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(54) **Title:** DETECTOR UNIT FOR A LIGHTING CONTROL SYSTEM

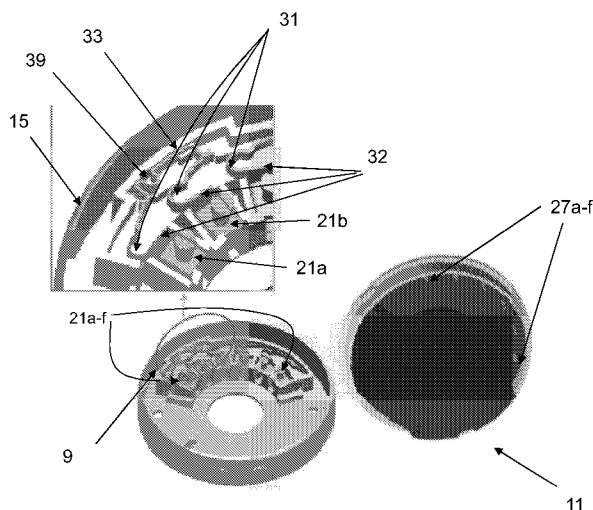


Figure 3a

(57) **Abstract:** Detector unit for a lighting control system A lighting control system (1) comprises a light (5), a power source (2) and a detector unit (3) having a first part (9) detachably coupled to a second part (11). The lighting control system (1) is operable between: an operating configuration, in which the system is arranged to control power to the light (5) in response to an output from a sensor in the second part (11) of the detector unit (3), and a maintenance configuration in which the second part (11) of the detector unit (3) is decoupled from the first part (9) of the detector unit. The lighting control system (1) is arranged such that in the maintenance configuration the power source (2) is electrically connected to the light (5) through the first part (9), such that the light (5) is on despite the second part (11) being decoupled from the first part (9).



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The present invention seeks to mitigate or overcome at least some of the above-mentioned disadvantages.

According to a first aspect of the invention, there is provided a lighting control system comprising:

5 a luminaire comprising a light source,
a power source, and
a detector unit having a first part detachably coupled to a second part,

the lighting control system being operable between:

10 (i) an operating configuration, in which the lighting control system is arranged to control power to the luminaire in response to an output from a sensor in the second part of the detector unit, and

(ii) a maintenance configuration in which the second part of
15 the detector unit is de-coupled from the first part of the detector unit, such that the lighting control system is no longer arranged to control power to the luminaire in response to the output from the sensor,

characterised in that the lighting control system is
20 arranged such that in the maintenance configuration the power source is electrically connected to the luminaire through the first part, such that the light source is on despite the second part being de-coupled from the first part. When a detector unit requires servicing or repair, it is often the
25 sensor that needs to be accessed. However, it has been recognised that by providing a detector unit having two detachably couplable parts, a first part can be arranged to connect the power source and luminaire even when the sensor (in the second part) is removed. Thus, the luminaire is able
30 to remain powered when the sensor is removed, thereby removing the need for emergency lighting, or manual re-wiring of the connection.

The luminaire comprises the light source. Although the two elements are therefore different (the luminaire being the light fixture itself and typically comprising the light source (e.g. bulb), the body of the light fixture and the light socket), it will nevertheless be appreciated that in many embodiments of the invention the references to 'light source' and 'luminaire' may be interchangeable. For example, the light source being powered may be synonymous with the luminaire being powered.

The luminaire is preferably located remotely from the detector unit. Other than the electrical connection between them, the detector unit and the luminaire may be independent of one another. The luminaire and detector are preferably structurally independent.

The lighting system may be automatically operable to the operating configuration upon coupling the first part and the second part. The lighting system may be automatically operable to the maintenance configuration by de-coupling the second part from the first part.

The lighting system is preferably operable such that the connection between the power source and the luminaire in the maintenance configuration is effected, and more preferably automatically effected, by the de-coupling of the second part from the first part. The lighting system may be operable such that the light source is automatically illuminated upon adopting the maintenance configuration.

The first part of the detector unit may comprise a live-in terminal connected to the power source and a live-out terminal connected to the light. The detector unit may be arranged such that in the operating configuration the live-in and live-out terminals are connected through the second part, but in the maintenance configuration the live-in and live-out terminals are short circuited. Thus, in the operating

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configuration the lighting control system may control power in response to an output of the sensor, by virtue of the second part being connected across the live-in and live-out terminals. In contrast, when the terminals are short-circuited (in the maintenance configuration), the luminaire and power source are directly connected through the first part.

The detector unit may comprise a movable contact. The detector unit may be arranged such that in the maintenance configuration the movable contact short circuits the live-in and live-out terminals, and in the operating configuration the movable contact is moved such that it does not short circuit the live-in and live-out terminals. The detector unit may be arranged such that the movement of the movable contact from its position in the operating configuration to its position in the maintenance configuration is effected by de-coupling the second part of the detector from the first part. The detector unit may be arranged such that the movement of the movable contact from its position in the maintenance configuration to its position in the operating configuration is effected by coupling the second part of the detector to the first part.

The second part of the detector may be arranged to push the movable contact from its position in the maintenance configuration to its position in the operating configuration during coupling of the second part to the first part. For example means may be provided (for example a mechanism such as a finger) to push the movable contact from its position in the operating configuration to its position in the maintenance configuration during de-coupling of the second part from the first part.

The first and second parts of the detector may be coupled/de-coupled from one another, at least partly, by relative rotation between the first and second parts. The

connection between the power source and the light in the maintenance configuration is preferably effected by relative rotation during the de-coupling of the second part from the first part. The de-coupling may also comprise an additional
5 component of movement (such as a translation away from the first part).

In most circumstances it is desirable for the light source to always be on when the lighting control system is in the maintenance configuration. However, it may be desirable in
10 some circumstances for the light source to be off when the second part is de-coupled from the first part. Accordingly, the lighting control system may also be operable to a second maintenance configuration in which the second part of the detector unit is de-coupled from the first part of the
15 detector unit, such that the lighting control system is no longer arranged to control power to the luminaire in response to the output from the sensor, and in which the power source is disconnected from the luminaire, such that the light source is off. In the second maintenance configuration, the power
20 source is preferably connectable to the luminaire through the first part, such that the light source may be switched on (despite the second part being de-coupled from the first part). The lighting control system may be arranged to be switchable between (A) being operable between the operating
25 configuration and the (first) maintenance configuration, and (B) being operable between the operating configuration and the second maintenance configuration. For example, the detector assembly may comprise a switch for setting whether the user wishes the lighting control system to adopt the first or
30 second maintenance configuration when the second part of the detector unit is decoupled from the first part. The lighting control system may be operable between the first maintenance configuration and the second maintenance configuration and

vice versa. For example in some embodiments of the invention, the lighting control system may be operable from the operating configuration to the second maintenance configuration and then operable to the first maintenance configuration. The lighting system may be automatically operable to the second maintenance configuration by de-coupling the second part from the first part.

The first part preferably comprises a mounting structure for mounting the detector unit on, or in, a surface (for example a ceiling or wall). It will be appreciated that reference herein to the power source being electrically connected to the light through the first part merely requires the first part to contain the required conductive pathways, and does not require all of the first part to be conductive.

For example, in embodiments in which the first part comprises a mounting structure, the mounting structure may be plastic and house wiring arranged to connect the live-in and live-out terminals of the first part. The mounting structure preferably bears the weight of the second part of the detector unit. First part may comprise a housing for coupling with a housing on the second part.

Embodiments of the present invention are especially advantageous in lighting control systems which control a luminaire in dependence on occupancy of an area. The sensor in the second part may be an occupancy sensor for detecting occupancy of a room. The lighting control system, in an operating configuration, may be arranged to control power to the luminaire in dependence on whether the room is occupied. The second part of the detector unit may comprise a further sensor. In the operating configuration the lighting control system may also be arranged to control power to the luminaire in response to an output from the further sensor. The further sensor is preferably a photo sensor for detecting the

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illumination level in the room. The photo sensor is preferably arranged to provide feedback to the control system on the current level of illumination in the room.

Embodiments of the present invention are particularly
5 suited for use in areas (for example rooms) having a multiplicity of luminaires. Each luminaire may be associated with the same detector unit. The lighting control system may comprise a plurality of luminaires, and more preferably a
10 multiplicity of luminaires. Each luminaire may comprise at least one light source. In the operating configuration, the lighting control system may be arranged to control power to the luminaires in response to an output from the sensor in the second part of the detector unit. In the maintenance
15 configuration, the lighting control system may no longer be arranged to control power to the luminaires in response to the output from the sensor. The lighting control system may be arranged such that in the maintenance configuration the power source is electrically connected to the luminaires through the first part.

20 The lighting control system may comprise a plurality or a multiplicity of detector units as described herein. Each detector is preferably associated with more than one luminaire.

The luminaire(s) in the lighting control system may be
25 independently operable by a switch (for example a wall switch). The lighting control system may be used in conjunction with the switch. Thus in some circumstances, the light source may already be switched off at the switch, when the lighting control system is changed to the maintenance
30 configuration. In this case it will be appreciated that the power source is still electrically connected to the luminaire because the light source may be turned on (at the switch) despite the second part of the detector having been de-

coupled. In some embodiments of the invention, the lighting control system may be arranged to override the switch. Thus in some circumstances, the light source may already be switched off at the switch, but when the lighting control system is changed to the maintenance configuration, the switch is bypassed and the light source is illuminated.

In the maintenance configuration the power source is preferably electrically connected to the luminaire through the first part, such that the luminaire remains operational despite the second part being de-coupled from the first part. It will be appreciated that the light source may remain operational if it is 'on' or if it is 'off' but operable to 'on' (for example using a switch).

According to a second aspect of the invention there is provided a detector unit in the lighting control system described herein. The detector unit preferably comprises a first part detachably coupled to a second part, the second part comprising a detector, wherein

the first part comprises means for connecting a power source to a light through the first part when the second part is de-coupled from the first part,

and the second part comprises means for connecting the power source to the light through the second part when the second part is coupled to the first part. The detector unit may comprise means for disconnecting the connection between the power source and light through the first part, when the second part is coupled to the first part

According to a further aspect of the invention there is provided a method of maintaining a lighting control system arranged to control power to a light source in a luminaire in response to an output from a sensor, the lighting system comprising the luminaire, a power source, and a detector unit

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having a first part detachably coupled to a second part, the second part comprising the sensor,

wherein the method comprises the step of:

5 de-coupling the second part of the detector unit from the first part such that the power source is electrically connected to the luminaire through the first part, such that the light source is on despite the second part being de-coupled from the first part. Maintaining the lighting control system may involve various acts (such as repair, replacement,
10 inspection etc. of the detector unit, and more preferably of the second part of the detector unit).

According to yet another aspect of the invention there is provided a method of installing a detector unit in a lighting control system arranged to control power to a luminaire
15 comprising a light source, in response to an output from a sensor, the lighting system comprising the luminaire, a power source, and a detector unit having a first part detachably coupled to a second part, the second part comprising the sensor,

20 wherein the method comprises the step of:

installing the first part of a detector unit such that the power source is electrically connected to the luminaire through the first part, and

25 subsequently coupling the second part of the detector unit to the first part, such that the power source is disconnected from the luminaire through the first part, and the lighting control system is instead arranged to control power to the luminaire in response to an output from the sensor in the second part of the detector unit. In
30 embodiments in which the first part of the detector unit comprises live-in and live-out terminals, the method of installing preferably comprises the step of wiring the first part of the detector such that the live-in terminal of the

first part is connected to the power source, and the line-out terminal is connected to the luminaire. The method of installing may further comprise the step of wiring the first part of the detector unit such that when it is coupled to the second part, the lighting control system is arranged to control power to the luminaire in response to an output from a sensor in the second part of the detector unit.

Aspects of the present invention may also be applicable to heating, ventilation or air conditioning (HVAC) control systems. According to yet another aspect of the invention there is provided an HVAC control system comprising:

an HVAC apparatus,

a power source, and

a detector unit having a first part detachably coupled to a second part,

the HVAC control system being operable between:

(i) an operating configuration, in which the HVAC control system is arranged to control power to the HVAC apparatus in response to an output from a sensor in the second part of the detector unit, and

(ii) a maintenance configuration in which the second part of the detector unit is de-coupled from the first part of the detector unit, such that the HVAC control system is no longer arranged to control power to the HVAC apparatus in response to the output from the sensor,

characterised in that the HVAC control system is arranged such that in the maintenance configuration the power source is electrically connected to the HVAC apparatus through the first part, such that the HVAC apparatus is powered despite the second part being de-coupled from the first part. There is also provided a detector for use in such a system. There is also provided a method of maintaining an HVAC control system arranged to control power to an HVAC apparatus in response to

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an output from a sensor, the HVAC system comprising an HVAC apparatus, a power source, and a detector unit having a first part detachably coupled to a second part, the second part comprising the sensor, wherein the method comprises the step

5 of: de-coupling the second part of the detector unit from the first part such that the power source is electrically connected to the HVAC apparatus through the first part, such that the HVAC apparatus is powered despite the second part being de-coupled from the first part. There is also provided

10 a method of installing a detector unit in an HVAC control system arranged to control power to an HVAC apparatus in response to an output from a sensor, the HVAC system comprising an HVAC apparatus, a power source, and a detector unit having a first part detachably coupled to a second part,

15 the second part comprising the sensor, wherein the method comprises the step of: installing the first part of a detector unit such that the power source is electrically connected to the HVAC apparatus through the first part, and subsequently coupling the second part of the detector unit to the first

20 part, such that the power source is disconnected from the HVAC apparatus through the first part, and the HVAC control system is instead arranged to control power to the HVAC apparatus in response to an output from the sensor in the second part of the detector unit.

25 Any features described with reference to one aspect of the invention are equally applicable to any other aspect of the invention, and *vice versa*. For example, any features described with reference to the lighting control system of the first aspect of the invention are equally applicable to the

30 methods of maintaining/installing the lighting control system of the invention. Furthermore, any features relating to lighting control systems/methods are also applicable to the HVAC control systems/methods of another aspects of the

invention, wherein references to light/lighting are replaced with references to HVAC apparatus as appropriate.

Description of the Drawings

5

Various embodiments of the invention will now be described, by way of example only, with reference to the accompanying schematic drawings of which:

10 Figure 1 is a schematic view of a lighting control system according to a first embodiment of the invention

Figure 2 is a perspective view of first and second parts of a detector unit in the first embodiment of the invention;

15 Figure 3a is a perspective view of the first and second parts of the detector unit of Figure 2, with a close-up view of the live-in and live-out terminals;

Figure 3b is a close-up view of the live-in and live-out terminals in Figure 3a showing the different positions of the moveable contact;

20 Figure 4a is a perspective view of part of the first part of a detector unit of a second embodiment of the invention;

Figure 4b is a perspective view of the first and second parts of the detector unit of the second embodiment of the invention, showing the first and second parts de-coupled;

25 Figure 4c is a perspective view of the first and second parts of the detector unit in Figure 4b, showing the first and second parts coupled together.

Detailed Description

30

Figure 1 is a schematic of a lighting control system 1 according to a first embodiment of the invention. The lighting control system 1 comprises a power source 2 (such as

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a mains power source, or local power source), a detector unit 3 comprising a Passive Infrared (PIR) sensor and a photo sensor, and a light 5. The detector unit 3 is mounted on the ceiling of a room 7 in which a luminaire containing the light source is also contained (labelled "light" in Figure 1). The luminaire is located remotely from the detector unit 3.

In an operating configuration, the lighting control system 1 is arranged to control the luminaire 5 in dependence on output signals from the PIR and photo sensor. In accordance with known lighting control systems the system thereby seeks to reduce power consumption by ensuring optimum use of the light 5 by sensing occupancy and current light level and controlling the light levels as appropriate. In the first embodiment, the lighting control system is installed in a commercial building to monitor the occupancy of the room 7.

Figures 2, 3a and 3b show the detector unit 3 of the first embodiment of the invention. The detector unit 3 comprises a first part 9 and a second part 11. The first part 9 has a mounting structure forming a circular base 13 and surrounding curtain wall 15. The circular base 13 has screw holes 17 (only one of which is visible in Figure 2) for receiving a screw to attach the mounting structure to the ceiling. The curtain wall 15 on the first part 9 is arranged to couple to a corresponding curtain wall 19 on the second part 11 of the detector unit 3. The curtain walls 15, 19 are arranged to inter-engage under relative rotation between the first and second parts 9, 11, thereby detachably coupling the first and second parts 9, 11 together.

The circular base 13 of the first part 9 also includes six terminals 21a-f arranged in an arc. The terminals are best-shown in Figure 3a in which the terminal cover 23 is shown removed. The left-most terminals 21a, 21b (as shown in Figures 2 and 3a) are live-in and line-out terminals

respectively. The other terminals 21c-e are neutral, earth and dimmer terminals respectively (terminal 21f is redundant in the first embodiment of the invention). When installed in the lighting control system 1, the terminals 21a-f are wired
5 onto corresponding conductors from/to the power source 2 /light 5. In particular, the live-in terminal 21a is connected to the power source 2, and the live-out terminal 21b is connected to the luminaire 5.

The second part 11 of the detector unit 3 comprises the
10 PIR and photo sensors. The sensors, together with a PCB containing the associated electronics, is located in the upper region of the second part behind a floor 25, and these are therefore not visible in Figures 2 and 3a-b. The outer surface of the second part 11 includes a window (not visible
15 in Figures 2 and 3a-b) through which the sensors are able to receive appropriate signals.

Six connection pins 27a-f extend through the floor 25 in the second part 11. The pins are arranged such that when the first and second parts 9, 11 are coupled together, the pins
20 27a-f extend through slots 29 in the terminal cover 23 and make electrical contact with the terminals (via respective semi-circular recesses 31 on plates 32 extending from the respective terminals (see Figure 3a)). Accordingly, the pins 27a-f are wired to the sensors and associated electronics for
25 live-in, live-out, neutral, earth and dimmer signals respectively.

The lighting control system 1 of the first embodiment of the invention is usually in the operating configuration. In such a configuration, the live-in and live-out terminals 21a,
30 21b are connected only through the second part 11 such that the lighting control system 1 is arranged to control the luminaire 5 in dependence on output signals from the PIR and photo sensors. However, the system is also operable to a

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maintenance configuration in which the sensors of the detector unit 3 are disconnected from the lighting control system (for example for repair, inspection or other maintenance). The maintenance configuration is adopted when the second part 11
5 of the detector is de-coupled from the first part 9. The manner in which the system is operable between these two configurations is described in more details below.

Referring to Figures 3a 3b, the first part 9 of the detector unit 3 comprises a movable contact 33. The movable
10 contact 33 is located radially outwardly of the terminals 21a-f and is slideably moveable along a short track parallel with the curtain wall 15. The position of the moveable contact 33 when the first and second parts of the detector are coupled together is shown in Figure 3b. The position of the moveable
15 contact 33 when the parts are de-coupled is shown in the close-up in Figure 3a and is shown in phantom in Figure 3b.

As shown in Figures 3b, when the two parts 9, 11 are coupled together (and the system is therefore in the operating configuration) the moveable contact 33 is positioned such that
20 it does not contact any of the terminals. Insulating portions 35 ensure separation between the moveable contact and the semi-circular recesses 31 in the plates 32 when the moveable contact 33 is in this position.

In contrast, when the two parts are de-coupled (see
25 Figures 3a), and the system is therefore in the maintenance configuration, the moveable contact 33 is shifted leftwards in its track and either end of the contact 33 touches the respective plates 32 extending from the live-in and live-out terminals 21a, 21b. The live-in and live-out terminals are
30 therefore shorted. Since these terminals are shorted, power is supplied directly to the luminaire 5.

Movement of the moveable contact 33 between these two positions is effected by relative rotation of the first and

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second parts 9, 11 of the detector unit 3. More specifically the movement is effected by a finger 37 on the second part (see Figure 2) being engaged with a detent 39 in the moveable contact (see Figures 3a and 3bb) such that when the second
5 part 11 of the detector unit is rotated to de-couple it from the first part 9, the finger 37 pushes the moveable contact from the open-circuit position in Figure 3b to the short-circuit position in Figure 3a. When the system is in the maintenance configuration, the power source 2 is therefore
10 connected to the luminaire 5 through the first part 9, despite the second part 11 being decoupled from the first part. By providing the above-described detector unit, the light automatically remains powered when the sensor is removed, thereby removing the need for emergency lighting, or manual
15 re-wiring of the connection.

Movement of the moveable contact 33 from the maintenance configuration to, or back to, the operating configuration is achieved by (re)coupling the first and second parts of the detector. Movement of the moveable contact between its
20 position in the operating and maintenance configurations is indicated by the double-ended arrow in Figures 3b, and the moveable contact shown in phantom.

Figures 4a to 4c show a detector unit 103 for use in a lighting system according to a second embodiment of the
25 invention. When referring to equivalent features from the first embodiment, the same reference numerals are used, but with the prefix "1" or "10" as appropriate. The function of the detector unit 103 is broadly similar to that in the first embodiment and is therefore not described further. The
30 primary differences are in the structure, and those are described below.

The first part 109 of the detector unit 103 is for mounting on a surface such as a wall or ceiling. The first

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part 109 comprises terminals 121a-c for connecting to live-in, live-out and neutral. The second part comprises an insulating finger 133 (shown in phantom in Figure 4a as if the second part were coupled). In the maintenance configuration shown in
5 Figure 4a (in which the second part 111 has been de-coupled from the first part 109), the insulating finger is not present and the upper contacts 122a,122b and lower contacts 124a,124b touch one another thereby ensuring completion of the mains circuit such that a light source(s) to which the detector unit
10 can be connected, is switched on (the lower contact 124a, 124b are connected).

Figure 4b and 4c show the detector unit 103 being re-assembled after maintenance, and placed into an operating configuration (Figures 4c). The first part 109 is adapted to
15 couple to the second part 111 under relative translational movement (indicated by the dashed arrow in Figures 4b). L-shaped plate contacts 127a, 127b on the second part are arranged to touch the respective upper contacts 122a, 122b which are connected to the live-in and live-out terminals
20 121a, 121b on the first part, once the two parts 109, 111 of the detector unit are coupled together. The second part 111 also comprises the insulating finger 133 which is arranged to push between the upper and lower contacts 122a/124a, and 122b/124b, and break the connection between them, and
25 therefore break the connection to the light source. Instead the connection to the light source is established through the second part.

The detector unit is therefore arranged such that, when installed in a lighting control system, and when the first
30 part is coupled to the second part, the system would control the luminaire(s) in response an output from the sensors in the second part 111 of the detector unit. However, if the second part is de-coupled, the connection with the main power source

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is re-established thereby continually powering the luminaires until the second part is re-coupled.

Whilst the present invention has been described and illustrated with reference to particular embodiments, it will be appreciated by those of ordinary skill in the art that the invention lends itself to many different variations not specifically illustrated herein. Where in the foregoing description, integers or elements are mentioned which have known, obvious or foreseeable equivalents, then such equivalents are herein incorporated as if individually set forth. Reference should be made to the claims for determining the true scope of the present invention, which should be construed so as to encompass any such equivalents. It will also be appreciated by the reader that integers or features of the invention that are described as preferable, advantageous, convenient or the like are optional and do not limit the scope of the independent claims.

Claims

1. A lighting control system comprising:

a luminaire comprising a light source,

5 a power source, and

a detector unit having a first part detachably coupled to a second part,

the lighting control system being operable between:

10 (i) an operating configuration, in which the lighting control system is arranged to control power to the luminaire in response to an output from a sensor in the second part of the detector unit, and

15 (ii) a maintenance configuration in which the second part of the detector unit is de-coupled from the first part of the detector unit, such that the lighting control system is no longer arranged to control power to the luminaire in response to the output from the sensor,

20 characterised in that the lighting control system is arranged such that in the maintenance configuration the power source is electrically connected to the luminaire through the first part, such that the light source is on despite the second part being de-coupled from the first part.

25 2. A lighting control system according to claim 1, wherein the luminaire is located remotely from the detector unit.

30 3. A lighting control system according to claim 1 or claim 2, wherein the connection between the power source and the luminaire in the maintenance configuration is effected by the de-coupling of the second part from the first part.

4. A lighting control system according to any preceding claim 1, wherein the first part of the detector unit comprises a

live-in terminal connected to the power source and a live-out terminal connected to the luminaire, and wherein the detector unit is arranged such that in the operating configuration the live-in and live-out terminals are connected through the
5 second part, but in the maintenance configuration the live-in and live-out terminals are short circuited.

5. A lighting control system according to claim 4, wherein the detector unit comprises a movable contact, the detector unit
10 being arranged such that in the maintenance configuration the movable contact short circuits the live-in and live-out terminals, and in the operating configuration the movable contact is moved such that it does not short circuit the live-in and live-out terminals.

15 6. A lighting control system according to claim 5, wherein the detector unit is arranged such that the movement of the movable contact from its position in the operating configuration to its position in the maintenance configuration
20 is effected by de-coupling the second part of the detector from the first part.

25 7. A lighting control system according to claim 5 or claim 6, wherein the detector unit is arranged such that the movement of the movable contact from its position in the maintenance configuration to its position in the operating configuration
is effected by coupling the second part of the detector to the first part.

30 8. A lighting control system according to claim 6 or claim 7, wherein the second part of the detector is arranged to push the movable contact from its position in the maintenance

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configuration to its position in the operating configuration during coupling of the second part to the first part.

9. A lighting control system according to any preceding claim
5 wherein the first and second parts of the detector are coupled/de-coupled from one another, at least partly by relative rotation between the first and second parts.

10. A lighting control system according to any preceding claim,
10 wherein the sensor in the second part is an occupancy sensor for detecting occupancy of a room, and the lighting control system, in an operating configuration, is arranged to control power to the luminaire in dependence on whether the room is occupied.

15

11. A lighting control system according to claim 10, wherein
the second part of the detector unit comprises a further
sensor, and in the operating configuration the lighting
control system is also arranged to control power to the
20 luminaire in response to an output from the further sensor.

12. A lighting control system according to claim 11, wherein
the further sensor is a photo sensor for detecting the
illumination level in the room.

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13. A lighting control system according to any preceding claim,
the system comprising a plurality of luminaires, each
luminaire comprising a light source, and the lighting control
system being arranged such that in the maintenance
30 configuration the power source is electrically connected to
the luminaires through the first part, such that the light
sources are on despite the second part being de-coupled from
the first part.

14. A detector unit for use as the detector unit in the lighting control system of any preceding claim.

5 15. A detector unit according to claim 14 comprising a first part detachably coupled to a second part, the second part comprising a detector, wherein

the first part comprises means for connecting a power source to a luminaire through the first part when the second
10 part is de-coupled from the first part,

and the second part comprises means for connecting the power source to the luminaire through the second part when the second part is coupled to the first part.

15 16. A detector unit according to claim 15, wherein the detector unit comprises means for disconnecting the connection between the power source and luminaire through the first part, when the second part is coupled to the first part.

20 17. A method of maintaining a lighting control system arranged to control power to a light source in a luminaire in response to an output from a sensor, the lighting system comprising the luminaire, a power source, and a detector unit having a first part detachably coupled to a second part, the second part
25 comprising the sensor,

wherein the method comprises the step of:

de-coupling the second part of the detector unit from the first part such that the power source is electrically
30 the light source is on despite the second part being de-coupled from the first part.

18. A method of installing a detector unit in a lighting control system arranged to control power to a luminaire comprising a light source, in response to an output from a sensor, the lighting system comprising the luminaire, a power source, and a detector unit having a first part detachably coupled to a second part, the second part comprising the sensor,

wherein the method comprises the step of:

installing the first part of a detector unit such that the power source is electrically connected to the luminaire through the first part, and

subsequently coupling the second part of the detector unit to the first part, such that the power source is disconnected from the luminaire through the first part, and the lighting control system is instead arranged to control power to the luminaire in response to an output from the sensor in the second part of the detector unit.

19. A lighting control system and/or detector unit as herein described with reference to the drawings.

20. A heating, ventilation or air conditioning (HVAC) control system comprising:

an HVAC apparatus,

a power source, and

a detector unit having a first part detachably coupled to a second part,

the HVAC control system being operable between:

(i) an operating configuration, in which the HVAC control system is arranged to control power to the HVAC apparatus in response to an output from a sensor in the second part of the detector unit, and

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(ii) a maintenance configuration in which the second part of the detector unit is de-coupled from the first part of the detector unit, such that the HVAC control system is no longer arranged to control power to the HVAC apparatus in response to the output from the sensor,

characterised in that the HVAC control system is arranged such that in the maintenance configuration the power source is electrically connected to the HVAC apparatus through the first part, such that the HVAC apparatus is powered despite the second part being de-coupled from the first part.

21. A method of maintaining an HVAC control system arranged to control power to an HVAC apparatus in response to an output from a sensor, the HVAC system comprising an HVAC apparatus, a power source, and a detector unit having a first part detachably coupled to a second part, the second part comprising the sensor,

wherein the method comprises the step of:

de-coupling the second part of the detector unit from the first part such that the power source is electrically connected to the HVAC apparatus through the first part, such that the HVAC apparatus is powered despite the second part being de-coupled from the first part.

22. A method of installing a detector unit in an HVAC control system arranged to control power to an HVAC apparatus in response to an output from a sensor, the HVAC system comprising an HVAC apparatus, a power source, and a detector unit having a first part detachably coupled to a second part, the second part comprising the sensor,

wherein the method comprises the step of:

- 25 -

installing the first part of a detector unit such that the power source is electrically connected to the HVAC apparatus through the first part, and

5 subsequently coupling the second part of the detector unit to the first part, such that the power source is disconnected from the HVAC apparatus through the first part, and the HVAC control system is instead arranged to control power to the HVAC apparatus in response to an output from the sensor in the second part of the detector unit.

10

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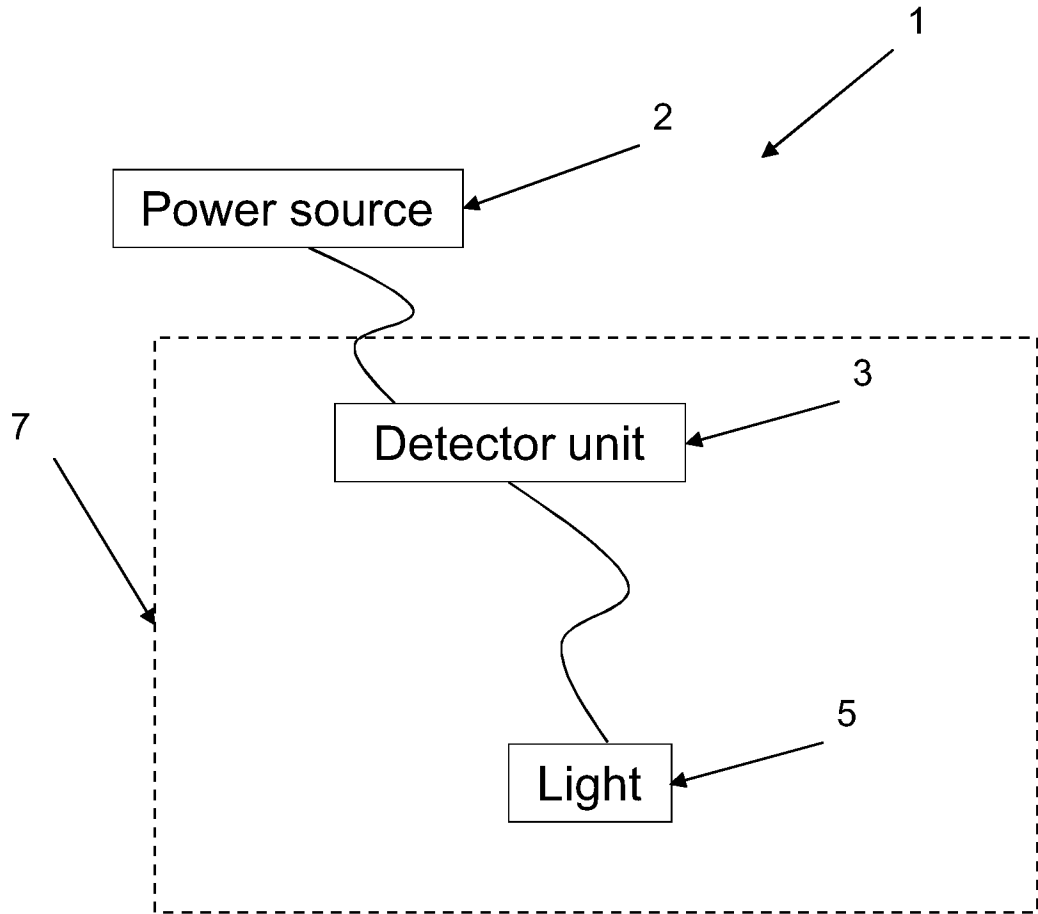


Figure 1

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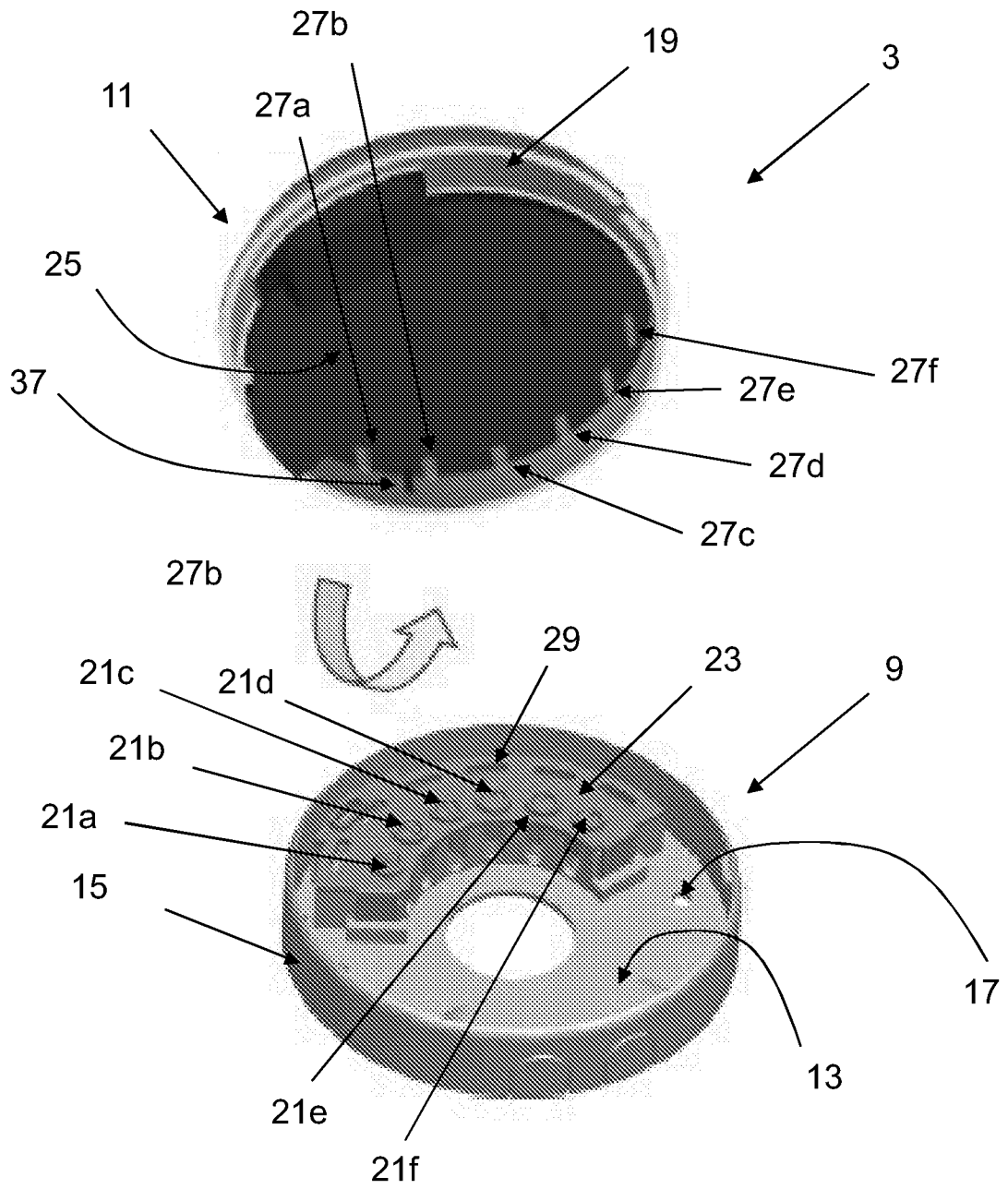


Figure 2

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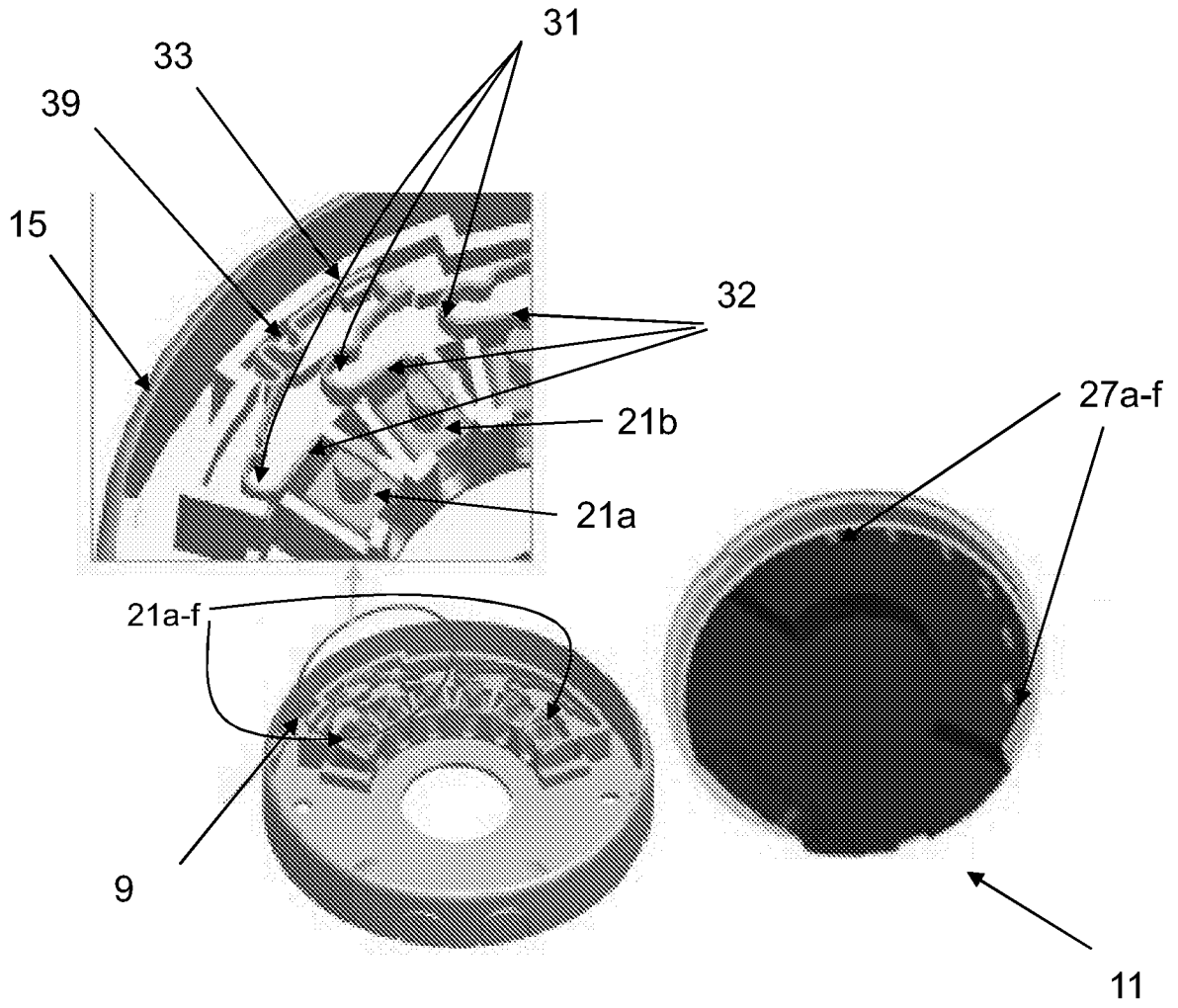


Figure 3a

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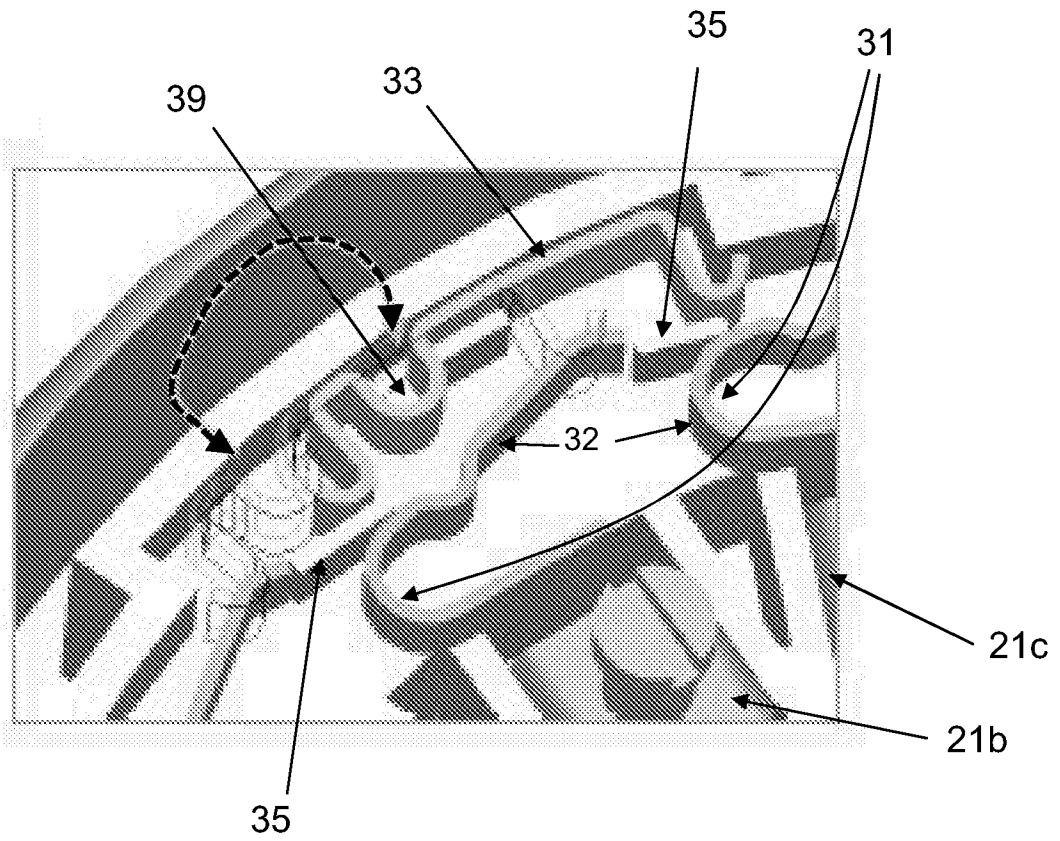


Figure 3b

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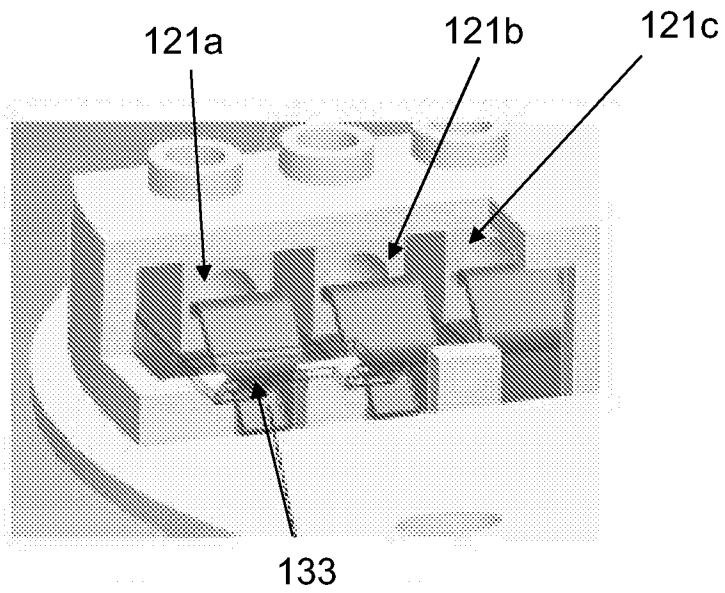


Figure 4a

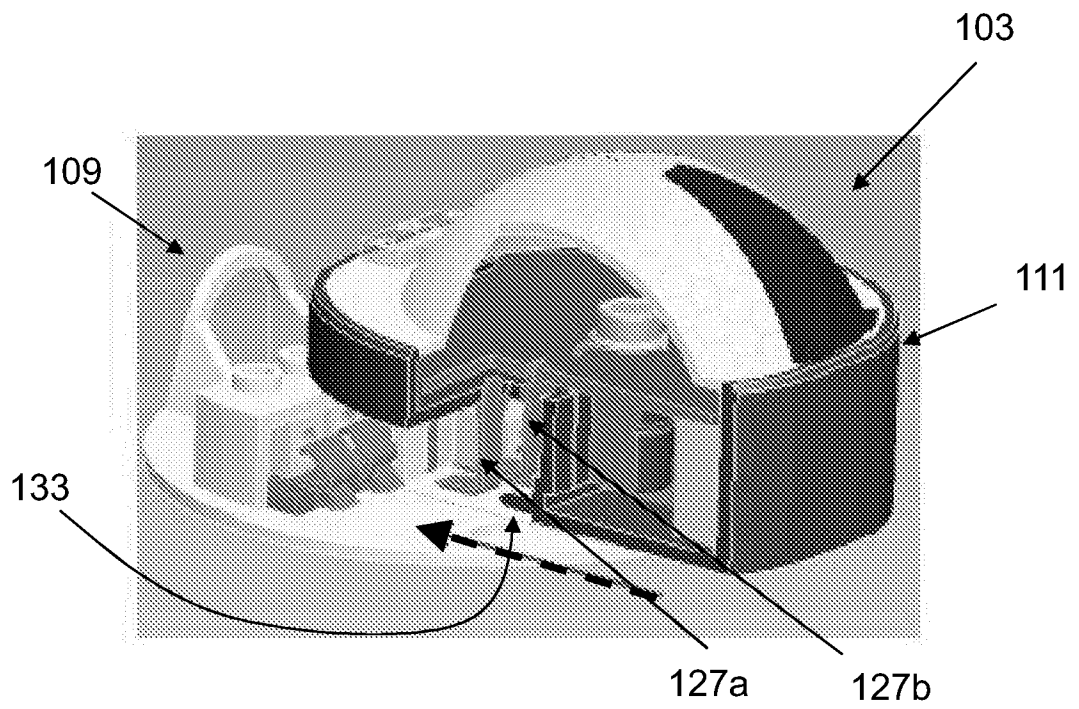


Figure 4b

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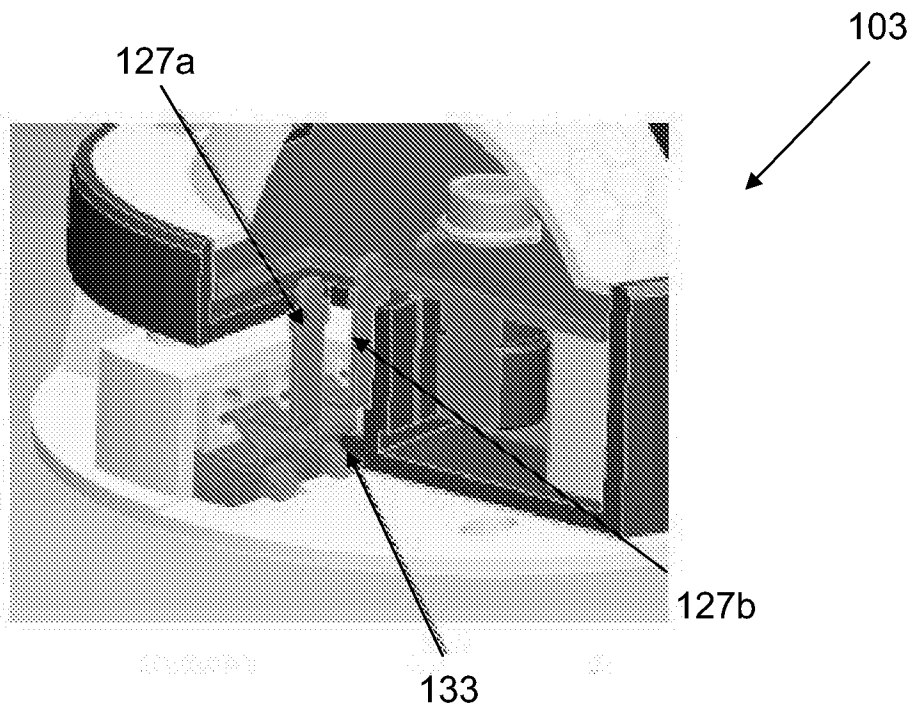


Figure 4c

INTERNATIONAL SEARCH REPORT

International application No
PCT/GB2013/051599

A. CLASSIFICATION OF SUBJECT MATTER
INV. H05B37/02 F21V23/04 G01J5/08
ADD.
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)
H05B F21V G01J

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

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)
EPO-Internal, WPI Data

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	EP 2 149 746 A2 (PANASONIC ELEC WORKS CO LTD [JP]) 3 February 2010 (2010-02-03) abstract paragraphs [0003] - [0007] paragraphs [0011] - [0037] figures 1-24	1-22
X	EP 2 096 901 A2 (PANASONIC ELEC WORKS CO LTD [JP]) 2 September 2009 (2009-09-02) the whole document	1-22
A	US 2009/088021 A1 (KAUFFMAN RICK [US] ET AL) 2 April 2009 (2009-04-02) the whole document	1-22
A	US 4 653 834 A (NORDEN ALEXANDER R [US]) 31 March 1987 (1987-03-31) the whole document	1-22
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Further documents are listed in the continuation of Box C.

See patent family annex.

* Special categories of cited documents :

<p>"A" document defining the general state of the art which is not considered to be of particular relevance</p> <p>"E" earlier application or patent but published on or after the international filing date</p> <p>"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)</p> <p>"O" document referring to an oral disclosure, use, exhibition or other means</p> <p>"P" document published prior to the international filing date but later than the priority date claimed</p>	<p>"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</p> <p>"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</p> <p>"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</p> <p>"&" document member of the same patent family</p>
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Date of the actual completion of the international search 21 August 2013	Date of mailing of the international search report 02/09/2013
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Name and mailing address of the ISA/ European Patent Office, P.B. 5818 Patentlaan 2 NL - 2280 HV Rijswijk Tel. (+31-70) 340-2040, Fax: (+31-70) 340-3016	Authorized officer João Carlos Silva
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INTERNATIONAL SEARCH REPORT

International application No
PCT/GB2013/051599

C(Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT		
Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	US 2010/294915 A1 (WILLIAMS JONATHAN D [US] ET AL) 25 November 2010 (2010-11-25) figures 4-17 paragraphs [0003] - [0019] paragraphs [0055] - [0076] -----	1-22

INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No

PCT/GB2013/051599

Patent document cited in search report	Publication date	Patent family member(s)	Publication date	
EP 2149746	A2	03-02-2010	EP 2149746 A2 US 2010020550 A1	03-02-2010 28-01-2010

EP 2096901	A2	02-09-2009	CN 101521970 A EP 2096901 A2 JP 5075673 B2 JP 2009205841 A US 2009212718 A1	02-09-2009 02-09-2009 21-11-2012 10-09-2009 27-08-2009

US 2009088021	A1	02-04-2009	NONE	

US 4653834	A	31-03-1987	NONE	

US 2010294915	A1	25-11-2010	CA 2666785 A1 US 2010294915 A1 US 2012175494 A1	22-11-2010 25-11-2010 12-07-2012
