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(54) **DETECTION APPARATUS FOR DETECTING OPEN STATE OF BOX COVER AND DEVICE BOX**

(57) Embodiments of the disclosure provide a detection apparatus for detecting the open state of a box cover and a device box. The detection apparatus includes a mounting plate arranged in a box body of the device box and spaced a predetermined distance from the box cover of the device box; a reflection part arranged on the box cover and facing an inner side of the box body; and a detection unit arranged on the mounting plate and includes a transmitter adapted to emit a detection light signal; and a receiver adapted to receive the detection light signal reflected by the reflection part, so that the detection unit determines the open state of the box cover based on the received detection light signal.

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Description

FIELD

[0001] Example embodiments of the present disclosure relate generally to the field of electrical apparatuses, and in particular to a detection apparatus for detecting an open state of a box cover and device box.

BACKGROUND

[0002] Current vehicle charging stations are typically equipped with a device box to protect the internal components. Users need to open the device box to access the components inside when using the charging station. Due to safety and protection considerations for the charging station, the detection of the opening of the device box has gradually gained attention.

SUMMARY

[0003] In a first aspect of the present disclosure, a detection apparatus for detecting an open state of a box cover is provided. The detection apparatus comprises a mounting plate arranged in a box body of a device box and spaced a predetermined distance from the box cover of the device box; a reflection part arranged on the box cover and facing an inner side of the box body; and a detection unit arranged on the mounting plate and the detection unit comprises a transmitter adapted to emit a detection light signal; and a receiver adapted to receive the detection light signal reflected by the reflection part, so that the detection unit determines the open state of the box cover based on the received detection light signal.

[0004] In some embodiments, the detection apparatus further includes an inner cover arranged on a side of the mounting plate facing the box cover, and including a detection hole, the detection hole being aligned with the detection unit for the detection light signal to pass through.

[0005] In some embodiments, the detection apparatus further comprises a light shield arranged between the mounting plate and the inner cover and at least partially surrounding the detection unit.

[0006] In some embodiments, the light shield and the inner cover are integrally formed.

[0007] In some embodiments, the detection apparatus further comprises an indication element arranged on the mounting plate and adapted to emit light in different forms to indicate a state of the device box and/or electronic devices therein; and a light guide arranged between the indication element and the box cover for guiding the light emitted by the indication element to outside of the box cover.

[0008] In some embodiments, the inner cover comprises a perforation for the light guide to pass through.

[0009] In some embodiments, a cross-section of the light guide is an arc-shaped and partially surrounds the detection unit.

[0010] In some embodiments, the detection apparatus further includes a detection circuit arranged on the mounting plate and coupled to the detection unit, the detection circuit comprises an input power supply for supplying power to the transmitter and the receiver; a test interface coupled to an end of the receiver near the input power supply and adapted to output test data; and a signal generation unit connected in series to a side of the transmitter away from the input power supply to generate a square wave signal to at least control on and off of a circuit in which the detection unit is located.

[0011] In some embodiments, the detection circuit further comprises a first resistor coupled between the transmitter and the input power supply.

[0012] In some embodiments, the detection circuit further comprises a second resistor coupled between the receiver and the input power supply.

[0013] In some embodiments, the detection circuit further comprises an operational amplifier, a non-inverting input end of the operational amplifier is coupled between the second resistor and the receiver, an inverting input end of the operational amplifier is coupled to the input power supply, and an output end of the operational amplifier is coupled to the test interface.

[0014] In some embodiments, the detection circuit further comprises a filter circuit coupled between the output end of the operational amplifier and the test interface.

[0015] By arranging the detection unit in the box body and arranging the reflection part on the side of the box cover facing the box body, when the box cover is placed over the opening of the box body, the detection light signal emitted by a transmitter of the detection unit is reflected by a reflection part coupled to the box cover and subsequently received by a receiver, Thus, it is determined that the box cover is covered on the device box at this time, and when the box cover is opened relative to the device box or the box cover is separated from the device box, the reflection part moves away from its reflective position due to the opening of the box cover, causing the receiver to be unable to receive the detection light signal reflected by the reflection part. Thus, it can be determined that the box cover of the device box is opened.

[0016] In a second aspect of the present disclosure, a device box is provided. The device box comprises a box body, a box cover snap-fitted on the box body; and the detection apparatus provided according to the first aspect of the present disclosure.

[0017] It should be understood that the content described in this content part is not intended to limit the key features or important features of embodiments of the present disclosure, nor is it intended to limit the scope of the present disclosure. Other features of the present disclosure will become apparent from the description below.

BRIEF DESCRIPTION OF THE DRAWINGS

[0018] The above and other features, advantages, and aspects of various embodiments of the present disclosure will become more apparent with reference to the following detailed description taken in conjunction with the accompanying drawings. In the drawings, the same or similar reference numbers represent the same or similar elements, where:

FIG. 1 illustrates an exploded schematic view of a device box according to embodiments of the present disclosure;

FIG. 2 illustrates a cross-sectional view of an inner structure of a device box according to embodiments of the present disclosure;

FIG. 3 illustrates a schematic view of a box cover of a device box according to embodiments of the present disclosure;

FIG. 4 illustrates a schematic diagram of a box body of a device box according to embodiments of the present disclosure; and

FIG. 5 illustrates a simplified circuit diagram of a detection circuit according to embodiments of the present disclosure.

DETAILED DESCRIPTION

[0019] Embodiments of the present disclosure will be described in more detail below with reference to the accompanying drawings. Although certain embodiments of the present disclosure are shown in the accompanying drawings, it should be understood that the present disclosure may be implemented in various forms and should not be construed as limited to embodiments set forth herein. Rather, these embodiments are provided for a more thorough and complete understanding of the present disclosure. It should be understood that the accompanying drawings and embodiments of the present disclosure are only for illustrative purposes and are not intended to limit the scope of protection of the present disclosure.

[0020] It should be noted that the title of any section/sub section provided herein is not limiting. Various embodiments are described throughout this article, and any type of embodiment can be included under any section/subsection. Furthermore, embodiments described in any section/subsection may be combined in any manner with any other embodiments described in the same section/subsection and/or a different section/subsection.

[0021] In the description of embodiments of the present disclosure, the term "comprise" and similar terms should be interpreted as open inclusion, that is, "including but not limited to". The term "based on" should be interpreted as "based at least in part on". The term "an embodiment" or "the embodiment" should be interpreted as "at least one embodiment". The term "some embodiments" should be interpreted as "at least some embodiments". Other explicit and implicit definitions may also be included below. The terms "first", "second", etc. may refer to different or identical objects. Other explicit and implicit definitions may also be included below.

[0022] As mentioned briefly above, a typical household charging stations are relatively compact in size, and if a mechanical lock or an electronic lock is mounted on an external device box of the charging station, it may occupy internal space of the charging station, thereby easily affecting the layout of a circuit and the like inside the charging station. Therefore, in consideration of safety and protection, it is necessary to detect the open state of the device box of the charging station, so as to timely report to the user after the device box of the charging station is opened.

[0023] In order to solve or at least partially solve the described problems or other potential problems existing in the prior art, embodiments of the present disclosure provide a detection apparatus for detecting the open state of a box cover and a device box. By arranging the detection unit in the box body and arranging the reflection part on the side of the box cover facing the box body, when the box cover is placed over the opening of the box body, the detection light signal emitted by a transmitter of the detection unit is reflected by a reflection part coupled to the box cover and subsequently received by a receiver, Thus, it is determined that the box cover is covered on the device box at this time, and when the box cover is opened relative to the device box or the box cover is separated from the device box, the reflection part moves away from its reflective position due to the opening of the box cover, causing the receiver to be unable to receive the detection light signal reflected by the reflection part. Thus, it can be determined that the box cover of the device box is opened.

[0024] FIG. 1 illustrates an exploded schematic view of a device box according to embodiments of the present disclosure, and FIG. 2 illustrates a cross-sectional view of an inner structure of a device box according to embodiments of the present disclosure. As shown in FIGS. 1 and 2, the device box includes a box body 9 having an opening on a side, a box cover 91 covering the opening side of the box body 9, and a detection apparatus arranged in the box cover 91.

[0025] FIGS. 3 and 4 respectively illustrate schematic views of the box cover 91 and the box body 9 of the device box according to embodiments of the present disclosure. As shown in FIGS. 3 and 4, in some embodiments, the box cover 91 and the box 9 may be coupled together by means such as fasteners like bolts and/or snap-fit connections, and the box cover 91 may be completely separated from the box body 9 and expose the opening of the box 9. In other embodiments, the box cover 91 and the box body 9 may also be coupled together by means of a

hinge, and the box cover 91 may rotate around a hinge axis, so as to expose the opening of the box body 9. In some alternative embodiments, the box cover 91 may also be slidably connected at the opening of the box body 9, so that the box cover 91 can slide along the sliding direction and expose the opening of the box body 9.

[0026] As shown in FIG. 2, the detection apparatus includes a mounting plate 1 arranged in box body 9, a reflection part 2 arranged on the box cover 91 and facing an inner side of the box body 9, and a detection unit 3 arranged on the mounting plate 1. The mounting plate 1 is a circuit board spaced a certain distance from the box cover 91 of the box body 9. The mounting plate 1 may be a circuit board specially used for arranging the detection apparatus. In some alternative embodiments, the mounting plate 1 may also be a circuit board integrated with other functions of the device box, which is not limited in embodiments of the present disclosure. By directly arranging the detection apparatus on the mounting plate 1, the footprint of the detection apparatus can be reduced, facilitating the miniaturization of the detection apparatus and the whole device box.

[0027] The detection unit 3 includes a transmitter 31 and a receiver 32 coupled to the mounting plate 1. The transmitter 31 is adapted to emit a detection light signal. When the box cover 91 covers the opening of the box body 9, the detection light signal is emitted to the reflection part 2, and after being reflected by the reflection part 2, and it is received by the receiver 32. The receiver 32 determines that the box cover 91 is in a closed state based on the received detection light signal. However, after the box cover 91 is opened, the reflected light signal cannot irradiate the receiver 32 by means of reflection of the reflection part 2. When the receiver 32 cannot receive the light signal, the detection apparatus can determine that the box cover 91 is opened, i.e. the box cover 91 is separated from the box body 9 (for example, the box cover 91 is opened or is detached from the box body 9).

[0028] A predetermined distance is provided between the mounting plate 1 and the box cover 91 so that the detection light signal emitted from the transmitter 31 can be irradiated to the reflection part 2 and received by the receiver 32 by reflection of the reflection part 2.

[0029] In some embodiments, the reflection part 2 may be a part of the inner surface of the box cover 91 and may be made of any suitable opaque material to reflect the detected light signal. For example, the reflection part 2 and the box cover 91 may be integrally formed, and made of opaque materials such as plastic or resin. In some embodiments, the reflection part 2 may also be made of a metal material, for example, a sheet-like member supported by the metal material is adhered to a corresponding position of the inner surface of the box cover 91.

[0030] FIG. 5 illustrates a simplified circuit diagram of a detection circuit according to embodiments of the present disclosure. As shown in FIG. 5, a detection circuit is coupled to a mounting plate 1 to support the operation of the transmitter 31 and the receiver 32. The detection circuit includes an input power supply 81 for providing power to the transmitter 31 and the receiver 32. After the receiver 32 is connected in parallel to the transmitter 31, an end of the receiver 32 is further coupled to the input power supply 81, and the other end of the receiver 32 is grounded. The transmitter 31 and the receiver 32 are connected in parallel, and a signal generation unit 83 is further connected in series between a side near the ground (i.e. a side of the transmitter 31 away from the input power supply 81) and the ground. The signal generation unit 83 controls on or off of interval of the circuit where the transmitter 31 and the receiver 32 are located through a pulsed square wave signal. A test interface 82 is also coupled to a side of the receiver 32 facing the input power supply 81. For example, in some embodiments, the test interface 82 may be coupled to a tester or other suitable electronic device to detect a voltage signal at an end of the receiver 32 near the input power supply 81.

[0031] Specifically, the signal generation unit 83 intermittently controls the on or off of the circuit by means of a square wave signal, thereby causing the transmitter 31 to intermittently emit the detection light signal. When the box cover 91 covers the opening of the box body 9 (i.e. the receiver 32 may receive the detection light signal), the receiver 32 may intermittently receive the detection light signal, thereby causing the circuit in which the receiver 32 is located to be conducted or disconnected intermittently. In this way, the test interface 82 coupled to the side of the receiver 32 near the input power supply 81 may detect a square wave signal corresponding to the on or off state of the circuit in which the receiver 32 is located.

[0032] The tester can determine that the box cover 91 covers the opening of the box body 9 based on the square wave signal, and when the box cover 91 is separated from the box body 9, the reflection part 2 cannot reflect the detection light signal emitted by the transmitter 31 to the receiver 32, and at this time, since the receiver 32 cannot receive the detection light signal, the circuit in which the receiver 32 is located remains in the disconnected state, causing the tester to detect only a stable low-level or high-level signal from the test port instead of the aforementioned square wave signal, and at this time, the detector can determine that the box cover 91 is separated from the box body 9, and report the separation to the user.

[0033] While using the presence or absence of the square wave signal to determine whether the box cover 91 is separated from the box body 9, the operation stability of the electronic component may also be determined based on the square wave signal, thereby improving the reliability of signal detection. When the box cover 91 covers the opening of the box body 9, only under the condition that the electronic components in the detection apparatus all stably operate, the test port can stably output a square wave signal to the tester. When a fault occurs in the detection apparatus, the test port can only output a fixed high-level or low-level signal to the tester, and the operation and maintenance personnel can maintain the detection apparatus in time based on these

abnormal signals. In this way, the problem of not being able to timely respond to the separation of the box cover 91 from the box body 9 due to the damage of electronic components in the testing device is avoided, thereby improving the reliability of the detection apparatus.

[0034] In some embodiments, the signal generation unit 83 may include a signal output port and a metal-oxide semiconductor field effect transistor. A gate electrode of the metal-oxide semiconductor field effect transistor is coupled to the signal output port, a drain electrode thereof is coupled to an end of the transmitter 31 away from the input power supply 81, and a source electrode thereof is grounded. The signal output port is adapted to intermittently output a high-level pulse signal, and the metal-oxide semiconductor field effect transistor is adapted to control the conduction between the source electrode and the drain electrode after receiving a high-level signal, so that the circuit where the emitter electrode is located is conducted.

[0035] In some embodiments, the detection circuit further includes a first resistor 64 coupled between the transmitter 31 and the input power supply 81, such that the first resistor 84 may provide at least voltage division and current limiting protection for the transmitter 31.

[0036] In some embodiments, the detection circuit also includes a second resistor 85 coupled between the receiving region and the input power supply 81 such that the second resistor 85 may provide at least voltage division and current limiting protection for the receiver 32.

[0037] In some embodiments, the detection circuit further includes an operational amplifier 86, a non-inverting input end of the operational amplifier 86 is coupled between the second resistor 85 and the receiver 32, an inverting input end of the operational amplifier 86 is coupled to the input power supply 81, and an output end of the operational amplifier 86 is coupled to the test interface 82. In some embodiments, the operational amplifier 86 may be a reverse amplifier.

[0038] In some embodiments, the detection circuit further includes a filter circuit. The filter circuit includes a filter resistor 88 and a filter capacitor 87 which are connected in series with each other. An end of the filter capacitor 87 away from the filter resistor 88 is coupled to an output end of the operational amplifier 86. An end of the filter capacitor 87 near the filter resistor 88 is grounded. An end of the filter resistor 88 away from the filter capacitor 87 is coupled to a test port. The filter circuit may eliminate interference from spurious waves in a test signal, thereby improving detection accuracy.

[0039] Referring back to FIGS. 3 and 4, in some embodiments, the detection apparatus further includes an inner cover 4 fixedly coupled within the box body 9, and the mounting plate 1 is coupled to a side of the inner cover 4 facing away from the box cover 91. The inner cover 4 further includes a detection hole 41, which the detection holes 41 penetrate through both sides of the inner cover 4 and is aligned with the transmitter 31 and the receiver 32 on the mounting plate 1, so that a detection light signal emitted by the transmitter 31 may pass through the inner cover 4 through the detection holes 41 and irradiates the reflection part 2, and the reflection part 2 may also reflect the detection light signal to irradiate the receiver 32 through the detection holes 41. The arrangement of the detection holes 41 also enables that the detection light signal can only be reflected into the receiver 32 by the reflection part 2 when the box cover 91 is in the closed state, When the position of the box cover 91 changes, for example, the box cover 91 opens the opening of the box body 9 by means of direct detaching, rotating or sliding, In this case, because the relative position relationship between the reflection part 2 and the transmitter 31 changes, the reflection part 2 cannot accurately reflect the detection light signal to the receiver 32, Thus, the detection accuracy is improved.

[0040] As shown in FIGS. 3 and 4, in some embodiments, the detection apparatus further includes a light shield 5 disposed between the mounting plate 1 and the inner cover 4 and at least partially surrounding a periphery of the transmitter 31 and the receiver 32. The light shield 5 is adapted to close off the gap between the mounting plate 1 and the inner cover 4, thereby reducing interference of other light sources (such as the indication light mentioned below) on the receiver 32. In addition, the light shield 5 is arranged between the mounting plate 1 and the inner cover 4, and can also provide support for the inner cover 4, so that the inner cover 4 is maintained at a predetermined distance from the mounting plate 1.

[0041] In some embodiments, the light shield 5 and the inner cover 4 may be integrally formed, for example, the light shield 5 and the inner cover 4 may be integrally formed by injection molding or the like. In other embodiments, the light shield 5 and the inner cover 4 may also be fixed together by means of ultrasonic welding, bonding or the like.

[0042] As shown in FIGS. 3 and 4, in some embodiments, the detection apparatus further includes an indication element 6 that indicates a working state of the device box or the electronic components inside the device box by emitting a light source. The indication element 6 is coupled on the mounting plate 1. For example, the indication element 6 may be an LED light. The indication element 6 is arranged on the mounting plate 1. Correspondingly, the inner cover 4 is provided with a through-hole, and the indication light emitted by the indication element 6 may cover the box cover 91 through the through-hole, a light guide 7 is coupled to the indication element 6, the light guide 7 passes through the through-hole, and the other end thereof abuts against the box cover 91, Thus, the indication light emitted by the indication element 6 for indicating the device box and/or electronic devices within the device box can be mapped onto the box cover 91 via the light guide 7, so that the user observes the corresponding indication light outside the box cover 91 and determines the state of the device box and/or the electronic component based on the indication light. Moreover, since the light guide 7 is provided, the

light emitted by the indication element 6 can be transmitted along the light guide 7 without being emitted to the outside from the side surface, thereby effectively avoiding the influence on the receiver 32 and improving the reliability of the detection apparatus.

[0043] In some embodiments, a cross-section of the light guide 7 may be arc-shaped and partially surrounds the outside of the detection unit 3, and an end of the light guide 7 facing the mounting plate 1 is aligned with the indication element 6 on the mounting plate 1. In some alternative embodiments, the light guide 7 may also adopt other suitable cross-sectional shapes, such as rectilinear shape and any other suitable curvilinear shape.

[0044] It can be seen from the above description that the solution according to embodiments of the present disclosure use the reflective photoelectric sensor for monitoring, which can accurately determine the opening state of the outer cover. At the same time, by directly arranging the detection apparatus on the mounting plate 1, the footprint of the detection apparatus can be reduced, thereby further facilitating the miniaturization of both the detection apparatus and the device box. By providing the light guide and the light shield, the detection unit of the detection apparatus is not affected by the external environment, and even can be mounted near an indicator lamp of the product, which further contributes to the miniaturization of the product. In addition, the reflection distance and direction of the detection unit are adjustable, so that the detection unit can be configured flexibly, the additional structural design and space occupation are reduced, and the stability and reliability are higher.

[0045] Implementations of the present disclosure have been described above. The above description is illustrative, not exhaustive, and is not limited to the disclosed implementations. Many modifications and variations will be apparent to those of ordinary skill in the art without departing from the scope and spirit of the described implementations. The terminology used herein is chosen to best explain the principles, practical applications, or improvements to the technology in the market, or to enable other persons of ordinary skill in the art to understand the various implementations disclosed herein.

Claims

1. A detection apparatus for detecting an open state of a box cover, **characterized by** comprising:

   a mounting plate (1) arranged in a box body (9) of a device box and spaced a predetermined distance from the box cover (91) of the device box;
   a reflection part (2) arranged on the box cover (91) and facing an inner side of the box body (9); and
   a detection unit (3) arranged on the mounting plate (1) and comprising:

      a transmitter (31) adapted to emit a detection light signal; and
      a receiver (32) adapted to receive the detection light signal reflected by the reflection part (2), so that the detection unit (3) determines the open state of the box cover (91) based on the received detection light signal.

2. The detection apparatus of claim 1, **characterized by** further comprising:
   an inner cover (4) arranged on a side of the mounting plate (1) facing the box cover (91), and comprising a detection hole (41), the detection hole (41) being aligned with the detection unit (3) for the detection light signal to pass through.

3. The detection apparatus of claim 2, **characterized by** further comprising:
   a light shield (5) arranged between the mounting plate (1) and the inner cover (4) and at least partially surrounding the detection unit (3).

4. The detection apparatus of claim 3, **characterized in that** the light shield (5) and the inner cover (4) are integrally formed.

5. The detection apparatus of any of claims 2 to 4, **characterized by** further comprising:

   an indication element (6) arranged on the mounting plate (1) and adapted to emit light in different forms to indicate a state of the device box and/or electronic devices therein; and
   a light guide (7) arranged between the indication element (6) and the box cover (91) for guiding the light emitted by the indication element (6) to outside of the box cover (91).

6. The detection apparatus of claim 5, **characterized in that** the inner cover (4) comprises a perforation for the light guide (7) to pass through.

7. The detection apparatus of claim 5, **characterized in that** a cross-section of the light guide (7) is an arc-shaped and partially surrounds the detection unit (3).

8. The detection apparatus of any of claims 1-4 and 6, **characterized by** further comprising a detection circuit arranged on the mounting plate (1) and coupled to the detection unit (3), the detection circuit comprising:

   an input power supply (81) for supplying power to the transmitter (31) and the receiver (32);
   a test interface (82) coupled to an end of the

receiver (32) near the input power supply (81) and adapted to output test data; and
a signal generation unit (83) connected in series to a side of the transmitter (31) away from the input power supply (81) to generate a square wave signal to at least control on and off of a circuit in which the detection unit (3) is located.

9. The detection apparatus of claim 8, **characterized in that** the detection circuit further comprises a first resistor (84) coupled between the transmitter (31) and the input power supply (81).

10. The detection apparatus of claim 8, **characterized in that** the detection circuit further comprises a second resistor (85) coupled between the receiver (32) and the input power supply (81).

11. The detection apparatus of claim 10, **characterized in that** the detection circuit further comprises an operational amplifier (86), a non-inverting input end of the operational amplifier (86) is coupled between the second resistor (85) and the receiver (32), an inverting input end of the operational amplifier (86) is coupled to the input power supply (81), and an output end of the operational amplifier (86) is coupled to the test interface (82).

12. The detection apparatus of claim 11, **characterized in that** the detection circuit further comprises a filter circuit coupled between the output end of the operational amplifier (86) and the test interface (82).

13. A device box, **characterized by** comprising:

a box body (9),
a box cover (91) snap-fitted on the box body (9); and
a detection apparatus of any of claims 1 to 12.

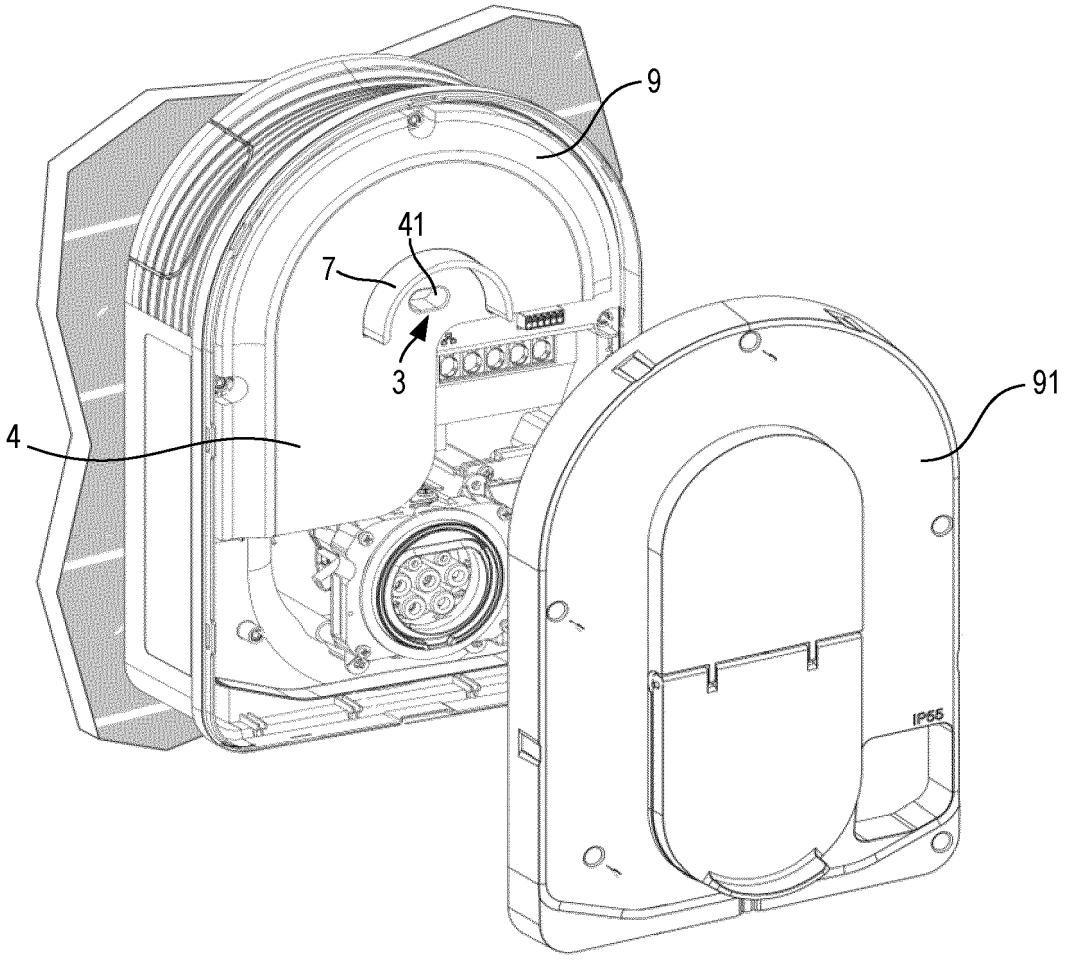

FIG. 1

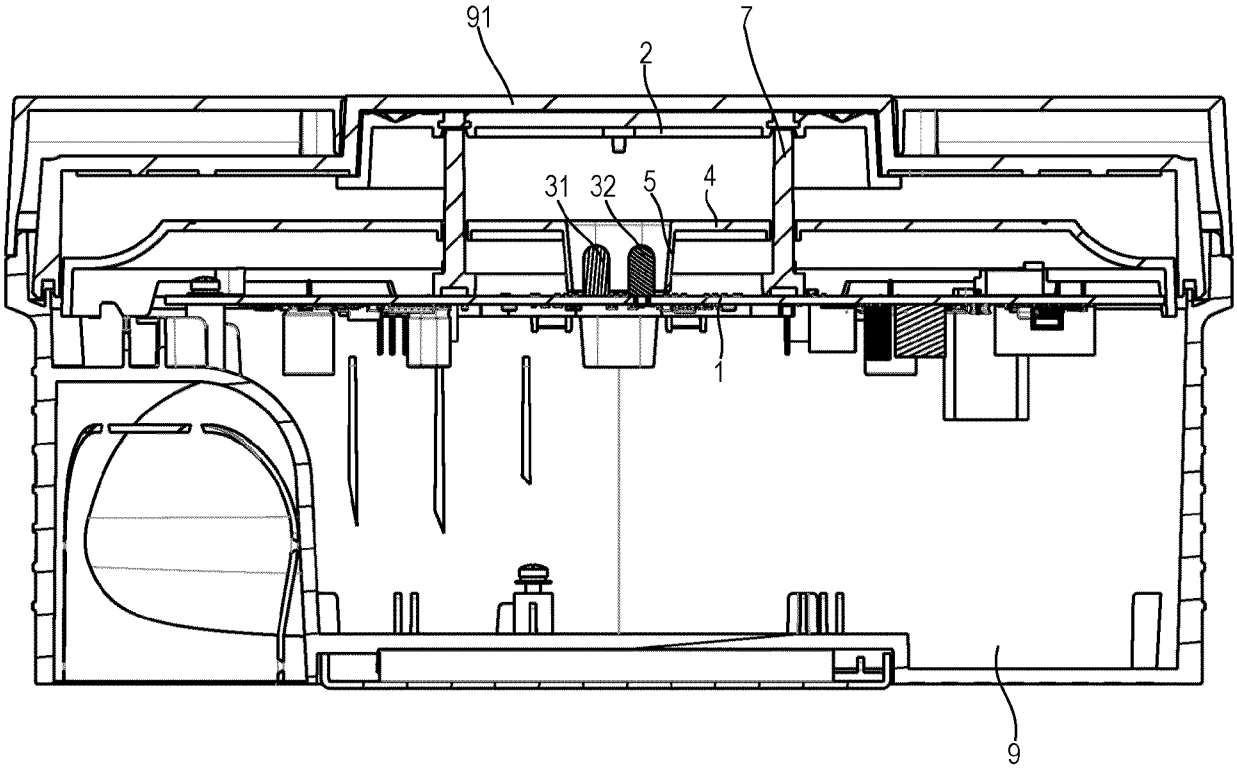

FIG. 2

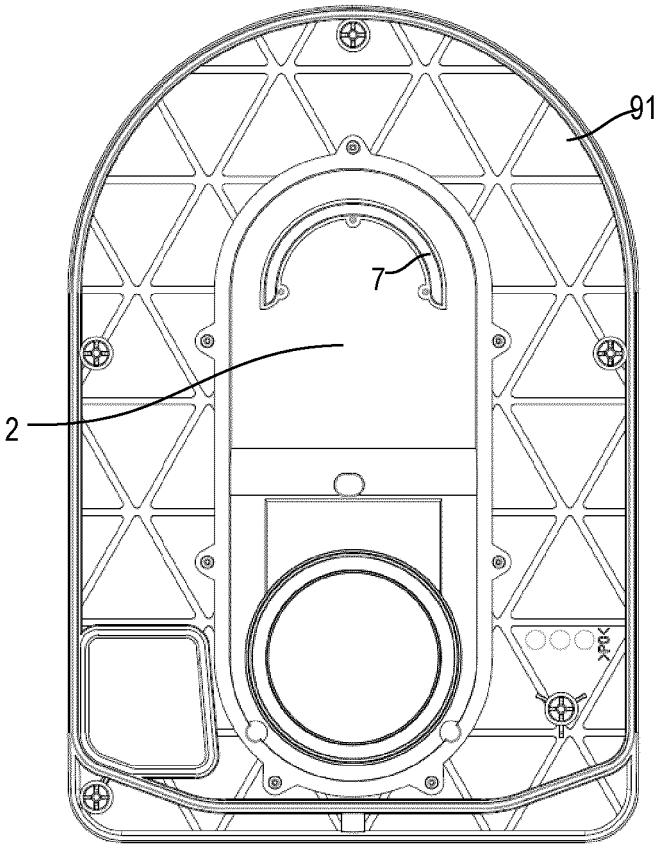

FIG. 3

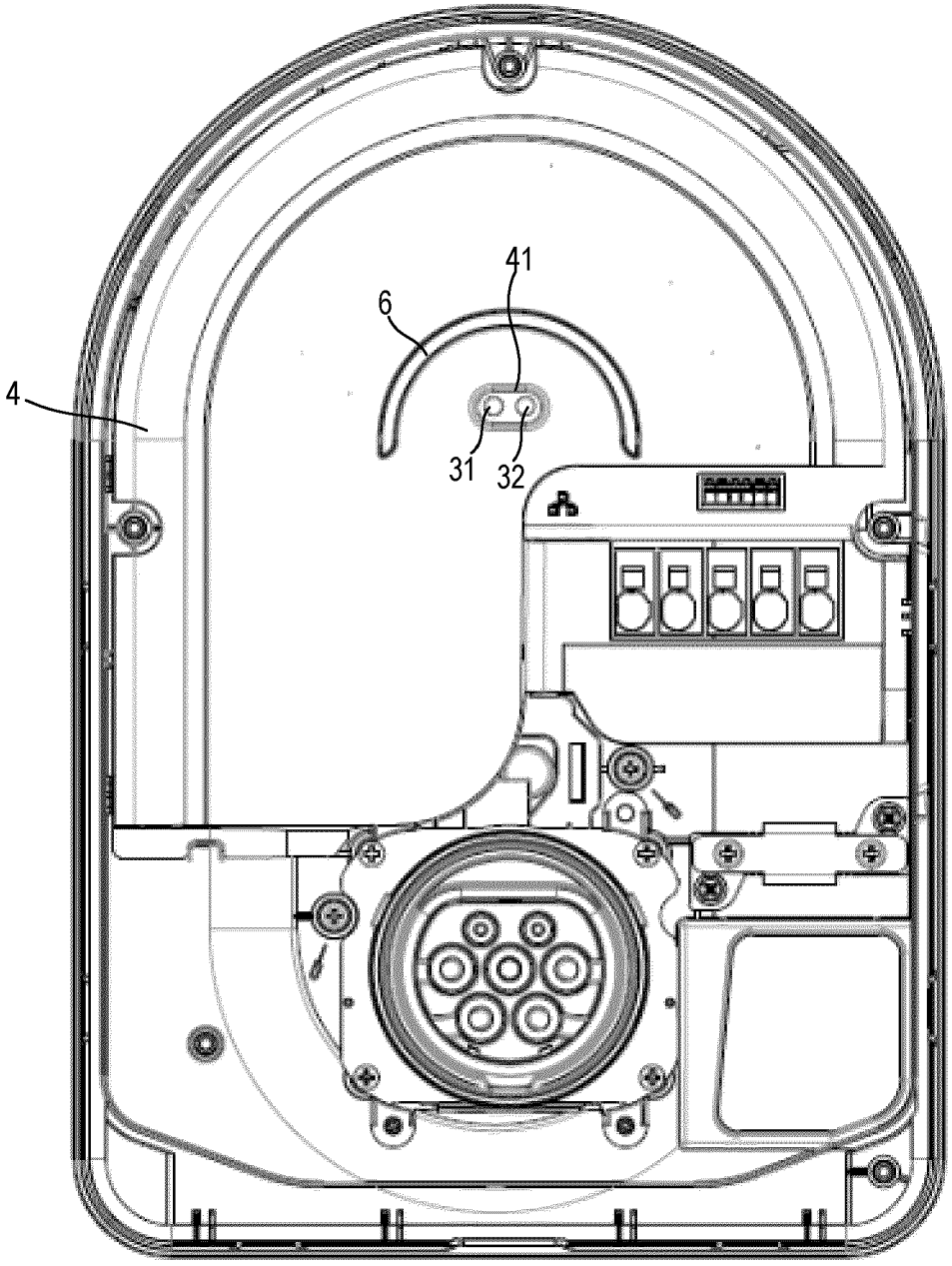

FIG. 4

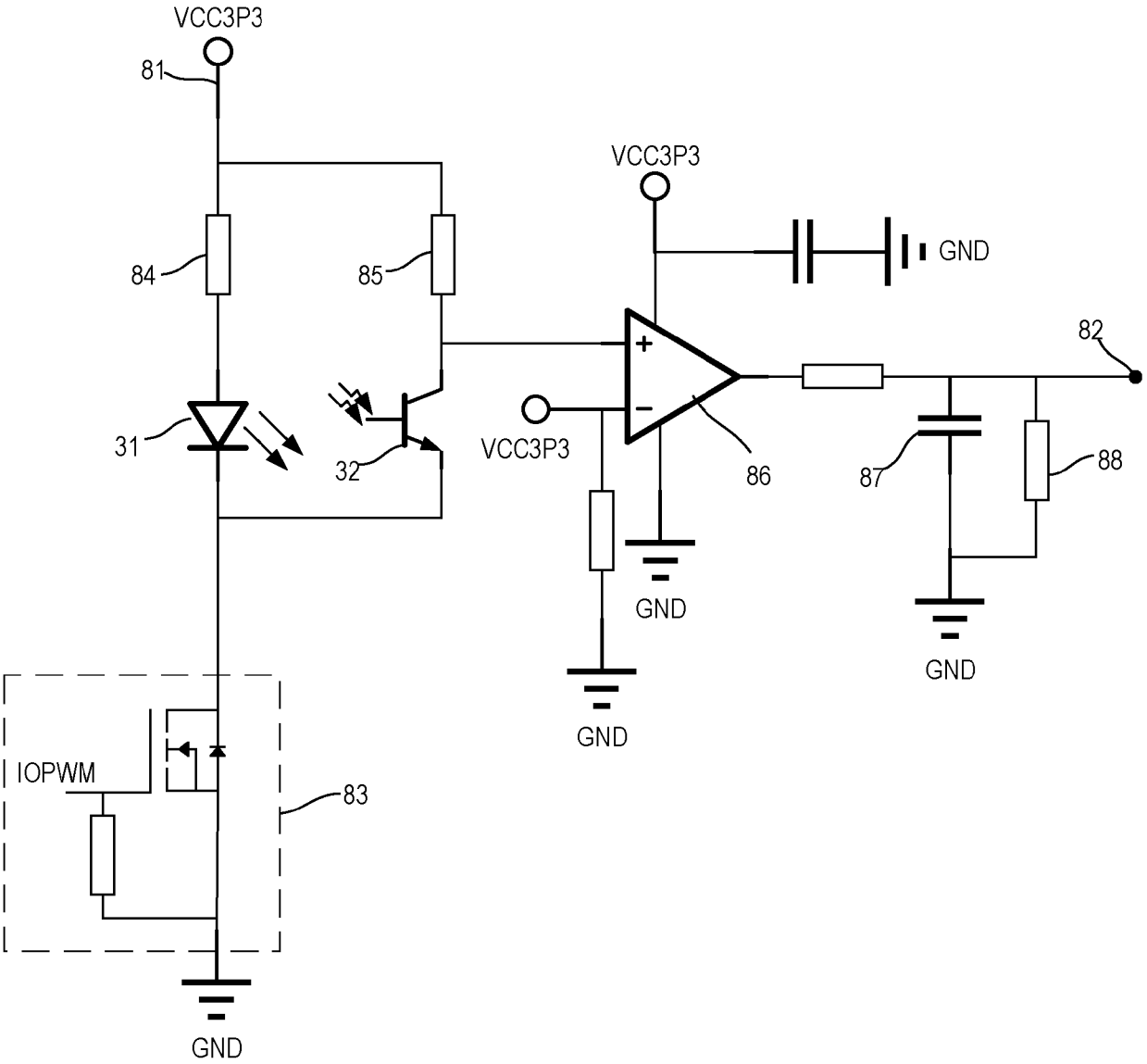
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FIG. 5

Europäisches Patentamt
European Patent Office
Office européen des brevets

EUROPEAN SEARCH REPORT

Application Number
EP 24 30 7007

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
X Y A	EP 2 905 585 A1 (GEN ELECTRIC [US]) 12 August 2015 (2015-08-12) * paragraph [0012]; figures 3-8 * * paragraph [0034] - paragraph [0038] * * paragraph [0040] - paragraph [0041] * * paragraph [0044] *	1-4,13 5-10 11,12	INV. G08B13/08
Y	CN 204 556 685 U (WASION GROUP LTD) 12 August 2015 (2015-08-12) * the whole document *	5-7	
X Y A	US 5 216 246 A (WEIDMAN WILLIAM T [US] ET AL) 1 June 1993 (1993-06-01) * page 1, line 46 - line 57; figures 1-4 * * page 2, line 30 - line 64 *	1 8-10 2-7, 11-13	
X A	EP 1 134 711 A1 (SIEMENS BUILDING TECH AG [CH]) 19 September 2001 (2001-09-19) * paragraph [0007]; figures 2,3 * * paragraph [0019] * * paragraph [0028] - paragraph [0030] *	1,13 2-12	TECHNICAL FIELDS SEARCHED (IPC) G08B

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
Munich	1 April 2025	Kurzbauer, Werner

CATEGORY OF CITED DOCUMENTS

X : particularly relevant if taken alone
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E : earlier patent document, but published on, or after the filing date
D : document cited in the application
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EPO FORM 1503 03.82 (P04C01)

ANNEX TO THE EUROPEAN SEARCH REPORT ON EUROPEAN PATENT APPLICATION NO. EP 24 30 7007

This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report. The members are as contained in the European Patent Office EDP file on
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