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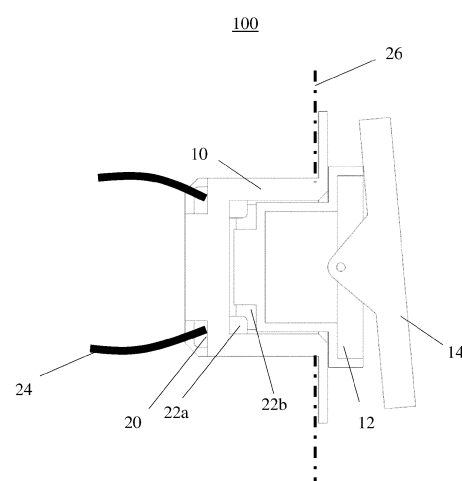
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(54) **MODULAR SWITCHING ASSEMBLY**

(57) A modular switching assembly (100) is provided. The modular switching assembly (100) comprises a socket element (10) which has a installation interface (20) for connection with an electrical network (24), and a socket interface (22a). The modular switching assembly further comprises at least one modular element (12). The at least one modular element (12) has a modular interface (22b). The modular interface is a counter-part to the socket interface of the socket element. The modular element is replaceably coupled to the socket element by the first and modular interfaces (22a, 22b). The first and modular interface (22a, 22b) form a mechanical latching connection when the modular element is coupled to the socket element.

Fig. 2



## Description

### TECHNICAL FIELD

**[0001]** The disclosure generally relates to a modular switching assembly.

### BACKGROUND

**[0002]** Electric equipment, such as an outlet, switch, or operating element, provides an interface to an electrical network of a house. According to the conventional technology, such electric equipment is self-contained and independent. Each electric equipment has a fixed function. For instance, an electric equipment for light switches is distinct from an electric equipment for intermediate switching.

**[0003]** With the line or current conductor of the electrical network permanently connected to the electrical equipment, a trained specialist is necessary in case the electric equipment or its function needs to be installed, updated or changed. Also, the entire electric equipment needs to be replaced. Thus, updating or replacing electric equipment comes with expenditures regarding human and material resources.

### SUMMARY OF THE DISCLOSURE

**[0004]** According to an aspect, a modular switching assembly is provided. The modular switching assembly comprises a socket element which has an installation interface for connection with an electrical network and a socket interface. The modular switching assembly further comprises at least one modular element. The at least one modular element has a modular interface. The modular interface is a counter-part to the socket interface of the socket element. The modular element is replaceably coupled to the socket element by the socket interface and the modular interface. The socket interface and the modular interface form a mechanical latching connection when the modular element is coupled to the socket element.

**[0005]** Mechanical latching connection, as used herein, refers to a connection which may signify application of a lever and/or force when the connection is to be resolved. Mechanical latching connection, as used herein, may refer to a connection where a user may have to press together parts of the modular element to release the modular element from the socket element. While connected to the socket element, the mechanical latching connection may keep the at least one modular element in place such that an electrical connection between the socket element and the modular element may be provided. The mechanical latching connection may enable a technical layman to safely remove and/or replace the modular element.

**[0006]** Further features are derivable from the dependent claims.

**[0007]** In embodiments, the socket interface and the modular interface may form an electrical connection when the modular element is coupled to the socket element. The electrical connection of the modular switching assembly may comprise contacts. The contacts may comprise static plug contacts and/or wiper contacts which may comprise any or any combination of copper, graphite, brass, palladium, silver, bronze and gold.

**[0008]** In embodiments, the socket interface and the modular interface may comprise at least two interface points, in particular any of in the range of 2 - 10 interface points that form the mechanical latching connection, in particular any of 2, 3, 4, 5 or 6 interface points. In embodiments, the socket interface may comprise more interface points than the modular interface. In embodiments, the socket interface may comprise a manifold of the interface points of the modular interface.

**[0009]** The installation interface of the socket element may comprise fixtures to accommodate conductors of the electrical network. The fixtures may comprise recesses. The recesses may have conducting pads to connect the line or current conductor of the electrical network to the modular switching assembly.

**[0010]** The modular switching may further comprise a second modular element. The second modular element may have a further modular interface. The further modular interface also may be a further counter-part to the socket interface of the socket element. The socket interface of the socket element may be configured to accommodate modular interfaces of more than one modular element. In embodiments, the socket interface may provide a number of interface points and/or electrical contacts corresponding to the number of modular elements. The disclosure may not be limited to a second modular element. Any workable number of modular elements is disclosed herein.

**[0011]** In embodiments, the modular element may comprise a charger, wherein the charger may be configured to provide a direct current, DC. The charger may be configured to provide a DC voltage for charging devices with low voltages in the range of 0,5 - 50 V, in particular any DC in the range of 1 - 18 V; or 1 - 15 V; or even 1 - 12 V; in particular in the range of 3 - 9 V; in particular any of 3V, 3,3 V, 5V or 7V DC. The modular element may comprise a transformer to transform the voltage of the electric network to the respective magnitude DC.

**[0012]** The modular element may comprise a switch, in particular any of a pushbutton switch, a rocker switch, a wipe switch, a slider switch, a rotate switch, a gesture switch, a key switch, a dimmer switch, or a light sensor switch.

**[0013]** In embodiments, the modular element may comprise a device. In particular, the device may comprise any or any combination of a sensor, in particular a motion sensor, air quality sensor, luminosity sensor, temperature sensor or humidity sensor; a control device, in particular a temperature controller, or a manual control point; a light insert in particular an ambient illumination insert, a light-

emitting diode, LED, or LED light guide; a display; a digital camera; a digital radio; a humidifier; a room scent apparatus; a receiver; a sender; a communication or peering means, in particular a Programmable Logic Controller, PLC or Ethernet hub; plug-in terminals for loud speaker; or a measuring device such as an electricity meter.

**[0014]** In embodiments, the modular element comprises any of a power outlet or a combination of power outlet and charger.

**[0015]** The modular switching assembly may connect a neutral conductor of the electrical network to the device and/or the power outlet and/or charger. The modular switching assembly may be configured to allow connection of the neutral conductor without adaptation of the modular switching assembly.

**[0016]** The modular element may be configured to be controlled locally. The modular element may be configured to be controlled remotely. Also, a combination of controlling the modular element locally and remotely may be possible. In embodiments, certain default setting may be controlled remotely, while a user may adapt such default setting locally to his/her preferences.

**[0017]** The electrical network of a household may provide electrical energy to loads. It may also comprise signal communication devices and/or interfaces. Alternatively or in addition, it may comprise an PLC device and/or interface.

**[0018]** The socket element may be configured to be permanently fixed in a wall of a building. As the socket element may be connected to the line or current conductor of the domestic electrical network, a trained specialist may be required to install it. The socket element may be configured to comply with the protection class DIN EN 60529. The socket element may be adapted to prevent interfering objects and water from entering. It may be configured to be installed to a wall and tools may be required for its removal. The socket element may in its entirety or partly correspond to a flush-mounted insert. When installed, the socket element may fit in a mounting box.

**[0019]** In embodiments, the socket element may be configured to be permanently fixed to a fixing element or a mounting box. The mounting box may be commonly available mounting box for electric installations. The socket element may be configured to be permanently fixed to a mounting box via any of screws, claws, screw clamps, drywall screws, and/or spax screws. The mounting box may be permanently fixed to a wall of a building.

**[0020]** The socket element may have a circumferential flange. The circumferential flange may extend in a direction parallel to a wall when the modular switching assembly is fixed to it. The circumferential flange may be configured for application of a force by a user. The circumferential flange may facilitate application of a lever to the modular element for its removal from the socket element.

**[0021]** The dimensions of the outer edges of the socket element may be any of 80 mm \* 80 mm, 63 mm \* 63 mm, 50 mm \* 50 mm.

**[0022]** The dimensions of the outer edges of the modular element may be any of 80 mm \* 80 mm, 63 mm \* 63 mm, 50 mm \* 50 mm.

**[0023]** When mounted to a wall, the socket element may have a height in a range of 10 - 20 mm, in particular of any of 11 mm, 14 mm, 18 mm, in a direction perpendicular to the modular switching assembly.

**[0024]** The socket element may be configured to fit into a mounting box. The depth of the socket element may be less or equal to the depth of a mounting box. The depth of the socket element may be less than 32 mm; in particular less than 30 mm or less than 25 mm.

**[0025]** The socket element may be configured to be permanently fixed into any of a parapet channel, a device installation channel, a railing, or a parapet.

**[0026]** The socket element and the modular element may be formed of the same material. The socket element and the modular element may be formed of different materials. The socket element may be formed of plastic, thermoplastic or resin.

**[0027]** The modular element or parts thereof, such as a rocker switch, may be formed of disposable material, or biologically degradable material. The modular element or parts thereof may be formed of plastic, thermoplastic, duroplastic, resin, porcelain, pressed fiber boards, plastic, resin, glass, wood, bamboo, cardboard, copper, stainless steel, or any combination thereof. In embodiments, the modular element may comprise an outer layer of textile, plastic, paper, wallpaper, or coated paper. The modular element may be varnished. The surface of the modular element may be matt or glossy. The modular element may be adapted to hygienic and/or design requirements in terms of material, size and/or look. For instance, the material of the modular element may be germophobic and/or easily cleanable. It may be surface-tempered such that it is anti-fingerprint and/or reduces stains. In instances, the modular element may be adapted to the environment of the modular switching assembly. It may, for instance, be UV-resistant or water-resistant.

**[0028]** The socket element and/or the modular element may be produced by injection molding technology or by 3D printing technology. The socket element and/or the modular element may be formed as assemblies. The assemblies and/or the contacts may be moulded and/or lasered, for instance with Laser direct structuring (LDS).

## BRIEF DESCRIPTION OF THE DRAWINGS

**[0029]**

Fig. 1a illustrates a schematic diagram of a modular switching assembly in assembled form according to an embodiment;

Fig. 1b illustrates a cross-sectional view of a modular switching assembly in assembled form according to an embodiment;

Fig. 1c illustrates a schematic diagram of a modular switching assembly in disassembled form according to an embodiment;

Fig. 2 illustrates a cross-sectional view of a modular switching assembly from a side perspective;

Fig. 3a and 3b illustrate schematic diagrams of a modular switching assembly according to embodiments described herein;

Fig. 4a and 4b illustrate schematic diagrams of a modular switching assembly according to embodiments described herein;

Fig. 5a and 5b illustrate schematic diagrams of the socket element and different modular elements according to embodiments described herein.

## DESCRIPTION OF EMBODIMENTS

**[0030]** In the following, embodiments are set forth to describe specific examples presented herein. The person skilled in the art will recognize that one or more other examples and/ or variations of these examples may be practiced without all the specific details outlined below. Also, well known features may not be described in detail so as not to obscure the description of the examples herein. For the ease of illustration, like reference numerals are used in different figures to refer to the same elements or additional instances of the same element. Features illustrated or described as part of one embodiment can be used on or in conjugation with any other embodiment to yield yet a further embodiment.

**[0031]** Referring now to the drawings, Fig. 1a - 1c each illustrates a schematic diagram of a modular switching assembly 100 according to an embodiment. As exemplarily illustrated with Fig. 1a, the modular element 12 may be plugged-in to the socket element. The modular element 12 together with the socket element 10 may form a mechanical switch assembly. The modular element 12 may be replaced with a modular element configured to provide another function.

**[0032]** As may be seen in Fig. 1b, a cross-sectional view of the modular switching assembly 100, the modular part 12 may have a tiltable mounted rocker part 14 which a user may actuate.

**[0033]** Fig. 1c illustrates a schematic diagram of a modular switching assembly where the modular part 12 is plugged out from the socket element 10. A certain force and/or lever may have been applied to the modular part in order for its removal.

**[0034]** Fig. 2 illustrates a schematic diagram of the modular switching assembly 100 from a side perspective. The modular switching assembly 100 may be mounted to a wall 26. In particular, the socket element 10 may be permanently fixed to the wall 26. Conductors 24 may be electrically connected to the installation interfaces 20 of

the socket element 10. The part of the socket element 10 which may be positioned left of the wall level 26 may be referred to as flush-mounted insert. The socket element 10 may have an interface 22a that may meet interface 22b of the modular element 12. The interfaces 22a, 22b may form a mechanical connection to plug the modular element 12 to the socket element 10. Also, the interfaces 22a, 22b may provide an electrical connection between the modular element 12 and the socket element 10. The electrical connection may be a wiper contact.

**[0035]** The modular element 12 may comprise a rocker element 14 to be actuated by a user. The modular element 12 may be adapted to convert the mechanical actuation by the user into an electrical signal and to convey the signal through interfaces 22a, 22b to the conductors 24.

**[0036]** Now referring to Fig. 3a and 3b which present a schematic diagram of a modular switching assembly 300 according to embodiments. Fig. 3a presents the whole modular switching assembly 300, while Fig. 3b presents its cross-sectional view. Switching assembly 300 may have the socket element 10 discussed above, while a different modular element 32 may be plugged in. Modular element 32 may be a gesture switch. A gesture switch may convert a user touch into an electrical signal that is then conveyed to a load of the electrical network.

**[0037]** Fig. 4a and 4b illustrate schematic diagrams of a modular switching assembly according to embodiments described herein. Fig. 4a presents the whole modular switching assembly 400, while Fig. 4b presents its cross-sectional view. Switching assembly 400 may have the socket element 10 discussed above, while a different modular element 42 may be plugged in. Modular element 42 may be a power supply providing one more electrical interface.

**[0038]** Fig. 5a illustrates schematic diagrams of the rear view of the socket element and different modular elements according to embodiments described herein. Socket element 10 may be configured to accommodate any of the modular elements 14, 32, or 42. Modular element 14 may be a common mechanical switch, while modular element 32 may be a gesture switch, and modular element 42 may be a power supply. Any technical layman may plug one of the modular elements 14, 32, or 42 to the socket elements 10.

**[0039]** Fig. 5b illustrates schematic diagrams of the side view of the socket element 10 and different modular elements discussed with reference to Fig. 5a.

## Claims

1. A modular switching assembly (100), comprising:
  - a socket element (10) having an installation interface (20) for connection with an electrical network, and a socket interface(22a);
  - at least one modular element (12) having a

- modular interface (22b), the modular interface being a counter-part to the socket interface of the socket element;  
 wherein the modular element is replaceably coupled to the socket element by the modular interface;  
 wherein the socket interface and the modular interface form a mechanical latching connection when the modular element is coupled to the socket element.
2. The modular switching assembly according to claim 1, wherein the socket interface and the modular interface form an electrical connection when the modular element is coupled to the socket element.
3. The modular switching assembly of the preceding claim, wherein the electrical connection comprises contacts.
4. The modular switching assembly of any of the preceding claims, wherein the socket interface and the modular interface comprises at least two interface points.
5. The modular switching assembly of any of the preceding claims, wherein the installation interface comprises fixtures to accommodate conductors of the electrical network.
6. The modular switching assembly of any of the preceding claims, comprising a second modular element having a further modular interface, the further modular interface being a counter-part to the socket interface of the socket element.
7. The modular switching assembly of any of the preceding claims, wherein the modular element comprises a charger, wherein the charger is configured to provide a DC voltage in the range of 0,5 - 50 V, in particular any of 3 V, 3.3 V, or 5V DC.
8. The modular switching assembly of any of the preceding claims, wherein the modular element comprises a switch, in particular any of a pushbutton switch, a rocker switch, a wipe switch, a slider switch, a rotate switch, a gesture switch, a key switch, a dimmer switch, a light sensor switch.
9. The modular switching assembly of any of the preceding claims, wherein the modular element comprises a device, in particular any or any combination of
- a sensor;
  - a control device;
  - a light insert;
  - a display;
- a digital camera;
  - a digital radio;
  - a humidifier;
  - a room scent apparatus;
  - a receiver;
  - a sender;
  - a measuring device.
10. The modular switching assembly of any of the preceding claims, wherein the modular element comprises any of
- a power outlet;
  - a combination of power outlet and charger for external devices.
11. The modular switching assembly of claim 9 or 10, wherein the switching assembly connects a neutral conductor of the electrical network to the device and/or the power outlet and/or charger.
12. The modular switching assembly of any of the preceding claims, wherein the modular element is configured to be controlled locally.
13. The modular switching assembly of any of the preceding claims, wherein the modular element is configured to be controlled remotely.
14. The modular switching assembly of any of the preceding claims, wherein the socket element is configured to be permanently fixed to any of a mounting box, a wall, a parapet channel, a device installation channel, a railing or a parapet.
15. The modular switching assembly of the preceding claim, wherein the socket element is configured to be permanently fixed to the mounting box, mounting box, a wall, a parapet channel, a device installation channel, or a railing or a parapet, via any of
- screws,
  - claws,
  - drywall screws,
  - spax screws.

Fig. 1a

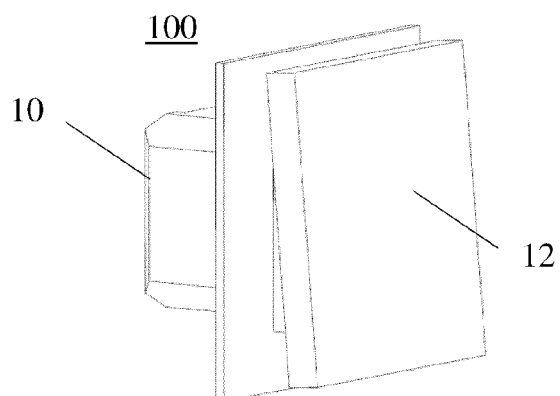


Fig. 1b

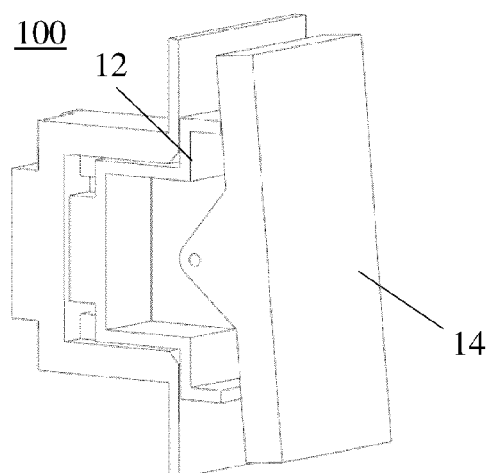


Fig. 1c

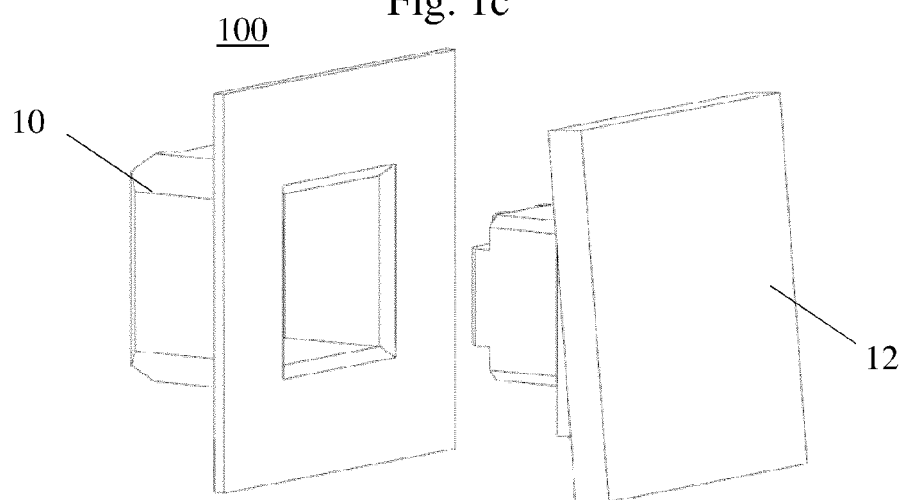


Fig. 2

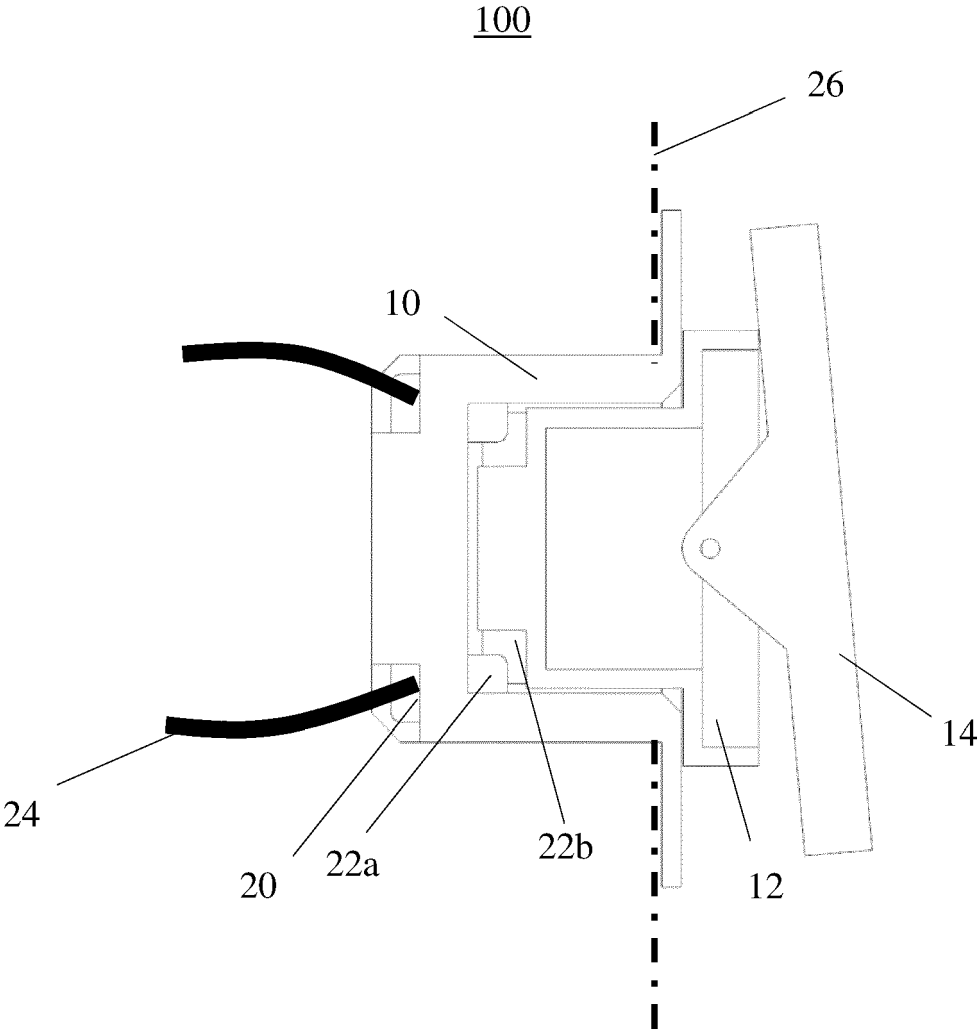


Fig. 3a

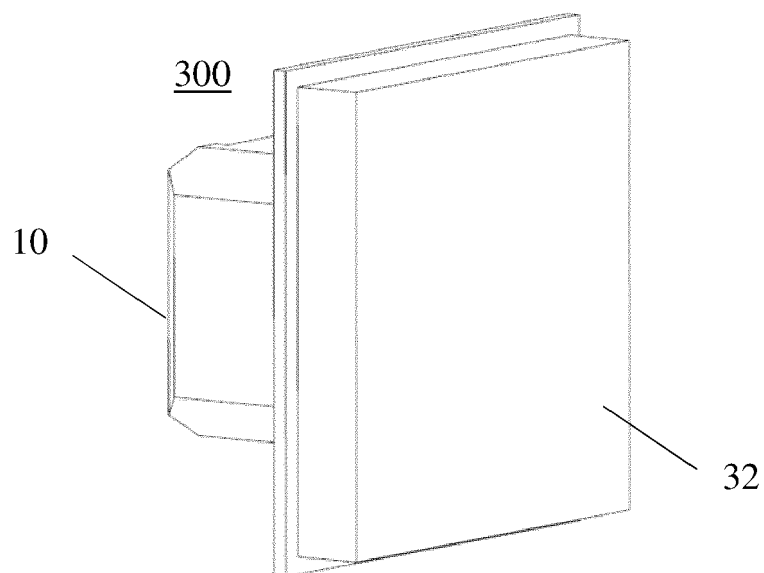


Fig. 3b

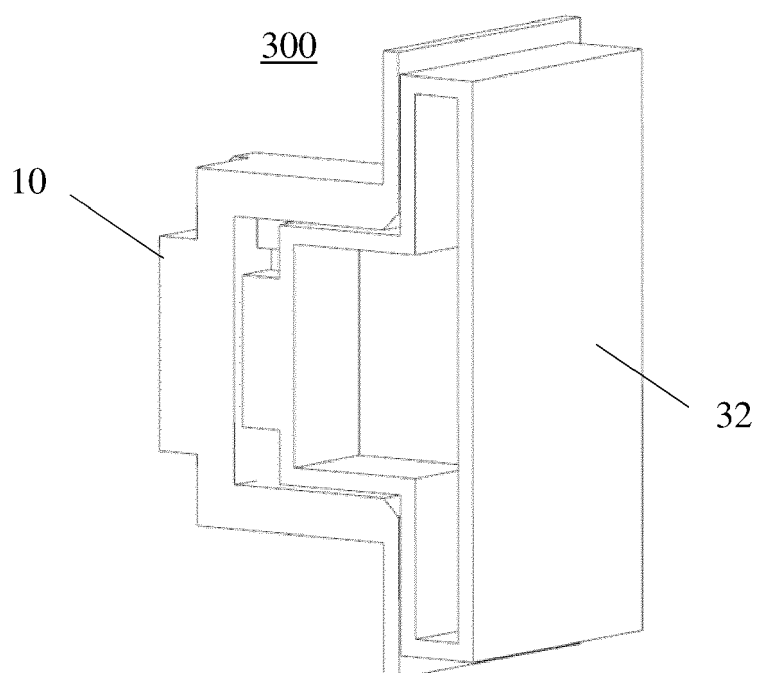




Fig. 4a

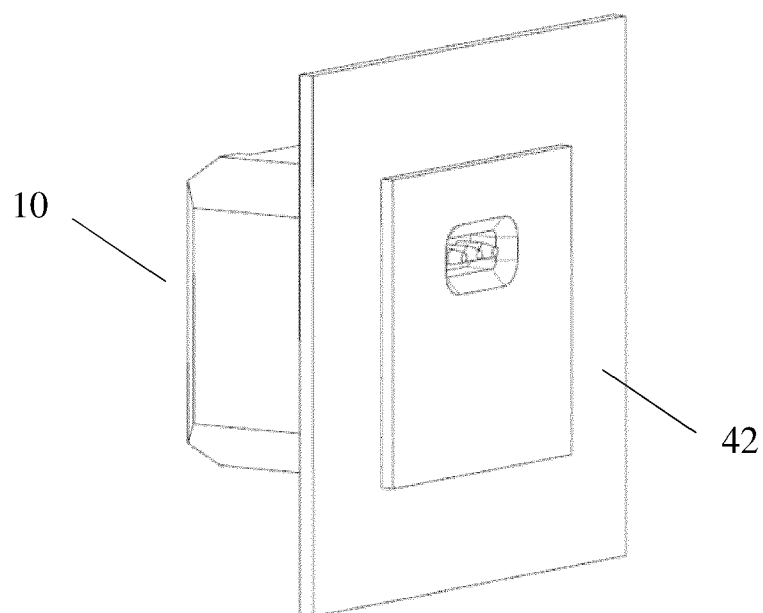


Fig. 4b

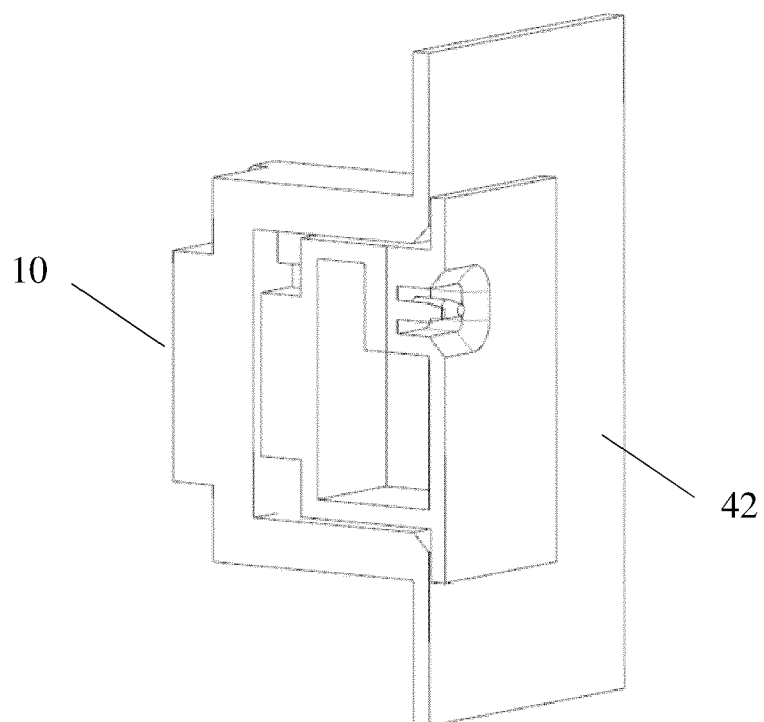


Fig. 5a

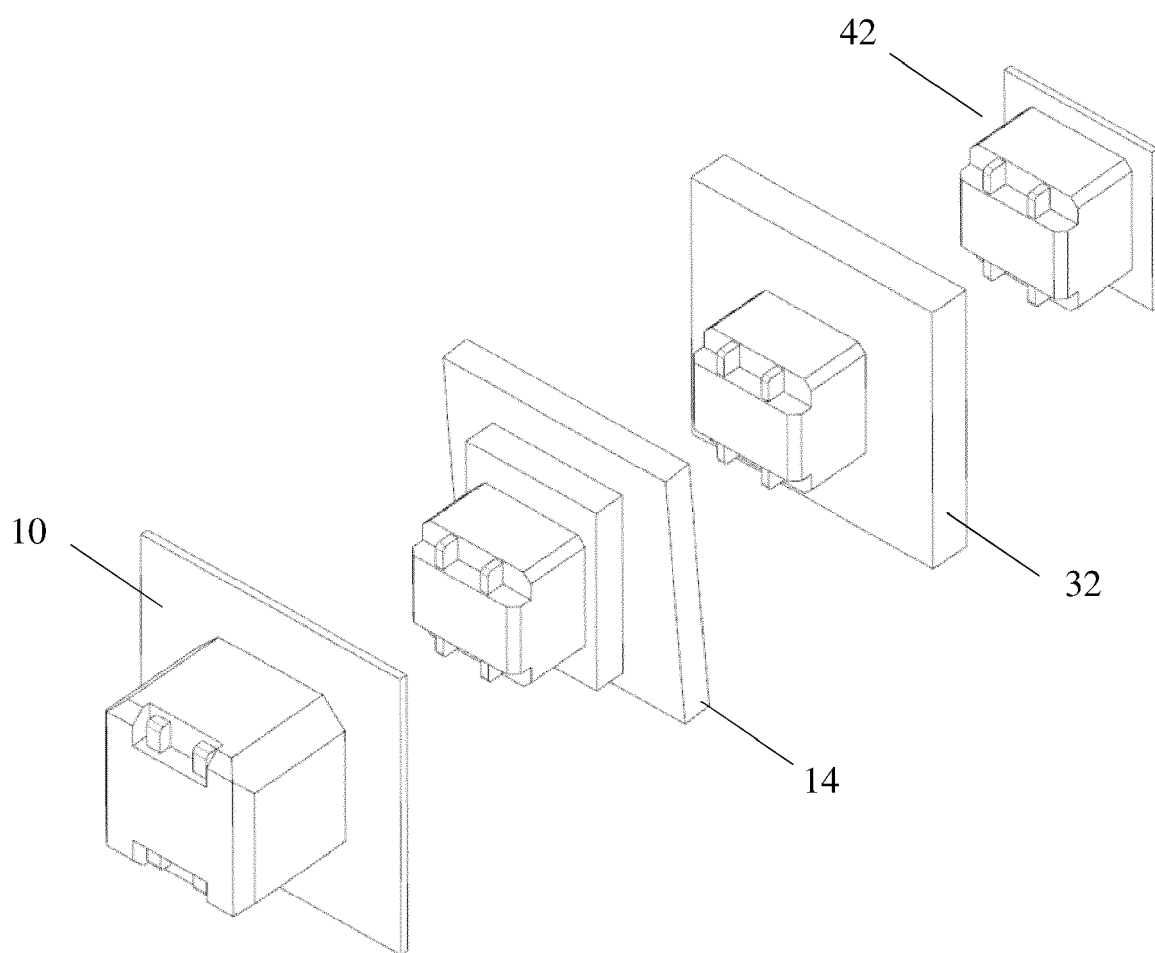
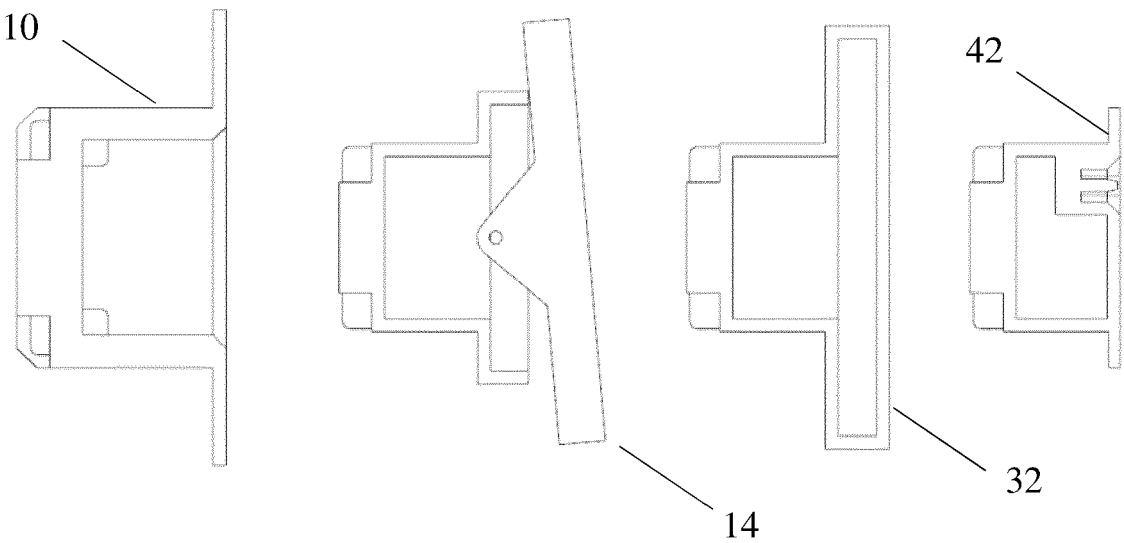


Fig. 5b





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Place of search		Date of completion of the search	Examiner
The Hague		29 January 2024	Georgiadis, Ioannis
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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This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report. The members are as contained in the European Patent Office EDP file on  
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