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(54) STATE INDICATING MODULE AND AUTOMATIC TRANSFER SWITCHING EQUIPMENT

(57) The utility model discloses a state indicating module used to indicate an on and off state of an automatic transfer switching equipment, including: a housing detachably assembled to the body of the automatic transfer switching equipment; a first micro switch assembly detachably installed in the housing and including a first micro switch button, a position of the first micro switch button indicating an on and off state of a first power supply; a second micro switch assembly detachably installed in the housing and including a second micro switch button, a position of the second micro switch button indicating an on and off state of a second power supply; and a transmission assembly movably mounted to the housing and configured to transmit a movement of a driving rod to the first micro switch button and the second micro switch button. The state indicating module is convenient for installation and maintenance and one or more state indicating modules can be set according to customer needs. The module is small in size, easy to be installed and wired, and can be switched-on-triggered or switched-off-triggered according to the characteristics of the mechanism.

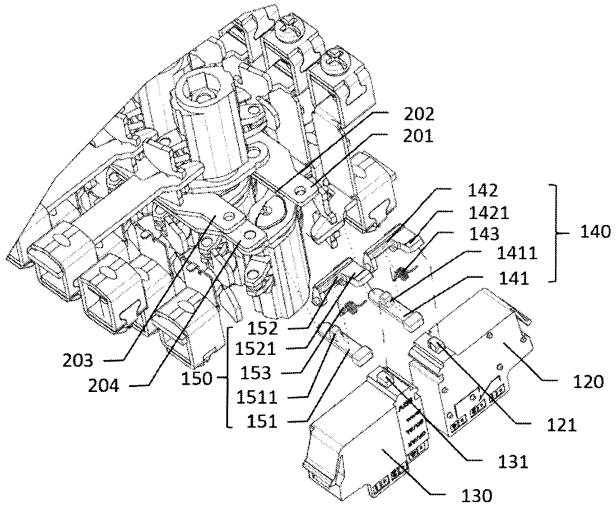

FIG. 2

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Description

FIELD OF THE INVENTION

[0001] The utility model relates to an improved state indicating module, and also relates to an automatic transfer switching equipment including the state indicating module.

BACKGROUND OF THE INVENTION

[0002] An indicator of an automatic transfer switching equipment (ATSE) is a safety-related functional block. It indicates a current on and off state of contacts of the ATSE to the user, such as a first power supply on (S 1 on) position or a second power supply on (S2 on) position or a switched off (OFF) position where the power supply 1 and the power supply 2 are not being contacted. The indicator includes a mechanical indication and an electrical indication of the position of the contacts. The state indication module involved in the present utility model provides an electrical indication of the position of the contacts, and its proper design is also very critical. Usually, customers need ATSE to provide one or more state indicating module signals to meet certain application requirements of customers.

[0003] At present, some state indicating modules put the micro switch indicating the state indicating module signal(s) inside the ATSE product and use a connector as an interface. Such structure is inconvenient to maintain and has no scalability.

BRIEF DESCRIPTION OF THE INVENTION

[0004] In view of the above problems, according to the present utility model, an improved state indicating module is proposed, which is used to indicate an on and off state of the automatic transfer switching equipment. The automatic transfer switching equipment includes a first upper driving rod, a first lower driving rod, a second upper driving rod, and a second lower driving rod that are disposed in parallel to each other in a body of the automatic transfer switching equipment, when a first power supply and a second power supply are both switched off, the first upper driving rod and the second lower driving rod are in a driving position, and the first lower driving rod and the second upper driving rod are in an initial position; when the first power supply is switched on, the first upper driving rod and the first lower driving rod are in the driving position, the second upper driving rod and the second lower driving rod are in the initial position; when the second power supply is switched on, the second upper driving rod and the second lower driving rod are in the driving position, and the first upper driving rod and the first lower driving rod are in the initial position. The state indicating module includes: a housing detachably assembled to the body of the automatic transfer switching equipment; a first micro switch assembly detachably installed in the housing and including a first micro switch button, a position of the first micro switch button indicating an on and off state of the first power supply; a second micro switch assembly detachably installed in the housing and including a second micro switch button, a position of the second micro switch button indicating an on and off state of the second power supply; and a transmission assembly movably mounted to the housing and configured to transmit a movement of the driving rods to the first micro switch button and the second micro switch button.

[0005] The micro switch of the state indicating module according to the present utility model is arranged in the state indicating module, which is convenient for installation and maintenance. And it is possible to provide one or more state indicating modules in an expandable manner according to customer needs, thereby outputting one or more state indicating module signal. The state indicating module is small in size, easy to be installed and wired, and can be switched-on-triggered or switched-off-triggered according to the characteristics of the mechanism.

[0006] The state indicating module according to the present utility model may have one or more of the following features.

[0007] According to an embodiment, when the first power supply is switched off, the first micro switch button is in a released position, and when the first power supply is switched on, the first micro switch button is in a triggered position; when the second power supply is switched off, the second micro switch button is in a released position, and when the second power supply is switched on, the second micro switch button is in a triggered position. In other words, the state indicating module can be triggered by the switched on.

[0008] According to an embodiment, the transmission assembly includes a first transmission assembly and a second transmission assembly. The first transmission assembly includes: a first pushing rod extending along a driving direction of the first lower driving rod on a plane of the first lower driving rod, linearly movably mounted to the housing in an extending direction and including a first protrusion upwardly protruding from a rod body of the first pushing rod; a first oscillating rod rotatably mounted to the housing about a rotation axis and including a first actuating portion extending outward from a rod body of the first oscillating rod, the rotation axis of the first oscillating rod being perpendicular to the extending direction of the first pushing rod; and a first return spring configured to act a return elastic force on the first oscillating rod. When the first power supply is switched on, the first lower driving rod moves toward the driving position, contacts and drives the first pushing rod to move linearly and at the same time, the first protrusion on the first pushing rod contacts and drives the first oscillating rod to rotate and the first actuating portion on the first oscillating rod actuates the first micro switch button to the triggered position; when the first power supply is switched off, the first lower driving rod moves to the initial position, the first oscillating rod returns to the initial po-

sition under an action of the elastic force of the first return spring, thereby bringing the first pushing rod to return to the initial position through the first protrusion, and the first micro switch button returns to the released position under an action of its return force. The second transmission assembly includes: a second pushing rod extending along a driving direction of the second upper driving rod on a plane of the second upper driving rod, linearly movably mounted to the housing in an extending direction and including a second protrusion upwardly protruding from a rod body of the second pushing rod; a second oscillating rod rotatably mounted to the housing about a rotation axis and including a second actuating portion extending outward from a rod body of the second oscillating rod, the rotation axis of the second oscillating rod being perpendicular to the extending direction of the second pushing rod; and a second return spring configured to act a return elastic force on the second oscillating rod. When the second power supply is switched on, the second upper driving rod moves toward the driving position, contacts and drives the second pushing rod to move linearly and at the same time, the second protrusion on the second pushing rod contacts and drives the second oscillating rod to rotate and the second actuating portion on the second oscillating rod actuates the second micro switch button to the triggered position; when the second power supply is switched off, the second upper driving rod moves to the initial position, the second oscillating rod returns to the initial position under an action of the elastic force of the second return spring, thereby bringing the second pushing rod to return to the initial position through the second protrusion, and the second micro switch button returns to the released position under an action of its return force. The state indicating module according to this embodiment is simple and reliable, and can realize switched on triggering. When multiple state indicating modules are connected in series, the movement of the pushing rod of the previous state indicating module can be transmitted to the pushing rod of the next state indicating module.

[0009] According to an embodiment, when the first power supply is switched off, the first micro switch button is in a triggered position, and when the first power supply is switched on, the first micro switch button is in a released position; when the second power supply is switched off, the second micro switch button is in a triggered position, and when the second power supply is switched on, the second micro switch button is in a released position. In other words, the state indicating module can be triggered by the switched off.

[0010] According to an embodiment, the transmission assembly includes a first transmission assembly and a second transmission assembly. The first transmission assembly includes: a first pushing rod extending along a driving direction of the second lower driving rod on a plane of the second lower driving rod, linearly movably mounted to the housing in an extending direction , and comprising a first protrusion downwardly protruding from a rod body of the first pushing rod, the first protrusion including a slope surface; a first sliding member linearly movably mounted to the housing in an up and down direction, including an slope surface cooperating with the slope surface of the first protrusion so that the linear movement of the first pushing rod in its extending direction can be converted to a linear movement of the first sliding member in the up and down direction, and further including a first actuating portion configured to actuate the first micro switch button; and a first return spring configured to act a return elastic force on the first pushing rod. When the first power supply is switched off, the second lower driving rod moves toward the driving position, contacts and drives the first pushing rod to move linearly, and pushes the first sliding member to slide downwardly through a cooperation of the slope surface of the first protrusion and the slope surface of the first sliding member so that the first actuating portion of the first sliding member actuates the first micro switch button to the triggered position; when the first power supply is switched on, the second lower driving rod moves to the initial position, the first pushing rod returns to the initial position under an action of the elastic force of the first return spring, and the first micro switch button and the first sliding member return to the released position and the initial position respectively under a return force of the first micro switch button. The second transmission assembly includes: a second pushing rod extending along a driving direction of the first upper driving rod on a plane of the first upper driving rod, linearly movably mounted to the housing in an extending direction and including a second protrusion downwardly protruding from a rod body of the first pushing rod, the second protrusion including a slope surface; a second sliding member linearly movably mounted to the housing in an up and down direction, comprising a slope surface cooperating with the slope surface of the second protrusion so that the linear movement of the second pushing rod in its extending direction can be converted to a linear movement of the second sliding member in the up and down direction, and further including a second actuating portion configured to actuate the second micro switch button; and a second return spring configured to act a return elastic force on the second pushing rod. When the second power supply is switched off, the first upper driving rod moves toward the driving position, contacts and drives the second pushing rod to move linearly, and pushes the second sliding member to slide downwardly through a cooperation of the slope surface of the second protrusion and the slope surface of the second sliding member so that the second actuating portion of the second sliding member actuates the second micro switch button to the triggered position; when the second power supply is switched on, the first upper driving rod moves to the initial position, the second pushing rod returns to the initial position under an action of the elastic force of the second return spring, and the second micro switch button and the second sliding member return to the released position and the initial position

respectively under a return force of the second micro switch button. The state indicating module according to this embodiment is simple and reliable, and can realize switched off triggering. When multiple state indicating modules are connected in series, the movement of the pushing rod of the previous state indicating module can be transmitted to the pushing rod of the next state indicating module.

[0011] According to an embody ment, the state indicating module includes a hook, the body of the automatic transfer switching equipment includes a corresponding slot, and the state indicating module is assembled to the body of the automatic transfer switching equipment through a cooperation of the hook and the slot. The assembling of the body of the state indicating module to the automatic transfer switching equipment is simple and quick.

[0012] According to an embodiment, the state indicating module further includes a slot corresponding to the hook, so that a next state indicating module is able to assembled to a previous state indicating module, thereby to assemble a plurality of state indicating modules to the automatic transfer switching equipment according to user needs. Thus, multiple on and off signals of the automatic transfer switching equipment can be reliably output.

[0013] According to an embodiment, the first micro switch assembly and the second micro switch assembly each include a wiring terminal configured to output a signal indicating the on and off state of the automatic transfer switching equipment through wiring in respond respectively to the positions of the first micro switch button and the second micro switch button. The first micro switch assembly and the second micro switch assembly can be installed in the housing of the state indicating module after being wired, which is convenient for wiring and maintenance.

[0014] According to an embodiment, the housing includes a base and a cover that are able to be separated from each other, and when the base and the cover are separated, the first micro switch assembly having been wired and the second micro switch assembly having been wired are able to be installed in the housing. The assembly is simple and convenient.

[0015] According to the present utility model, an automatic transfer switching equipment is also proposed, which includes: a body of the automatic transfer switching equipment; and one or more state indicating modules according to the above attached to the body of the automatic transfer switching equipment.

BRIEF DESCRIPTION OF THE DRAWINGS

[0016] In order to explain the technical solutions of the embodiments of the present utility model more clearly, the drawings of the embodiments of the present utility model will be briefly introduced below. The drawings are only used to show some embodiments of the present utility model, rather than limiting all the embodiments of the present utility model to these.

Fig. 1 is an exploded view showing a part of an automatic transfer switching equipment including a state indicating module according to the present utility model viewed from the outside.

Fig. 2 is an exploded perspective view showing the part of the automatic transfer switching equipment and the structure of the state indicating module according to a first embodiment of the present utility model, viewed from below.

Fig. 3 is a schematic view showing the part of the automatic transfer switching equipment and the state of the state indicating module according to the first embodiment of the present utility model when the first power supply and the second power supply are switched off, viewed from below.

Fig. 4 is a schematic view showing the part of the automatic transfer switching equipment and the state of the state indicating module according to the first embodiment of the present utility model when the first power supply is switched on, viewed from below.

Fig. 5 is a schematic view showing the part of the automatic transfer switching equipment and the state of the state indicating module according to the first embodiment of the present utility model when the second power supply is switched on, viewed from below.

Fig. 6 is an exploded perspective view showing the part of the automatic transfer switching equipment and the structure of the state indicating module according to a second embodiment of the present utility model, viewed from below.

Fig. 7 is a schematic view showing the part of the automatic transfer switching equipment and the state of the state indicating module according to the second embodiment of the present utility model when the first power supply and the second power supply are switched off, viewed from below.

Fig. 8 is a schematic view showing the part of the automatic transfer switching equipment and the state of the state indicating module according to the second embodiment of the present utility model when the first power supply is switched on, viewed from below.

Fig. 9 is a schematic view showing the part of the automatic transfer switching equipment and the state of the state indicating module according to the second embodiment of the present utility model when the second power supply is switched on, viewed from below.

DETAILED DESCRIPTION

[0017] In order to make the purpose, technical solution and advantages of the technical solution of the present

utility model clearer, the technical solution of the embodiment of the present utility model will be described clearly and completely in conjunction with the drawings of the specific embodiments of the present utility model. The same reference signs in the drawings represent the same components. It should be noted that the described embodiments are part of the embodiments of the present utility model, rather than all of the embodiments. Based on the described embodiments of the present utility model, all other embodiments obtained by those of ordinary skill in the art without creative work are within the scope of the present utility model.

[0018] Unless otherwise defined, the technical terms or scientific terms used here should have the ordinary meanings understood by those with ordinary skills in the field of the utility model. The "first", "second" and similar words used in the specification and claims of the utility model patent application do not indicate any order, quantity or importance, but are only used to distinguish different components. The "include" or "comprise" and other similar words mean that the element or item appearing before the word covers the element or item listed after the word and its equivalents, but does not exclude other elements or items. The "connect" or "couple" and other similar words are not limited to physical or mechanical connections, but may include electrical connections, whether direct or indirect. The "up", "down", "left", "right", etc. are only used to indicate the relative position relationship and when the absolute position of the described object changes, the relative position relationship may also change accordingly.

[0019] The following describes the present utility model in detail by describing exemplary embodiments.

[0020] Fig. 1 is an exploded view showing a part of an automatic transfer switching equipment 1 including a state indicating module 100 according to the present utility model viewed from the outside. Referring to Fig. 1, the automatic transfer switching equipment 1 according to the present utility model includes a body 200 of the automatic transfer switching equipment 1 and one or more state indicating modules 100 attached to the body 200 of the automatic transfer switching equipment 1.

[0021] Fig. 2 is an exploded perspective view showing the part of the automatic transfer switching equipment 1 and the structure of the state indicating module according to a first embodiment of the present utility model 100, viewed from below. Referring to Fig. 2, the automatic transfer switching equipment 1 includes a first upper driving rod 201, a first lower driving rod 202, a second upper driving rod 203, and a second lower driving rod 204 which are parallel to each other, and are arranged in the body 200 of the automatic transfer switching equipment 1. It should be noted that the up and down direction here are described with reference to Figs. 2-9, and are opposite to the up and down directions of the automatic transfer switching equipment 1 in normal use, that is, opposite to the up and down direction in Fig. 1. Referring to Figs. 3 and 7, when the first power supply and the second power supply are both switched off, the first upper driving rod 201 and the second lower driving rod 204 are in a driving position (shown in Fig. 7), and the first lower driving rod 202 and the second upper driving rod 203 are in an initial position (shown in Fig. 3). Referring to Figs. 4 and 8, when the first power supply is switched on, the first upper driving rod 201 (shown in Fig. 8) and the first lower driving rod 202 (shown in Fig. 4) are in the driving position, and the second upper driving rod 203 (shown in Fig. 4) and the second lower driving rod 204 (shown in Fig. 8) are in the initial position. Referring to in Figs. 5 and 9, when the second power supply is switched on, the second upper driving rod 203 (shown in Fig. 5) and the second lower driving rod 204 (shown in Fig. 9) are in the driving position, and the first upper driving rod 201 (shown in Fig. 9) and the first lower driving rod 202 (shown in Fig. 5) are in the initial position.

[0022] Referring back to Fig. 1, the state indicating module 100 according to the present utility model may include a housing 110, a first micro switch assembly 120, and a second micro switch assembly 130. The housing 110 may include a base 111 and a cover 112 which are separable from each other. When the base 111 and the cover 112 are separated, the first micro switch assembly 120 and the second micro switch assembly 130 can be installed in the base 111 or separated from the base 111. That is, the first micro switch assembly 120 and the second micro switch assembly 130 are detachably installed in the housing 110.

[0023] Referring to Fig. 2, the first micro switch assembly 120 includes a first micro switch button 121 the position of which indicating the on and off state of the first power supply; the second micro switch assembly 130 includes a second micro switch button 131 the position of which indicating the on and off state of the second power supply. However, depending on the different specific structure of the state indicating module 100, the released position and the triggered position of the first micro switch button 121 and the second micro switch button 131 may indicate different on and off states of the first power supply and the second power supply. In other words, the first micro switch button 121 and the second micro switch button 131 may be switched-on-triggered or switched-off-triggered. The specific implementation will be described in detail below.

[0024] Referring to Figs. 2 and 6, the state indicating module 100 according to the present utility model may further include a transmission assembly, and the transmission assembly may include a first transmission assembly 140 and a second transmission assembly 150. The transmission assembly is movably mounted to the housing 110 and is configured to transmit the movement of the driving rods to the first micro switch button 121 and the second micro switch button 131.

[0025] Referring back to Fig. 1, the first micro switch assembly 120 and the second micro switch assembly 130 may include wiring terminals 122 and 132, respectively, configured to output a signal indicating the on and

off state of the automatic transfer switching equipment 1 through wiring in respond respectively to the positions of the first micro switch button 121 and the second micro switch button 131. The first micro switch button 121, the second micro switch button 131 and the wiring terminals are all arranged in the first micro switch assembly 120 and the second micro switch assembly 130, so that the first micro switch assembly 120 and the second micro switch assembly 130 can be installed in the housing 110 of the state indicating module 100 after being wired, which is convenient for wiring and maintenance.

[0026] The state indicating module 100 may include a hook 113. The body 200 of the automatic transfer switching equipment 1 includes a corresponding slot 114. The state indicating module 100 is assembled to the automatic transfer switching equipment 1 through the cooperation of the hook 113 and the slot 114. The assembling is thus simple and quick. The state indicating module 100 also includes a slot 114 corresponding to the hook 113, that is, the same slot 114 as the slot 114 on the body 200 of the automatic transfer switching equipment 1, so that a next state indicating module 100 can be assembled to a previous one. Thus a plurality of the state indicating module 100 can be assembled to the body 200 of the automatic transfer switching equipment 1 according to user needs. At this time, a pushing rod of the previous state indicating module 100 is used to actuate a pushing rod of the next state indicating module 100, so as to gradually transfer the movement of the driving rods in the body 200 backward. Each state indicating module 100 can output a set of on and off information of the automatic transfer switching equipment 1.

[0027] The specific structure of the state indicating module 100 according to the first embodiment and the second embodiment of the present utility model will be described in detail below with reference to the accompanying drawings.

<First embodiment

[0028] Fig. 2 is an exploded perspective view showing the part of the automatic transfer switching equipment 1 and the structure of the state indicating module according to a first embodiment of the present utility model 100, viewed from below. Referring to Fig. 2, the first transmission assembly 140 of the state indicating module 100 according to the first embodiment of the present utility model may include a first pushing rod 141. The first pushing rod 141 extends along the driving direction of the first lower driving rod 202 on the plane of the first lower driving rod 202 (seen more clearly in Figs. 3-5), is linearly movably mounted to the housing 110 in the extending direction, and includes a first protrusion 1411 protruding upward from the rod body of the first pushing rod 141. The end of the first pushing rod 141 adjacent to the first lower driving rod 202 has an arc shape, so that a linear end of the first lower driving rod 202 is convenient to contact with the arc end of the first pushing rod 141, and transmit the linear movement of the lower driving rod 202 to the first pushing rod 141, pushing the first pushing rod 141 to perform linear movement. The first transmission assembly 140 of the state indicating module 100 according to the first embodiment of the present utility model may further include a first oscillating rod 142, which is rotatably mounted to the housing 110 about a rotation axis. The first oscillating rod 142 may include a first actuating portion 1421 extending outward from the rod body of the first oscillating rod 142. The first actuating portion 1421 is configured to actuate the first micro switch button 121 when the first oscillating rod 142 is in the actuating position and to release the first micro switch button 121 when the first oscillating rod 142 is in the initial position. The rotation axis of the first oscillating rod 142 is perpendicular to the extending direction of the first pushing rod 141. The first transmission assembly 140 of the state indicating module 100 according to the first embodiment of the present utility model may further include a first return spring 143 configured to act on the first oscillating rod 142 with a return elastic force. As shown in Fig. 2, the first return spring 143 according to the first embodiment of the present utility model is a torsion spring, and is configured to apply an elastic force to the first oscillating rod 142 to restore it to the initial position.

[0029] The structure of the second transmission assembly 150 of the state indicating module 100 according to the first embodiment of the present utility model is similar to that of the first transmission assembly 140, and includes: a second pushing rod 151, which extends along the driving direction of the second upper driving rod 203 on the plane of the second upper driving rod 203, is linearly movably mounted to the housing 110 in the extending direction, and includes a second protrusion 1511 protruding upward from the rod body of the second pushing rod 151; a second oscillating rod 152, which is rotatably mounted to the housing 110 around a rotation axis, and includes a second actuating portion 1521 extending outward from the rod body of the second oscillating rod 152, the rotation axis of the second oscillating rod 152 is perpendicular to the extending direction of the second pushing rod 151; and a second return spring 153, which is configured to act on the second oscillating rod 152 with a return elastic force. It will not be described in detail here.

[0030] The principle of the state indicating module 100 according to the first embodiment of the present utility model will be described below with reference to Figs. 3-5.

[0031] Referring first to Figure 3, the first power supply and the second power supply are both switched off at this time, so the first upper driving rod 201 and the second lower driving rod 204 are in the driving position, and the first lower driving rod 202 and the second upper driving rod 203 are in the initial position. Since the first pushing rod 141 extends along the driving direction of the first lower driving rod 202 on the plane of the first lower driving rod 202, that is, aligned with the first lower driving rod 202, and the first lower driving rod 202 is in the initial position, the first pushing rod 141 is not pushed and is in

the initial position, so that the first oscillating rod 142 and the first actuating portion 1421 thereon are also in the initial position, and thereby the first micro switch button 121 is in the released position, outputting a signal indicating the first power supply is switched off. In the same way, since the second pushing rod 151 extends along the driving direction of the second upper driving rod 203 on the plane of the second upper driving rod 203, that is, aligned with the second upper driving rod 203, and the second upper driving rod 203 is in the initial position, the second pushing rod 151 is not pushed and is in the initial position, so that the second oscillating rod 152 and the second actuating portion 1521 thereon are also in the initial position, and thereby the second micro switch button 131 is in the released position, outputting a signal indicating the second power supply is switched off.

[0032] Referring to Fig. 4 from Fig. 3, the first power supply transfers from switched off to switched on at this time, so the first lower driving rod 202 moves from the initial position to the driving position. At the same time, the first lower driving rod 202 contacts and drives the first pushing rod 141 aligned with the first lower driving rod 202 to move linearly, the first protrusion 1411 on the first pushing rod 141 contacts and drives the first oscillating rod 142 to rotate, and the first actuating portion 1421 on the first oscillating rod 142 actuates the first micro switch button 121 to the triggered position where the first micro switch button 121 is depressed, outputting a signal indicating the first power supply is switched on. In addition, since the second power supply is still off and the second upper driving rod 203 is still in the initial position, the second micro switch button 131 is not actuated, outputting a signal indicating the second power supply is switched off.

[0033] Referring to Fig. 5 from Fig. 4, the second power supply transfers from switched off to switched on at this time, so the second upper driving rod 203 moves from the initial position to the driving position. At the same time, the second upper driving rod 203 contacts and drives the second pushing rod 151 aligned with the second upper driving rod 203 to move linearly, the second protrusion 1511 on the second pushing rod 151 contacts and drives the second oscillating rod 152 to rotate, and the second actuating portion 1521 on the second oscillating rod 152 actuates the second micro switch button 131 to the triggered position where the second micro switch button 151 is depressed, outputting a signal indicating the second power supply is switched on. In addition, since the first power supply transfers from switched on to switched off, the first lower driving rod 202 moves from the driving position back to the initial position, and the first oscillating rod 142 returns to the initial position under the action of elastic force of the first return spring 143 thereby bringing the first pushing rod 141 to return to the initial position through the first protrusion 1411 where the first micro switch button 121 is released and returns to the released position under the action of its return force, outputting a signal indicating the first power supply is switched off.

[0034] Referring back to Fig. 3 from Fig. 5, when the second power supply transfers from switched on to switched off, the second upper driving rod 203 moves from the driving position back to the initial position, and the second oscillating rod 152 returns to the initial position under the action of elastic force of the second return spring 153 thereby bringing the second pushing rod 151 to return to the initial position through the second protrusion 1511 where the second micro switch button 131 is released and returns to the released position under the action of its return force, outputting a signal indicating the second power supply is switched off. In addition, since the first power supply is still off and the first lower driving rod 202 is still in the initial position, the first micro switch button 121 is not actuated, outputting a signal indicating the first power supply is switched off.

[0035] Because the first micro switch button 121 is in the released position when the first power supply is switched off, and the first micro switch button 121 is in the triggered position when the first power supply is switched on; the second micro switch button 131 is in the released position when the second power supply is switched off and the second micro switch button 131 is in the triggered position when the second power supply is switched on, the state indicating module 100 according to the first embodiment is switched-on-triggered.

<Second Embodiment>

[0036] Fig. 6 is an exploded perspective view showing the part of the power automatic transfer switch and the structure of the state indicating module 100 according to a second embodiment of the present utility model, viewed from below. Referring to Fig. 6, the first transmission assembly 140 of the state indicating module 100 according to the second embodiment of the present utility model may include a first pushing rod 141. The first pushing rod 141 extends along the driving direction of the second lower driving rod 204 on the plane of the second lower driving rod 204 (seen more clearly in Figs. 7-9) and linearly movably mounted to the housing 110 in the extending direction. The end of the first pushing rod 141 adjacent to the first lower driving rod 202 has an arc shape, so that the linear end of the first lower driving rod 202 is convenient to contact with the arc end of the first pushing rod 141, and transmit the linear movement of the first lower driving rod 202 to the first pushing rod 141, pushing the first pushing rod 141 to perform linear movement. The first pushing rod 141 includes a first protrusion 1411 protruding downward from the rod body of the first pushing rod 141, and the first protrusion 1411 includes a slope surface. The first transmission assembly 140 of the state indicating module 100 according to the second embodiment of the present utility model may further include a first sliding member 144 that is linearly movably mounted to the housing 110 in the up and down direction. The first sliding member 144 includes a slope surface that coop-

erates with the slope surface of the first protrusion 1411 of the first pushing rod 141, so that the linear movement of the first pushing rod 141 in its extension direction can be converted into the linear movement of the first sliding member 144 in the up and down direction. The first sliding member 144 further includes a first actuating portion 1421 configured to actuate the first micro switch button 121. The first transmission assembly 140 of the state indicating module 100 according to the second embodiment of the present utility model may further include a first return spring 143 configured to act on the first pushing rod 141 with a return elastic force. As shown in Fig. 6, the first return spring 143 according to the second embodiment of the present utility model is a compressed spring and is configured to apply an elastic force to the first pushing rod 141 to restore it to the initial position.

[0037] The structure of the second transmission assembly 150 of the state indicating module 100 according to the second embodiment of the present utility model is similar to that of the first transmission assembly 140, and includes: a second pushing rod 151 extending along a driving direction of the first upper driving rod 201 on a plane of the first upper driving rod 201, linearly movably mounted to the housing 110 in the extending direction, and including a second protrusion 1511 downwardly protruding from the rod body of the first pushing rod 141, the second protrusion 1511 including a slope surface; a second sliding member 154 linearly movably mounted to the housing 110 in the up and down direction, including an slope surface cooperating with the slope surface of the second protrusion 1511 so that the linear movement of the second pushing rod 151 in its extending direction can be converted to a linear movement of the second sliding member 1554 in the up and down direction, and further including a second actuating portion 1521 configured to actuate the second micro switch button 131; and a second return spring 153 configured to act a return elastic force on the second pushing rod 151. It will not be described in detail here.

[0038] It should be noted that, compared with the first embodiment, the relative position of the first transmission assembly 140 and the second transmission assembly 150 according to the second embodiment is opposite, and relative position of the first micro switch assembly 120 and the second transmission assembly 130 according to the second embodiment is also opposite.

[0039] The principle of the state indicating module 100 according to the second embodiment of the present utility model will be described below with reference to Figs. 7-9.

[0040] Referring first to Figure 7, the first power supply and the second power supply are both switched off at this time, so the first upper driving rod 201 and the second lower driving rod 204 are in the driving position, and the first lower driving rod 202 and the second upper driving rod 203 are in the initial position. Since the first pushing rod 141 extends along the driving direction of the second lower driving rod 204 on the plane of the second lower driving rod 204, that is, aligned with the second lower driving rod 204, and the second lower driving rod 204 is in the driving position, the first pushing rod 141 is pushed to the actuating position, so that the first sliding member 144 is pushed by the first pushing rod 141 to move downwardly to the actuating position through the cooperation of the slope surface of the first protrusion 1411 and the slope surface of the first sliding member 144, the first actuating portion 1421 of the first sliding member 144 is also in the actuating position, and thereby the first micro switch button 121 is in the triggering position, outputting a signal indicating the first power supply is switched off. In the same way, since the second pushing rod 151 extends along the driving direction of the first upper driving rod 201 on the plane of the first upper driving rod 201, that is, aligned with the first upper driving rod 201, and the first upper driving rod 201 is in the actuating position, the second pushing rod 151 is pushed to the actuating position, so that the second sliding member 154 is pushed by the second pushing rod 151 to move downwardly to the actuating position through the cooperation of the slope surface of the second protrusion 1511 and the slope surface of the second sliding member 154, the second actuating portion 1521 of the second sliding member 154 is also in the actuating position, and thereby the second micro switch button 131 is in the triggering position, outputting a signal indicating the second power supply is switched off.

[0041] Referring to Fig. 8 from Fig. 7, the first power supply transfers from switched off to switched on at this time, so the second lower driving rod 204 moves from the driving position back to the initial position. The first pushing rod 141 returns to the initial position under the action of the elastic force of the first return spring 143, and the first micro switch button 121 and the first sliding member 144 return to the released position and the initial position respectively under the action of the return force of the first micro switch button 121, outputting a signal indicating the first power supply is switched on. In addition, since the second power supply is still off and the first upper driving rod 201 is still in the driving position, the second micro switch button 131 is still actuated and is in the triggered position, outputting a signal indicating the second power supply is switched off.

[0042] Referring to Fig. 9 from Fig. 8, the second power supply transfers from switched off to switched on at this time, so the first upper driving rod 201 moves from the driving position back to the initial position. The second pushing rod 151 returns to the initial position under the action of the elastic force of the second return spring 153, and the second micro switch button 131 and the second sliding member 154 return to the released position and the initial position respectively under the action of the return force of the second micro switch button 131, outputting a signal indicating the second power supply is switched on. In addition, since the first power supply transfers from switched on to switched off, the second lower driving rod 204 moves from the initial position to the driving position, and the second lower driving rod 204

contacts and drives the first pushing rod 141 aligned with the second lower driving rod 204 to perform a linear movement, so that the first sliding member 144 is pushed by the first pushing rod 141 to move downwardly to the actuating position through the cooperation of the slope surface of the first protrusion 1411 and the slope surface of the first sliding member 144, and the first actuating portion 1421 of the first sliding member 144 presses down the first micro switch button 121 to the triggered position, outputting a signal indicating the first power supply is switched off.

[0043] Referring back to Fig. 7 from Fig. 9, the second power supply transfers from switched on to switched off, the first upper driving rod 201 moves from the initial position to the driving position, and the first upper driving rod 201 contacts and drives the second pushing rod 151 aligned with the first upper driving rod 201 to perform a linear movement, so that the second sliding member 154 is pushed by the second pushing rod 151 to move downwardly to the actuating position through the cooperation of the slope surface of the second protrusion 1511 and the slope surface of the second sliding member 154, and the second actuating portion 1521 of the second sliding member 154 presses down the second micro switch button 131 to the triggered position, outputting a signal indicating the second power supply is switched off. In addition, since the first power supply is still off and the second lower driving rod 204 is still in the driving position, the first micro switch button 121 is still actuated and is in the triggered position, outputting a signal indicating the first power supply is switched off.

[0044] Because the first micro switch button 121 is in the triggered position when the first power supply is switched off, and the first micro switch button 121 is in the released position when the first power supply is switched on; the second micro switch button 131 is in the triggered position when the second power supply is switched off and the second micro switch button 131 is in the released position when the second power supply is switched on, the state indicating module 100 according to the second embodiment is switched-off-triggered.

[0045] The micro switch of the state indicating module 100 according to the present utility model is arranged in the state indicating module 100, which is convenient for installation and maintenance. And it is possible to provide one or more state indicating modules 100 in an expandable manner according to customer needs, thereby outputting one or more states indicating module signal. The state indicating module is small in size, easy to be installed and wired, and can be switched-on-triggered or switched-off-triggered according to the characteristics of the mechanism.

[0046] The exemplary implementation of the state indicating module 100 proposed by the present utility model is described in detail above with reference to the preferred embodiments. However, those skilled in the art can understand that variations and modifications can be made to the specific embodiments above without departing from the concept of the present utility model and various technical features and structures proposed by the utility model can be combined without going beyond the scope of the utility model.

List of reference signs

[0047]

1 automatic transfer switching equipment
100 state indicating module
110 housing
111 base
112 cover
113 hook
114 slot
120 first micro switch assembly
121 first micro switch button
122 wiring terminal
130 second micro switch assembly
131 second micro switch button
132 wiring terminal
140 first transmission assembly
141 first pushing rod
1411 first protrusion
142 first oscillating rod
1421 first actuating portion
143 first return spring
144 first sliding member
150 second transmission assembly
151 second pushing rod
1511 second protrusion
152 second oscillating rod
1521 second actuating portion
153 second return spring
154 second sliding member
200 body of the automatic transfer switching equipment
201 first upper driving rod
202 first lower driving rod
203 second upper drive lever
204 second lower driving rod

Claims

1. A state indicating module used to indicate an on and off state of an automatic transfer switching equipment, **characterized in that**
the automatic transfer switching equipment comprises a first upper driving rod, a first lower driving rod, a second upper driving rod, and a second lower driving rod that are disposed in parallel to each other in a body of the automatic transfer switching equipment, when a first power supply and a second power supply are both switched off, the first upper driving rod and the second lower driving rod are in a driving position, and the first lower driving rod and the sec-

ond upper driving rod are in an initial position; when the first power supply is switched on, the first upper driving rod and the first lower driving rod are in the driving position, the second upper driving rod and the second lower driving rod are in the initial position; when the second power supply is switched on, the second upper driving rod and the second lower driving rod are in the driving position, and the first upper driving rod and the first lower driving rod are in the initial position,
wherein the state indicating module comprises:

a housing detachably assembled to the body of the automatic transfer switching equipment;
a first micro switch assembly detachably installed in the housing and comprising a first micro switch button, a position of the first micro switch button indicating an on and off state of the first power supply;
a second micro switch assembly detachably installed in the housing and comprising a second micro switch button, a position of the second micro switch button indicating an on and off state of the second power supply;
a transmission assembly movably mounted to the housing and configured to transmit a movement of the driving rods to the first micro switch button and the second micro switch button.

2. The state indicating module according to claim 1, **characterized in that** when the first power supply is switched off, the first micro switch button is in a released position, and when the first power supply is switched on, the first micro switch button is in a triggered position; when the second power supply is switched off, the second micro switch button is in a released position, and when the second power supply is switched on, the second micro switch button is in a triggered position.

3. The state indicating module according to claim 2, **characterized in that** the transmission assembly comprises a first transmission assembly and a second transmission assembly,
wherein the first transmission assembly comprises:

a first pushing rod extending along a driving direction of the first lower driving rod on a plane of the first lower driving rod, linearly movably mounted to the housing in an extending direction, and comprising a first protrusion upwardly protruding from a rod body of the first pushing rod;
a first oscillating rod rotatably mounted to the housing about a rotation axis and comprising a first actuating portion extending outward from a rod body of the first oscillating rod, the rotation axis of the first oscillating rod being perpendicular to the extending direction of the first pushing rod; and
a first return spring configured to act a return elastic force on the first oscillating rod,
wherein when the first power supply is switched on, the first lower driving rod moves toward the driving position, contacts and drives the first pushing rod to move linearly and at the same time, the first protrusion on the first pushing rod contacts and drives the first oscillating rod to rotate, and the first actuating portion on the first oscillating rod actuates the first micro switch button to the triggered position; when the first power supply is switched off, the first lower driving rod moves to the initial position, the first oscillating rod returns to the initial position under an action of the elastic force of the first return spring, thereby bringing the first pushing rod to return to the initial position through the first protrusion, and the first micro switch button returns to the released position under an action of its return force,
and wherein the second transmission assembly comprises:

a second pushing rod extending along a driving direction of the second upper driving rod on a plane of the second upper driving rod, linearly movably mounted to the housing in an extending direction and comprising a second protrusion upwardly protruding from a rod body of the second pushing rod;
a second oscillating rod rotatably mounted to the housing about a rotation axis and comprising a second actuating portion extending outward from a rod body of the second oscillating rod, the rotation axis of the second oscillating rod being perpendicular to the extending direction of the second pushing rod; and
a second return spring configured to act a return elastic force on the second oscillating rod,
wherein when the second power supply is switched on, the second upper driving rod moves toward the driving position, contacts and drives the second pushing rod to move linearly and at the same time, the second protrusion on the second pushing rod contacts and drives the second oscillating rod to rotate, and the second actuating portion on the second oscillating rod actuates the second micro switch button to the triggered position; when the second power supply is switched off, the second upper driving rod moves to the initial position, the second oscillating rod returns to the initial position under an action of the elastic force of the second return spring, thereby bringing the second pushing rod to return to the initial position through the second protrusion, and the second micro switch button returns to the released position under an action of its return force,

4. The state indicating module according to claim 1, **characterized in that** when the first power supply is switched off, the first micro switch button is in a triggered position, and when the first power supply is switched on, the first micro switch button is in a released position; when the second power supply is switched off, the second micro switch button is in a triggered position, and when the second power supply is switched on, the second micro switch button is in a released position.

5. The state indicating module according to claim 4, **characterized in that** the transmission assembly comprises a first transmission assembly and a second transmission assembly,
wherein the first transmission assembly comprises:

a first pushing rod extending along a driving direction of the second lower driving rod on a plane of the second lower driving rod, linearly movably mounted to the housing in an extending direction, and comprising a first protrusion downwardly protruding from a rod body of the first pushing rod, the first protrusion comprising a slope surface;
a first sliding member linearly movably mounted to the housing in an up and down direction, comprising a slope surface cooperating with the slope surface of the first protrusion so that the linear movement of the first pushing rod in its extending direction can be converted to a linear movement of the first sliding member in the up and down direction, and further comprising a first actuating portion configured to actuate the first micro switch button; and
a first return spring configured to act a return elastic force on the first pushing rod,
wherein when the first power supply is switched off, the second lower driving rod moves toward the driving position, contacts and drives the first pushing rod to move linearly, and pushes the first sliding member to slide downwardly through a cooperation of the slope surface of the first protrusion and the slope surface of the first sliding member so that the first actuating portion of the first sliding member actuates the first micro switch button to the triggered position; when the first power supply is switched on, the second lower driving rod moves to the initial position, the first pushing rod returns to the initial position under an action of the elastic force of the first return spring, and the first micro switch button and the first sliding member return to the released position and the initial position respectively under a return force of the first micro switch button,
and wherein the second transmission assembly comprises:

a second pushing rod extending along a driving direction of the first upper driving rod on a plane of the first upper driving rod, linearly movably mounted to the housing in an extending direction, and comprising a second protrusion downwardly protruding from a rod body of the first pushing rod, the second protrusion comprising a slope surface;
a second sliding member linearly movably mounted to the housing in an up and down direction, comprising a slope surface cooperating with the slope surface of the second protrusion so that the linear movement of the second pushing rod in its extending direction can be converted to a linear movement of the second sliding member in the up and down direction, and further comprising a second actuating portion configured to actuate the second micro switch button; and
a second return spring configured to act a return elastic force on the second pushing rod,
wherein when the second power supply is switched off, the first upper driving rod moves toward the driving position, contacts and drives the second pushing rod to move linearly, and pushes the second sliding member to slide downwardly through a cooperation of the slope surface of the second protrusion and the slope surface of the second sliding member so that the second actuating portion of the second sliding member actuates the second micro switch button to the triggered position; when the second power supply is switched on, the first upper driving rod moves to the initial position, the second pushing rod returns to the initial position under an action of the elastic force of the second return spring, and the second micro switch button and the second sliding member return to the released position and the initial position respectively under a return force of the second micro switch button.

6. The state indicating module according to any one of claims 1-5 **characterized in that**, the state indicating module comprises a hook, the body of the automatic transfer switching equipment comprises a corresponding slot, and the state indicating module is assembled to the body of the automatic transfer switching equipment through a cooperation of the hook and the slot.

7. The state indicating module according to claim 6, **characterized in that** the state indicating module further comprises a slot corresponding to the hook, so that a next state indicating module is able to as-

sembled to a previous state indicating module, thereby to assemble a plurality of state indicating modules to the automatic transfer switching equipment according to user needs.

8. The state indicating module according to any one of claims 1 to 5, **characterized in that** the first micro switch assembly and the second micro switch assembly each comprise a wiring terminal configured to output a signal indicating the on and off state of the automatic transfer switching equipment through wiring in respond respectively to the positions of the first micro switch button and the second micro switch button.

9. The state indicating module according to any one of claims 1-5, **characterized in that** the housing comprises a base and a cover that are able to be separated from each other, and when the base and the cover are separated, the first micro switch assembly having been wired and the second micro switch assembly having been wired are able to be installed in the housing.

10. An automatic transfer switching equipment, **characterized in that** it comprises:

a body of the automatic transfer switching equipment; and
one or more state indicating modules according to any one of claims 1-9 attached to the body of the automatic transfer switching equipment.

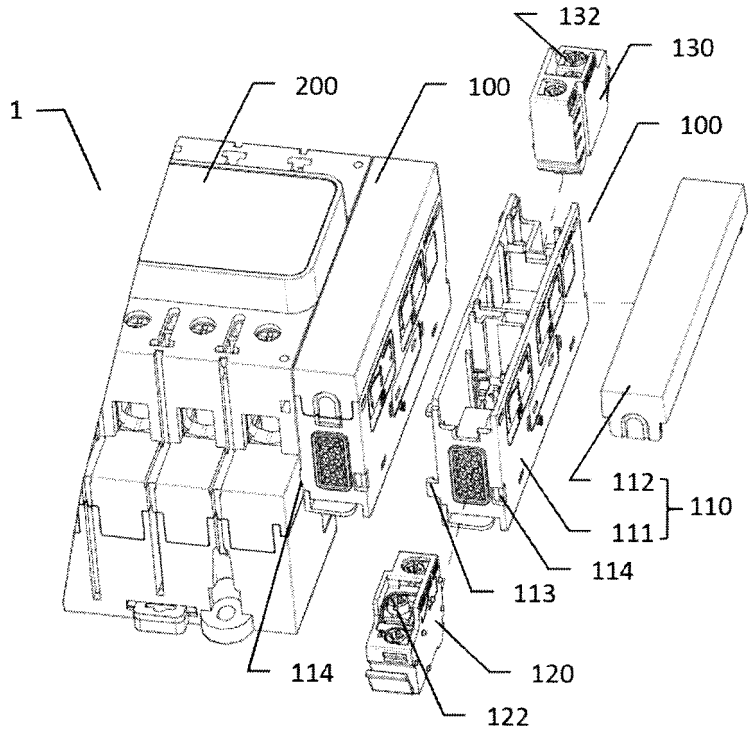
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FIG. 1

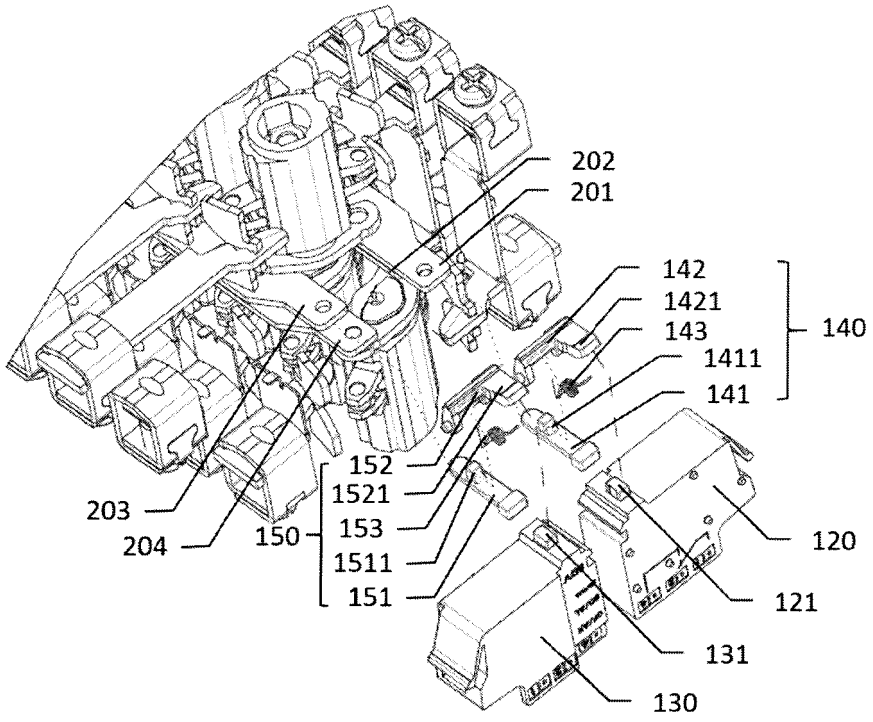
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FIG. 2

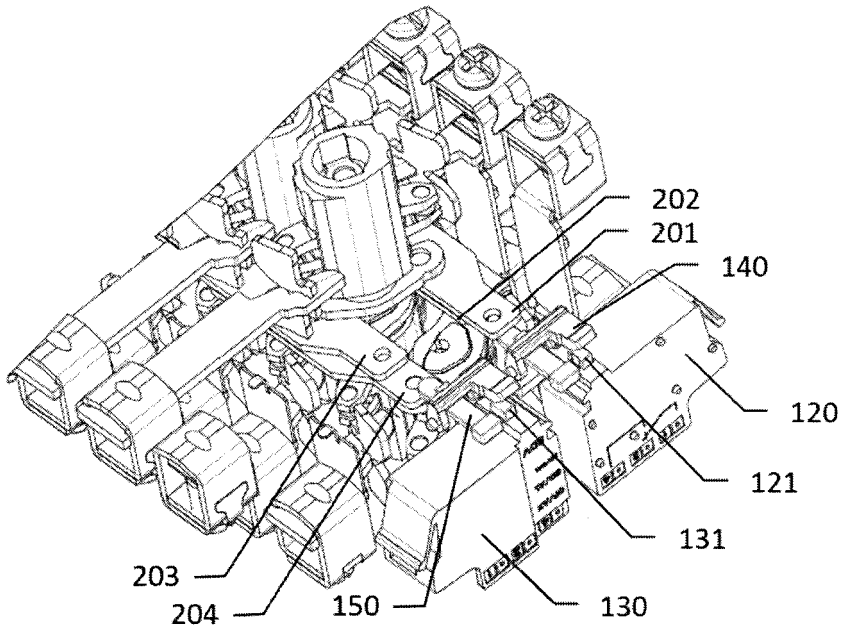
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FIG. 3

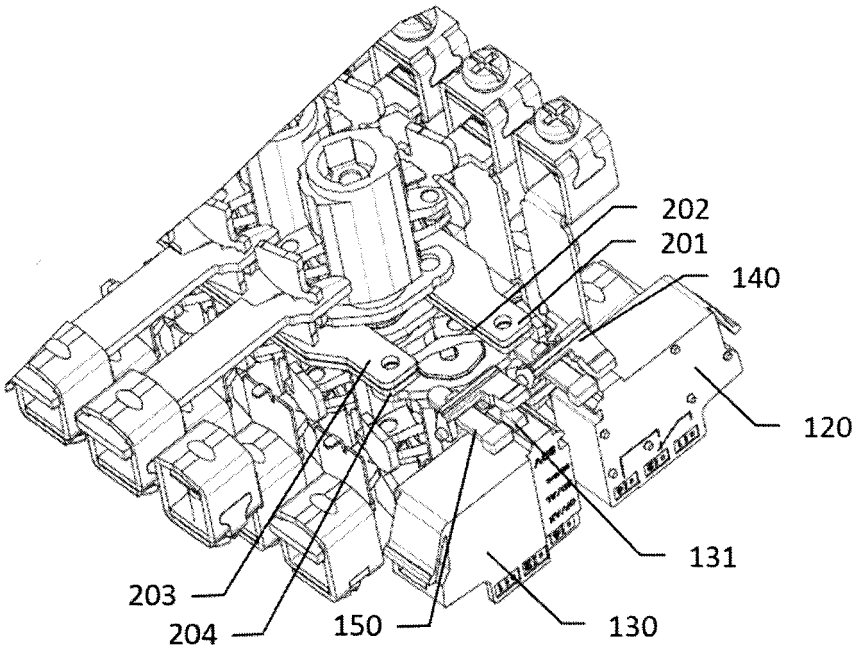
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FIG. 4

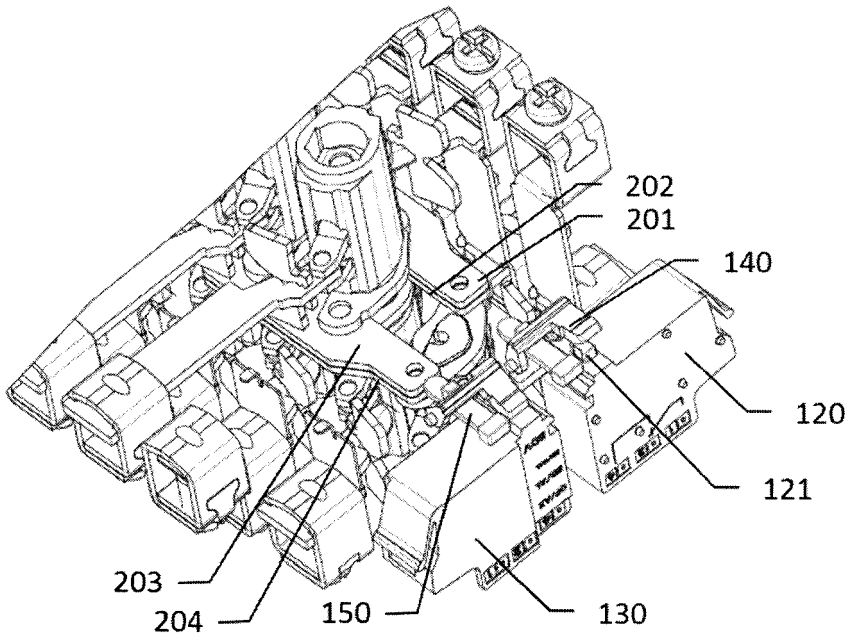
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FIG. 5

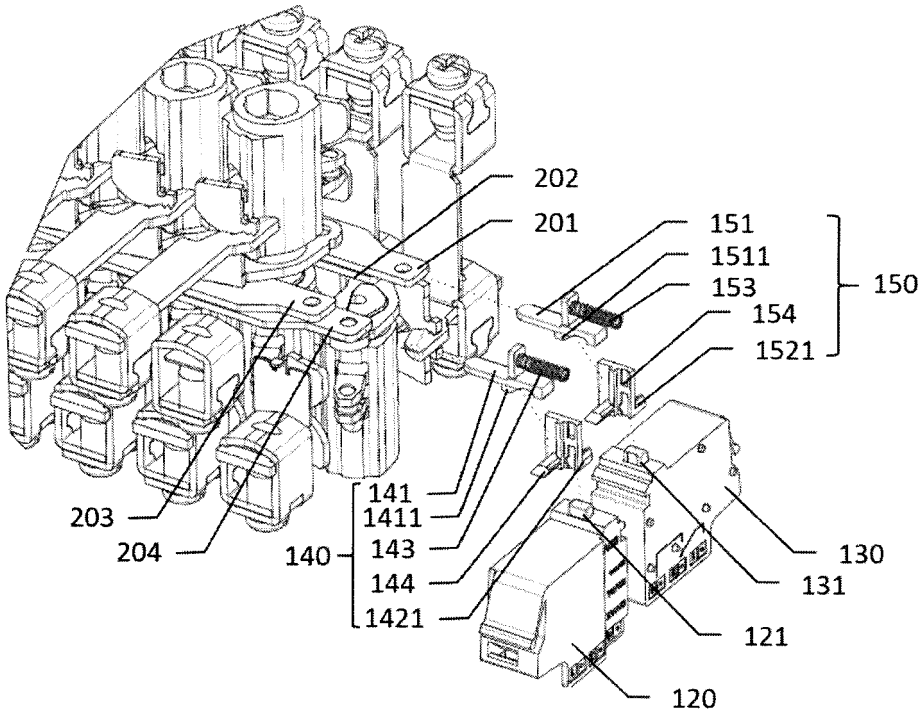
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FIG. 6

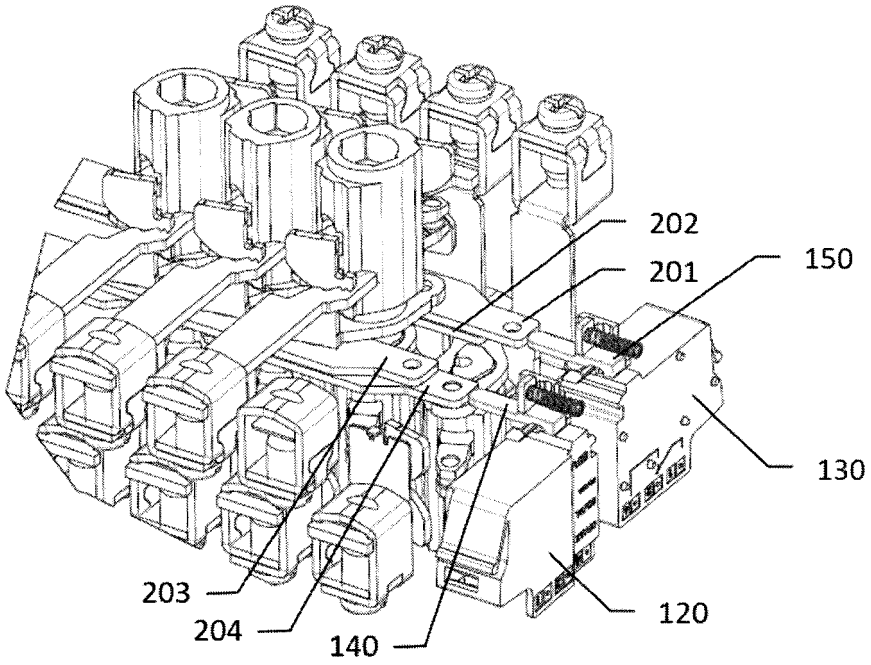
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FIG. 7

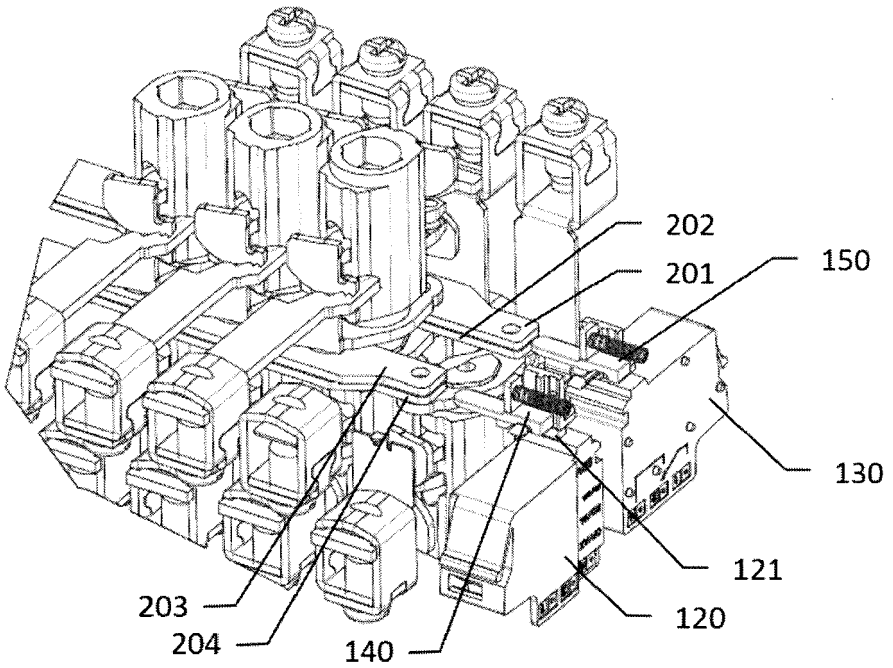
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FIG. 8

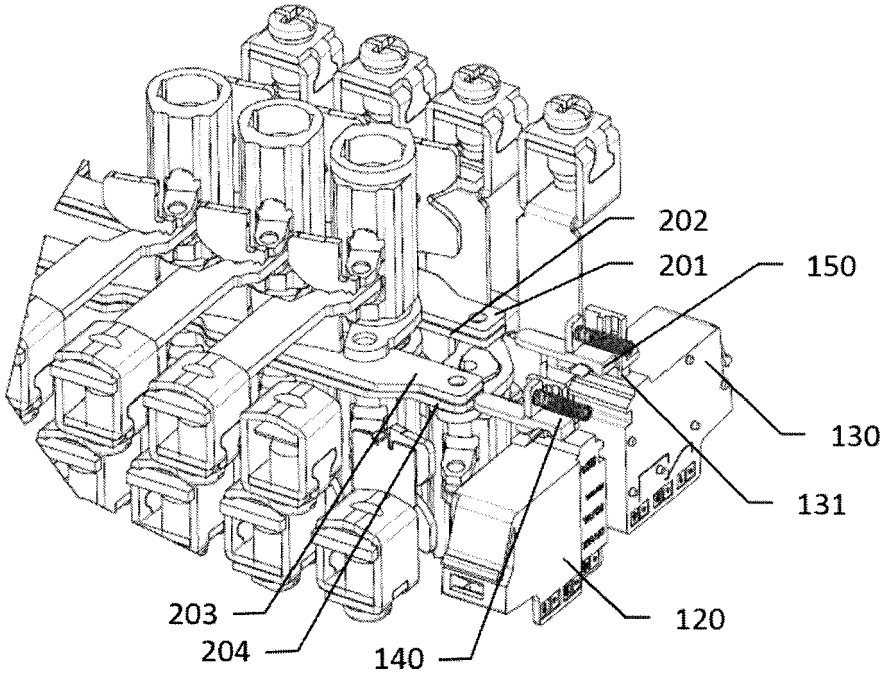

FIG. 9

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EUROPEAN SEARCH REPORT

Application Number
EP 20 30 6130

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
X Y A	CN 209 071 158 U (CHANGSHU SWITCHGEAR MFG CO LTD FORMER CHANGSHU SWITCHGEAR PLANT) 5 July 2019 (2019-07-05) * figures 2,6,8 * -----	1,2 10 3-9	INV. H01H9/16
Y	CN 208 142 045 U (SCHNEIDER ELECTRIC IND SAS) 23 November 2018 (2018-11-23) * figure 1 * -----	10	
			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	27 January 2021	Simonini, Stefano

CATEGORY OF CITED DOCUMENTS

X : particularly relevant if taken alone
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& : member of the same patent family, corresponding document

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ANNEX TO THE EUROPEAN SEARCH REPORT ON EUROPEAN PATENT APPLICATION NO. EP 20 30 6130

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27-01-2021

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
CN 209071158 U	05-07-2019	NONE	
CN 208142045 U	23-11-2018	NONE	

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For more details about this annex : see Official Journal of the European Patent Office, No. 12/82