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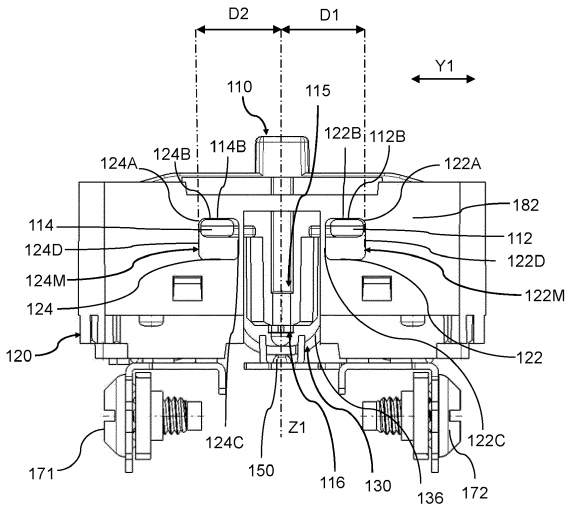
(54) A MODULAR ELECTRIC DEVICE FOR CONTROLLING AND/OR DISTRIBUTING ELECTRICITY

(57) It is described a modular electric device (100) for controlling and/or distributing electricity, adapted to be wall mounted, comprising:
- a casing (120,140) made of an electrically insulating material;
- an actuation button (110);
- coupling elements (111-114,121-124) operatively interposed between the actuation button (110) and the casing (120,140), said coupling elements (111-114,121-124) being adapted and configured to couple the actuation button (110) to the casing (120,140) so that the actuation button (110) can take a first angular resting position and a second angular position different from the first angular resting position, respectively, said coupling elements (111-114,121-124) being also adapted to define a first rotation fulcrum (121A, 122A) for said actuation button (110);
- a tilting switching member (130) accommodated in the casing (120, 140);
- a first movable contact (131) arranged on the tilting switching member (130);
- a first fixed contact (161).

The actuation button (110) comprises a control portion (115) including an elastic return device (116) for returning the actuation button (110) to said first angular resting position, said control portion (115) being adapted and configured to contact and move the tilting switching member (130) by means of the elastic return device (116) so that, when the actuation button (110) takes the first angular resting position and the second angular position, the tilting switching member (130) takes:
a first angular configuration, in which the first movable contact (131) is separated from the first fixed contact (161); and
a second angular end-of-stroke configuration, in which the first movable contact (131) is in contact with the first fixed contact (161), respectively.

When the actuation button (110) takes said first angular resting position, the first rotation fulcrum (121A, 122A) is misaligned with respect to the elastic return device (116) .



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Description

[0001] The present invention relates to the technical field of modular devices usually intended to be wall mounted, and more specifically it is directed to a modular electric device for controlling and/or distributing electricity.

[0002] Modular electric devices are known, which are usually installed on a wall, forming composite mounting structures, or groups of parts, generally including:

- a plurality of modular electric devices;
- a box intended to be flush mounted in the wall;
- a support frame fixable to the box, directly or by means of adapters, which are referred to as "mudrings", and adapted to support the plurality of modular electric devices mutually arranged side-by-side; and
- a cover plate fixable to the support frame and provided with a through opening to allow a user to access, visually or manually, the modular electric and/or electronic devices installed on the support frame.

The aforesaid part assemblies are often indicated by the term "light points".

[0003] In the light points indicated above, some types of modular devices, such as switches or diverters, for example, are provided with a manual actuation button. The actuation buttons are generally either of the axially sliding type or of the tilting type.

[0004] With reference to the modular devices provided with a tilting actuation button, by way of non-limiting example, modular switching devices are particularly known, in which such an actuation button comprises a central rotation pin by means of which the actuation button is pivoted to the respective casing, so as to allow the actuation button to tilt about a rotation axis. In particular, the actuation button is adapted to take a first central angular resting position and a second and a third angular end-of-stroke position which are opposite to each other. The actuation button comprises a control portion including a return spring, in particular a piston spring, which is adapted to return the actuation button to the first angular resting position when the pressure on the actuation button is released. Considering a view of the modular switching device on a plane orthogonal to the rotation axis of the actuation button, the aforesaid piston spring in all angular positions taken by the actuation button is always aligned with the rotation fulcrum and therefore with the rotation pin of the actuation button.

[0005] A drawback of this type of modular switching devices, provided with a tilting actuation button of the prior art, is linked to the fact that, to allow the correct alignment of the actuation button in the first angular resting position, it is necessary to provide, in addition to the piston spring, two further alignment coil springs which are arranged at two opposite end portions of the actuation button so as to react on the casing and on the actuation button itself. The fact of having to provide the aforesaid alignment springs, in addition to complicating the assembly of the modular device, has the drawback of requiring a greater force to actuate the actuation button with respect to that which would be required if only the piston spring were provided.

[0006] It is a general object of the present invention to provide a modular electric device for controlling and/or distributing electricity of an alternative type with respect to the solutions described above with reference to the prior art.

[0007] Additionally or alternatively to the aforesaid object, it is an object of the present invention to provide a modular electric device for controlling and/or distributing electricity which is capable of overcoming or at least partially reducing the drawbacks of the modular devices provided with a tilting actuation button described above with reference to the prior art.

[0008] Additionally or alternatively to the aforesaid objects, it is an object of the present invention to provide a modular electric device for controlling and/or distributing electricity which allows obtaining an optimal alignment of the actuation button in the angular resting position.

[0009] Additionally or alternatively to the aforesaid objects, it is an object of the present invention to provide a modular electric device for controlling and/or distributing electricity which requires less actuation force to actuate the actuation button as compared to the solutions with a tilting actuation button described above with reference to the prior art.

[0010] These and other objects are achieved by a modular electric device for controlling and/or distributing electricity as defined in the appended claim 1 in the more general form thereof, and in the dependent claims in some particular embodiments.

[0011] It is a further aspect of the present invention to provide a part assembly as defined in claim 15.

[0012] The invention will become more apparent from the following detailed description of the embodiments thereof, given by way of non-limiting examples, with reference to the accompanying drawings, in which:

- Figure 1 shows a partially exploded perspective view of a part assembly comprising a modular electric device for controlling and/or distributing electricity according to a currently preferred embodiment, a support frame for such a modular electric device and a cover plate;
- Figure 2 shows an exploded perspective view of the modular electric device in Figure 1;
- Figures 3, 4, 5 show side plane views of the modular electric device in Figure 1 in which a part of the casing has been removed and where such a device is shown in a first, second and third configuration, respectively;
- Figure 6 shows a side plane view similar to Figure 3, where the modular electric device is shown in the

first configuration in Figure 3 and is seen from the opposite side with respect to that in Figure 3; moreover, in Figure 6, a part of a component of the modular electric device has been removed, so as to show inner elements of the device itself;

- Figure 7 shows a side plane view of the modular electric device in Figure 1, a face of such a device being shown in Figure 7, which is orthogonal to the faces of such a device shown in Figure 3 and in Figure 6;
- Figure 8 shows a front plane view of an actuation button of the modular electric device in Figure 1;
- Figure 9 shows a rear perspective view of the actuation button in Figure 8 in which an element has been removed;
- Figure 10 shows a perspective view of a part of the casing, in particular of an inner support frame, of the modular electric device in Figure 1;
- Figure 11 shows a perspective view of a further part of the casing, in particular of an outer casing, of the modular electric device in Figure 1;
- Figure 12 shows a plane sectional view of the part assembly in Figure 1 shown assembled and in a first configuration, where, in particular, the modular electric device is shown in the first configuration in Figure 3;
- Figure 13 shows a plane sectional view of the part assembly in Figure 1 assembled and shown in a second configuration, where, in particular, the support frame has not been shown and where the modular electric device is shown in the second configuration in Figure 4;
- Figure 14 shows a plane sectional view of the part assembly in Figure 1 assembled and shown in a third configuration, where, in particular, the support frame has not been shown and the modular electric device is shown in the third configuration in Figure 5.

[0013] In the accompanying Figures, the same or similar elements will be generally indicated by means of the same reference numerals. However, in some cases, for greater clarity of description, identical or similar elements in the accompanying Figures can also be indicated by different reference numerals.

[0014] With initial reference to Figure 1, a part assembly 1 is shown for the wall mounting of modular electric devices for an electrical installation, preferably for a residential electrical installation, such as a domestic electrical system, for example. In the present description, the aforesaid part assembly 1 can also be indicated by the term light point 1.

[0015] For the purposes of the present description, the term "modular electric device" generally means any means or electric or electronic device generally belonging to electrical and/or home automation installations in residential buildings and the like, and usually intended to be mounted to, e.g., built into, walls of such buildings preferably alongside other modular electric or electronic devices.

[0016] This definition thus includes, but is not limited to, switches, mains sockets, sockets for data networks, TV sockets, telephone sockets, buttons, switches, deviators, electrical regulation devices in general, connectors, thermostats, timers, fuse blocks, bells/buzzers, emergency lamps, for example removable ones, signaling lamps, for example step markers, displays, for example LCDs and the like.

[0017] The light point 1 comprises at least one modular electric device 100, a support frame 200 for modular electric devices intended to be wall mounted and a cover plate 300. In a manner known per se, in the light points indicated above, the role of the cover plate is both to ensure a minimum protection for the electrical appliances, for example from dust, and to prevent dangerous accesses (for example, by means of sharp objects) to the electrically conductive parts of the electrical appliances. It is a further role of the cover plate also to act as a screen to prevent electric arcs, flames, incandescent wires from escaping to the outside, so as to prevent fires being started.

[0018] It is another important task of the cover plate to mask imperfections produced, for example, by the presence of a cavity in the wall and by the presence of the box and of the support frame which, rather than having an aesthetic value, have a functional value which is difficult to match with aesthetic requirements or standards.

[0019] Again with reference to Figure 1, in accordance with an embodiment, the support frame 200 comprises a plurality of fixing through openings 201, for example a pair of fixing through openings 201, and it is fixable to a wall or to an electrical box flush-mountable to a wall (known per se and not shown in the Figures) by means of a respective plurality of fixing screws, for example two fixing screws, insertable into the fixing through openings 201. In accordance with an embodiment, the support frame 200 has a frame-shaped base body preferably comprising four frame sides parallel and opposing in twos, preferably made of an electrically insulating material, e.g., plastic. Two of the aforesaid opposite frame sides are provided with interlocking and snap-engaging fixing elements 202, 203 to allow fixing at least one modular electric device 100, which is preferably provided with interlocking and snap-engaging fixing elements 142, 143 conjugated to the interlocking and snap-engaging fixing elements 202, 203.

[0020] The support frame 200 comprises an assembly window 204 in which the modular device 100 can be fixed, preferably together with one or more further modular electric devices mutually arranged side-by-side. In accordance with an embodiment, the modular electric device 100 is fixable to the support frame 200 by means of the aforesaid conjugated interlocking and snap-engaging fixing elements 142, 143.

[0021] Again with reference to Figure 1, the cover plate 300 is adapted and configured to be fixed, preferably in a removable manner, to the support frame 200. In par-

ticular, in accordance with an embodiment, the support frame 200 comprises a plurality of fixing seats 205 or fixing channels 205, preferably defined in the frame-shaped base body, to allow fixing the cover plate 300 to the support frame 200. Preferably, the fixing seats or channels 205 are four.

[0022] According to an embodiment, the cover plate 300 comprises a frame-shaped base body 310 which extends about a through opening 304. The cover plate 300 preferably comprises a plurality of fixing teeth 311, in the example four fixing teeth 311 (only one of which can be seen in Figure 1), which project from the base body 310 towards the support frame 200. Each fixing tooth 311 is adapted to engage in a respective fixing seat or channel 205. The base body 310 preferably comprises two mounting crosspieces 312 mutually arranged on opposite sides with respect to the through opening 304, two connection uprights 313 mutually arranged on opposite sides with respect to the through opening 304 and adapted to connect, or connecting, the two mounting crosspieces 312 to each other. The base body 310 is, for example, made of plastic material, for example for molding. Preferably, the base body 310 is formed in one piece. The connection uprights 313 of the base body 310 can also be more than two, for example by providing one or more intermediate connection uprights, for example a central connection upright, between the two connection uprights 313 shown in Figure 1.

[0023] The cover plate 300 comprises one or more cover elements 320, 330 configured to cover all or part of the through opening 304 and preferably the base body 310. In accordance with an embodiment, the cover elements 320, 330 comprise at least a first cover element 320 and, more preferably, a plurality of first cover elements 320 mutually arranged side-by-side. Preferably, the first cover elements are mutually arranged side-by-side between the connection uprights 313 to cover all or part of the through opening 304. Preferably, the first cover elements 320 define an array of cover elements having a flat front face.

[0024] In the example in Figure 1, although the cover plate 300 comprises, but is not limited to, three first cover elements 320, only two of the aforesaid first cover elements 320 are shown, one of which is shown upside down with respect to the other first cover element 320. Preferably, each of the first cover elements 320 is associable with a respective modular electric device, even if only one modular electric device 100 is shown in Figure 1. In the example shown in Figure 1, at least one of the first cover elements 320 is, in particular, associable with the modular electric device 100. For the purposes of the present description, "associable" means that it can be placed in a functional relationship, for example to achieve a mechanical and/or electric functional interaction, or in a positional relationship , for example in an alignment relationship, with a respective modular electric device 100.

[0025] The cover plate 300 preferably comprises coupling elements 321 adapted to mechanically couple the first cover elements 320 to the mounting crosspieces 312 of the base body 310.

[0026] In accordance with an embodiment, in the cover plate 300, the first cover elements 320 advantageously overlap the mounting crosspieces 312, to cover, in addition to the through opening 304, also the mounting crosspieces 312 of the frame-shaped base body 310. Preferably, the first cover elements 320 cover the mounting crosspieces 312 in their entirety from the front.

[0027] In accordance with an embodiment, the at least a first cover element 320 performs the function of a manual control button of the modular electric device 100. Such an embodiment thus relates to a first cover element 320 which is, in particular, a cover and actuation element. In general terms, it is thus possible to consider that, in accordance with an embodiment, the modular device 100 comprises a cover and actuation element 320 which preferably performs the function of manual control button of the modular electric device 100.

[0028] In accordance with an embodiment, in a manner known per se, the at least a first cover and actuation element 320 comprises a plate-like body 340 and coupling elements 321 fixed to the plate-like body 340, adapted and configured to mechanically couple the first cover and actuation element 320 to the cover plate 300, in particular, to the base body 310 and more preferably to the mounting crosspieces 312. In accordance with an embodiment, such coupling elements 321 allow constraining the plate-like body 340 of the first cover and actuation element 320 to the cover plate 300, particularly to the base body 310 and more preferably to the mounting crosspieces 312, so that the plate-like body 340 can move with respect to the mounting crosspieces 312 preferably between two opposite end-of-stroke positions, in one of which the plate-like body 340 is relatively closer to the mounting crosspieces 312 and in the other of which the plate-like body 340 is relatively further away from the mounting crosspieces 312. For example, the aforesaid coupling elements 321 comprise snap-engaging teeth 321 which, once inserted inside the through opening 304, and which, once crossed the inner edges of the mounting crosspieces 312, going beyond a snap position, engage with such inner edges, in respective engagement seats defined in the mounting crosspieces 312, inside which the snap-engaging teeth 321 can slide but from which, in order to prevent an accidental detachment of the cover and actuation element 320 from the mounting crosspieces 312, they cannot slip unless this not done forcibly or intentionally.

[0029] With reference to Figure 1 and to Figures 12-14, in accordance with an embodiment, the at least a first cover and actuation element 320 comprises at least one pressure transmission member 350 operatively coupled to the plate-like body 340, so as to transmit to the modular electric device 100 a pressure force applied to the plate-like body 340 and thus actuate the modular electric device 100. In accordance with an embodiment, the cover

and actuation element 320 comprises, in particular, at least one rotatable pressure transmission member 350 operatively interposed between the cover and actuation element 320 and an actuation button 110 of the modular device 100. Such a rotatable pressure transmission member 350 allows transmitting a pressure force, applied to the cover and actuation element, 320 to the actuation button 110. In accordance with an embodiment, the pressure transmission member 350 is coupled in a rotatable manner to the plate-like body 340 preferably by means of two pins which protrude from the plate-like body 340 to engage in respective engagement seats of the pressure transmission member 350, the pins and the respective engagement seats being not shown in the Figures.

[0030] In an embodiment, the aforesaid pressure transmission member 350 comprises at least one stroke multiplier lever 351, preferably two stroke multiplier levers 351. In the example in Figure 1, the at least a first cover and actuation element 320 comprises two pressure transmission members 350 and preferably each pressure transmission member 350 comprises two stroke multiplier levers 351 parallel and joined together by a connection bar so as to be integral with each other in the movement. For example, the pin engagement seats are defined in the stroke multiplier levers 351.

[0031] In accordance with an embodiment, in a manner known per se, the at least one cover and actuation element 320 comprises a rotation fulcrum associated with each stroke multiplier lever. In accordance with an embodiment, each stroke multiplier lever 351 has two opposite end portions 352, 353 of which one end portion 352 reacts on the cover plate, preferably on the base body 310 and, more preferably, on an assembly crosspiece 312, and the other end portion 353 reacts on the actuation button 110 of the modular electric device 100, as shown in Figures 12-14. Note that, by virtue of the at least one stroke multiplier lever 351 it is possible to limit the stroke of an end portion 370 (Figure 13) of the cover and actuation element 320 required to move the actuation button 110 along the useful stroke thereof. In fact, although the actuation button 110 is decentralized with respect to the end portion 370, a reduced movement of the end portion 370 is required with respect to a situation in which the stroke multiplier lever 351 is not provided. Since, in the example shown, the system is symmetrical, the same considerations apply in the case where the pressure force is applied to an end portion of the first cover and actuation element 320 opposite to the end portion 370.

[0032] In accordance with an embodiment, the at least a first cover and actuation element 320 is coupled to the base body 310 of the cover plate 300 and, in particular, to the mounting crosspieces 312 so as to at least rotate with respect to the base body 310 and, more preferably, so as to both translate and rotate with respect to the base body 310. In the example in Figure 1 and Figures 12-14, the coupling elements 321 and the pressure transmission member 350 form a coupling system which allows translating and rotating each first cover and actuation element 320 with respect to the base body 310.

[0033] In accordance with an embodiment, the cover plate 300 further comprises a plurality of second cover elements 330 comprising a second cover element 330 fixed to one of the connection uprights 313 and a further second cover element 330 fixed to the other connection upright 313, each of the second cover elements 330 being such as to cover a respective connection upright 313.

[0034] In accordance with an embodiment, the first cover elements 320 are interposed between the second cover elements 330. Preferably, the plurality of first cover elements 320, together with the plurality of second cover elements 330, defines an array of cover elements having a flat front face of the cover plate 300. In accordance with an embodiment, the second cover elements 330 are fixed onto the respective connection uprights 313 by means of fixing elements, which, in an advantageous and non-limiting embodiment, are interlocking and snap-engaging fixing elements.

[0035] Note that in accordance with an embodiment, the support frame 200 and/or the cover plate 300 are equal to those described in the patent application published under number WO/2019/021083 in the name of the applicant. For this reason, the support frame 200 and the cover plate 300 will not be described in greater detail.

[0036] Again with reference to Figure 1, the modular electric device 100 is a modular electric device for controlling and/or distributing electricity. In a manner known per se, the modular device 100 is adapted to be operatively connected to an electrical system of a building. The modular electric device 100 is adapted to be wall mounted, preferably by means of the support frame 200. In accordance with a preferred embodiment, the modular device 100 is, in particular, a modular electric control device. In accordance with an embodiment, the modular device 100 is, more in particular, a commutator switch. In accordance with an embodiment, the modular electric device 100 is an electric control device for a roller shutter or an automatic curtain. In other words, in accordance with an embodiment, the modular device 100 is configured to produce electric control signals so as to raise or lower roller shutters or automatic curtains associated with doors or windows of buildings, such as residential or commercial buildings, for example.

[0037] With reference to Figure 2, Figure 10 and Figure 11, the modular electric device 100 comprises a casing 140, 120 made of electrically insulating material, preferably plastic. In accordance with an embodiment, the casing 140, 120 comprises a first casing part 140, or outer casing 140. In accordance with an embodiment, the first casing part 140, or outer casing 140 comprises a tubular side wall 141 and a bottom wall 147 connected to the tubular side wall 141. The outer casing 140 further comprises an open side 148, or front opening 148, opposite to the bottom wall 147. The tubular side wall 141 and the bottom wall 147 delimit an inner compartment 146 adapted to accommodate the electromechanical components

of the modular device 100. The outer casing 140 preferably comprises the aforesaid conjugated interlocking and snap-engaging fixing elements 142, 143 which are adapted to engage with the fixing elements 202, 203 of the support frame 200. Preferably, the aforesaid conjugated interlocking and snap-engaging fixing elements 142, 143 are provided on two first opposite outer walls 144A, 144B of the tubular side wall 141 of the first part 140 of casing or outer casing 140. In accordance with an embodiment, the tubular side wall 141 further comprises two second opposite outer walls 145A, 145B which are connected and arranged transversely, and more preferably orthogonally, to the two first opposite outer walls 144A, 144B.

[0038] With reference, for example, to Figures 2-3 and Figure 7, in accordance with an embodiment, the modular device 100 comprises a plurality of electrical connection terminals 171, 172, 173, preferably electrical connection clamps 171, 172, 173. In accordance with an embodiment, the modular device 100 preferably comprises at least three electrical connection terminals 171, 172, 173, preferably three electrical connection clamps 171, 172, 173, such as three screw connection clamps 171, 172, 173, for example. In accordance with an embodiment, the electrical connection clamps 171, 172, 173 are housed in the casing 140, 120.

[0039] With reference to Figures 2-6, the modular device 100 comprises the aforesaid actuation button 110, which is preferably made of electrically insulating material, for example plastic. Furthermore, with reference to Figure 8 and Figure 10, the modular electric device 100 comprises coupling elements 111-114, 121-124 operatively interposed between the actuation button 110 and the casing 120, 140. The coupling elements 111-114, 121-124 are adapted and configured to couple the actuation button 110 to the casing 120, 140 so that the actuation button 110 can take a first angular resting position (Figure 3, Figure 6, Figure 12) and a second angular position (Figure 4, Figure 13) different from the first angular resting position, respectively. In practicing the invention, the first angular resting position corresponds to an angular position of the actuation button 110 in which the modular device 100 cannot transmit electric control signals, neither through the first movable contact 131 and the first fixed contact 161, which will be described below, nor, if provided, through the second movable contact 132 and the second fixed contact 162, which will be described below. In accordance with an embodiment, the first angular resting position is, in particular, the only angular resting position of the actuation button 110. In accordance with an embodiment, the second angular position of the actuation button 110 is an angular end-of-stroke position. In accordance with an embodiment, the second angular position of the actuation button 110 is, in particular, an unstable position, meaning that, when the actuation button 110 is pressed and takes the second angular position, by releasing the pressure on the actuation button 110, the latter returns to the first angular resting position. This is made possible by the elastic reaction exerted by an elastic return device 116 provided in the modular device 100 which will be described in greater detail below.

[0040] With reference to Figure 3 and Figure 6, the coupling elements 111-114, 121-124 are also adapted to define a first rotation fulcrum 121A, 122A for the actuation button 110. For the purposes of the present description, the term "fulcrum" generally means at least one portion of support on which an element suitable for rotation is adapted to rest, such as the actuation button 110, for example, so as to allow the rotation of the element itself.

[0041] With reference to Figure 2 and Figures 12-14, the modular device 100 comprises a tilting switching member 130 having a first end portion 133 and a second end portion 134 opposite the first end portion 133. Preferably, the tilting switching member 130 comprises a concave central portion 136 connected to the first and second end portions 133, 134. In accordance with an embodiment, the tilting switching member 130 comprises a plate-like main body made of an electrically conductive material, for example brass. The tilting switching member 130 is, for example, made of sheared and folded sheet metal.

[0042] Again with reference to Figures 12-14, the modular device 100 comprises the aforesaid first movable contact 131, which is arranged on the tilting switching member 130, preferably on the first end portion 133. Preferably, the first movable contact 131 is a tablet made of electrically conductive material, for example, made of silver alloy, which is fixed, for example welded, onto the tilting switching member 130. The tilting switching member 130 is thus a movable contact-holder support, in particular a revolving contact-holder support.

[0043] The modular device 100 further comprises the aforesaid first fixed contact 161. In accordance with an embodiment, the first fixed contact 161 is fixed, for example welded, to a respective electrically conductive contact-holder support 163, for example made of brass. Preferably, the contact-holder support 163 is fixed to, or integrated in, a respective connection terminal 171.

[0044] With reference to Figure 2 and to Figures 12-14, in accordance with an embodiment, the modular device 100 comprises the aforesaid second movable contact 132, which is arranged on the tilting switching member 130, preferably on the second end portion 134. Preferably, the second movable contact 132 is a tablet made of electrically conductive material, for example, made of silver alloy, which is fixed, for example welded, onto the tilting switching member 130. In accordance with an embodiment, the modular device 100 further comprises the aforesaid second fixed contact 162. In accordance with an embodiment, the second fixed contact 162 is fixed, for example welded, onto a respective electrically conductive contact-holder support 164, for example made of brass. Preferably, the contact-holder support 164 is fixed to, or integrated in, a respective connection terminal 172.

[0045] In accordance with an embodiment, the modu-

lar device 100 comprises a support fulcrum 150, preferably an electrically conductive support fulcrum 150, on which the tilting switching member 130 and, more preferably, the central portion 136 of the tilting switching member 130 rests. In accordance with an embodiment, the support fulcrum 150 is fixed to the bottom wall 147 of the outer casing 140. The support fulcrum 150 is, for example, made of folded and sheared sheet metal. Preferably, the support fulcrum 150 comprises a protruding support and contact portion 150. In accordance with an embodiment, the support fulcrum 150 is connected to a connection portion 151 which is part of an electrical connection terminal 173 of the modular device 100.

[0046] With reference to Figure 2 and Figure 10, in accordance with an embodiment, the modular device 100 comprises a second casing part 120, or inner support frame 120, inserted inside the outer casing 140, preferably in the aforesaid inner compartment 146. In accordance with an embodiment, one or more components of the device 100, such as the actuation button 110, for example, are fixed or connected to the second casing part 120, or inner support frame 120. The inner support frame 120 is, for example, snap-engaged inside the outer casing 140. Preferably the second casing part 120, or inner support frame 120, is made of an electrically insulating material, for example plastic.

[0047] With reference to Figure 10, in accordance with an embodiment, the inner support frame 120 comprises a plurality of side walls 181-184 and a bottom wall 185 connected to the side walls 181-184. In accordance with an embodiment, the plurality of side walls 181-184 comprises at least two first opposite side walls 181, 182 and, more preferably, also comprises two second opposite side walls 183, 184 which are arranged transversely, preferably orthogonally, to the two first opposite side walls 181, 182. In accordance with an embodiment, the two first opposite side walls 181, 182 are arranged parallel to the two second opposite outer walls 145A, 145B of the outer casing 140. In accordance with an embodiment, the plurality of side walls 181-184 and the bottom wall 185 delimit a housing compartment 186 for one or more electrical and/or mechanical components of the modular device 100. In accordance with an embodiment, the plurality of side walls 181-184 delimits an open side 187 or front opening 187. In accordance with an embodiment, the open side 187 allows access to the housing compartment 186.

[0048] In accordance with an embodiment, the tilting switching member 130, the first fixed contact 161 and, if provided, the second fixed contact 162, are arranged in the outer casing 140 so as to be interposed between the bottom wall 147 of the outer casing 140 and the bottom wall 185 of the inner support frame 120.

[0049] In a manner known per se, providing the inner support frame 120 has the advantage of simplifying the assembly of the modular device 100 and allowing the optimization of using the space available inside the outer casing 140. In practicing the invention, such an inner support frame 120 determines a division of the space inside the outer casing 140 and, for this reason, is also called a division frame or diaphragm. While providing the inner support frame 120 in the casing 140 is advantageous, the inner support frame 120 can be omitted in an alternative embodiment. From now on, however, reference will be made to the case in which the modular device 100, and in particular the casing 140, 120 comprises the inner support frame 120, without thereby introducing any limitation. Therefore, when it is described that some elements of the modular device 100 are provided in the inner support frame 120 or are associated with the inner support frame 120, it must be understood that such elements may be directly provided in, or associated with, the outer casing 140, in the case where the inner support frame 120 is not provided. For example, in the case where the support frame 120 is not provided, the coupling elements 111-114, 121-124 described above will be operatively interposed between the actuation button 110 and the outer casing 140.

[0050] With reference to Figure 2, Figure 6, Figure 9 and Figure 12, the actuation button 110 comprises a control portion 115 including the elastic return device 116 mentioned above. The elastic return device 116 allows returning the actuation button 110 to the first angular resting position. More in particular, the elastic return device 116, by virtue of the elastic reaction force that it exerts, allows returning the actuation button 110 to the first angular resting position starting from the second angular position or from the third angular position which will be described below. In accordance with an embodiment, the elastic return device 116 is accommodated in a suitable hollow accommodation seat 115A (Figure 9) provided in the control portion 115. Preferably, the elastic return device 116 comprises a piston spring 116, which preferably comprises a coil spring 116A coupled to a piston 116B. The control portion 115 is adapted and configured to contact and move the tilting switching member 130 by means of the elastic return device 116 so that, when the actuation button 110 takes the first angular resting position and the second angular position, the tilting switching member 130 takes:

- a first angular configuration (Figure 6, Figure 12), in which the first movable contact 131 is separated from the first fixed contact 161; and
- a second angular end-of-stroke configuration (Figure 13), in which the first movable contact 131 is in contact with the first fixed contact 161, respectively.

[0051] Note that, in the second angular configuration of the tilting switching member 130, the elastic return device 116 is adapted to generate a contact force between the first movable contact 131 and the first fixed contact 161 .

[0052] Note that, when the actuation button 110 takes the first angular resting position, the elastic return device 116 is adapted to define an elastic reaction axis Z1 (i.e.,

the axis according to which the elastic reaction force of the elastic return device 116 is directed or would be directed when the latter is elastically stressed) which is arranged orthogonally to the front opening 148 of the outer casing 140 or the front opening 187 of the inner support frame 120. In this respect, note that in the present description, when referring to the axis Z1 or to the elastic return device 116 to define the arrangement or the position of an element or of a direction or of an axis relating to the modular device 100, it will be understood that the actuation button 110 is in the first angular resting position (Figure 3, Figure 6, Figure 12) and, furthermore, that the modular device 100 is seen according to a side view of the device 100 itself, i.e., on a plane (such as the plane in Figure 6, for example) which is parallel to a rotation plane of the actuation button 110 (such as the rotation plane in Figure 12, or Figure 13, or Figure 14, for example). In other words, in the present description, when reference is made to the axis Z1 or to the elastic return device 116 to define the arrangement or the position of an element or of a direction or of an axis relating to the modular device 100, it will be understood that the actuation button 110 is in the first angular resting position and, furthermore, that the modular device 100 is seen on a plane parallel to the second opposite walls 145A, 145B of the outer casing 140 (such as the plane in Figure 3 or Figure 6, for example).

[0053] As it can be seen for example in Figure 6, advantageously, when the actuation button 110 takes said first angular resting position, the aforesaid first rotation fulcrum 121A, 122A is misaligned with respect to the elastic return device 116. In other words, when the actuation button 110 takes the first angular resting position, the first rotation fulcrum 121A, 122A is spaced laterally by a first predetermined distance D1 with respect to the elastic return device 116. Again with reference to Figure 6, in accordance with an embodiment, when the actuation button 110 takes the first angular resting position, the first rotation fulcrum 121A, 122A is spaced laterally in the direction orthogonal to the elastic reaction axis Z1 by the aforesaid first distance D1. Again in other words, the first rotation fulcrum 121A, 122A is adapted to define at least a first rotation axis X1 (Figure 10) of the actuation button 110 which is orthogonal to a rotation plane of the actuation button 110 (such as the rotation plane in Figure 12 or Figure 13 or Figure 14, for example) or to the second opposite walls 145A, 145B of the outer casing 140 and which is spaced apart from the elastic reaction axis Z1 by the aforesaid first distance D1.

[0054] With reference to Figures 3-6, in accordance with an embodiment, the coupling elements 111-114, 121-124 are adapted and configured to couple the actuation button 110 to the casing 120, 140, and, more preferably, to the inner support frame 120, so that the actuation button 110 can also take a third angular position (Figure 5, Figure 14) opposite to the second angular position. In accordance with an embodiment, the third angular position of the actuation button 110 is an angular end-of-stroke position. In accordance with an embodiment, the third angular position of the actuation button 110 is an unstable position, meaning that, when the actuation button 110 is pressed and takes the third angular position, by releasing the pressure on the actuation button 110, the latter returns to the first angular resting position. This is made possible by the elastic reaction exerted by the elastic return device 116. In accordance with an embodiment, if the actuation button 110 is adapted to take the aforesaid second and third angular positions, the first angular resting position is a central angular position with respect to the second and third angular positions.

[0055] With reference to Figure 6, in accordance with an embodiment, the coupling elements 111-114, 121-124 are also adapted to define a second rotation fulcrum 123A, 124A for the actuation button 110. Advantageously, as it can be seen in Figure 6, the second rotation fulcrum 123A, 124A is misaligned with respect to the elastic return device 116. In other words, when the actuation button 110 takes the first angular resting position, the second rotation fulcrum 123A, 124A is spaced laterally by a second predetermined distance D2 with respect to the elastic return device 116. In accordance with an embodiment, the first distance D1 and the second distance D2 are equal to each other. Again with reference to Figure 6, in accordance with an embodiment, when the actuation button 110 takes the first angular resting position, the second rotation fulcrum 123A, 124A is spaced laterally in the direction orthogonal to the aforesaid elastic reaction axis Z1 by the aforesaid second distance D2. In other words, the second rotation fulcrum 123A, 124A is adapted to define at least a second rotation axis X2 (Figure 10) of the actuation button 110 which is orthogonal to a rotation plane of the actuation button 110 (such as the rotation plane in Figure 12 or Figure 13 or Figure 14, for example) or to the second opposite walls 145A, 145B of the outer casing 140 and which is spaced apart from the elastic reaction axis Z1 by the aforesaid second distance D2. Again in other words, seeing the modular device 100 according to the aforesaid side view (for example, Figure 6) in the first angular position of the actuation button 110, the elastic return device 116 is interposed between the first rotation fulcrum 121A, 122A and the second rotation fulcrum 123A, 124A. In particular, in accordance with an embodiment, when the actuation button 110 takes the first angular resting position, viewing the modular device 100 according to the aforesaid side view, the first rotation fulcrum 121A, 122A and the second rotation fulcrum 123A, 124A are arranged symmetrically on two opposite sides with respect to the elastic return device 116 or to the aforesaid elastic reaction axis Z1.

[0056] With reference to Figures 12-14, in accordance with an embodiment, the modular device 100 comprises a second movable contact 132 arranged on the tilting switching member 130 and a second fixed contact 162. Note that the assembly consisting of the tilting switching

member 130 and the first movable contact 131 and/or the second movable contact 132 substantially is a movable contact member 130, 131, 132 of the modular device 100. In particular, the control portion 115 is adapted to move the tilting switching member 130 so that when the actuation button 110 takes the third angular position (Figure 5, Figure 14) the tilting switching member 130 takes a third angular configuration (Figure 14) in which the second movable contact 132 contacts the second fixed contact 162 and the first movable contact 131 is separated from the first fixed contact 161. Note that, in the third angular configuration of the tilting switching member 130, the elastic return device 116 is adapted to generate a contact force between the second movable contact 132 and the second fixed contact 162. Further note that, in the first angular configuration of the tilting switching member 130 (Figure 12) the second movable contact 132 is separated from the second fixed contact 162. In other words, in the first angular position of the actuation button 110, and therefore in the first angular configuration of the tilting switching member 130, the first movable contact 131 is separated from the first fixed contact 161 and the second movable contact 132 is separated from the second fixed contact 162. Therefore, when the actuation button 110 takes the first angular resting position, the modular device 100 cannot transmit electric control signals, neither through the first movable contact 131 and the first fixed contact 161, nor through the second movable contact 132 and the second fixed contact 162. In practicing the invention, in no angular position of the actuation button 110, the modular device 100 can transmit electric control signals through both the first movable contact 131 and the first fixed contact 161, and the second movable contact 132 and the second fixed contact 162, simultaneously. In this respect, the modular device 100 can be defined as an interlocked modular device.

[0057] With reference to Figure 3, Figure 6 and Figure 8, in accordance with an advantageous embodiment, the coupling elements 111-114, 121-124 comprise alignment elements 111B-114B, 121B-124B configured to allow an alignment of the actuation button 110 when the actuation button 110 takes the first angular resting position (Figure 3, Figure 6 and Figure 12). In accordance with an embodiment, the actuation button 110 comprises an actuation portion 110A which extends transversely or orthogonally to the control portion 115. In other words, the actuation portion 110A extends according to a prevailing longitudinal extension direction which is transversal, and more preferably orthogonal, the control portion 115 or to the elastic return device 116. The actuation portion 110A is configured to be pressed so as to make the actuation button 110 take the second and/or third angular position. In accordance with an embodiment, as it can be seen in Figure 3, Figure 6 and Figure 12, the alignment elements 111B-114B, 121B-124B are, in particular, configured to allow aligning the actuation portion 110A of the actuation button 110 along a plane orthogonal to the elastic reaction axis Z1 when the actuation button 110A takes the first angular resting position. In other words, the alignment elements 111B-114B, 121B-124B allow aligning the actuation button 110, and, more preferably, the actuation portion 110A, parallel to the front opening 148 of the outer casing 140 or to the front opening 187 of the inner support frame 120. Advantageously, the fact of providing coupling elements 111-114, 121-124 which define at least a first rotation fulcrum 121A, 122A of the actuation button 110 which is misaligned with respect to the elastic return device 116 and where the coupling elements 111-114, 121-124 comprise alignment elements 111B-114B, 121B-124B to allow aligning the actuation button 110 in the first angular resting position, allows avoiding the use of one or more additional alignment springs of the actuation button 110 in addition to the elastic return device 116 to align the actuation button 110 in the first angular resting position. Therefore, the assembly of the modular device 100 is thus simplified and less force is required to actuate the actuation button 100, so that the actuation of the actuation button 110 is particularly fluid and easy. Note in particular that, in accordance with an embodiment, the modular device 100 comprises a single elastic return device 116 and does not comprise any further alignment spring of the actuation button 110.

[0058] With reference to Figure 3, Figure 6, Figure 8 and Figure 10, in accordance with an embodiment, the coupling elements 111-114, 121-124 comprise first coupling elements 111-114 and second coupling elements 121-124. The second coupling elements 121-124 are adapted to couple with the first coupling elements 111-114. In accordance with an embodiment, the actuation button 110 comprises the first coupling elements 111-114 and the inner support frame 120 comprises the second coupling elements 121-124. Preferably the second coupling elements 121-124 are provided, in particular, on the aforesaid plurality of side walls 181-184 of the inner support frame 120 and, more preferably, on the first two opposite side walls 181, 182 of the inner support frame 120. As mentioned above, if the inner support frame 120 is not provided, the second coupling elements 121-124 are preferably provided in the tubular side wall 141 of the outer casing 140 and, more preferably, in the two second opposite outer walls 145A, 145B of the outer casing 140.

[0059] With reference to Figures 3-6 and Figure 8, in accordance with an embodiment, the first coupling elements 111-114 comprise at least a first coupling projection 111, 112 which protrudes from the actuation button 110, while the second coupling elements 121-124 comprise at least a first coupling opening 121, 122 through which the first coupling projection 111, 112 is adapted to move when the actuation button 110 moves between the first angular resting position and the second angular position. The at least a first coupling projection 111, 112 preferably comprises at least one tab or plate-like flap 111, 112, i.e., a flat flap 111, 112 or a flattened flap 111, 112. Advantageously, the fact of realizing the at least a

first coupling projection 111, 112 as a plate-like flap allows the rotation axis of the actuation button 110 to be brought closer to the first rotation fulcrum 121A, 122A without compromising, or even increasing, the sturdiness of the at least one coupling projection 111, 112. It is thus possible to increase the arm of the lever and thus reduce the force required to actuate the actuation button 110, thus making actuation of the button 110 itself more fluid. Furthermore, the fact of realizing the at least one coupling projection 111, 112 allows reducing the overall dimensions in the direction Z, thus allowing the at least a first coupling opening 121, 122 to be made shorter in the direction Z. The at least a first coupling opening 121, 122 is delimited by a respective first opening edge 121M, 122M which is adapted to define the aforesaid first rotation fulcrum 121A, 122A.

[0060] In accordance with an embodiment, the aforesaid at least a first coupling projection 111, 112 comprises a pair of first coupling projections 111, 112 which project from two opposite sides of the actuation button 110 and which are preferably mutually aligned in the direction of the aforesaid first rotation axis X1 (Figure 10). As shown for example in Figures 5, 6, 8, the pair of first coupling projections 111, 112 preferably comprises a pair of plate-like tabs or flaps 111, 112. In accordance with an embodiment, the first coupling projections 111, 112 are, in particular, coplanar with each other. Furthermore, the aforesaid at least a first coupling opening 121, 122 comprises a pair of first coupling openings 121, 122 by means of which the first coupling projections 111, 112 are adapted to move when the actuation button 110 moves between the first angular resting position (Figure 3) and the second angular position (Figure 4). In accordance with an embodiment, the first coupling openings 121, 122 are mutually opposite and aligned in the direction of the first rotation axis X1 (Figure 10). Each of the aforesaid first coupling openings 121, 122 is, in particular, delimited by a respective first opening edge 121M, 122M. In particular, the first opening edges 121M, 122M are adapted to define the aforesaid first rotation fulcrum 121A, 122A.

[0061] Again with reference to Figures 3-6 and Figure 8, in accordance with an embodiment, the first coupling elements 111-114 further comprise at least a second coupling projection 113, 114 which protrudes from the actuation button 110, while the second coupling elements 121-124 comprise at least a second coupling opening 123, 124 through which the aforesaid at least a second coupling projection 113, 114 is adapted to move when the actuation button 110 moves between the first angular resting position and the third angular position. The at least a second coupling projection 113, 114 preferably comprises at least one tab or plate-like flap 113, 114, i.e., a flat flap 113, 114 or a flattened flap 113, 114. The at least a second coupling opening 123, 124 is delimited by a respective second opening edge 123M, 124M which is adapted to define the aforesaid second rotation fulcrum 123A, 124A. Note that when the actuation button 110 moves from the first angular resting position to the second angular position, the at least a second coupling projection 113, 114 moves through the at least a second coupling opening 123, 124, in particular, so as to move away from the front opening 187 of the inner support frame 120 or from the front opening 148 of the outer casing 140. Conversely, when the actuation button 110 moves from the first angular resting position to the third angular position, the at least a first coupling projection 111, 112 moves through the at least a first coupling opening 121, 122, in particular, so as to move away from the front opening 187 of the inner support frame 120 or from the front opening 148 of the outer casing 140.

[0062] With reference to Figure 6, considering the actuation button 110 in the first angular resting position, and considering a side view of the modular device 100, i.e., a view on a plane parallel to a rotation plane of the actuation button 110 or on a plane parallel to the two opposite second walls 145A, 145B of the outer casing 140, in accordance with an embodiment, the elastic return device 116 is interposed between the at least a first coupling projection 111, 112 and the at least a second coupling projection 113, 114.

[0063] In accordance with an embodiment, the at least a second coupling projection 113, 114 comprises a pair of second coupling projections 113, 114 which project from two opposite sides of the actuation button 110 and which are preferably mutually aligned in the direction of the aforesaid first rotation axis X1 (Figure 10). As shown for example in Figures 5, 6, 8, the pair of second coupling projections 113, 114 preferably comprises a pair of plate-like tabs or flaps 113, 114. In accordance with an embodiment, the second coupling projections 113, 114 are, in particular, coplanar to each other and are preferably also coplanar to the first coupling projections 111, 112. Furthermore, the at least a second coupling opening 123, 124 comprises a pair of second coupling openings 123, 124 by means of which said second coupling projections 113, 114 are adapted to move when the actuation button 110 moves between the first angular resting position (Figure 3, Figure 6, Figure 12) and the third angular position (Figure 5, Figure 14). In accordance with an embodiment, the first coupling openings 121, 122 are mutually opposite and aligned in the direction of the first rotation axis X1 (Figure 10) . Each of the second coupling openings 123, 124 is delimited by a respective second opening edge 123M, 124M. The second opening edges 123M, 124M are adapted to define said second rotation fulcrum 123A, 124A.

[0064] In accordance with an embodiment, each first coupling projection 111, 112 is aligned with a respective second coupling projection 113, 114 in a direction Y1 (Figures 3-6) which is orthogonal to the elastic reaction axis Z1 and parallel to a rotation plane of the actuation button 110 or to the second opposite outer walls 145A, 145B of the outer casing 140. In other words, the direction Y1 is a direction orthogonal both to the first rotation axis X1 and to the elastic reaction axis Z1. Furthermore, according to an embodiment, each first coupling opening

121, 122 is aligned with a respective second coupling opening 123, 124 in the aforesaid direction Y1.

[0065] With reference to Figure 3 and Figure 6, in accordance with an embodiment, the first opening edges 121M, 122M have a polygonal shape having at least one rounded corner 121A, 122A and the first rotation fulcrum 121A, 122A is defined by a pair of rounded corners 121A, 122A of the first opening edges 121M, 122M. Preferably, each first coupling projection 111, 112 comprises a respective rounded portion adapted to engage a respective rounded corner 121A, 122A. Advantageously, the fact of providing the rounded corners 121A, 122A allows facilitating the rotation of the actuation button 110 and making it easier and more fluid. In accordance with an embodiment, the first opening edges 121M, 122M have, in particular, a quadrangular shape with one or more rounded corners, preferably a square or rectangular shape having, preferably, four rounded corners. Similarly, in accordance with an embodiment, the second opening edges 123M, 124M have a polygonal shape having at least one rounded corner 123A, 124A and the second rotation fulcrum 123A, 124A is defined by a pair of rounded corners 123A, 124A of the second opening edges 123M, 124M. Preferably, each second coupling projection 113, 114 comprises a respective rounded portion adapted to engage a respective rounded corner 123A, 124A. Advantageously, the fact of providing the rounded corners 123A, 124A allows facilitating the rotation of the actuation button 110 and making it easier and more fluid. In accordance with an embodiment, the first opening edges 121M, 122M have, in particular, a quadrangular shape with one or more rounded corners, preferably a square or rectangular shape having, preferably, four rounded corners.

[0066] With reference to Figures 3-6, in accordance with an advantageous embodiment, the alignment elements 111B-114B, 121B-124B comprise first alignment elements 111B, 112B, 121B, 122B including a flat portion 111B, 112B of each of the aforesaid first coupling projections 111, 112 and a straight portion 121B, 122B of each of the aforesaid first opening edges 121M, 122M. The flat portions 111B, 112B of the first coupling projections 111, 112 are in particular adapted to abut against the straight portions 121B, 122B of the first opening edges 121M, 122M when the actuation button 110 takes the first angular resting position. Advantageously, the fact of providing the flat portions 111B, 112B and the straight portions 121B, 122B allows a particularly precise and stable alignment of the actuation button 110. In accordance with an embodiment, in the first angular position of the actuation button 110 the first coupling projections 111, 112 abut against the first opening edges 121M, 122M by means of the elastic thrust exerted by the elastic return device 116. More preferably, the flat portions 111B, 112B of the first coupling projections 111, 112 abut against the straight portions of the first opening edges 121M, 122M by means of the thrust exerted by the elastic return device 116. The straight portions 121B, 122B thus define an alignment reference in the direction of the elastic reaction axis Z1 (considering the actuation button 110 in the first angular resting position) to allow the alignment of the actuation button 110.

[0067] With reference to Figure 3 and Figure 6, in accordance with an embodiment, each of the aforesaid first opening edges 121M, 122M comprises an edge portion 121C, 122C closer to the elastic return device 116 or to the axis Z1 and an opposite edge portion 121D, 122D further away from the elastic return device 116 or from the axis Z1 with respect to the aforesaid closer edge portion 121C, 122C. In particular, when the actuation button 110 takes the first angular resting position, each of the aforesaid first coupling projections 111, 112 is off-centered in the respective coupling opening 121, 122 so as to be closer to the edge portion 121D, 122D further away from the elastic return device 116 or from the axis Z1 with respect to the edge portion 121C, 122C closer to the elastic return device 116.

[0068] In accordance with an embodiment, the aforesaid alignment elements 111B-114B, 121B-124B comprise second alignment elements 113B, 114B, 123B, 124B including a flat portion 113B, 114B of each of the aforesaid second coupling projections 113, 114 and a straight portion 123B, 124B of each of the aforesaid second opening edges 123M, 124M. The flat portions 113B, 114B of the second coupling projections 113, 114 are adapted to abut against the straight portions 123B, 124B of the second opening edges 123M, 124M when the actuation button 110 takes the first angular resting position. Advantageously, the fact of providing the flat portions 113B, 114B and the straight portions 123B, 124B allows a particularly precise and stable alignment of the actuation button 110. In accordance with an embodiment, in the first angular position of the actuation button 110 the second coupling projections 113, 114 abut against the second opening edges 123M, 124M by means of the elastic thrust exerted by the elastic return device 116. More preferably, the flat portions 113B, 114B of the second coupling projections 113, 114 abut against the straight portions of the second opening edges 123M, 124M by means of the elastic thrust exerted by the elastic return device 116. The straight portions 123B, 124B thus define an alignment reference in the direction of the elastic reaction axis Z1 (considering the actuation button 110 in the first angular resting position) to allow the alignment of the actuation button 110.

[0069] With reference to Figure 3 and Figure 6, in accordance with an embodiment, each of the aforesaid second opening edges 123M, 124M comprises an edge portion 123C, 124C closer to the elastic return device 116 or to the axis Z1 and an opposite edge portion 123D, 124D further away from the elastic return device 116 or from the axis Z1 with respect to the aforesaid closer edge portion 123C, 124C. In particular, when the actuation button 110 takes the first angular resting position, each of the aforesaid second coupling projections 113, 114 is off-centered in the respective coupling opening 123, 124 so

as to be closer to the edge portion 123D, 124D further away from the elastic return device 116 or from the axis Z1 with respect to the edge portion 123C, 124C closer to the elastic return device 116 or to the axis Z1.

[0070] Based on the above description, it is thus possible to understand how a modular electric device of the type described above allows achieving the aforesaid objects with reference to the prior art. Without prejudice to the principle of the invention, the embodiments and the construction details may be broadly varied with respect to the above description merely disclosed by way of non-limiting example, without departing from the scope of the invention as defined in the appended claims.

Claims

1. A modular electric device (100) for controlling and/or distributing electricity adapted to be wall mounted, comprising:

   - a casing (120,140) made of an electrically insulating material;
   - an actuation button (110);
   - coupling elements (111-114,121-124) operatively interposed between the actuation button (110) and the casing (120,140), said coupling elements (111-114,121-124) being adapted and configured to couple the actuation button (110) to the casing (120,140) so that the actuation button (110) can take a first angular resting position and a second angular position different from the first angular resting position, respectively, said coupling elements (111-114,121-124) being also adapted to define a first rotation fulcrum (121A, 122A) for said actuation button (110);
   - a tilting switching member (130) accommodated in the casing (120, 140);
   - a first movable contact (131) arranged on the tilting switching member (130);
   - a first fixed contact (161);

   wherein the actuation button (110) comprises a control portion (115) including an elastic return device (116) for returning the actuation button (110) to said first angular resting position, said control portion (115) being adapted and configured to contact and move the tilting switching member (130) by means of the elastic return device (116) so that, when the actuation button (110) takes the first angular resting position and the second angular position, the tilting switching member (130) takes:

   a first angular configuration, in which the first movable contact (131) is separated from the first fixed contact (161); and
   a second angular end-of-stroke configuration, in which the first movable contact (131) is in contact with the first fixed contact (161), respectively;
   wherein when the actuation button (110) takes said first angular resting position, the first rotation fulcrum (121A, 122A) is misaligned with respect to the elastic return device (116).

2. A modular electric device (100) according to claim 1, wherein said coupling elements (111-114,121-124) are adapted and configured to couple the actuation button (110) to the casing (120,140) so that the actuation button (110) can further take a third angular position opposite to the second angular position, said first angular resting position being an angular position which is central with respect to said first and second angular positions, said coupling elements (111-114, 121-124) being further adapted to define a second rotation fulcrum (123A, 124A) for said actuation button (110), said second rotation fulcrum (123A, 124A) being misaligned with respect to said elastic return device (116), said elastic return device (116) being interposed between the first rotation fulcrum (121A, 122A) and the second rotation fulcrum (123A, 124A), wherein said modular electric device (100) comprises a second movable contact (132) arranged on the tilting switching member (130) and a second fixed contact (162), wherein the control portion (115) is adapted to move the tilting switching member (130) so that, when the actuation button (110) takes the third angular position, the tilting switching member (130) takes a third angular configuration, in which the second movable contact (132) contacts the second fixed contact (162) and the first movable contact (131) is separated from the first fixed contact (161), wherein the second movable contact (132) is separated from the second fixed contact (162) in said first angular configuration of the tilting switching member (130).

3. A modular electric device (100) according to claim 1 or 2, wherein said coupling elements (111-114,121-124) comprise alignment elements (111B-114B, 121B-124B) configured to allow an alignment of the actuation button (110) when the actuation button (110) takes the first angular resting position.

4. A modular electric device (100) according to any one of the preceding claims, wherein said coupling elements (111-114,121-124) comprise first coupling elements (111-114) and second coupling elements (121-124) adapted to be coupled to the first coupling elements (111-114), the actuation button (110) comprising the first coupling elements (111-114) and the casing (120,140) comprising the second coupling elements (121-124), wherein said first coupling elements (111-114) comprise at least a first coupling

projection (111,112) which protrudes from the actuation button (110) and wherein the second coupling elements (121-124) comprise at least a first coupling opening (121,122) through which the first coupling projection (111,112) is adapted to move when the actuation button (110) moves between the first angular resting position and the second angular position, wherein said at least a first coupling opening (121, 122) is delimited by a respective first opening edge (121M, 122M) which is adapted to define said first rotation fulcrum (121A, 122A).

5. A modular electric device (100) according to claim 4, wherein said at least a first coupling projection (111,112) comprises a pair of first coupling projections (111,112) which protrude from two opposite sides of the actuation button (110) and wherein said at least a first coupling opening (121,122) comprises a pair of first coupling openings (121,122) through which said first coupling projections (111,112) are adapted to move when the actuation button (110) moves between the first angular resting position and the second angular position, each of said first coupling openings (121, 122) being delimited by a respective first opening edge (121M, 122M), said first opening edges (121M, 122M) being adapted to define said first rotation fulcrum (121A, 122A).

6. A modular electric device (100) according to claim 5, wherein said first opening edges (121M, 122M) have a polygonal shape having at least one rounded corner (121A, 122A) and wherein said first rotation fulcrum (121A, 122A) is defined by a pair of rounded corners (121A, 122A) of the first opening edges (121M, 122M).

7. A modular electric device (100) according to claim 5 as it depends on claims 2, 3, 4, wherein said alignment elements (111B-114B, 121B-124B) comprise first alignment elements (111B, 112B, 121B, 122B) including a flat portion (111B, 112B) of each of said first coupling projections (111,112) and a straight portion (121B, 122B) of each of said first opening edges (121M, 122M), said flat portions (111B, 112B) of the first coupling projections (111, 112) being adapted to abut against said straight portions (121B, 122B) of the first opening edges (121M, 122M) when the actuation button (110) takes the first angular resting position.

8. A modular electric device (100) according to any one of claims 5 to 7, wherein each of said first opening edges (121M, 122M) comprises an edge portion (121C, 122C) closer to the elastic return device (116) and an opposite edge portion (121D, 122D) further away from the elastic return device (116) with respect to said closer edge portion (121C, 122C), wherein, when the actuation button (110) takes the first angular resting position, each of said first coupling projections (111,112) is off-center in the respective coupling opening (121,122) so as to be closer to the edge portion (121D, 122D) further away from the elastic return device (116) with respect to the edge portion (121C, 122C) closer to the elastic return device (116) .

9. A modular electric device (100) according to claim 4 as it depends on claim 2, wherein said first coupling elements (111-114) comprise at least a second coupling projection (113,114) which protrudes from the actuation button (110) and wherein the second coupling elements (121-124) comprise at least a second coupling opening (123,124) through which said at least a second coupling projection (113,114) is adapted to move when the actuation button (110) moves between the first angular resting position and the third angular position, wherein said at least a second coupling opening (123,124) is delimited by a respective second opening edge (123M, 124M) which is adapted to define said second rotation fulcrum (123A, 124A).

10. A modular electric device (100) according to claim 9, wherein said at least a second coupling projection (113,114) comprises a pair of second coupling projections (113,114) which protrude from two opposite sides of the actuation button (110) and wherein said at least a second coupling opening (123,124) comprises a pair of second coupling openings (123,124) through which said second coupling projections (113,114) are adapted to move when the actuation button (110) moves between the first angular resting position and the third angular position, each of said second coupling openings (123, 124) being delimited by a respective second opening edge (123M, 124M), said second opening edges (123M, 124M) being adapted to define said second rotation fulcrum (123A, 124A).

11. A modular electric device (100) according to claim 10, wherein said second opening edges (123M, 124M) have a polygonal shape having at least one rounded corner (123A, 124A) and wherein said second rotation fulcrum (123A, 124A) is defined by a pair of rounded corners (123A, 124A) of the second opening edges (123M, 124M).

12. A modular electric device (100) according to claim 10 as it depends on claims 2, 3, 4, 9, wherein said alignment elements (111B-114B, 121B-124B) comprise second alignment elements (113B, 114B, 123B, 124B) including a flat portion (113B, 114B) of each of said second coupling projections (113,114) and a straight portion (123B, 124B) of each of said second opening edges (123M, 124M), said flat portions (113B, 114B) of the second coupling projec-

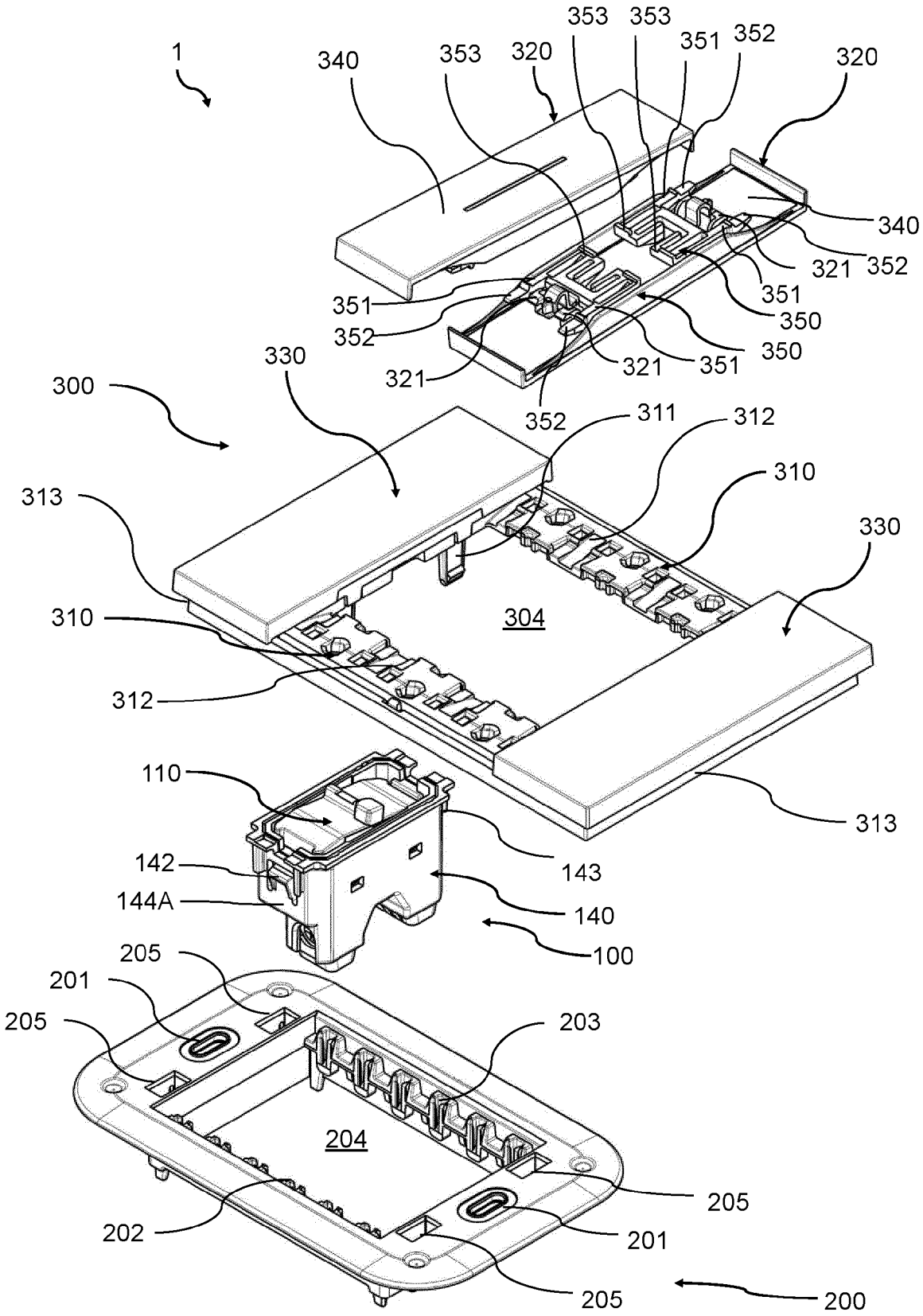
tions (113, 114) being adapted to abut against said straight portions (123B, 124B) of the second opening edges (123M, 124M) when the actuation button (110) takes the first angular resting position.

13. A modular electric device (100) according to any one of claims 10 to 12, wherein each of said second opening edges (123M, 124M) comprises an edge portion (123C, 124C) closer to the elastic return device (116) and an opposite edge portion (123D, 124D) further away from the elastic return device (116) with respect to the aforesaid closest edge portion (123C, 124C), wherein, when the actuation button (110) takes the first angular resting position, each of said second coupling projections (113,114) is off-center in the respective coupling opening (123,124) so as to be closer to the edge portion (123D, 124D) further away from the elastic return device (116) with respect to the edge portion (123C, 124C) closer to the elastic return device (116).

14. A modular electric device (100) according to any one of the preceding claims, wherein said modular electric device (100) is an electric control device (100), preferably a control device for a roller shutter.

15. A part assembly (100, 200, 300) comprising:

- a modular electric device (100) according to any one of the preceding claims;
- a support frame (200) for modular electric devices;
- a cover plate (300).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144A
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100
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201
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202
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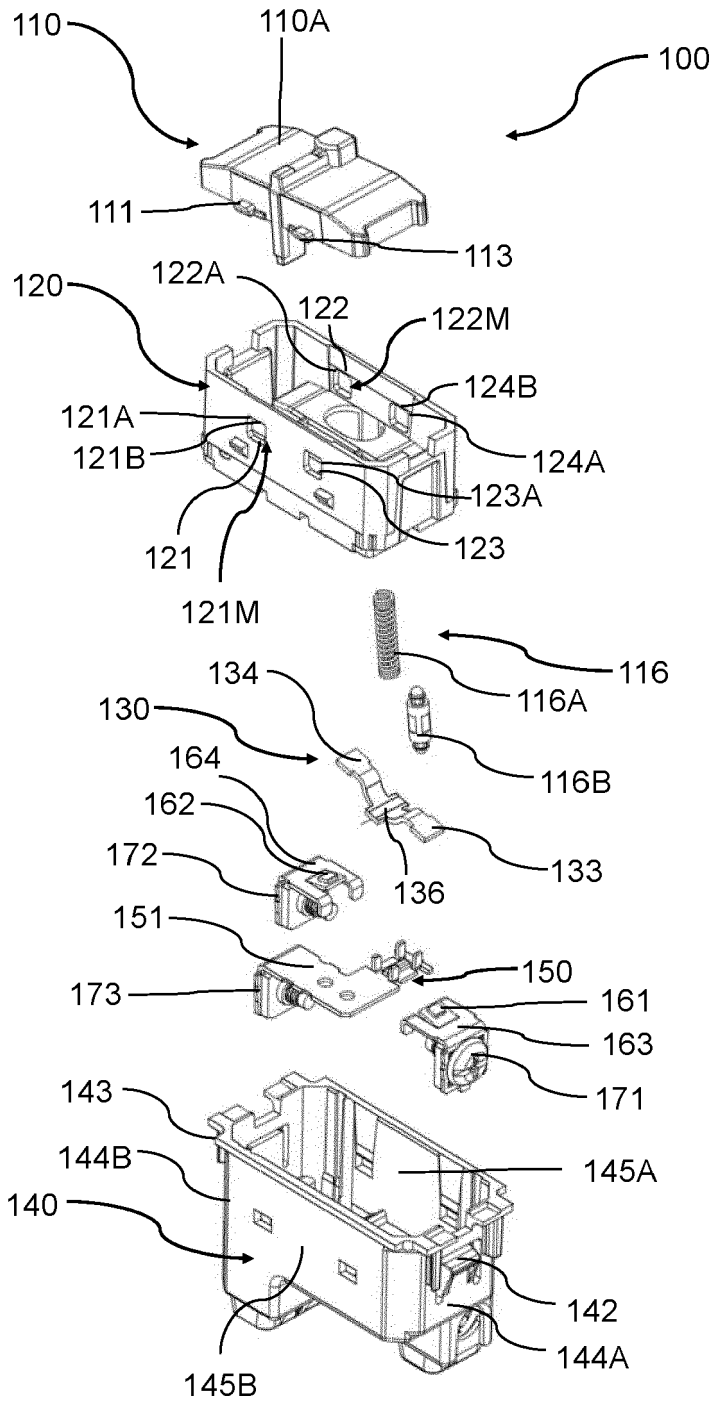
205
200

FIG. 1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134
130
116B
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144B
145A
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144A
145B

FIG. 2

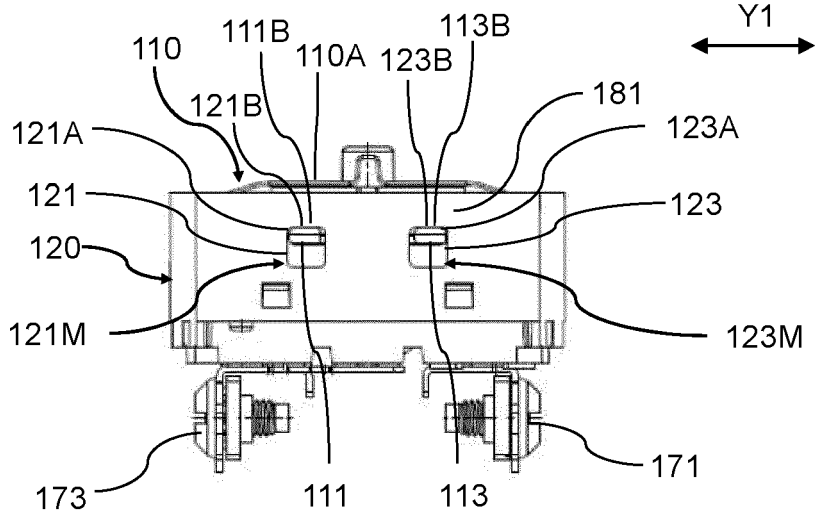


FIG. 3

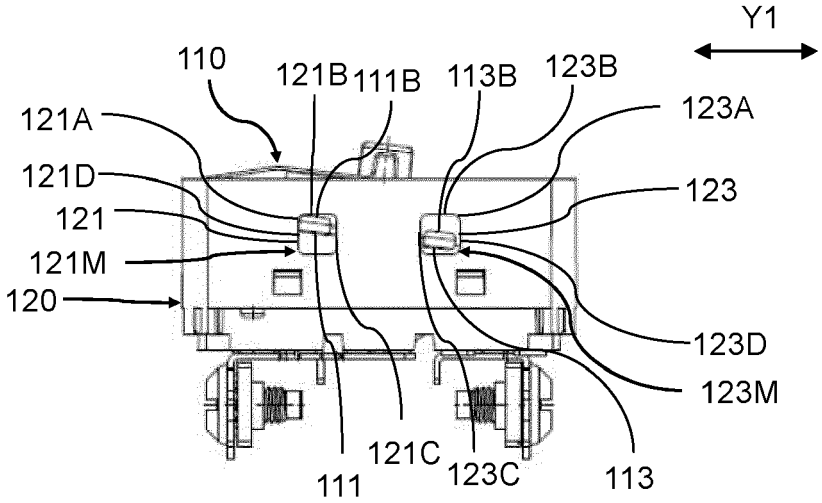


FIG. 4

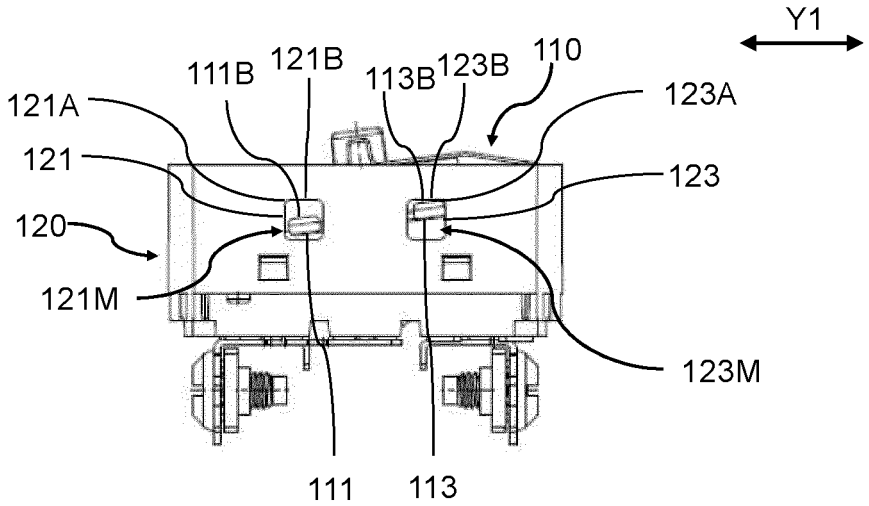
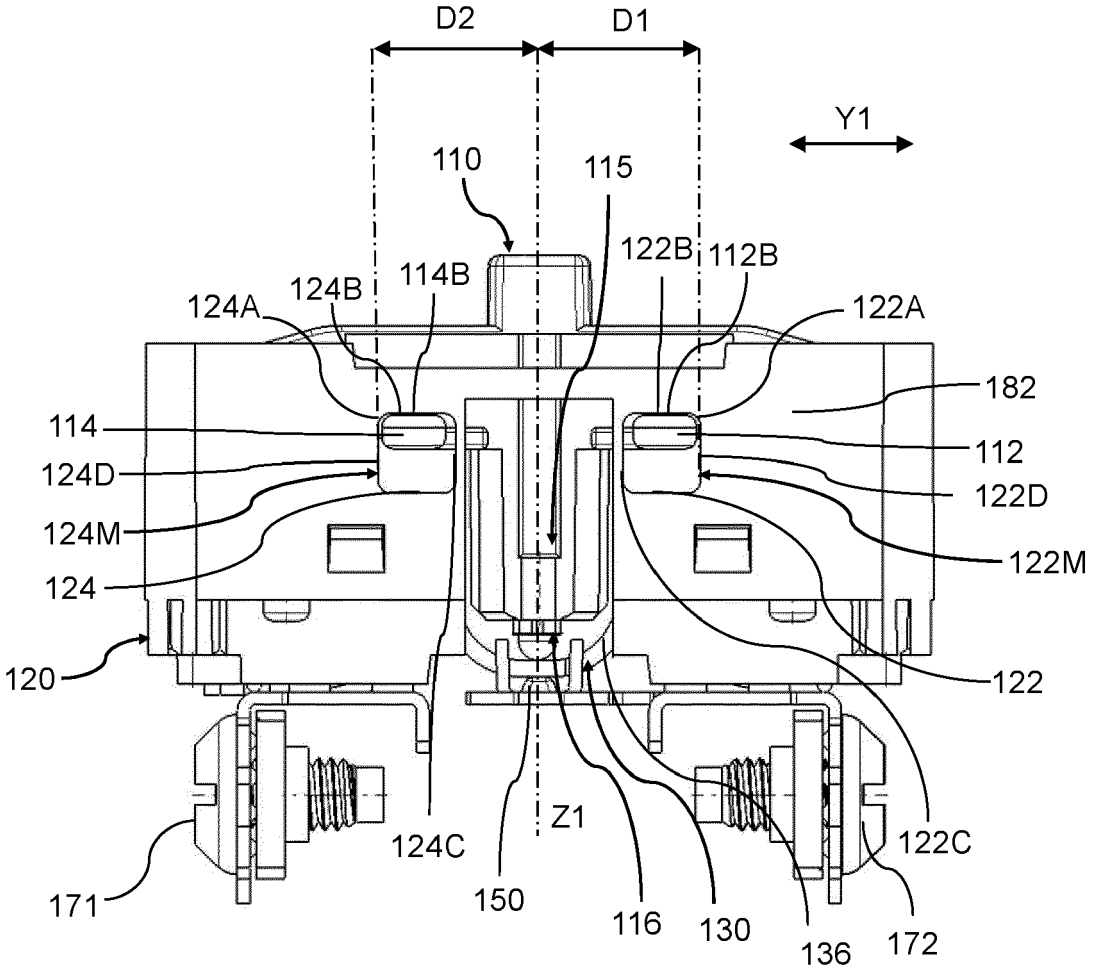


FIG. 5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115
122B
112B
114B
124B
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122A
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114
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124D
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124C
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122C
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FIG. 6

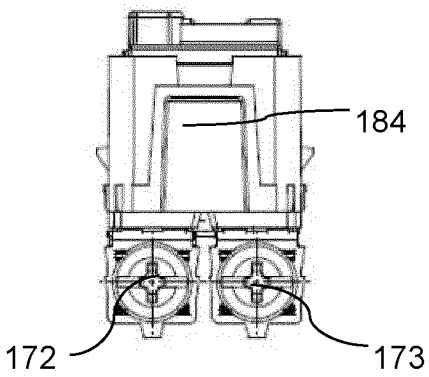
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FIG. 7

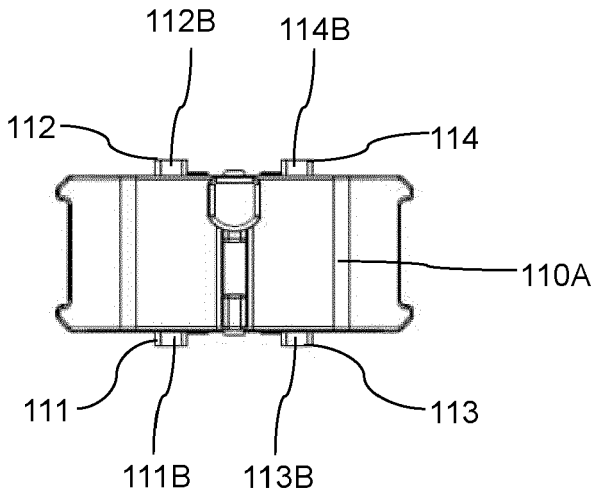

FIG. 8

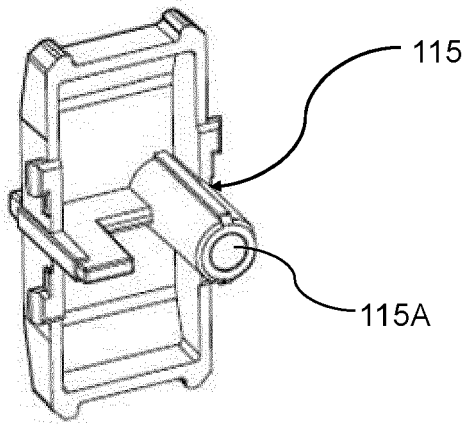

FIG. 9

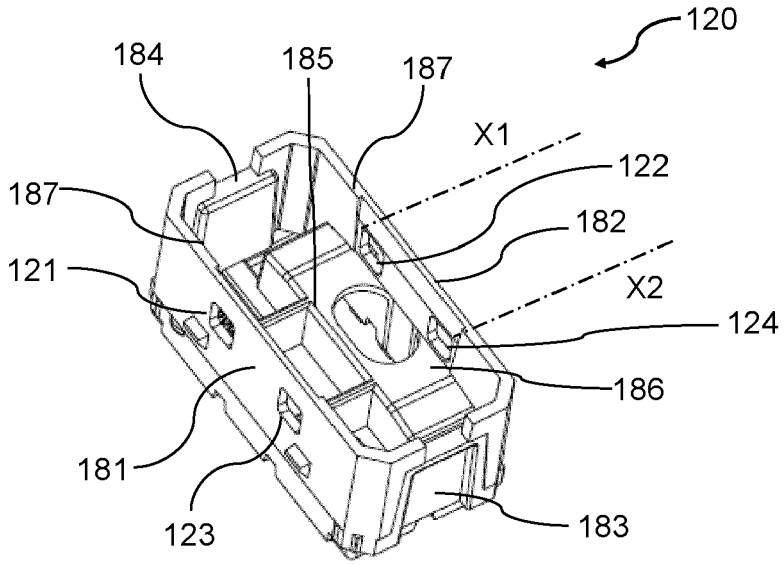

FIG. 10

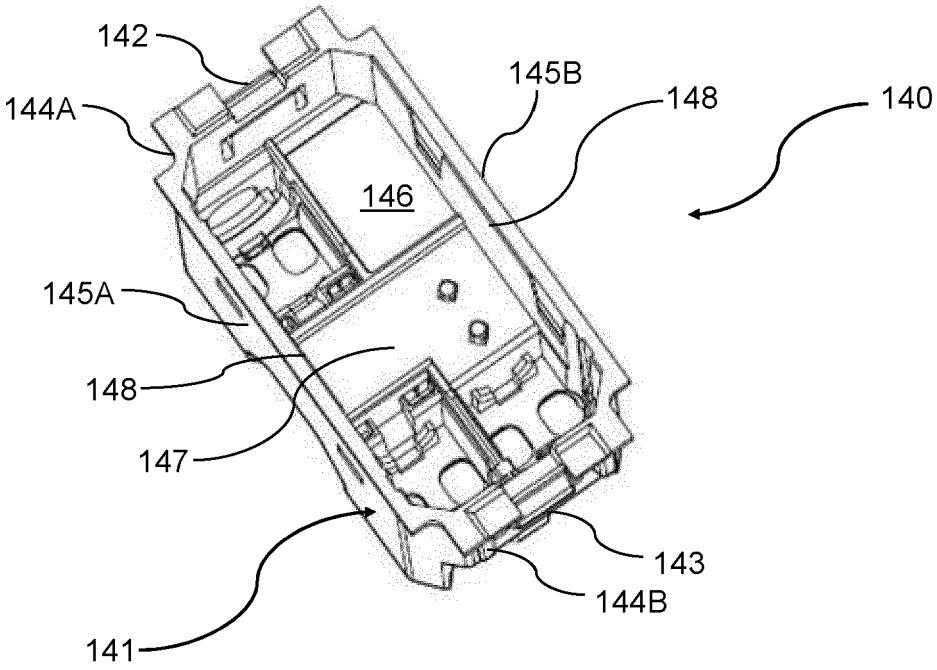
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FIG. 11

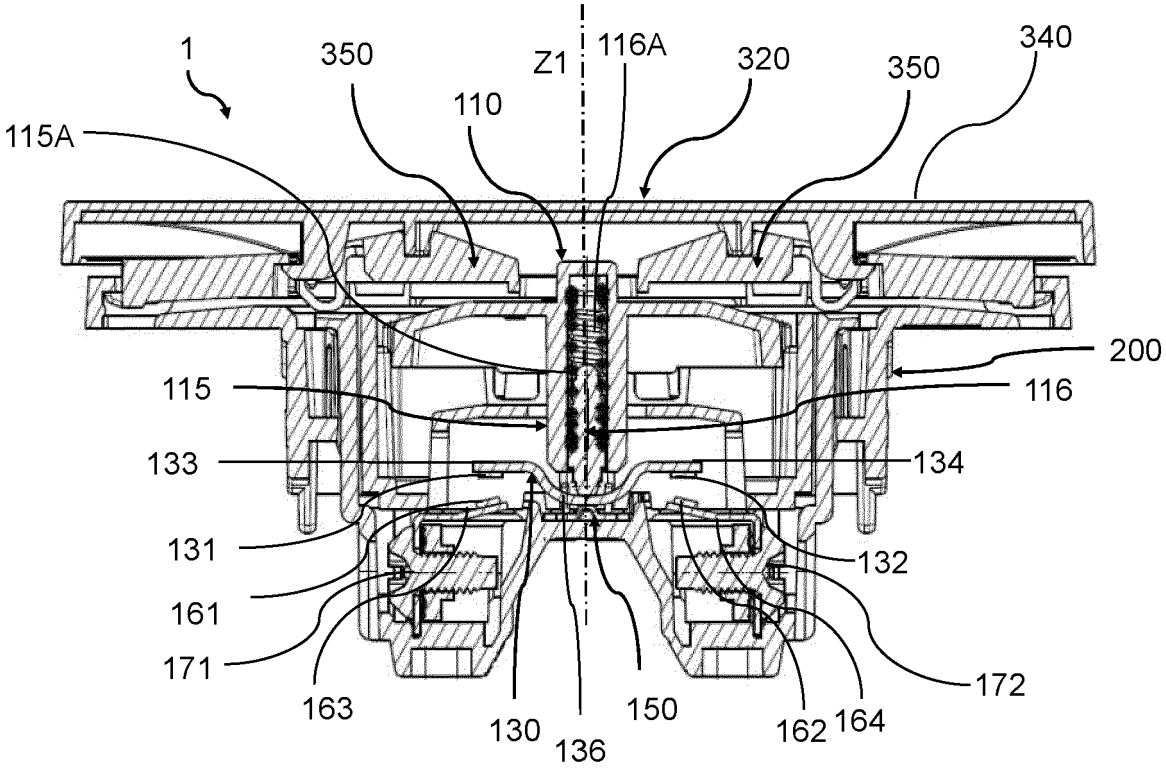
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FIG. 12

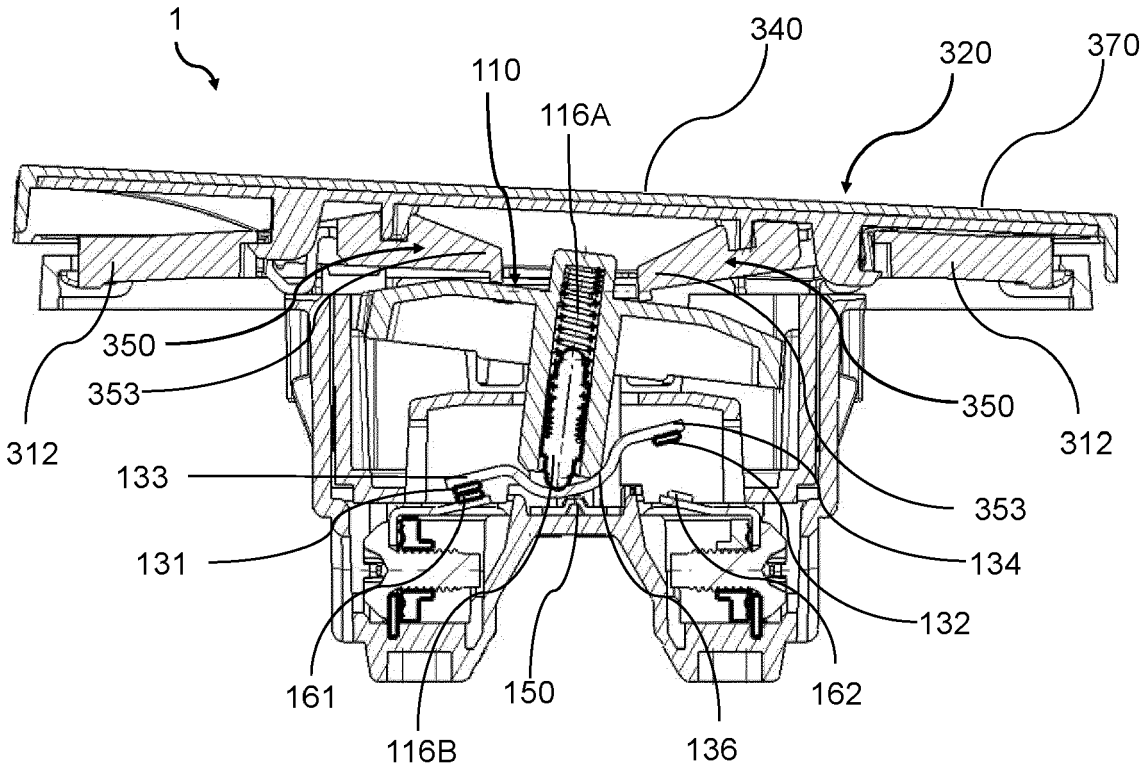
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FIG. 13

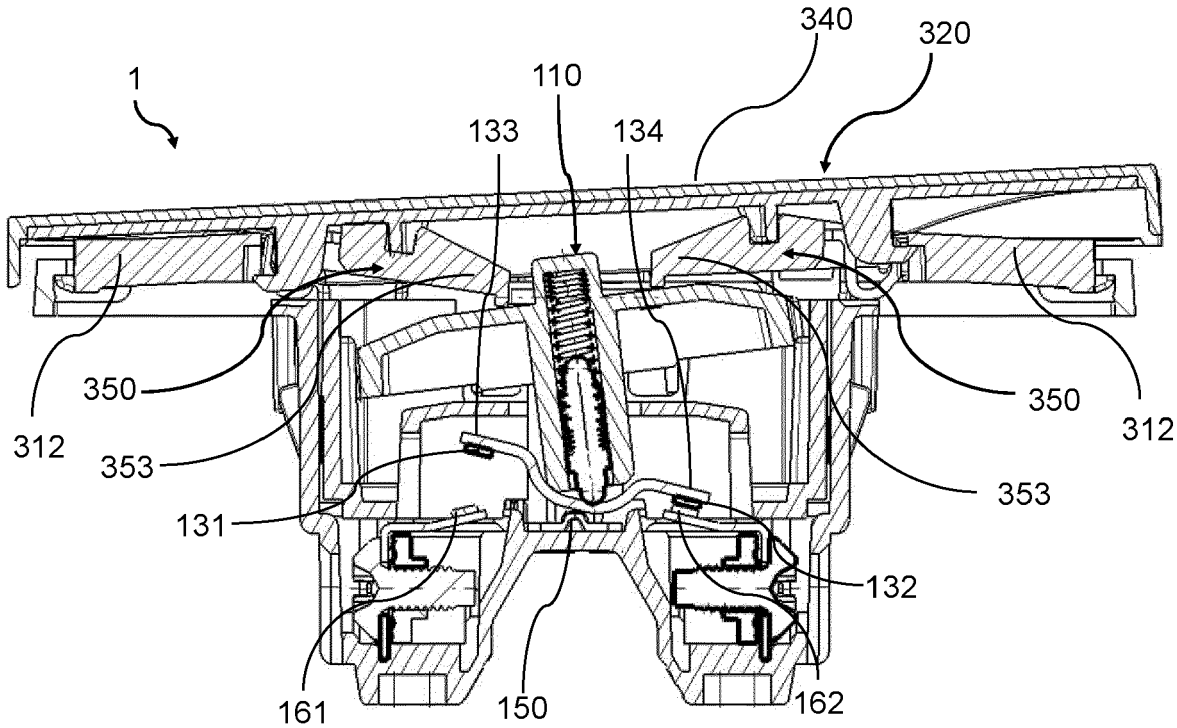
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FIG. 14

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EUROPEAN SEARCH REPORT

Application Number
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H01H

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
Munich	27 November 2023	Findeli, Luc

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