(19) Europäisches Patentamt
European Patent Office
Office européen des brevets

(11) **EP 4 191 553 A1**

(12) **EUROPEAN PATENT APPLICATION**
published in accordance with Art. 153(4) EPC

(43) Date of publication:
**07.06.2023 Bulletin 2023/23**

(21) Application number: **20947072.3**

(22) Date of filing: **31.07.2020**

(51) International Patent Classification (IPC):
***G08B 17/00*** *(2006.01)*

(52) Cooperative Patent Classification (CPC):
**G08B 17/00**

(86) International application number:
**PCT/JP2020/029413**

(87) International publication number:
**WO 2022/024338 (03.02.2022 Gazette 2022/05)**

(84) Designated Contracting States:
**AL AT BE BG CH CY CZ DE DK EE ES FI FR GB GR HR HU IE IS IT LI LT LU LV MC MK MT NL NO PL PT RO RS SE SI SK SM TR**
Designated Extension States:
**BA ME**
Designated Validation States:
**KH MA MD TN**

(71) Applicant: **Nittan Company, Limited**
**Tokyo 151-8535 (JP)**

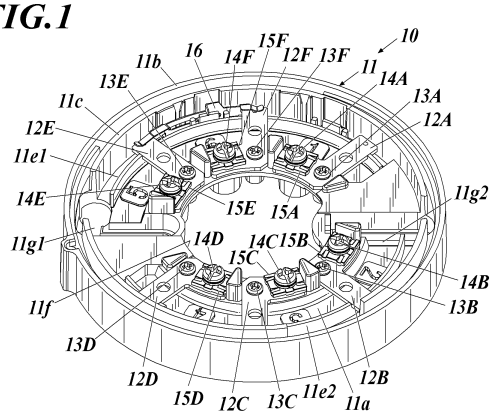
(72) Inventors:
- **KOYANO, Satoru**
**Tokyo 151-8535 (JP)**
- **YANAGISAWA, Satoshi**
**Tokyo 151-8535 (JP)**

(74) Representative: **Grünecker Patent- und Rechtsanwälte**
**PartG mbB**
**Leopoldstraße 4**
**80802 München (DE)**

(54) **SENSOR BASE AND SENSING DEVICE**

(57) A detector base comprising a bottom plate that forms a circular shape, an outer peripheral wall that is provided surrounding the bottom plate, and a plurality of connection terminals that are arranged on the bottom plate at prescribed intervals in the circumferential direction, the detector base being configured so as to enable attachment of a detector provided with a plurality of external terminals that are capable of contacting each of the plurality of connection terminals, wherein: the detector base comprises, between any two connection terminals among the plurality of connection terminals, short-circuit members that have contact parts capable of contacting the respective contact terminals at both ends and that are arranged so as to be capable of moving in a reciprocating manner; two protruding parts having different heights are provided to the short-circuit members; and the short-circuit members are configured such that the contact parts at both ends are contacted by two corresponding contact terminals when the short circuit members are moved to one side of a movement range thereof, and such that at least one of the contact parts at the two ends is separated from the connection terminals when the short-circuit members are moved to the other side of the movement range.

*FIG.1*




EP 4 191 553 A1

## Description

### Technical Field

**[0001]** The present invention relates to a detector base for mounting a detector for detecting abnormalities such as fires that produce flame, smoke, and the like on a ceiling or a wall surface, and a detecting device including the detector base and the detector (smoke detector, heat detector, infrared detector, and the like).

### Background Art

**[0002]** The detector is configured to be removably attached to the detector base installed on the ceiling surface of a building or the like. The detector base is connected to a receiver installed in a fire monitoring room, and the like via wiring called the detector line installed above the ceiling, and the like. One detector line is connected to multiple detector bases. Each detector base has its own fire detector attached to it.

**[0003]** A conduction test is generally performed when the detector line has been installed in the building and the detector bases have been installed, to ensure that the line has been installed correctly. Before attaching the detector to the detector base, conduction is maintained between positive or negative power input/output terminals at each detector base, and the voltage or current between the positive and negative power terminals at the detector base at the end of the line is measured with a tester. Thereby, the conduction test of the detector line is performed.

**[0004]** There is conventionally disclosed an invention relating to a detector base which is connected electrically between the terminals of the same polarity by a short-circuit wire spring, and the short-circuit wire spring can be easily removed after the inspection of the line is completed, in order to enable conduction between the positive or negative pair of power input/output terminals at each detector base before the detector is installed. (See Patent Document 1).

**[0005]** In addition, an invention relating to the detector base in which an arc-shaped metal piece is provided between the terminals to be conducted, and by sliding this arc-shaped metal piece, it is possible to electrically conduct or interrupt between a pair of terminals is disclosed (see Patent Document 2).

### Citation List

### Patent Literatures

**[0006]**

Patent Document 1: Japanese Patent Application Publication No. H05-303692
Patent Document 2: British Patent Application Publication No. 2396752

### Summary of Invention

### Technical Problem

**[0007]** The detector base of Patent Document 1 requires inserting and connecting the ends of the short-circuit wire springs between the same polarity terminals of each detector base during the conduction test performed after the installation of the detector line, and removing the short-circuit wire springs after the test is completed. In the detector base of Patent Document 2, electrical conduction and interruption are performed by means of an arc-shaped metal piece for short-circuiting between the terminals to be conducted, but the operation of sliding the arc-shaped metal piece must be performed with the fingers (human hands).

**[0008]** Therefore, both the detector bases of the Patent Documents 1 and 2 have a problem that it is troublesome to set up the conduction/interruption of the short-circuit means between the specified terminals during the conduction test, and since the operator is responsible for setting up the conduction/interruption of the short-circuit means, there is a possibility of setting up errors.

**[0009]** In addition, there are, as the types of the detector, a type in which multiple detectors are monitored as a unit for each detector line, and a type in which multiple detectors connected to the detector line are managed individually with individual addresses.

**[0010]** Specifically, in the case of the detector called the conventional type, which is used in the system that monitors multiple detectors as a unit for each detector line, if even one detector connected to the detector line is out of the detector base, it is desired to be detected to trigger an alarm. Therefore, as shown in FIG. 11A, during the conduction test after the detector line has been installed, it is desirable to set the conductive state "A" set by the short-circuit means in the detector base DB to the interrupted state "B" by attaching of the detector, and to maintain the interrupted state "C" even when the detector comes off.

**[0011]** Even if the negative power input terminal 6 and the negative power output terminal 1 are electrically interrupted in the detector base DB by the attaching of the detector, the terminal 6 and the terminal 1 are in a conductive state via the power line inside the detector. This allows power (electric power) to be transmitted to the adjacent detector connected to the same detector line.

**[0012]** On the other hand, in the case of the detector called the analog type used in the system where multiple detectors connected to one detector line are managed with the individual addresses, even if the detector is removed from the detector base, the removed detector can still be identified by the loss of communication. Therefore, it is desirable for the detector line to remain monitored, since the other detectors can be properly managed by the receiver connected via the detector line. Therefore, as shown in FIG. 11B, during the conduction test after the detector line has been installed, it is desirable to set

the conductive state "A" set by the short-circuit means in the detector base DB to the interrupted state "B" by attaching of the detector, and switch to the conductive state "C" when the detector is removed.

**[0013]** However, both the detector bases of the Patent Documents 1 and 2 have a problem that the setting of the short-circuit means is left to the operator's judgment, and there is a possibility of setting errors in the short-circuit means when the detector comes off.

**[0014]** The present invention was made in view of the above-mentioned problems, the object of which is to provide the detector base and the detecting device that can easily perform the setting work of conduction/interruption of the short-circuit means between the specified terminals according to the type (type) of the detector after the conduction test after the detector line has been installed.

**[0015]** Another object of the present invention is to provide the detector base and the detecting device capable of preventing setting errors during the setting work of conduction/interruption of the short-circuit means between the specified terminals according to the type (type) of the detector after the conduction test after the detector line has been installed.

Solution to Problem

**[0016]** In order to achieve the object, this invention is a detector base to which a detector is attachable and which includes: a bottom plate that is circularly shaped; a peripheral wall that is provided along a periphery of the bottom plate; and multiple connection terminals that are arranged at a predetermined interval in a circumferential direction on the bottom plate, the detector including multiple external terminals that are able to contact the respective multiple connection terminals, and the detector base comprising, between two connection terminals among the multiple connection terminals, a short-circuiting member that has, at ends, a pair of contact portions which are able to contact the respective two connection terminals, and that is arranged to be movable back and forth in a predetermined direction, wherein two protruding portions of different heights are provided in the short-circuiting member, the contact portions at the ends contact the corresponding two connection terminals when the short-circuiting member is moved to one side of a movement range by a force acting on one protruding portion among the two protruding portions, and at least one of the contact portions at the ends separates from a corresponding connection terminal among the connection terminals when the short-circuiting member is moved to the other side of the movement range by a force acting on the other protruding portion among the two protruding portions.

**[0017]** According to the detector base having the above configuration, the short-circuiting member is arranged to be movable back and forth between any two connection terminals, so that by moving the short-circuiting member, the state between the two corresponding connection terminals is shifted to the electrically conductive or non-conductive state. In addition, since the short-circuiting member is provided with two protruding portions of different heights, the mechanism for moving the short-circuiting member in both directions and the mechanism for moving only to one side can be provided by using these protruding portions of different heights.

**[0018]** Here, the short-circuiting member includes two protruding portions of different heights from a surface of the bottom plate, and a guide structure that guides the short-circuiting member is provided on an inner side of the peripheral wall.

**[0019]** According to such a configuration, since the short-circuiting member is provided with two protruding portions of different heights from the surface of the bottom plate, when the detector base is provided with the projection that can intersect the above two protruding portions, it is easier to avoid interference with other parts or sections. In addition, the guide structure allows the short-circuiting member to move stably.

**[0020]** In addition, the peripheral wall is an outer peripheral wall and an inner wall that is formed with a predetermined interval on an inner side of the outer peripheral wall, each of the multiple connection terminals is provided to extend to a vicinity of the inner wall, and the short-circuiting member is arc-shaped, and arranged to be movable along an inner circumferential surface of the inner wall.

**[0021]** According to such a configuration, the inner wall can be used to realize a guide structure that guides and moves the short-circuiting member, and the outer peripheral wall and inner wall can be used to configure a fitting unit with the case of the detector that is joined to the detector base.

**[0022]** Furthermore, the short-circuiting member has a main body that has a strip shape, and a slit that is elongated in a movement direction is formed in the main body, and on the bottom plate, a locking piece that has a claw so as to be able to engage with the slit is provided in parallel with the main body.

**[0023]** According to such a configuration, the locking piece prevents the short-circuiting member from slipping out of the detector base.

**[0024]** Furthermore, the locking piece is formed such that the claw faces the inner circumferential surface of the inner wall, and a protrusion that contacts the inner circumferential surface of the inner wall is provided on a lateral surface of the short-circuiting member.

**[0025]** According to such a configuration, a protrusion on the lateral surface of the short-circuiting member pushes the short-circuiting member toward the locking piece, so that the engagement between the slit of the short-circuiting member and the claw of the locking piece is difficult to disengage.

**[0026]** In addition, a groove that is able to guide the protrusion on the lateral surface of the short-circuiting member in a height direction of the inner wall is formed at a predetermined position on the inner circumferential

surface of the inner wall.

**[0027]** According to such a configuration, the short-circuiting member can be easily installed in a predetermined location with accurate positioning.

**[0028]** In addition, on an inner side of the inner wall, multiple guide structures are provided corresponding to between different connection terminals, each of the multiple guide structures being the guide structure, and the short-circuiting member is arranged selectively to one of the multiple guide structures.

**[0029]** According to such a configuration, the detector base can be commonly used for products for which the short-circuiting member is to be arranged between two connection terminals which is different for each of the products. Thus, it is possible to reduce costs.

**[0030]** In addition, a connection terminal among the multiple connection terminals is formed of a plate-shaped conductive material, and each of the contact portions at the ends of the short-circuiting member is formed by a pair of curved pieces that contact the connection terminal so as to pinch the connection terminal from above and below.

**[0031]** According to such a configuration, the contact surface between the short-circuiting member and the connection terminal can be increased to ensure good electrical conductive state.

**[0032]** Another invention of the present application is a detecting device including: the detector base having the configuration as described above; and a detector that is joined to the detector base, wherein multiple external terminals and a projection are provided on a bottom surface of a case of the detector, the multiple external terminals being able to contact the respective multiple connection terminals, and the projection facing the short-circuiting member, being located between the two protruding portions, and having such a height that is able to interfere with at least one of the two protruding portions when the detector is rotated in a state in which the detector is fitted to the detector base.

**[0033]** According to the detecting device having the above configuration, by fitting the detector to the detector base and rotating it, it is possible to move the short-circuiting member in the desired direction to transition the state between the corresponding two connection terminals to the conductive or non-conductive state.

## Advantageous Effects of Invention

**[0034]** According to the detector base and the detecting device according to the present invention, it is possible to easily perform the setting work of conduction/interruption of the short-circuit means between the specified terminals when the conduction test is performed after the detector line has been installed. There is also an effect that it is possible to prevent setting errors during the setting work of conduction/interruption of the short-circuit means between the specified terminals when the conduction test is performed after the detector line has been installed.

## Brief Description of Drawings

**[0035]**

FIG. 1 is a diagrammatic view showing the structure of the front side of one embodiment of the detector base according to the present invention.

FIG. 2 is a diagrammatic view showing the structure of the back side of the detector base of the embodiment.

FIG. 3 is a partially enlarged bottom view showing details of the first screw-insertion slit in the detector base of the embodiment.

FIG. 4 is a partially enlarged diagrammatic view showing details of the second screw-insertion slit of the detector base of the embodiment.

FIG. 5A is a diagrammatic view showing a specific example of a short-circuiting piece forming the detector base of the embodiment.

FIG. 5B is a diagrammatic view of the short-circuiting piece shown in FIG. 5A, viewed from another direction.

FIG. 6A is a partially enlarged diagrammatic view showing the state in which the short-circuiting piece is installed in the detector base.

FIG. 6B is a partially enlarged diagrammatic view showing the state of the connection between the short-circuiting piece and the connection terminal.

FIG. 6C is a cross-sectional main part view showing the state in which the short-circuiting piece is installed in the detector base.

FIG. 7A is a partially enlarged diagrammatic view showing the relationship between the short-circuiting piece and the high projection of the detector.

FIG. 7B is a partially enlarged diagrammatic view showing the relationship between the short-circuiting piece and the high projection of the detector.

FIG. 8A is a partially enlarged diagrammatic view showing the relationship between the short-circuiting piece and the low projection of the detector.

FIG. 8B is a partially enlarged diagrammatic view showing the relationship between the short-circuiting piece and the low projection of the detector.

FIG. 9A is a diagrammatic view showing the structure of the bottom of the body case of the detector.

FIG. 9B is a diagrammatic view showing the structure of the bottom of the body case of another type of the detector.

FIG. 10A is a partially enlarged diagrammatic view showing details of the terminal number display section on the connection terminal of the detector base of the embodiment.

FIG. 10B is a diagrammatic view of the terminal number display section shown in FIG. 10A, viewed from the opposite side.

FIG. 11A is a circuit diagram showing the transition

of the state of the connection between the terminals of the detector base in the detector line using the conventional type of the detector.

FIG. 11B is a circuit diagram showing the transition of the state of the connection between the terminals of the detector base in the detector line using the analog type of the detector.

Description of Embodiments

**[0036]** The embodiment of the detector base according to the present invention is explained with reference to the drawings. FIG. 1 is a diagrammatic view showing the structure of the front side of the detector base 10 of the embodiment.

**[0037]** FIG. 2 is a diagrammatic view showing the structure of the back side of the detector base 10.

**[0038]** The detector base 10 is generally fixed and installed on the ceiling surface of a building with the back side facing upward and the front side facing downward. The detector is mounted on the front side. The detector base is connected to a receiver, not shown, that centrally manages multiple detectors in the area to be detected. When the detector detects an event such as fire, the receiver is notified of the detection signal from the detector via the terminals on the detector base and the wiring (the detector line) connected to the terminals.

**[0039]** The detector attached to the detector base can be a thermal detector with a thermistor, a smoke detector with a photoelectric element, a flame detector with an infrared detector, or any other detector with any detection method.

**[0040]** The detector base 10 of the embodiment is made of synthetic resin and, as shown in FIG. 1, includes: the base body 11, which has a small height and a bottomed cylindrical shape; connection terminals 12A to 12F arranged in a radial line on the bottom plate 11a that forms a circular shape inside the base body 11; screws 13A to 13F for fixing the connection terminals 12A to 12F on the above bottom plate 11a; and screws 14A to 14F and safety washers 15A to 15F for electrically connecting the wiring cores to terminals 12A to 12F.

**[0041]** The above connection terminals 12A to 12F each have an inverted-L shape. An insertion hole through which the each of the above screws 13A to 13F is inserted is formed at the intersection of the shorter side and the longer side, and the shorter side has an insertion hole through which each of the above screws 14A to 14F is inserted.

**[0042]** Around the above bottom plate 11a, an outer peripheral wall 11b is provided. On the inner side of the outer peripheral wall 11b, an inner wall 11c of the same height is formed with a slight gap between the outer peripheral wall 11b and the inner wall 11c. The circular wall at the bottom of the case of the detector is placed between the outer peripheral wall 11b and the inner wall 11c, so that the case of the detector is fitted to the base body 11.

**[0043]** In addition, the base body 11 has arc-shaped terminal support ribs 11e1, 11e2, which are lower in height than the above inner wall 11c, on the bottom plate 11a of the base body 11. The connection terminals 12A to 12F are arranged so that the longer sides of the connection terminals 12A to 12F are in contact with these terminal support ribs 11e1, 11e2. As a result, a gap is formed between the longer sides of the connection terminals 12A to 12F and the inner surface of the bottom plate 11a of the base body 11 so that terminals 22A to 22F (see FIG. 9) of the detector are inserted into these gaps and contact with each other and make an electrical connection. (The above description shows an example with six terminals 22A to 22F. However, in the case where the terminal which is not to be used as the detector, for example, the terminal 22D is not used, the terminal itself may not be installed).

**[0044]** Furthermore, as shown in FIG. 2, the bottom plate 11a of the base body 11 has, in the center thereof, a circular opening 11f through which the wires extending from the ceiling are passed. The bottom plate 11a also has slits 11g1, 11g2, each extending in the radial direction of the base body across the opening 11f. The slits 11g1 and 11g2 can be used to insert the necks of two screws that have been installed in advance with their heads facing down (to the floor) at the installation site (ceiling surface) of the base body 11.

**[0045]** The slits 11g1, 11g2 are formed one step lower than the inner surface of the above bottom plate 11a, and the width of the slits 11g1 and 11g2 is smaller than the diameter of the head of the screws used to fasten the base body 11 to the ceiling surface and larger than the diameter of the neck of the screws.

**[0046]** As shown enlarged in FIG. 3, the slit 11g1 among the slits 11g1 and 11g2 is bent at a nearly right angle at its outer end. There, a screw insertion hole 11h is formed, the diameter of which is slightly larger than the diameter of the head of the screw used to fix the base body 11 to the ceiling surface.

**[0047]** The inner end of the other slit 11g2 is provided with a cut portion 11i forming an entrance large enough to allow the head of the above screw to pass through, as shown enlarged in FIG. 4. When the head of the screw is fitted to this cut portion 11i with the top surface of the head of the screw in contact with the back surface of the bottom plate 11a, the neck of the screw can move along the slit 11g2.

**[0048]** Therefore, the detector base 10 is joined to the ceiling surface so that the screw insertion hole 11h and the entrance (cut portion 11i) are aligned with the heads of two screws which are provided at a predetermined interval from each other with the heads facing down at the base installation position on the ceiling surface in advance. Then, the detector base 10 is rotated about 10 degrees around the entrance (111). After relative movement of the screw of the screw insertion hole 11h to the slit 11g1, the detector base 10 is moved in the direction of the extension of the slits 11g1, 11g2. Then, by the relative slide of the necks of the above two screws along

the slits 11g1 and 11g2, the detector base 10 is then set in the normal position. By turning and tightening the two screws in this state, the detector base 10 is fixed to the ceiling surface.

**[0049]** As described above, the detector base 10 of the embodiment is configured to be installed in a predetermined position by attaching, in advance, two screws at a predetermined interval to the base installation position on the ceiling surface, and the like, and aligning the screw insertion holes 11h and the entrance (11i) of the detector base 10 with these screws and sliding and then tightening the screws. This improves work efficiency compared to the installation method in which the detector base 10 is first joined to the base installation position and the screws are later tightened through the screw holes in the detector base. Also, when the detector base 10 needs to be replaced, the detector base 10 can be removed to attach another detector base simply by loosening the screws, without the need to remove them. This means that the work can be completed in a short period of time.

**[0050]** Furthermore, as shown in FIG. 1, on the inner circumferential surface of the inner wall 11c between the above connection terminals 12E and 12F, an arc-shaped short-circuiting piece 16 for electrical connection between terminals 12E and 12F is arranged so as to be slidable along the inner circumferential surface. The above short-circuiting piece 16 is formed by punching and bending a plate-shaped metal material such as used for plate springs.

**[0051]** Though the detector base 10 of the embodiment is not especially limited, the inner circumferential surface of the inner wall 11c between the connection terminals 12F and 12A, in addition to between the connection terminals 12E and 12F, is also provided with a structure to allow the above-mentioned short-circuiting piece 16 to be slidably arranged along the circumferential surface. In the embodiment, when the short-circuiting piece 16 is arranged between the connection terminals 12F and 12A, the short-circuiting piece 16 is not arranged between the connection terminals 12E and 12F.

**[0052]** FIG. 5A and FIG. 5B show the detailed shape of the above short-circuiting piece 16. FIG. 6A and FIG. 6B show the details of the state in which this short-circuiting piece 16 is placed on the inner circumference of the inner wall 11c and the joining state of the connection terminals 12E and 12F with the short-circuiting piece 16. FIG. 6C also shows an example of a slip-off stopping structure of the short-circuiting piece 16.

**[0053]** As shown in FIGS. 5, the short-circuiting piece 16 includes: a horizontal plate-shaped main body 16a; contact portions 16b provided at both ends of the main body 16a; a bent piece 16c that protrudes upward from a position a little further away from the center of the upper side of the main body 16a, and then bends inward; and a bent piece 16d that protrudes upward from a position a little further away to the opposite side of the above from the center of the upper side of the main body 16a, and then bends inward, and furthermore has the tip bent downward. The bent piece 16d is formed to be lower in height than the bent piece 16c.

**[0054]** The main body 16a of the short-circuiting piece 16 has a strip shape, and this main body 16a has a slit 16e, which is elongated in the movement direction, to which the slip-off stopping piece 11j (see FIG. 6C) described below engages. The contact portion 16b at each end of the main body 16a is a pair of elongated plate-shaped pieces extending toward both sides, curved so that portions are closer to each other. The interval between the closest portions is formed to be smaller than the thickness of the connection terminals 12A to 12F. When the short-circuiting piece 16 is moved in the longitudinal direction, the connection terminals 12A to 12F can pass between the contact portions 16b from one side to the other.

**[0055]** Furthermore, a pair of punched, deformed and machined protrusions 16f are formed on the outer surfaces of both ends of the main body 16a.

**[0056]** FIG. 6A shows a state in which the short-circuiting piece 16 is arranged between the two connection terminals 12E and 12F. In the state shown in FIG. 6A, the contact portion 16b of the short-circuiting piece 16 is off the connection terminal 12E and is not in contact with the connection terminal 12E, so the area between the connection terminals 12E and 12F is electrically non-conductive. When the short-circuiting piece 16 is slid toward the connection terminal 12E from this state, as shown in FIG. 6B, the contact portions 16b at both ends of the short-circuiting piece 16 pinch the tips of the connection terminals 12E and 12F from above and below, so that the area between the connection terminals 12E and 12F becomes electrically conductive.

**[0057]** The contact portions 16b at both ends of the short-circuiting piece 16 slide in contact with the surfaces of the connection terminals 12E and 12F, which can be expected to clean the contact surfaces and maintain good electrical contact.

**[0058]** Between the connection terminals 12E and 12F as shown in FIG. 6A, and between the inner wall 11c and the terminal support ribs 11e as shown in FIG. 6C, the detector base 10 has a slip-off stopping piece 11j with an outward-facing claw at the upper end, which rises upward from the bottom plate 11a. The short-circuiting piece 16 is then located along the inner circumferential surface of the inner wall 11c with the central slit 16e engaging with the claw of the slip-off stopping piece 11j.

**[0059]** Therefore, the short-circuiting piece 16 is held in place so that it does not fall out of the detector base 10 even if the detector base 10 is turned upside down or subjected to impact. Furthermore, a pair of protrusions 16f formed on the outer surfaces of both ends of the main body 16a presses the entire short-circuiting piece 16 inwardly, so that the slip-off stopping piece 11j is firmly inserted into the slit 16e, making the engagement between the short-circuiting piece 16 and the slip-off stopping piece 11j difficult to disengage.

**[0060]** In addition, in the embodiment, as shown in FIG.

6A, a guiding groove 11k, which has a width approximately the same as the diameter of the aforementioned protrusion 16f and which becomes wider as it moves upward is provided at a predetermined site of the inner circumferential surface of the inner wall 11c. Thus, when the short-circuiting piece 16 is inserted on the inner side of the inner wall 11c, the protrusion 16f is aligned with the upper portion of the guiding groove 11k and pushed downward, and thereby aligned with the predetermined mounting position and stored. In other words, the protrusion 16f has the function of guiding the short-circuiting piece 16 during insertion, and the function of pressing the short-circuiting piece 16 inward after insertion.

**[0061]** Furthermore, at the portion of the inner circumferential surface of the inner wall 11c that is facing the aforementioned slip-off stopping piece 11j, a groove 11m slightly wider than the width of the slip-off stopping piece 11j is formed. This groove 11m allows the tip of a tool such as a flat screwdriver to be inserted between the short-circuiting piece 16 and the slip-off stopping piece 11j, hook it to the slit 16e, and lift it up to easily remove the short-circuiting piece 16 from the inner side of the inner wall 11c. Furthermore, although not shown in the figure, a guide groove where the lower edge of the short-circuiting piece 16 engages is formed with a predetermined length at the base of the inner wall 11c, and this guide groove is configured to limit the slidable range of the short-circuiting piece 16.

**[0062]** Next, the function of the bent pieces 16c and 16d on the short-circuiting piece 16 and the reason for changing the height of the bent pieces 16c and 16d will be explained.

**[0063]** FIG. 7A and FIG. 7B show the configuration of the bent pieces 16c and 16d of the short-circuiting piece 16 and the bottom surface of the detector. In FIG. 7A and FIG. 7B, the sign 21 indicates a part of the circularly shaped bottom plate of the body case of the detector that is joined to the detector base of the embodiment. The bottom plate 21 has a projection 21a that is in an inverted L-shape in a side view on the part of the bottom plate 21 facing the short-circuiting piece 16 and located between the bent pieces 16c and 16d of the short-circuiting piece 16 when the body case of the detector is joined to the detector base.

**[0064]** The height of the projection 21a is set such that its tip (lower end in FIG. 7A and FIG. 7B) reaches the position where the tip intersects with the bent pieces 16c and 16d of the short-circuiting piece 16. Thus, in FIG. 7A, when the bottom plate 21 is moved (rotated) to the right, the side of the tip of the projection 21a contacts the bent piece 16c, and the short-circuiting piece 16 moves together. On the other hand, when the bottom plate 21 is moved (rotated) to the left, as shown in FIG. 7B, the side of the tip of the projection 21a contacts the bent piece 16d and the short-circuiting piece 16 moves together.

**[0065]** The reason why the projection 21a is shaped in the inverted L-shape is to increase the strength against bending stress generated at the base of the projection 21a when a force acts on the tip of the projection 21a. Therefore, the shape of the projection 21a is not limited to the inverted L-shape viewed in a side view, but may be rectangular with the tip having the same width as that of the base, that is, the entire projection may be cuboid.

**[0066]** In the embodiment, the body case of the detector is rotated by a predetermined angle (approximately 10°) in a circumferential direction when the body case of the detector is joined to the detector base 10 and when the body case of the detector is separated from the detector base 10. Therefore, in order to join the body case of the detector to the detector base 10, when the body case is rotated after being aligned with and fitted to the detector base 10 at a predetermined angle, the short-circuiting piece 16 is moved by the rotation operation. Then, as shown in FIG. 6A, the contact portions 16b of the short-circuiting piece 16 come off the connection terminals 12E and 12F, which sets the electrically non-conductive state between the connection terminals 12E and 12F.

**[0067]** On the other hand, when the body case of the detector is rotated in the opposite direction to the above in order to separate the body case of the detector from the detector base 10, the short-circuiting piece 16 is moved by the rotation operation. Then, as shown in FIG. 6B, the contact portions 16b of the short-circuiting piece 16 pinch and contact the connection terminals 12E and 12F, which sets the electrically conductive state between the connection terminals 12E and 12F. By reversing the positional relationship between the bent pieces 16c and 16d, the direction of the rotation operation of the body case of the detector and setting of the non-conductive state or the conductive state can be the opposite of the above.

**[0068]** FIG. 8A and FIG. 8B show the relationship between the projection 21a and the bent pieces 16c and 16d of the short-circuiting piece 16 in the case where the height of the projection 21a is set to be lower than FIG. 7A and FIG. 7B, and to be such height that the tip of the projection 21a intersects the bent piece 16c of the short-circuiting piece 16 but does not intersect the bent piece 16d.

**[0069]** In the case where the height of the projection 21a is set as described above, when the body case of the detector is rotated relative to the detector base 10 in order to join the body case of the detector to the detector base 10, the rotation operation causes the projection 21a to contact the bent piece 16c and the short-circuiting piece 16 is moved together, as shown in FIG. 8A. Then, as shown in FIG. 6A, the contact portions 16b of the short-circuiting piece 16 come off the connection terminals 12E and 12F, which sets the electrically non-conductive state between the connection terminals 12E and 12F.

**[0070]** On the other hand, when the body case of the detector is rotated in the opposite direction to the above in order to separate the body case of the detector from the detector base 10, the short-circuiting piece 16 is

moved by the rotation operation. As shown in FIG. 8B, the projection 21a does not contact the bent piece 16d and passes over it, and the short-circuiting piece 16 is not moved. Therefore, the contact portions 16b of the short-circuiting piece 16 remain off the connection terminals 12E and 12F, maintaining the electrically non-conductive state between the connection terminals 12E and 12F.

**[0071]** Since the detector base 10 of the embodiment has the above functions, there is an advantage that the electrical connection (conductive or non-conductive state) between the connection terminals 12E and 12F after the detector has been removed from the detector base 10 can be changed by selecting and forming the high projection 21a or the low projection 21a at the bottom of the body case of the detector according to the type (type) of the detector.

**[0072]** FIG. 9A shows the configuration of the bottom of the body case of the detector, which is called the conventional type, which is used in the system in which multiple detectors are monitored as a unit for each detector line. FIG. 9B shows the configuration of the bottom of the body case of the detector called the analog type, which is used in the system in which multiple detectors connected to one detector line are managed with individual addresses.

**[0073]** As shown in FIG. 9A and FIG. 9B, respectively, the bottom plate 21 of the body case 20 of the detector has external terminals 22A to 22F connected to the connection terminals 12A to 12F provided on the detector base 10 of the embodiment. The external terminals 22A to 22F are each provided with an inner terminal and an outer terminal having contact pieces that are bent in a direction getting closer to each other. The contact pieces are arranged so that they overlap each other, and inserting the connection terminals 12E to 12F of the detector base 10 between the contact pieces of the inner and outer terminals makes the electrical connection between the terminals of the detector and their corresponding terminals of the detector base.

**[0074]** In addition, a peripheral wall portion 23 that enters the gap between the outer peripheral wall 11b and the inner wall 11c of the circumferential edge of the detector base 10 is provided in the periphery of the bottom plate 21. By fitting this peripheral wall portion 23 to the gap between the outer peripheral wall 11b and the inner wall 11c of the detector base 10 and rotating it, the external terminals 22A to 22F enter between the connection terminals 12E to 12F and the bottom plate 11a. Thereby, the detector is joined to the detector base, while making electrical connection between the corresponding terminals.

**[0075]** In the detector base 10 to which the analog type detector of FIG. 9B is joined, as shown in FIG. 1, the short-circuiting piece 16 is arranged between the connection terminals 12E and 12F. In the detector base 10 to which the conventional type detector of FIG. 9A is joined, the short-circuiting piece 16 is arranged between the connection terminals 12F and 12A in FIG. 1.

**[0076]** The bottom plate 21 of the body case 20 shown in FIG. 9A has the low projection 21a in the vicinity of the external terminal 22A (first terminal). The bottom plate 21 of the body case 20 shown in FIG. 9B is provided with the high projection 21a in the vicinity of the external terminal 22F (sixth terminal) . Therefore, even if any of the detectors is joined to the detector base 10, when the body case 20 of the detector is turned for joining, the contact portion 16b, as shown in FIG. 6A, comes off the connection terminals 12F, 12A or 12E, 12F, making the electrically non-conductive state between the connection terminals 12F and 12A or between 12E and 12F.

**[0077]** In the state in which this detector is joined to the detector base 10, the wiring in the detector makes the connection, and thus there is no disconnection as the detector line.

**[0078]** In separating the detector from the detector base 10, when the detector (conventional type detector) shown in FIG. 9A, which is provided with the low projection 21a, is rotated to separate from the detector base 10, the projection 21a passes over the bent piece 16d without contacting it. Thus, the short-circuiting piece 16 is not moved and the contact portions 16b of the short-circuiting piece 16 remain off the connection terminals 12F and 12A, which maintains the electrically non-conductive state between the connection terminals 12F and 12A.

**[0079]** In the detector (conventional type detector) shown in FIG. 9A, the connection terminal 12F is the negative power input terminal, and the connection terminal 12A is the negative power output terminal. Therefore, when the electrically non-conductive state is made between the connection terminals 12F and 12A, the detector can be found to be off (the detector line is disconnected) by measuring the voltage of the line to which the detector base 10 is connected.

**[0080]** On the other hand, when the detector (analog type detector) shown in FIG. 9B, which is provided with the high projection 21a, is rotated to separate from the detector base 10, the projection 21a contacts the bent piece 16d and moves the short-circuiting piece 16. Thus, the contact portions 16b of the short-circuiting piece 16 contact the connection terminals 12E and 12F, returning to the electrically conductive state between the connection terminals 12E and 12F.

**[0081]** In the detector (analog type detector) shown in FIG. 9B, the connection terminal 12F is the negative power input terminal, and the connection terminal 12E is the negative power output terminal. Therefore, by making the electrically conductive state between the connection terminals 12E and 12F, power is transmitted to other adjacent detectors. Even if any of the detectors is removed from the detector base 10, the remaining detectors operate normally, and when an abnormality is detected, the receiver can detect the occurrence of the abnormality via the detector line.

**[0082]** The following List 1 and List 2 respectively show

examples of applications for the connection terminals 12B to 12E or 12A to 12D, which are other than the connection terminals 12F and 12A or 12E and 12F which are used as the negative power input terminal and the negative power output terminal. Among them, the List 1 shows an example of terminal usage for the conventional type detector that uses the connection terminals 12F and 12A as the negative power input terminal and the negative power output terminal. The List 2 shows an example of terminal usage for the analog type detector that uses the connection terminals 12E and 12F as the negative power input terminal and the negative power output terminal.

List 1 (Example of use of conventional type detector)

**[0083]**

Terminal 1: Negative (-) power output terminal
Terminal 2: Not used
Terminal 3: Positive (+) power input/output terminal
Terminal 4: Not used
Terminal 5: External indicator light control terminal
Terminal 6: Negative (-) power input terminal

List 2 (Example of use of analog type detector)

**[0084]**

Terminal 1: Positive (+) power input/output terminal
Terminal 2: Terminal for relay control
Terminal 3: External indicator light control terminal
Terminal 4: Not used
Terminal 5: Negative (-) power output terminal
Terminal 6: Negative (-) power input terminal

**[0085]** The examples of use shown in the above lists are examples and are not limited to these.

**[0086]** For example, the number of terminals for the detector and the detector base may be different.

**[0087]** Specifically, in the above List 2 (example of use of the analog type detector), the terminal 4 of the detector is not used and no terminal metal fittings are provided, thereby reducing the number of parts.

**[0088]** As explained above, according to the detecting device including the detector base 10 and the detector having the projection 21a in the embodiment, the height of the projection 21a provided on the bottom plate 21 of the detector is changed according to the type (type) of the detector. This difference in the height of the projection 21a corresponding to the type (type) of the detector enables setting of the electrical conduction between the pair of negative power input/output terminals (same polarity terminals) of the detector base 10 when the detector is removed from the detector base 10, to conductive or non-conductive in conjunction with the removal of the detector.

**[0089]** By providing, on the detector base 10, multiple locations where the short-circuiting piece 16 can be installed, it is possible to realize the common use of parts and cost reduction, for the detector base used in the detection system to which different types (types) of detectors are connected. Furthermore, by not providing the short-circuiting piece 16 in the detector base, the detector base can also be used to connect the detector that does not have the projection 21a.

**[0090]** FIG. 10A and FIG. 10B show a specific example of the terminal number display section on the base body 11 of the detector base 10 in the embodiment.

**[0091]** In the detector base of the embodiment, the numbers representing the terminal numbers are marked near the connection terminals 12A to 12F on the bottom plate 11a of the base body 11 as outline numbers that penetrate through the bottom plate 11a. FIG. 10A shows the terminal number "2", among the terminal numbers, marked near the connection terminal 12B. As shown in the figure, the outline number representing the terminal number is formed on the step 11n provided on the bottom plate 11a.

**[0092]** Some conventional products also have numbers representing terminal numbers in the vicinity of connection terminals 12A to 12F, but these are generally marked as embossed numbers. Such embossed numbers have the disadvantage that they are difficult to read because they are the same color as the base body. It is possible to color the surface of the embossed numbers in colors different from the color of the base body. However, there is a problem that the cost increases because of the additional process. On the other hand, if the numbers are written as outline numbers as described above, the numbers can be formed at the same time as forming the detector base with synthetic resin, thus reducing the cost.

**[0093]** FIG. 10A represents the lower side surface of the detector base when it is installed on the ceiling surface. If the numbers representing the terminal numbers are outline numbers that penetrate the bottom plate 11a, there is a possibility that water may flow down from the part of the outline numbers to the detector below and degrade the function of the detector in the case where water from condensation enters the upper side of the base body 11 through the ceiling surface. Moreover, if the bottom plate 11a is simply provided with the outline numbers, the area where the water drops will fall is not stable.

**[0094]** On the other hand, as described above, when the outline numbers representing the terminal numbers are formed on the steps 11n, it is possible to limit the point where water flows down to the detector, to the edges of the steps 11n. Therefore, for example, drainage holes can be provided in the parts of the case of the detector corresponding to the steps 11n to allow the water that has entered to drain out quickly, thereby preventing the detector from deteriorating its function.

**[0095]** Furthermore, in the detector base of the embodiment, as shown in FIG. 10B which represents the

opposite side of FIG. 10A of the base body 11, the rib 11p is formed around the outline number. Thus, it is possible to stop, with the rib 11p, water entering the upper side of the base body 11 from the ceiling and prevent water from flowing down from the penetration area of the outline numbers to the detector below.

**[0096]** The present invention has been described based on the embodiment. However, the present invention is not limited to the above embodiment, and can be modified to the extent not to depart from the gist thereof. For example, the above embodiment shows the detector base with six connection terminals, but the number of connection terminals is not limited to six.

**[0097]** Also, in the above embodiment, when setting the non-conductive state between a pair of negative power input/output terminals (same polarity terminals), the contact portions 16b at both ends of the short-circuiting piece 16 separate from the corresponding connection terminals almost at the same time. However, only one of the contact portions 16b may separate from the corresponding connection terminal.

**[0098]** Furthermore, in the above embodiment, the short-circuiting piece 16 is configured to move along the inner circumferential surface of the inner wall 11c of the base body 11. However, it is also possible to configure the short-circuiting piece 16 to move linearly by providing a guide member for the short-circuiting piece 16 in the base body 11 or by other means.

**[0099]** In the above embodiment, the short-circuiting piece 16 is provided with, on the upper part, the bent pieces 16c and 16d of different heights. However, the short-circuiting piece 16 may have, on the lateral surface, two bent pieces of different heights in the horizontal direction, and the body case of the detector may be provided with the projection 21a of the length different in the horizontal direction that can intersect at least one of the above bent pieces.

**[0100]** In addition, the above embodiment shows the double-walled structure with the outer peripheral wall and the inner wall along the periphery of the bottom plate of the detector base, but a single peripheral wall may be formed.

Industrial Applicability

**[0101]** The present invention is not limited to the detector for fire detecting, but also can be used for the detector base and the detecting device for attaching, to buildings, detectors that detect harmful gases and other detectors.

Reference Signs List

**[0102]**

10 detector base
11 base body
11a bottom plate
11b outer peripheral wall
11c inner wall
11e terminal support rib
11j locking piece
12A to 12F connection terminals
13A to 13F screws for fixing
14A to 14F screws for wiring connection
15A to 15F safety washers
16 short-circuiting piece
16a main body
16b contact portion
16c bent piece
16d bent piece
16e slit for guide
16f protrusion
20 body case of detector
21 bottom plate
21a projection
22A to 22F external terminals
23 peripheral wall portion

## Claims

**1.** A detector base to which a detector is attachable and which includes: a bottom plate that is circularly shaped; a peripheral wall that is provided along a periphery of the bottom plate; and multiple connection terminals that are arranged at a predetermined interval in a circumferential direction on the bottom plate, the detector including multiple external terminals that are able to contact the respective multiple connection terminals, and the detector base comprising, between two connection terminals among the multiple connection terminals, a short-circuiting member that has, at ends, a pair of contact portions which are able to contact the respective two connection terminals, and that is arranged to be movable back and forth in a predetermined direction, wherein

two protruding portions of different heights are provided in the short-circuiting member,
the contact portions at the ends contact the corresponding two connection terminals when the short-circuiting member is moved to one side of a movement range by a force acting on one protruding portion among the two protruding portions, and
at least one of the contact portions at the ends separates from a corresponding connection terminal among the connection terminals when the short-circuiting member is moved to the other side of the movement range by a force acting on the other protruding portion among the two protruding portions.

**2.** The detector base according to claim 1, wherein

the short-circuiting member includes two protruding portions of different heights from a surface of the bottom plate, and
a guide structure that guides the short-circuiting member is provided on an inner side of the peripheral wall.

**3.** The detector base according to claim 2, wherein

the peripheral wall is an outer peripheral wall and an inner wall that is formed with a predetermined interval on an inner side of the outer peripheral wall,
each of the multiple connection terminals is provided to extend to a vicinity of the inner wall, and
the short-circuiting member is arc-shaped, and arranged to be movable along an inner circumferential surface of the inner wall.

**4.** The detector base according to claim 3, wherein

the short-circuiting member has a main body that has a strip shape, and a slit that is elongated in a movement direction is formed in the main body, and
on the bottom plate, a locking piece that has a claw so as to be able to engage with the slit is provided in parallel with the main body.

**5.** The detector base according to claim 4, wherein

the locking piece is formed such that the claw faces the inner circumferential surface of the inner wall, and
a protrusion that contacts the inner circumferential surface of the inner wall is provided on a lateral surface of the short-circuiting member.

**6.** The detector base according to claim 5, wherein a groove that is able to guide the protrusion on the lateral surface of the short-circuiting member in a height direction of the inner wall is formed at a predetermined position on the inner circumferential surface of the inner wall.

**7.** The detector base according to any one of claims 3 to 6, wherein, on an inner side of the inner wall, multiple guide structures are provided corresponding to between different connection terminals, each of the multiple guide structures being the guide structure, and the short-circuiting member is arranged selectively to one of the multiple guide structures.

**8.** The detector base according to any one of claims 1 to 7, wherein

a connection terminal among the multiple connection terminals is formed of a plate-shaped conductive material, and
each of the contact portions at the ends of the short-circuiting member is formed by a pair of curved pieces that contact the connection terminal so as to pinch the connection terminal from above and below.

**9.** A detecting device comprising:

the detector base according to any one of claims 1 to 8; and
a detector that is joined to the detector base, wherein
multiple external terminals and a projection are provided on a bottom surface of a case of the detector, the multiple external terminals being able to contact the respective multiple connection terminals, and the projection facing the short-circuiting member, being located between the two protruding portions, and having such a height that is able to interfere with at least one of the two protruding portions when the detector is rotated in a state in which the detector is fitted to the detector base.

FIG.1

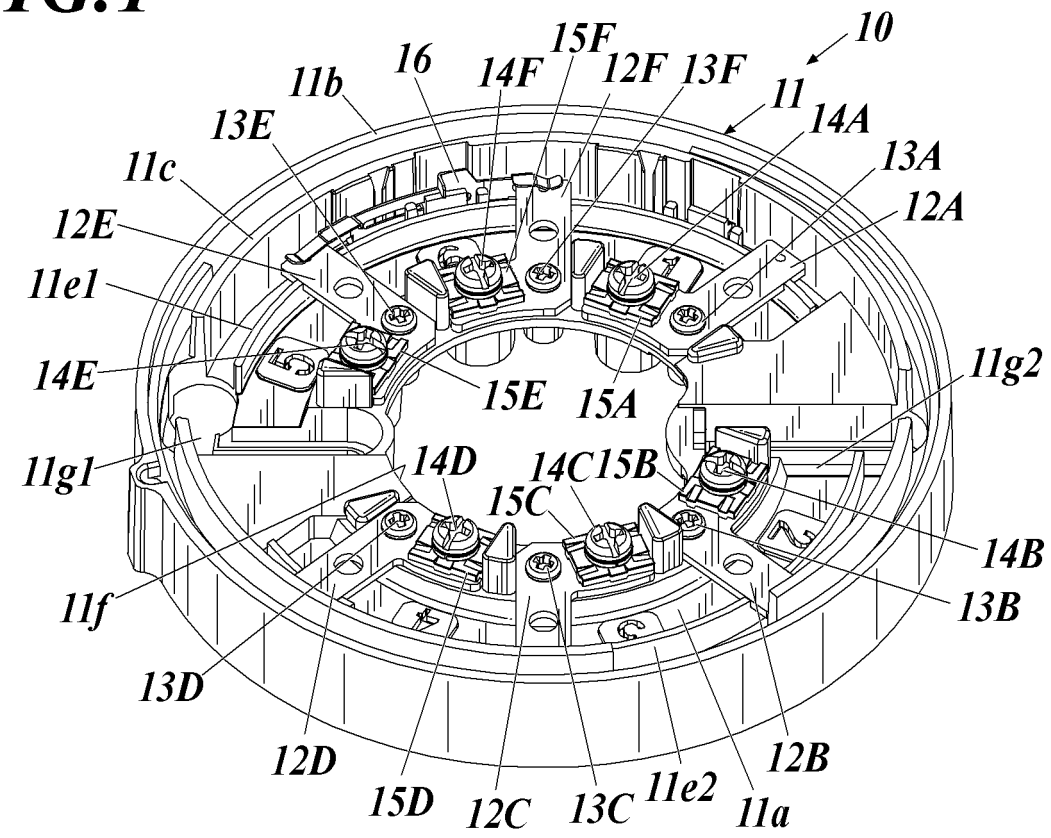

10
11
16
15F
14F
12F
13F
11b
13E
14A
11c
13A
12E
12A
11e1
14E
15E
15A
11g2
11g1
14D
14C
15B
15C
14B
11f
13B
13D
12D
15D
12C
13C
11e2
11a
12B

FIG.2

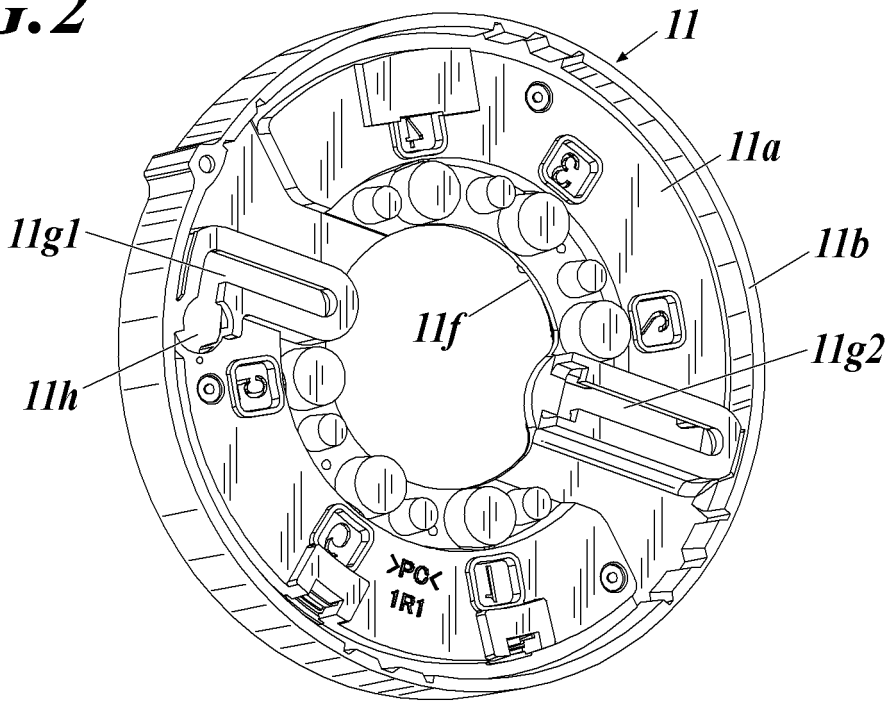

11
11a
11g1
11b
11f
11g2
11h

FIG.3

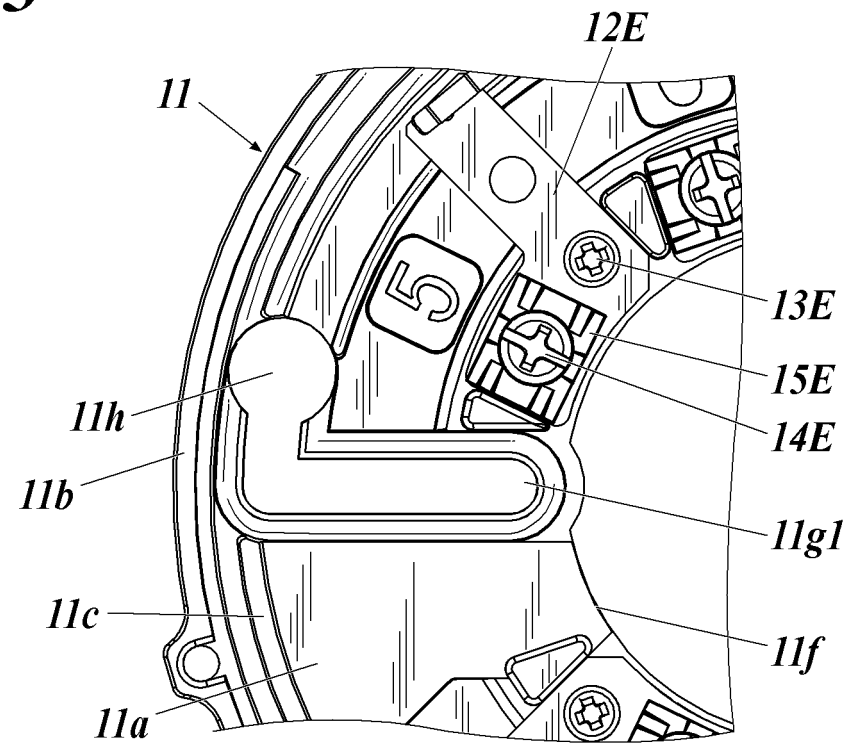

12E
11
13E
15E
14E
11h
11b
11g1
11c
11f
11a

FIG.4

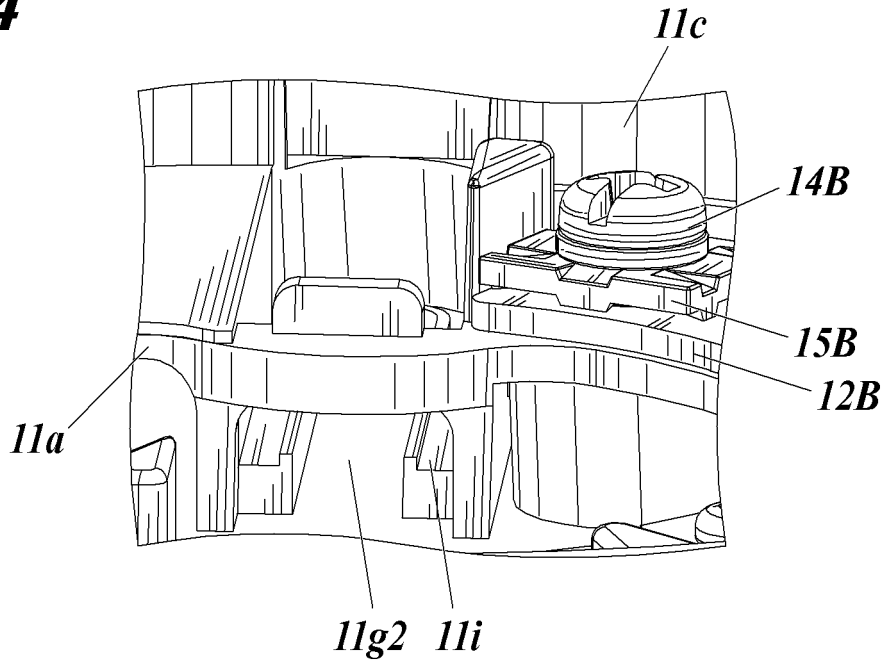

11c
14B
15B
12B
11a
11g2
11i

FIG.5A

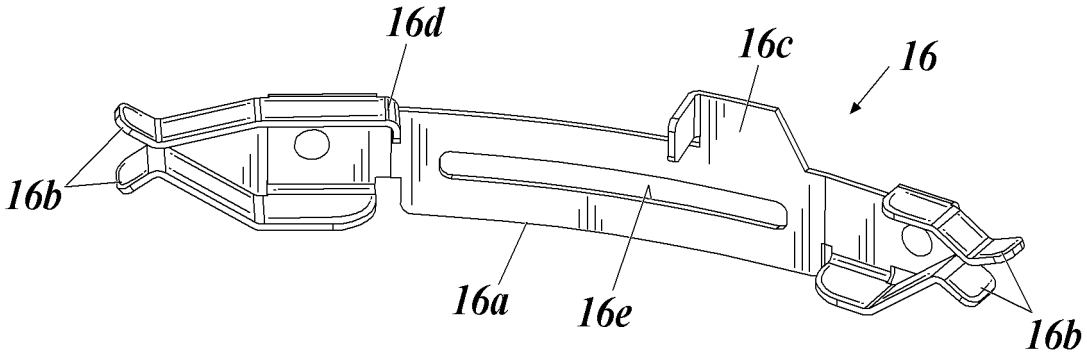



FIG.5B

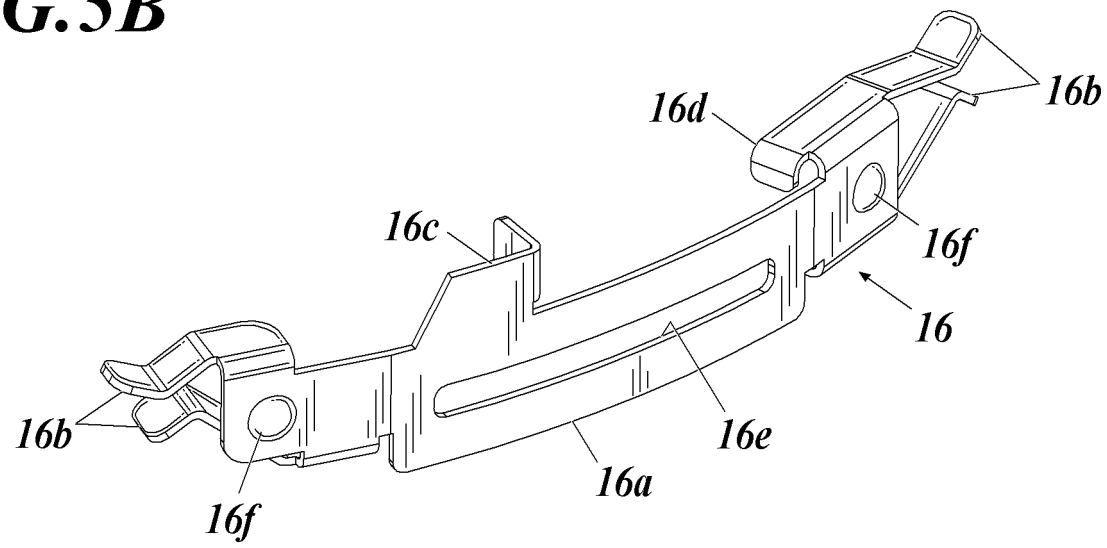


FIG.6A

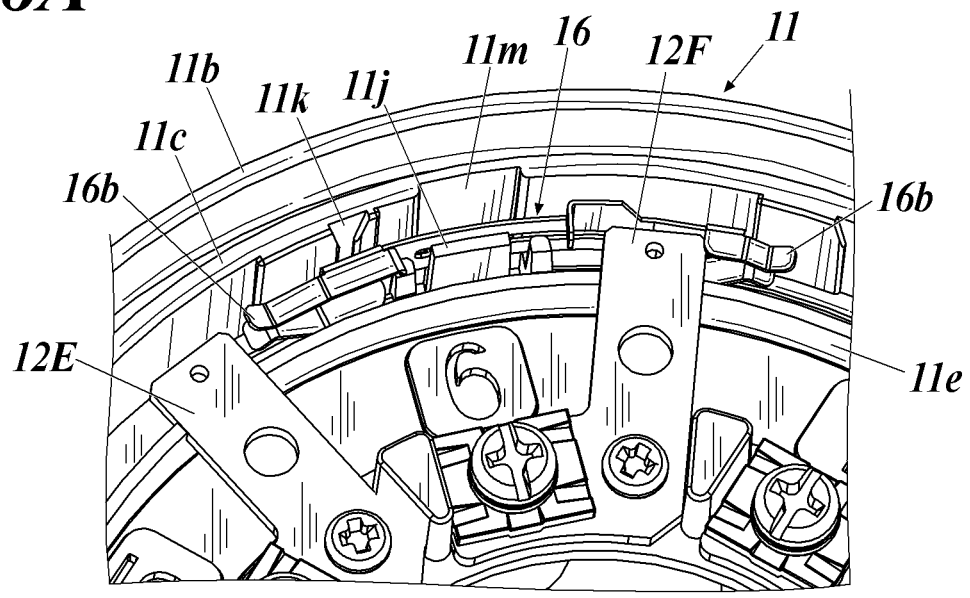



FIG.6B

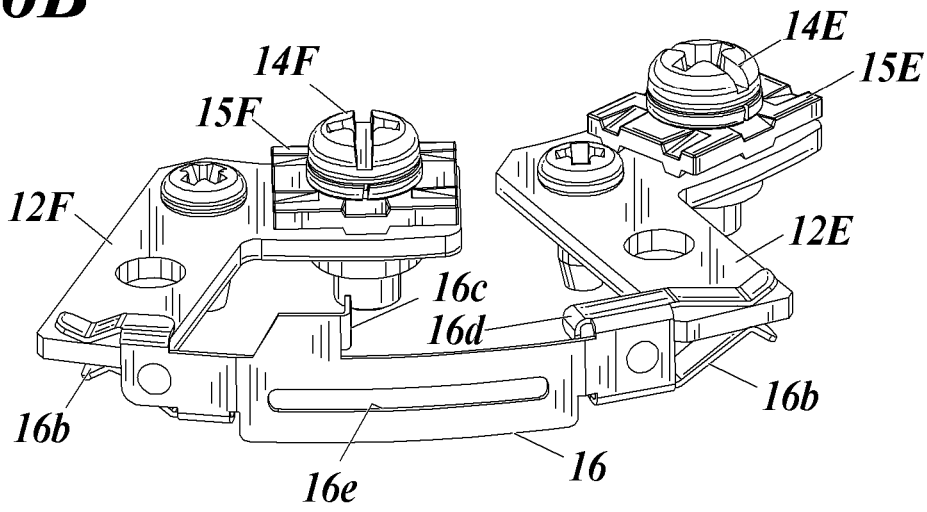



FIG.6C

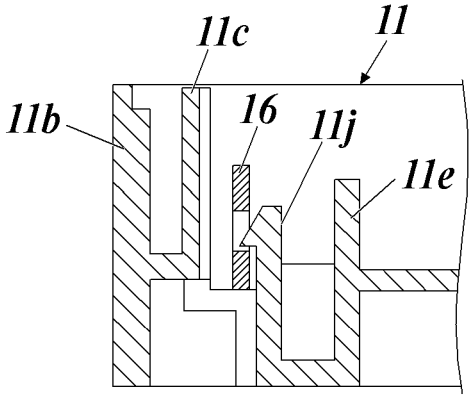


FIG. 7A

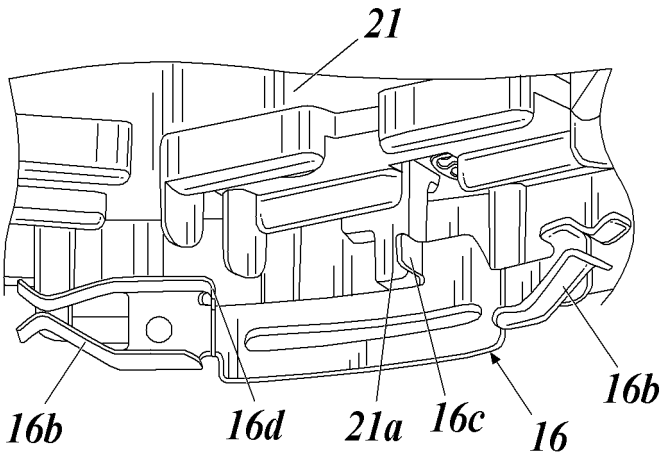



FIG. 7B

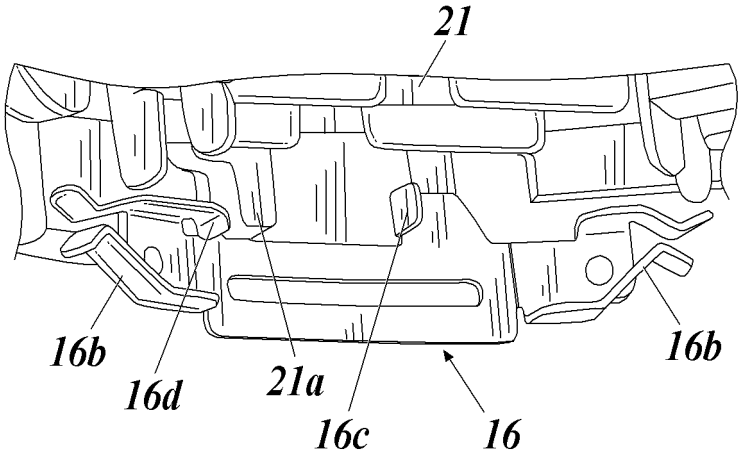


FIG. 8A

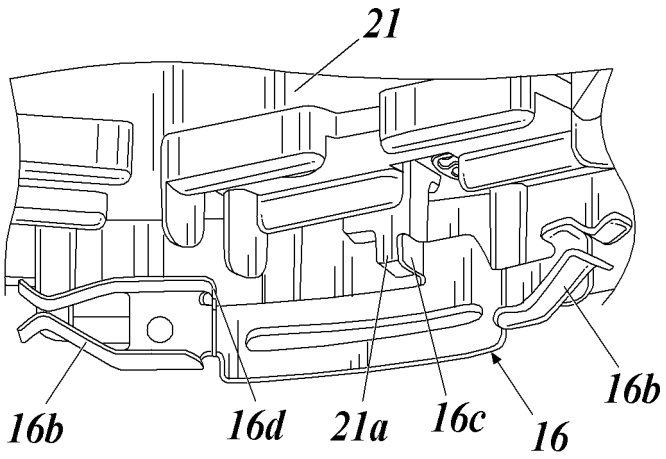



FIG. 8B

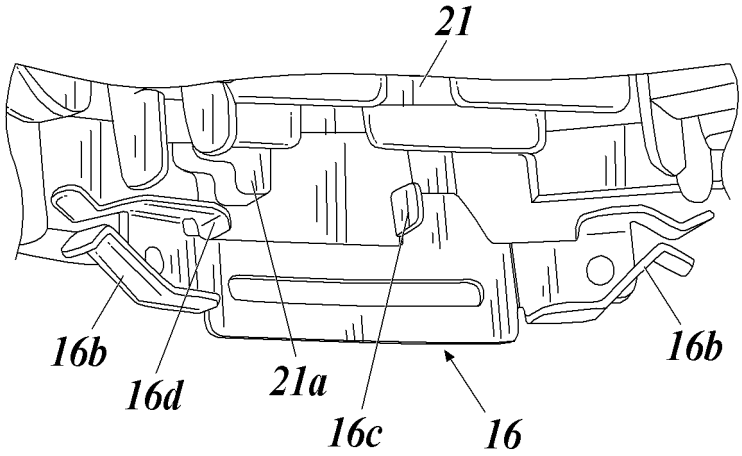


FIG.9A

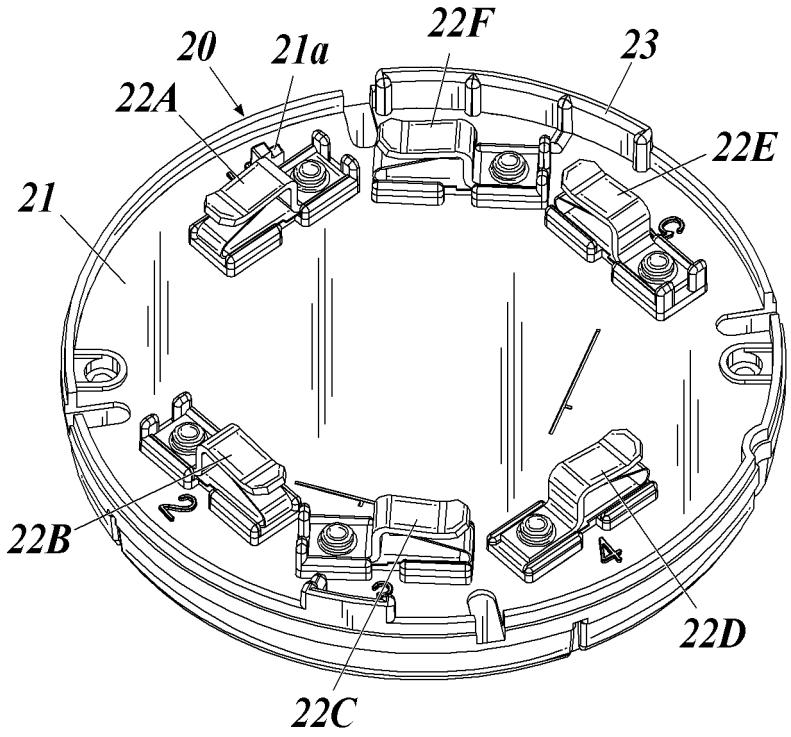

20
21a
22F
23
22A
22E
21
22B
22D
22C

FIG.9B

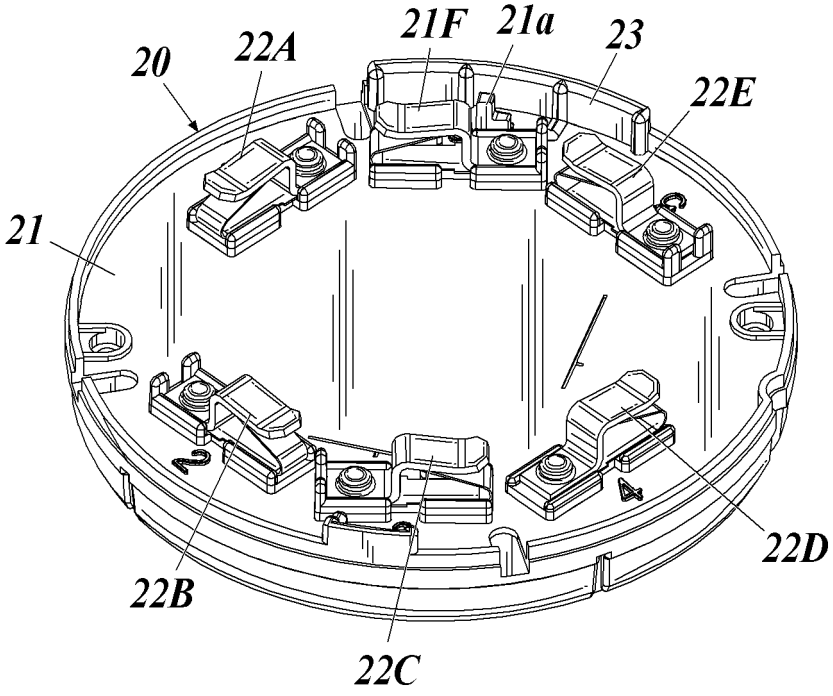

21F
21a
23
20
22A
22E
21
22B
22D
22C

FIG.10A

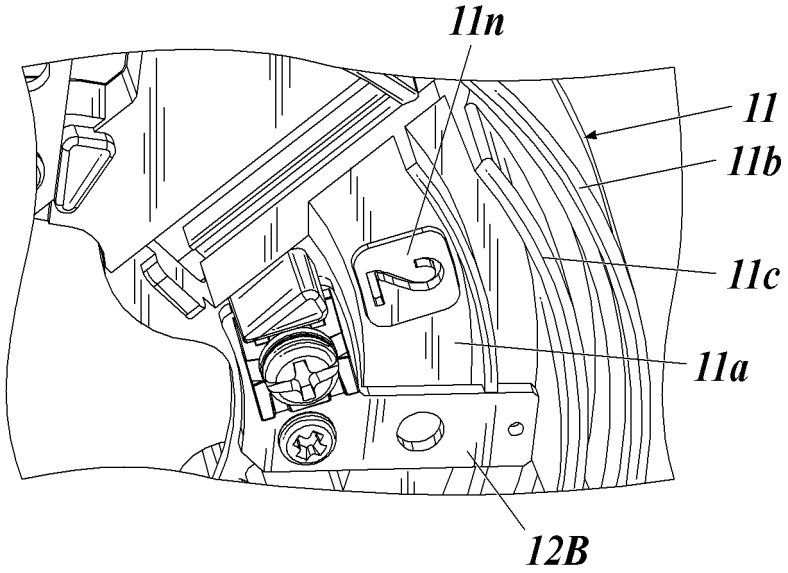



FIG.10B

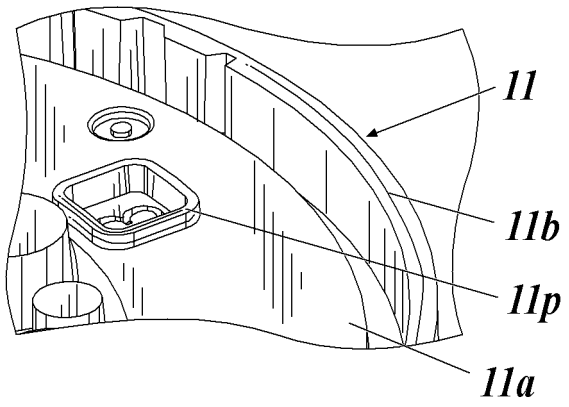


FIG.11A

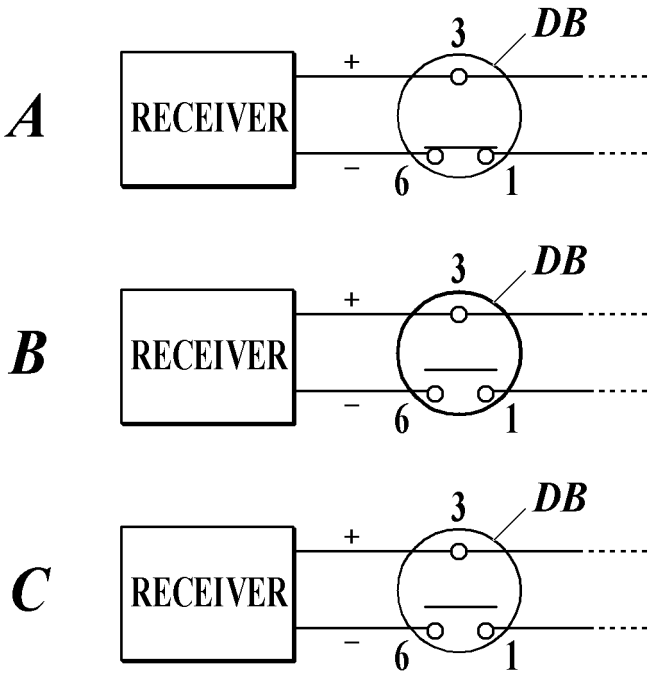
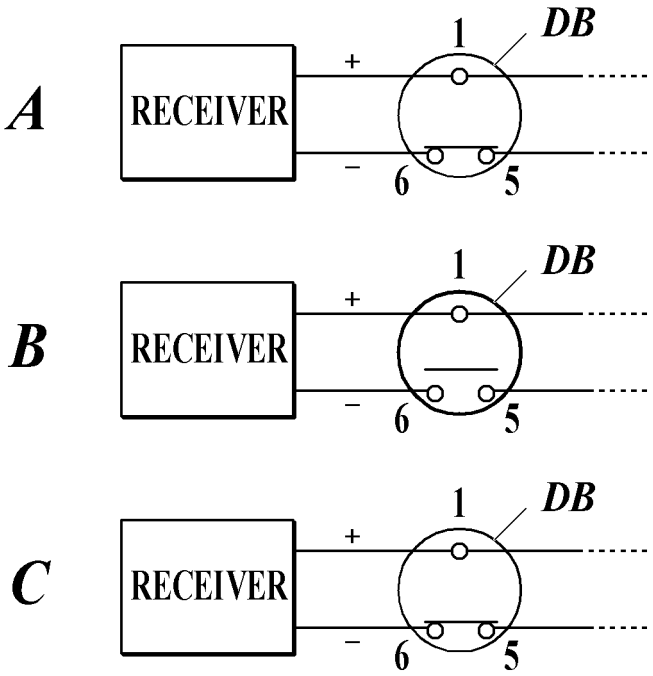



FIG.11B



**INTERNATIONAL SEARCH REPORT**

International application No.
PCT/JP2020/029413

A. CLASSIFICATION OF SUBJECT MATTER
Int. Cl. G08B17/00(2006.01)i
FI: G08B17/00 G

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
Int. Cl. G08B17/00

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

| | |
|---|---|
| Published examined utility model applications of Japan | 1922-1996 |
| Published unexamined utility model applications of Japan | 1971-2020 |
| Registered utility model specifications of Japan | 1996-2020 |
| Published registered utility model applications of Japan | 1994-2020 |

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

C. DOCUMENTS CONSIDERED TO BE RELEVANT

| Category* | Citation of document, with indication, where appropriate, of the relevant passages | Relevant to claim No. |
|---|---|---|
| A | GB 2396752 A (APOLLO FIRE DETECTORS LIMITED) 30 June 2004, entire text, all drawings | 1-9 |
| A | JP 05-303692 A (NOHMI BOSAI LTD.) 16 November 1993, entire text, all drawings | 1-9 |

☐ Further documents are listed in the continuation of Box C.

☒ See patent family annex.

* Special categories of cited documents:

"A" document defining the general state of the art which is not considered to be of particular relevance

"E" earlier application or patent but published on or after the international filing date

"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)

"O" document referring to an oral disclosure, use, exhibition or other means

"P" document published prior to the international filing date but later than the priority date claimed

"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art

"&" document member of the same patent family

| Date of the actual completion of the international search | Date of mailing of the international search report |
|---|---|
| 01.10.2020 | 13.10.2020 |

| Name and mailing address of the ISA/ | Authorized officer |
|---|---|
| Japan Patent Office<br>3-4-3, Kasumigaseki, Chiyoda-ku,<br>Tokyo 100-8915, Japan | Telephone No. |

Form PCT/ISA/210 (second sheet) (January 2015)

**INTERNATIONAL SEARCH REPORT**

International application No.
PCT/JP2020/029413

| Patent Documents referred to in the Report | Publication Date | Patent Family | Publication Date |
|---|---|---|---|
| GB 2396752 A | 30.06.2004 | (Family: none) | |
| JP 05-303692 A | 16.11.1993 | US 5403198 A<br>entire text, all drawings<br>US 5478256 A<br>EP 567820 A1 | |

Form PCT/ISA/210 (extra sheet) (January 2015)

## REFERENCES CITED IN THE DESCRIPTION

*This list of references cited by the applicant is for the reader's convenience only. It does not form part of the European patent document. Even though great care has been taken in compiling the references, errors or omissions cannot be excluded and the EPO disclaims all liability in this regard.*

### Patent documents cited in the description


- JP H05303692 B **[0006]**
- GB 2396752 A **[0006]**