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## (54) MOVEMENT DETECTION DEVICE, IN PARTICULAR FOR USE IN ALARM SYSTEMS

(57) The present invention relates in general to a movement detection device, in particular for use in alarm systems, comprising a hollow housing body (11) containing at least one electronic control board (14), at least one movement sensor (12a, 12b), and a frame (15) configured to support the at least one movement sensor (12a, 12b) in an orientable manner with respect to at least one axis of rotation (A,B), characterised in that the frame (15) is constrained to the housing body (11) by interposition of a support element (16) movable between a position proximal to the control board (14) wherein the support element (16) substantially prevents access to the control board (14), and a position distal from the control board (14), wherein the support element (16) substantially allows access to the control board (14).

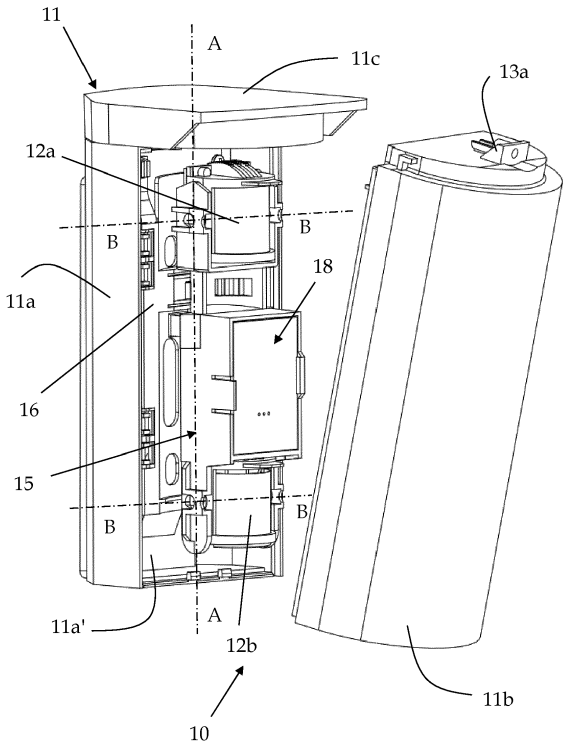


FIG. 1

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## Description

### TECHNICAL FIELD

**[0001]** The present invention concerns a movement detection device, in particular for use in alarm systems. In detail, the invention relates to a movement detection device for alarm systems, which allows for fast and effective installation and wiring.

### BACKGROUND

**[0002]** As is well known, movement detection devices for use in alarm systems comprise at least one movement sensor, e.g. an infra-red sensor, a microwave sensor or an ultrasound sensor, which can be directed towards a specific area to be monitored. For this purpose, the entire movement device and/or the movement sensors integrated into the detection device can be constrained to an orientable support, e.g. free to oscillate about an axis, such as a vertical and/or horizontal axis.

**[0003]** For the installation of outdoor movement detectors, it is necessary to electrically connect the movement detectors to an electronic control board, necessarily located at the back of the sensors, in order not to cover and/or reduce their detection range. The arrangement of the sensors in front of and close to the control board makes access to the board difficult. The connection operation therefore proves somewhat awkward and complex since, despite the orientability of the sensors, it is not easy to reach the connectors on the control board.

**[0004]** In addition, in the context of maintenance operations that require the connection of sensors to the control board to be changed or reset, it often happens that the orientation of these sensors is accidentally changed or has to be changed on purpose in order to make certain areas of the control board accessible. In both cases, it is therefore necessary to readjust the orientation of the sensors after maintenance operations to restore the previous installation conditions.

**[0005]** For this reason, the installation of movement detection devices has so far been time-consuming and laborious.

### OBJECTS AND SUMMARY OF THE INVENTION

**[0006]** In light of the above, the problem underlying the present invention is to devise a movement detection device that can be installed easily and quickly.

**[0007]** In the context of this problem, an aim of the present invention is to make a movement detection device that allows easy access to the connectors of the electronic control board.

**[0008]** A further purpose of the present invention is to devise a movement detection device that allows maintenance operations requiring access to the control board to be performed, while preserving the orientation of the movement sensors comprised in the device.

**[0009]** In accordance with a first aspect thereof, the invention thus relates to a movement detection device, in particular for use in alarm systems, comprising a hollow housing body containing at least one electronic control board, the at least one movement sensor, and a frame configured to support the at least one movement sensor in an orientable manner with respect to at least one axis of rotation. According to the present invention the frame is constrained to the housing body by interposition of a movable support element between a position proximal to the control board wherein the support element substantially prevents access to the control board, and a position distal from the control board wherein the support element substantially allows access to the control board.

**[0010]** The Applicant has designed a movement detection device in which the movement sensors, usually located between the access opening to the electronic control board and the board itself, can be moved away from the control board.

**[0011]** In essence, the Applicant has identified an extremely effective solution to carry out the installation and/or maintenance of the detection device. In fact, thanks to the solution devised by the Applicant, an operator is able to gain access to the control board in a simple manner, thus being able to carry out wiring or maintenance operations quickly.

**[0012]** The present invention may have at least one of the following preferred features; the latter may in particular be combined with one another as desired in order to meet specific application needs.

**[0013]** Preferably, the support element is made in the form of a door hinged inside the housing body at a hinge side thereof.

**[0014]** This specific embodiment of the movement of the frame allows it to be easily moved between the position proximal to the control board and the position distal from the control board.

**[0015]** According to a variant of the invention, the frame is made as a single piece with the support element.

**[0016]** In accordance with an alternative variant of the invention, the frame is constrained to the support element in an orientable manner about the at least one first axis of rotation A of the at least one axis of rotation A,B.

**[0017]** Preferably, the support element comprises a shelf element on which the frame rests in a rotatable manner about the first axis of rotation A, the shelf element defining in particular a housing space configured to retain in a rotatable manner a support pin integral with the frame.

**[0018]** Advantageously, the rotatable constraint between the frame and the support element allows the position of the movement sensors to be adjusted, maintaining it even when moving away from and towards the control board.

**[0019]** According to a variant of the invention, the detection device comprises means for retaining the frame at a given angular position with respect to the first axis of rotation A.

**[0020]** Preferably, the frame retaining means comprise a pair of elastic tabs made on the movable support element and a toothed surface made on the frame. In addition, the pair of elastic tabs defines an elastic retaining seat of an adjusting tooth belonging to the toothed surface.

**[0021]** Advantageously, the frame retaining means ensure that the angular position of the movement sensors with respect to the first axis of rotation is firmly secured even when moving away from and towards the control board.

**[0022]** According to a variant of the invention, the detection device comprises means for retaining the at least one movement sensor at a given angular position relative to a respective second axis of rotation B of the at least one axis of rotation A,B.

**[0023]** Preferably, the retaining means of the at least one movement sensor comprise at least one toothed surface made on the at least one movement sensor configured to engage with a complementary toothed surface present on the frame.

**[0024]** Advantageously, the retaining means of the at least one movement sensor ensure that the angular position of the movement sensors with respect to the respective second axis of rotation is also firmly secured even when moving away from and towards the control board.

**[0025]** In a variant of the invention, the housing comprises a pair of pins configured to engage in corresponding windows made at the hinge side of the support element.

**[0026]** In a variant of the invention, the support element comprises at least one through-hole configured to allow access to the control board when the support element is in the position proximal to the control board.

**[0027]** This makes it possible to make adjustments on the control board without necessarily moving the supporting element and with it the movement sensors.

**[0028]** In a variant of the invention, the support element comprises an elastic tab configured to be movable between an elastic return position and an elastic stress position.

**[0029]** Preferably, in the elastic return position, the tab is kept raised with respect to the control board when the support element is in the proximal position to the control board.

**[0030]** Furthermore, preferably, in the elastic stress position, the tab is pressed against the control board when the support element is in the proximal position to the control board.

**[0031]** Advantageously, this allows attempts to tamper with the detection devices to be reported by detecting the opening of the two half-shells of the housing body.

## BRIEF DESCRIPTION OF THE DRAWINGS

**[0032]** Further features and advantages of the present invention will be more evident from the following detailed description of certain preferred embodiments thereof made with reference to the appended drawings.

**[0033]** The different features in the individual configurations may be combined with one another as desired according to the preceding description, should there be advantages specifically resulting from a specific combination.

**[0034]** In such drawings,

- figure 1 is a perspective view of a first preferred embodiment of the movement detection device according to the present invention, in an open configuration with the front half-shell removed;
- figure 2 is a perspective view of the movement detection device of figure 1, in an open configuration with the front screen removed and the sensor element support in a distal position from the electronic control board;
- figure 3 is an exploded perspective view of the sensor element support used in the movement detection device of figure 1;
- figure 4 is an exploded perspective view of the movement sensor of figure 1;
- figure 5 is a perspective view of the movement detection device of figure 1 with the front screen removed and the sensor elements arranged in a first orientation with respect to a vertical axis;
- figure 5a is a cross-sectional bottom view of the movement detection device of figure 5;
- figure 6 is a perspective view of the movement detection device of figure 1 with the front screen removed and a sensor element arranged with a second orientation with respect to a horizontal axis;
- figures 7 and 7a are a cross-sectional view of the movement detection device of figure 6 and an enlarged detail of this cross-sectional view, respectively;
- figure 8 is a perspective view of a second preferred embodiment of the movement detection device according to the present invention, in an open configuration with the front screen removed and the sensor element support in a distal position from the electronic control board; and
- figure 9 is a perspective view of the sensor element support used in the movement detection device of figure 8.

## DETAILED DESCRIPTION OF THE INVENTION

**[0035]** For the illustration of the drawings, use is made in the following description of identical numerals or symbols to indicate construction elements with the same function. Moreover, for clarity of illustration, certain references may not be repeated in all drawings.

**[0036]** While the invention is susceptible to various modifications and alternative constructions, certain preferred embodiments are shown in the drawings and are described hereinbelow in detail. It is in any case to be noted that there is no intention to limit the invention to the specific embodiment illustrated rather on the contrary, the invention intends covering all the modifications, alternative and equivalent constructions that fall within the scope of the invention as defined in the claims.

**[0037]** The use of "for example", "etc.", "or" indicates non-exclusive alternatives without limitation, unless otherwise indicated. The use of "comprises" and "includes" means "comprises or includes, but not limited to", unless otherwise indicated.

**[0038]** With reference to figures 1-7, a first preferred embodiment of a movement detection device according to the present invention, collectively referred to as 10, is illustrated.

**[0039]** The detection device 10 comprises a hollow housing body 11 made of two releasable half-shells 11a, 11b that can be constrained to each other. A first half-shell 11a integrates or is connected to an interface 11d (illustrated in figure 4) configured to be fastened to a support surface, e.g. an interior wall, an exterior wall or a stand. The fastening interface 11d borders onto or is located in particular at the bottom wall 11a' of the first half-shell 11a. A second half-shell 11b is made at least partially of a material permeable to the detection signals to enable the transmission and reception of detection signals by at least one movement sensor 12a,12b arranged within the housing body 11. Examples of detection signals are electromagnetic signals, such as signals in the infra-red or microwave frequency range, acoustic signals, such as ultrasound, or other types of signals suitable for detecting the presence or movement of objects, animals or persons.

**[0040]** The first 11a and second 11b half-shells comprise complementary reciprocal constraint elements 13a,13b, configured to make a releasable constraint between the two half-shells 11a, 11b. In the first embodiment illustrated, the constraint elements 13a,13b between the two half-shells 11a, 11b comprise a seat 13a and a screw 13b (shown in figure 4). A covering element 11c configured to prevent direct access to the constraint elements 13a,13b is also preferably provided.

**[0041]** An electronic control board 14, illustrated in schematic terms in figure 2, is arranged inside the housing body 11, which is constrained at the bottom wall 11a' of the first half-shell 11a. An adjustable casing or frame 15 is also provided internally to the housing body 11, bound to the housing body 11 in such a way as to be interposed between the control board 14 housed in the first half-shell 11a and the second half-shell 11b. The adjustable frame 15 is configured to support at least one movement sensor 12a, 12b in an orientable manner with respect to at least one axis of rotation A,B.

**[0042]** In the first illustrated embodiment, the adjustable frame 15 is configured to support a first 12a and a second 12b movement sensor, each in an orientable manner with respect to a first and a respective second axis of rotation A,B, wherein the first and second axis of rotation A,B are orthogonal to each other. In the first embodiment illustrated, the adjustable frame 15 defines a pair of seats 15a,15b each configured to accommodate a movement sensor 12a, 12b and retain it by shape and/or force coupling. For this purpose, the movement sensors 12a,12b comprise a pair of projections 12a',12b' which extend from opposing sensor walls and which are configured to be slotted into corresponding recesses 15a',15b' made in the seats 15a,15b. The pair of projections 12a',12b' defines, for each movement sensor 12a,12b, the respective second axis of rotation B.

**[0043]** The adjustable frame 15 also preferably comprises a housing 18 for a possible electronic unit (not shown) dedicated to controlling the sensors 12a,12b. The housing 18 is preferably provided with an upper closing element 18a.

**[0044]** According to the present invention, the adjustable frame 15 is constrained to the housing body 11 by interposition of a support element 16, shown in detail in figure 3, movable between a position proximal to the control board 14 wherein the support element 16 substantially prevents access to the control board 14, and a position distal from the control board 14, wherein said support element 16 substantially allows access to the control board 14.

**[0045]** The support element 16 is made in the form of a door hinged to the housing 11 at a side thereof, indicated by the hinge side 16a. In the first illustrated embodiment, the hinge side 16a to which the support element 16 is hinged to the housing body 11 is substantially parallel to the vertical, with reference to the normal installation configuration of the detection device 10. For this purpose, the housing body 11 comprises a pair of pins 19 configured to engage in corresponding windows 16b made at the hinge side 16a of the support element 16. In an alternative embodiment not illustrated, the support element 16 is hinged to the housing body 11 at its own hinge side which, in the normal installation configuration, is substantially parallel to the horizontal, thereby allowing a tilting or overturning movement of the support element 16.

**[0046]** The support element 16 comprises at least one retaining element 16f configured to engage by shape and/or force coupling with a corresponding retaining seat 11a" made in an inner wall of the first half-shell 11a, when the support element 16 is in the position proximal to the control board 14. For example, the retaining element 16f is made in the form of an elastic tab and the retaining

seat 11a" is defined between two projections extending from the inner wall of the first half-shell 11a. The elastic tab is shaped to be inserted and retained by elastic coupling between the two projections that define the retaining seat 11a". In this way, the support element 16 is firmly retained in the position proximal to the control board 14.

**[0047]** In the first illustrated embodiment, the frame 15 is connected to the movable support element 16 in an orientable manner about the first axis of rotation A of the movement sensors 12a, 12b, which in the specific embodiment illustrated is parallel to the hinge side 16a of the support element 16. For this purpose, the support element 16 comprises a shelf element 16c on which the frame 15 rests in a rotatable manner about the first axis of rotation A. In particular, the shelf element 16c defines a receiving space 16c' in which a support pin 15c integral with the frame 15 is retained in a rotatable manner. In the first embodiment illustrated, the receiving space 16c' is defined between a recess made in the thickness of the shelf element 16c and a plate 16c" (shown in figure 4) releasably constrained to the shelf element 16c and configured to close the recess so as to define a perimetrically closed housing space 16c'. In addition, the support element 16 comprises a rotation pin 16d configured to be accommodated in a corresponding recess 15d (shown in figure 7) provided on the frame 15.

**[0048]** The support element 16 further comprises at least one through opening 17 allowing the passage of at least one electrical conductor for connecting the movement sensors 12a, 12b to the control board 14. There is also at least one through hole 22 configured to allow access to the control board 14 when the support element 16 is in the proximal position to the control board 14.

**[0049]** The support element 16 comprises an elastic tab 16e configured to be movable between an elastic return position and an elastic stress position. When the support element 16 is in the proximal position to the control board 14, the elastic return position keeps the tab 16e raised with respect to the control board 14. In the elastic stress position, the tab 16e is pressed against the control board 14, in particular against a switch 14a made on the control board 14.

**[0050]** Advantageously, the detection device 10 comprises means 20 for retaining the frame 15 at a given angular position with respect to the first axis of rotation A, for example the position shown in figure 5 in which the frame is rotated with respect to the first half-shell 11a such that the movement sensors 12a, 12b face sideways.

**[0051]** The retaining means 20 of the frame 15 - shown in detail in figure 5a - comprise a pair of elastic tabs 20a made on the movable support element 16 in such a way as to define between them an elastic retaining seat of an adjustment tooth belonging to a toothed surface 20b on the frame 15. Clearly, according to an alternative embodiment not illustrated, the means for retaining the frame 15 configured to hold it in a certain angular position with respect to the first axis of rotation A may provide an opposite conformation in which the pair of tabs is formed on the frame 15 and the toothed surface is obtained on the movable support element 16. In this way, a rotated position of the frame 15 about the first axis of rotation A with respect to the movable support element 16 can be set and maintained permanently.

**[0052]** There are also means 21 for retaining a movement sensor 12a, 12b at a given angular position with respect to the respective second axis of rotation B, within its housing seat 15a, 15b. For example, a configuration is shown in figures 6 and 7 in which the upper movement sensor 12a is arranged with its rear wall parallel to the movable support 16, while the lower movement sensor 12b is rotated downwards with respect to its second axis of rotation B.

**[0053]** The retaining means 21 of the movement sensor 12a, 12b - shown in detail in figure 7a - comprise at least one toothed surface 21a formed on the movement sensor 12a, 12b which engages a complementary toothed surface 21b present on the frame 15. In this way, it is possible to stably maintain the positioning of a movement sensor 12a, 12b at a certain inclination with respect to the respective second axis of rotation B.

**[0054]** With reference to figures 8 and 9, a second preferred embodiment of a movement detection device according to the present invention, collectively referred to as 10', is shown.

**[0055]** The movement detection device 10' in accordance with the second embodiment differs from the movement detection device 10 in accordance with the first embodiment in terms of the formation of the movable support element 16, which in the second embodiment is made as a single piece with the frame 15.

**[0056]** Therefore, in the second embodiment illustrated, the frame 15 is configured to support the first 12a and the second 12b movement sensor, each in an orientable manner with respect to a single axis of rotation B, specifically an axis of rotation orthogonal to the hinge side 16a of the support element 16. In fact, the movement sensors 12a, 12b can only be brought and held in a given angular position with respect to their respective axis of rotation B, within their housing seat 15a, 15b. The operation of the detection device 10 according to the present invention is as follows.

**[0057]** Thanks to the provision of the movable support element 16 that supports the adjustable frame 15, and with it the movement sensors 12a, 12b, it is possible, during installation, to easily move the frame 15 and the sensors 12a, 12b away from the circuit board 14 in order to have better access to the board's connectors and thus to easily operate the wiring and connections of the sensors 12a, 12b. The connection cables (not shown) between the sensors 12a, 12b and the circuit board 14 can conveniently be routed through the through holes 17 on the support element 16.

**[0058]** Once the wiring and connection operations are completed, the frame 15 and sensors 12a, 12b are moved to the position proximal to the circuit board 14. In this position, the movable support element 16 essentially cov-

ers the control board 14, acting as protection for it both from accidental impacts and in the event of tampering attempts.

**[0059]** In the proximal position of the support element 16 to the circuit board 14, it is also possible to make certain electronic adjustments to the operating parameters of the sensors - e.g. to adjust their degree of sensitivity - by acting on the circuit board 14 through the through holes 22 on the support element 16.

**[0060]** The support element 16 also acts as an opening indicator for the detection device 10. In fact, the half-shell 11b at least partially permeable to detection signals is shaped to exert - when assembled on the other half-shell 11a - pressure on the elastic tab 16e present on the support element 16. This keeps the elastic tab 16e pressed against the switch on the control board 14, keeping it closed. If the two half-shells 11a, 11b are disassembled, the pressure on the elastic tab 16e is removed. It therefore elastically returns to its rest position, ending the pressure on the switch and thus opening it. The opening of the housing body 11 is thus immediately detected, thus being able to report any unauthorised attempts to open it.

**[0061]** Advantageously, the possible retaining means 20,21 for maintaining the relative position between the frame 15 and the support element 16 and between the movement sensors 12a, 12b and the frame 15 respectively makes it possible to move the support element 16 to gain access to the control board 14, while maintaining the specific pre-set orientations on the movement sensors 12a, 12b aimed at detecting any moving bodies within a given monitoring area.

**[0062]** In this way, wiring and maintenance operations, as well as being facilitated by easier access to the control board, also require considerably less time due to the fact that access to the board does not require changing the preset positions and orientations on the sensors.

## Claims

1. Movement detection device (10), in particular for use in alarm systems, comprising a hollow housing body (11) containing at least one electronic control board (14), at least one movement sensor (12a,12b), and a frame (15) configured to support the at least one movement sensor (12a,12b) in an orientable manner with respect to at least one axis of rotation (A,B), **characterised in that** the frame (15) is constrained to the housing body (11) by interposition of a support element (16) movable between a position proximal to the control board (14) wherein the support element (16) substantially prevents access to the control board (14), and a position distal from the control board (14), wherein the support element (16) substantially allows access to the control board (14).

2. Detection device (10) according to claim 1, wherein the support element (16) is made in the form of a door hinged inside the housing body (11) at a hinge side (16a) thereof.

3. Detection device (10) according to claim 1 or 2, wherein the frame (15) is made as a single piece with the support element (16).

4. Detection device (10) according to claim 1 or 2, wherein the frame (15) is constrained to the support element (16) in an orientable manner about the at least one first axis of rotation (A) of the at least one axis of rotation (A,B).

5. Detection device (10) according to claim 4, wherein the support element (16) comprises a shelf element (16c) on which the frame (15) rests in a rotatable manner about the first axis of rotation (A), the shelf element (16c) defining in particular a housing space (16c') configured to retain in a rotatable manner a support pin (15c) integral with the frame (15).

6. Detection device (10) according to claim 4 or 5, comprising means (20) for retaining the frame (15) at a given angular position with respect to the first axis of rotation (A).

7. Detection device (10) according to claim 6, wherein the retaining means (20) of the frame (15) comprise a pair of elastic tabs (20a) made on the movable support element (16) and a toothed surface (20b) made on the frame (15), the pair of elastic tabs (20a) defining an elastic retaining seat of an adjustment tooth belonging to the toothed surface (20b).

8. Detection device (10) according to any one of the preceding claims, comprising means (21) for retaining the at least one movement sensor (12a,12b) at a given angular position with respect to a respective second axis of rotation (B) of the at least one axis of rotation (A,B) wherein the retaining means (21) of the at least one movement sensor (12a,12b) comprise at least one toothed surface (21a) made on the at least one movement sensor (12a,12b) configured to engage with a complementary toothed surface (21b) present on the frame (15).

9. Detection device (10) according to any one of claims 2 to 8, wherein the housing body (11) comprises a pair of pins (19) configured to engage in corresponding windows (16b) made at the hinge side (16a) of the support element (16).

10. Detection device (10) according to any one of the preceding claims, wherein the support element (16) comprises an elastic tab (16e) configured to be movable between an elastic return position and an elastic stress position, in the elastic return position, the tab (16e) being held raised with respect to the control

board (14) when the support element (16) is in the position proximal to the control board (14), in the elastic stress position, the tab (16e) being pressed against the control board (14) when the support element (16) is in the position proximal to the control board (14).

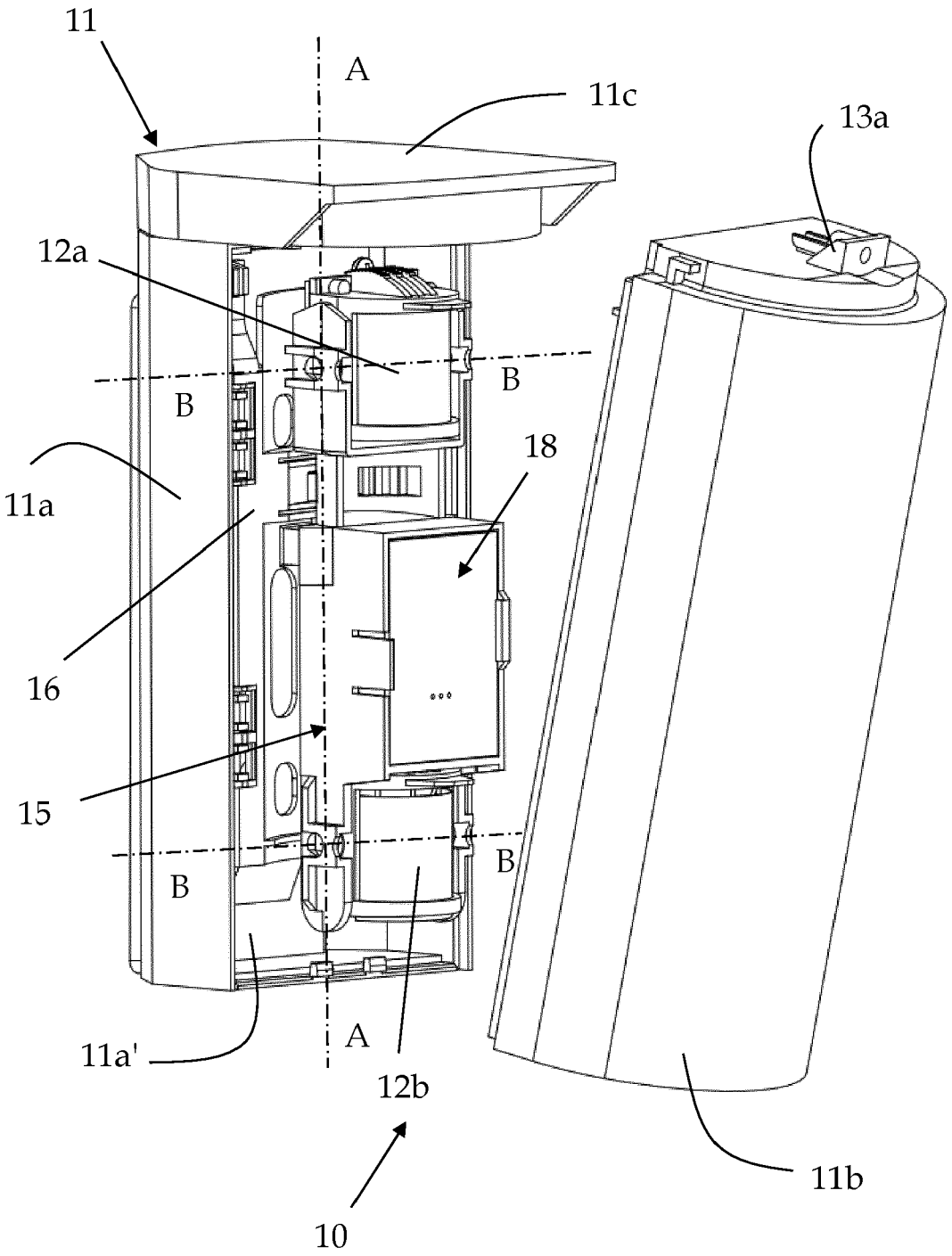
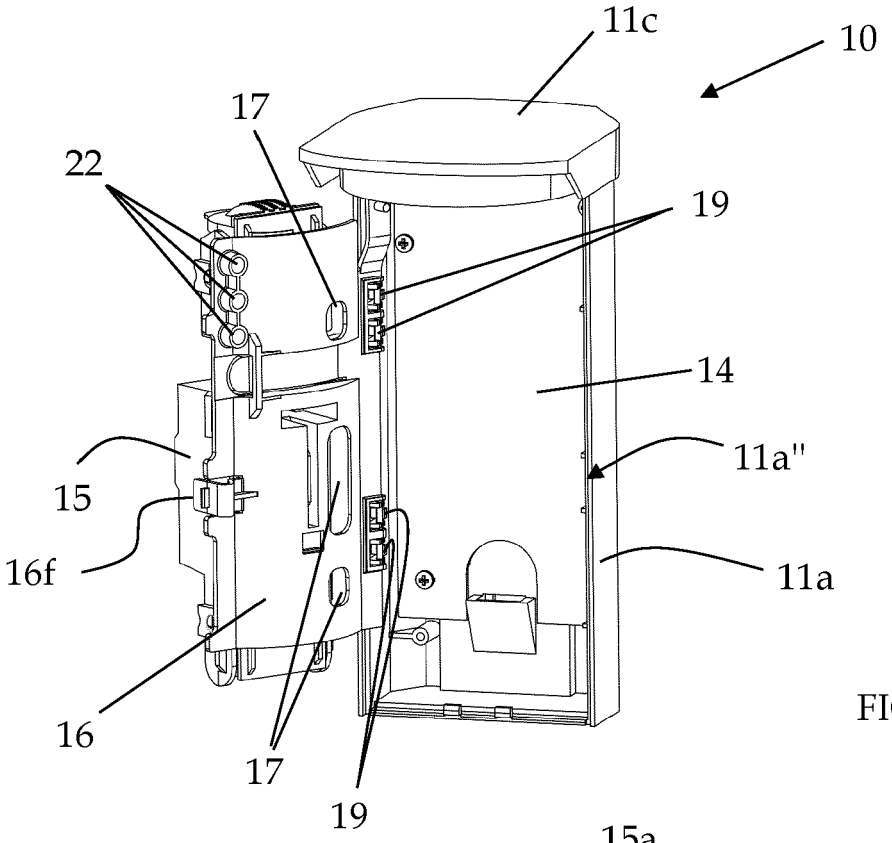



FIG. 1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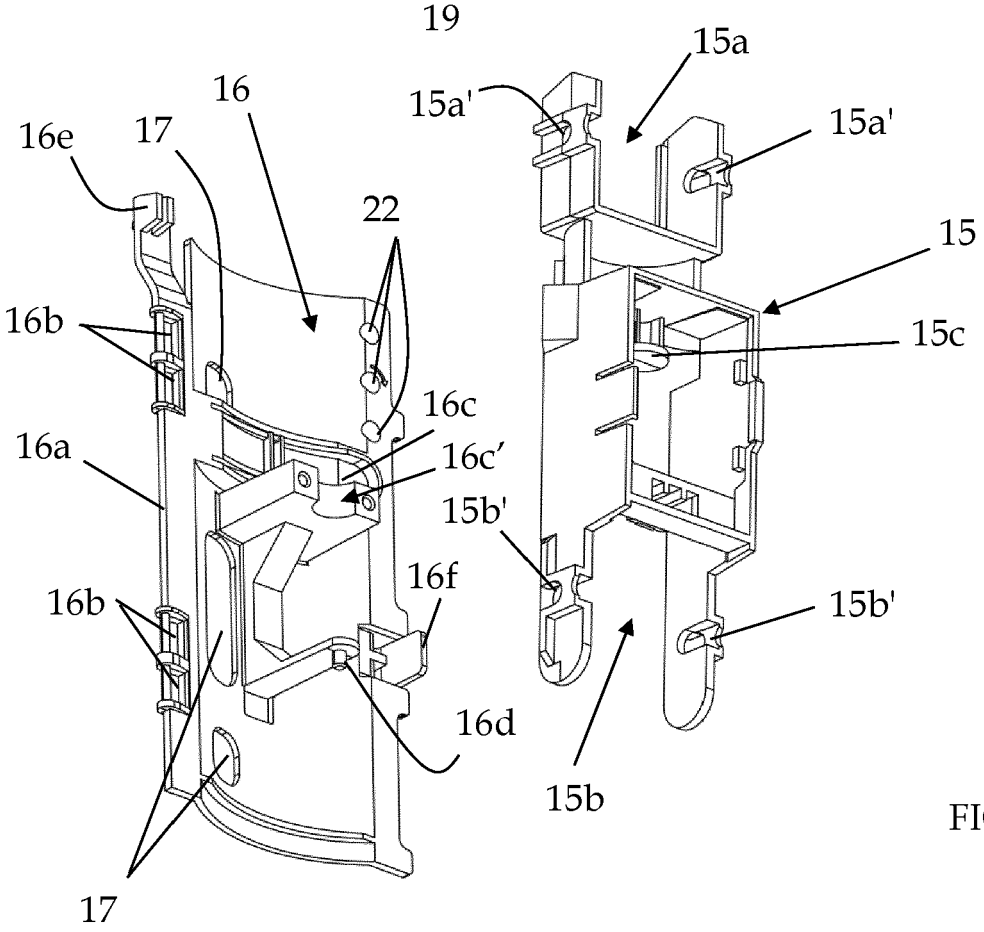
16f
11a
16
17
19

FIG. 2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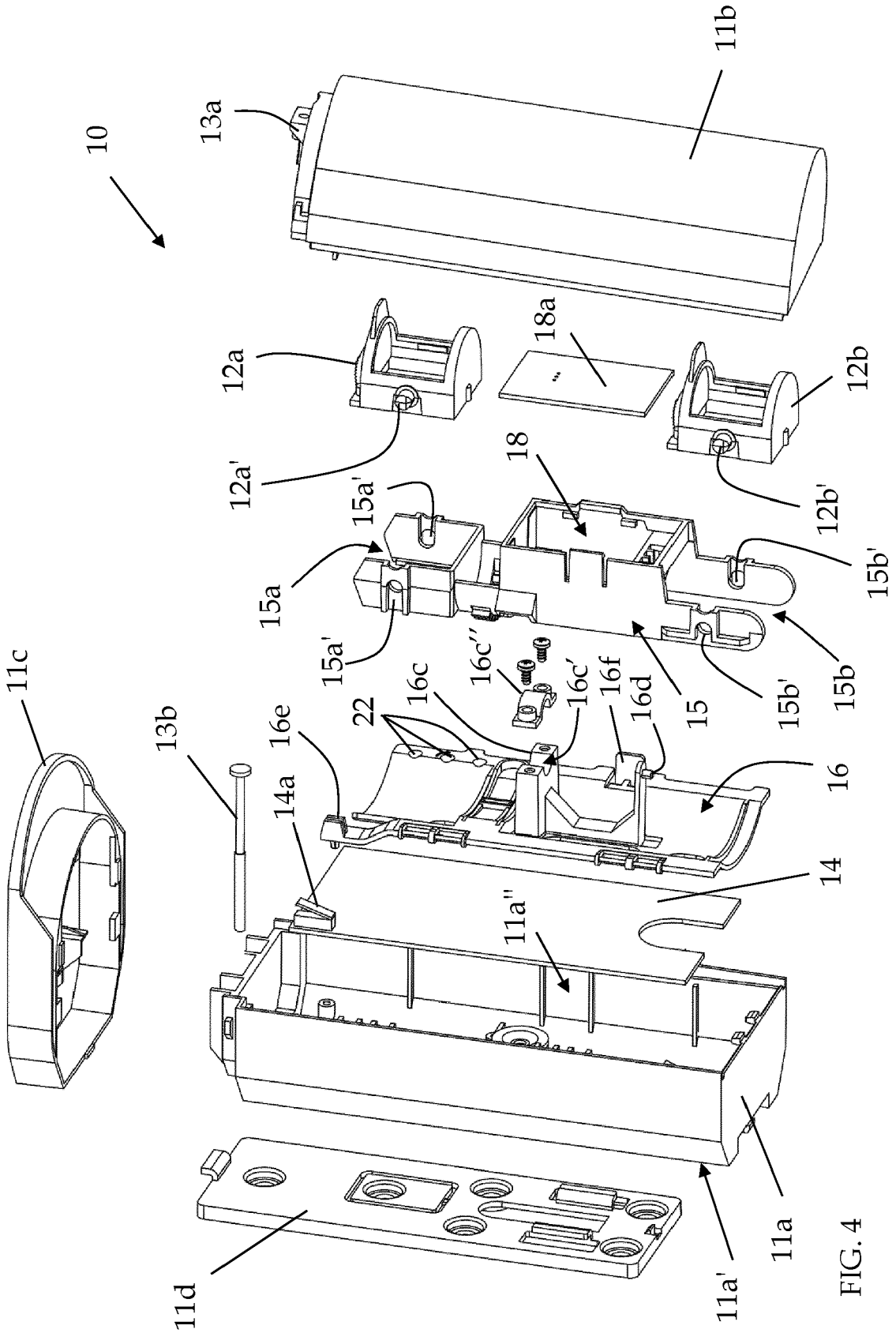
15b'
16d
15b
17

FIG. 3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15a
15b'
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16c'
16f
16d
22
15
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14a
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11a'
11a

FIG. 4

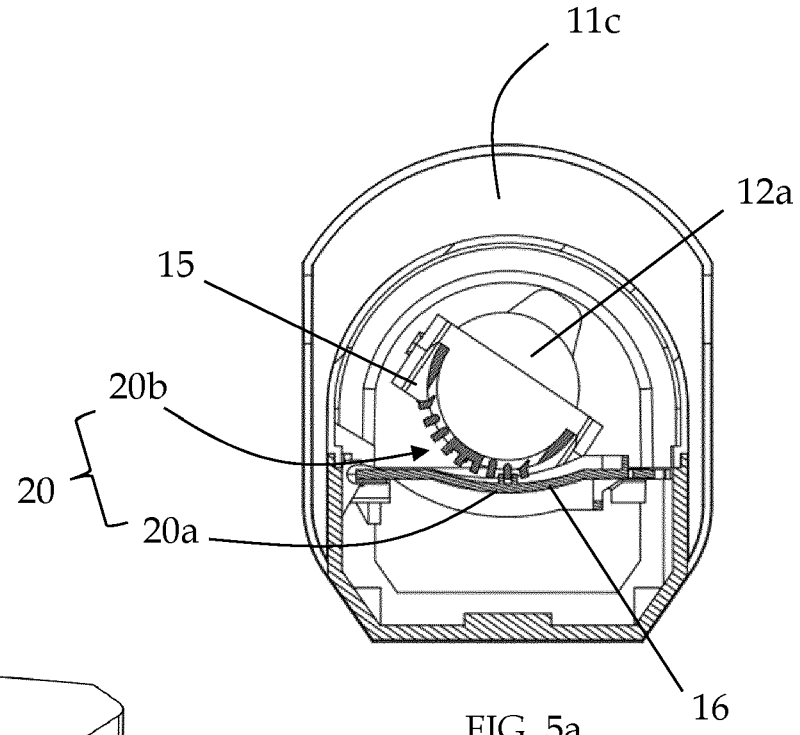


FIG. 5a

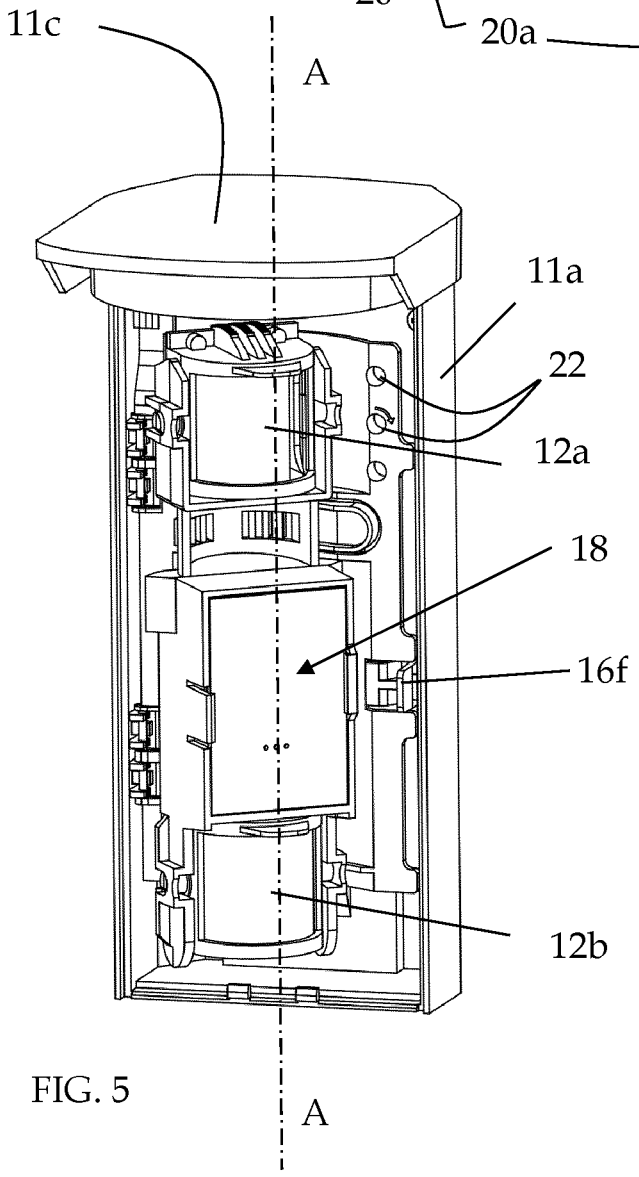


FIG. 5

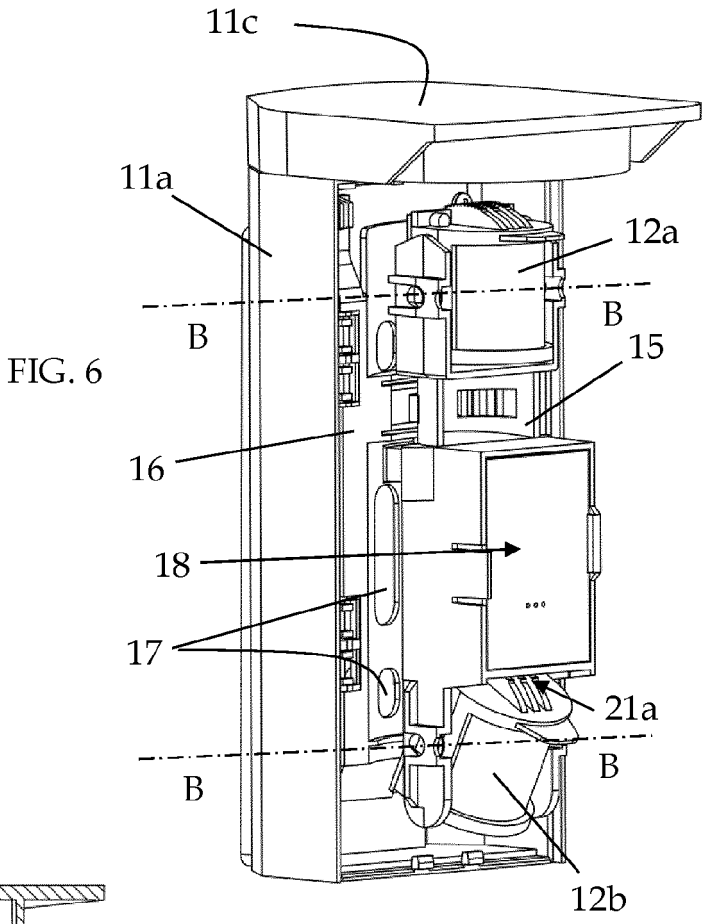


FIG. 6

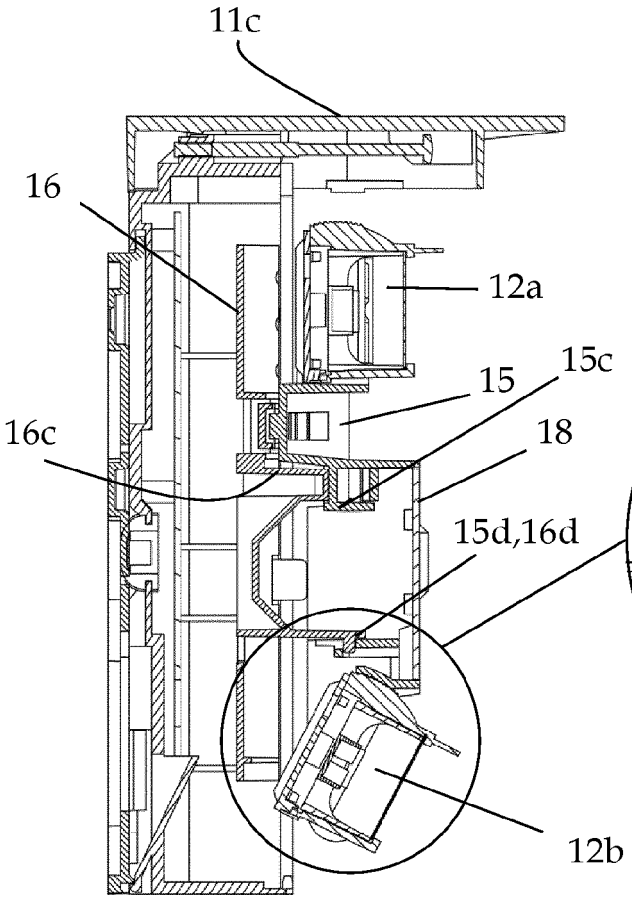


FIG. 7

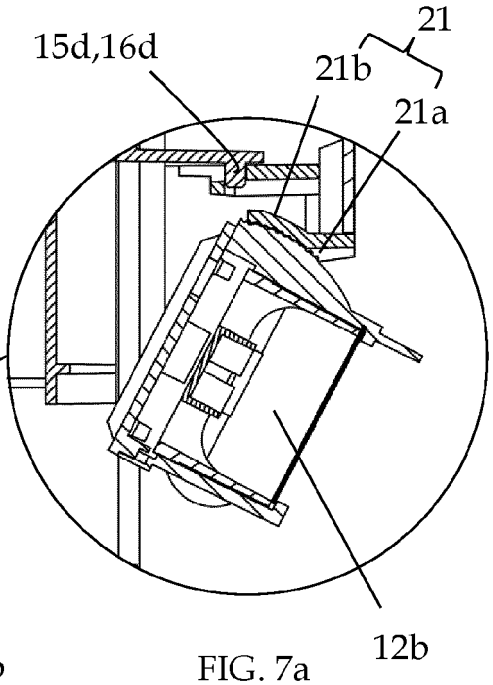


FIG. 7a

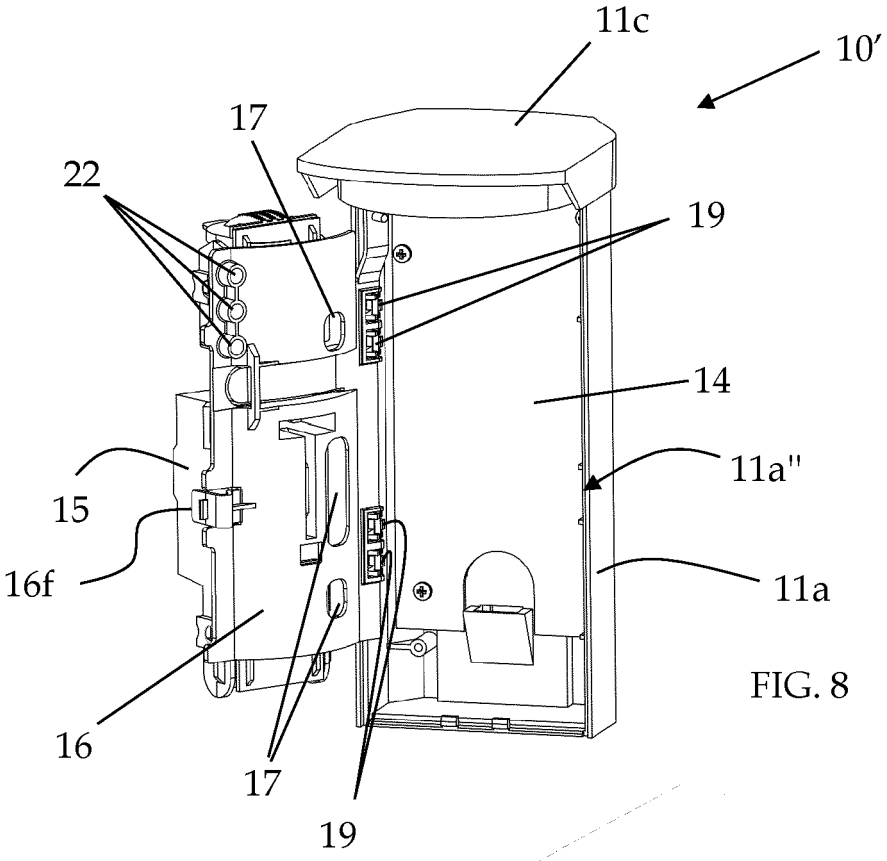
11c
10'
17
22
19
14
11a''
15
16f
11a
16
17
19

FIG. 8

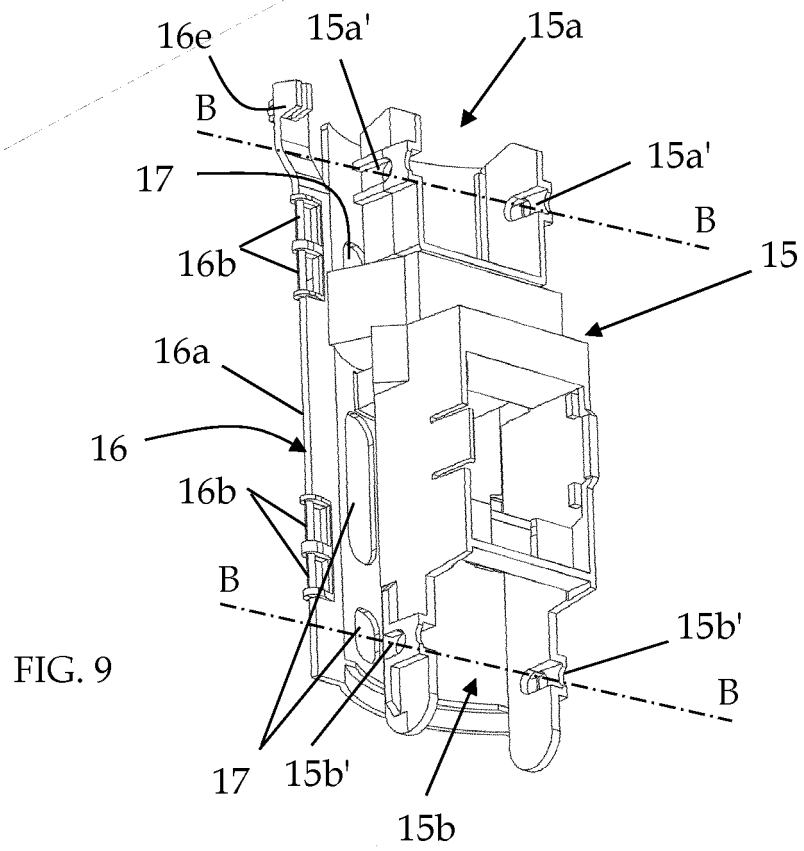
16e
15a'
15a
B
15a'
17
B
16b
15
16a
16
16b
B
15b'
B
17
15b'
15b

FIG. 9

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# EUROPEAN SEARCH REPORT

Application Number
EP 23 15 2656

## DOCUMENTS CONSIDERED TO BE RELEVANT

| Category | Citation of document with indication, where appropriate, of relevant passages | Relevant to claim | CLASSIFICATION OF THE APPLICATION (IPC) |
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G08B

The present search report has been drawn up for all claims

| Place of search | Date of completion of the search | Examiner |
|---|---|---|
| Munich | 28 June 2023 | Köniğer, Axel |

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| US 2010239241 A1 | 23-09-2010 | NONE | |

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