

# US Patent & Trademark Office

## Patent Public Search | Text View

United States Patent Application Publication

20250256305

Kind Code

A1

Publication Date

August 14, 2025

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### CLEANING DEVICE

#### Abstract

A cleaning device is provided. The cleaning device includes a cleaning assembly, a driving controlling assembly, a bottom plate and a diagnosis feeding-back assembly; both of the cleaning assembly and the driving controlling assembly are fixed on the bottom plate, and the driving controlling assembly and the cleaning assembly are connected; the bottom plate is provided with a cleaning through slot, the diagnosis feeding-back assembly is connected to the bottom plate, and the diagnosis feeding-back assembly is configured to detect a relative position between the current-collection box and the bottom plate, and configured to detect a power-on state of the current-collection box; and when it is detected by the diagnosis feeding-back assembly that the current-collection box is located at a bottom of the bottom plate, the driving controlling assembly drives the cleaning assembly to, by using the cleaning through slot, remove a foreign matter on the current-collection box.

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<b>Appl. No.:</b>	18/702408
<b>Filed (or PCT Filed):</b>	April 28, 2023
<b>PCT No.:</b>	PCT/CN2023/091706

# Foreign Application Priority Data

CN

202210603792.6

May. 27, 2022

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## Publication Classification

**Int. Cl.:** **B08B1/32** (20240101); **B08B1/12** (20240101); **B08B5/04** (20060101); **B08B13/00** (20060101)

**U.S. Cl.:**

**CPC** **B08B1/32** (20240101); **B08B1/12** (20240101); **B08B5/04** (20130101); **B08B13/00** (20130101);

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## Background/Summary

### CROSS REFERENCE TO RELEVANT APPLICATIONS

[0001] The present application claims the priority of the Chinese patent application filed on May 27, 2022 before the Chinese Patent Office with the application number of 202210603792.6 and the title of “CLEANING DEVICE”, which is incorporated herein in its entirety by reference.

### TECHNICAL FIELD

[0002] The present disclosure relates to the technical field of automated equipment and, more particularly, to a cleaning device.

### BACKGROUND

[0003] A current-collection box is an integrated component used to supply power for the tooling plate on an assembly line, and its power-on state directly decides whether the tooling plate on the assembly line is powered, which influences whether the tooling plate can supply the electric power on the assembly line for the display screen.

[0004] In the long-term usage of the current-collection box, the problems of smudge, grease and line damage easily emerge, therefore the current-collection box requires maintenance and periodical cleaning and diagnosis.

[0005] Currently, the cleaning and diagnosis of the current-collection boxes are usually done artificially. For the assembly lines using a large quantity of current-collection boxes, the artificial mode is time-consuming and labor-consuming, and has a low efficiency, thus the cleaning and diagnosis cannot be realized in a short time, and the current-collection box in an abnormal state cannot be detected artificially and quickly, which causes great difficulties for the subsequent operator to maintain and replace the current-collection box.

### SUMMARY

[0006] A cleaning device is provided by the embodiments of the present disclosure to solve the problem in the related art that the cleaning and the diagnosis of current-collection boxes is time-consuming and labor-consuming.

[0007] In order to solve the technical problem stated above, the present disclosure is realized as follows:

[0008] A cleaning device is provided by the embodiments of the present disclosure, configured for cleaning a current-collection box, wherein the cleaning device includes a cleaning assembly, a driving controlling assembly, a bottom plate and a diagnosis feeding-back assembly; [0009] both of the cleaning assembly and the driving controlling assembly are fixed on the bottom plate, and the

driving controlling assembly and the cleaning assembly are connected; [0010] the bottom plate is provided with a cleaning through slot, the diagnosis feeding-back assembly is connected to the bottom plate, and the diagnosis feeding-back assembly is configured to detect a relative position between the current-collection box and the bottom plate, and configured to detect a power-on state of the current-collection box; and [0011] when it is detected by the diagnosis feeding-back assembly that the current-collection box is located at a bottom of the bottom plate, the driving controlling assembly drives the cleaning assembly to, by using the cleaning through slot, remove a foreign matter on the current-collection box.

[0012] Optionally, the cleaning assembly includes a cleaning chain, a cleaning roller and a cleaning chain wheel, and the driving controlling assembly includes a driving chain wheel, a driving motor and a controller; [0013] the controller and the driving motor are connected, and the controller controls the driving motor to rotate; and [0014] a cleaning brush is fixed on a surface of the cleaning roller, the driving chain wheel is connected to an end of an output shaft of the driving motor, the cleaning chain is connected to the driving chain wheel and the cleaning chain wheel, and the cleaning chain wheel is fixed at an input end of the cleaning roller.

[0015] Optionally, the cleaning assembly further includes a cleaning hood body; and [0016] the cleaning hood body is covered on the cleaning roller.

[0017] Optionally, the cleaning device further includes a cleaning fixing seat and a cleaning supporting seat; and [0018] the cleaning roller is fixed on the cleaning fixing seat, and the cleaning fixing seat is fixed on the bottom plate via the cleaning supporting seat.

[0019] Optionally, the cleaning device further includes a cleaning vacuum cleaner; and [0020] the cleaning vacuum cleaner is in communication with the cleaning hood body, the cleaning vacuum cleaner is electrically connected to the controller, and the controller controls the cleaning vacuum cleaner to suck a foreign matter in the cleaning hood body.

[0021] Optionally, the cleaning assembly further includes a polishing chain, a polishing chain wheel and a polishing roller, and the driving chain wheel is a duplex chain wheel; [0022] the polishing roller and the cleaning roller are located at two sides of the driving motor; and [0023] a polishing brush is fixed on the cleaning roller, the polishing chain wheel is fixed at an input end of the polishing roller, the polishing chain is connected to the polishing chain wheel and the driving chain wheel, and the driving chain wheel is fixed at an end of the polishing roller.

[0024] Optionally, the cleaning assembly further includes a polishing hood body; and [0025] the polishing hood body is covered on the polishing roller.

[0026] Optionally, the cleaning device further includes a polishing fixing seat and a polishing supporting seat; and [0027] the polishing roller is fixed on the polishing fixing seat, and the polishing fixing seat is fixed on the polishing supporting seat.

[0028] Optionally, the cleaning device further includes a polishing vacuum cleaner, the polishing vacuum cleaner is in communication with the polishing hood body, the polishing vacuum cleaner is electrically connected to the controller, and the controller controls the polishing vacuum cleaner to suck a foreign matter inside the polishing hood body.

[0029] Optionally, the cleaning device further includes a diagnosis feeding-back assembly; [0030] the diagnosis feeding-back assembly includes an in-position travel switch and an off-position travel switch, the in-position travel switch and the off-position travel switch are fixed on the bottom plate, and the in-position travel switch and the off-position travel switch are electrically connected to the controller; and [0031] the in-position travel switch is configured to detect that the current-collection box is located at a first position of the bottom plate, and the off-position travel switch is configured to detect that the current-collection box is located at a second position of the bottom plate; [0032] wherein the first position refers to a position where the current-collection box and the bottom plate coincide in a first direction, and the second position refers to a position where the bottom plate is in stagger in the first direction, wherein the first direction refers to a direction perpendicular to the bottom plate.

[0033] Optionally, the diagnosis feeding-back assembly further includes a contactor, the bottom plate is provided with a cable, and the contactor is electrically connected to the cable; and [0034] the contactor is configured to detect the power-on state of the current-collection box.

[0035] Optionally, the diagnosis feeding-back assembly further includes a position marking component, and the position marking component is configured to mark a first target current-collection box, wherein the first target current-collection box refers to a current-collection box in a powering-off state.

[0036] Optionally, the diagnosis feeding-back assembly further includes an indicator lamp, the indicator lamp is electrically connected to the controller, and when it is detected by the contactor that the current-collection box is in a powering-off state, the indicator lamp is in a lightening state.

[0037] Optionally, the position marking component includes a straight-line driver and a marking pen; and [0038] the marking pen is fixed on the straight-line driver, and when it is detected by the contactor that the current-collection box is in the powering-off state, the straight-line driver drives the marking pen to make a mark on the current-collection box.

[0039] Optionally, the position marking component further includes a display panel; and [0040] the display panel is electrically connected to the current-collection box, and when the current-collection box is marked by the marking pen, the display panel displays a position of the current-collection box.

[0041] Optionally, the cleaning device further includes a protecting hood body; and [0042] the protecting hood body is covered on the diagnosis feeding-back assembly and the driving controlling assembly.

[0043] In the embodiments of the present disclosure, because both of the cleaning assembly and the driving controlling assembly are fixed on the bottom plate, in the washing of the current-collection box, the bottom plate can be moved to the top of the current-collection box, so that the cleaning assembly and the driving controlling assembly are located at the top of the current-collection box. Further, because the driving controlling assembly and the cleaning assembly are connected, and the bottom plate is provided with a cleaning through slot, when it is detected by the diagnosis feeding-back assembly that the current-collection box is located at the bottom of the bottom plate, the driving controlling assembly can drive the cleaning assembly to, by using the cleaning through slot, remove a foreign matter on the current-collection box, thereby the automated washing of the current-collection box is realized. In this way, in an aspect, by using the cleaning assembly and the driving controlling assembly, the process of washing the current-collection box can be time-saving and labor-saving, and the washing of the current-collection box can be completed within a short time, which facilitates to increase the efficiency of the washing of the current-collection box. In another aspect, the relative position between the cleaning device and the current-collection box can be determined accurately by using the diagnosis feeding-back assembly, so that the process of washing the current-collection box is more accurate and controllable, and the current-collection box in an abnormal state can be diagnosed quickly by using the diagnosis feeding-back assembly, thereby the current-collection box in an abnormal state is facilitated to be subsequently maintained and replaced.

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## Description

### BRIEF DESCRIPTION OF THE DRAWINGS

[0044] In order to more clearly illustrate the technical solutions of the embodiments of the present disclosure or the prior art, the figures that are required to be used to describe the embodiments or the prior art will be briefly introduced below. Apparently, the figures that are described below are some embodiments of the present disclosure, and a person skilled in the art can obtain other figures according to these figures without paying creative work.

[0045] FIG. 1 shows a schematic diagram of an exterior structure of a cleaning device according to an embodiment of the present disclosure;

[0046] FIG. 2 shows a schematic diagram of an interior structure of a cleaning device according to an embodiment of the present disclosure; and

[0047] FIG. 3 shows a schematic diagram of a bottom structure of a cleaning device according to an embodiment of the present disclosure.

#### REFERENCE NUMBERS

[0048] **1**: cleaning assembly; **2**: driving controlling assembly; **3**: bottom plate; **4**: diagnosis feeding-back assembly; **5**: protecting hood body; **11**: cleaning chain; **12**: cleaning roller; **13**: cleaning chain wheel; **14**: cleaning brush; **15**: cleaning hood body; **16**: cleaning fixing seat; **17**: cleaning supporting seat; **18**: cleaning vacuum cleaner; **19**: collecting box; **21**: driving chain wheel; **22**: driving motor; **23**: controller; **31**: cleaning through slot; **41**: in-position travel switch; **42**: off-position travel switch; **43**: contactor; **44**: position marking component; **45**: indicator lamp; **101**: polishing chain; **102**: polishing chain wheel; **103**: polishing roller; **104**: polishing brush; **105**: polishing hood body; **106**: polishing fixing seat; **107**: polishing supporting seat; **108**: polishing vacuum cleaner; **441**: straight-line driver; **442**: marking pen; and **443**: display panel.

#### DETAILED DESCRIPTION

[0049] The technical solutions according to the embodiments of the present disclosure will be clearly and completely described below with reference to the drawings according to the embodiments of the present disclosure. Apparently, the described embodiments are merely a certain embodiments of the present disclosure, rather than all of the embodiments. All of the other embodiments that a person skilled in the art obtains on the basis of the embodiments of the present disclosure without paying creative work fall within the protection scope of the present disclosure.

[0050] It should be understood that the “one embodiment” or “an embodiment” as used throughout the description means that particular features, structures or characteristics with respect to the embodiments are included in at least one embodiment of the present disclosure. Therefore, the “in one embodiment” or “in an embodiment” as used throughout the description does not necessarily refer to the same embodiment. Furthermore, those particular features, structures or characteristics may be combined in one or more embodiments in any suitable form.

[0051] A cleaning device is provided by the embodiments of the present disclosure. FIG. 1 shows a schematic diagram of an exterior structure of a cleaning device according to an embodiment of the present disclosure. FIG. 2 shows a schematic diagram of an interior structure of a cleaning device according to an embodiment of the present disclosure. FIG. 3 shows a schematic diagram of a bottom structure of a cleaning device according to an embodiment of the present disclosure. As shown in FIGS. 1, 2 and 3, the cleaning device is configured for cleaning a current-collection box, and includes a cleaning assembly **1**, a driving controlling assembly **2**, a bottom plate **3** and a diagnosis feeding-back assembly **4**. Both of the cleaning assembly **1** and the driving controlling assembly **2** are fixed on the bottom plate **3**, and the driving controlling assembly **2** and the cleaning assembly **1** are connected. The bottom plate **3** is provided with a cleaning through slot **31**, the diagnosis feeding-back assembly **4** is connected to the bottom plate **3**, and the diagnosis feeding-back assembly **4** is configured to detect the relative position between the current-collection box and the bottom plate **3**, and configured to detect a power-on state of the current-collection box. When it is detected by the diagnosis feeding-back assembly that the current-collection box is located at the bottom of the bottom plate, the driving controlling assembly **2** drives the cleaning assembly **1** to, by using the cleaning through slot **31**, remove a foreign matter on the current-collection box.

[0052] The bottom plate **3** is the supporting member for fixing the cleaning assembly **1** and the driving controlling assembly **2**. Various connectors and sockets may be disposed on the bottom plate **3**. In usage, the bottom plate **3** is moved along a predetermined trajectory, and accordingly moved to the top of the to-be-cleaned current-collection box, thereby the current-collection box is cleaned or detected. In addition, the bottom plate **3** may be manufactured directly by using the

tooling plate in an assembly line, which facilitates to save the manufacturing cost, and facilitates the maintenance in the later stage.

[0053] The cleaning assembly **1** disposed on the bottom plate **3** may include one set of cleaning member, for example, an automatic cleaning brush **14**, may also include a plurality of sets of cleaning members, for example, a cleaning roller **12** and a polishing roller **103** that are used together, or may include other device configured for cleaning the current-collection box, which is not limited in the embodiments of the present disclosure. The driving controlling assembly **2** is a device configured for driving and controlling the cleaning assembly **1** to perform the foreign-matter removal to the cleaning assembly **1**, and may include a driving element and a controlling element. The cleaning through slot **31** disposed in the bottom plate **3** should be corresponded to the position of the cleaning assembly **1** that is configured for removing the foreign matter, so that the position of the cleaning assembly **1** that is configured for removing the foreign matter can contact the current-collection box via the cleaning through slot **31**, thus, when the driving controlling assembly **2** drives the cleaning assembly **1** to move, the foreign matter on the current-collection box can be removed.

[0054] Additionally, in the embodiments of the present disclosure, the diagnosis feeding-back assembly **4** may be used to determine the relative position between the cleaning device and the current-collection box and detect whether the current-collection box is in an abnormal state. When it is detected by the diagnosis feeding-back assembly that the current-collection box is located at the bottom of the bottom plate, the driving controlling assembly **2** drives the cleaning assembly **1** to, by using the cleaning through slot **31**, remove the foreign matter on the current-collection box. In this way, the relative position between the cleaning device and the current-collection box can be determined accurately by using the diagnosis feeding-back assembly **4**, so that the process of washing the current-collection box is more accurate and controllable, and the power-on state of the current-collection box in an abnormal state can be diagnosed quickly by using the diagnosis feeding-back assembly **4**, thereby the function of detecting the state of the current-collection box is realized.

[0055] It can be seen from the above embodiments that, in the embodiments of the present disclosure, because both of the cleaning assembly **1** and the driving controlling assembly **2** are fixed on the bottom plate **3**, in the washing of the current-collection box, the bottom plate **3** can be moved to the top of the current-collection box, so that the cleaning assembly **1** and the driving controlling assembly **3** are located at the top of the current-collection box. Further, because the driving controlling assembly **2** and the cleaning assembly **1** are connected, and the bottom plate **3** is provided with a cleaning through slot **31**, when it is detected by the diagnosis feeding-back assembly **4** that the current-collection box is located at the bottom of the bottom plate **3**, the driving controlling assembly **2** can drive the cleaning assembly **1** to, by using the cleaning through slot **31**, remove a foreign matter on the current-collection box, thus the automated washing of the current-collection box is realized. Accordingly, in an aspect, by using the cleaning assembly **1** and the driving controlling assembly **3**, the process of washing the current-collection box can be time-saving and labor-saving, and the washing of the current-collection box can be completed within a short time, the efficiency of the washing of the current-collection box is facilitated to be increased. In another aspect, the relative position between the cleaning device and the current-collection box can be determined accurately by using the diagnosis feeding-back assembly **4**, so that the process of washing the current-collection box is more accurate and controllable, and the current-collection box in an abnormal state can be diagnosed quickly by using the diagnosis feeding-back assembly **4**, thereby the current-collection box in an abnormal state is facilitated to be subsequently maintained and replaced.

[0056] The specific structures of the cleaning assembly **1** and the driving controlling assembly **2** will be explained specifically below:

[0057] In some embodiments, the cleaning assembly **1** may include a cleaning chain **11**, a cleaning

roller **12** and a cleaning chain wheel **13**, and the driving controlling assembly **2** includes a driving chain wheel **21**, a driving motor **22** and a controller **23**. The controller **23** and the driving motor **22** are connected, and the controller **23** controls the driving motor **22** to rotate. The driving chain wheel **21** is connected to an end of the output shaft of the driving motor **22**, the cleaning chain **11** is connected to the driving chain wheel **21** and the cleaning chain wheel **13**, and the cleaning chain wheel **13** is fixed at the input end of the cleaning roller **12**.

[0058] It should be noted that the cleaning chain **11** is a metal chain of a chain link or a ring. In the assembling, the cleaning chain **11** is connected to the driving chain wheel **21** and the cleaning chain wheel **13**. Because the driving chain wheel **21** is connected to an end of the output shaft of the driving motor **22**, and the cleaning chain wheel **13** is fixed at the input end of the cleaning roller **12**, when the controller **23** controls the driving motor **22** to rotate, the output shaft of the driving motor **22** also rotates, and in turn drives the driving chain wheel **21** disposed at the end of the output shaft of the driving motor **22** to rotate. When the driving chain wheel **21** rotates, the cleaning chain **11** mounted to the driving chain wheel **21** can be rotated, so that the power transmitted by the cleaning chain **11** reaches the cleaning chain wheel **13**, thus the cleaning chain wheel **13** rotates. While the cleaning chain wheel **13** rotates, it drives the cleaning roller **12** to rotate, and accordingly the function of removing the foreign matter of the current-collection box is reached by the rotation of the cleaning roller **12**.

[0059] It should also be noted that both of the cleaning chain wheel **13** and the driving chain wheel **21** are of a disk-like structure of which the end face is a sprocket, which, in the assembling, can be engaged with the cleaning chain **11**, thereby the synchronous rotation of the cleaning chain wheel **13** and the driving chain wheel **21** is realized. In the embodiments of the present disclosure, the diameter of the cleaning chain wheel **13** and the diameter of the driving chain wheel **21** may be equal, and may also be unequal, and the particular diameters are decided according to the transmission ratio between the driving motor **22** and the cleaning roller **12**, and are not limited in the embodiments of the present disclosure. In addition, the driving motor **22** may be a gear motor, a servomotor or other motors, which is also not limited in the embodiments of the present disclosure.

[0060] Additionally, the cleaning assembly **1** further includes a cleaning brush **14**, and the cleaning brush **14** is fixed on the surface of the cleaning roller **12**. It should be noted that the cleaning brush **14** may be of a rectangular sheet-like structure, and, in the assembling, may be wrapped on the surface of the cleaning roller **12**, so that the cleaning face of the cleaning brush **14** faces the cleaning through slot **31**. Accordingly, while the cleaning roller **12** rotates, it can drive the cleaning face of the cleaning brush **14** to contact the current-collection box, thereby the foreign matter on the current-collection box is wiped.

[0061] Furthermore, the cleaning assembly **1** further includes a cleaning hood body **15**. The cleaning hood body **15** is covered on the cleaning roller **12**.

[0062] It should be noted that the cleaning hood body **15** may be a square housing, and may also be a cylindrical housing. The bottom face of the cleaning hood body **15** and the cleaning through slot **31** may be communicated by means of disposing a through slot at the bottom of the cleaning hood body **15** or configuring the bottom face of the cleaning hood body **15** to have an opening, and so on. When the cleaning hood body **15** is covered on the cleaning roller **12**, in an aspect the cleaning roller **12** can be protected, and in another aspect, the foreign matter of the current-collection box removed by the cleaning roller **12** can be collected into the inner cavity of the cleaning hood body **15**, which, while facilitating the collection and the treatment of the foreign matter, can prevent splashing of the foreign matter from affecting the working environment.

[0063] Optionally, the cleaning device further includes a cleaning fixing seat **16** and a cleaning supporting seat **17**. The cleaning roller **12** is fixed on the cleaning fixing seat **16**, and the cleaning fixing seat **16** is fixed on the bottom plate **3** via the cleaning supporting seat **17**.

[0064] It should be noted that the cleaning fixing seat **16** may be a support having a connecting component. As an example, the cleaning fixing seat **16** may include two lugs having a bolt hole,

and by using the two lugs, the cleaning roller **12** is enabled to be fixed between the two lugs, so that the cleaning fixing seat **16** can enable the cleaning roller **12** to maintain the position stability. The cleaning fixing seat **16** is fixed on the bottom plate **3** via the cleaning supporting seat **17**. In this way, the cleaning supporting seat **17** can support the cleaning roller **12** to a certain extent, to prevent the cleaning roller **12** from being directly fixed on the bottom plate **3**, and a sufficient room for the rotation of the cleaning roller **12** can be left by using the cleaning supporting seat **17**, thus the entire structure is more compact.

[0065] Furthermore, the cleaning device further includes a cleaning vacuum cleaner **18**. The cleaning vacuum cleaner **18** is in communication with the cleaning hood body **15**, the cleaning vacuum cleaner **18** is electrically connected to the controller **23**, and the controller **23** controls the cleaning vacuum cleaner **18** to suck a foreign matter in the cleaning hood body **15**.

[0066] It should be noted that the cleaning vacuum cleaner **18** may be communicated with the cleaning hood body **15** by using a pipeline. Accordingly, when the foreign matter stored in the cleaning hood body **15** reaches a certain quantity, the foreign matter can be sucked into the cleaning vacuum cleaner **18**, thereby a long-term and effective operation of the cleaning device is realized, and the normal movement of the cleaning roller **12** is prevented being affected by accumulation of the foreign matter.

[0067] In addition, in order to further enhance the effect of the foreign-matter removal by the cleaning assembly **1**, and in order to further increase the degree of the cleanliness of the current-collection box, in another alternative implementation, the cleaning assembly **1** further includes a polishing chain **101**, a polishing chain wheel **102** and a polishing roller **103**, and the driving chain wheel **21** is a duplex chain wheel.

[0068] The polishing roller **103** and the cleaning roller **12** are located at the two sides of the driving motor **22**, the polishing chain wheel **102** is fixed at the input end of the polishing roller **103**, the polishing chain **101** is connected to the polishing chain wheel **102** and the driving chain wheel **21**, and the driving chain wheel **21** is fixed at an end of the polishing roller **103**.

[0069] It should be noted that the polishing chain **101** is a metal chain of a chain link or a ring, and the polishing chain wheel **102** is of a disk-like structure of which the end face is a sprocket. In the assembling, the polishing chain **101** is engaged with the driving chain wheel **21** and the polishing chain wheel **102**. Because the polishing chain **101** is connected to the polishing chain wheel **102** and the driving chain wheel **21**, and the driving chain wheel **21** is fixed at an end of the polishing roller **103**. When the controller **23** controls the driving motor **22** to rotate, the output shaft of the driving motor **22** also rotates, and in turn drives the driving chain wheel **21** disposed at the end of the output shaft of the driving motor **22** to rotate. When the driving chain wheel **21** rotates, the polishing chain **101** mounted to the driving chain wheel **21** can be rotated, so that the power transmitted by the polishing chain **101** reaches the polishing chain wheel **102**, so that the polishing chain wheel **102** rotates. While the polishing chain wheel **102** rotates, it drives the polishing roller **103** to rotate, and accordingly the function of further removing the foreign matter of the current-collection box is reached by the rotation of the polishing roller **103**.

[0070] It should also be noted that, because the polishing roller **103** and the cleaning roller **12** are located at the two sides of the driving motor **22**, in the removal of the foreign matter of the current-collection box, a primary removal may be performed by using the cleaning roller **12**, and subsequently a secondary removal may be performed by using the polishing roller **103**, so that the effect of the foreign-matter removal of the current-collection box is further improved. In addition, in order to enable the same driving motor **22** to simultaneously drive the polishing roller **103** and the cleaning roller **12** to rotate, in the embodiments of the present disclosure, the driving chain wheel **21** is a duplex chain wheel; in other words, the driving chain wheel **21** is simultaneously engaged with the polishing chain and the cleaning chain **11**, which, while simplifying the transmission path, reduces the volume of the cleaning device, and can serve to save electricity. When the above issues are not taken into consideration, in the embodiments of the present



disclosure, two driving motors **22** may also be disposed, and the two driving motors **22** may be separately used to drive the polishing roller **103** and the cleaning roller **12** to rotate, which can also serve to further remove the foreign matter of the current-collection box.

[0071] Additionally, the cleaning assembly **1** further includes a polishing brush **104**. The polishing brush **104** is fixed on the polishing roller **103**. It should be noted that the polishing brush **104** may be of a rectangular sheet-like structure, and, in the assembling, may be wrapped on the surface of the polishing roller **103**, so that the cleaning face of the polishing brush **104** faces the cleaning through slot **31**. Accordingly, while the polishing roller **103** rotates, it can drive the cleaning face of the polishing brush **104** to contact the current-collection box, thereby the secondary removal is performed to the foreign matter on the current-collection box.

[0072] It should also be noted that, in order to enable the cleaning through slot **31** to be suitable for the operations of the cleaning brush **14** and the polishing brush **104** simultaneously, in the embodiments of the present disclosure, the area of the opening of the cleaning through slot **31** may be increased, so that the cleaning through slot **31** faces the cleaning brush **14** and the polishing brush **104** simultaneously. One cleaning through slot **31** may also be disposed at the position facing the cleaning brush **14**, and one cleaning through slot **31** may be provided at the position facing the polishing brush **104**, which is not limited in the embodiments of the present disclosure.

[0073] Furthermore, the cleaning assembly **1** further includes a polishing hood body **105**. The polishing hood body **105** is covered on the polishing roller **103**.

[0074] It should be noted that the polishing hood body **105** may be a square housing, and may also be a cylindrical housing. The bottom face of the polishing hood body **105** and the cleaning through slot **31** may be communicated by means of disposing a through slot at the bottom of the polishing hood body **105** or configuring the bottom face of the polishing hood body **105** to have an opening, and so on. When the polishing hood body **105** is covered on the polishing roller **103**, in an aspect, the polishing roller **103** can be protected, and in another aspect, the foreign matter of the current-collection box removed by the polishing roller **103** can be collected into the inner cavity of the polishing hood body **105**, which, while facilitating the collection and the treatment of the foreign matter, can prevent splashing of the foreign matter from affecting the working environment.

[0075] Optionally, the cleaning device further includes a polishing fixing seat **106** and a polishing supporting seat **107**. The polishing roller **103** is fixed on the polishing fixing seat **106**, and the polishing fixing seat **106** is fixed on the polishing supporting seat **107**.

[0076] It should be noted that the polishing fixing seat **106** may be a support having a connecting component. As an example, the polishing fixing seat **106** may include two lugs having a bolt hole, and by using the two lugs, the polishing roller **103** is enabled to be fixed between the two lugs, so that the polishing fixing seat **106** can enable the polishing roller **103** to maintain the position stability. The polishing fixing seat **106** is fixed on the bottom plate **3** via the polishing supporting seat **107**. In this way, the polishing supporting seat **107** can support the polishing roller **103** to a certain extent, to prevent the polishing roller **103** from being directly fixed on the bottom plate **3**, and a sufficient room for the rotation of the polishing roller **103** can be left by using the polishing supporting seat **107**, thus the entire structure is more compact.

[0077] Furthermore, the cleaning device further includes a polishing vacuum cleaner **108**, the polishing vacuum cleaner **108** is in communication with the polishing hood body **105**, the polishing vacuum cleaner **108** is electrically connected to the controller **23**, and the controller **23** controls the polishing vacuum cleaner **108** to suck a foreign matter inside the polishing hood body **105**.

[0078] It should be noted that the polishing vacuum cleaner **108** may be communicated with the polishing hood body **105** by using a pipeline. Accordingly, when the foreign matter stored in the polishing hood body **105** reaches a certain quantity, the foreign matter can be sucked into the polishing vacuum cleaner **108**, thereby a long-term and effective operation of the polishing device is realized, and the normal movement of the polishing roller **103** is prevented being affected by accumulation of the foreign matter.

[0079] It should also be noted that a foreign-matter collecting box **19** may be disposed between the polishing vacuum cleaner **108** and the cleaning vacuum cleaner **18**, and the foreign matter removed by the polishing vacuum cleaner **108** and the cleaning vacuum cleaner **18** is collected by using the foreign-matter collecting box **19**, which facilitates the working personnel to collect and treat it subsequently.

[0080] Additionally, in the embodiments of the present disclosure, the diagnosis feeding-back assembly **4** may be used to determine the relative position between the cleaning device and the current-collection box and detect whether the current-collection box is in an abnormal state.

[0081] Specifically, in some embodiments, as shown in FIG. **2**, the diagnosis feeding-back assembly **4** includes an in-position travel switch **41** and an off-position travel switch **42**, the in-position travel switch **41** and the off-position travel switch **42** are fixed on the bottom plate **3**, and the in-position travel switch **41** and the off-position travel switch **42** are electrically connected to the controller **23**. The in-position travel switch **41** is configured to detect that the current-collection box is located at a first position of the bottom plate **3**, and the off-position travel switch **42** is configured to detect that the current-collection box is located at a second position of the bottom plate **3**. The first position refers to the position where the current-collection box and the bottom plate **3** coincide in a first direction, and the second position refers to the position where the bottom plate **3** is in stagger in the first direction, wherein the first direction refers to the direction perpendicular to the bottom plate **3**.

[0082] It should be noted that the in-position travel switch **41** and the off-position travel switch **42** may be a type of position sensor. The in-position travel switch **41** is configured to detect that the current-collection box is located at the first position of the bottom plate **3**, and because the first position refers to the position where the current-collection box and the bottom plate **3** coincide in the first direction, in other words, the in-position travel switch **41** is configured to detect that the bottom plate **3** has moved to the top of the current-collection box. At this point, the in-position travel switch **41** may be used to send a signal to the controller **23**, and the controller **23** is used to control the cleaning assembly **1** to start the removal of the foreign matter of the current-collection box. Moreover, the off-position travel switch **42** is configured to detect that the current-collection box is located at a second position of the bottom plate **3**, and because the second position refers to the position where the bottom plate **3** is in stagger in the first direction, in other words, the bottom plate **3** and the current-collection box are at positions where they do not coincide, or, in other words, the bottom plate **3** has left the top of the current-collection box. At this point, the off-position travel switch **42** may be used to send a signal to the controller **23**, and the controller **23** controls the cleaning assembly **1** to stop the removal of the foreign matter of the current-collection box. In this way, the relative position between the cleaning device and the current-collection box can be determined accurately by using the in-position travel switch **41** and the off-position travel switch **42**, so that the process of washing the current-collection box is more accurate and controllable.

[0083] Optionally, the diagnosis feeding-back assembly **4** further includes a contactor **43**, the bottom plate **3** is provided with a cable, and the contactor **43** is electrically connected to the cable. The contactor **43** is configured to detect the power-on state of the current-collection box.

[0084] It should be noted that the contactor **43** may be one or more of a current sensor, a voltage sensor, a current switch and a voltage switch. In the detection, the contactor **43** may contact the current-collection box, and accordingly the contactor **43** is used to determine the power-on state of the current-collection box, thereby the function of detecting the state of the current-collection box is realized.

[0085] Furthermore, the diagnosis feeding-back assembly **4** further includes a position marking component **44**, and the position marking component **44** is configured to mark a first target current-collection box, wherein the first target current-collection box refers to a current-collection box in a powering-off state. It should be noted that, when it is detected by the contactor **43** that the current-

collection box is in the powering-off state, the current-collection box may be marked by using the position marking component **44**, thereby the current-collection box in an abnormal state is facilitated to be subsequently treated.

[0086] Optionally, the diagnosis feeding-back assembly **4** further includes an indicator lamp **45**, the indicator lamp **45** is electrically connected to the controller **23**, and when it is detected by the contactor **43** that the current-collection box is in the powering-off state, the indicator lamp **45** is in a lightening state.

[0087] It should be noted that the contactor **43** may be electrically connected to the controller **23**. When it is detected by the contactor **43** that the current-collection box is in the powering-off state, the contactor **43** may feed back a signal to the controller **23**. The controller **23**, by using an internal program, controls the indicator lamp **45** to be in the lightening state, to prompt the working personnel that the current-collection box is in an abnormal state. It should also be noted that the controller **23** may be a controlling device such as a programmable logic controller (PLC) element component, a single chip microcomputer and a board card, which is not limited in the embodiments of the present disclosure.

[0088] Optionally, the position marking component **44** includes a straight-line driver **441** and a marking pen **442**. The marking pen **442** is fixed on the straight-line driver **441**, and when it is detected by the contactor **43** that the current-collection box is in the powering-off state, the straight-line driver **441** drives the marking pen **442** to make a mark on the current-collection box.

[0089] It should be noted that the straight-line driver **441** may be a driving device driving a straight-line movement such as an electric actuator, an air cylinder and a screw rod. The straight-line driver **441** may be used to drive the marking pen **442** to move, so that, when it is detected by the contactor **43** that the current-collection box is in the powering-off state, the straight-line driver **441** can drive the marking pen **442** to make a mark on the current-collection box, wherein the mark is, for example, an underline, a cross and so on, thereby facilitating the working personnel to screen the current-collection boxes subsequently by using the mark made on the current-collection box by using the marking pen **442**.

[0090] In some embodiments, the position marking component **44** further includes a display panel **443**. The display panel **443** is electrically connected to the current-collection box, and when the current-collection box is marked by the marking pen **442**, the display panel **443** displays the position of the current-collection box. In this way, by displaying the position of the current-collection box in an abnormal state on the display panel **443**, it is facilitated that the working personnel checks and replaces the current-collection boxes subsequently.

[0091] Optionally, the cleaning device further includes a protecting hood body **5**. The protecting hood body **5** is covered on the diagnosis feeding-back assembly **4** and the driving controlling assembly **2**. The protecting hood body **5** can protect the diagnosis feeding-back assembly **4** and the driving controlling assembly **2** to a certain extent, thereby the service life of the cleaning device is prolonged.

[0092] It can be seen from the above embodiments that, in the embodiments of the present disclosure, because both of the cleaning assembly **1** and the driving controlling assembly **2** are fixed on the bottom plate **3**, in the washing of the current-collection box, the bottom plate **3** can be moved to the top of the current-collection box, so that the cleaning assembly **1** and the driving controlling assembly **3** are located at the top of the current-collection box. Further, because the driving controlling assembly **2** and the cleaning assembly **1** are connected, and the bottom plate **3** is provided with a cleaning through slot **31**. When it is detected by the diagnosis feeding-back assembly **4** that the current-collection box is located at the bottom of the bottom plate **3**, the driving controlling assembly **2** can drive the cleaning assembly **1** to, by using the cleaning through slot **31**, remove a foreign matter on the current-collection box, thereby the automated washing of the current-collection box is realized. In this way, in an aspect, by using the cleaning assembly **1** and the driving controlling assembly **3**, the process of washing the current-collection box can be time-

saving and labor-saving, and the washing of the current-collection box can be completed within a short time, which facilitates to increase the efficiency of the washing of the current-collection box. In another aspect, the relative position between the cleaning device and the current-collection box can be determined accurately by using the diagnosis feeding-back assembly **4**, so that the process of washing the current-collection box is more accurate and controllable, and the current-collection box in an abnormal state can be diagnosed quickly by using the diagnosis feeding-back assembly **4**, thereby the current-collection box in an abnormal state is facilitated to be subsequently maintained and replaced.

[0093] Additionally, in the embodiments of the present disclosure, because the cleaning assembly **1** further includes the polishing chain **101**, the polishing chain wheel **102** and the polishing roller **103**, the driving chain wheel **21** is a duplex chain wheel, the polishing roller **103** and the cleaning roller **12** are located at the two sides of the driving motor **22**, the polishing chain wheel **102** is fixed at the input end of the polishing roller **103**, the polishing chain **101** is connected to the polishing chain wheel **102** and the driving chain wheel **21**, and the driving chain wheel **21** is fixed at an end of the polishing roller **103**, secondary washing can be performed to the current-collection box by using the polishing roller **103**, thereby the effect of the washing of the current-collection box is further improved. In addition, the diagnosis feeding-back assembly **4** may be used to determine the relative position between the cleaning device and the current-collection box and detect whether the current-collection box is in an abnormal state, which does not only enable the process of the foreign-matter removal of the current-collection box to be more accurate and controllable, but also facilitates the working personnel to subsequently replace the current-collection box in an abnormal state.

[0094] It should be noted that the embodiments of the description are described in the mode of progression, each of the embodiments emphatically describes the differences from the other embodiments, and the same or similar parts of the embodiments may be referred to each other.

[0095] Although alternative embodiments of the embodiments of the present disclosure have been described, once a person skilled in the art has known the essential inventive concept, he may make further variations and modifications on those embodiments. Therefore, the appended claims are intended to be interpreted as including the alternative embodiments and all of the variations and modifications that fall within the scope of the embodiments of the present disclosure.

[0096] Finally, it should also be noted that, herein, relation terms such as first and second are merely intended to distinguish one entity from another entity, and that does not necessarily require or imply that those entities have therebetween any such actual relation or order. Furthermore, the terms “include”, “contain” or any variants thereof are intended to cover non-exclusive inclusions, so that articles or terminal devices that include a series of elements do not only include those elements, but also include other elements that are not explicitly listed, or include the elements that are inherent to such articles or terminal devices. Unless further limitation is set forth, an element defined by the wording “including a . . . ” does not exclude additional same element in the article or terminal device including the element.

[0097] The technical solutions of the present disclosure have been described in detail above. The principle and the embodiments of the present disclosure are described herein with reference to the particular examples. Moreover, for a person skilled in the art, according to the principle and the implementations of the present disclosure, the particular embodiments and the range of application may be varied. In conclusion, the contents of the description should not be understood as limiting the present disclosure.

## Claims

**1.** A cleaning device, configured for cleaning a current-collection box, wherein the cleaning device comprises a cleaning assembly, a driving controlling assembly, a bottom plate and a diagnosis

feeding-back assembly; both of the cleaning assembly and the driving controlling assembly are fixed on the bottom plate, and the driving controlling assembly and the cleaning assembly are connected; the bottom plate is provided with a cleaning through slot, the diagnosis feeding-back assembly is connected to the bottom plate, and the diagnosis feeding-back assembly is configured to detect a relative position between the current-collection box and the bottom plate, and configured to detect a power-on state of the current-collection box; and when it is detected by the diagnosis feeding-back assembly that the current-collection box is located at a bottom of the bottom plate, the driving controlling assembly drives the cleaning assembly to, by using the cleaning through slot, remove a foreign matter on the current-collection box.

**2.** The cleaning device according to claim 1, wherein the cleaning assembly comprises a cleaning chain, a cleaning roller and a cleaning chain wheel, and the driving controlling assembly comprises a driving chain wheel, a driving motor and a controller; the controller and the driving motor are connected, and the controller controls the driving motor to rotate; and a cleaning brush is fixed on a surface of the cleaning roller, the driving chain wheel is connected to an end of an output shaft of the driving motor, the cleaning chain is connected to the driving chain wheel and the cleaning chain wheel, and the cleaning chain wheel is fixed at an input end of the cleaning roller.

**3.** The cleaning device according to claim 2, wherein the cleaning assembly further comprises a cleaning hood body; and the cleaning hood body is covered on the cleaning roller.

**4.** The cleaning device according to claim 2, wherein the cleaning device further comprises a cleaning fixing seat and a cleaning supporting seat; and the cleaning roller is fixed on the cleaning fixing seat, and the cleaning fixing seat is fixed on the bottom plate via the cleaning supporting seat.

**5.** The cleaning device according to claim 3, wherein the cleaning device further comprises a cleaning vacuum cleaner; and the cleaning vacuum cleaner is in communication with the cleaning hood body, the cleaning vacuum cleaner is electrically connected to the controller, and the controller controls the cleaning vacuum cleaner to suck a foreign matter in the cleaning hood body.

**6.** The cleaning device according to claim 2, wherein the cleaning assembly further comprises a polishing chain, a polishing chain wheel and a polishing roller, and the driving chain wheel is a duplex chain wheel; the polishing roller and the cleaning roller are located at two sides of the driving motor; and a polishing brush is fixed on the cleaning roller, the polishing chain wheel is fixed at an input end of the polishing roller, the polishing chain is connected to the polishing chain wheel and the driving chain wheel, and the driving chain wheel is fixed at an end of the polishing roller.

**7.** The cleaning device according to claim 6, wherein the cleaning assembly further comprises a polishing hood body; and the polishing hood body is covered on the polishing roller.

**8.** The cleaning device according to claim 6, wherein the cleaning device further comprises a polishing fixing seat and a polishing supporting seat; and the polishing roller is fixed on the polishing fixing seat, and the polishing fixing seat is fixed on the polishing supporting seat.

**9.** The cleaning device according to claim 7, wherein the cleaning device further comprises a polishing vacuum cleaner, the polishing vacuum cleaner is in communication with the polishing hood body, the polishing vacuum cleaner is electrically connected to the controller, and the controller controls the polishing vacuum cleaner to suck a foreign matter inside the polishing hood body.

**10.** The cleaning device according to claim 2, wherein the diagnosis feeding-back assembly comprises an in-position travel switch and an off-position travel switch, the in-position travel switch and the off-position travel switch are fixed on the bottom plate, and the in-position travel switch and the off-position travel switch are electrically connected to the controller; and the in-position travel switch is configured to detect that the current-collection box is located at a first position of the bottom plate, and the off-position travel switch is configured to detect that the current-collection box is located at a second position of the bottom plate; wherein the first position

refers to a position where the current-collection box and the bottom plate coincide in a first direction, and the second position refers to a position where the bottom plate is in stagger in the first direction, wherein the first direction refers to a direction perpendicular to the bottom plate.

**11.** The cleaning device according to claim 10, wherein the diagnosis feeding-back assembly further comprises a contactor, the bottom plate is provided with a cable, and the contactor is electrically connected to the cable; and the contactor is configured to detect the power-on state of the current-collection box.

**12.** The cleaning device according to claim 11, wherein the diagnosis feeding-back assembly further comprises a position marking component, and the position marking component is configured to mark a first target current-collection box, wherein the first target current-collection box refers to a current-collection box in a powering-off state.

**13.** The cleaning device according to claim 11, wherein the diagnosis feeding-back assembly further comprises an indicator lamp, the indicator lamp is electrically connected to the controller, and when it is detected by the contactor that the current-collection box is in a powering-off state, the indicator lamp is in a lightening state.

**14.** The cleaning device according to claim 12, wherein the position marking component comprises a straight-line driver and a marking pen; and the marking pen is fixed on the straight-line driver, and when it is detected by the contactor that the current-collection box is in the powering-off state, the straight-line driver drives the marking pen to make a mark on the current-collection box.

**15.** The cleaning device according to claim 14, wherein the position marking component further comprises a display panel; and the display panel is electrically connected to the current-collection box, and when the current-collection box is marked by the marking pen, the display panel displays a position of the current-collection box.

**16.** The cleaning device according to claim 2, wherein the cleaning device further comprises a protecting hood body; and the protecting hood body is covered on the diagnosis feeding-back assembly and the driving controlling assembly.

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