the two moving wheels 256 are both slidably connected with the two moving grooves 15 on the front side. Each of the front parts of the outer surfaces of the two driving shafts 255 is movably connected to the rear end of the supporting plate 22 at the front side through a bearing. The front end of the driver 251 is fixedly connected to the front cover wall of the protection cover 23 at the front side. The lower end of the moving wheel 256 is in contact with the lower groove wall of the moving groove 15 at the lower side.

10 The diameter length of the moving wheel 256 is smaller than the distance from the upper groove wall of the moving groove 15 at the upper side to the lower moving groove 15 at the lower side. The upper end of the limit wheel 28 is in contact with the upper groove wall of the limit groove 16. The diameter length of the limit wheel 28 is smaller than the distance between the upper groove wall of the limit groove 16 and the lower groove wall of the mounting groove 26,

15 which can guide and limit the position of the moving mechanism 2, to ensure stability and smoothness of the moving mechanism 2 when moving on the track 1.

The rear part of the lower box wall of control box 3 is fixedly connected with a regulation motor 31, the output end of the regulation motor 31 is insertedly fixedly connected with a regulation gear 32, and a fixed shaft 33 is insertedly fixedly connected to the middle part of the upper end of the regulation gear 32. The upper end of the fixed shaft 33 is movably connected with the upper box wall of the control box 3 through the bearing, the middle part of the front end of the regulation gear 32 is meshed with the large gear 34, the regulation shaft 35 is insertedly fixedly connected to the middle part of the upper end of the large gear 34, and the lower end of the regulation shaft 35 penetrates through the lower box wall of the control box 3 and is fixedly connected to the upper end of the telescopic controller 12. The upper end and the lower part of the outer surface of the regulation shaft 35 are movably connected to the upper box wall and the lower box wall of the control box 3 respectively through bearings.

The regulation mechanism 4 comprises a fixed frame 41, the middle part of the right end of the fixed frame 41 is movably connected with an adjustment cylinder 42 through a connecting seat, and one end of the adjustment cylinder 42 away from the fixed frame 41 is movably connected with the right part of an upper end of the camera 5 through the connecting seat. Each of the front part of the upper end and the rear part of the upper end of the fixed frame 41 is fixedly connected to the limit mechanism 43, and a connecting plate 44 is jointly insertedly fixedly connected between the upper parts of the outer surfaces of the two limit mechanisms 43. The middle part of the upper end of the connecting plate 44 is insertedly fixedly connected to the upper part of the outer surface of the telescopic controller 12. The upper part of the front end and the upper part of the rear end of the fixed frame 41 are each fixedly connected with a temperature sensor 45. The lower part of the box frame wall and the lower part of the rear

frame wall of the fixed frame 41 are insertedly movably connected with the middle part of the front end and the middle part of the rear end of the camera 5 through the movable shaft.

5 The limit mechanism 43 comprises a limit cylinder 431, a multi-stage telescopic rod 432 is insertedly movably connected to the middle part of the lower cylinder wall of the limit cylinder 431, and the lower end of the multi-stage telescopic rod 432 penetrates through the upper end of the connecting plate 44 and is fixedly connected with the upper end of the fixed frame 41. A spring 433 is sleeved on the outer surface of the multi-stage telescopic rod 432, the middle part of the upper end of the limit cylinder 431 is movably connected with a universal wheel 434 through a bearing, and the lower end of the limit cylinder 431 is fixedly connected with the upper end of the connecting plate 44. The upper end of the universal wheel 434 is in contact with the lower end of the control box 3, which improves the stability of the camera 5 when being rotatably adjusted. The diameter length of the spring 433 is greater than the diameter length of the upper end face of the multi-stage telescopic rod 432. The temperature sensor 45 and the camera 5 are both electrically connected with the display 11. When the temperature sensor 45 senses that the temperature exceeds the set value, the camera 5, under control of the display 11, can be adjusted to a sensing position for shooting. With the help of the camera 5, the sensing position can be obtained in time to determine the fault of the equipment, and the diameter length of the regulation gear 32 is smaller than that of the large gear 34. When the regulation gear 32 rotates by two rounds, the large gear 34, being engaged, can be rotated for one round, thereby slowing down the rotation speed of the telescopic controller 12 and improving the stability of the camera 5.

30 The sensing mechanism 8 comprises a casing 81, a heat isolation plate 82 is fixedly connected to the middle part of the inner casing wall of the casing 81, a smoke sensor 83 is fixedly connected to the middle part of the lower end of the heat isolation plate 82, and an alarm device 85 is movably connected to the middle part of the upper end of the heat isolation plate 82. The lower part of the outer surface of the casing 81 is provided with a number of smoke inlet holes 84. The upper end of the casing 81 is fixedly connected with a connection frame 86. The screws 87 are insertedly movably connected to each of the left part of the upper end and the right part of the upper end of the connection frame 86. The connection frame 86 is insertedly fixedly connected with the upper frame wall of the fixed support 7 through two screws 87. The smoke sensor 83 is electrically connected with the alarm device 85. When the smoke sensor 83 senses smoke, the alarm device 85 can be controlled to emit an alarm sound for alarming. The upper end face of the connection frame 86 is lower than the upper end face of the mounting frame 9, so that the connection frame 86 does not contact the roof of the computer room, which does not affect the movement of the connection frame 86.

A method for using a device for quickly sensing faults of equipment in a data center computer room, comprising the following steps.

Step 1. mounting the device, wherein the trail of the track 1 can be arranged through the layout of the computer room, facilitating that the device can inspect each device in the computer room, and then the track 1 can be mounted onto the roof of the data center computer room through the several mounting holes 10 on the mounting frame 9, and then it is convenient for the device to move according to the planned route, through the arranged inspection trail of the track 1, so that the equipment in the data center computer room can be inspected comprehensively, and then the stability and smoothness of the movement of the moving mechanism 2 on the track 1 are ensured, through the position limiting by the limit strip 13 and the limit groove 16.

Step 2. moving the device, wherein the driver 251 is started, the driving wheel 252 is driven to rotate through the driver 251, and then the driven wheel 254 is driven to rotate through the belt 253, so that the two driving shafts 255 can respectively drive the two moving wheels 256 to rotate together, and thereby the moving wheel 256 is moved in the moving groove 15, and the whole device is driven to move on the track 1 together. At the same time, the limit block 24 and the limit wheel 28 also slide in the limit strip 13 and the limit groove 16, respectively, which can limit the position of the whole device, improving the stability of the device during the movement process, and then through the camera 5 and the sensing mechanism 8, the equipment in the data center computer room can be inspected during movement. The comprehensive inspection on the equipment in the computer room is realized, and the inspection effect of the device is strengthened and the practicability of the device is improved.

Step 3. rotating by an angle, wherein the regulation motor 31 is started, the regulation gear 32 is driven to rotate through the regulation motor 31, and the stability of the regulation gear 32 during rotation is ensured through the fixed shaft 33, and then through the meshing transmission between the regulation gear 32 and the large gear 34, it can be made that the regulation shaft 35 drives the telescopic controller 12 to rotate slowly, which can drive the regulation mechanism 4 and the camera 5 to rotate slowly together, and then the stability of the camera 5 during movement is ensured through the universal wheel 434 moving at the lower end of the control box 3, which therefore facilitates to rotate the camera head 6 and adjust the shooting angle thereof, expanding the shooting range of the camera head 6 and making the camera head 6 shoot more comprehensively.

Step 4. adjusting the angle, wherein the telescopic controller 12 is started, the fixed frame 41 is pushed downward through the telescopic controller 12, and the multi-stage telescopic rod 432 also extends accordingly, to limit the position of the fixed frame 41, and the stability of the fixed frame 41 during movement is ensured by the elasticity of the spring 433, so that the height of the camera 5 can be stably adjusted, and then by adjusting the expansion and contraction of the cylinder 42, the right part of the outer surface of the camera 5 can be pushed and pulled to move downward or upward, that is, the tilt angle of the camera 5 is

changed, thereby facilitating the adjustment on the height and angle of the camera 5 and improving the flexibility of the camera 5.

Step 5. sensing a fault, wherein whether there is smoke in the data center computer room can be sensed by the smoke sensor 83. When there is smoke in the computer room, the smoke moves upward and enters the casing 81 through the smoke inlet hole 84. At this time, the smoke sensor 83 senses smoke, and send the data to the alarm device 85, and then the alarm device 85 sounds to alarm. Meanwhile, the sensing mechanism 8 can be disassembled from the fixed support 7 through the screw 87 on the connection frame 86, which is beneficial to disassemble and replace the smoke sensor 83, and then the temperature sensor 45 can sense the temperature of the data center computer room. It can be sensed whether the temperature exceeds the set value, and the camera 5 can be adjusted through the display 11 to a position with a higher sensed temperature, for shooting. Cooperating with the camera 5, it is determined whether the equipment in the data center computer room is faulty, which enhances the perception speed of the device for faults, so that the device can automatically monitor situation of the equipment in the computer room in real time, which is convenient for monitoring the smoke and temperature, and can effectively prevent fires, improve the safety factor, and also increase the inspection efficiency of the device.

The basic principles and main features of the present disclosure and advantages of the present disclosure are shown and described in the above. Those skilled in the art should understand that the present disclosure is not limited by the above-mentioned embodiments. Only the principles of the present disclosure are described and illustrated in the above-mentioned embodiments and the specification. Without departing from the spirit and scope of the present disclosure, the present disclosure will be subject to various changes and modifications, all of which fall within the protection scope of the claimed disclosure. The protection scope claimed by the present disclosure is defined by the appended claims and their equivalents.

Industrial Applicability

The present application provides a device and method for quickly sensing faults of equipment in a data center computer room. In the present disclosure, through providing a track, a moving mechanism and a driving mechanism, the inspection trail of the device can be arranged through the track, and then the moving wheel can be driven by the driver to rotate, so as to drive the camera and the sensing mechanism to move on the track for inspection, which realizes a comprehensive inspection on the equipment in the computer room, strengthens the inspection effect of the device for the computer room, and improves the practicability of the device. Through providing the control box, the regulation mechanism and the limit mechanism, the height of the camera can be adjusted by increasing expansion and contraction of the telescopic controller, and then the regulation gear is driven to rotate by the regulation motor, and the shooting

angle of the camera head can be adjusted by the meshing transmission between the regulation gear and the large gear, and then the tilt angle of the camera can be adjusted by the extension of the regulation cylinder, thereby expanding the shooting range of the camera head and making the shooting of the camera head more comprehensive. Through providing the sensing mechanism, the smoke sensor can sense whether there is smoke in the data center computer room. When smoke is detected, the alarm device will give an alarm. At the same time, the temperature sensor can sense whether the temperature in the computer room exceeds the set value, and it can be judged whether the equipment in the data center computer room is faulty, thereby enhancing the perception speed of the device for faults. It can fully perceive the faults of the equipment in the computer room, and thus improve the working efficiency of the device.

In addition, it can be understood that the device and method for rapidly sensing faults of equipment in the data center computer room of the present application are reproducible, and can be used in various industrial applications. For example, the device and method for quickly sensing faults of equipment in a data center computer room of the present application can be used in the technical field of sensing faults of equipment.

Claims

1. A device for quickly sensing faults of equipment in a data center computer room, comprising a track (1), wherein a moving mechanism (2) is slidably connected at a lower part of an outer surface of the track (1), a control box (3) is fixedly connected to an lower end of the moving mechanism (2), a telescopic controller (12) is movably connected to a middle part of an lower end of the control box (3) through a bearing, a regulation mechanism (4) is insertedly fixedly connected to an upper part of an outer surface of the telescopic controller (12), a camera (5) is movably connected to a lower part of an outer surface of the regulation mechanism (4), a camera head (6) is provided at each of a front part of a left end and a rear part of the left end of the camera (5), a display (11) is fixedly connected to a middle part of a front end of the control box (3), a fixed support (7) is fixedly connected to each of a front part of an upper end and a rear part of the upper end of the moving mechanism (2), two fixed supports (7) are respectively located at front and rear sides of the track (1), an sensing mechanism (8) is insertedly fixedly connected to each of a middle part of an upper frame wall of the two fixed supports (7), several mounting frames (9) are fixedly connected to a middle part of an upper end of the track (1) with by bolts, several mounting holes (10) are formed at a middle part of a upper frame wall and a middle part of a lower frame wall of each of the several mounting frames (9), a limit strip (13) is fixedly connected to each of an upper part of a front end, a lower part of the front end, a lower part of a rear end and a upper part of the rear end of the track (1), a fixed groove (14) is formed in each of a middle part of the front end and a middle part of the rear end of the track (1), a moving groove (15) is formed in each of a middle part of an upper groove wall and a middle part of a lower groove wall of two fixed grooves (14), and a limit groove (16) is formed in a middle part of a lower end of the track (1); and
 - the moving mechanism (2) comprises a fixed plate (21), and a supporting plate (22) is fixedly connected to each of a front part of an upper end and a rear part of the upper end of the fixed plate (21), a protection cover (23) is fixedly connected to each of peripheries of opposite surfaces of two supporting plates (22), a limit block (24) is fixedly connected to each of left and right parts of surfaces of the two supporting plates (22) facing to each other, a driving mechanism (25) is movably connected, through insertion, to each of middle parts of opposite surfaces of the two supporting plates (22), a mounting groove (26) is formed in a middle part of the upper end of the fixed plate (21), three connecting rods (27) are jointly fixedly connected between an upper part of a front groove wall and an upper part of a rear groove wall of the mounting groove (26), a limit wheel (28) is movably connected, through insertion by a bearing, to an upper part of an outer surface of each of the three connecting rods (27), and four limit

blocks (24) are respectively slidably connected with corresponding four limit strips (13).

2. The device for quickly sensing faults of equipment in a data center computer room according to claim 1, wherein the driving mechanism (25) comprises a driver (251), the driver (251) has an output end which is insertedly fixedly connected with a driving wheel (252), a belt (253) is sleeved on a middle part of an outer surface of the driving wheel (252), a driven wheel (254) is sleeved on a right part of the belt (253), each of a middle part of a rear end of the driven wheel (254) and a middle part of a rear end of the driving wheel (252) is movably connected, through a bearing, to a front end of a supporting plate (22) on the front, a driving shaft (255) is insertedly fixedly connected to each of the middle part of the rear end of the driven wheel (254) and the middle part of the rear end of the driving wheel (252), each of rear ends of two driving shafts (255) penetrates through the front end of the supporting plate (22) on the front and is insertedly fixedly connected with a moving wheel (256), each of two moving wheels (256) is slidably connected with two moving grooves (15) on the front, each of front parts of outer surfaces of the two driving shafts (255) is movably connected to a rear end of the supporting plate (22) on the front through a bearing, and a front end of the driver (251) is fixedly connected with a front cover wall of a protection cover (23) on the front.
3. The device for quickly sensing faults of equipment in a data center computer room according to claim 1 or 2, wherein a regulation motor (31) is fixedly connected to a rear part of a lower box wall of the control box (3), a regulation gear (32) is insertedly fixedly connected to an output end of the regulation motor (31), a fixed shaft (33) is insertedly fixedly connected to a middle part of an upper end of the regulation gear (32), an upper end of the fixed shaft (33) is movably connected with an upper box wall of the control box (3) through a bearing, an middle part of a front end of the regulation gear (32) is meshed with a large gear (34), a regulation shaft (35) is insertedly fixedly connected to a middle part of an upper end of the large gear (34), a lower end of the regulation shaft (35) penetrates through the lower box wall of the control box (3) and is fixedly connected with an upper end of the telescopic controller (12), and an upper end and a lower part of an outer surface of the regulation shaft (35) are each movably connected with an upper box wall and the lower box wall of the control box (3) respectively, through a bearing.
4. The device for quickly sensing faults of equipment in a data center computer room according to claim 3, wherein the regulation mechanism (4) comprises a fixed frame (41), a middle part of a right end of the fixed frame (41) is movably connected with a regulation cylinder (42) through a connecting seat, one end of the regulation cylinder (42) away from the fixed frame (41) is movably connected with a right part of an upper end of a camera (5) through a connecting seat, a front part of an

upper end and a rear part of the upper end of the fixed frame (41) are each fixedly connected with a limit mechanism (43), a connecting plate (44) is insertedly fixedly connected between upper parts of outer surfaces of two limit mechanisms (43), a middle part of an upper end of the connecting plate (44) and an upper part of an outer surface of the telescopic controller (12) are insertedly fixedly connected, each of an upper part of a front end and an upper part of a rear end of the fixed frame (41) is fixedly connected with a temperature sensor (45), and each of a lower part of a box frame wall and a lower part of a rear frame wall of the fixed frame (41) is insertedly movably connected with a middle part of a front end and a middle part of a rear end of the camera (5) through a movable shaft.

5. The device for quickly sensing faults of equipment in a data center computer room according to claim 4, wherein the limit mechanism (43) comprises a limit cylinder (431), a multi-stage telescopic rod (432) is insertedly movably connected to a middle part of a lower cylinder wall of the limit cylinder (431), a lower end of the multi-stage telescopic rod (432) runs through the upper end of the connecting plate (44) and is fixedly connected with the upper end of the fixed frame (41), a spring (433) is sleeved on an outer surface of the multi-stage telescopic rod (432), a middle part of an upper end of the limit cylinder (431) is movably connected with a universal wheel (434) through a bearing, and a lower end of the limit cylinder (431) is fixedly connected with the upper end of the connecting plate (44).

6. The device for quickly sensing faults of equipment in a data center computer room according to any one of claims 1 to 5, wherein the sensing mechanism (8) comprises a casing (81), a middle part of an inner casing wall of the casing (81) is fixedly connected with a heat insulation plate (82), a middle part of a lower end of the heat insulation plate (82) is fixedly connected with a smoke sensor (83), a middle part of an upper end of the heat insulation plate (82) is movably connected with an alarm device (85), a plurality of smoke inlet holes (84) are formed in a lower part of an outer surface of the casing (81), a connection frame (86) is fixedly connected to an upper end of the casing (81), each of a left part of an upper end and a right part of the upper end of the connection frame (86) is insertedly movably connected with a screw (87), and the connection frame (86) is insertedly fixedly connected with an upper frame wall of the fixed support (7) through two screws (87).

7. The device for quickly sensing faults of equipment in a data center computer room according to any one of claims 2 to 5, wherein a lower end of the moving wheel (256) contacts a lower groove wall of a moving groove (15) at a lower side, a diameter length of the moving wheel (256) is smaller than a distance from an upper groove wall of a moving groove (15) on an upper side to the moving groove (15) on the lower side, an upper end of the limit wheel (28) contacts an upper groove wall of the

limit groove (16), and a diameter length of the limit wheel (28) is smaller than a distance from the upper groove wall of the limit groove (16) to a lower groove wall of the mounting groove (26).

- 5 8. The device for quickly sensing faults of equipment in a data center computer room according to claim 5, wherein an upper end of the universal wheel (434) is in contact with a lower end of the control box (3), a diameter length of the spring (433) is greater than a diameter length of an upper end face of the multi-stage telescopic rod (432), the temperature sensor (45) and the camera (5) are each electrically connected with a display (11), and a diameter length of the regulation gear (32) is greater than a diameter length of the large gear (34).
- 10 9. The device for quickly sensing faults of equipment in a data center computer room according to claim 6, wherein the smoke sensor (83) is electrically connected to the alarm device (85), and an upper end face of the connection frame (86) is lower than an upper end face of the mounting frame (9).
- 15 10. A use method of the device for quickly sensing faults of equipment in a data center computer room according to any one of claims 1-9, comprising following steps:

20 step 1, mounting a device, wherein the track (1) is mounted onto a roof of the data center computer room through the mounting holes (10) on the mounting frame (9), and an inspection trail of the device is arranged through the track (1), so as to facilitate the device to move on the track (1) fixed, which can conduct a comprehensive inspection on the equipment in the data center computer room, and then ensure stability and smoothness of movement of the moving mechanism (2) on the track (1) through the limit strip (13) and the limit groove (16);

25 step 2, moving the device, wherein a driver (251) is started, so as to drive through the driver (251) a driving wheel (252) to rotate, and then drive through a belt (253) a moving wheel (256) to rotate, thereby driving the whole device to move on the track (1), and then using the camera (5) and the sensing mechanism (8) to make inspection on the data center computer room, while moving;

30 step 3, rotating by an angle, wherein a regulation motor (31) is started, so as to drive through the regulation motor (31) a regulation gear (32) to rotate, and then make the telescopic controller (12) to drive the regulation mechanism (4) and the camera (5) to rotate together, by a meshing transmission between the regulation gear (32) and a large gear (34), so that a shooting angle of the camera head (6) can be adjusted and a shooting range of the camera head (6) can be expanded;

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step 4, adjusting an angle, wherein the telescopic controller (12) is started to make the telescopic controller (12) stretch and push a fixed frame (41) downward, that is, a height of the camera (5) is adjusted, and then, by adjusting expansion and contraction of a cylinder (42), a right part of an outer surface of the camera (5) is pushed and pulled to move down or up, that is, a tilt angle of the camera (5) can be adjusted; and

step 5, sensing a fault, wherein whether smoke exists in the data center computer room is sensed by a smoke sensor (83), wherein when smoke is sensed, the smoke sensor (83) transmits data to an alarm device (85), the alarm device (85) emits a sound to carry out an alarm, and then temperature of the data center computer room is sensed by a temperature sensor (45), and whether the equipment in the data center computer room has fault is determined based on whether a sensed temperature exceeds a set value.

11. The use method according to claim 10, wherein the step of driving through a belt (253) a moving wheel (256) to rotate, thereby driving the whole device to move on the track (1) comprises:

making, through the belt (253) driving a driven wheel (254) to rotate, two driving shafts (255) drive respectively two moving wheels (256) to rotate together, so that the moving wheels (256) move in moving grooves (15), so as to drive the whole device to move on the track (1).

12. The use method according to claim 10 or 11, wherein while the whole device moves on the track (1), the limit block (24) and the limit wheel (28) slide respectively on the limit strip (13) and the limit groove (16) to limit a position of the whole device.

13. The use method according to any one of claims 10 to 12, wherein when the regulation motor (31) drives the regulation gear (32) to rotate, a fixed shaft (33) ensures stability of the regulation gear (32) during rotation; and when the telescopic controller (12) drives the regulation mechanism (4) and the camera (5) to rotate together, stability of the camera (5) during movement is ensured through the universal wheel (434) moving at a lower end of the control box (3).

14. The use method according to any one of claims 10 to 13, wherein when the telescopic controller (12) extends and pushes the fixed frame (41) downward, a multi-stage telescopic rod (432) also extends to limit a position of the fixed frame (41), and stability of the fixed frame (41) during movement is ensured through elasticity of a spring (433).

15. The use method according to any one of claims 10 to 14, wherein the sensing mechanism (8) can be disassembled from the fixed support (7) through screws (87) on a connection frame (86), to remove and replace the smoke sensor (83).

16. The use method according to any one of claims 10 to 15, wherein when the temperature sensor (45) senses that a temperature exceeds the set value, the camera (5) is adjusted through the display (11) to a position with higher sensed temperature and performs shooting, and it is determined, by cooperating with the camera (5), whether the equipment in the data center computer room has fault.
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