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(54) MICRO SWITCH

(57) A micro switch (100) comprises a casing (10), a circuit board (20) assembled with the casing (10), and a switching assembly (40). The circuit board (20) has a first side (21), a plurality of first printed circuits (22) arranged on the first side (21), at least one first resistor (23) disposed on the first side (21), and a trigger structure 24 located on the first side (21), two of the first printed circuits (22) extend out of the casing (10) to serve as at least two first conductive pins (221, 222), the first printed circuits (22), the first resistor (23) and the trigger structure (24) cause the two first conductive pins (221, 222) generate at least two first electrical signals. The switching assembly (40) comprises an elastic member (41), and an operating member (42) connected with the elastic member (41), the operating member (42) contacts the trigger structure (24) when being displaced, and causes one of the two first electrical signals generated by the two first conductive pins (221, 222) change to the other one of the two first electrical signals.

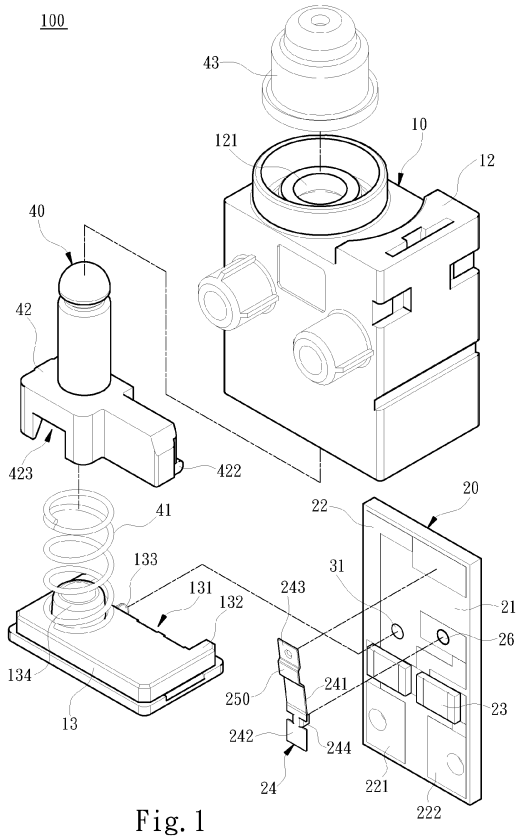

Fig. 1

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Description

FIELD OF THE INVENTION

[0001] The invention relates to a micro switch, and more particularly to a micro switch with conductive pins formed by printed circuits on a circuit board.

BACKGROUND OF THE INVENTION

[0002] With the evolution of science and technology, requirements for the accuracy of switch control in today's society are increasing day by day, so the development of switch devices is getting more attention. Conventional switch devices are usually connected with external resistors to improve signal discrimination. However, the space provided for assembly of a switch device is limited, implementation of an externally added resistor increases the required assembly space of the switch device, which is not conducive to installation. In addition, since conventional resistors are exposed outside the switch device, manufacturers need to add additional circuit boards for installing the resistors. At the same time, in order to ensure the operational stability of the resistors, designs for the resistors must be taken into consideration or other components must be added to protect the resistors.

[0003] In order to solve the aforementioned problems, resistors are disposed of in most of the existing switch devices, as disclosed in JP Patent No. 6413583B2, and corresponding patents such as CN Patent No. 105489429B, US Patent No. 10256056B2 and EP Patent No. 3002768B1; further, JP Publication No. 6188155, and corresponding patent, CN Publication No. 204167164U. The switch devices disclosed in the aforementioned patents are implemented with a metal lead frame, and the conductive pins of the switch devices are formed through the metal lead frame. At the same time, the metal lead frame and the resistor form at least two conductive paths. When the switch devices are operated, the operating member controls the movable contact point to conduct one of the two conductive paths, thereby changing the electrical signal output by the conductive pins. However, when manufacturing the switch devices in the conventional mechanism, the metal lead frame has to be additionally installed, resulting in complicated manufacturing steps, and the metal lead frame has to be positioned during the assembly process, which is not conducive to assembly.

SUMMARY OF THE INVENTION

[0004] A main object of the invention is to solve the problems of complicated manufacturing steps and not conducive to assembly caused by the use of a metal lead frame in the conventional switch devices.

[0005] In order to achieve the above object, the invention provides a micro switch comprising a casing, a circuit board, and a switching assembly. The casing is formed with a space. The circuit board is assembled with the casing, and the circuit board comprises a first side, a plurality of first printed circuits arranged on the first side, at least one first resistor disposed on the first side and forming a conductive relationship with two of the first plurality of printed circuits, and a trigger structure located on the first side, wherein a part of the first side at least partially faces the space, two of the plurality of first printed circuits extend out of the casing to be served as at least two first conductive pins of the micro switch, and at least two first electrical signals are generated from the at least two first conductive pins which are controlled by the plurality of first printed circuits, the first resistor, and the trigger structure, resistance values of the at least the two first electrical signals are different. The switching assembly comprises an elastic member located in the space, and an operating member connected with the elastic member and extending out of the casing for pressing, the operating member comprises a displacement stroke in the space, the operating member contacts the trigger structure while moving along the displacement stroke, and one of the two first electrical signals generated by the two first conductive pins being changed to an other one of the two first electrical signals.

[0006] In one embodiment, the trigger structure is is formed of at least one conductive elastic plate.

[0007] In one embodiment, the at least one conductive elastic plate comprises a fixed end mounted on the circuit board and electrically connected to one of the plurality of first printed circuits, and a free end opposite to the fixed end, the free end is contacted to contact another one of the plurality of first printed circuits when the operating member moves along the displacement stroke.

[0008] In one embodiment, the trigger structure is formed of at least two conductive elastic plates, and the operating member contacts at least one of the two conductive elastic plates before and after the moving along the displacement stroke, respectively.

[0009] In one embodiment, the circuit board comprises a second side opposite to the first side, a plurality of second printed circuits arranged on the second side, and at least one conductive through hole electrically connected to one of the plurality of first printed circuits with one of the second printed circuits, two of the plurality of second printed circuits extend out of the casing to be served as at least two second conductive pins of the micro switch, when the operating member contacts the trigger structure while moving along the displacement stroke, electrical signals generated by the two of the plurality of second conductive pins are changed.

[0010] In one embodiment, the circuit board comprises at least one second resistor disposed on the second side and electrically connected to the two of the plurality of second printed circuits.

[0011] In one embodiment, the casing comprises a cover forming the space and a base mounted in the cover for disposal of the circuit board, the base divides the space into a first part and a second part, the first part

provides the operating member to move therein, and the second part is provided with the first resistor therein.

[0012] In one embodiment, the base comprises a slot formed on a side of the base for disposal of the circuit board.

[0013] In one embodiment, the base comprises at least one protruding rib formed in the slot to jointly restrain the circuit board.

[0014] In one embodiment, the cover comprises at least one stepped wall surrounding the space to limit a position of the base.

[0015] In one embodiment, the base comprises a positioning block located in the first part for positioning the elastic member.

[0016] Accordingly, comparing with the conventional technique, the invention has the following characteristics: the invention provides the circuit board, forms a conductive relationship with the first resistor and the trigger structure through the first printed circuits disposed on the circuit board, and utilizes the first printed circuits to form the first conductive pins. The invention no longer uses a metal lead frame to form the pins, and does not need to additionally dispose the metal lead frame and position the metal lead frame during the manufacturing process of the micro switch, which is conducive to improving production efficiency.

BRIEF DESCRIPTION OF THE DRAWINGS

[0017]

FIG. 1 is an exploded perspective structural view of a first embodiment of a micro switch of the invention.

FIG. 2 is an exploded perspective structural view of the first embodiment of the micro switch of the invention viewed from another direction.

FIG. 3 is a cross-sectional structural view of the first embodiment of the micro switch of the invention.

FIG. 4 is a schematic diagram of a circuit board of the first embodiment of the micro switch of the invention.

FIG. 5 is a schematic circuit diagram of the first embodiment of the micro switch of the invention.

FIG. 6 is a cross-sectional structural view when the first embodiment of the micro switch of the invention is implemented.

FIG. 7 is a schematic circuit diagram when the first embodiment of the micro switch of the invention is implemented.

FIG. 8 is a cross-sectional structural view of a second embodiment of the micro switch of the invention.

FIG. 9 is a schematic diagram of the circuit board of a third embodiment of the micro switch of the invention.

FIG. 10 is a schematic circuit diagram of the third embodiment of the micro switch of the invention.

FIG. 11 is a schematic circuit diagram when the third embodiment of the micro switch of the invention is implemented.

FIG. 12 is an exploded perspective structural view of a fourth embodiment of the micro switch of the invention.

FIG. 13 is an exploded perspective structural view of the fourth embodiment of the micro switch of the invention viewed from another direction.

FIG. 14 is a cross-sectional structural view of the fourth embodiment of the micro switch of the invention.

FIG. 15 is a schematic diagram of a first side of the circuit board of the fourth embodiment of the micro switch of the invention.

FIG. 16 is a schematic circuit diagram of the first side of the fourth embodiment of the invention.

FIG. 17 is a cross-sectional structural view when the fourth embodiment of the micro switch of the invention is implemented.

FIG. 18 is a schematic circuit diagram of the first side when the fourth embodiment of the micro switch of the invention is implemented.

FIG. 19 is a schematic diagram of a second side of the circuit board of the fourth embodiment of the micro switch of the invention.

FIG. 20 is a schematic circuit diagram of the second side of the fourth embodiment of the micro switch of the invention.

FIG. 21 is a schematic circuit diagram of the second side when the fourth embodiment of the micro switch of the invention is implemented.

FIG. 22 is a cross-sectional structural view of a fifth embodiment of the micro switch of the invention.

FIG. 23 is a schematic diagram of the circuit board of a sixth embodiment of the micro switch of the invention.

FIG. 24 is a schematic circuit diagram of the sixth embodiment of the micro switch of the invention.

FIG. 25 is a schematic circuit diagram when the sixth embodiment of the micro switch of the invention is implemented.

FIG. 26 is a schematic diagram of the circuit board of a seventh embodiment of the micro switch of the invention.

FIG. 27 is a schematic circuit diagram of the seventh embodiment of the micro switch of the invention.

FIG. 28 is a schematic circuit diagram when the seventh embodiment of the micro switch of the invention is implemented.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

[0018] The detailed description and technical content of the invention are described below with reference to the accompanying drawings.

[0019] Please refer to FIG. 1, FIG. 2, FIG. 3, FIG. 4, FIG. 5, FIG. 6, FIG. 7 and FIG. 8, the invention provides

a micro switch 100 comprising a casing 10, a circuit board 20 and a switching assembly 40. The casing 10 is formed with a space 11. The circuit board 20 is assembled with the casing 10, and the circuit board 20 comprises a first side 21, a plurality of first printed circuits 22 arranged on the first side 21, at least one first resistor 23 disposed on the first side 21, and a trigger structure 24 located on the first side 21. A part of the first side 21 at least partially faces the space 11. Specifically, the first side 21 refers to one of side surfaces of the circuit board 20 that is provided for printing, the plurality of first printed circuits 22 are conductive patterns printed on an insulating substrate of the circuit board 20, and the plurality of first printed circuits 22 are used to provide a conductive function for the circuit board 20. In one embodiment, the plurality of first printed circuits 22 is formed of copper foil. The first resistor 23 is connected to two of the first printed circuits 22 and capable of forming a conductive relationship with the two of the plurality of first printed circuits 22. In one embodiment, the first resistor 23 is fixed on the circuit board 20 by through-hole technology (THT), or surface-mount technology (SMT). The trigger structure 24 comprises a conductive function and is conducted with the plurality of first printed circuits 22. The trigger structure 24 changes a working state thereof after being acted on, so that a conductive relationship with the plurality of first printed circuits 22 and the first resistor 23 can be determined. In one embodiment, the trigger structure 24 is formed of at least one conductive elastic plate 241, and the working state of the trigger structure 24 described herein is that the at least one conductive elastic plate 241 is in contact with and conducted with the plurality of first printed circuits 22, or is not in contact with and not conducted with the plurality of first printed circuits 22.

[0020] Two of the plurality of first printed circuits 22 extend out of the casing 10 to be served as at least two first conductive pins 221, 222 of the micro switch 100, and the at least two first conductive pins 221, 222 are provided for connecting with an external device (not shown in the figures), so that the external device can be controlled according to outputs of the at least two first conductive pins 221, 222. At least two first electrical signals are generated from the at least two first conductive pins 221, 222 which are controlled by the plurality of first printed circuits 22, the first resistor 23, and the trigger structure 24, and the resistance values of the at least two first electrical signals are changed based on a conductive relationship between the plurality of first printed circuits 22, the first resistor 23 and the trigger structure 24. It should be understood that the difference in resistance value described herein refers to a difference in resistance value measured at two nodes of an electrical circuit formed by the plurality of first printed circuits 22 at the time that before and after the micro switch 100 is actuated. For example, the micro switch 100 can be provided with a plurality of the first resistors 23, different resistance values can be generated when the plurality of first resistors 23 are respectively conducted, or different resistance values can be generated by the plurality of first resistors 23 with different electrical circuits, or different resistance values can be generated before and after one of the plurality of first resistor 23 is conducted.

[0021] The switching assembly 40 comprises an elastic member 41 located in the space 11, and an operating member 42 connected with the elastic member 41. A portion of the operating member 42 is extended out of the casing 10 for pressing. The operating member 42 presses against the elastic member 41 after being pressed, so that the elastic member 41 provides a restoring force for the operating member 42 when the operating member 42 is released from being pressed. In addition, the operating member 42 has a displacement stroke 421 in the space 11 after being pressed. During the displacement stroke 421, the operating member 42 contacts the trigger structure 24, and one of the two first electrical signals generated by the at least two first conductive pins 221, 222 being changed to the other one of the two first electrical signals.

[0022] Please refer to FIG. 3, FIG. 4, FIG. 5, FIG. 6 and FIG. 7, implementation of the micro switch 100 will be described hereinafter. For the convenience of describing and explaining the micro switch 100, it is assumed that the at least two first conductive pins 221, 222 are COM pin and NC pin, respectively, known by a person having ordinary skill in the art, the trigger structure 24 is a single conductive elastic plate 241, and a quantity of the first resistor 23 is two. In order to distinguish two first resistors 23 herein, reference numerals of the two first resistors 23 are respectively distinguished as 231, 232, wherein a resistance value of the first resistor 231 is R1, and a resistance value of the first resistor 232 is R2. At the same time, it is assumed that the operating member 42 does not press against the elastic member 41 initially, but is in contact with the trigger structure 24. At this moment, the trigger structure 24 is abutted against by the operating member 42 to contact two of the plurality of first printed circuits 22, so that a conductive relationship is formed between the plurality of first printed circuits 22 and the first resistor 232 on the circuit board 20, and the resistance value R2 can be measured by the electrical signals output by the at least two first conductive pins 221, 222. After the operating member 42 is pressed, the operating member 42 moves along the displacement stroke 421 and presses against the elastic member 41, the operating member 42 no longer abuts against the trigger structure 24 to contact the plurality of first printed circuits 22, so that the trigger structure 24 does not conduct with the plurality of first printed circuits 22, and a conductive relationship is formed between the plurality of first printed circuits 22 and the first resistor 231 and the first resistor 232 on the circuit board 20, and a resistance value R1+R2 can be measured by the electrical signals output by the at least two first conductive pins 221, 222. Also, please refer to FIG. 8 for another embodiment, the operating member 42 is not in contact with the trigger structure 24 initially, so that the trigger structure

24 does not conduct with the plurality of first printed circuits 22 initially, and the resistance value R1+R2 can be measured by the electrical signals output by the at least two first conductive pins 221, 222. The operating member 42 moves along the displacement stroke 421 and then contacts the trigger structure 24, the trigger structure 24 is initially not conducted with the plurality of first printed circuits 22, and the resistance value R2 can be measured by the electrical signals output by the at least two first conductive pins 221, 222. In this embodiment, the at least two first conductive pins 221, 222 are COM pin and NO pin, respectively, known by a person having ordinary skill in the art.

[0023] It can be known from the above that the invention is no longer implemented with a metal lead frame, the plurality of first printed circuits 22 are provided with a conductive function through arrangement on the circuit board 20, thereby achieving an object of providing signal discrimination in control by using the difference in resistance value. Meanwhile, compared with the prior art, the invention has the characteristics of being easy to assemble, which is beneficial to improving a production efficiency of the micro switch 100.

[0024] In one embodiment, when the at least one conductive elastic plate 241 is used to be the trigger structure 24 for implementation, the at least one conductive elastic plate 241 has elastic deformation capability, and the at least one conductive elastic plate 241 comprises a fixed end 242 mounted on the circuit board 20, and a free end 243 opposite to the fixed end 242. The fixed end 242 normally contacts one of the plurality of first printed circuits 22. In one embodiment, a mounting hole 26 is formed on the circuit board 20, and the at least one conductive elastic plate 241 comprises at least one mounting arm 244 located at the fixed end 242. When the fixed end 242 is mounted on the circuit board 20, the mounting arm 244 is inserted into the mounting hole 26, so that the fixed end 242 is electrically connected to one of the plurality of first printed circuits 22. The free end 243 is capable of contacting the operating member 42 when the operating member 42 moves along the displacement stroke 421, so that the free end 243 is deformed and displaced relative to the circuit board 20. For example, assuming that the free end 243 is initially in contact with the other one of the plurality of first printed circuits 22, from a side view of the circuit board 20, there is a distance between the free end 243 and the other one of the plurality of first printed circuits 22 without conduction. The free end 243 is contacted by the operating member 42 when the operating member 42 moves along the displacement stroke 421, so that the free end 243 is deformed to contact the other one of the plurality of first printed circuits 22. In one embodiment, the at least one conductive elastic plate 241 of the invention comprises at least one conductive bulge 245 disposed on the free end 243, the at least one conductive bulge 245 provides the free end 243 to be conducted with the other one of the plurality of first printed circuits 22, and provides a single-point contact function for the at least one conductive elastic plate 241.

[0025] Please refer to FIG. 9, FIG. 10, FIG. 11, FIG. 12, FIG. 13 and FIG. 14 for another embodiment that the trigger structure 24 is formed of two conductive elastic plates 241.The operating member 42 is capable of contacting the two conductive elastic plates 241 during the displacement stroke 421, or the two conductive elastic plates 241 are respectively contacted before and after moving along the displacement stroke 421, as shown in FIG. 23. Please refer to FIG. 15 and FIG. 23, for the convenience of explanation, two conductive elastic plates 246, 247 and two free ends 248, 249 of the two conductive elastic plates 246, 247 are provided. When the operating member 42 contacts the two conductive elastic plates 246, 247, the free end 248 and the free end 249 are disposed facing each other, that is, the two free ends 248, 249 are disposed at a same level of the circuit board 20. The operating member 42 can contact the two free ends 248, 249 initially, or can contact the two free ends 248, 249 after the displacement stroke 421 is completed. When the operating member 42 contacts the two conductive elastic plates 246, 247 before and after moving along the displacement stroke 421 respectively, the two free ends 248, 249 are not at a same level of the circuit board 20 and the free end 248 does not face the free end 249 as shown in FIG. 23.

[0026] On the other hand, a quantity of first conductive pins in one embodiment is at least three, and in this embodiment, the first conductive pins are labeled as 221, 222, 223, as shown in FIG. 23. The first conductive pins 221, 222, 223 can be COM pin, NO pin and NC pin, respectively, which are commonly known by a person having ordinary skill in the art. In another embodiment, the circuit board 20 of the invention is regarded as a unit of the micro switch 100. When the micro switch 100 is spliced by with multiple units based on requirements, the first conductive pins 221, 222 on each of the circuit boards 20 of the micro switch 100 are served as a pin set, and a plurality of pin sets are provided on the micro switch 100. In this embodiment, a quantity of the first conductive pins 221, 222 on the circuit boards 20 will be four, five, six, and so on. In addition, a quantity of the first resistor 23 in the invention is not limited to those depicted in FIG. 1, FIG. 2, FIG. 3, FIG. 4, FIG. 5, FIG. 6, FIG. 7, FIG. 8, FIG. 9, FIG. 10, FIG. 11, FIG. 12, FIG. 13, FIG. 14, FIG. 15, FIG. 16, FIG. 17 and FIG. 18, a quantity of the first resistor 23 is not limited to one or two, but can be three, four, five, etc., based on requirements as shown in FIG. 26, FIG. 27 and FIG. 28.

[0027] In addition to the above, please refer to FIG. 12, FIG. 13 and FIG. 19, FIG. 20 and FIG. 21. In one embodiment, the circuit board 20 comprises a second side 27 opposite to the first side 21, a plurality of second printed circuits 28 arranged on the second side 27, and at least one conductive through hole 29. Specifically, the second side 27 refers to the other side surface of the circuit board 20 that is provided for printing, and the second side 27 is located on the other side of the circuit

board 20 that does not face the space 11. The plurality of second printed circuits 28 are partially located in the casing 10, and the plurality of second printed circuits 28 are used to provide a conductive function for the circuit board 20 on the second side 27. In one embodiment, the plurality of second printed circuits 28 can be formed of copper foil. The at least one conductive through hole 29 penetrates through the circuit board 20, and the at least one conductive through hole 29 electrically connects one of the plurality of first printed circuits 22 with one of the second printed circuits 28. In one embodiment, please refer to FIG. 17, a port of the at least one conductive through hole 29 on a side of the first side 21 as shown by reference numeral 291 that is connected with the trigger structure 24. When the trigger structure 24 is conducted, one of the plurality of second printed circuits 28 is capable of conducting with the plurality of first printed circuits 22 through the at least one conductive through hole 29.

[0028] Two of the plurality of second printed circuits 28 extend out of the casing 10 to serve as at least two second conductive pins 281, 282 of the micro switch 100. It should be understood that in this embodiment, a quantity of the at least two second conductive pins 281, 282 is also not limited to two, a quantity of the at least two second conductive pins 281, 282 can be three, four, five, etc., based on requirements, provided that a width condition of the circuit board 20 permits. In addition, the at least two second conductive pins 281, 282 are capable of providing assembly of another external device, so that the micro switch 100 is capable of realizing a function of providing control by the plurality of first printed circuits 22 and the plurality of second printed circuits 28 respectively. Accordingly, the micro switch 100 of the invention is capable of improving technical drawbacks in the conventional metal lead frame of only capable of providing a single type of circuit during a single conduction process and incapable of breaking through the single-pole single-throw technology.

[0029] In addition, in this embodiment, the at least two second conductive pins 281, 282 are capable of generating differences in electrical signals based on conduction states of the plurality of second printed circuits 28. The structures shown in FIG. 15, FIG. 16, FIG. 17, FIG. 18, FIG. 19, FIG. 20 and FIG. 21 are taken as an example, it is assumed that when the trigger structure 24 is conducted with one of the plurality of first printed circuits 22, the plurality of first printed circuits 22 are conducted with the plurality of second printed circuits 28, and at the same time, it is assumed that initially the operating member 42 does not cause the trigger structure 24 conduct the plurality of first printed circuits 22 electrically connected with the plurality of second printed circuits 28. At this moment, the plurality of second printed circuits 28 electrically connected with the plurality of first printed circuits 22 cannot receive electric power, and therefore there is no electric power flow between the second printed circuits 28, and there is an open circuit between the two second conductive pins 281, 282. After the operating member 42 is operated, the trigger structure 24 conducts the plurality of first printed circuits 22 electrically connected with the plurality of second printed circuits 28, so that electric power flows between the plurality of second printed circuits 28, and the at least two second conductive pins 281, 282 are conducted with each other. In another example, the operating member 42 can also conduct the plurality of first printed circuits 22 with the second printed circuits 28 at an initial stage, and cause the plurality of first printed circuits 22 not conducted with the plurality of second printed circuits 28 after being operated, and the detailed implementation thereof will not be repeated herein.

[0030] Further, in another embodiment, when the trigger structure 24 is at least two conductive elastic plates 241, one of the two conductive elastic plates 241 is disposed at a port (shown as 291) of the at least one conductive through hole 29 on the side of the first side 21, and the other one of the at least two conductive elastic plates 241 is disposed in the mounting hole 26. When the at least two conductive elastic plates 241 disposed in the at least one conductive through hole 29 are conducted, the plurality of first printed circuits 22 and the plurality of second printed circuits 28 are conducted with one another.

[0031] In another embodiment, the at least one conductive through hole 29 can also be disposed on one of the at least two second conductive pins 281, 282, and the at least one conductive through hole 29 is used to conduct one of the two first conductive pins 221, 222 and one of the at least two second conductive pins 281, 282. In addition, the at least one conductive through hole 29 can further be a conductive hole 292 or a non-conductive hole 293. Taking FIG. 16, FIG. 19 to FIG. 21 as an example, when the conductive hole 292 is disposed on the first conductive pin 221 and the second conductive pin 282, the conductive hole 292 causes the plurality of first printed circuits 22 and the plurality of second printed circuits 28 form a loop, when the non-conductive hole 293 is disposed on the first conductive pin 222 and the plurality of second conductive pin 282, the plurality of first printed circuits 22 and the plurality of second printed circuits 28 do not form a loop.

[0032] In yet another embodiment, the circuit board 20 is also provided with at least one second resistor (not shown in the figures) on the second side 27, the second resistor is electrically connected to two of the plurality of second printed circuits 28, and is used to provide outputs of the at least two second conductive pins 281, 282 with higher discrimination.

[0033] From another aspect, in one embodiment of the invention, in order to ensure that the operating member 42 is capable of reliably contacting the conductive elastic plate 241 when the operating member 42 moves along the displacement stroke 421, the operating member 42 comprises a bulging portion 422 bulging toward the conductive elastic plate 241. The bulging portion 422 is in contact with the conductive elastic plate 241 when the

operating member 42 moves along the displacement stroke 421. In another embodiment, the conductive elastic plate 241 comprises a protruding portion 250 protruding toward the operating member 42. The protruding portion 250 can be directly formed by the conductive elastic plate 241, or can be a structure additionally disposed on the conductive elastic plate 241. The protruding portion 250 is in contact with the operating member 42 when the operating member 42 moves along the displacement stroke 421, and causes the free end 243 to contact the circuit board 20 by contacting of the operating member 42.

[0034] On the other hand, in one embodiment, the casing 10 comprises a cover 12 forming the space 11 and a base 13 installed in the cover 12. The cover 12 is formed with an opening 121 through which the operating member 42 protrudes. The base 13 is provided for disposing the circuit board 20, the base 13 divides the space 11 into a first part 111 and a second part 112. The first part 111 is closed, and provided for the operating member 42 to move therein, the second part 112 is open, and the first resistor 23 is disposed in the second part 112.

[0035] In order to stably install the circuit board 20 on the base 13, the base 13 comprises a slot 131 formed on a side of the base 13, and the slot 131 provides the circuit board 20 for disposal therein. In one embodiment, the slot 131 can be formed through two extending arms 132 on the base 13. In another embodiment, the base 13 further comprises at least one protruding rib 133 formed in the slot 131, and the protruding rib 133 is matched with a through hole 31 on the circuit board 20. When the circuit board 20 is disposed in the slot 131, the protruding rib 133 is inserted into the through hole 31, so that the protruding rib 133 and the slot 131 jointly restrain the circuit board 20.

[0036] In addition, in order for the invention to be capable of limiting assembly positions of the base 13 and the cover 12, in one embodiment, the cover 12 comprises at least one stepped wall 122 surrounding the space 11, and the stepped wall 122 is matched with the base 13 to limit a position of the base 13. In addition, the cover 12 of the invention further comprises at least one restricting block 123, the restricting block 123 protrudes toward the space 11, after the base 13 and the cover 12 are assembled with each other, the restricting block 123 is stuck on a bottom of the base 13 to prevent the base 13 from falling off.

[0037] Furthermore, in order for the invention to be capable of limiting an assembly position of the elastic member 41, in one embodiment, the base 13 comprises a positioning block 134 located in the first part 111, the positioning block 134 provides the elastic member 41 to be sleeved thereon, and provides a positioning function. In addition, in another embodiment, the operating member 42 is formed with an accommodating groove 423 facing the base 13, and the accommodating groove 423 provides the elastic member 41 to be disposed therein to limit an assembly position of the elastic member 41. In addition, the switching assembly 40 of the invention comprises a cap 43 located outside the casing 10 and sleeved on the operating member 42.

Claims

1. A micro switch (100), comprising:

a casing (10), formed with a space (11);
a circuit board (20), assembled with the casing (10), and the circuit board (20) comprising a first side (21), a plurality of first printed circuits (22) arranged on the first side (21), at least one first resistor (23) disposed on the first side (21) and forming a conductive relationship with two of the plurality of first printed circuits (22), and a trigger structure (24) located on the first side (21), wherein a part of the first side (21) at least partially faces the space (11), the two of the plurality of first printed circuits (22) extend out of the casing (10) to be served as at least two first conductive pins (221, 222) of the micro switch 100, and at least two first electrical signals are generated from the at least two first conductive pins (221, 222) which are controlled by the plurality of first printed circuits (22), the first resistor (23), and the trigger structure (24), resistance values of the at least the two first electrical signals are different; and
a switching assembly (40), comprising an elastic member (41) located in the space (11), and an operating member (42) connected with the elastic member (41) and extending out of the casing (10) for pressing, wherein the operating member (42) comprises a displacement stroke (421) in the space (11), the operating member (42) contacts the trigger structure (24) while moving along the displacement stroke (421), and one of the two first electrical signals generated by the two first conductive pins (221, 222) being changed to an other one of the two first electrical signals.

2. The micro switch (100) as claimed in claim 1, wherein the trigger structure (24) is formed of at least one conductive elastic plate (241).

3. The micro switch (100) as claimed in claim 2, wherein the at least one conductive elastic plate (241) comprises a fixed end (242) mounted on the circuit board (20) and electrically connected to one of the plurality of first printed circuits (22), and a free end (243) opposite to the fixed end (242), the free end (243) is contacted to another one of the plurality of first printed circuits (22) when the operating member (42) moves along the displacement stroke (421).

4. The micro switch (100) as claimed in claim 2 or 3, wherein the trigger structure (24) is formed of at least two conductive elastic plates (241), and the operating member (42) contacts at least one of the two conductive elastic plates (241) before and after moving along the displacement stroke (421), respectively.

5. The micro switch (100) as claimed in any of the claims 1 to 4, wherein the circuit board (20) comprises a second side (27) opposite to the first side (21), a plurality of second printed circuits (28) arranged on the second side (27), and at least one conductive through hole (29) electrically connected to one of the plurality of first printed circuits (22) with one of the second printed circuits (28), two of the plurality of second printed circuits (28) extend out of the casing (10) to be served as at least two second conductive pins (281, 282) of the micro switch (100), when the operating member (42) contacts the trigger structure (24) while moving along the displacement stroke (421), electrical signals generated by the two of the at least two second conductive pins (281, 282) are changed.

6. The micro switch (100) as claimed in claim 5, wherein the circuit board (20) comprises at least one second resistor disposed on the second side (27) and electrically connected to the two of the plurality of second printed circuits (28).

7. The micro switch (100) as claimed in claim 5 or 6, wherein the trigger structure (24) is formed of at least one conductive elastic plate (241).

8. The micro switch (100) as claimed in claim 7, wherein the conductive elastic plate (241) comprises a fixed end (242) mounted on the circuit board (20) and electrically connected to one of the plurality of first printed circuits (22), and a free end (243) opposite to the fixed end (242), the free end (243) is contacted to contact another one of the plurality of first printed circuits (22) when the operating member (42) moves along the displacement stroke (421).

9. The micro switch (100) as claimed in claim 8, wherein the trigger structure (24) is formed of at least two conductive elastic plates (241), and the operating member (42) contacts at least one of the two conductive elastic plates (241) before and after moving along the displacement stroke (421), respectively.

10. The micro switch (100) as claimed in any one of claims 1 to 9, wherein the casing (10) comprises a cover (12) forming the space (11) and a base (13) mounted in the cover (12) for disposal of the circuit board (20), the base (13) divides the space (11) into a first part (111) and a second part (112), the first part (111) provides the operating member (42) to move therein, and the second part (112) is provided with the first resistor (23) therein.

11. The micro switch (100) as claimed in claim 10, wherein the base (13) comprises a slot (131) formed on a side of the base (13) for disposal of the circuit board (20).

12. The micro switch (100) as claimed in claim 11, wherein the base (13) comprises at least one protruding rib (133) formed in the slot (131) to jointly restrain the circuit board (20).

13. The micro switch (100) as claimed in claim 11 or 12, wherein the cover (12) comprises at least one stepped wall (122) surrounding the space (11) to limit a position of the base (13).

14. The micro switch (100) as claimed in any of the claims 10 to 13, wherein the base (13) comprises a positioning block (134) located in the first part (111) for positioning the elastic member (41).

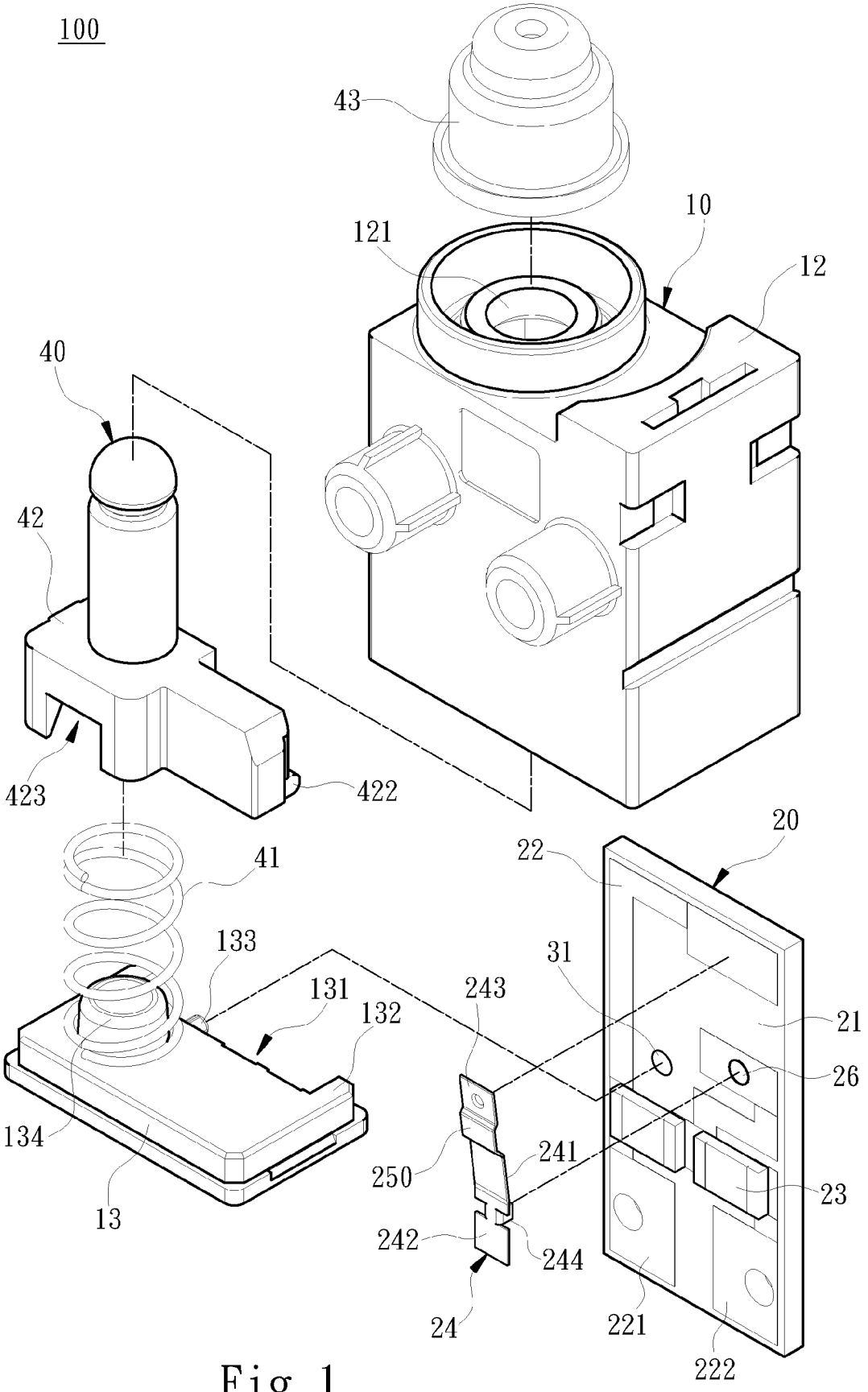
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Fig. 1

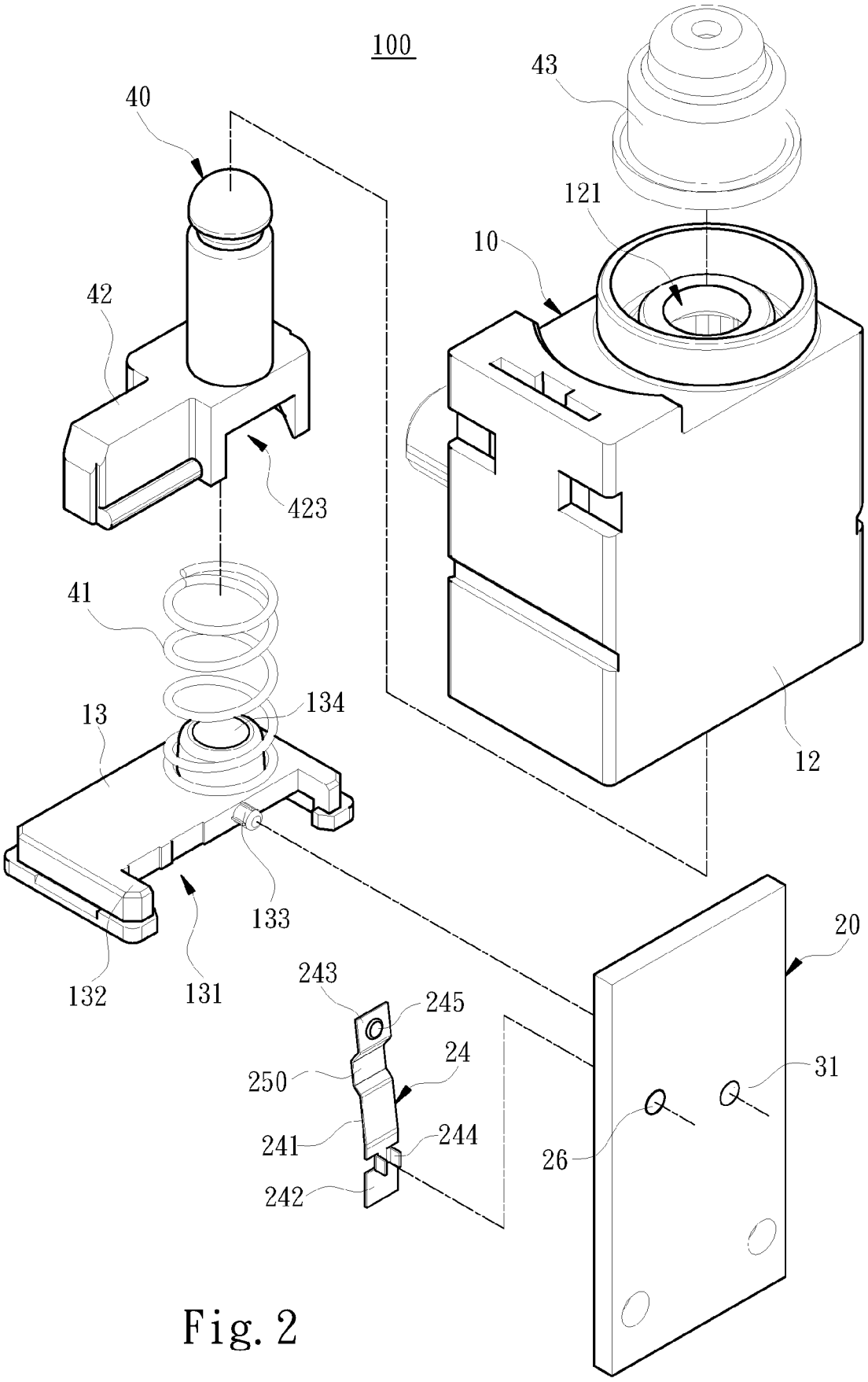
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Fig. 2

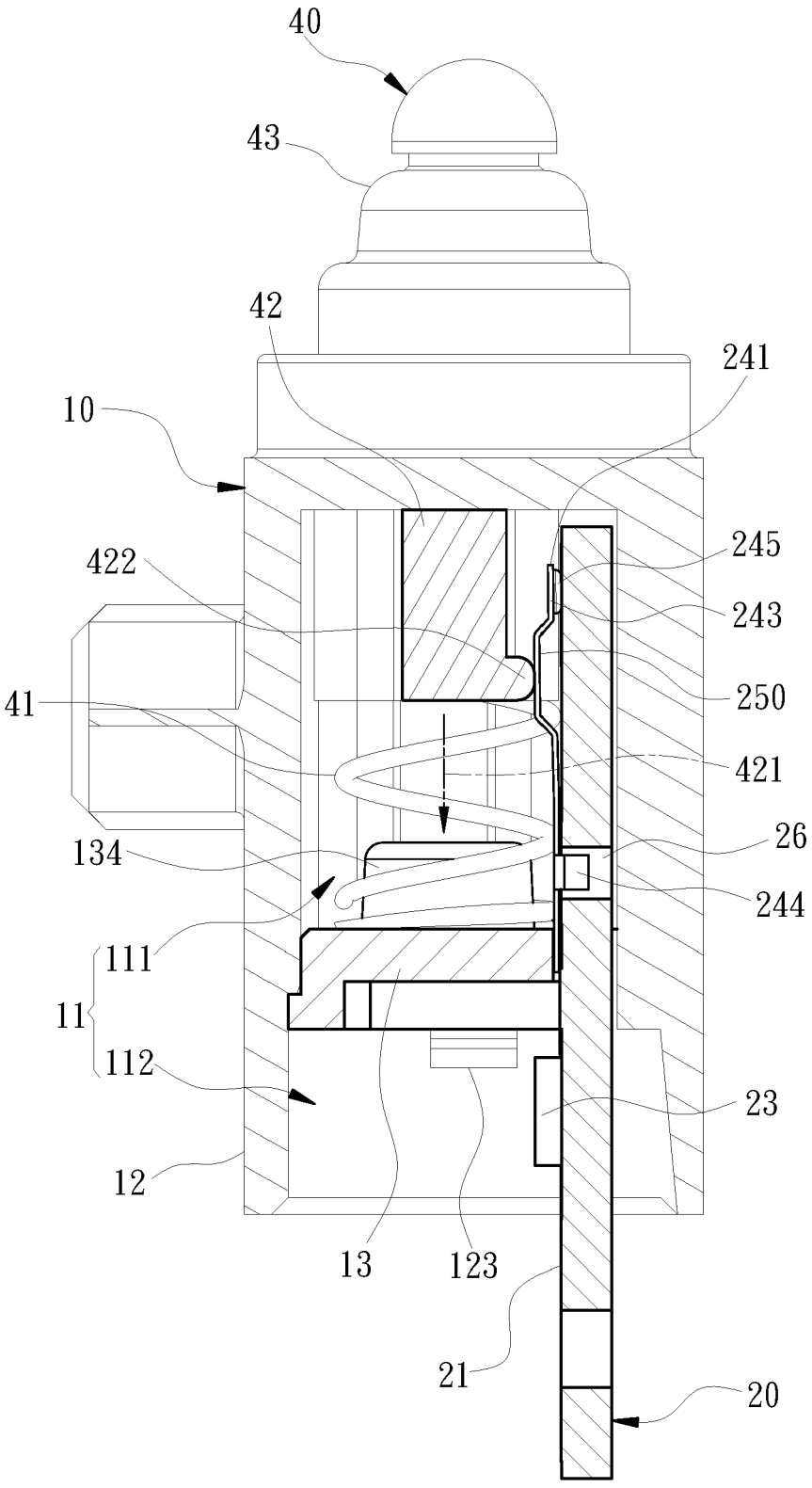
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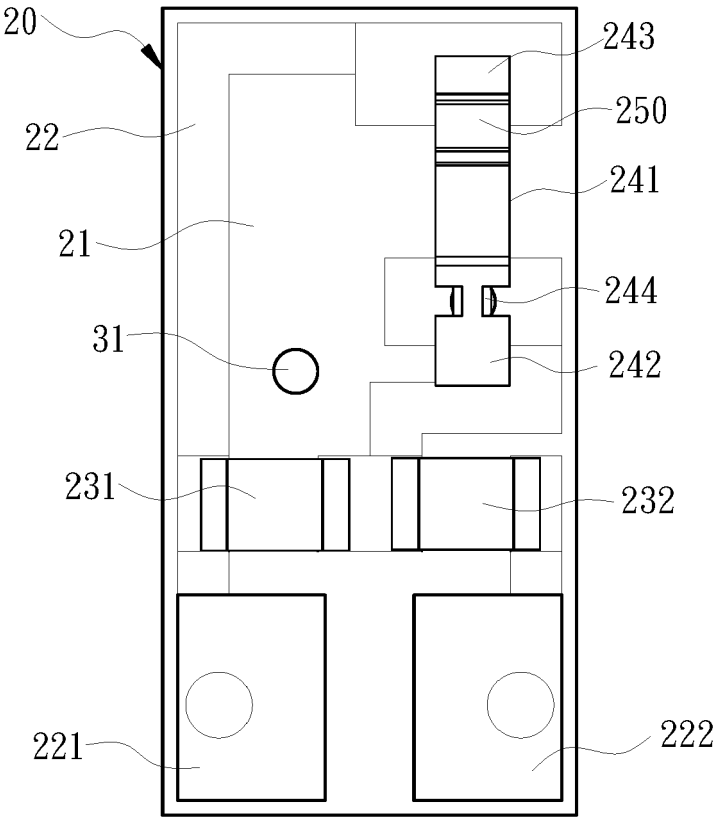
Fig. 3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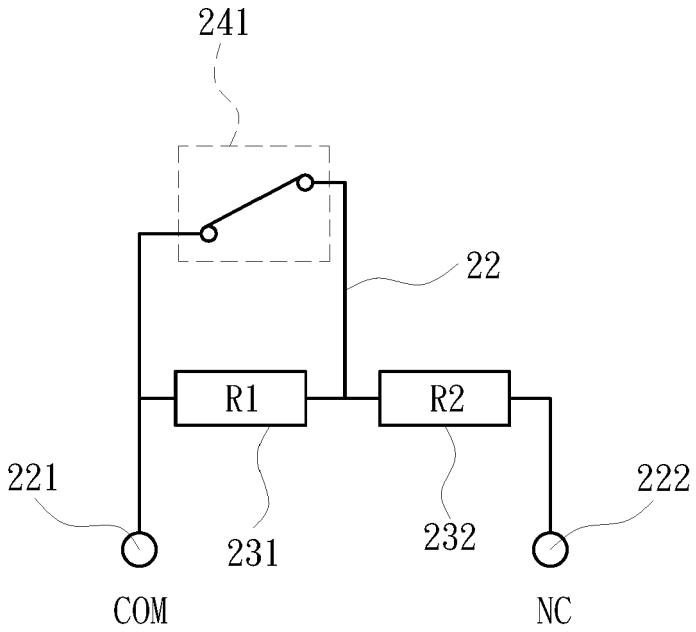
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Fig. 5

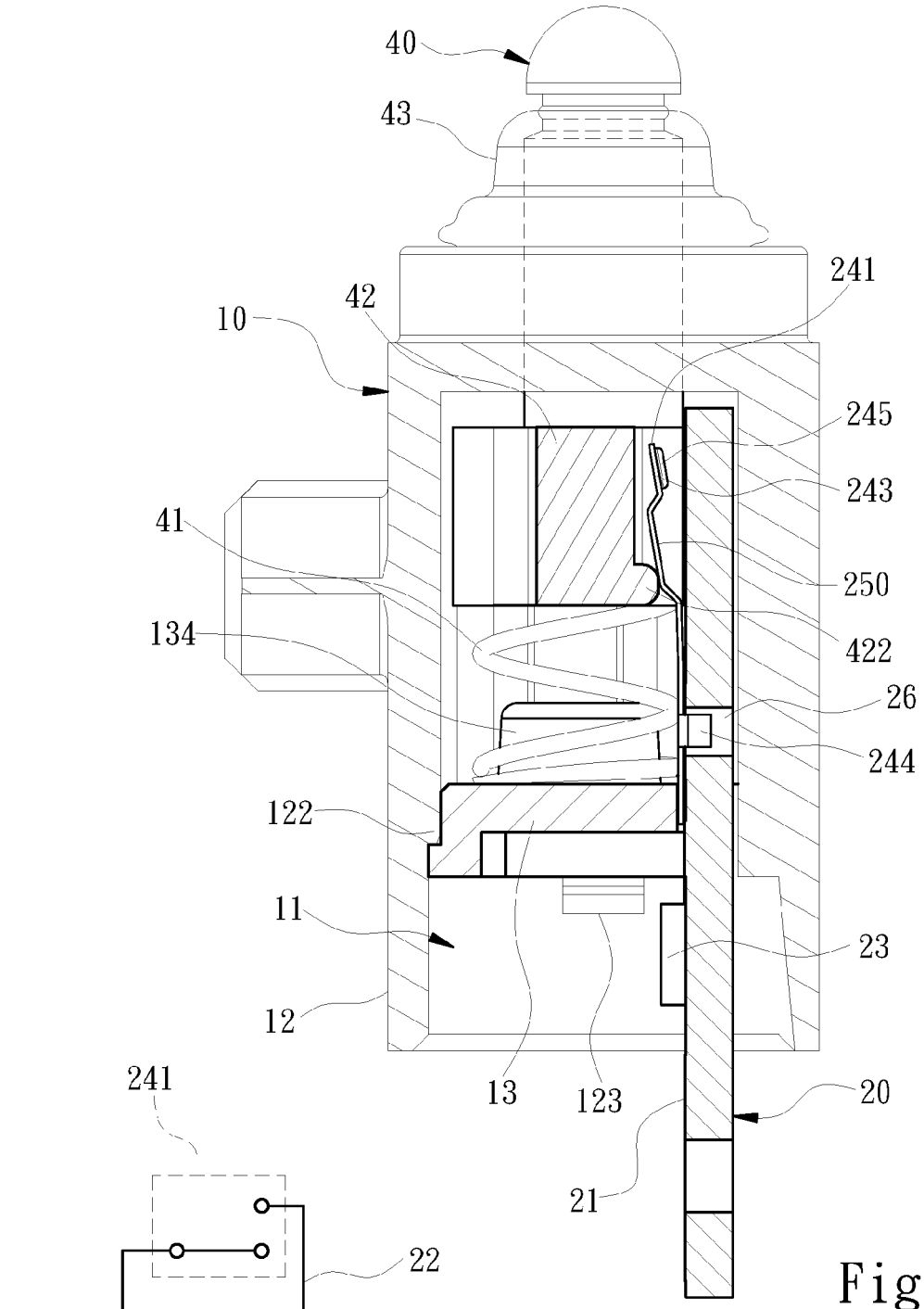
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Fig. 6

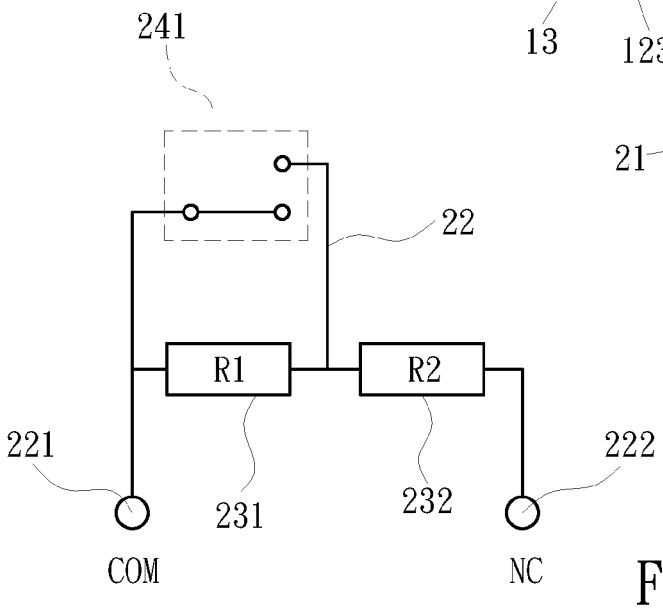
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Fig. 7

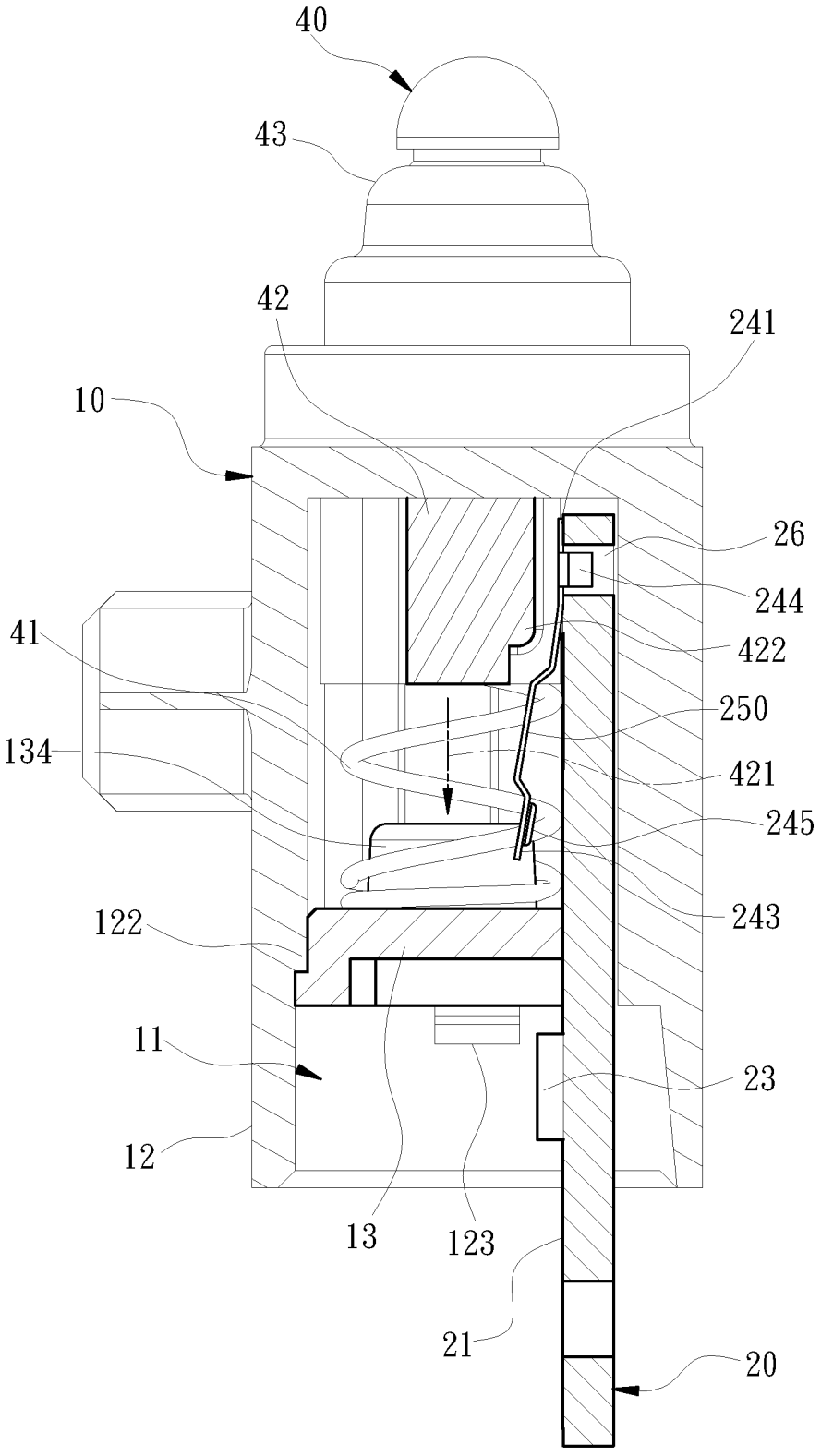
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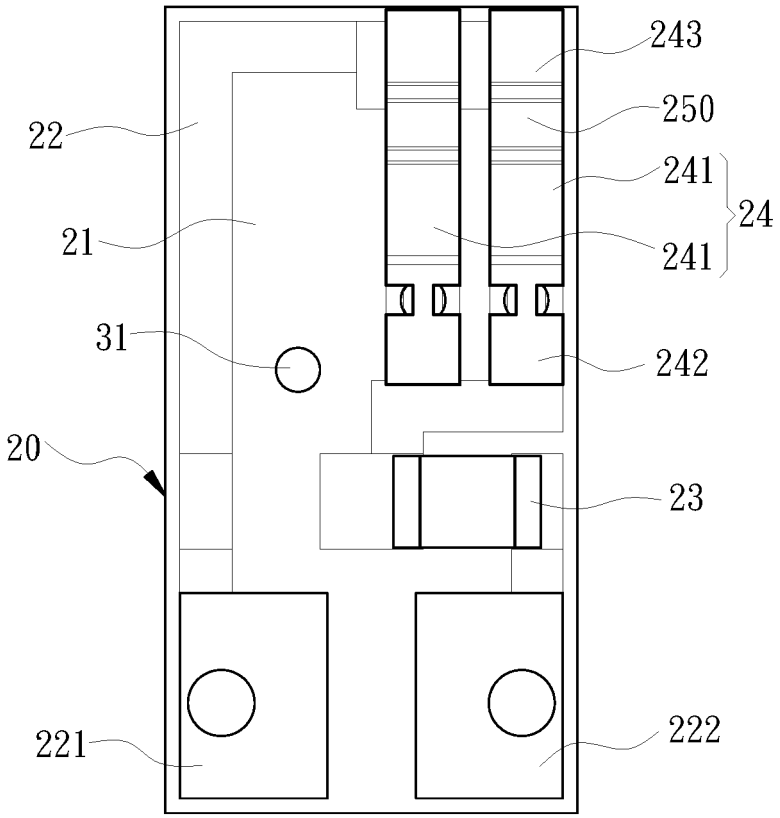
Fig. 8



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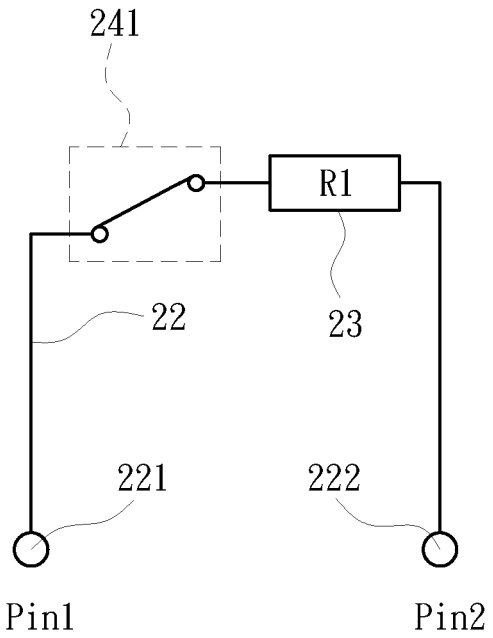

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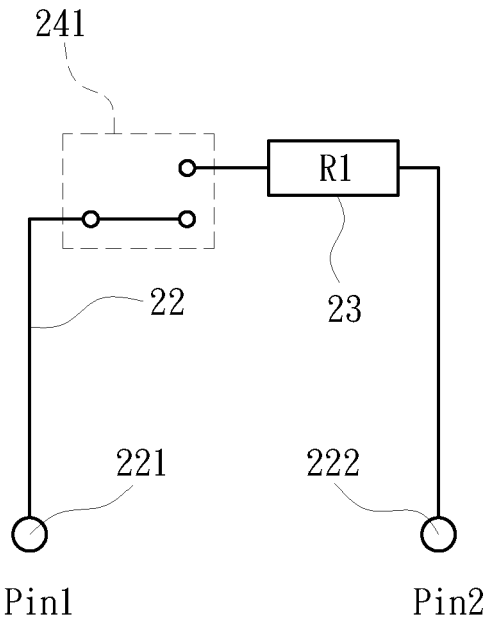

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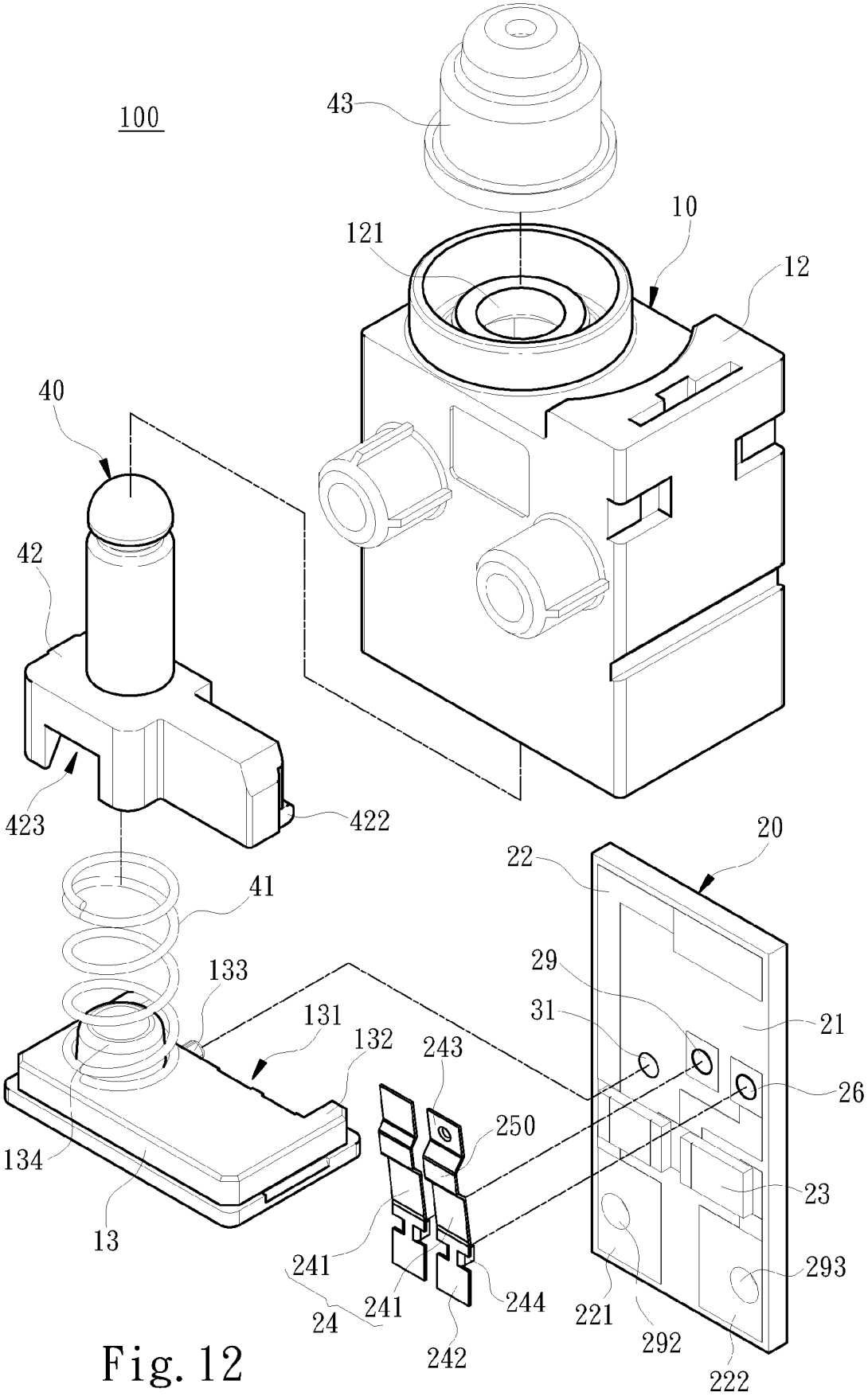
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Fig. 12

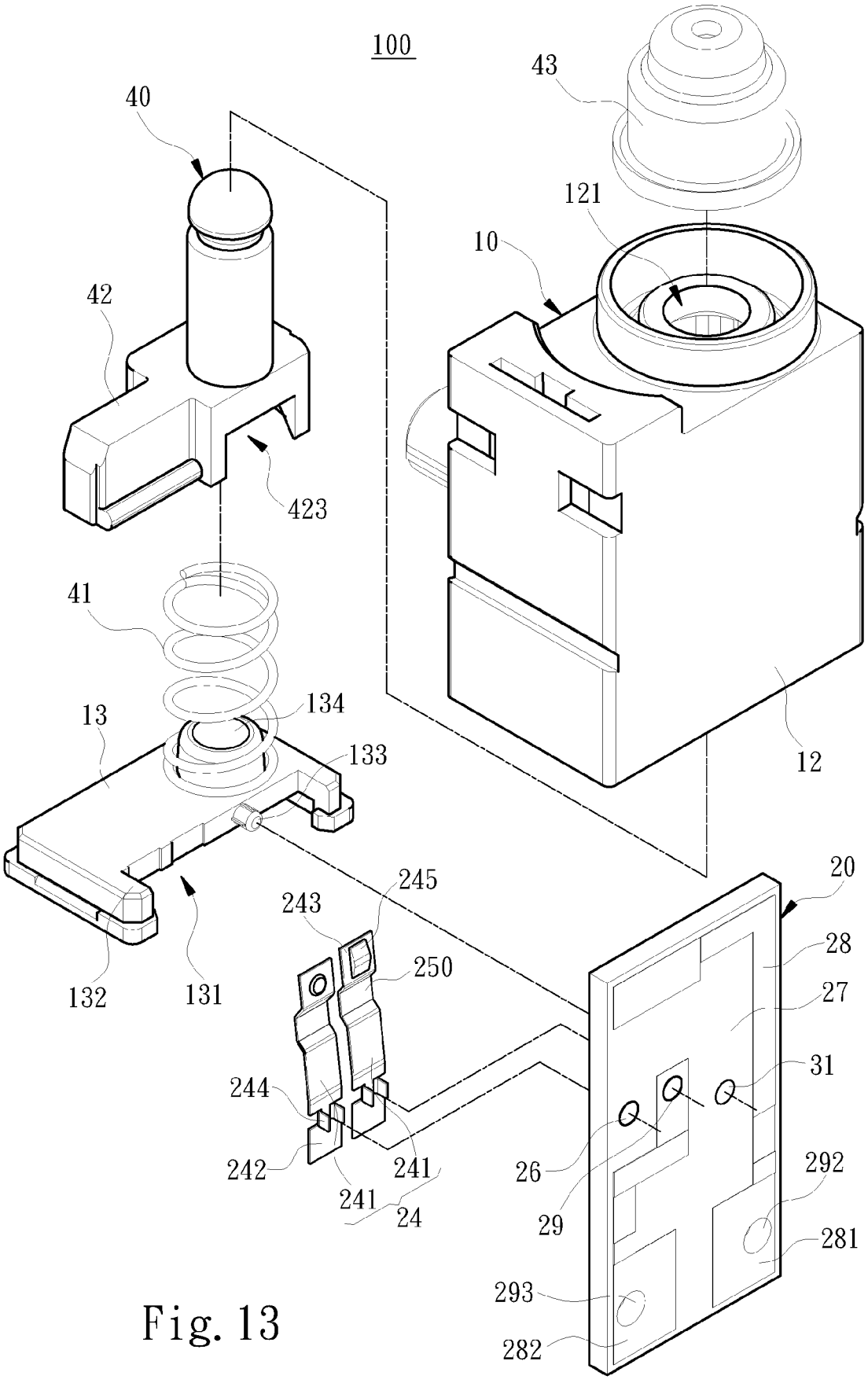
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Fig. 13

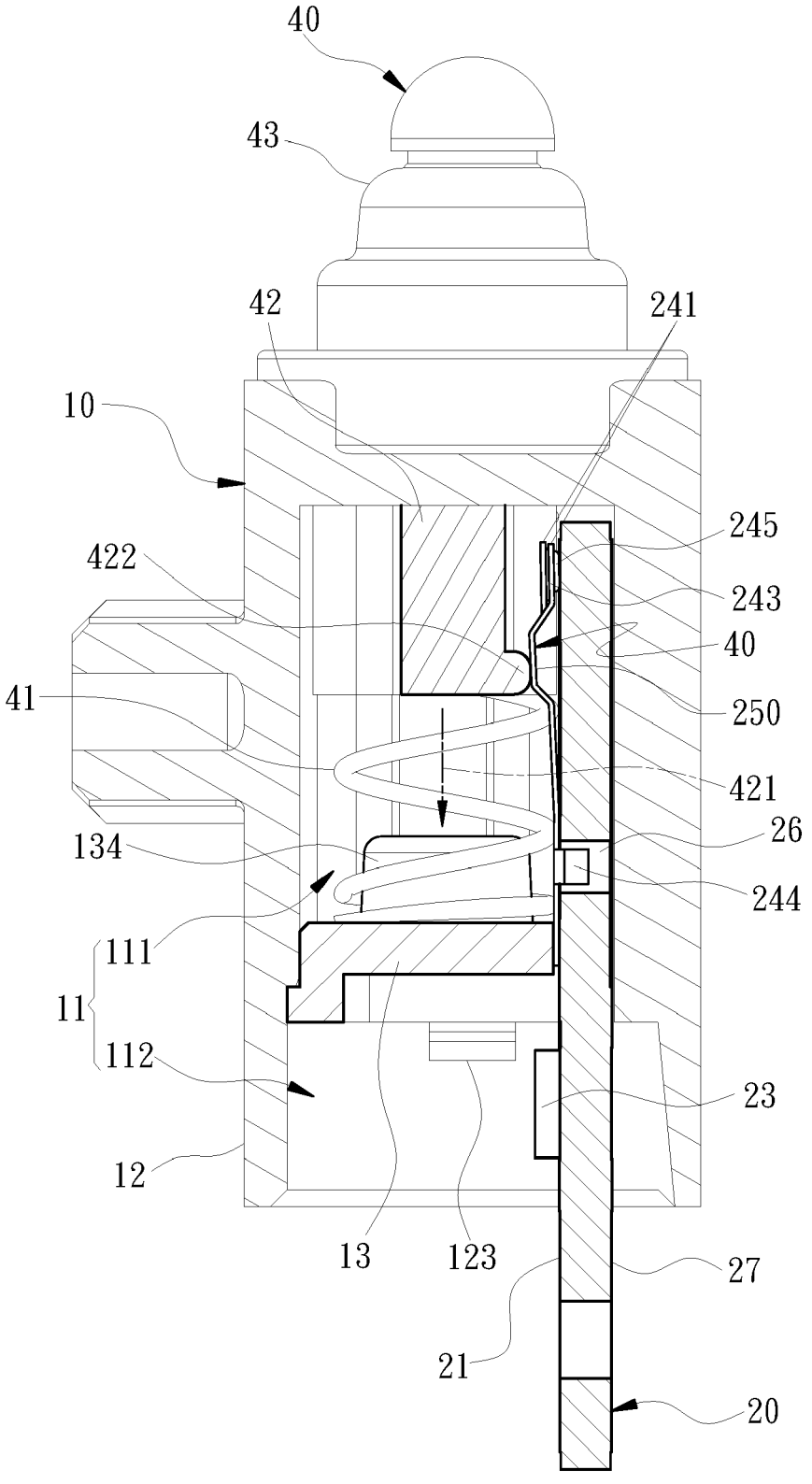
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Fig. 14

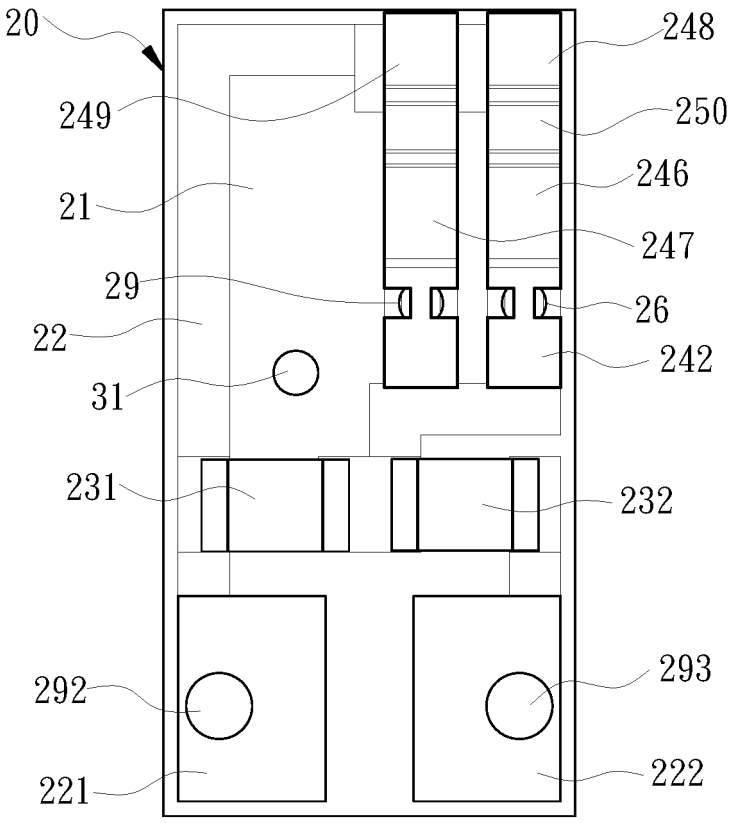
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Fig. 15

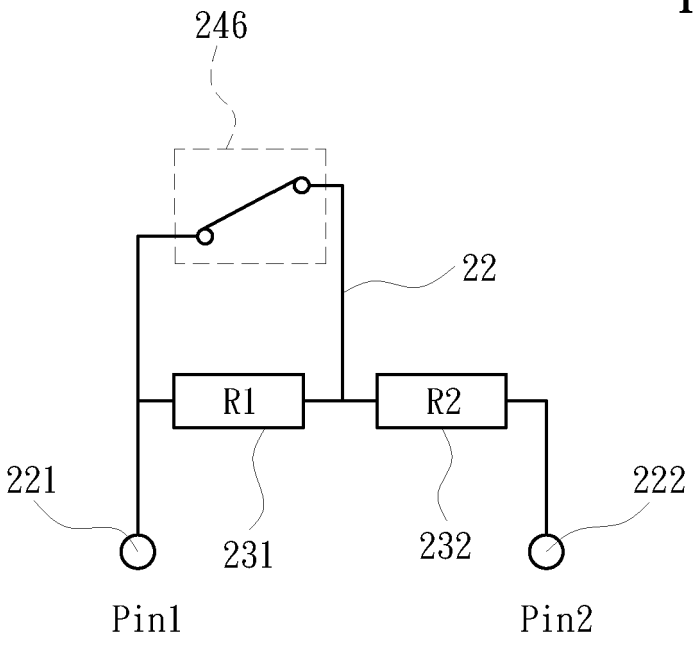
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Fig. 16

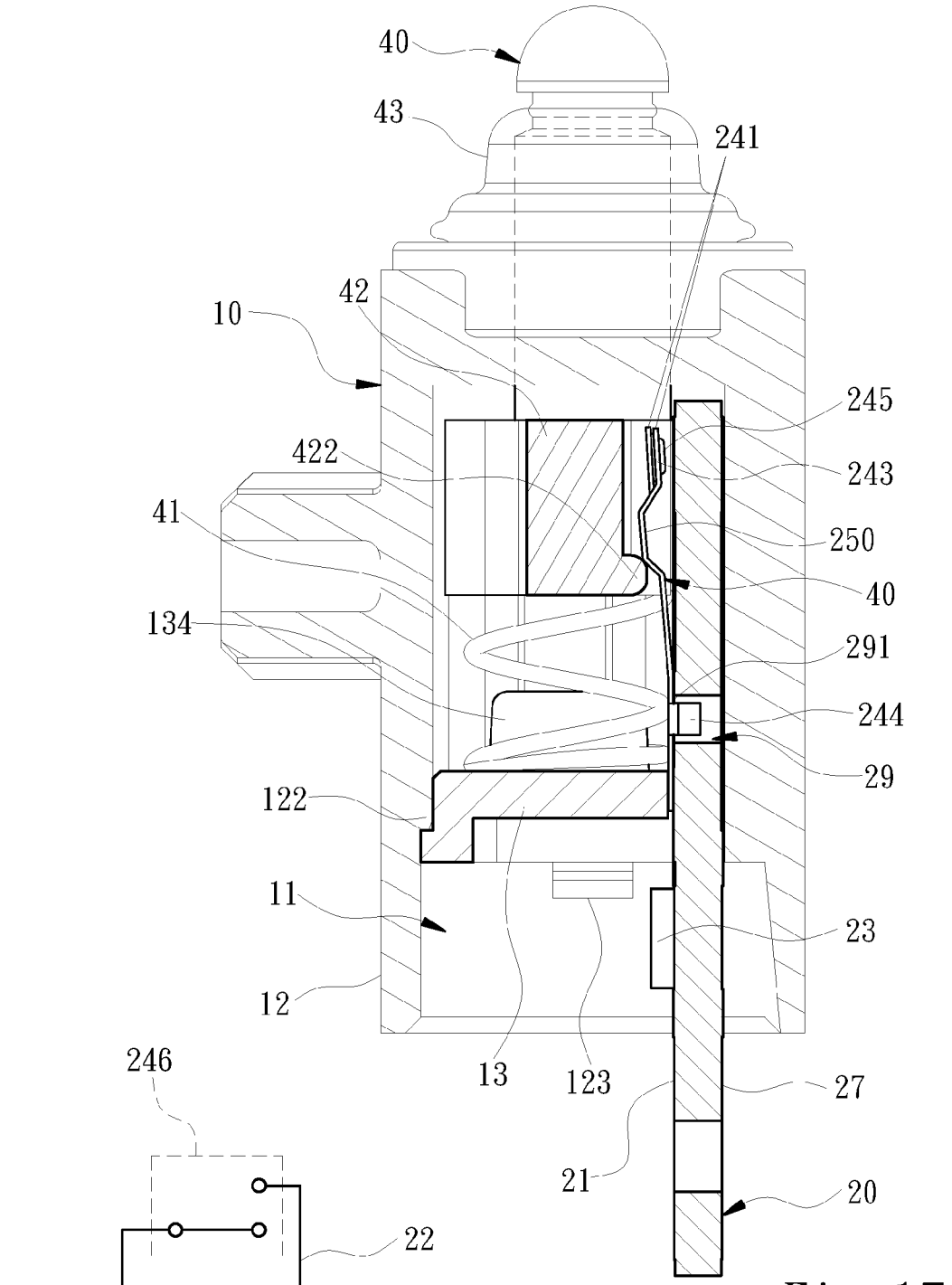
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Fig. 17

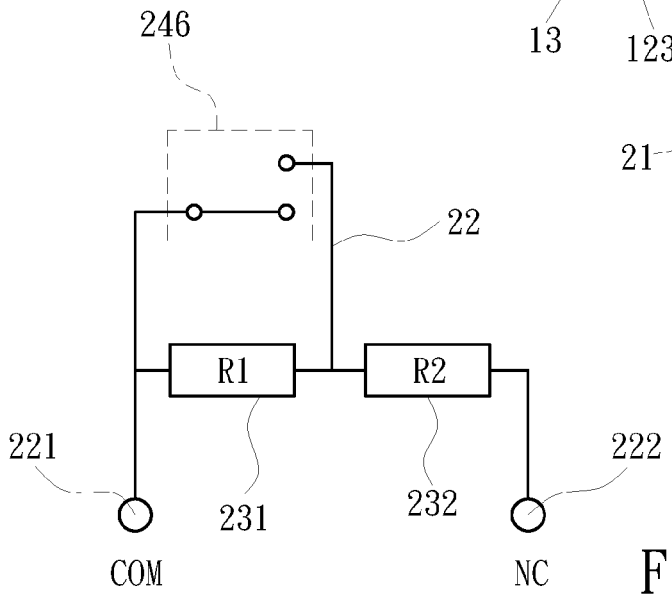
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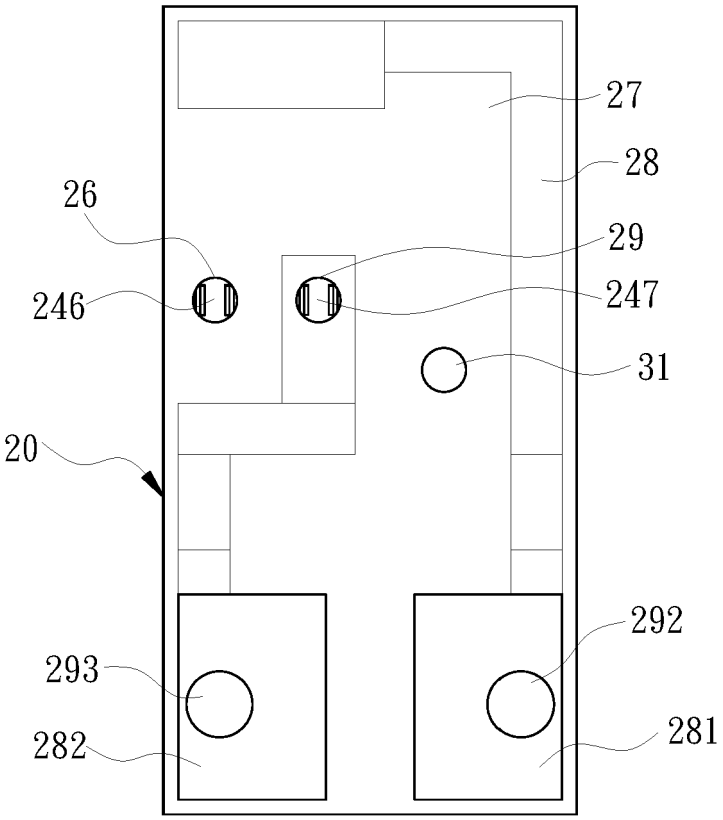
Fig. 18



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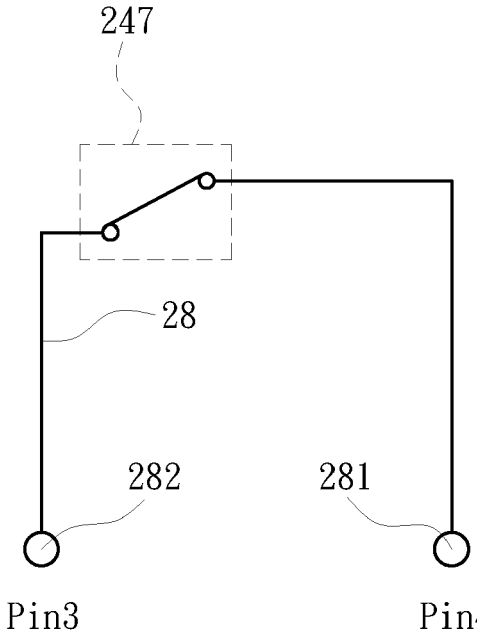

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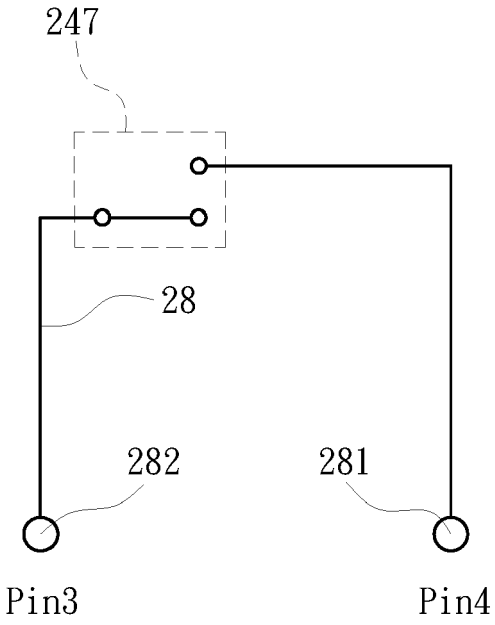

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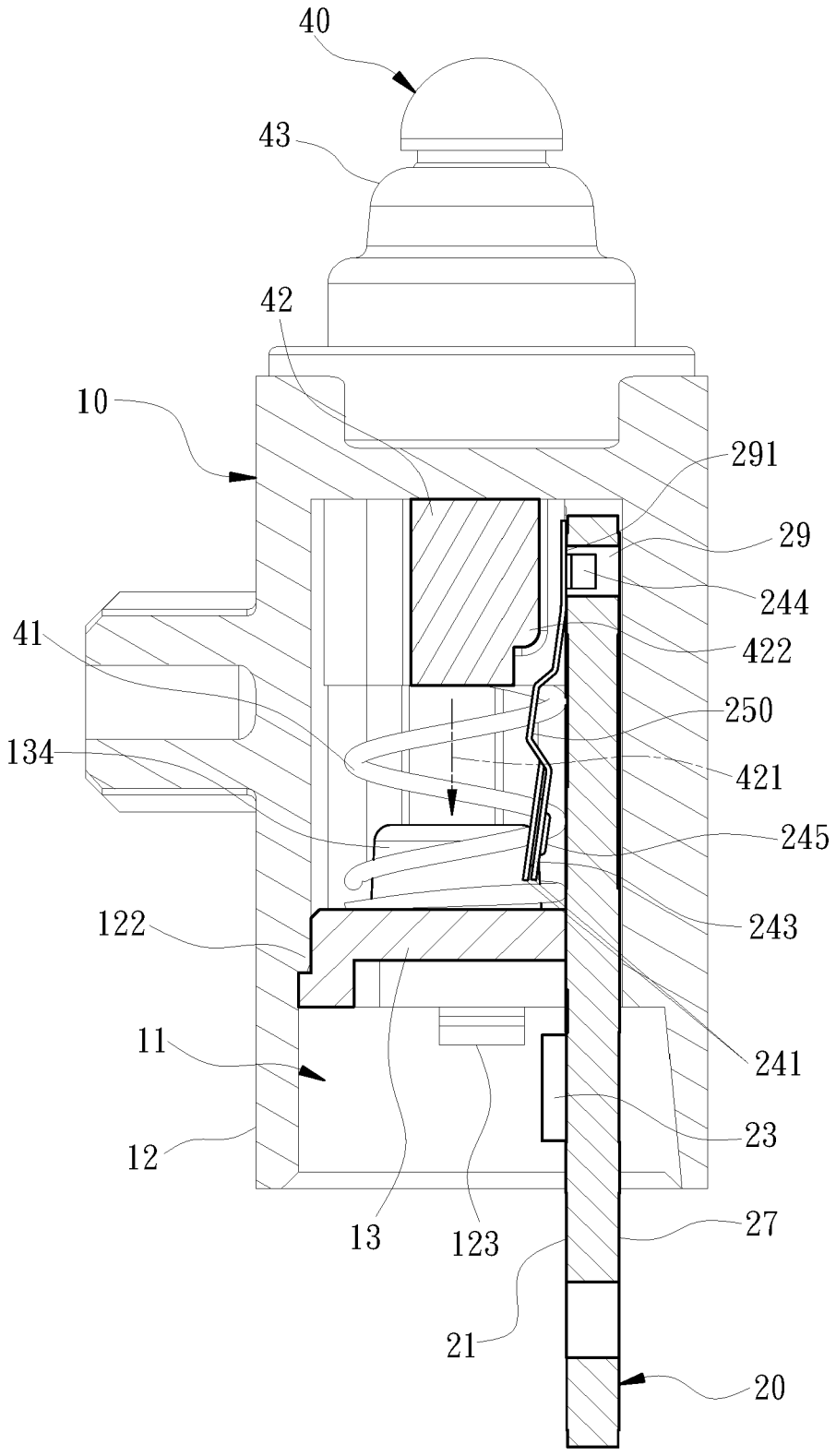
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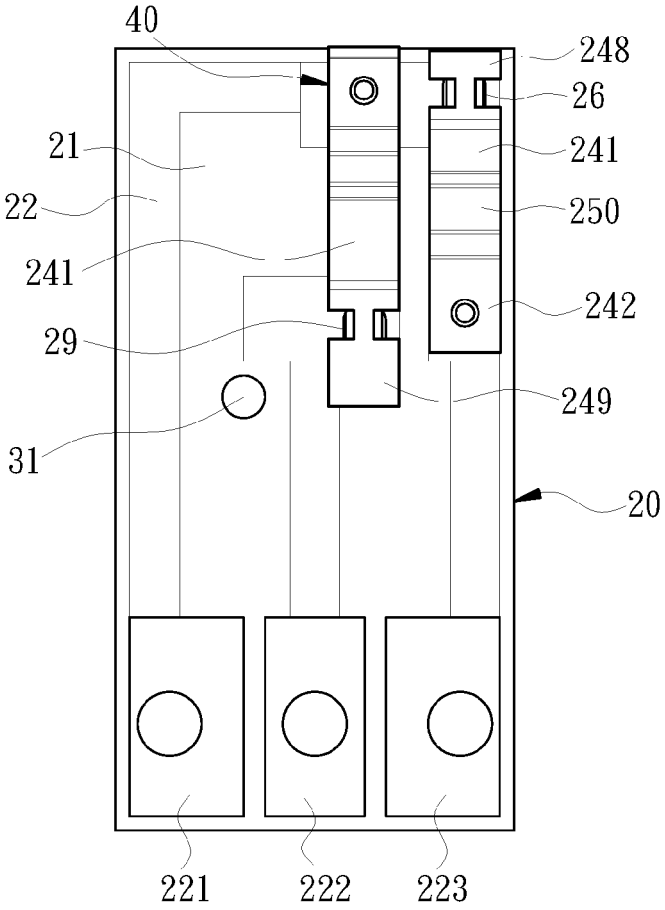
Fig. 22



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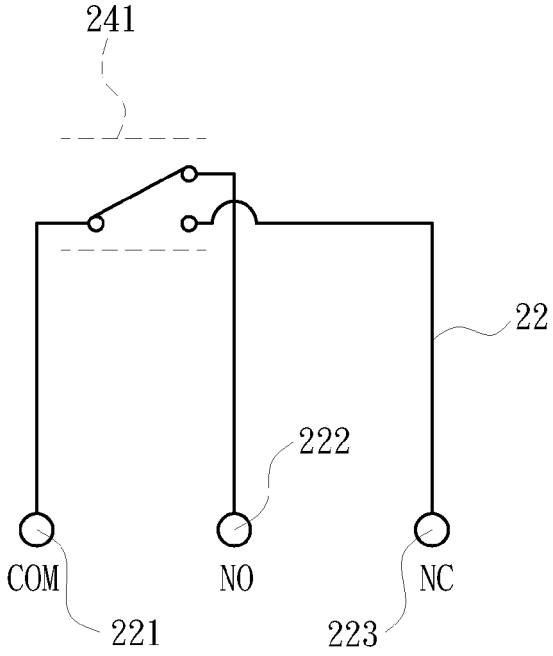

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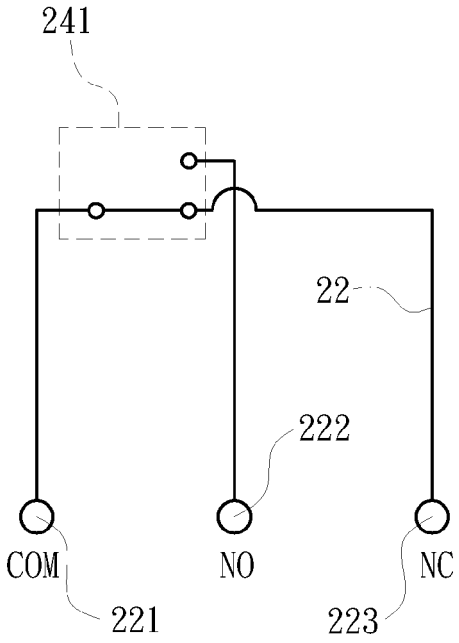

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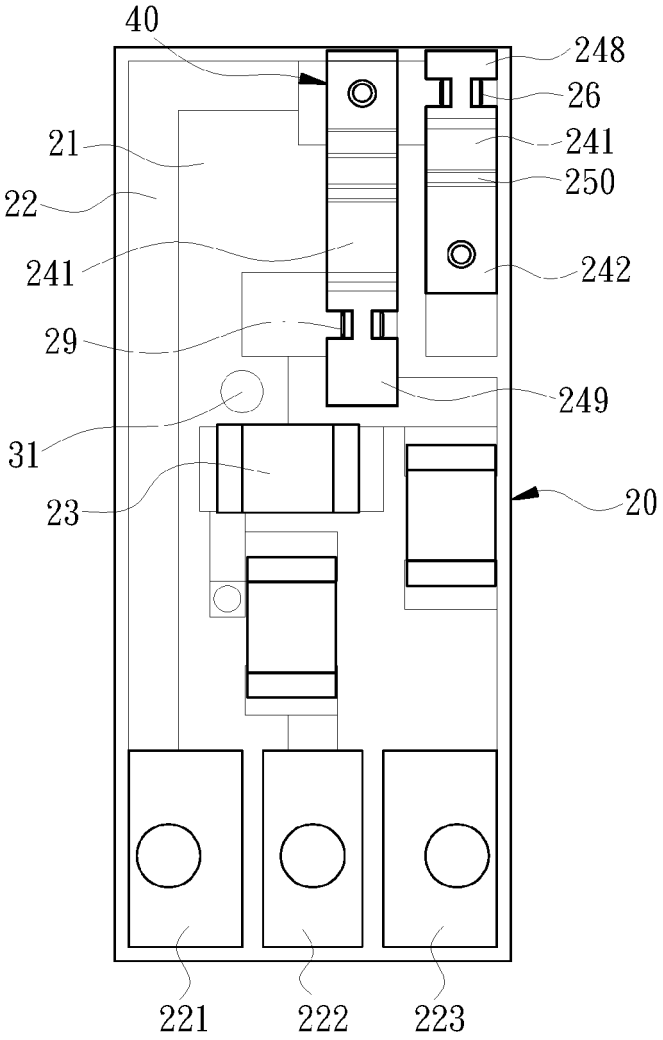

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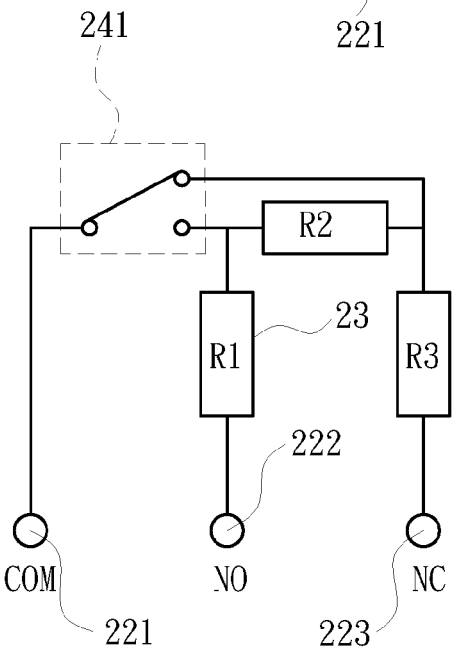

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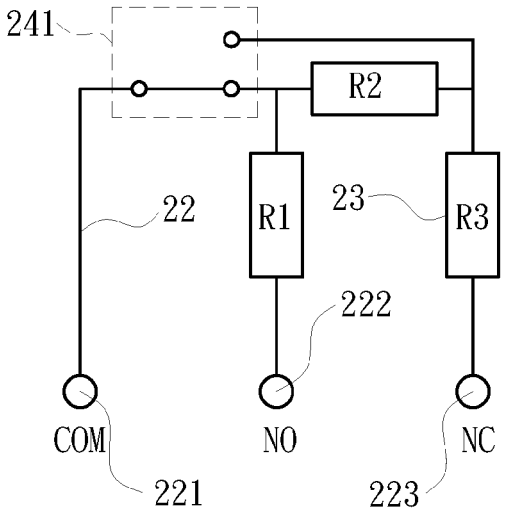

Fig. 28

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EUROPEAN SEARCH REPORT

Application Number
EP 22 17 2949

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
A	US 2016/099119 A1 (MIYOSHI TETSUHIKO [JP] ET AL) 7 April 2016 (2016-04-07) * paragraph [0039] - paragraph [0056]; figures 1-6A *	1-14	INV. H01H9/02 H01H13/28 H01H3/02 H01H13/18
A	EP 3 745 436 B1 (KEDU ELECTRIC CO LTD [CN]) 1 December 2021 (2021-12-01) * paragraph [0015] - paragraph [0038]; figures 1-7 *	1-14	
A	US 2017/092445 A1 (ZHANG HUA [CN] ET AL) 30 March 2017 (2017-03-30) * paragraph [0015] - paragraph [0019]; figures 1,2 *	1-14	
A	JP 6 188155 B2 (ALPS ELECTRIC CO LTD) 30 August 2017 (2017-08-30) * the whole document *	1-14	
			TECHNICAL FIELDS SEARCHED (IPC)
			H01H

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
Munich	31 October 2022	Drabko, Jacek

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31-10-2022

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- CN 105489429 B **[0003]**
- US 10256056 B2 **[0003]**
- EP 3002768 B1 **[0003]**
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