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(54) ELECTRONIC DEVICE WITH MULTI-FUNCTIONAL CONNECTION TERMINAL

(57) The present invention relates to an electronic device comprising a circuit board (9) and a terminal (3, 24, 44) mounted on the circuit board (9), wherein the terminal (3, 24, 44) comprises at least one conductor connection terminal (7a..7e, 25a..25e, 46a..46d) and an electrical connector and is configured to connect, to a

pole of the circuit board (9), an electrical conductor (36a) connected to the at least one conductor connection terminal (7a..7e, 25a..25e, 46a..46d) and to connect, to the pole of the circuit board (9), at least one contact (18a, 39a..39c, 47a..47d) of a plug-in connector (19, 38, 49) connected to the electrical connector.

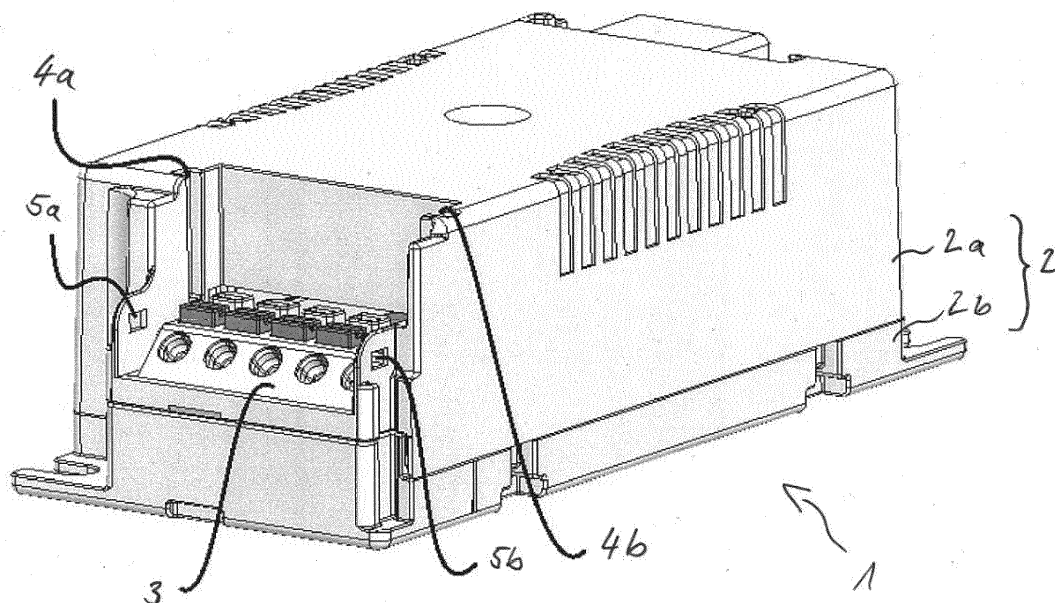


Fig. 1

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Description

[0001] The present invention relates to an electronic device, a system and an extension module for an electronic device. In particular, the present invention relates to an operating device for an illuminant having a terminal for connecting sensor, main power and/or control cables.

[0002] In lighting systems, operating devices are used to drive lighting means such as gaseous-discharge lamps, halogen bulbs, light-emitting diodes (LED), wherein the operating device can be further configured to monitor operations of lighting means and/or to control color temperature or dimming.

[0003] Many operating devices comprise screw or spring terminals, to which sensor, mains power and/or control cables can be connected. Alternatively, the cables are connected by plug-in connectors for quick, safe and easy connection and disconnection, wherein the terminal of the operating device comprises a socket or plug connector for connecting the cable fitted with the respective plug-in connector (plug or socket). However, for each of the different connections, an operating device having a special terminal must be provided.

[0004] Further, for many purposes, an electronic device must be flat or slim, so that there are also limitations regarding the size of the terminal, i.e. number of electrical connections and/or the maximum cable cross-section.

[0005] It is an object of the present invention to provide an apparatus and a system, which reduce the above problems. In particular, an object of the present invention is to provide an electronic device, a system and an extension module that offer a variety of connection options.

[0006] This object is achieved by the electronic device, the system and the extension module according to the enclosed independent claims. Advantageous features of the present invention are defined in the corresponding subclaims.

[0007] According to the present invention, the electronic device comprises a circuit board and a terminal mounted on the circuit board. The terminal comprises at least one conductor connection terminal for connecting an electrical conductor (wire) to the electronic device and an electrical connector for connecting a plug-in connector (plug or socket) to the electronic device, wherein the terminal is configured to connect the electrical conductor to a pole of the circuit board and to connect at least one contact of the plug-in connector to the pole of the circuit board.

[0008] In this way, cables fitted with the plug-in connector and cables without the plug-in connector can be connected to the same terminal of the electronic device, wherein an electrical conductor (wire) can be connected to the conductor connection terminal and a cable fitted with the plug-in connector can be connected to the electrical connector (socket or plug).

[0009] The electronic device can be an operating device for an illuminant (e.g. a LED driver or a ballast for fluorescent lamps), a LED module, a sensor device or a

lamp.

[0010] At least one conductor connection terminal can be a screw terminal. Alternatively or in addition, at least one conductor connection terminal can be a spring terminal, wherein the at least one conductor connection terminal comprises a clamping spring for clamping the at least one electrical conductor, the terminal comprises at least one insulating housing, and the clamping spring is arranged within the at least one insulating housing.

[0011] In order to provide a defined and reduced contact surface and secure fixing of the electric conductor, the clamping spring can comprise a protrusion and/or a clamping edge for clamping the at least one electrical conductor.

[0012] Alternatively or in addition, the terminal can comprise an actuating element operated by a user when inserting or pulling out the electric conductor. The actuating element is pivotally or movably supported in the insulator housing and is configured to strike an actuating section of the clamping spring by pivoting or moving the actuating element at least from an open to a closed position and vice versa.

[0013] In order to reduce the size of the terminal, at least one conductor connection terminal can be a part of the electrical connector, wherein the clamping spring is configured to clamp the at least one contact.

[0014] In addition, the electrical connector can comprise a locking element for locking the plug-in connector and the actuating element can be configured to also actuate the locking element to unlock the plug-in connector.

[0015] Alternatively, the at least one conductor connection terminal and the electrical connector can be spaced apart to one another, wherein the electrical connector comprises at least one contact element for connecting the at least one contact and the terminal comprises a first contact limb for connecting the at least one contact element and the clamping spring. The at least one conductor connection terminal and the electrical connector can be arranged in such a way that the electrical conductor and the plug-in connector can be connected to the electronic device at the same time.

[0016] The terminal can be soldered onto the circuit board, wherein the terminal comprises a second contact limb for connecting the first contact limb to the pole of the circuit board.

[0017] Preferably, at least the clamping spring, the first contact limb and the contact element can be made of one piece.

[0018] The terminal can comprise a plurality of the conductor connection terminals arranged adjacent to each other (terminal strip) and/or the electrical connector can comprise a plurality of the electrical connectors (contact sockets or pins) adjacent to each other, wherein each of the electrical connectors is configured to connect one contact (contact pin or contact sockets) of a plurality of contacts of the plug-in connector.

[0019] According to the present invention, the system comprises the electronic device and the plug-in connector.

tor, wherein at least one electrical cable is connected to the plug-in connector and/or the plug-in connector comprises a terminal for connecting the at least one electrical cable.

[0020] In addition, the system can comprise an extension module for the electronic device, wherein the plug-in connector is a part of the extension module. The extension module comprises at least a first terminal for connecting a first electrical conductor and a second terminal for connecting a second electrical conductor, wherein the extension module is configured to connect the contact of the plug-in connector to the first terminal and to the second terminal; and/or at least a first electrical cable and a second electrical cable, wherein the extension module is configured to connect the contact of the plug-in connector to an electrical conductor of the first electrical cable and to an electrical conductor of the second electrical cable.

[0021] According to the present invention, an extension module for an electronic device comprises a plug-in connector for connecting the extension module to a terminal of the electronic device, at least a first terminal for connecting a first electrical conductor and a second terminal for connecting a second electrical conductor, wherein a contact of the plug-in connector is connected to the first terminal and is connected to the second terminal, and/or at least a first electrical cable and a second electrical cable, wherein the contact of the plug-in connector is connected to an electrical conductor of the first electrical cable and is connected to an electrical conductor of the second electrical cable.

[0022] The invention is to be explained more detailed in the following with reference to the accompanying drawing, wherein:

FIG. 1 shows a first embodiment of the electronic device according to the present invention in a perspective view;

FIG. 2 shows the terminal of the electronic device shown in FIG. 1 from a top view;

FIG. 3 shows the circuit board of the electronic device shown in FIG. 1 in a perspective view;

FIG. 4 shows the circuit board and the terminal of the electronic device shown in FIG. 1 in a sectional view;

FIG. 5 shows the circuit board and the terminal shown in FIG. 4 in a state, in which the actuating element is actuated;

FIG. 6 shows the terminal shown in FIG. 4 connected with the plug-in connector;

FIG. 7 shows a system of the electronic device shown in FIG. 1 and the plug-in connector according

to the present invention;

FIG. 8 shows a terminal of an electronic device according to a second embodiment of the present invention in a perspective view;

FIG. 9 shows the terminal shown in FIG. 8 connected with a cable;

FIG. 10 shows the terminal shown in FIG. 9 in a sectional view;

FIG. 11 shows a plug-in connector connectable to the terminal shown in FIG. 8;

FIG. 12 shows the plug-in connector shown in FIG. 11 connected to the terminal shown in FIG. 8 in a sectional view;

FIG. 13 shows an electronic device connected with a plug-in connector according to a third embodiment of the present invention in a side view;

FIG. 14 shows an extension module according to the present invention and an electronic device, to which the extension module can be connected, in a top view; and

FIG. 15 shows the extension module and the electronic device shown in FIG. 14 plugged together in a side view.

[0023] In the figures 1 to 15, same reference signs refer to the same or analogous elements.

[0024] Fig. 1 shows an electronic device 1 according to an embodiment of the present invention. The electronic device 1 is an operating device for an illuminant (e.g. LED module) and comprises a housing 2 formed in multiple parts 2a, 2b and a terminal 3 for connecting electrical conductors (wires) and a plug-in connector (plug) to the electronic device 1. The lower part of the terminal 3 is covered by the housing 2, wherein guide grooves 4a, 4b for the plug-in connector and latching openings (recesses) 5a, 5b, in which locking elements (latches) of the plug-in connector can engage, are formed in the upper part 2a of the housing 2 above the terminal 3.

[0025] Terminal 3 comprises five conductor connection terminals arranged adjacent to each other to connect the electrical conductors of a power cable and a cable to the illuminant and comprises, parallel to that, a connection socket having five electrical connectors (contact sockets) adjacent to each other to connect contact pins of the plug-in connector. In this way, the power cable and the cable to the illuminant can be connected to the electronic device 1 by the conductor connection terminals or the connection socket when the cables are fitted with the plug-in connector. Alternatively, since the conductor connection terminals and the electrical connectors are con-

nected in parallel, the conductor connection terminals and the electrical connectors can be used for looping through to other devices. As shown in FIG. 1, the terminal 3 is arranged at one end of the electronic device 1 with respect to the main direction of orientation of the electronic device 1 and a further terminal for connecting electrical conductors and/or plug-in connector(s) may be arranged at the other end. In this way, the terminal 3 comprising the five conductor connection terminals and the five-pin socket maybe an input terminal including three-pole power connection and double-pole DALI connection whereas the terminal arranged at the other end may be an output terminal for connecting the cable to the illuminant. Preferably, the terminal 3 and/or the other terminal comprises at least two conductor connection terminals and a respective two-pin socket.

[0026] FIG. 2 shows a part of the electronic device 1 from a top view. As shown in Fig. 2, the terminal 3 comprises openings 6a..6e of the electrical connectors, in which contact pins of the plug-in connector are inserted when the plug-in connector is connected to the electronic device 1, openings 7a..7e of the conductor connection terminals, in which the electrical conductors can be inserted and actuating elements 8a..8e of the electrical conductors operable by a user. Each of the actuating elements 8a..8e can be pressed by the user to insert/remove an electrical conductor into/from the respective conductor connection terminal.

[0027] The electronic device 1 further comprises a rectifier, a PFC (Power Factor Correction) circuit, a DC-to-DC converter and a microcontroller or another controlling means for controlling at least the DC-to-DC converter. At least a part of these electronic components and the terminal 3 are mounted on a circuit board or a printed circuit board (PCB).

[0028] FIG. 3 shows an area of the circuit board 9, in which the terminal 3 is mounted. The terminal 3 is soldered directly to the circuit board 9 or in addition thereto fixed to the circuit board 9 by screws or snap-fits (not shown). The insertion openings 6a..6e and the insertion openings 7a..7e are arranged in an angle of 45 degrees to each other and guide a contact pin and an electrical conductor to be clamped, respectively. The angle may vary from 0 to 90 degree.

[0029] FIG. 4 and 5 show a sectional view of the circuit board 9, wherein, in opposition to FIG. 4, the actuating element 8a is pushed down in FIG. 5. The terminal 3 has an insulating housing formed at least in two parts, with a cover part 10a and a base part 10b. The actuating element 8a and a clamping insert are built into the insulating housing, wherein the clamping insert is integrally formed as a metal part formed from a clamping spring 11a, a contact leg 12a, a first contact limb (busbar piece) 13a arranged between the clamping spring 11a and the contact leg 12a and a second contact limb 14a that connects the clamping insert to a pole (soldering point) of the circuit board 9.

[0030] The contact leg 12a and the part of the insulating

housing surrounding the contact leg 12a form the first electrical connector of the five electrical connectors (contact sockets), wherein the upper part of the contact leg 12a is elastic and has a protrusion 15a to provide a defined and reduced contact surface for the contact pin of a plug-in connector.

[0031] The insertion opening 7a, the clamping spring 11a and the actuating element 8a form the first conductor connection terminal of the five conductor connection terminals having all the same structure, but are connected to different poles of the circuit board 9. The clamping spring 11a comprises a clamping edge 16a for clamping the electrical conductor and an actuating bracket (not shown) on at least one side. The actuating bracket projects laterally and is used as a support for the actuating element 8a to displace the clamping spring 11a in the direction of the circuit board 9 as shown in FIG. 5. The actuating element 8 may thus be operated (pressed down) by a user for inserting or pulling out the electric conductor. When the electric conductor is inserted and the actuating element 8 is released, the electric conductor is laterally clamped and connected by the clamping edge 16a, wherein the electric conductor, the pole and a contact pin connected to the contact leg 12a have the same electrical potential.

[0032] FIG. 6 shows a plug-in connector 17 connected to the terminal 3 shown in FIG. 4. As shown in FIG. 6, if the plug-in connector 17 is plugged to the electronic device 1, a contact pin 18a is inserted into the opening 6a and contacts the protrusion 15a. The plug-in connector 17 comprises five contact pins 18a..18e (not all are shown in FIG. 6), an insulating housing 19 that extends over the contact pins 18a..18e, two actuating brackets 20a, 20b (not all are shown in FIG. 6) attached to the insulating housing 19 and conductor connection terminals 21, 22 for connecting the power cable and the cable to the illuminant. A latching pin 23a, 23b is provided on each actuating bracket 20a, 20b and is latched into the respective latching opening 5a, 5b of the electronic device 1 when the plug-in connector 17 is plugged to the electronic device 1 as shown in FIG. 7. In order to unplug the plug-in connector 17, the actuating brackets 20a, 20b are pushed, so that the plug-in connector 17 can be pulled upwards to remove it.

[0033] In the terminal 3 as described above, the conductor connection terminals and the electrical connectors are spaced apart to one another, so that the plug-in connector 17 does not block the insertion openings 7a..7e of electrical conductors when the plug-in connector 17 is plugged to the electronic device 1. In this way, electrical conductors can be connected to the conductor connection terminals and the plug-in connector 17 can be plugged to the electronic device 1 at the same time, which increases the number of devices that can be connected to the electronic device 1 and/or the connection options. However, the separated arrangement of the conductor connection terminals and the connection socket including electrical connectors requires a lot of space.

[0034] FIG. 8 shows a terminal 24 mounted on the circuit board 9, where electrical connectors are integrated into electrical connectors 25a..25e. Each electrical connector 25a..25e comprises a clamping insert 26a..26e for clamping contact pins of the plug-in connector as well as electrical conductors of a cable 27 as shown in FIG. 9. The terminal 24 has an actuating element 28, which can be pressed by the user in a horizontal direction to remove the electrical conductors from the electrical connectors 25a..25e.

[0035] FIG. 10 shows a sectional view of the terminal 24 shown in FIG. 9 in a section of the electrical connector 25a. As shown in FIG. 10, the clamping insert 26a and the actuating element 28 are arranged at least predominantly within an insulating housing 30, wherein the clamping insert 26a is integrally formed as a metal part formed from a clamping spring 31a, a contact leg 32a connecting the clamping insert 26a to a pole (soldering point) of the circuit board 9, a first contact limb (busbar piece) 33a arranged between the clamping spring 31a and the contact leg 32a and a second contact limb 34a connected to the first contact limb 33a and fixed to the circuit board 9.

[0036] The clamping spring 31a comprises a clamping edge 35a that laterally clamps the electrical conductor (core) 36a of the cable 27 so that the electric conductor 36a is fixed and connected to the pole of the circuit board 9. The actuating element 28 supports the clamping spring 31a and displaces the clamping spring 31a in a horizontal direction when the actuating element 28 is operated (pressed) by a user for pulling out (and/or inserting) the electric conductor 36a.

[0037] Further, a latching pin 29a configured to latch into a respective latching opening of a plug-in connector can be formed on each electrical connector 25a..25e. As shown in FIG. 10, the latching pin 29a is formed on an elastic part of the insulating housing 30 and a pin 37a (or edge) provided on the actuating element 28 contacts and displaces the elastic part in the horizontal direction when the actuating element 28 is pressed/moved beyond a certain point, up to which the clamping spring 31a is displaced only. In this way, the user can move the actuating element 28 to the certain point in a first stage in order to connect/disconnect the electric conductor 36a and move the actuating element 28 beyond the certain point in a second stage to unplug a plug-in connector.

FIG. 11 shows the plug-in connector 38 that can be plugged to the terminal 24 shown in FIG. 10 instead of the electric conductor 36a. The plug-in connector 38 comprises contact pins 39a..39e, an insulating housing 19 that extends over the contact pins 39a..39e and latching openings (not shown).

[0038] FIG. 12 shows a sectional view of the terminal 24 and the plug-in connector 38 plugged into the terminal 24. As shown in FIG. 12, the clamping spring 31a connects the contact pin 39e inserted in the electrical connector 25a and the latching pin 29a is latched into a latching opening of the plug-in connector 38, from which the

latching pin 29a is lifted out when the actuating element 28 is pressed so that the pin 37a contacts and displaces an edge 40a of the elastic part of the insulating housing 30.

[0039] With the latching pins 29a..29e and the respective latching openings, which form a latching mechanism, the plug-in connector 38 is fixed to the electronic device 1. Alternatively, as shown in FIG. 13, the actuating brackets 20a, 20b and the latching openings 5a, 5b are provided on the plug-in connector 38 and the electronic device 1, respectively. In the same way described above, the latching pin 23a, 23b is provided on each actuating bracket 20a, 20b and is latched into the respective latching opening 5a, 5b of the electronic device 1 when the plug-in connector 38 is plugged to the electronic device 1. In order to unplug the plug-in connector 38, the actuating brackets 20a, 20b are pushed.

[0040] In the electronic device 1 shown in FIG. 12 and 13, the cable 27 can be directly connected to the terminal 24 or via the plug-in connector 38, wherein the plug-in connector 38 comprises screw terminals or spring terminals that clamp the electrical conductors (cores) 36a of the cable 27 and connect each electrical conductor (core) to a respective contact pin 39a..39e. In this way, the number of the screw terminals or spring terminals corresponds to the number of the contact pins 39a..39e.

[0041] Alternatively, the number of the screw terminals and/or spring terminals can be larger than the number of the contact pins 39a..39e, wherein, within the plug-in connector 38, at least a part of the screw terminals and/or spring terminals are connect in parallel. The increased number of the screw terminals and/or spring terminals can be used to increase the number of cables connectable to the plug-in connector 38 and/or to increase the connection options with respect to the cable type (rigid or flexible) and/or the cross-section of the cable or its electrical conductors, wherein the screw terminals and/or the spring terminals connected in parallel are adapted to connect different cable types and/or cables with different cross-sections, i.e., some terminals are adapted to connect large cross-sections and other terminals are adapted to connect small wire cross sections.

[0042] In addition or alternatively, the plug-in connector 17 and/or the plug-in connector 38 can be configured to provide the said extension of connectivity, wherein such plug-in connectors 17, 38 hereafter referred to as an extension module can be connected to an electronic device having a terminal configured to connect both electrical conductors and plug-in connectors or to connect plug-in connectors only.

[0043] FIG. 13 shows, in a top view, another embodiment of an extension module 41 and an electronic device 42, to which the extension module 41 can be connected. The electronic device 42 is an operating device for an illuminant (e.g. LED module) or a motion detector and comprises a terminal 43 mounted on the circuit board 9, a housing cover (removed in FIG. 13) that covers at least the terminal 43, four threaded holes 45a..45d for fixing

the housing cover by four screws and two threaded holes (not shown) for fixing the extension module 41 to electronic device 42. The terminal 43 comprises four electrical connectors (contact sockets) 46a..46d adjacent to each other, wherein each electrical connector has a clamping insert for clamping at least contact pins of the extension module 41 or another plug-in connector.

[0044] The extension module 41 comprises eight screw terminals 48a..48h for connecting electrical conductors, a plug-in connector 49 with four contact pins 47a..47d, a cable clamp 50, a housing cover (removed in FIG. 13), four threaded holes 51a..51d for fixing the housing cover by four screws and two brackets 52a, 52b that are each equipped with a screw 53a, 53b for fixing the extension module 41 to electronic device 42. As shown in FIG. 13, the contact pins 47a..47d of the plug-in connector 49 are exposed. Alternatively, the insulating housing of the plug-in connector 49 can be extended over the contact pins 47a..47d as shown in FIG. 6 or 11.

[0045] With the extension module 41, the number of electrical conductors connectable to the terminal 44 is doubled, wherein, within the extension module 41, the screw terminals 48a and 48c are connected to the contact pin 47a, the screw terminals 48b and 48d are connected to the contact pin 47b, the screw terminals 48e and 48g are connected to the contact pin 47c and the screw terminals 48f and 48h are connected to the contact pin 47d. The number of the screw terminals 48a..48h and the number of the contact pins 47a..47d are not limited to eight and four, respectively, but in any case the number of the screw terminals 48a..48h is greater than the number of the contact pins 47a..47d. Alternatively or in addition, the increased number of the (screw) terminals 48a..48h can be used to provide different terminal types as described above.

[0046] FIG. 14 shows the extension module 41 and the electronic device 42 plugged together in a side view. The extension module 41 is fixed to the electronic device 42 by the screws 53a, 53b and the housing cover 54 of the extension module 41, which replaces the housing cover of the electronic device 42. The housing cover 54 is mounted by eight screws screwed into the threaded holes 45a..45d and 51a..51d, wherein the brackets 52a, 52b also serve as guiding means for positioning the contact pins 47a..47d with respect to the electrical connectors 46a..46d in at least one plane when the extension module 41 and the electronic device 42 are plugged together.

Claims

1. An electronic device comprising

a circuit board (9) and
a terminal (3, 24, 44) mounted on the circuit board (9), wherein
the terminal (3, 24, 44) comprises at least one conductor connection terminal (7a..7e,

25a..25e, 46a..46d) and an electrical connector and is configured to connect, to a pole of the circuit board (9), an electrical conductor (36a) connected to the at least one conductor connection terminal (7a..7e, 25a..25e, 46a..46d) and to connect, to the pole of the circuit board (9), at least one contact (18a, 39a..39c, 47a..47d) of a plug-in connector (19, 38, 49) connected to the electrical connector.

2. The electronic device according to claim 1, wherein the electronic device (1, 42) is a LED driver, a ballast for fluorescent lamps, a LED module, a sensor device or a lamp.

3. The electronic device according to claim 1 or 2, wherein the conductor connection terminal (7a..7e, 25a..25e, 46a..46d) is a screw terminal or a spring terminal.

4. The electronic device according to any one of claims 1 to 3, wherein

the at least one conductor connection terminal (7a..7e, 25a..25e, 46a..46d) comprises a clamping spring (11a, 31a) for clamping the electrical conductor (36a),
the terminal (3, 24, 44) comprises at least one insulating housing (10a, 10b, 30), and
the clamping spring (11a, 31a) is arranged within the at least one insulating housing (10a, 10b, 30).

5. The electronic device according to claim 4, wherein the clamping spring (11a, 31a) comprises a protrusion and/or a clamping edge (16a, 35a) for clamping the electrical conductor (36a).

6. The electronic device according to claim 4 or 5, wherein the terminal (3, 24, 44) comprises an actuating element (8a..8e, 28) pivotally or movably supported in the insulator housing and configured to strike an actuating section of the clamping spring (11a, 31a) by pivoting or moving the actuating element (8a..8e, 28) at least from an open to a closed position and vice versa.

7. The electronic device according to any one of claims 3 to 6, wherein

the at least one conductor connection terminal (7a..7e, 25a..25e, 46a..46d) is a part of the electrical connector and the clamping spring (11a, 31a) is configured to clamp the at least one contact (18a, 39a..39c, 47a..47d).

8. The electronic device according to claim 6 and 7, wherein

the electrical connector comprises a locking element (29a) for locking the plug-in connector (19, 38, 49), and
the actuating element (8a..8e, 28) is configured to actuate the locking element (5a..5b, 29a) to unlock the plug-in connector (19, 38, 49).

9. The electronic device according to any one of claims 1 to 6, wherein

the at least one conductor connection terminal (7a..7e, 25a..25e, 46a..46d) and the electrical connector are spaced apart to one another, the electrical connector comprises at least one contact element (12a) for connecting the at least one contact (18a, 39a..39c, 47a..47d), and the terminal (3, 24, 44) comprises a first contact limb (13a) for connecting the at least one contact element (12a) and the clamping spring (11a, 31a).

10. The electronic device according to claim 9, wherein the terminal (3, 24, 44) comprises a second contact limb (14a) for connecting the first contact limb (13a) to the pole of the circuit board (9).

11. The electronic device according to claim 9 or 10, wherein
at least the clamping spring (11a, 31a), the first contact limb (13a) and the contact element (12a) are made of one piece.

12. The electronic device according to any one of claims 1 to 11, wherein

the terminal (3, 24, 44) comprises a plurality of the conductor connection terminals (7a..7e, 25a..25e, 46a..46d) arranged adjacent to each other; and/or
the terminal (3, 24, 44) comprises a plurality of the electrical connectors adjacent to each other, wherein each of the electrical connectors is configured to connect one contact (18a, 39a..39c, 47a..47d) of a plurality of contacts of the plug-in connector (19, 38, 49).

13. A system comprising

the electronic device (1, 42) according to any one of claims 1 to 11 and the plug-in connector (19, 38, 49), wherein
at least one electrical cable (27) is connected to the plug-in connector (19, 38, 49) and/or the plug-in connector comprises a terminal for connecting the at least one electrical cable (27).

14. The system according to claim 13, further comprising

an extension module (41) for the electronic device (1, 42), wherein the plug-in connector (19, 38, 49) is a part of the extension module (41) and the extension module (41) comprises
at least a first terminal (48a) for connecting a first electrical conductor and a second terminal (48d) for connecting a second electrical conductor, wherein the extension module (41) is configured to connect the contact (18a, 39a..39c, 47a..47d) of the plug-in connector (19, 38, 49) to the first terminal (48a) and to the second terminal (48d); and/or
at least a first electrical cable and a second electrical cable, wherein the extension module (41) is configured to connect the contact (18a, 39a..39c, 47a..47d) of the plug-in connector (19, 38, 49) to an electrical conductor of the first electrical cable and to an electrical conductor of the second electrical cable.

15. An extension module for an electronic device comprising

a plug-in connector (19, 38, 49) for connecting the extension module (41) to a terminal (3, 24, 44) of the electronic device (1, 42),
at least a first terminal (48a) for connecting a first electrical conductor and a second terminal (48d) for connecting a second electrical conductor, wherein a contact (18a, 39a..39c, 47a..47d) of the plug-in connector (19, 38, 49) is connected to the first terminal (48a) and is connected to the second terminal (48d); and/or
at least a first electrical cable and a second electrical cable, wherein the contact (18a, 39a..39c, 47a..47d) of the plug-in connector (19, 38, 49) is connected to an electrical conductor of the first electrical cable and is connected to an electrical conductor of the second electrical cable.

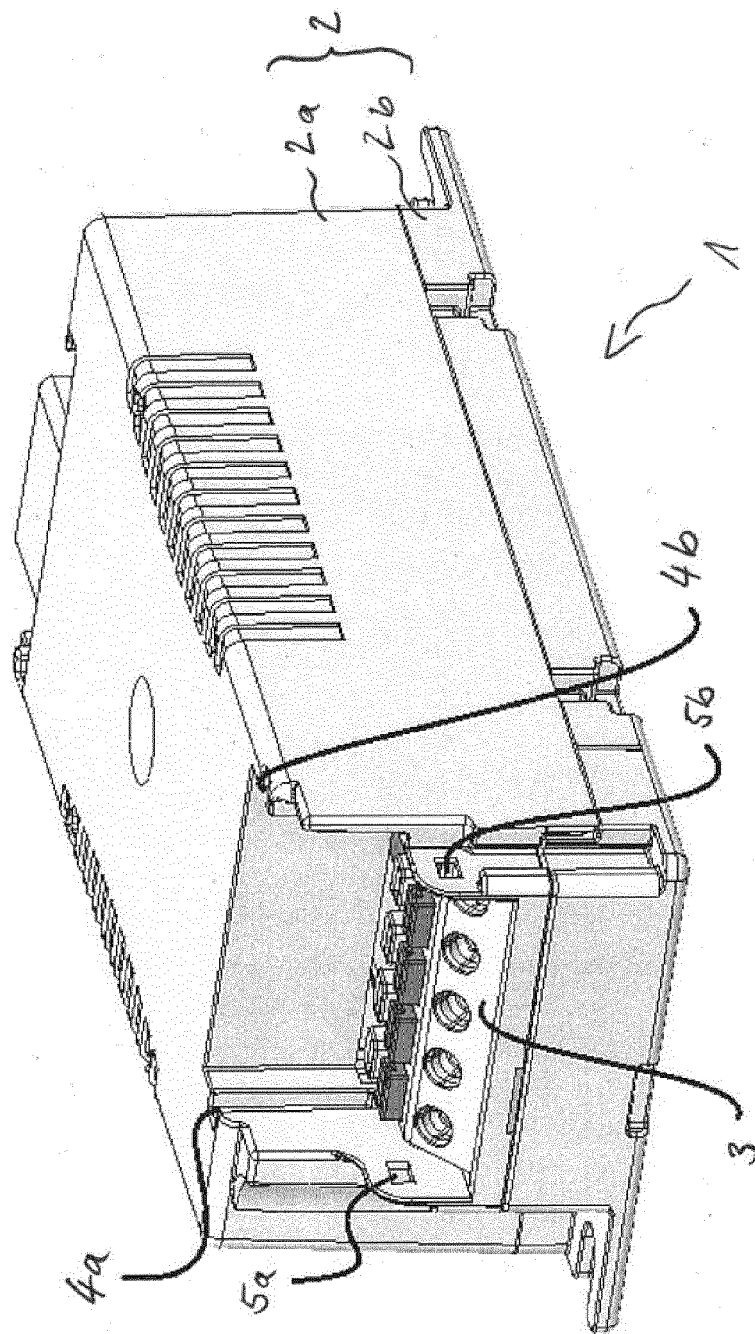


Fig. 1

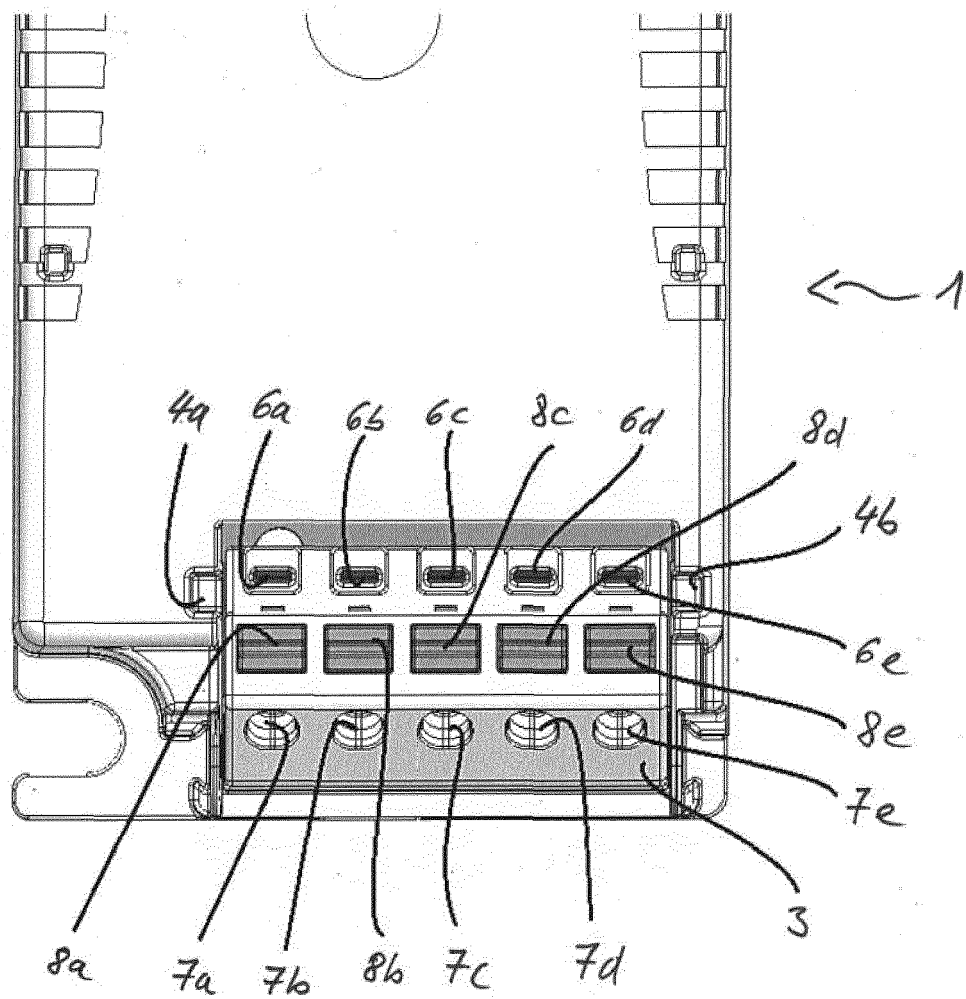


Fig. 2

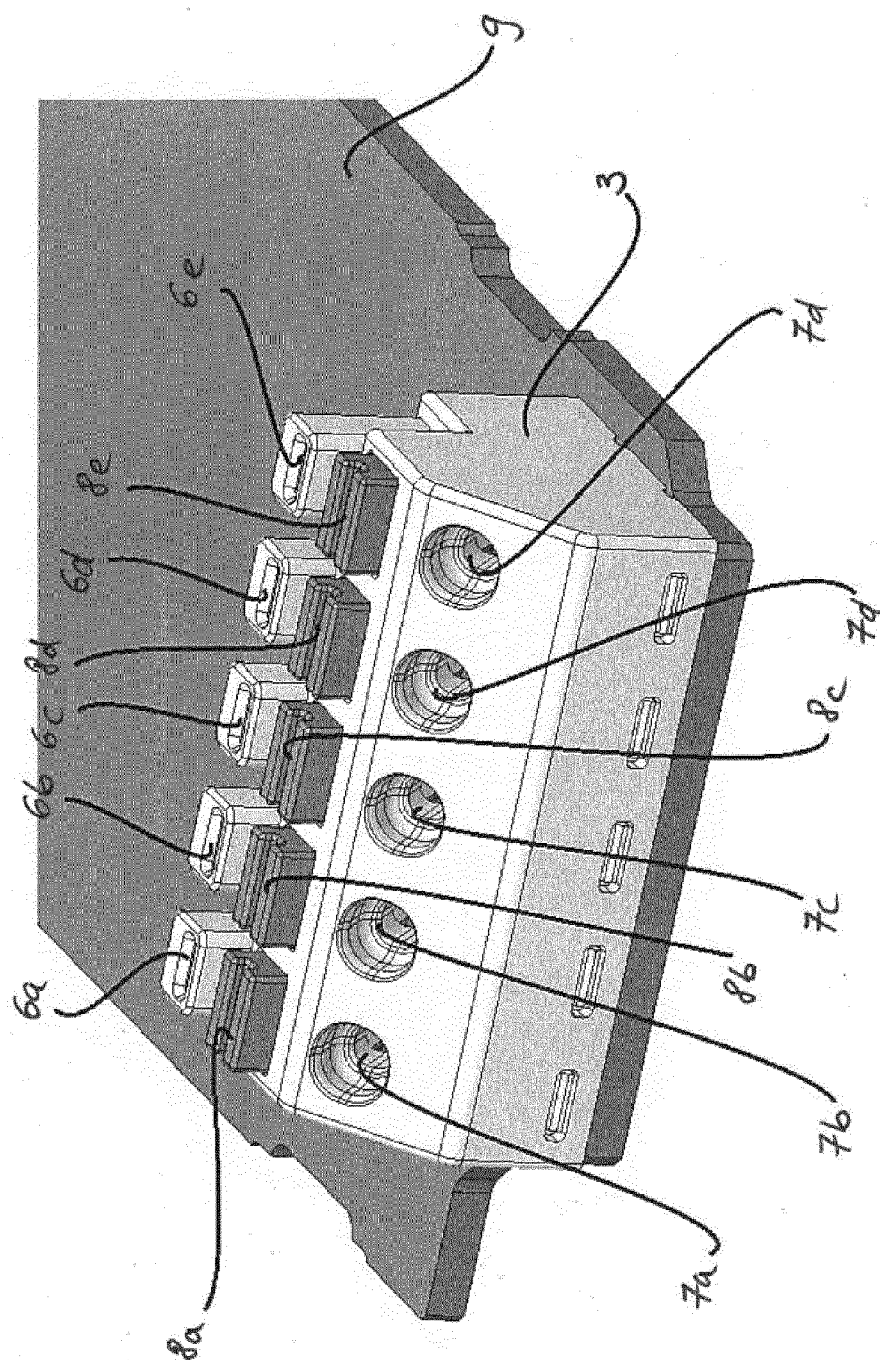


Fig. 3

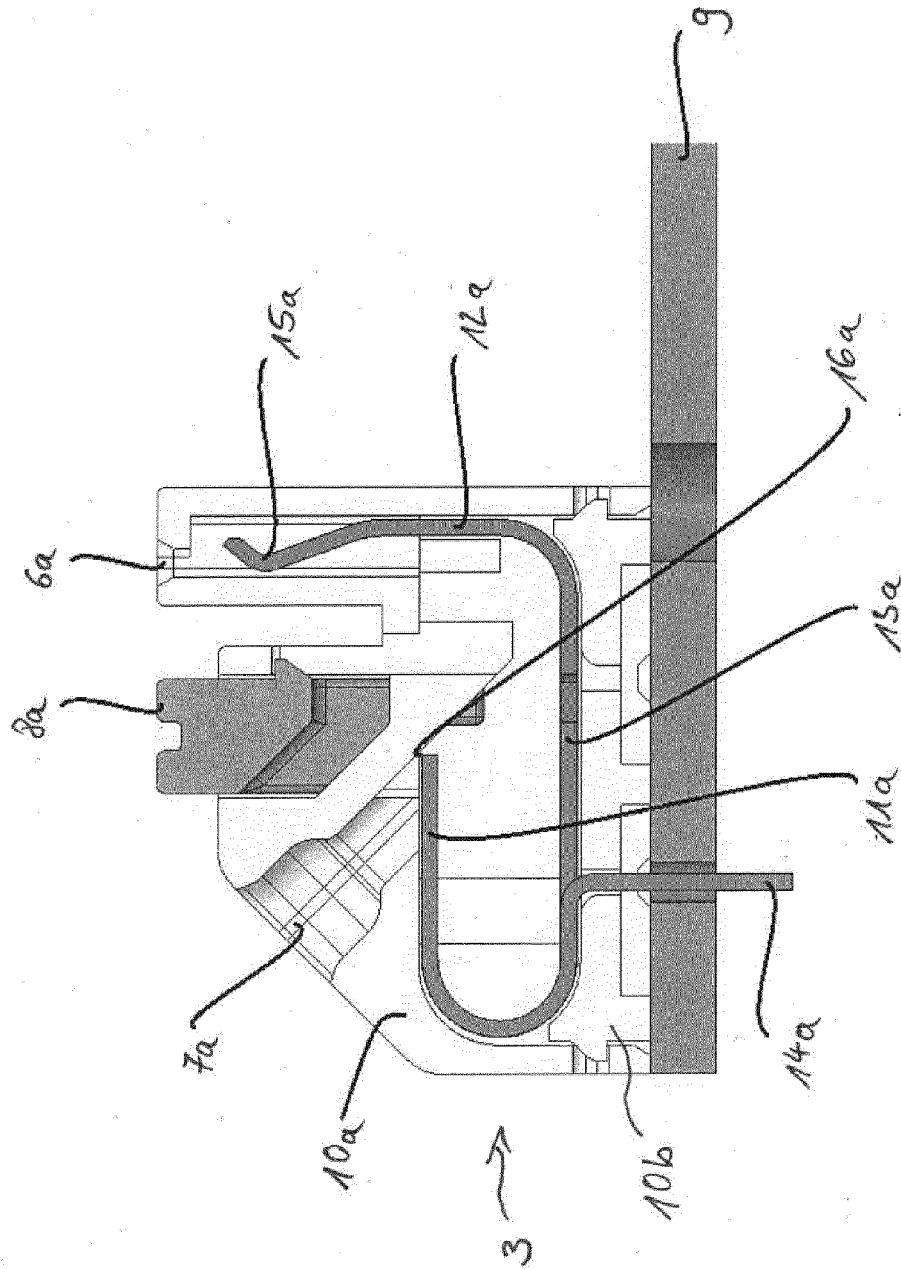


Fig. 4

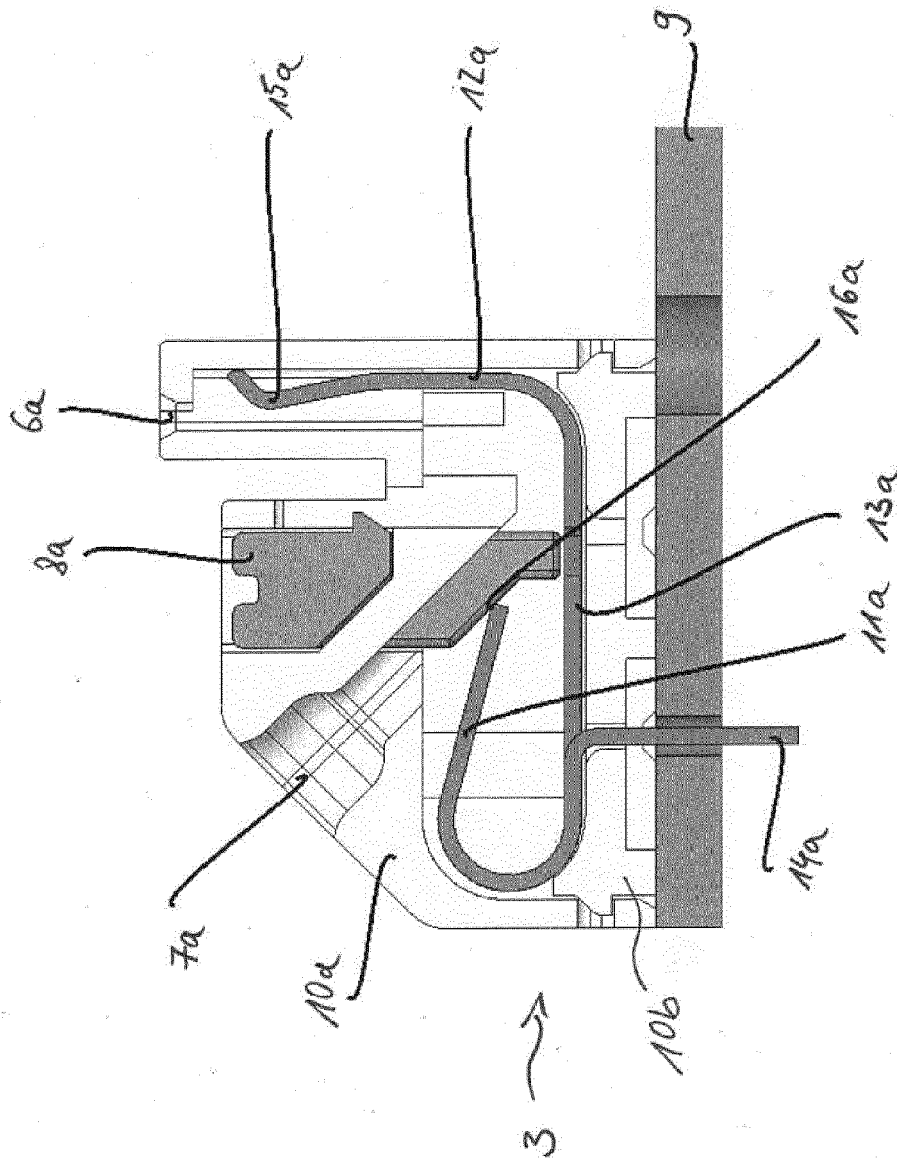


Fig. 5

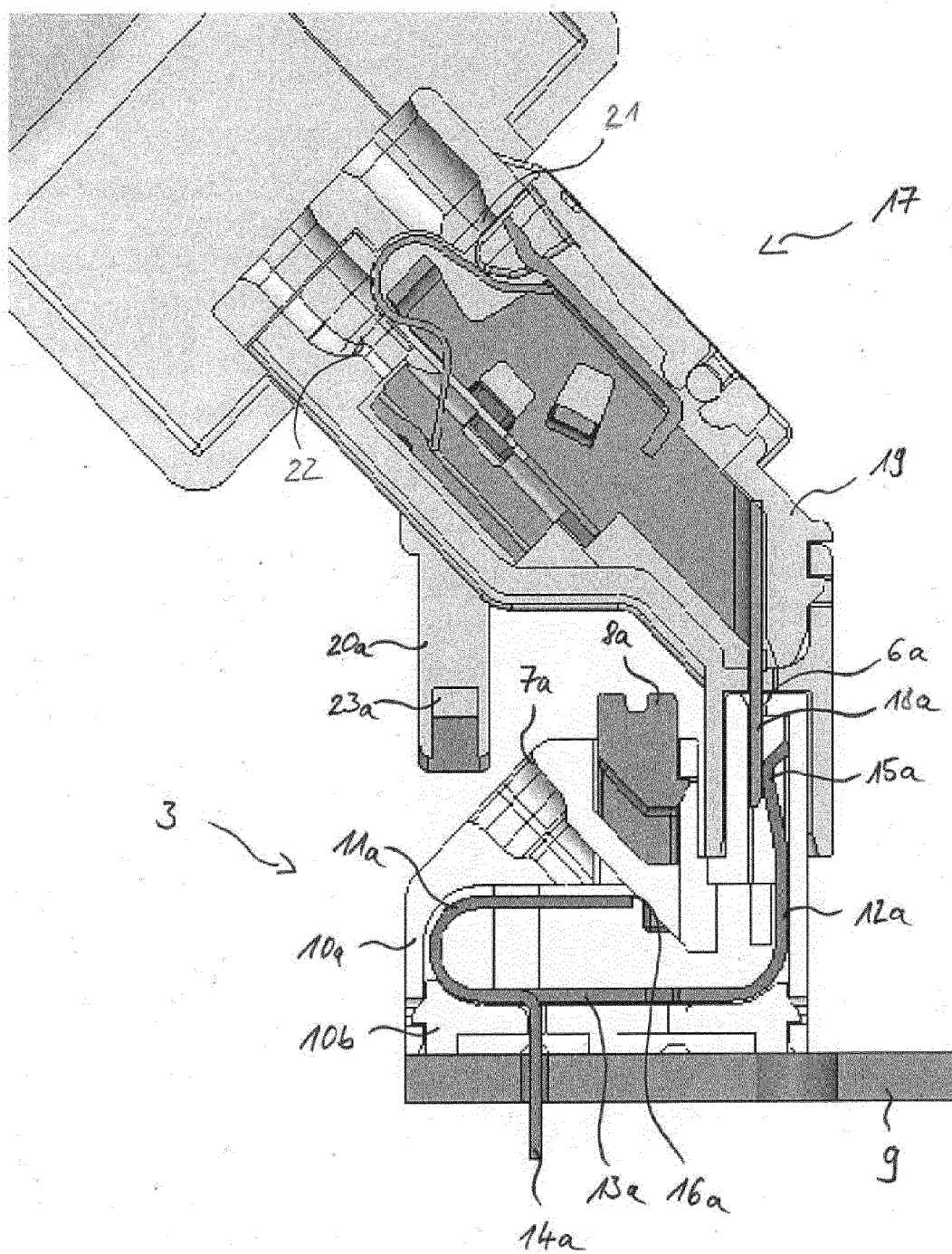
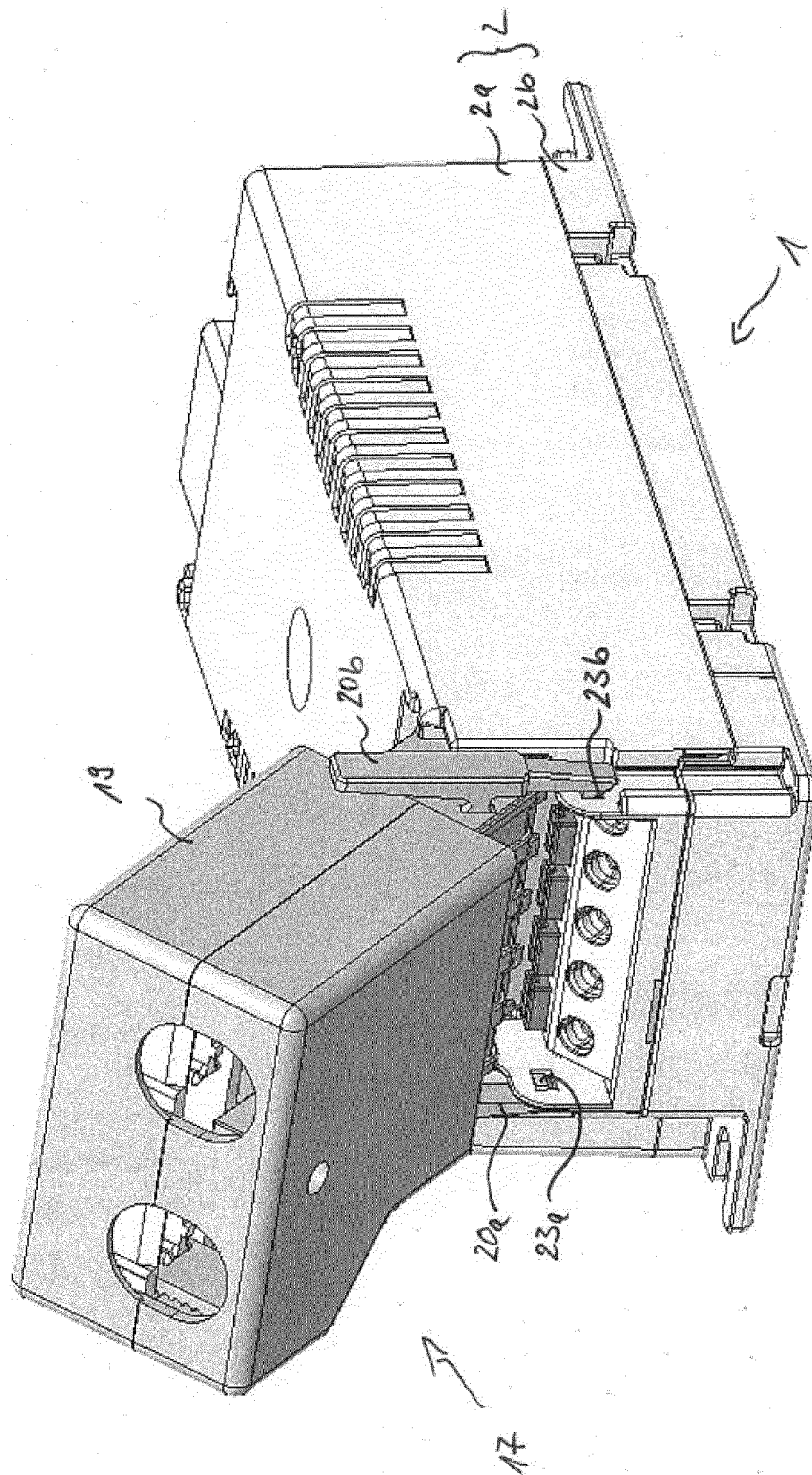


Fig. 6



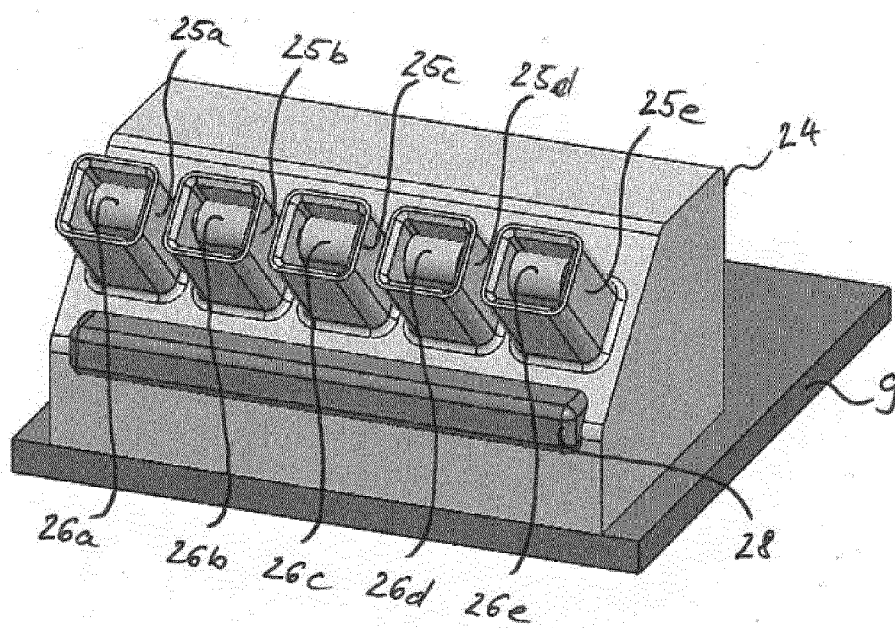


Fig. 8

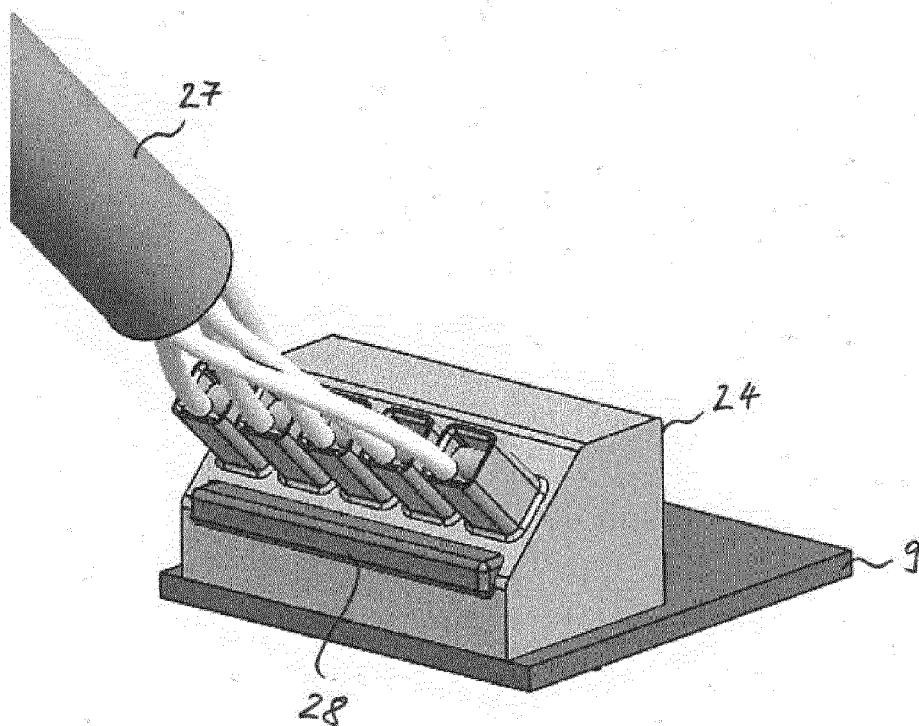


Fig. 9

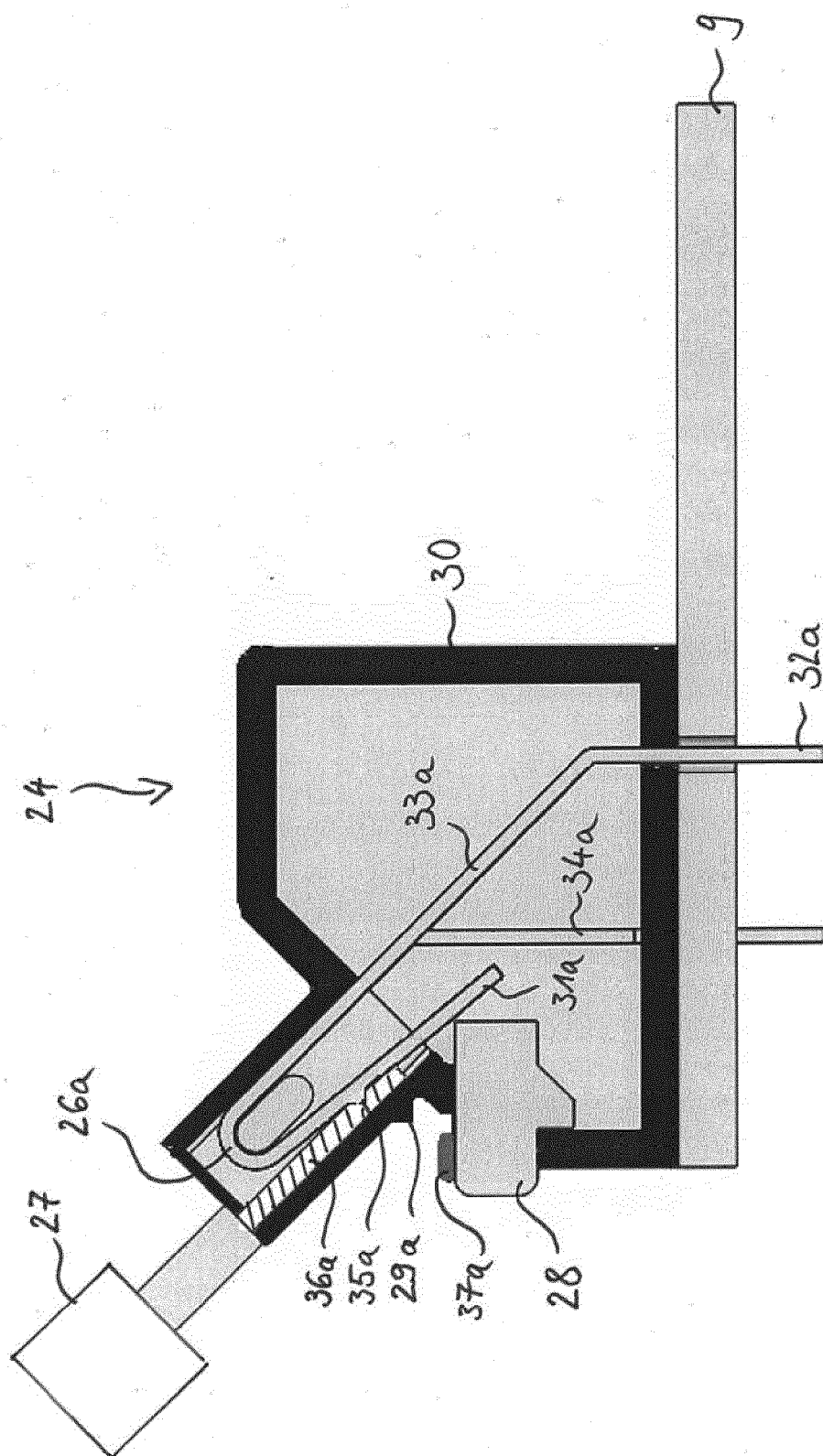


Fig. 10

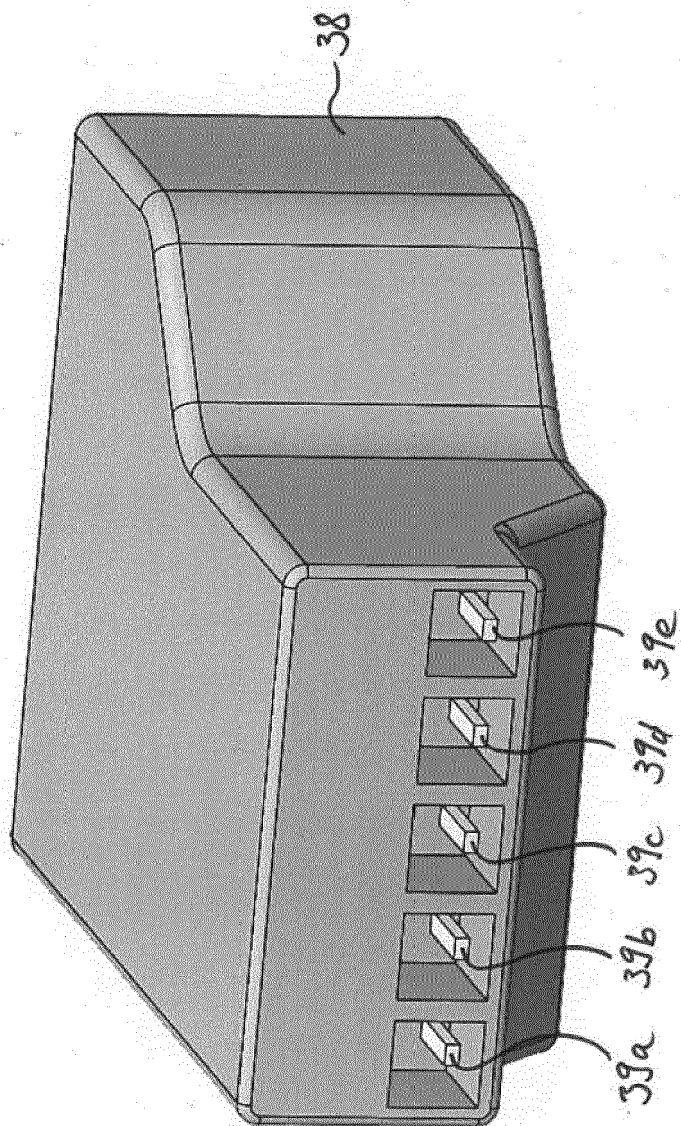


Fig. 11

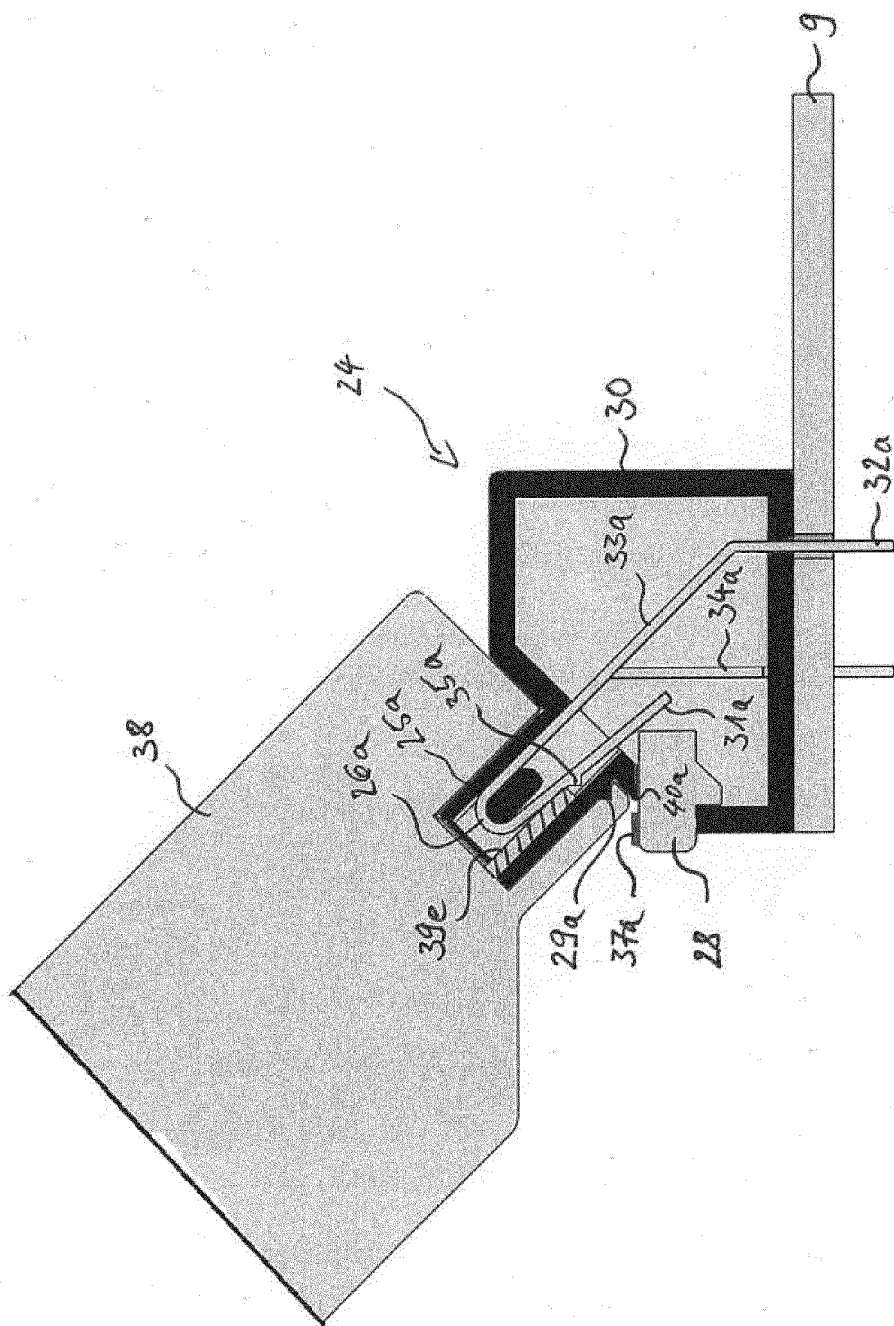


Fig. 12

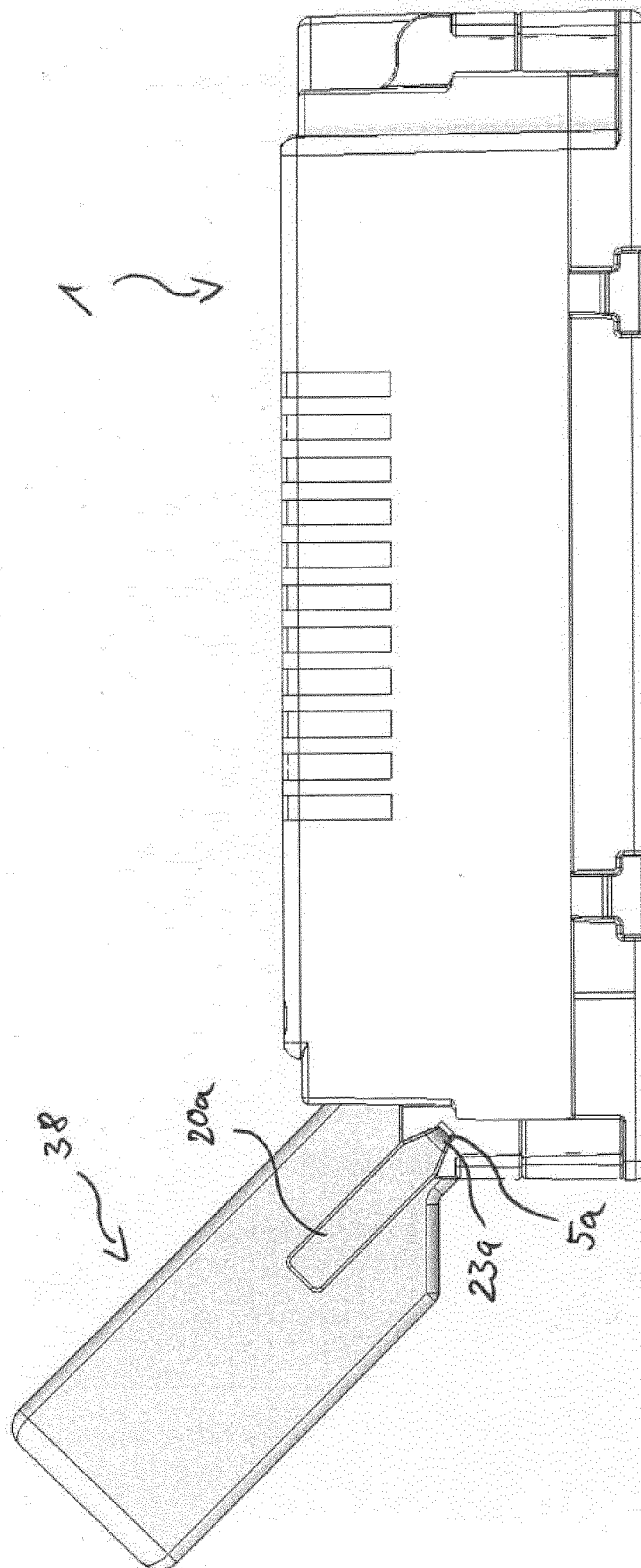


Fig. 13

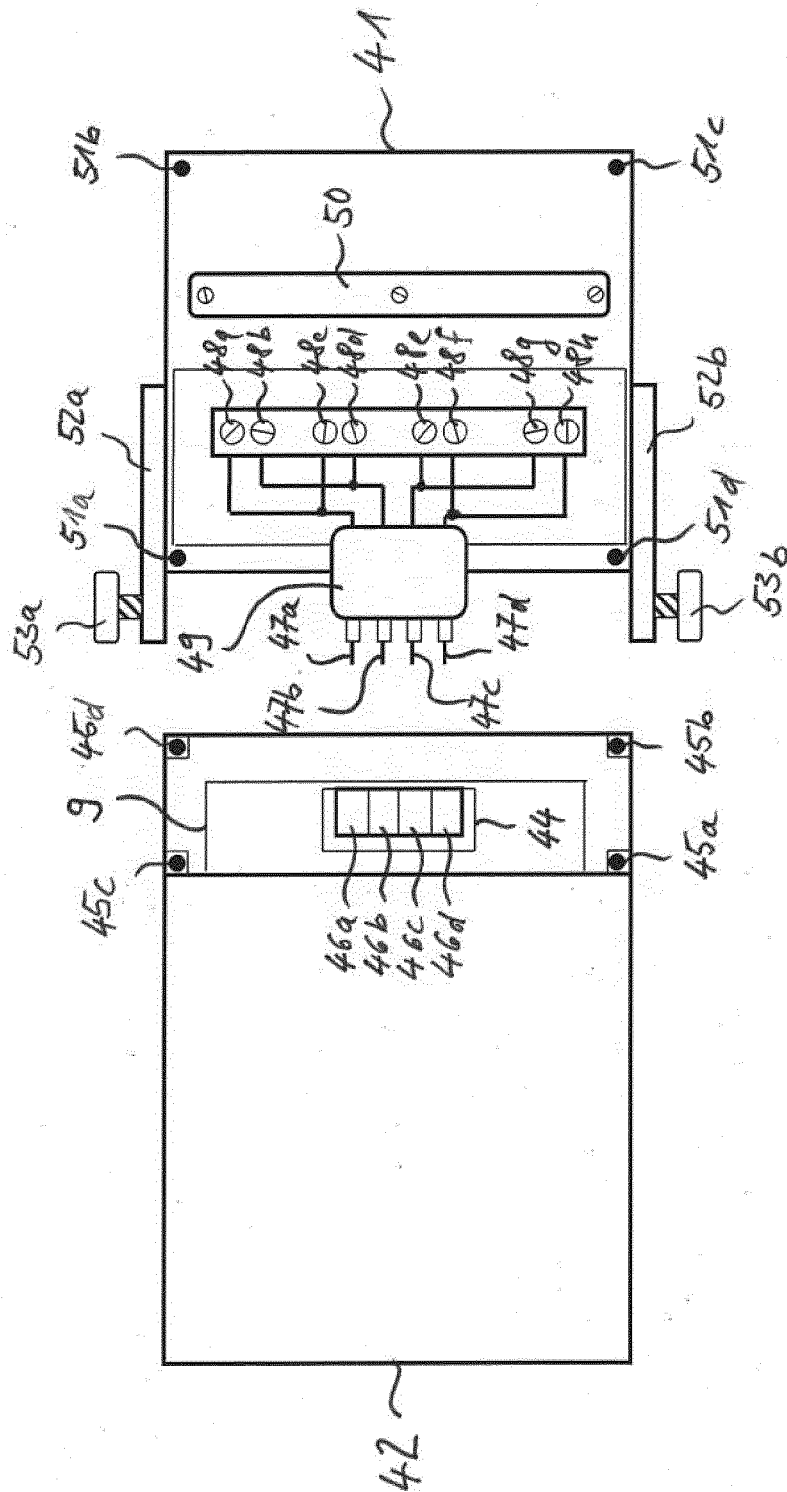


Fig. 14

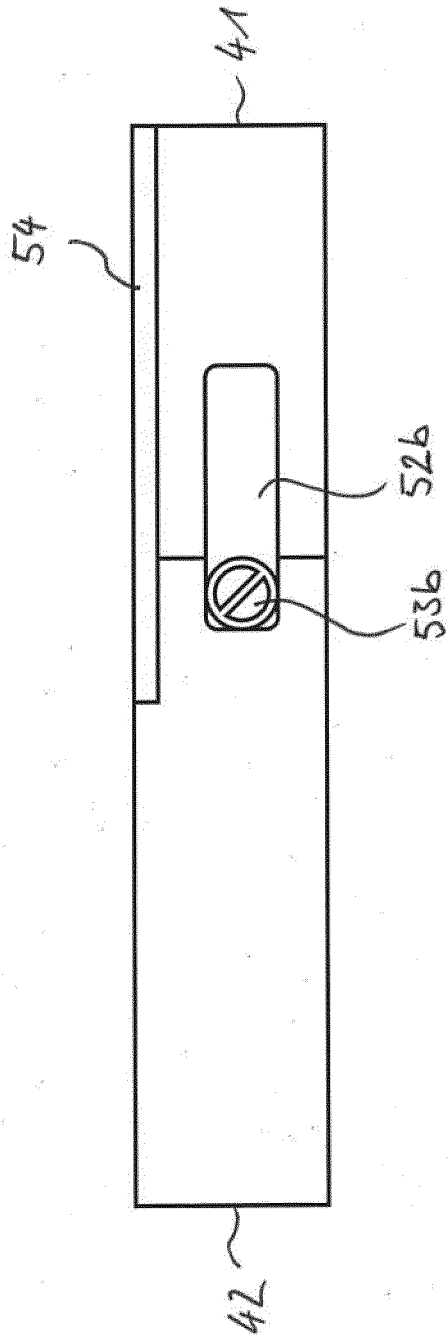


Fig. 15



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The present search report has been drawn up for all claims			
Place of search The Hague		Date of completion of the search 22 April 2021	Examiner Skaloumpakas, K
CATEGORY OF CITED DOCUMENTS X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons & : member of the same patent family, corresponding document			

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5 This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report.
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