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(54) VOLTAGE TAP SYSTEM FOR A FUSE-HOLDER BASE, FUSE-HOLDER BASE AND MEASUREMENT MODULE INCORPORATING SAID SYSTEM

(57) The invention allows offering maximum protection for the auxiliary connection circuit against possible accidents or hazards due to discharges or overvoltages both for qualified technical personnel and for electronic devices that can be connected to them, without having to include or add external peripheral elements, comprising a conductive element (30) connected on one hand to a contact point (3) for tapping the voltage of the fuse-holder base (1), and on the other hand to an electric cable (4) or voltage tap output terminal.

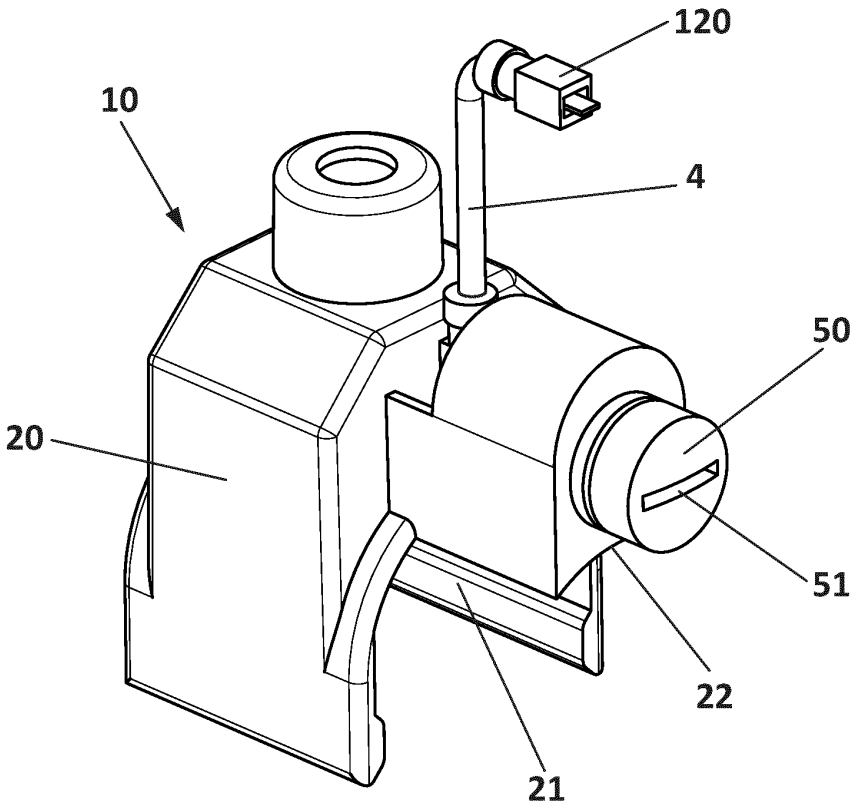

FIG. 4

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Description

Object of the Invention

[0001] The present invention is comprised in the field of fuse holders or protection devices for NH-type electrical fuses.

[0002] The object of the present invention is a voltage tap system for fuse-holder bases, a fuse-holder base, as well as a measurement module incorporating said voltage tap system, whereby effectively protecting the connection circuit, without having to include or add external peripheral elements, therefore reducing additional installation space.

Background of the Invention

[0003] Electric switches with fuses, based on housing a fuse for protecting distribution lines in low-voltage systems, also known as fuse-holder bases, are well known today.

[0004] A fuse-holder base generally consists of a rail or socket that supports the connection contacts or clamps and is connected to the respective bus bars. These fuse-holder bases can house one or more fuses, and in some cases can be load break blocks. In that sense, fuse-holder bases including three pairs of contacts are known, each pair of contacts being electrically connected to a conductive strip of the low-voltage switchboard of the corresponding electric installation. There is generally one pair of contacts for each electric phase, such that a fuse is coupled between each pair of contacts.

[0005] Generally, fuse-holder bases are classified according to the number of poles (or phases) they protect. They can be single-pole (when they protect one phase), two-pole (when they protect two phases), or, in the most common cases, three-pole (where the three phases of the distribution system are protected). Nevertheless, distribution systems can also be four- or five-pole systems, i.e., the three phases plus the neutral conductor, or the three phases plus the neutral conductor and the ground conductor. Power monitoring systems, which require the signal from the voltage tap, normally use signals from the three phases, but in some cases, depending on the application, a neutral conductor voltage tap is required.

[0006] In relation to the fuses, they can be fuses with high breaking capacity against short-circuit currents, better known as "NH fuses". These fuses basically consist of an input contact and an output contact, both in the form of a blade, which are electrically connected to the connection contacts. Furthermore, these fuses have a pair of generally T-shaped tabs, one of them being placed close to the input contact and the other one close to the output contact. These tabs serve as a grip or fixing element for handling the fuse, but they can also be isolated with respect to the blade of the fuse. When these tabs or posts are not electrically connected with the input and output contact of the fuse, it is the case of the so-called isolated post fuses.

[0007] Today, in order to know the potential of a specific point in an electric circuit, it is known to be common to establish contact at that point or at any other point that is electrically connected with it and there cannot be a high resistance or any other distorting element between them. More particularly, it is known that the basic circuit of a fuse-holder base can be divided into three well distinguished zones: 1) the input circuit, comprising the elements upstream of the fuse; 2) the fuse element itself; and 3) the output circuit, comprising the elements downstream of the fuse.

[0008] Today there is an ever growing trend to control user power consumption for the purpose of saving energy and accordingly saving costs, while at the same time benefitting the environment. To that end, the consumed voltage and current values need to be known, so measurement devices must be arranged in the low-voltage switchboards of the corresponding electric installation. In the specific case of fuse-holder bases for low-voltage switchboards, bases provided with systems that allow monitoring and measuring their electric working parameters are already known. Voltage and/or current values are detected by means of these systems either directly or through transducers associated with the fuse-holder base.

[0009] In a fuse-holder base, voltage taps can be implemented either upstream or downstream of the main fuse in order to measure working voltages and/or to monitory the state of the fuse. Therefore, voltage tap systems which are connected directly in the input contacts, others which are connected in the fuses, and others which are connected in the connection spades, or even touching the general contact bar, are known. However, they are all electrically connected points that are upstream of the fuse. The same thing occurs with the output contacts, the output terminals, the connection cable, or the input and output contacts of the fuses. They, too, are all electrically connected points. They are all points at which voltage tap systems are known to be connected. The voltage can also be tapped from the lugs of the fuse. The need to tap the voltage from one point or another will be determined by the accessibility to it and by the space available in the final application. To that end, it is necessary to find solutions for different positions of the voltage tap and for different particular embodiments, offering a solution to the different drawbacks existing.

[0010] In addition, measurement modules for the output terminals of a fuse-holder base including voltage and current taps are also known in the state of the art. The biggest problem with these current measurement modules is that their voltage taps are completely unprotected, without any isolation or protection element whatsoever. In other cases, there are auxiliary measurement systems based on the incorporation of an auxiliary support or peripheral outside the fuse-holder base, with the additional wiring and installation issues this entails, because low-voltage switchboards generally have a very small and limited space.

[0011] Another drawback is that in the event of a short-circuit in said current auxiliary measurement systems, the main fuses also blow, cutting off the power supply to the fuse-holder base, with the subsequent drawbacks this entails. Furthermore, the features required in the main fuses are different from those of the auxiliary protection system, because in the second case, they must be faster in order to protect the corresponding technical personnel at all times against the high voltage levels running through fuse-holder bases of this type with NH fuses for industrial, not household, applications.

[0012] Furthermore, the voltage tap itself and the subsequent lead cable transmitting the signal become a possible focus of origin of short-circuits. At the same time, the devices arranged for measuring or treating the acquired data become user handling points and added risks for the installation. In addition, maintenance work or any other task that requires handling the monitoring devices that can be connected to the voltage taps is common. In those cases, it may be necessary for safety's sake to disconnect them from the main circuit, i.e., to disconnect the contact point from the fuse-holder base.

Description of the Invention

[0013] The drawbacks mentioned above are solved by means of the present invention by providing a safe and effective voltage tap system for fuse-holder bases, as well as a fuse-holder base and a measurement module incorporating said voltage tap system, whereby maximum protection of the connection circuit against possible accidents or hazards due to discharges or overvoltages both for qualified technical personnel and for the electronic devices that can be connected to them, without having to include or add external peripheral elements, or therefore requiring any additional installation space. More particularly, auxiliary electrical protection having a specific application specific for voltage taps of fuse-holder bases with NH-type fuses is described herein.

[0014] The voltage tap system comprises a conductive element connected on one hand to a contact point for tapping the voltage of the fuse-holder base and on the other hand to an electrical conductor or voltage tap output terminal.

[0015] At this point it is important to point out that when "contact point for tapping the voltage" is mentioned in the present specification, it herein refers to any point of a fuse-holder base where it is possible to tap the voltage, whether it is at the usual output connection of each of the phases of the fuse-holder base, the fixing clamps for fixing the fuses, or the actual tabs or posts of the fuses, which are also active zones of the base and are, therefore, live.

[0016] So by means of this particular arrangement of the voltage tap system attached and/or connected directly on the contact point for tapping the voltage, whatever the latter may be, the physical distance existing between both elements is reduced to a minimum, assuring maximum protection of the electric installation and thereby protecting auxiliary voltage taps, secondary devices for data capture or acquisition of data and the technical personnel authorized to access low-voltage electric switchboards.

[0017] According to a preferred embodiment of the invention, the voltage tap system additionally comprises a support in which the conductive element is mounted. More preferably, the voltage tap system further comprises an auxiliary protection element communicating the contact point for tapping the voltage with the electrical conductor or voltage tap output terminal. The possibility of said auxiliary protection element being able to be an auxiliary cylindrical-type fuse, a thermal magnetic circuit breaker, or any other electronic device having similar functions capable of offering protection against overloads and short-circuits is therefore contemplated. Furthermore, the auxiliary protection element has been envisaged to be fixed on an auxiliary fuse-holder base.

[0018] According to a second object of the invention, a preferably three-pole fuse-holder base is described, comprising a socket or rail supporting at least one pair of clamps for fixing at least one fuse, input and output connections, and at least one input and/or output contact point for tapping the voltage. Said fuse-holder base further comprises a voltage tap system such as the one described in preceding paragraphs, suitable for being connected to an output connection of the fuse-holder base.

[0019] In addition, according to a third object of the invention, a measurement module is described, comprising at least one voltage tap system such as the one described in preceding paragraphs, preferably comprising at least one conductor that can be connected to the output connections of the fuse-holder base; voltage tapping connectors; and an additional electrical conductor for tapping the voltage in the neutral conductor.

[0020] Also, by means of a particular arrangement of the voltage tap system explained below, the fuse itself becomes the contact point, and the conductive element for tapping the voltage is a flexible element that may be in contact with the fuse or that may stop being in contact with the fuse simply by inserting or removing said fuse. Therefore, if it were necessary to cut off the power supply to the auxiliary circuit, the fuse would simply have to be taken out and the electronic devices connected to the voltage taps would be electrically isolated from the main circuit, thereby allowing the safe handling thereof.

Description of the Drawings

[0021] To complement the description that is being made and for the purpose of aiding to better understand the features of the invention according to a preferred practical embodiment thereof, a set of drawings is attached as an integral part of said description in which the following is depicted with an illustrative and non-limiting character:

Figure 1 shows a side view of a three-pole fuse-holder base in which the voltage tap system object of invention has been incorporated at its output, according to a first preferred embodiment.

Figure 2 shows a perspective view of the output of Figure 1, where three voltage tap systems arranged in the form of a triangle can be seen associated with each of the three voltage taps with the corresponding fuses.

Figure 3 shows a side view of one of the voltage tap systems shown in Figure 2, in this case without support to clearly depict the interconnection between the output of the fuse-holder base with the distribution cable and the conductive element, respectively.

Figure 4 shows a top perspective view of the support, an auxiliary fuse-holder base for fixing the corresponding auxiliary fuse, according to the first preferred embodiment, being seen in this case.

Figure 5 shows a bottom perspective view of the support shown in Figure 4.

Figure 6 shows a perspective view of a three-pole fuse-holder base in which the support and a measurement module incorporating three voltage tap systems have been installed "downstream", according to a second preferred embodiment, an aligned arrangement of the auxiliary fuse-holder bases being seen.

Figure 7 shows a perspective view of another three-pole fuse-holder base in which the auxiliary fuse-holder bases as well as voltage tapping connectors have been installed "upstream", according to a third preferred embodiment.

Figure 8 shows a side view of the fuse-holder base of Figure 7, being seen electrical conductors for the communication between the input connections of the fuse-holder base and the auxiliary protection elements.

Figures 9A and 9B show respective side views of the fuse-holder bases of the second and third embodiments, respectively, where an additional electrical conductor for tapping the voltage in the neutral conductor is furthermore shown.

Figures 10A-10D show respective perspective views of a fuse-holder base provided with the voltage tap system of the invention, according to a fourth preferred embodiment.

Preferred Embodiment of the Invention

[0022] Several preferred embodiments are described below in reference to the figures described above, without this limiting or reducing the scope of protection of the present invention.

[0023] Figure 1 shows a three-pole fuse-holder base (1), with its corresponding distribution cables (5) connected to the output connections (8), pairs of clamps (6) for fixing fuses (2) through their blades (2.1), as well as the corresponding input and output connections (7, 8) thereof. Furthermore, this fuse-holder base (1) shown in Figure 1 incorporates three voltage tap systems (10) object of invention, where according to a first preferred embodiment said voltage tap system (10) comprises:

- a support (20), shown in Figures 1, 2, 4 and 5, provided in this embodiment with a first chamber (21) for protecting, at least in part, the output connection (8) of the fuse-holder base (1), and a second chamber (22) for housing an auxiliary protection element (40) consisting in this embodiment of an auxiliary fuse fixed on an auxiliary fuse-holder base (50),
- a conductive element (30), depicted in Figures 3 and 5, which is mounted in the support (20) and is connected on one hand to a contact point (3) for tapping the voltage of the fuse-holder base (1) and on the other hand to an electrical conductor (4) or voltage tap output terminal;
- where a first end of said conductive element (30) is located inside the first chamber (21), whereas a second end is located inside the second chamber (22), both chambers (21, 22) communicating with one another, as shown in Figure 5.

[0024] Furthermore, in the embodiment of Figures 1 to 4 it is seen that the electrical conductor (4) has a first end intended for being housed inside the support (20) and connected to the conductive element (30), whereas a second end of the electrical conductor (4) is intended for being located outside the support (20), as shown in Figures 1, 3 and 4.

[0025] As can be seen in Figure 3, the auxiliary protection element (40), which is an auxiliary fuse in this embodiment, communicates the conductive element (30) making contact in the output connection (8) of the fuse-holder base (1) with the electrical output conductor (4). At this point, it should be pointed out that although the auxiliary protection element (40) in the present embodiment is an auxiliary fuse, particularly of the cylindrical type, said auxiliary protection element (40) can be any other switch device, such as a thermal magnetic circuit breaker, for example. Therefore, the fact that the voltage tap systems (10) described herein can be "physically" connected in a direct and simple manner at the output connections (8) of the fuse-holder base (1) allows dispensing with complex and troublesome external protection peripherals today, which furthermore take up additional space in the corresponding voltage switchboard.

[0026] As seen in Figures 2 and 4, the auxiliary fuse-holder base (50) has opening and closing means, in this example a groove (51), to allow access to the auxiliary protection element (40), making it detachable. Nevertheless, it has been envisaged that said auxiliary protection element (40) can be fixed, thereby simplifying the installation and mounting of the assembly. Furthermore, said opening and closing means can be installed in the support (20) itself or in any other type of enclosure.

[0027] In turn, it can be seen in Figures 3 and 5 that

the conductive element (30) in this first embodiment comprises a metallic element with flexible properties, such as an L-shaped band in this case, communicating the output connection (8) of the fuse-holder base (1) with the auxiliary protection element (40) by direct contact. Nevertheless, any flexible strip, screw or terminal that allows performing the same connection functions can be included instead of a metallic band.

[0028] In relation to the support (20), it should be indicated that it allows protecting against accidental contact of the terminals, thereby assuring maximum safety. Therefore, it can be seen in Figures 4 and 5 that both the first chamber (21) and the second chamber (22) of the support (20) have an arcuate, inverted U-shaped bottom surface, and where the second chamber (22) has a smaller section with respect to the first chamber (21). This particular configuration of the chambers (21, 22) allows optimal adaptation of the support (20) to the output connection (8) and distribution cable (5), as shown in Figures 1 and 2. However, in the event of them being other contact points for tapping the voltage, such as fixing clamps (6) for fixing the fuses (2) or the tabs themselves of the fuses (2), it is understood that the configuration of said support (20) would change, the final objective being to attach or couple said protection directly in the actual voltage taps.

[0029] According to a second preferred embodiment, shown in Figures 6 and 9A, a three-pole fuse-holder base (1) is seen in which the support (20) and a measurement module (100) incorporating three voltage tap systems (10) have been installed "downstream", the corresponding three auxiliary fuse-holder bases (50) being seen only in the view of Figure 6. Therefore, Figure 6 shows a vertical and aligned arrangement of said auxiliary fuse-holder bases (50) in the front panel of the measurement module (100), which favors rapid identification by and simple handling for the user.

[0030] It can be seen in Figures 6 and 9A that the measurement module (100) comprises at least one conductor (110) that can be connected to the output connections (8) of the fuse-holder base (1). Therefore, these conductors (110) of the measurement module (100) are electrically connected to the output connections (8) of the fuse-holder base (1), becoming an extension thereof and, electrically speaking, being the same point, and accordingly, said conductor (110) can be considered a contact point (3) for tapping the voltage of the fuse-holder base (1). With respect to the output connections (8), it should be indicated that in the embodiments of Figures 6 and 7, said output connections (8) are screw type, having a through hole in which a screw can be inserted, which screw is not depicted, such that a firm attachment is achieved when said screw is tightened, assuring electrical continuity.

[0031] In addition, it has been envisaged that the measurement module (100) can additionally incorporate voltage tapping connectors (120), as well as an additional electrical conductor (4) for tapping the voltage in the terminal of the neutral conductor (N), as depicted in Figures 9A and 9B.

[0032] In turn, Figures 7 and 8 show a third preferred embodiment, where an "upstream" installation of the auxiliary fuse-holder bases (50) and the voltage tapping connectors (120) can be seen. More specifically, the communication between the input connections (7) of the three-pole fuse-holder base (1) and the auxiliary protection elements (40) through respective electrical conductors (4) can be seen in the side view of Figure 8.

[0033] Finally, Figures 10A-10D depict a fourth preferred embodiment, where the conductive element (30) is flexible and/or elastic, such that said conductive element (30) is movable and/or deformable between an initial standby position and a working position in which the conductive element (30) is in direct contact with the blades (2.1) of the fuse (2). Therefore, as shown in Figure 10A, each of the conductive elements (30) is installed such that it takes up part of the path of the fuses (2), particularly their blades (2.1), such that when the fuse (2) is inserted in its corresponding location of the fuse-holder base (1), the blades (2.1) of each fuse (2) run into the conductive element (30), moving said element (30) and being in direct contact with the blades (2.1) of the fuse (2), as shown in Figure 10B or in the upper part of Figure 10C, this being seen in more detail in Figure 10D. Nevertheless, according to another non-depicted embodiment, it has been envisaged that the conductive element (30) can be a rigid element mounted on a flexible support (20), where for all intents and purposes it is essential for the conductive element (30) to be in two working positions.

[0034] More specifically, the two possible positions of the conductive element (30) can be seen in Figure 10C. Therefore, the conductive element (30) depicted in the lower position is in standby, without any deformation whatsoever and without contact with any live point of the fuse-holder base (1); whereas the conductive element (30) shown in the upper position is in the working position, i.e., moved to its second position by the action of the fuse (2), particularly by its blades (2.1) and shown to be slightly inclined towards the inner part of the casing, as seen in Figure 10D. The electrical contact between the blade (2.1) and conductive element (30) is thereby assured due to the elastic properties of the conductive element (30), and where said conductive element (30) is subjected to the pressure of the fuse (2) in the working position. This pressure applied by the fuse (2) on the conductive element (30) keeps the conductive element (30) subjected to temporary and reversible deformation, until the fuse (2) is removed, at which point the conductive element (30) returns to its initial standby position.

[0035] Therefore, in this fourth embodiment the contact point (3) for tapping the voltage would be the blades (2.1) of the fuses (2), whereas in the support (20) it would be the casing or enclosure itself of the fuse-holder base (1). Furthermore, similarly to the preceding embodiments, and though not shown in the drawings, each of the conductive elements (30) are connected to their re-

spective electrical conductor (4).

Claims

1. Voltage tap system (10) for a fuse-holder base (1), where the voltage tap system (10) is **characterized in that** it comprises a conductive element (30) connected on one hand to a contact point (3) for tapping the voltage of the fuse-holder base (1), and on the other hand to an electrical conductor (4) or voltage tap output terminal.

2. Voltage tap system (10) according to claim 1, **characterized in that** it additionally comprises a support (20) in which the conductive element (30) is mounted.

3. Voltage tap system (10) according to any one of the preceding claims, **characterized in that** it additionally comprises an auxiliary protection element (40) communicating the contact point (3) for tapping the voltage with the electrical conductor (4) or voltage tap output terminal.

4. Voltage tap system (10) according to claim 3, **characterized in that** the auxiliary protection element (40) is an auxiliary fuse.

5. Voltage tap system (10) according to claim 3, **characterized in that** the auxiliary protection element (40) is a thermal magnetic circuit breaker.

6. Voltage tap system (10) according to claim 4, **characterized in that** the auxiliary protection element (40) is fixed on an auxiliary fuse-holder base (50).

7. Voltage tap system (10) according to claim 3, **characterized in that** it additionally comprises opening and closing means to access the auxiliary protection element (40), making said auxiliary protection element (40) detachable.

8. Voltage tap system (10) according to claim 7, **characterized in that** the opening and closing means are installed in the auxiliary fuse-holder base (50) and comprise a groove (51).

9. Voltage tap system (10) according to claim 3, **characterized in that** the conductive element (30) is a metallic element provided with flexible properties which communicates an output connection (8) of the fuse-holder base (1) with the auxiliary protection element (40).

10. Voltage tap system (10) according to claim 2, **characterized in that** the support (20) comprises at least one first chamber (21) for protecting, at least in part, an output connection (8) of the fuse-holder base (1).

11. Voltage tap system (10) according to claims 2, 3 and 10, **characterized in that** the support (20) additionally comprises a second chamber (22) for housing the auxiliary protection element (40).

12. Voltage tap system (10) according to claim 1, **characterized in that** the conductive element (30) is provided with elastic properties, such that said conductive element (30) is movable and/or deformable between an initial standby position and a working position in which the conductive element (30) is in direct contact with the blades (2.1) of the fuse (2).

13. Voltage tap system (10) according to claim 12, **characterized in that** the conductive element (30) can shift from the standby position to the working position due to the very action of the fuse (2).

14. Voltage tap system (10) according to claim 12, **characterized in that** the conductive element (30), in the standby position, is not in contact with any live point of the fuse-holder base (1).

15. Fuse-holder base (1) comprising a socket supporting at least one pair of clamps (6) for fixing at least one fuse (2), input and output connections (7, 8), and at least one input and/or output contact point (3) for tapping the voltage, **characterized in that** it additionally comprises a voltage tap system (10) described in any one of the preceding claims 1-14 suitable for being coupled to a contact point (3) for tapping the voltage of the fuse-holder base (1).

16. Fuse-holder base (1) according to claim 15, **characterized in that** the voltage tap system (10) is connected in the contact point (3) of the fuse-holder base (1).

17. Fuse-holder base (1) according to claim 15, **characterized in that** the voltage tap system (10) is connected in the fixing clamps (6) for fixing the fuses (2).

18. Fuse-holder base (1) according to claim 15, **characterized in that** the voltage tap system (10) can be connected in the fuses (2).

19. Fuse-holder base (1) according to claim 15, **characterized in that** it is a three-pole fuse-holder base, with three pairs of clamps (6) for fixing three fuses (2).

20. Measurement module (100) comprising at least one voltage tap system (10) described in any one of claims 1-14.

21. Measurement module (100) according to claim 20, **characterized in that** it comprises at least one con-

ductor (110) that can be connected to the output connections (8) of the fuse-holder base (1).

22. Measurement module (100) according to any one of claims 20 or 21, **characterized in that** it additionally comprises voltage tapping connectors (120).

23. Measurement module (100) according to any one of claims 20-22, **characterized in that** it comprises an additional electrical conductor (4) for tapping the voltage in the neutral conductor (N).

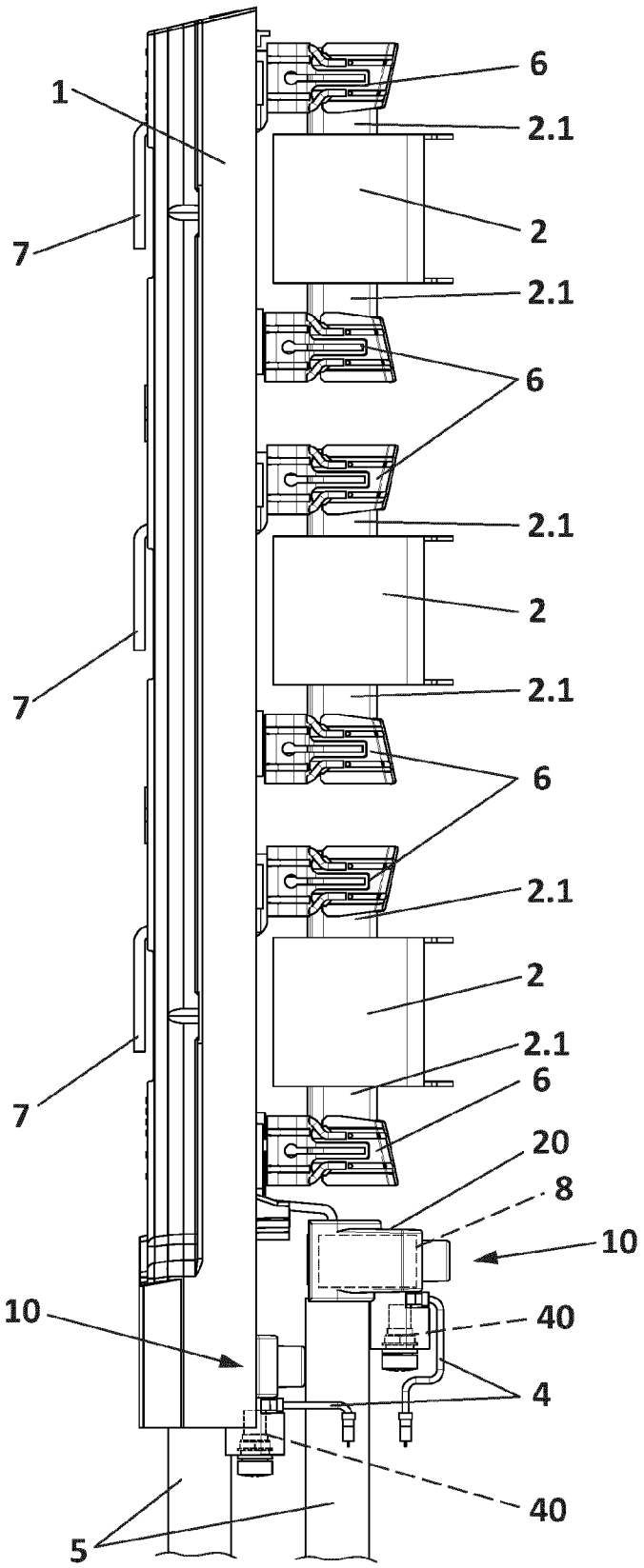


FIG. 1

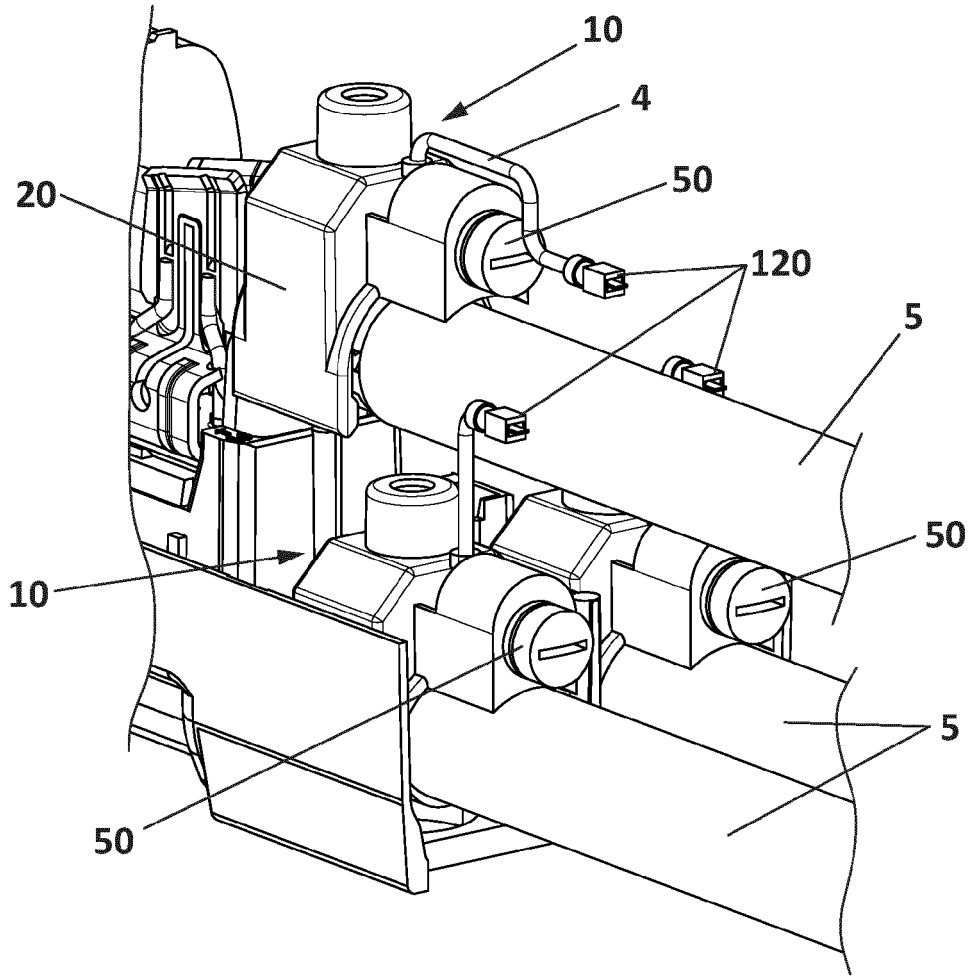


FIG. 2

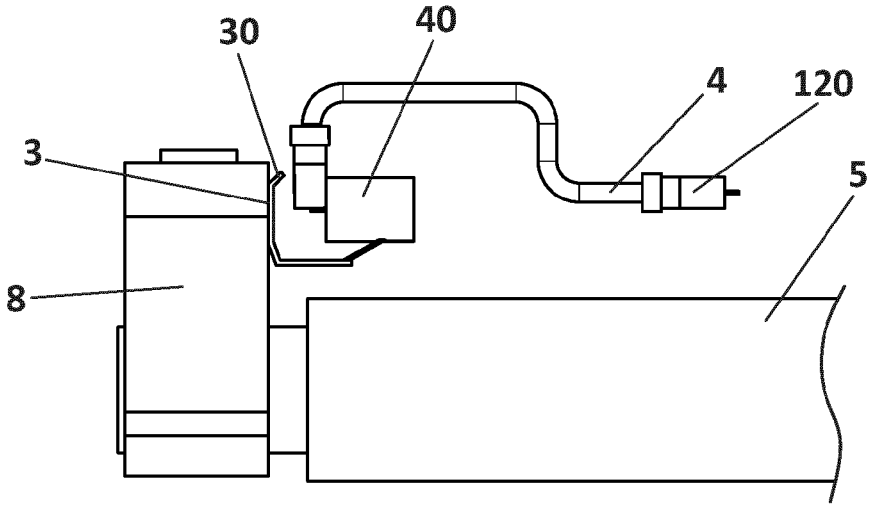


FIG. 3

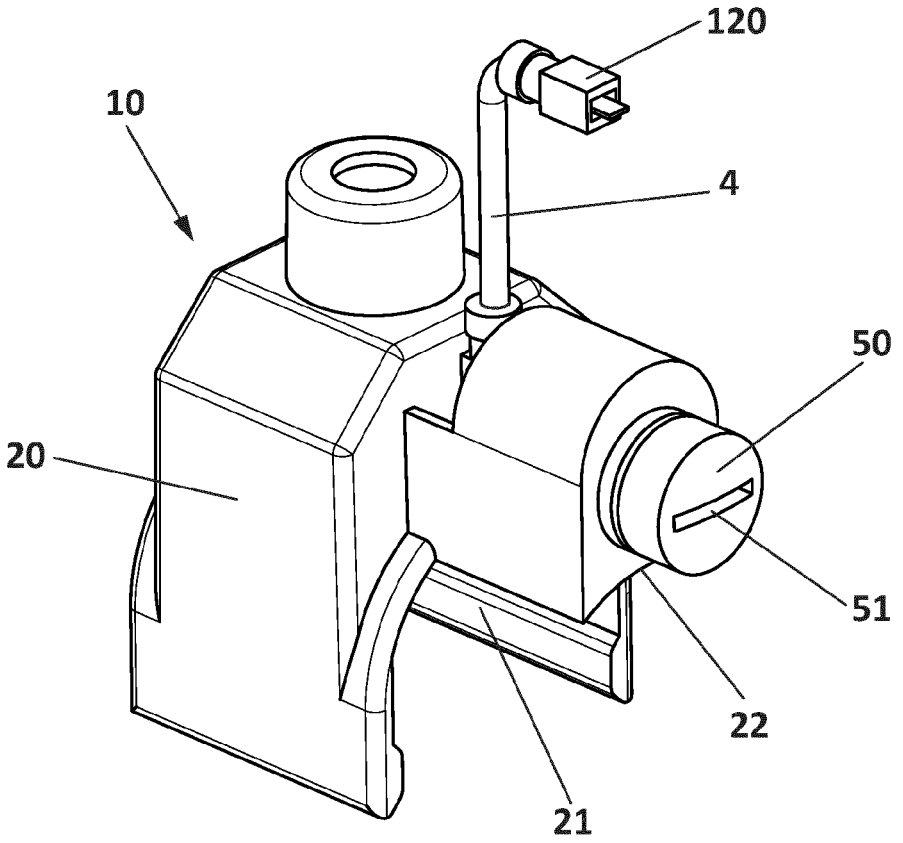


FIG. 4

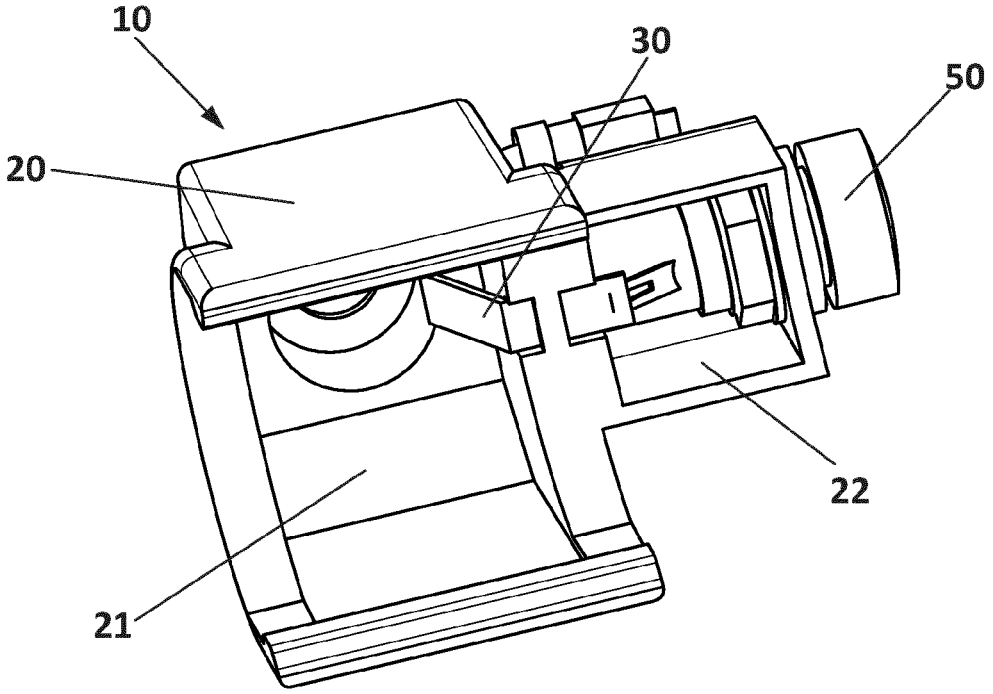


FIG. 5

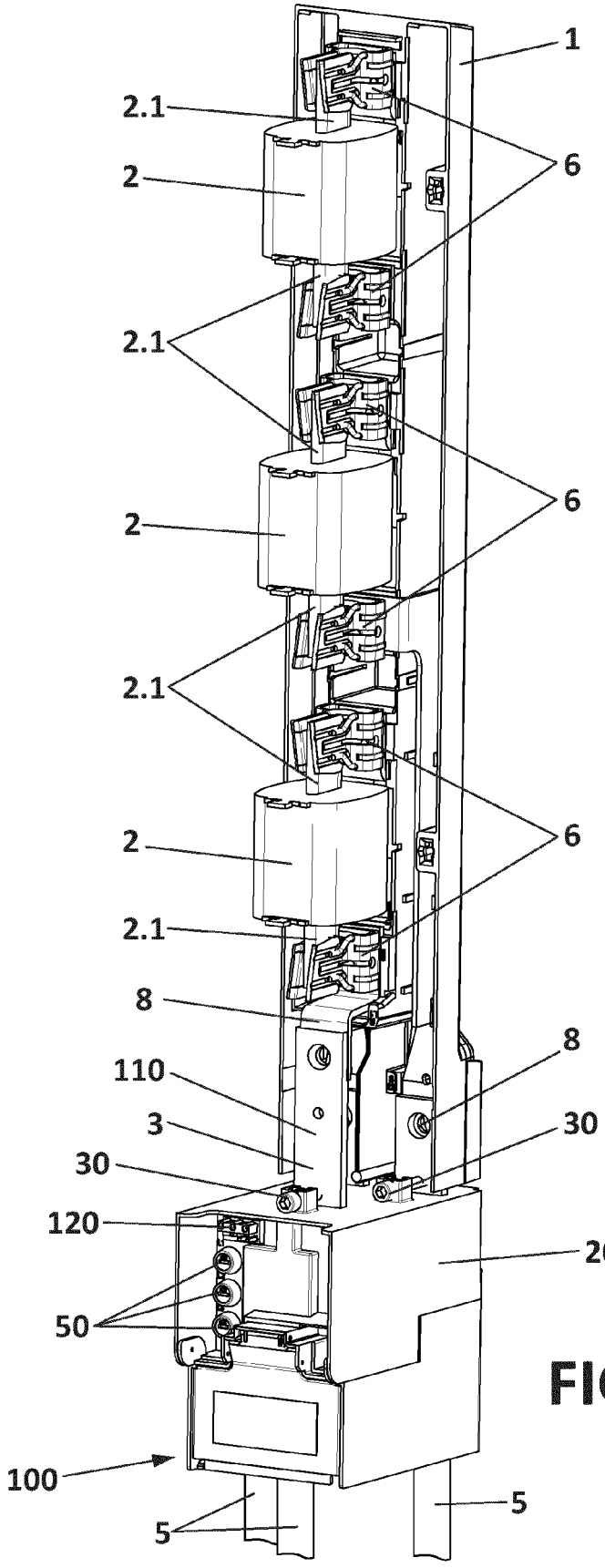
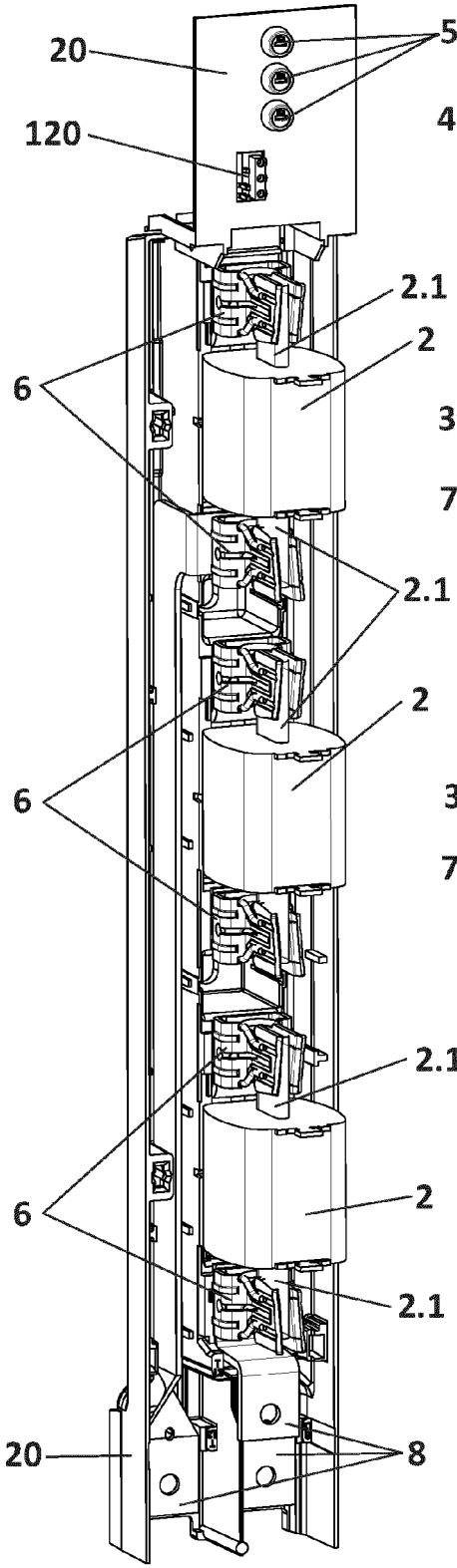


FIG. 6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6
2.1
2
6
2.1
2
6
2.1
20
8

FIG. 7

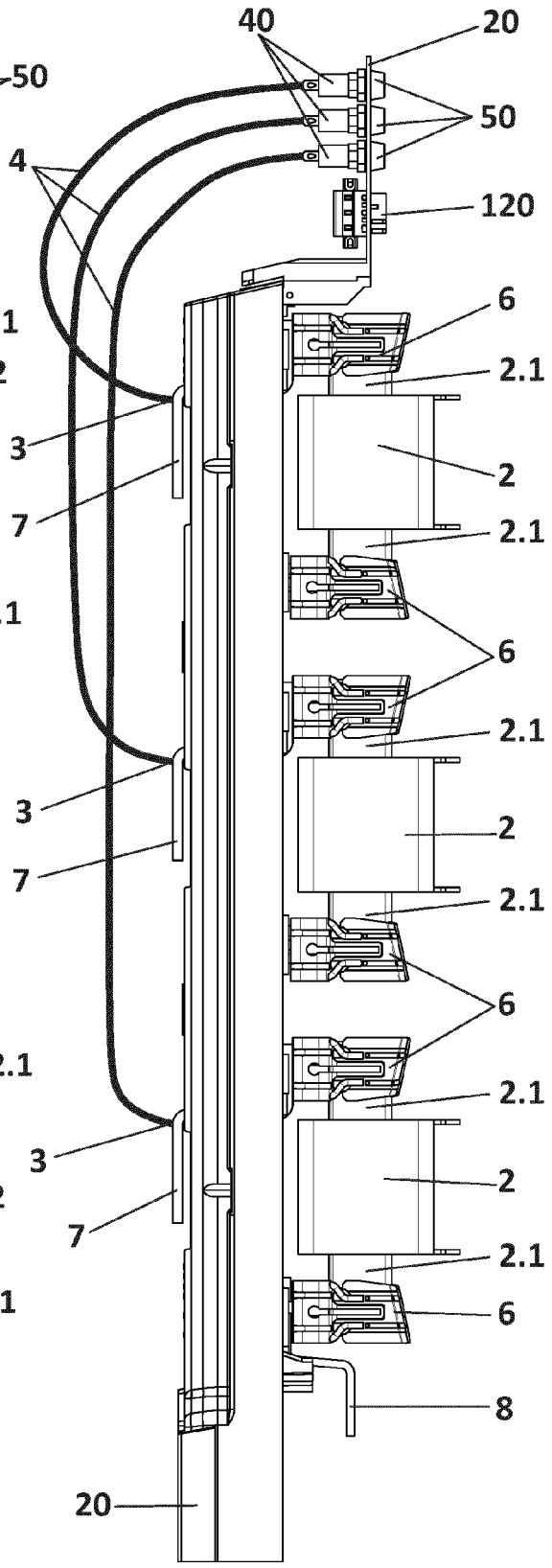
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FIG. 8

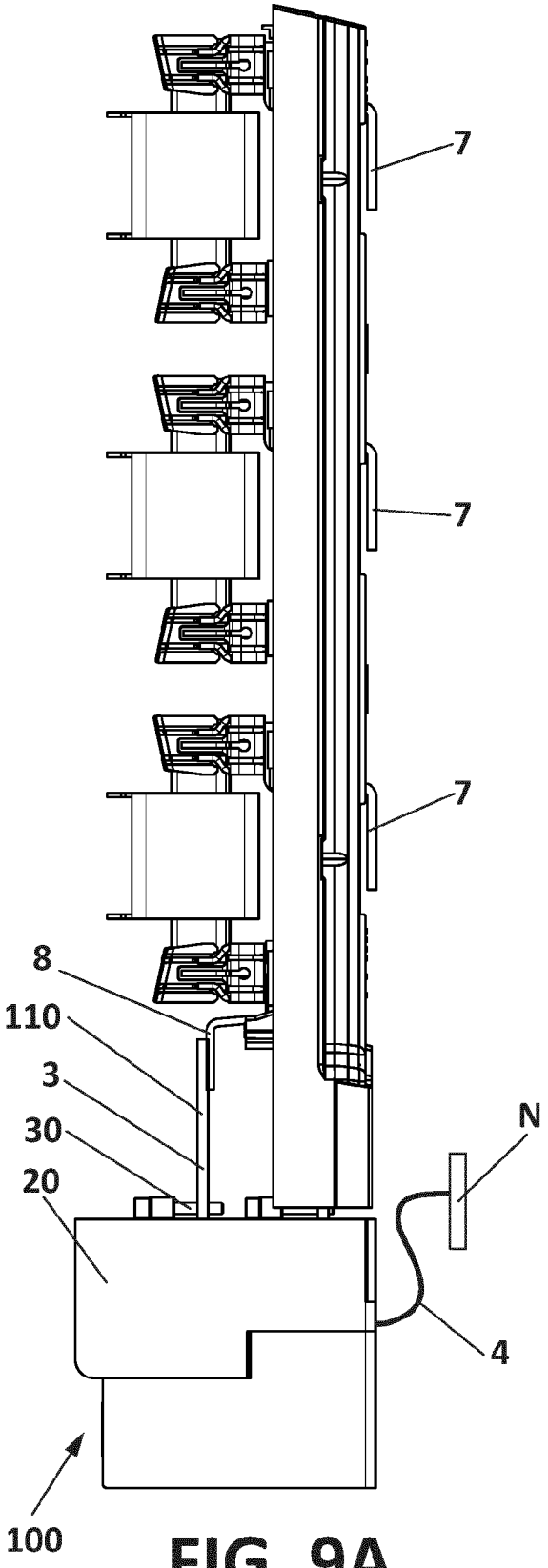

FIG. 9A

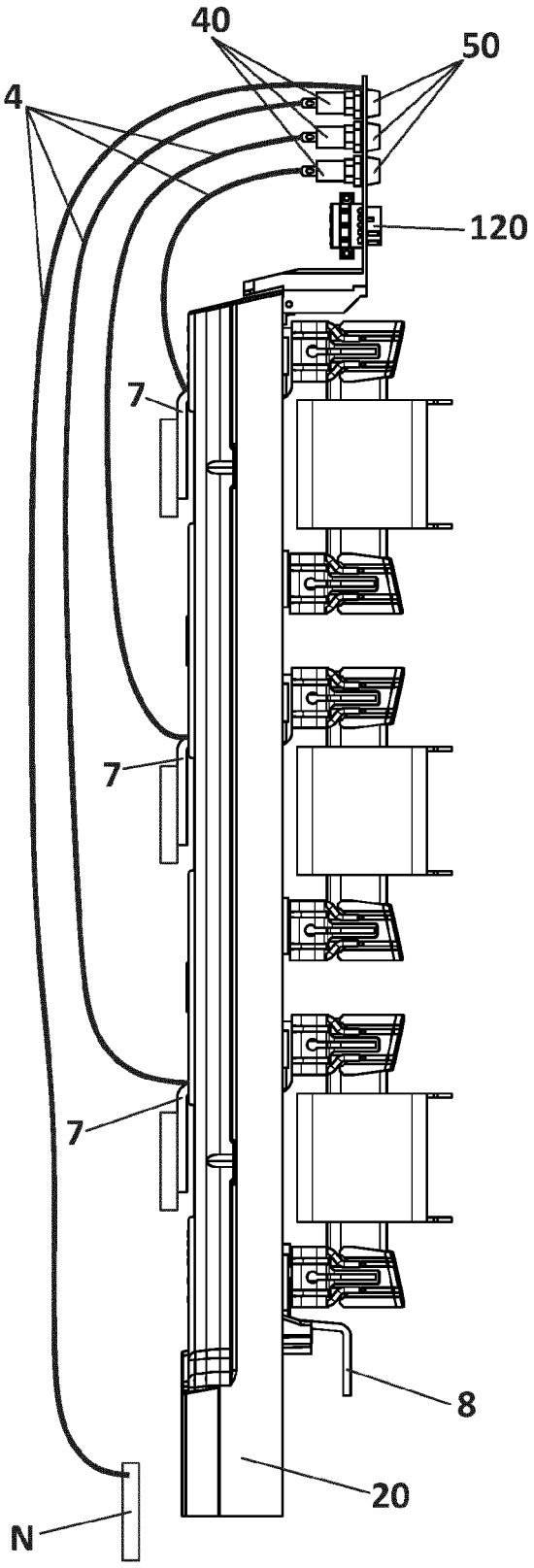

FIG. 9B

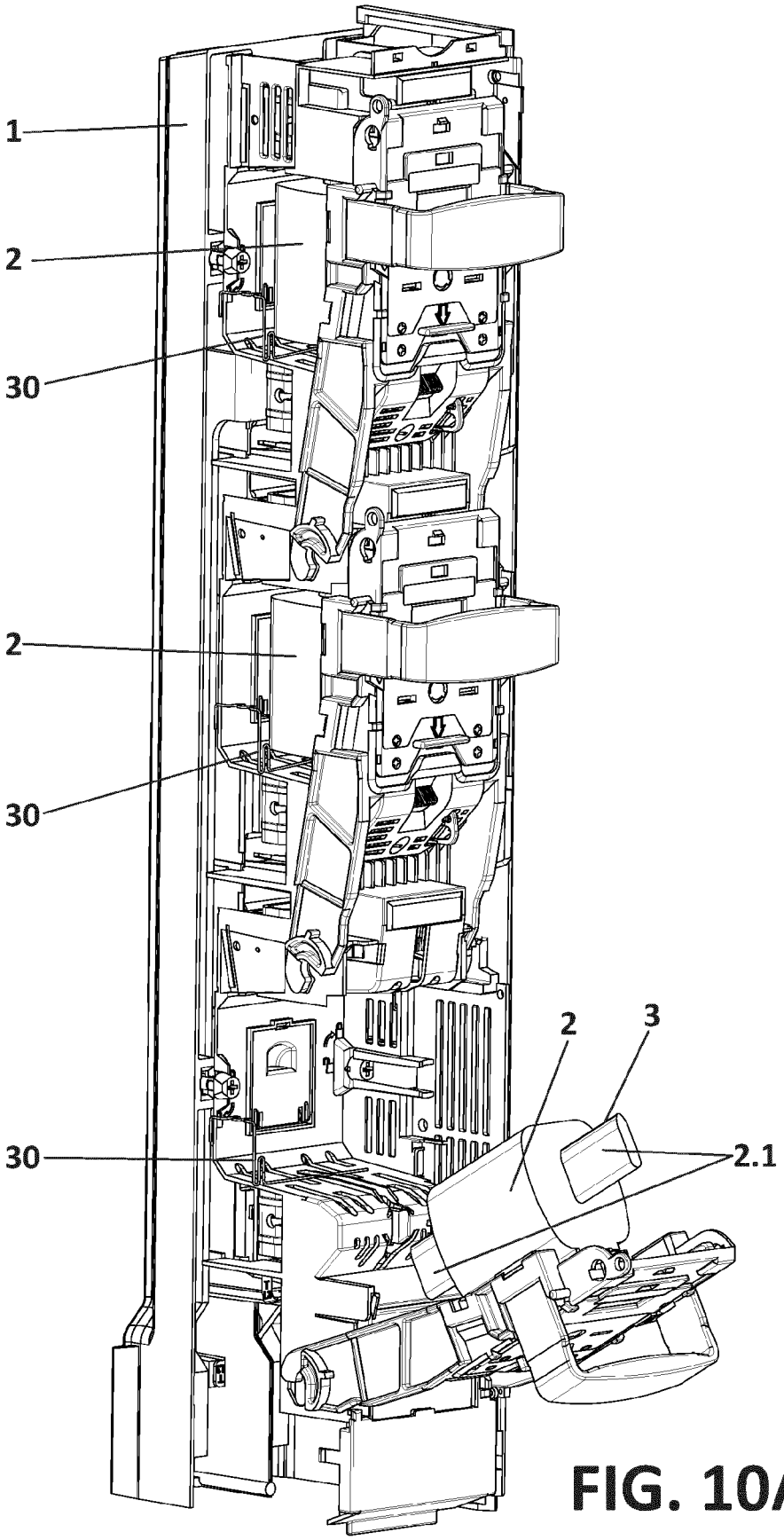

FIG. 10A

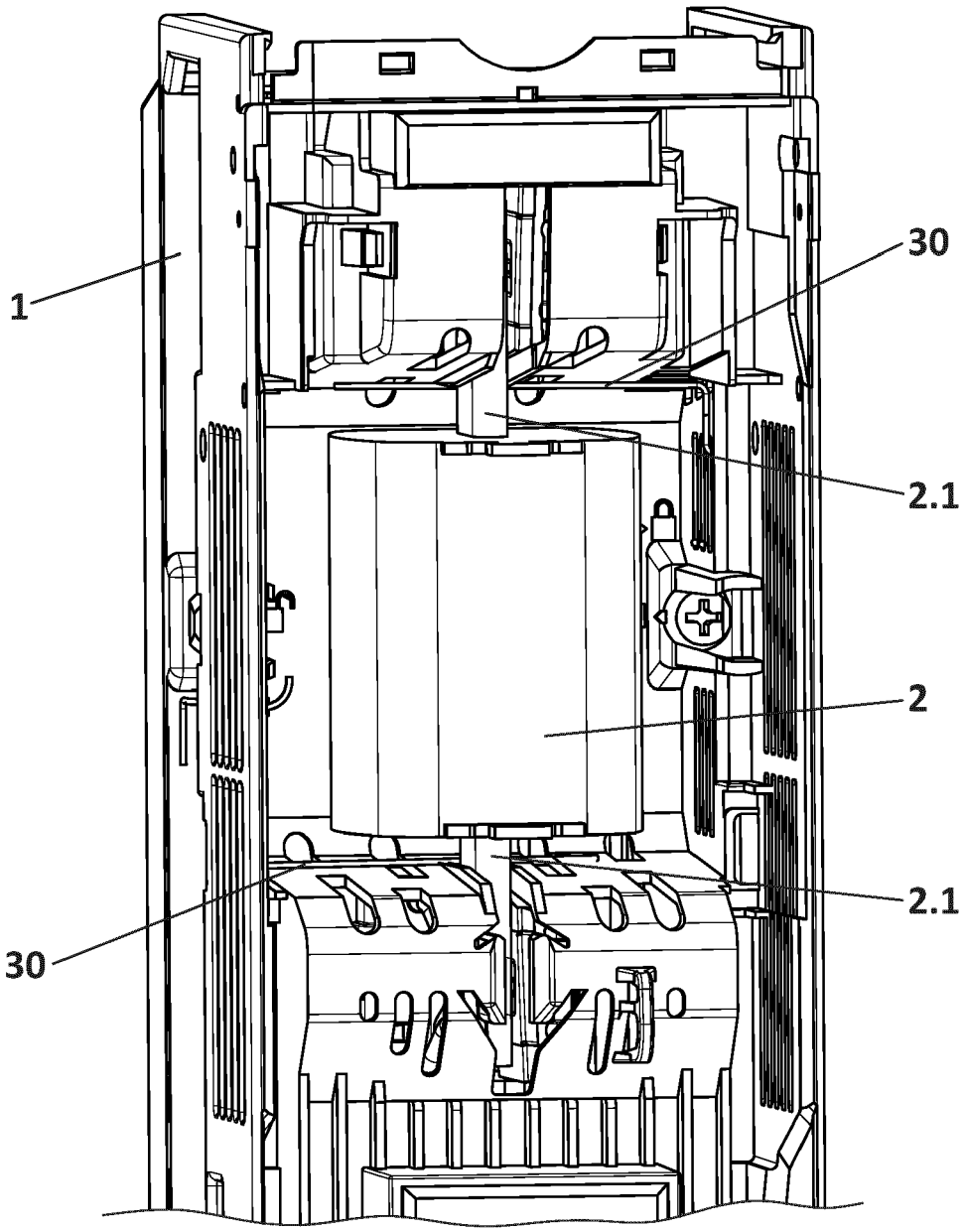

FIG. 10B

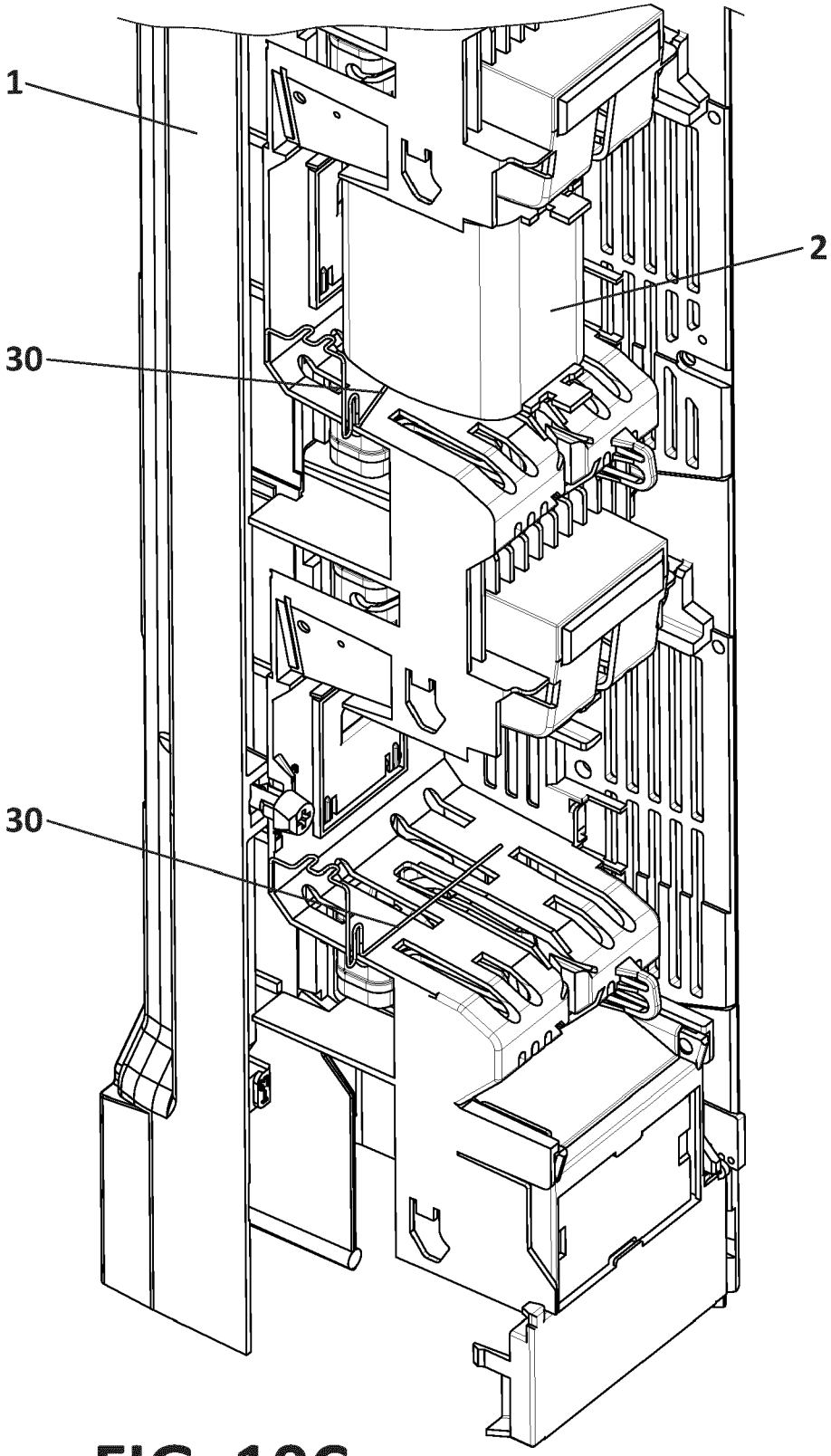

FIG. 10C

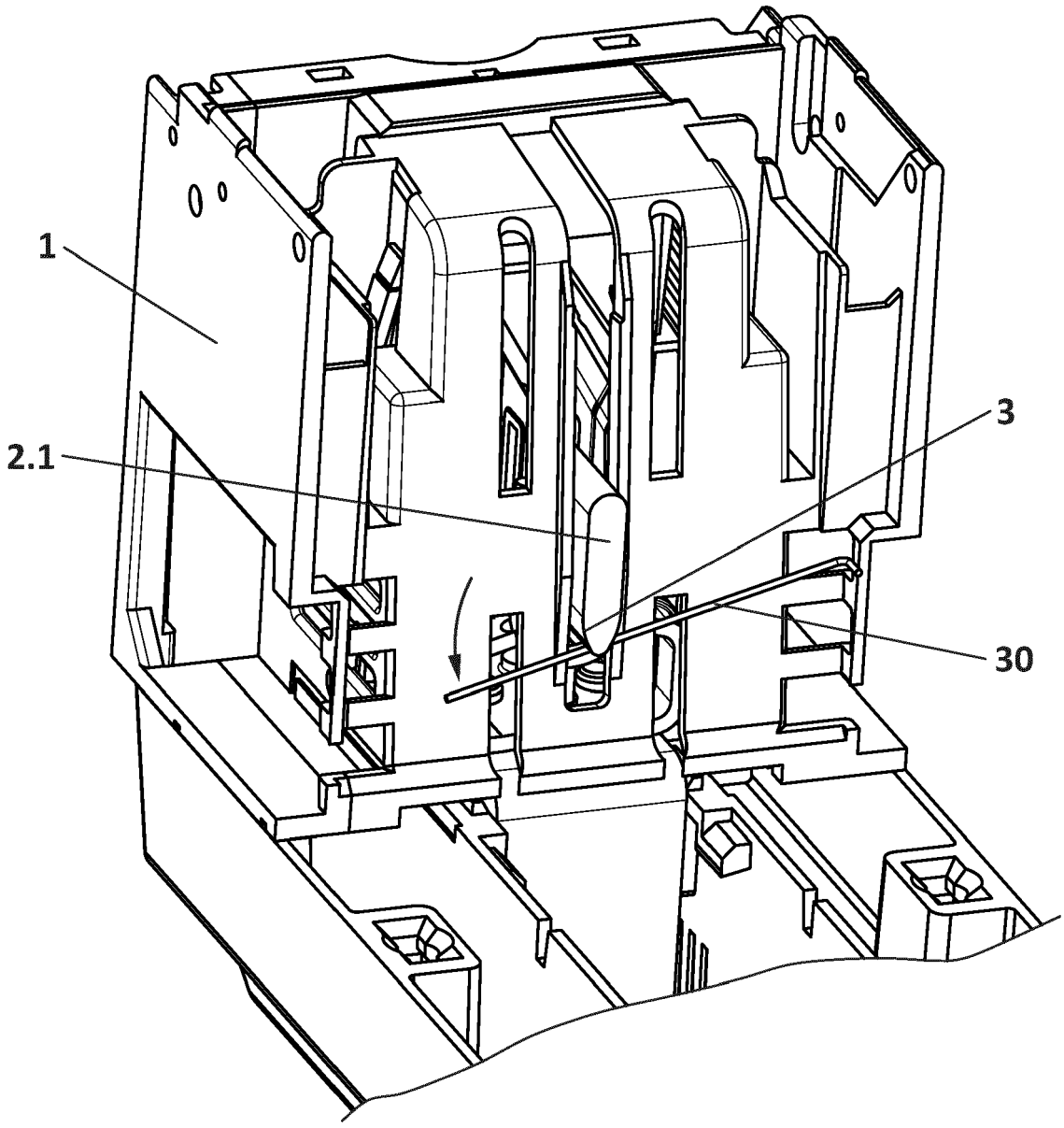

FIG. 10D

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Munich	6 October 2016	Bräckelmann, Gregor

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