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(71) Applicant: **Huawei Digital Power Technologies Co., Ltd.**
Shenzhen, Guangdong 518043 (CN)

(72) Inventors:
- **SUN, Jisheng**
  Shenzhen, 518043 (CN)
- **GUI, Xin**
  Shenzhen, 518043 (CN)

(74) Representative: **Gill Jennings & Every LLP**
The Broadgate Tower
20 Primrose Street
London EC2A 2ES (GB)

(54) CIRCUIT BREAKER AND ELECTRIC POWER DEVICE

(57) This application provides a circuit breaker and an electric power device. The circuit breaker includes a housing, an operating handle, an operating mechanism, a through-current assembly, an arc extinguishing chamber, and a tripping control assembly. The operating handle, the operating mechanism, the through-current assembly, and the arc extinguishing chamber are sequentially disposed along a depth direction of the circuit breaker. The through-current assembly includes a movable contact assembly and a stationary contact, and the movable contact assembly includes a movable contact. The operating mechanism is connected to the movable contact assembly. The operating handle is configured to control the operating mechanism to drive the movable contact assembly to move, so that the movable contact is in contact with or is separated from the stationary contact. The arc extinguishing chamber is configured to extinguish an electric arc generated when the movable contact is separated from the stationary contact. The tripping control assembly is in transmission connection to the operating mechanism. The tripping control assembly is configured to: when a fault current is detected, control the operating mechanism to drive the movable contact assembly to move, so that the movable contact is separated from the stationary contact. In the circuit breaker in this application, each mechanism is disposed along the depth direction of the circuit breaker, so that an overall size of the circuit breaker is changed, to increase a quantity of circuit breakers that can be arranged in a cabinet.

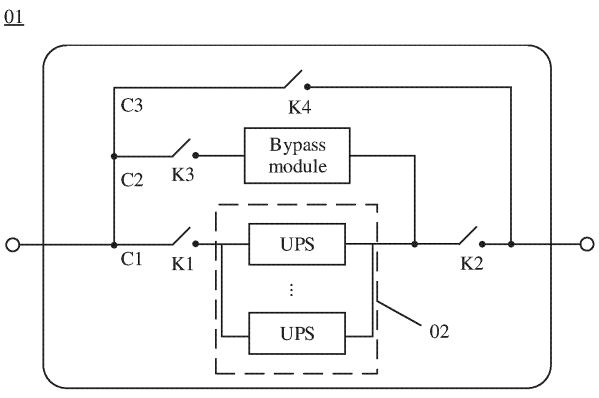

FIG. 1

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Description

TECHNICAL FIELD

[0001] This application relates to the field of communication device technologies, and in particular, to a circuit breaker and an electric power device.

BACKGROUND

[0002] As technologies such as artificial intelligence (artificial intelligence, AI), 5.5G, and autonomous driving are gradually applied to people's daily life and work, requirements for computing capabilities of these technologies also increase significantly. A data center, as a key field supported by using a computing capability, needs an ultra-high capacity and high density. An uninterruptible power supply (uninterruptible power supply, UPS) is an indispensable core unit in the modern data center, and is further miniaturized under the trend of capacity upgrade and high density.

[0003] In a power supply and distribution system at the data center, a circuit breaker usually needs to be used to distribute electric energy. As a key component in the power supply and distribution system, the circuit breaker can control a connection/disconnection of a circuit, and further has a specific protection function. Specifically, a mechanical switch may be disposed in the circuit breaker, and a staff may operate the mechanical switch to switch the circuit breaker between a switch-on state and a switch-on state, to make the circuit connected or disconnected. In addition, after a fault, for example, an overload or a short circuit, occurs in the circuit, the circuit breaker can also be automatically switched to the switch-off state to switch off a current in the circuit, thereby implementing the protection function of the circuit breaker.

[0004] As a volume and power consumption of a power conversion module further decrease, a current level of the data center also increases accordingly. However, internal space of an existing cabinet is limited. This causes a large limitation on layouts and a quantity of circuit breakers, and fails to meet a higher requirement for a running current.

SUMMARY

[0005] This application provides a circuit breaker and an electric power device, to adjust an overall size of the circuit breaker, and change occupied space of the circuit breaker in a cabinet. This increases a quantity of circuit breakers that can be deployed in the cabinet.

[0006] According to a first aspect, this application provides a circuit breaker. The circuit breaker includes a housing, an operating handle, an operating mechanism, a through-current assembly, and an arc extinguishing chamber. Specifically, the operating mechanism is connected to the operating handle. At least a portion that is of the operating handle and that is close to the operating mechanism, the operating mechanism, the through-current assembly, and the arc extinguishing chamber are sequentially disposed in the housing along a depth direction of the circuit breaker. The through-current assembly includes a movable contact assembly and a stationary contact, the movable contact assembly includes a movable contact, and the movable contact is capable of rotating relative to the housing. The operating mechanism is connected to the movable contact assembly, and is configured to drive the movable contact assembly to move, so that the movable contact is in contact with or is separated from the stationary contact. The operating handle is configured to control the operating mechanism to drive the movable contact assembly to move, so that the movable contact is in contact with or is separated from the stationary contact. The arc extinguishing chamber is configured to extinguish an electric arc generated when the movable contact is separated from the stationary contact. In addition, the circuit breaker further includes a tripping control assembly. The tripping control assembly is disposed on a side of the movable contact assembly along a height direction of the circuit breaker, and the tripping control assembly is in transmission connection to the operating mechanism. The tripping control assembly is configured to: when a fault current is detected, control the operating mechanism to drive the movable contact assembly to move, so that the movable contact is separated from the stationary contact.

[0007] The circuit breaker has a circuit breaker operating surface, and the circuit breaker operating surface is used by a staff to perform operations such as a switch-on operation and a switch-off operation, and viewing a working status of the circuit breaker. In a plane on which the circuit breaker operating surface is located, a size of the circuit breaker along a push direction of the operating handle is a height, and a size of the circuit breaker perpendicular to the height direction is a width. A size of the circuit breaker along the direction perpendicular to the circuit breaker operating surface is a depth. The circuit breaker in this application may be used in a power supply and distribution system, and the circuit breaker may be specifically mounted in a cabinet. Similarly, the cabinet has a user operating surface, and the user operating surface is used by the staff to perform operations such as a control operation, mounting and removing, or maintenance. The circuit breaker operating surface of the circuit breaker faces a same direction as the user operating surface. A state in which the cabinet is placed on the ground is used as an example. In a plane on which the user operating surface is located, a size of the cabinet parallel to the ground is a width, and a size of the cabinet perpendicular to the ground is a height. The cabinet is perpendicular to the user operating surface. When multiple circuit breakers are mounted in the cabinet, the circuit breakers are placed in parallel along a width direction of the cabinet, where the circuit breaker operating surface of the circuit breaker faces a same direction as the user operating surface of the cabinet, a height direction of

each circuit breaker is the same as the width direction of the cabinet, a width direction of each circuit breaker is the same as a height direction of the cabinet, and a depth direction of each circuit breaker is the same as a depth direction of the cabinet, in other words, each circuit breaker is horizontally placed in the cabinet.

[0008] In each circuit breaker, the operating handle, the operating mechanism, the through-current assembly, and the arc extinguishing chamber are disposed along the depth direction of the circuit breaker, which specifically means that the operating handle is disposed toward the circuit breaker operating surface, the operating mechanism is located on a side that is of the operating handle and that is away from the circuit breaker operating surface, the through-current assembly is located on a side that is of the operating mechanism and that is away from the operating handle, and the arc extinguishing chamber is located on a side that is of the through-current assembly and that is away from the operating mechanism. In other words, the operating handle, the operating mechanism, the through-current assembly, and the arc extinguishing chamber may be considered to be disposed along the depth direction of the circuit breaker in a layered manner, to reduce component layout of the circuit breaker along the height direction. This reduces a size of the height of the circuit breaker, reduces occupied space of the circuit breaker, and increases a quantity of circuit breakers that can be deployed in the cabinet. Specifically, the operating handle is located at a first layer (an electric operating layer or a manual operating layer), the operating mechanism is located at a second layer (an operating layer), the through-current assembly and the tripping control assembly are located at a third layer (a through-current layer), and the arc extinguishing chamber is located at a fourth layer (an arc extinguishing layer).

[0009] In a possible implementation, the operating mechanism specifically includes a connecting bar assembly, a latch assembly, and a driving piece. The connecting bar assembly is connected to the movable contact assembly, and the latch assembly and the driving piece each are connected to an end that is of the connecting bar assembly and that is away from the movable contact assembly. An end that is of the latch assembly and that is away from the connecting bar assembly is in transmission connection to the tripping control assembly, and an end that is of the driving piece and that is away from the connecting bar assembly is connected to the operating handle. In this way, when the fault current occurs, the tripping control assembly controls the latch assembly, the driving piece, and the connecting bar assembly to move sequentially, and then drives the movable contact assembly to move, so that the movable contact is separated from the stationary contact, implementing switch-off. When the switch-on operation or the switch-off operation is performed, the movement of the operating handle may drive the driving piece to move, to drive the connecting bar assembly to move, so that the movable contact assembly moves and is in contact with or is separated from the stationary contact, implementing switch-on or switch-off.

[0010] In a possible implementation, when the latch assembly is specifically disposed, the housing is provided with a first rotating shaft and a second rotating shaft. The latch assembly includes a latch and a tripping bar. The latch is disposed on the first rotating shaft and rotates around the first rotating shaft. The tripping bar is disposed on the second rotating shaft and rotates around the second rotating shaft. One end of the latch is connected to the connecting bar assembly, and the other end of the latch clasps the tripping bar, and an end point at which the latch clasps the tripping bar is located on a side that is of the second rotating shaft and that is away from the operating handle. In this way, the tripping control assembly is configured to control unlocking of the latch and the tripping bar. When the latch clasps the tripping bar, the latch assembly is locked, and the tripping bar is used to limit the rotation of the latch, so that the circuit breaker is switched on and switched off by using the operating handle. When clasping between the latch and the tripping bar is released, the latch moves under the action of the driving piece, to drive the connecting bar assembly to move, so that the movable contact is separated from the stationary contact, implementing switch-off.

[0011] In the foregoing circuit breaker, along the height direction, the tripping bar is located on a side that is of the latch and that is away from the operating handle, so that the tripping bar and the latch are located on a same side of the operating handle, to simplify a structure of the latch assembly and further improve space utilization of the operating layer.

[0012] In a possible implementation, the latch assembly further includes a rotating fastening bar and a rotating half shaft. The rotating fastening bar clasps an end that is of the tripping bar and that is away from the latch, and the rotating half shaft clasps an end that is of the rotating fastening bar and that is away from the tripping bar. The tripping control assembly is configured to drive the rotating half shaft to rotate, to sequentially unlock the rotating half shaft and the rotating fastening bar, the rotating fastening bar and the tripping bar, and the tripping bar and the latch, so that the latch rotates when driven by the driving piece, implementing a switch-off function of the tripping control assembly.

[0013] In a possible implementation, the connecting bar assembly may be designed as a system with four connecting bars. Specifically, the connecting bar assembly includes a first fastening bar, a first connecting bar, and a second connecting bar. The first fastening bar is connected to the movable contact assembly, and the first fastening bar is connected to the first connecting bar. An end that is of the first connecting bar and that is away from the first fastening bar is rotatably connected to the second connecting bar. An end that is of the second connecting bar and that is away from the first connecting bar is rotatably connected to the latch. One end of the driving

piece is connected to the operating handle, and the other end of the driving piece is connected to the end that is of the first connecting bar and that is away from the first fastening bar. The connecting bar assembly is configured to drive the movable contact assembly to rotate when driven by the driving piece.

[0014] A specific type of the tripping control assembly is not limited. In a possible implementation, the tripping control assembly includes a backup protector and a magnetic attraction bar, and the magnetic attraction bar is capable of rotating relative to the housing. The backup protector magnetically attracts the magnetic attraction bar, and the magnetic attraction bar is in transmission connection to the operating mechanism. The backup protector is configured to magnetically attract the magnetic attraction bar when the fault current is detected, to drive the operating mechanism to move.

[0015] In a possible implementation, the tripping control assembly includes a thermal-magnetic release body, a thermally deformable metal piece, and an electromagnetic clutter part. The thermally deformable metal piece is connected to the thermal-magnetic release body, the thermally deformable metal piece and the electromagnetic clutter part each are rotatably connected to the housing, and the thermally deformable metal piece and the electromagnetic clutter part each are in transmission connection to the operating mechanism. The thermal-magnetic release body is located on a side of the operating mechanism along the width direction of the circuit breaker. The thermal-magnetic release body is configured to: when a first fault current is detected, the thermally deformable metal piece generates thermal deformation, so that the thermally deformable metal piece drives the operating mechanism to move; or when a second fault current is detected, the thermal-magnetic release body quickly attracts the electromagnetic clutter part, so that the electromagnetic clutter part drives the operating mechanism to move.

[0016] In a possible implementation, the circuit breaker further includes a controller. The controller may be disposed on a same layer as the operating mechanism. Specifically, the controller is disposed on a side of the operating mechanism along the width direction of the circuit breaker. The tripping control assembly includes a transformer and a magnetic flux part. The transformer is located at a third layer (a through-current layer). The magnetic flux part and the operating mechanism are disposed on the same layer, in other words, the magnetic flux part is located on a second layer (an operating layer). The transformer and the magnetic flux part each are electrically connected to the controller. The transformer is disposed on a side of the movable contact assembly along the height direction of the circuit breaker, and is configured to send a fault current signal to the controller when the fault current is detected. The magnetic flux part is located between the controller and the operating mechanism, and is in transmission connection to the operating mechanism. The controller is configured to control, based on the fault current signal, the magnetic flux part to drive the operating mechanism to move.

[0017] In a possible implementation, when the movable contact assembly is specifically disposed, the movable contact assembly further includes a case and a first spring located in the case. The case is rotatably connected to the housing, and is in transmission connection to the operating mechanism; and the stationary contact is located on a side that is of the case and that is away from the operating mechanism, the movable contact is located in the case and extends out of the case alone a direction away from the operating mechanism, and an end that is of the movable contact and that is located in the case is rotatably connected to the housing. One end of the first spring is connected to the movable contact, and the other end of the first spring is connected to the case. The case is configured to push, when driven by the operating mechanism, the movable contact to rotate.

[0018] In a possible implementation, the through-current assembly further includes a conducting wire, and a first copper bar and a second copper bar that are disposed opposite to each other along the height direction, and the first copper bar and the second copper bar extend to two sides of the arc extinguishing chamber along the depth direction of the circuit breaker. An end that is of the first copper bar and that is close to the operating mechanism is electrically connected to the movable contact through the conducting wire, and a first connector is disposed at an end that is of the first copper bar and that is away from the operating mechanism. The stationary contact is disposed on the second copper bar and is electrically connected to the second copper bar, and a second connector is disposed at one end that is of the second copper bar and that is away from the operating mechanism. In this implementation, the first copper bar and the second copper bar are disposed in space of two sides of the arc extinguishing chamber, and the first connector and the second connector are disposed along the depth direction. This can further reduce a height size of the circuit breaker.

[0019] In a possible implementation, the movable contact includes a rotating bar and a contact, the rotating bar is located in the case and is rotatably connected to the housing, an end that is of the rotating bar and that is away from the operating mechanism extends out of the case. The contact is connected to a side that is of the rotating bar and that is away from the operating mechanism, and the conducting wire is connected to the rotating bar. In this way, the conducting wire is arranged in the space between the movable contact assembly, the arc extinguishing chamber and the tripping control assembly. This improves space utilization. In addition, when the operating mechanism drives the movable contact assembly to move, the conducting wire does not interfere with movement of the operating mechanism. In addition, this avoids the operating mechanism from being powered on because the conducting wire touches the operating mechanism by mistake.

[0020] Specific structural forms of the first connector and the second connector are not limited. In a possible implementation, the first connector includes two first metal pressing sheets that are disposed opposite to each other and a first elastic retaining piece. The two first metal pressing sheets are connected to a side that is of the first copper bar and that is away from the operating mechanism, ends that are of the two first metal pressing sheets and that are away from the first copper bar form a first socket, and a first cable is inserted into the first socket. The first elastic retaining piece is connected to the two first metal pressing sheets, and is configured to keep the two first metal pressing sheets press-fitting facing each other. Similarly, the second connector includes two second metal pressing sheets that are disposed opposite to each other and a second elastic retaining piece. The two second metal pressing sheets are connected to a side that is of the second copper bar and that is away from the operating mechanism, ends that are of the two second metal pressing sheets and that are away from the second copper bar form a second socket, and a second cable is inserted into the second socket. The second elastic retaining piece is connected to the two second metal pressing sheets, and is configured to keep the two second metal pressing sheets press-fitting facing each other.

[0021] In a possible implementation, the first connector includes a first transfer copper bar, and the first transfer copper bar is located on a side that is of the first copper bar and that is close to the arc extinguishing chamber and is fastened to the first copper bar. The second connector includes a second transfer copper bar, and the second transfer copper bar is located on a side that is of the second copper bar and that is close to the arc extinguishing chamber and is fastened to the second copper bar. The circuit breaker may further include a first clamp and a second clamp. The first clamp is disposed close to the first transfer copper bar and is fastened to the housing. The first clamp includes an I-shaped first metal piece, the first transfer copper bar is inserted into an opening at one end of the first metal piece, and a first cable is inserted into an opening at the other end of the first metal piece. The second clamp is disposed close to the second transfer copper bar and is fastened to the housing. The second clamp includes an I-shaped second metal piece, the second transfer copper bar is inserted into an opening at one end of the second metal piece, and a second cable is inserted into an opening at the other end of the second metal piece. In this implementation, a distance between the first clamp and the second clamp can be reduced, and a height of the circuit breaker can be further reduced.

[0022] In a possible implementation, an arc outlet is disposed at an end that is of the housing and that is away from the operating handle, and the arc outlet is disposed along the depth direction of the circuit breaker. The arc extinguishing chamber is located between the arc outlet and the through-current assembly, so that the arc extinguishing chamber emits a gas from the arc outlet along the depth direction of the circuit breaker after the electric arc is extinguished.

[0023] In a possible implementation, the arc extinguishing chamber may include multiple arc extinguishing sheets, and the multiple arc extinguishing sheets are disposed in an arc shape. In the circuit breaker, an eliminated charged free gas path formed by the multiple arc extinguishing sheets may extend from the top to the bottom along the height direction of the circuit breaker. This increases a path length, facilitates implementation of zero arc flying and zero breakdown, and improves safety of the circuit breaker.

[0024] In a possible implementation, the circuit breaker may further include an arc suppression module. The arc suppression module is disposed, along the depth direction of the circuit breaker, on a side that is of the arc outlet and that is away from the arc extinguishing chamber, and the arc suppression module is configured to purify a gas emitted from the arc outlet. The arc suppression module may be considered to be disposed on a side of the arc extinguishing chamber along the depth direction of the circuit breaker in a layered manner, to reduce component layout of the circuit breaker along the height direction. This reduces a size of the height of the circuit breaker, reduces occupied space of the circuit breaker, and increases a quantity of circuit breakers that can be deployed in the cabinet. Specifically, the arc suppression module is located at a fifth layer (an arc suppression layer).

[0025] According to a second aspect, this application provides an electric power device. The electric power device includes a cabinet and multiple circuit breakers according to the first aspect, where the multiple circuit breakers are sequentially disposed in the cabinet along a width direction of the cabinet, a height direction of the circuit breaker is the same as the width direction of the cabinet, a width direction of the circuit breaker is the same as a height direction of the cabinet, and a depth direction of the circuit breaker is the same as a depth direction of the cabinet. In the electric power device in this application, an operating handle, an operating mechanism, a through-current assembly, and an arc extinguishing chamber inside the circuit breaker are disposed along the depth direction of the circuit breaker, so that a size of a height of the circuit breaker can be reduced. In this way, when the foregoing multiple circuit breakers are mounted, the circuit breakers may be mounted horizontally in the cabinet, that is, the height direction of the circuit breakers is the same as the width direction of the cabinet, to increase a quantity of circuit breakers that can be deployed in the cabinet, to meet a higher requirement for a power supply running current.

[0026] According to a third aspect, this application provides an electric power device. The electric power device includes a cabinet and multiple circuit breakers according to the first aspect, where the multiple circuit breakers are sequentially disposed in the cabinet along a width direction of the cabinet, a height direction of the circuit breaker is the same as the width direction of the

cabinet, a width direction of the circuit breaker is the same as a height direction of the cabinet, and a depth direction of the circuit breaker is the same as a depth direction of the cabinet. An arc outlet is disposed at an end that is of the housing and that is away from the operating handle, and the arc outlet is disposed along the depth direction of the circuit breaker. The circuit breaker is inserted into a side that is of the cabinet and that is close to the arc outlet. The cabinet further includes an arc suppression module, and the arc suppression module is located at the arc outlet and is configured to purify a gas emitted from the arc outlet. In the electric power device in this application, an operating handle, an operating mechanism, a through-current assembly, and an arc extinguishing chamber inside the circuit breaker are disposed along the depth direction of the circuit breaker, so that a size of a height of the circuit breaker can be reduced. In this way, when the foregoing multiple circuit breakers are mounted, the circuit breakers may be mounted horizontally in the cabinet, that is, the height direction of the circuit breakers is the same as the width direction of the cabinet, to increase a quantity of circuit breakers that can be deployed in the cabinet, to meet a higher requirement for a power supply running current. In addition, the arc suppression module may be directly disposed in the cabinet, and installation and removing of the arc suppression module and the circuit breaker may be implemented by pulling in and drawing out the circuit breaker.

BRIEF DESCRIPTION OF DRAWINGS

[0027]

FIG. 1 is a diagram of an application scenario of a circuit breaker according to an embodiment of this application;
FIG. 2 is a diagram of another application scenario of a circuit breaker according to an embodiment of this application;
FIG. 3 is a diagram of a circuit breaker according to an embodiment of this application;
FIG. 4 is a sectional view, along an A-A direction, of the circuit breaker in FIG. 3;
FIG. 5 is a diagram of a circuit breaker in a switch-on state according to an embodiment of this application;
FIG. 6 is another sectional view of a circuit breaker according to an embodiment of this application;
FIG. 7 is another diagram of the circuit breaker in FIG. 6;
FIG. 8 is another diagram of the circuit breaker in FIG. 6;
FIG. 9 is another sectional view of a circuit breaker according to an embodiment of this application;
FIG. 10 is a partial sectional view of a circuit breaker according to an embodiment of this application;
FIG. 11 is another sectional view of a circuit breaker according to an embodiment of this application;
FIG. 12 is another partial sectional view of a circuit breaker according to an embodiment of this application;
FIG. 13 is another sectional view of a circuit breaker according to an embodiment of this application;
FIG. 14 is another sectional view of a circuit breaker according to an embodiment of this application;
FIG. 15 is another sectional view of a circuit breaker according to an embodiment of this application;
FIG. 16 is another sectional view of a circuit breaker according to an embodiment of this application;
FIG. 17 is a diagram of a circuit breaker in a switch-off state according to an embodiment of this application;
FIG. 18 is another diagram of a circuit breaker in a switch-off state according to an embodiment of this application;
FIG. 19 is another diagram of a circuit breaker according to an embodiment of this application;
FIG. 20 is another diagram of a circuit breaker according to an embodiment of this application;
FIG. 21 is another diagram of a circuit breaker according to an embodiment of this application; and
FIG. 22 is another diagram of a circuit breaker according to an embodiment of this application.

[0028] Reference numerals:

01-power supply and distribution system; 02-power supply module; 10-electric power device;
11-cabinet; 20-circuit breaker; 21-housing;
22-operating handle; 23-operating mechanism; 24-through-current assembly;
25-arc extinguishing chamber; 26-tripping control assembly; 27-arc suppression module;
110-user operating surface; 210-circuit breaker operating surface; 211-arc outlet;
231-connecting bar assembly; 232-latch assembly; 241-movable contact assembly;
242-stationary contact; 243-conducting wire; 244-first copper bar;
245-second copper bar; 246-first connector; 247-second connector;
248-first clamp; 249-second clamp; 251-arc extinguishing sheet;
261-backup protector; 262-transformer; 263-magnetic flux part;
2411-movable contact; 2412-case; 2441-welding copper bar;
2512-first arc guiding sheet; 2513-second arc guiding sheet; and 2631-activity pin.

DESCRIPTION OF EMBODIMENTS

[0029] To make the objectives, technical solutions, and advantages of this application clearer, the following further describes this application in detail with reference to accompanying drawings.

[0030] For ease of understanding a circuit breaker provided in embodiments of this application, the following

describes an application scenario of the circuit breaker. The circuit breaker provided in embodiments of this application can be widely used in various power supply and distribution systems. FIG. 1 is a diagram of an application scenario of a circuit breaker according to an embodiment of this application. As shown in FIG. 1, in an example provided in this application, the circuit breaker may be used in a power supply and distribution system 01 at a data center, and is configured to connect, carry, and disconnect a current between a power supply grid and the data center. The power supply and distribution system 01 may include a power supply module 02 (the power supply module 02 that is shown in FIG. 1 and that is formed by connecting multiple UPSs in parallel /in series) and multiple circuit breakers. For example, three circuits are disposed in the power supply and distribution system 01, and the three circuits are a first circuit C1, a second circuit C2, and a third circuit C3. A circuit breaker is correspondingly disposed in each circuit, where the first circuit C1 is connected to the power supply module 02, a first circuit breaker K1 is disposed at an input end of the power supply module 02, and a second circuit breaker K2 is disposed at an output end of the power supply module 02; the second circuit C2 is connected to a bypass module, a third circuit breaker K3 is disposed at one end of the bypass module, and the other end of the bypass module is connected to the second circuit breaker K2; and the third circuit C3 is a standby circuit, and a fourth circuit breaker K4 is disposed.

[0031] When the circuit between the power supply grid (or a power supply) and the data center needs to be connected, the first circuit breaker K1 and the second circuit breaker K2 each may be switched to a switch-on state; and when the circuit between the power supply grid and the data center needs to be disconnected, the first circuit breaker K1 or the second circuit breaker K2 may be switched to a switch-off state. In this way, power-on and power-off states at the data center are controlled by controlling the switch-on state and the switch-off state of the circuit breaker. When a power-consuming device of the data center needs to be overhauled and maintained, the first circuit breaker K1 and the second circuit breaker K2 each may be switched to the switch-off state, and the third circuit breaker K3 or the fourth circuit breaker K4 may be switched to the switch-on state, to facilitate operations such as overhauling and maintenance on the power-consuming device.

[0032] In addition, the circuit breaker in this application can also be used in a power supply and distribution system of an enterprise power-consuming device or a public power-consuming device, and is configured to connect, carry, and disconnect a current between the power supply grid and the enterprise power-consuming device or the public power-consuming device. For example, when a power-consuming device (for example, a 4G base station or a 5G base station) needs to work normally, a staff can make the circuit breaker to be in the switch-on state, so that the power supply grid can supply electric energy needed for normal work to the power-consuming device. When the power-consuming device needs to be overhauled and maintained, the staff can switch the circuit breaker to the switch-off state, to facilitate operations such as the overhaul and maintenance of the power-consuming device.

[0033] FIG. 2 is a diagram of another application scenario of a circuit breaker according to an embodiment of this application. As shown in FIG. 2, the power supply system may specifically include multiple electric power devices 10. Each electric power device 10 includes a cabinet 11, and multiple power modules and multiple circuit breakers (K1, ..., Km) located in the cabinet 11. A side that is of the cabinet 11 and that faces a staff is a user operating surface 110. In this application, a state in which the cabinet 11 is placed on the ground is used as an example. A size of the user operating surface 110 parallel to the ground is a width W, a size of the user operating surface 110 perpendicular to the ground is a height H, and a size perpendicular to the user operating surface 110 is a depth D. The foregoing multiple power modules are sequentially stacked along a height H direction of the cabinet 11, and the foregoing multiple circuit breakers are sequentially placed on one side of the foregoing multiple power modules along a width W direction of the cabinet 11. The power module is configured to perform power conversion on a voltage from a power grid, to output an adapted voltage to a load device. Specifically, the power module may be an AC/AC module, or may be an AC/DC module.

[0034] In the existing electric power device, because sizes of the width W and the height H of the cabinet are limited, a quantity of circuit breakers on the user operating surface 110 side is limited, which cannot meet a large-capacity and high-density layout requirement of a power supply and distribution system.

[0035] In this way, this application provides a circuit breaker and an electric power device, to adjust an overall size of the circuit breaker, and change occupied space of the circuit breaker in a cabinet. This increases a quantity of circuit breakers that can be deployed in the cabinet.

[0036] It should be noted that, terms used in the following embodiments are only for a purpose of describing specific embodiments, but are not intended to limit this application. The terms "one", "a" and "this" of singular forms used in this specification and the appended claims of this application are intended to also include expressions such as "one or more", unless otherwise specified in the context clearly.

[0037] Reference to "an embodiment", "some embodiments", or the like described in this specification indicates that one or more embodiments of this application include a specific feature, structure, or characteristic described with reference to embodiments. Therefore, statements such as "in an embodiment", "in some embodiments", "in some other embodiments", and "in other embodiments" that appear at different places in this specification do not necessarily mean referring to a same embodiment. In-

stead, the statements mean "one or more but not all of embodiments", unless otherwise specifically emphasized in another manner. The terms "include", "have", and their variants all mean "include but are not limited to", unless otherwise specifically emphasized in another manner.

[0038] FIG. 3 is a diagram of a circuit breaker according to an embodiment of this application. FIG. 4 is a sectional view, along an A-A direction, of the circuit breaker in FIG. 3. FIG. 5 is a diagram of the circuit breaker in a switch-on state according to this embodiment of this application. As shown in FIG. 3, FIG. 4, and FIG. 5, the circuit breaker 20 includes a housing 21, an operating handle 22, an operating mechanism 23, a through-current assembly 24, and an arc extinguishing chamber 25. Specifically, the operating handle 22 is connected to the operating mechanism 23. At least a portion that is of the operating handle 22 and that is close to the operating mechanism 23, the operating mechanism 23, the through-current assembly 24, and the arc extinguishing chamber 25 are located in the housing 21, and are disposed sequentially along a depth direction of the circuit breaker. In an embodiment, an end that is of the operating handle 22 and that is away from the operating mechanism 23 may extend out of the housing 21, so that a staff pushes the operating handle 22 to perform a switch-on operation and a switch-off operation. In another embodiment, the housing 21 is provided with a knob, to implement switch-off and switch-on of the circuit breaker 20 through a manual operation on the knob. Specifically, the end that is of the operating handle 22 and that is away from the operating mechanism 23 is connected to the knob. When the staff performs the manual operation on the knob, the knob is rotated and the operating handle 22 is driven to push along a height direction. In another embodiment, the circuit breaker 20 may further include a remote controller and an electric operating apparatus. The electric operating apparatus is connected to the operating handle 22 and is connected to the remote controller, to implement switch-off and switch-on of the circuit breaker 20 through an electric operation. When performing the electric operation, the staff sends a switch-on instruction or a switch-off instruction to the remote controller, and the remote controller may control the electric operating apparatus to push the operating handle 22. In this embodiment, the staff may send an instruction close to the circuit breaker 20, or may send an instruction remotely by using a communication apparatus. In addition, the operating mechanism 23 is located on a side of the operating handle 22, and is in transmission connection to the operating handle 22. The through-current assembly 24 is located on a side that is of the operating mechanism 23 and that is away from the operating handle 22. The through-current assembly 24 includes a movable contact assembly 241 and a stationary contact 242. The movable contact assembly 241 includes a movable contact 2411, and the movable contact 2411 is capable of rotating relative to the housing 21. The movable contact 2411 is configured to be in contact with and be electrically connected to the stationary contact 242. The operating mechanism 23 is connected to the movable contact assembly 241, and is configured to drive the movable contact assembly 241 to move, so that the movable contact 2411 is in contact with or is separated from the stationary contact 242. The operating handle 22 is configured to control the operating mechanism 23 to drive the movable contact 2411 to move, so that the movable contact 2411 is in contact with or is separated from the stationary contact 242. The arc extinguishing chamber 25 is configured to extinguish an electric arc generated when the movable contact 2411 is separated from the stationary contact 242.

[0039] In this application, the side that is of the operating handle 22 and that extends out of the housing 21 is a circuit breaker operating surface 210. The circuit breaker operating surface 210 is used as an example. A size of the circuit breaker 20 along a direction of pushing the operating handle 22 is a height h, a size perpendicular to the height h is a width w, and a size perpendicular to the circuit breaker operating surface 210 is a depth d. A first direction is the depth d direction of the circuit breaker 20. In other words, the operating handle 22, the operating mechanism 23, the through-current assembly 24, and the arc extinguishing chamber 25 are sequentially disposed along the depth d direction of the circuit breaker 20. When the circuit breaker 20 is placed in the cabinet 11, the height h direction of the circuit breaker 20 is the same as the width W direction of the cabinet 11, the width w direction of the circuit breaker 20 is the same as the height H direction of the cabinet 11, and the depth d direction of the circuit breaker 20 is the same as the depth D direction of the cabinet 11. In this way, when the staff performs the switch-on operation or the switch-off operation on the circuit breaker 20, the staff pushes the operating handle 22 along the width W direction of the cabinet 11. When the operating handle 22 is pushed to perform the switch-off operation or the switch-on operation, the operating mechanism 23 may move along with the operating handle 22, to drive the movable contact 2411 to be separated from or be in contact with the stationary contact 242. When the movable contact 2411 is in contact with the stationary contact 242, the circuit breaker 20 is in a switch-on state; or when the movable contact 2411 is separated from the stationary contact 242, the circuit breaker 20 is in a switch-off state. In the circuit breaker 20 in this application, the operating handle 22, the operating mechanism 23, the through-current assembly 24, and the arc extinguishing chamber 25 are disposed along the depth d direction of the circuit breaker 20, and are considered to be disposed in a layered manner, so that a size of the height h of the circuit breaker 20 can be reduced, occupied space of the circuit breaker 20 can be reduced, and a quantity of circuit breakers 20 that can be deployed in the cabinet 11 can be increased. Specifically, the operating handle 22 is located at a first layer (an electric operating layer or a manual operating layer), the operating mechanism 23 is

located at a second layer (an operating layer), the through-current assembly 24 is located at a third layer (a through-current layer), and the arc extinguishing chamber 25 is located at a fourth layer (an arc extinguishing layer).

[0040] Still refer to FIG. 5. The circuit breaker 20 further includes a tripping control assembly 26. The tripping control assembly 26 is disposed on a side of the movable contact assembly 241 along the height h direction of the circuit breaker 20, and is in transmission connection to the operating mechanism 23. The tripping control assembly 26 is located at the third layer (the through-current layer). The tripping control assembly 26 is configured to: when a fault current is detected, control the operating mechanism 23 to drive the movable contact 2411 to be separated from the stationary contact 242. In this embodiment, the fault current may include a short-circuit current, a first fault current, and a second fault current. The first fault current is less than the second fault current, and the second fault current is less than the short-circuit current. Specific thresholds of the first fault current and the second fault current may be set according to an actual application.

[0041] A specific type of the tripping control assembly 26 is not limited. In an embodiment, the tripping control assembly 26 may include a backup protector 261 and a magnetic attraction bar PN. The magnetic attraction bar PN may rotate around a point P relative to the housing 21. The backup protector 261 magnetically attracts the magnetic attraction bar PN, so that the magnetic attraction bar PN rotates around the point P relative to the housing 21. The magnetic attraction bar PN is in transmission connection to the operating mechanism 23. The backup protector 261 is configured to: when the fault current is detected, magnetically attract the magnetic attraction bar PN, and enable the magnetic attraction bar PN to rotate counterclockwise, to drive the operating mechanism 23 to move through the magnetic attraction bar PN.

[0042] In another embodiment, the tripping control assembly 26 includes a thermal-magnetic release body, a thermally deformable metal piece, and an electromagnetic clutter part. The thermally deformable metal piece is connected to the thermal-magnetic release body, the thermally deformable metal piece and the electromagnetic clutter part each are rotatably connected to the housing 21, and the thermally deformable metal piece and the electromagnetic clutter part each are in transmission connection to the operating mechanism 23. The thermal-magnetic release body is located on a side of the operating mechanism 23 along the width w direction of the circuit breaker 20 The thermal-magnetic release body is configured to: when the first fault current is detected, the thermally deformable metal piece is deformed due to heat accumulation, so that the thermally deformable metal piece drives a rotating half shaft LM of the operating mechanism 23 to rotate; or when the second fault current is detected, the thermal-magnetic release body quickly attracts the electromagnetic clutter part, so that the electromagnetic clutter part drives a rotating half shaft LM of the operating mechanism 23 to rotate.

[0043] As shown in FIG. 5, in an embodiment, the circuit breaker 20 further includes a controller, and the controller is disposed on a side of the operating mechanism 23 along the width d direction of the circuit breaker 20. The tripping control assembly 26 specifically includes a transformer 262, and the transformer 262 is electrically connected to the controller. The transformer 262 is disposed on a side of the movable contact assembly 241 along the height h direction of the circuit breaker 20, and may be specifically disposed on a side that is of the backup protector 261 and that is away from the movable contact assembly 241. The transformer 262 is configured to send a fault current signal to the controller through a transformer cable when the fault current is detected. FIG. 6 is another sectional view of the circuit breaker according to this embodiment of this application. FIG. 7 is another diagram of the circuit breaker in FIG. 6. FIG. 8 is another diagram of the circuit breaker in FIG. 6. As shown in FIG. 6, FIG. 7, and FIG. 8, the tripping control assembly 26 may further include a magnetic flux part 263, and the magnetic flux part 263 is electrically connected to the controller. The magnetic flux part 263 is provided with an activity pin 2631, and a rotating fastening bar LW is disposed on a side that is of the activity pin 2631 and that is close to the rotating half shaft LM of the operating mechanism 23. The activity pin 2631 may extend out of a case of the magnetic flux part 263, and push the rotating fastening bar LW to rotate, so that the rotating fastening bar LW pushes the rotating half shaft LM to rotate. The controller is configured to control, based on the fault current signal, the magnetic flux part 263 to drive the activity pin 2631 to extend out of the case of the magnetic flux part 263, to push the rotating half shaft LM to rotate clockwise, and to drive the operating mechanism 23 to move.

[0044] FIG. 9 is another sectional view of the circuit breaker according to this embodiment of this application, and FIG. 10 is a partial sectional view of the circuit breaker according to this embodiment of this application. As shown in FIG. 9 and FIG. 10, in an embodiment, the operating mechanism 23 includes a connecting bar assembly 231, a latch assembly 232, and a driving piece BQ. The connecting bar assembly 231 is connected to the movable contact assembly 241, the latch assembly 232 and the driving piece BQ each are connected to an end that is of the connecting bar assembly 231 and that is away from the movable contact assembly 241, an end that is of the latch assembly 232 and that is away from the connecting bar assembly 231 is in transmission connection to the tripping control assembly 26, and an end that is of the driving piece BQ and that is away from the connecting bar assembly 231 is connected to the operating handle 22. The latch assembly 232 is configured to drive, under control of the tripping control assembly 26, the driving piece BQ to move. The driving piece BQ is con-

figured to drive, when driven by the operating handle 22, the connecting bar assembly 231 to move, so that the movable contact assembly 241 moves, implementing contact or separation between the movable contact 2411 and the stationary contact 242. The driving piece BQ is further configured to drive, when driven by the tripping control assembly 26, the connecting bar assembly 231 to move, so that the movable contact assembly 241 moves, implementing separation between the movable contact 2411 and the stationary contact 242.

[0045] FIG. 11 is another sectional view of the circuit breaker according to this embodiment of this application, and FIG. 12 is another partial sectional view of the circuit breaker according to this embodiment of this application. As shown in FIG. 11 and FIG. 12, specifically, the latch assembly 232 includes a latch CDF and a tripping bar GH. The housing 21 is provided with a first rotating shaft D and a second rotating shaft G. The latch CDF is sleeved on the first rotating shaft D and may rotate around the first rotating shaft D, and the tripping bar GH is sleeved on the second rotating shaft G and may rotate around the second rotating shaft G. One end of the latch CDF is connected to the connecting bar assembly 231, and the other end of the latch CDF clasps the tripping bar GH. The tripping bar GH is configured to limit a rotation stroke of the latch CDF. In an embodiment, an end point F at which the latch CDF clasps the tripping bar GH is located on a side that is of the second rotating shaft G and that is away from the operating handle 22, so that the latch CDF and the tripping bar GH are located on a same side of the operating handle 22 along the height h direction of the circuit breaker 20. In this embodiment, along the height h direction of the circuit breaker 20, the tripping bar GH may be specifically located on a side that is of the latch CDF and that is away from the operating handle 22, so that the latch assembly 232 is arranged from the top to the operating handle 22 along the height h direction of the circuit breaker 20, to make full use of space of the circuit breaker 20 along the height h direction. FIG. 13 is another sectional view of the circuit breaker according to this embodiment of this application, and FIG. 14 is another sectional view of the circuit breaker according to this embodiment of this application. As shown in FIG. 13 and FIG. 14, certainly, in another embodiment, the end point F at which the latch CDF clasps the tripping bar GH may also be located on one side that is of the operating handle 22 and that is away from the second rotating shaft G, so that the latch CDF and the tripping bar GH are located on two sides of the operating handle 22.

[0046] Still refer to FIG. 11 and FIG. 12. The latch assembly 232 may further include a rotating fastening bar KIJ and a rotating half shaft LM. The rotating fastening bar KIJ clasps an end that is of the tripping bar GH and that is away from the latch CDF. The rotating half shaft LM clasps an end that is of the rotating fastening bar KIJ and that is away from the tripping bar GH. The tripping control assembly 26 is configured to drive the rotating half shaft LM to rotate, to sequentially unlock the rotating half shaft LM and the rotating fastening bar KIJ, the rotating fastening bar KIJ and the tripping bar GH, and the tripping bar GH and the latch CDF, so that the latch CDF rotates when driven by the driving piece BQ.

[0047] As shown in FIG. 5 and FIG. 11, the connecting bar assembly 231 includes a first fastening bar OA, a first connecting bar AB, and a second connecting bar BC. The first fastening bar OA, the first connecting bar AB, the second connecting bar BC, and a virtual connecting bar OC form a system with four connecting bars. Specifically, the first fastening bar OAis connected to the movable contact assembly 241, and the first fastening bar OAis connected to the first connecting bar AB. An end that is of the first connecting bar AB and that is away from the first fastening bar OA is rotatably connected to the second connecting bar BC. An end that is of the second connecting bar BC and that is away from the first connecting bar AB is rotatably connected to the latch CDF. One end of the driving piece BQ is connected to the operating handle 22, and the other end of the driving piece BQ is connected to the end that is of the first connecting bar AB and that is away from the first fastening bar OA.

[0048] FIG. 15 is another sectional view of the circuit breaker according to this embodiment of this application, and FIG. 16 is another sectional view of the circuit breaker according to this embodiment of this application. As shown in FIG. 15 and FIG. 16, the movable contact assembly 241 specifically includes a case 2412, a movable contact 2411, and a first spring ST located in the case 2412. The case 2412 is rotatably connected to the housing 21, and the case 2412 is fastened to the first fastening bar OA. The stationary contact 242 is located on a side that is of the case 2412 and that is away from the operating mechanism 23. The movable contact is located in the case 2412, and extends out of the case 2412 along a direction away from the operating mechanism 23. An end that is of the movable contact 2411 and that is located in the case 2412 is rotatably connected to the housing 21, and may rotate around a point O' (overlapping with a point O). The first spring ST may extend into the case 2412 and may rotate around the rotation center O' relative to the housing 21, and a contact point between the movable contact 2411 and the case 2412 is a point E. One end of the first spring ST is connected to the movable contact 2411, and the other end of the first spring ST is connected to the case 2412. The case 2412 is configured to push the movable contact 2411 to rotate when driven by the first fastening bar OA of the operating mechanism 23.

[0049] In an embodiment, the movable contact 2411 includes a rotating bar and a contact. The rotating bar is located in the case 2412 and is rotatably connected to the housing 21, in other words, the rotating bar may rotate around the point O'. An end that is of the rotating bar and that is away from the operating mechanism 23 extends out of the case 2412. The contact is connected to a side that is of the rotating bar and that is away from the operating mechanism 23. In this embodiment, a hook T is disposed on the rotating bar, one end of the first spring

ST is connected to the hook T, and the other end of the first spring ST is connected to a point S of the case 2412. When the circuit breaker 20 is switched on, the first spring ST applies a pulling force to the movable contact 2411, so that the movable contact 2411 and the stationary contact 242 are kept pressed when the circuit breaker 20 is switched on.

[0050] In the foregoing embodiment, the movable contact assembly 241 may include multiple movable contacts 2411 and multiple first springs ST that are disposed corresponding to the multiple movable contacts 2411. One end of the first spring ST is fastened to the corresponding movable contact 2411, and the other end of the first spring ST is fastened to the case 2412.

[0051] FIG. 17 is a diagram of the circuit breaker in a switch-off state according to this embodiment of this application. As shown in FIG. 5 and FIG. 17, in an actual application, the staff may push the operating handle 22 along the height h direction through a manual operation. Specifically, when the circuit breaker 20 is in the switch-on state, the operating handle 22 is pushed along the height h direction to perform a switch-off operation. When the operating handle 22 is pushed downward, the operating handle 22 rotates clockwise around a point R. During rotation of the operating handle 22, the driving piece BQ is pulled to rotate clockwise, so that a point B moves downward along the height h direction. After the point B moves from one side of a point C along the height h direction to the other side, the driving piece BQ applies pulling forces to the connecting bar assembly 231 and the latch assembly 232. In this case, the point B of the connecting bar assembly 231 moves rightward under a pulling force of the driving piece BQ, to pull the first connecting bar AB to move rightward. The first fastening bar OA is subject to a pulling force of the first connecting bar AB at a point A, so that the first fastening bar OA drives the case 2412 to rotate clockwise around the point O. During rotation of the case 2412, the contact point E between the case 2412 and the movable contact 2411 is subject to a pushing force, so that the movable contact 2411 rotates clockwise around the point O, and the movable contact 2411 is separated from the stationary contact 242, implementing switch-off. In addition, in the latch assembly 232, the latch CDF is subject to torque of counterclockwise rotation under a pulling force of the driving piece BQ. However, because clasping between the rotating half shaft LM and the rotating fastening bar KIJ is in a locked state, clasping between the rotating fastening bar KIJ and the tripping bar GH, and clasping between the tripping bar GH and the latch CDF cannot be unlocked, so that the latch CDF remains in a static state, in other words, the latch assembly 232 is in a locked state.

[0052] Still refer to FIG. 5 and FIG. 17. When the circuit breaker 20 is in the switch-off state, the operating handle 22 is pushed along the height h direction to perform a switch-on operation. When the operating handle 22 is pushed upward, the operating handle 22 rotates counterclockwise around the point R. During rotation of the operating handle 22, the driving piece BQ is pulled to rotate counterclockwise, so that the point B moves upward along the height h direction. After the point B moves from one side of the point C along the height h direction to the other side, the driving piece BQ applies pulling forces to the connecting bar assembly 231 and the latch assembly 232. In this case, the point B of the connecting bar assembly 231 moves leftward under a pulling force of the driving piece BQ, to pull the first connecting bar AB to move leftward. The first fastening bar OA is subject to a pulling force of the first connecting bar AB at the point A, so that the first fastening bar OA drives the case 2412 to rotate counterclockwise around the point O. During rotation of the case 2412, the movable contact 2411 is subject to a pushing force of the case 2412, so that the movable contact 2411 rotates counterclockwise around the point O, and the movable contact 2411 is in contact with the stationary contact 242, implementing switch-on. In addition, the latch assembly 232 is still in a locked state, so that the latch CDF, the tripping bar GH, the rotating fastening bar KIJ, and the rotating half shaft LM each are in a static state.

[0053] FIG. 18 is another diagram of the circuit breaker in a switch-off state according to this embodiment of this application. As shown in FIG. 5 and FIG. 18, the staff may perform a switch-off operation on the circuit breaker 20 through multiple auxiliary parts. Specifically, when the circuit breaker 20 is in a switch-on state, and when the tripping control assembly 26 detects a fault current, the tripping control assembly 26 drives the rotating half shaft LM to rotate clockwise. The rotating half shaft LM is unlocked with the rotating fastening bar KIJ during rotation of the rotating half shaft LM. As described above, in the switch-on state, the latch CDF is subject to the torque of the counterclockwise rotation under a pulling force of the driving piece BQ, and has a counterclockwise rotation trend. After the rotating half shaft LM is unlocked with the rotating fastening bar KIJ, clasping between the rotating fastening bar KIJ and the tripping bar GH and clasping between the tripping bar GH and the latch CDF are also unlocked at the same time, so that the latch CDF is released and rotates counterclockwise around the first rotating shaft D. During counterclockwise rotation of the latch CDF, the tripping bar GH is pushed to rotate clockwise around the second rotating shaft G, so that the tripping bar GH pushes the rotating fastening bar KIJ and rotates clockwise around a point I at the same time, to completely unlock the latch assembly 232. After the latch assembly 232 is completely unlocked, the latch CDF drives the second fastening bar CD to rotate counterclockwise during counterclockwise rotation of the latch CDF, to drive the driving piece BQ to rotate counterclockwise, so that the point B moves downward along the height h direction. After the point B moves from one side of the point C along the height h direction to the other side, the driving piece BQ applies pulling forces to the connecting bar assembly 231 and the latch assembly 232. In this case, the point B of the connecting bar assembly 231

moves rightward under a pulling force of the driving piece BQ, to pull the first connecting bar AB to move rightward. The first fastening bar OA is subject to a pulling force of the first connecting bar AB at the point A, so that the first fastening bar OA drives the case 2412 to rotate clockwise around the point O. During rotation of the case 2412, the contact point E between the case 2412 and the movable contact 2411 is subject to a pushing force, so that the movable contact 2411 rotates clockwise around the point O, and the movable contact 2411 is separated from the stationary contact 242, implementing switch-off.

[0054] In an embodiment, when the tripping control assembly 26 includes the backup protector 261 and the magnetic attraction bar PN, the backup protector 261 detects a fault current, magnetically attracts the magnetic attraction bar PN, and enables the magnetic attraction bar PN to rotate counterclockwise. The rotating half shaft LM rotates clockwise during rotation of the magnetic attraction bar PN.

[0055] In another embodiment, when the tripping control assembly 26 includes the transformer 262 and the magnetic flux part 263, the transformer 262 detects a fault current, and sends a fault current signal to the controller. The controller controls, based on the received signal, the activity pin 2631 of the magnetic flux part 263 to push the rotating half shaft LM to rotate clockwise.

[0056] Still refer to FIG. 15 and FIG. 16. When the through-current assembly 24 is specifically disposed, the through-current assembly 24 further includes a conducting wire 243, a first copper bar 244, and a second copper bar 245. The first copper bar 244 and the second copper bar 245 are disposed opposite to each other along the height h direction of the circuit breaker 20, and the first copper bar 244 and the second copper bar 245 extend to two sides of the arc extinguishing chamber 25 along the depth d direction of the circuit breaker 20. An end that is of the first copper bar 244 and that is close to the operating mechanism 23 is electrically connected to the movable contact 2411 through the conducting wire 243, and a first connector 246 is disposed at an end that is of the first copper bar 244 and that is away from the operating mechanism 23. The stationary contact 242 is disposed on the second copper bar 245 and is electrically connected to the second copper bar 245. A second connector 247 is disposed at an end that is of the second copper bar 245 and that is away from the operating mechanism 23. During specific disposing, the first copper bar 244 and the second copper bar 245 each may be fastened to the housing 21, where a surface of a side that is of the first copper bar 244 and that is away from the arc extinguishing chamber 25 is attached to an inner wall of the housing 21, and a surface of a side that is of the second copper bar 245 and that is away from the arc extinguishing chamber 25 is attached to the inner wall of the housing 21. In an embodiment, the transformer 262 may be a ring transformer. An end that is of the first copper bar 244 and that is close to the operating handle 22 may extend to the ring transformer. A welding copper bar 2441 is disposed in the ring transformer, and the first copper bar 244 is connected to the conducting wire 243 through the welding copper bar 2441. In addition, when the movable contact assembly 241 includes multiple movable contacts 2411, the through-current assembly 24 may include multiple conducting wires 243, and the conducting wires 243 are connected to the movable contacts 2411 in a one-to-one correspondence. In addition, the conducting wire 243 is connected to the rotating bar of the movable contact 2411. In this way, the conducting wire 243 is arranged in space between the movable contact assembly 241, the arc extinguishing chamber 25, and the tripping control assembly 26. This improves space utilization. In addition, when the operating mechanism 23 drives the movable contact assembly 241 to move, the conducting wire 243 does not interfere with movement of the operating mechanism 23. In addition, this avoids the operating mechanism 23 from being powered on because the conducting wire 243 touches the operating mechanism 23 by mistake.

[0057] In an embodiment, the first connector 246 and the second connector 247 may be spring bridge connectors. Specifically, the first connector 246 includes a first transfer copper bar, and the first transfer copper bar is located on a side that is of the first copper bar 244 and that is close to the arc extinguishing chamber 25 and is fastened to the first copper bar 244. The second connector 247 includes a second transfer copper bar, and the second transfer copper bar is located on a side that is of the second copper bar 245 and that is close to the arc extinguishing chamber 25 and is fastened to the second copper bar 245. Still refer to FIG. 15 and FIG. 16. In the foregoing embodiment, the circuit breaker 20 may further include a first clamp 248 and a second clamp 249. The first clamp 248 is disposed close to the first transfer copper bar and is fastened to the housing 21. The first clamp 248 includes an I-shaped first metal piece, the first transfer copper bar is inserted into an opening at one end of the first metal piece, and a first cable in a power supply and distribution system is inserted into an opening at the other end of the first metal piece. The second clamp 249 is disposed close to the second transfer copper bar and is fastened to the housing 21. The second clamp 249 includes an I-shaped second metal piece, the second transfer copper bar is inserted into an opening at one end of the second metal piece, and a second cable in the power supply and distribution system is inserted into an opening at the other end of the second metal piece.

[0058] In an embodiment, the first connector 246 includes two first metal pressing sheets that are disposed opposite to each other and a first elastic retaining piece. The two first metal pressing sheets are connected to a side that is of the first copper bar 244 and that is away from the operating mechanism 23, ends that are of the two first metal pressing sheets and that are away from the first copper bar 244 form a first socket, and the first cable is inserted into the first socket. The first elastic retaining piece is connected to the two first metal pressing sheets,

and is configured to keep the two first metal pressing sheets press-fitting facing each other, so that the first cable is in good contact with the first socket when the first cable is inserted into the first socket. Similarly, the second connector 247 includes two second metal pressing sheets that are disposed opposite to each other and a second elastic retaining piece. The two second metal pressing sheets are connected to a side that is of the second copper bar 245 and that is away from the operating mechanism 23, ends that are of the two second metal pressing sheets and that are away from the second copper bar 245 form a second socket, and the second cable is inserted into the second socket. The second elastic retaining piece is connected to the two second metal pressing sheets, and is configured to keep the two second metal pressing sheets press-fitting facing each other, so that the second cable is in good contact with the second socket when the second cable is inserted into the second socket. When the first cable is inserted into the circuit breaker 20, an end portion of the first cable is inserted between the two first metal pressing sheets, and the first elastic retaining piece is squeezed, to maintain an electrical connection between the first cable and the first copper bar 244. When the second cable is inserted into the circuit breaker 20, an end portion of the second cable is inserted between the two second metal pressing sheets, and the second elastic retaining piece is squeezed, to maintain an electrical connection between the second cable and the second copper bar 245. The first elastic retaining piece and the second elastic retaining piece may specifically include elastic pieces such as a spring, a spring sheet, and a torsion spring. This is not limited herein.

[0059] In addition, the movable contact 2411 and the stationary contact 242 each are welded to a welding spot (for example, a silver spot). The movable contact 2411 is welded to the conducting wire 243, an end that is of the conducting wire 243 and that is away from the movable contact 2411 is electrically connected to the first copper bar 244, or an end that is of the conducting wire 243 and that is away from the movable contact 2411 is welded to the welding copper bar 2441, and the welding copper bar 2441 is fastened to the first copper bar 244. When the movable contact 2411 is in contact with the stationary contact 242, the circuit breaker 20 is in a switch-on state. In this case, the current flows from the second connector 247 to the stationary contact 242 through the second copper bar 245. After the current flows through the movable contact 2411, the current flows to the first copper bar 244 through the conducting wire 243, and finally reaches the first connector 246.

[0060] Still refer to FIG. 5. When the arc extinguishing chamber 25 is specifically disposed, the arc extinguishing chamber 25 includes multiple arc extinguishing sheets 251, and the multiple arc extinguishing sheets 251 are disposed in an arc shape. The arc extinguishing chamber 25 further includes a first arc guiding sheet 2512 and a second arc guiding sheet 2513. The first arc guiding sheet 2512 is disposed between the multiple arc extinguishing sheets 251 and the first copper bar 244, and the first arc guiding sheet 2512 is electrically connected to the first copper bar 244, so that the first arc guiding sheet 2512 and the first copper bar 244 maintain the same voltage/electric potential, helping improve arc voltage and further improving a segment-based arc extinguishing capability. The second arc guiding sheet 2513 is disposed on the second copper bar 245 and is electrically connected to the second copper bar 245.

[0061] FIG. 19 is another diagram of the circuit breaker according to this embodiment of this application. As shown in FIG. 5 and FIG. 19, an arc outlet 211 is disposed at an end that is of the housing 21 and that is away from the operating handle 22, and the arc outlet 211 is disposed along the depth d direction of the circuit breaker 20. The arc extinguishing chamber 25 is located between the arc outlet 211 and the through-current assembly 24. The circuit breaker 20 further includes an arc suppression module 27. The arc suppression module 27 is disposed, along the depth h direction, on a side that is of the arc outlet 211 and that is away from the arc extinguishing chamber 25. The circuit breaker 20 is in a switch-on state, and in this case, the current sequentially flows through the second connector 247, the second copper bar 245, the stationary contact 242, the movable contact 2411, the first copper bar 244, and the first connector 246. In this embodiment, the arc extinguishing chamber 25 and the operating handle 22 are separately disposed at two ends of the housing 21 along the depth d direction, so that space can be reserved for the arc extinguishing assembly 25 in the circuit breaker 20. When the movable contact 2411 is disconnected from the stationary contact 242, the electric arc is guided to the multiple arc extinguishing sheets 251 by using the first arc guiding sheet 2512 and the second arc guiding sheet 2513 to perform arc extinguishing. After free gases generated by the arc extinguishing chamber 25 pass through the arc suppression module 27, a free state of emitted gas can be reduced, and oxide particles with large particles are prevented from being ejected. In this way, when the movable contact 2411 and the stationary contact 242 are separated, the gas emitted by the circuit breaker 20 is more pure, and the free state of the gas is effectively reduced, thereby improving a breaking capability of the circuit breaker 20 and implementing zero-arc-flash breaking.

[0062] In the foregoing embodiment, the arc suppression module 27 may be disposed in the circuit breaker 20, in other words, the arc suppression module 27 is located at a fifth layer (an arc suppression layer). In another embodiment, the arc suppression module 27 may also be disposed in the cabinet 11, and the first clamp 248 and the second clamp 249 are mounted together with the arc suppression module 27. When the circuit breaker 20 is inserted into the cabinet 11, the arc outlet 211 is aligned with the arc suppression module 27, the first connector 246 of the first copper bar 244 is inserted into the first clamp 248, and the second connector 247 of the second

copper bar 245 is inserted into the second clamp 249. This implements a pluggable design between the circuit breaker 20 and the cabinet 11.

[0063] FIG. 20 is another diagram of a circuit breaker according to an embodiment of this application. As shown in FIG. 20, a layout of the circuit breaker operating surface 210 may be designed according to an actual application scenario. For example, a magnetic flux part 263, a controller, a separation and undervoltage module, a fault alarm module, and an auxiliary module may be further disposed on two sides of the operating mechanism 23 along the width w direction. In addition, along the height h direction, a cable bundle path may be disposed on the top of the operating handle 22, and a transformer cable may be accommodated inside the cable bundle path.

[0064] As shown in FIG. 5, in some embodiments of this application, along the height h direction, the movable contact 2411 may be located above the stationary contact 242. FIG. 21 is another diagram of a circuit breaker according to an embodiment of this application. As shown in FIG. 21, in some other embodiments, along the height h direction, the movable contact 2411 may be located below the stationary contact 242. Specifically, in this embodiment, the tripping control assembly 26 is disposed at an end that is close to the second copper bar 245 and that faces the operating mechanism 23, and the second copper bar 245 is connected to the second arc guiding sheet 2513 in the arc extinguishing chamber 252 through the welding copper bar 2441, the conducting wire, and the stationary contact 242 sequentially. The movable contact assembly 241 is disposed at an end that is close to the first copper bar 244 and that faces the operating mechanism 23. When the movable contact 2411 is in contact with the stationary contact 242, the circuit breaker 20 is in a switch-on state. In this case, the second connector 247, the second copper bar 245, the welding copper bar 2441, the conducting wire, the stationary contact 242, the movable contact 2411, the conducting wire 243, the first copper bar 244, and the first connector 246 form a current path.

[0065] In the embodiment shown in FIG. 21, the staff pushes the operating handle 22 along the height h direction through a manual operation. Specifically, when the circuit breaker 20 is in the switch-on state, the operating handle 22 is pushed along the height h direction to perform a switch-off operation. When the operating handle 22 is pushed upward, the operating handle 22 rotates counterclockwise around the point R. During rotation of the operating handle 22, the driving piece BQ is pulled to rotate counterclockwise, so that the point B moves upward along the height h direction. After the point B moves from one side of the point C along the height h direction to the other side, the driving piece BQ applies pulling forces to the connecting bar assembly 231 and the latch assembly 232. In this case, the point B of the connecting bar assembly 231 moves rightward under a pulling force of the driving piece BQ, to pull the first connecting bar AB to move rightward. The first fastening bar OA is subject to a pulling force of the first connecting bar AB at the point A, so that the first fastening bar OA drives the case 2412 to rotate counterclockwise around the point O. During rotation of the case 2412, the contact point E between the case 2412 and the movable contact 2411 is subject to a pushing force, so that the movable contact 2411 rotates counterclockwise around the point O, and the movable contact 2411 is separated from the stationary contact 242, implementing switch-off. In addition, in the latch assembly 232, the latch CDF is subject to torque of clockwise rotation under a pulling force of the driving piece BQ. However, because clasping between the rotating half shaft LM and the rotating fastening bar KIJ is in a locked state, clasping between the rotating fastening bar KIJ and the tripping bar GH, and clasping between the tripping bar GH and the latch CDF cannot be unlocked, so that the latch CDF remains in a static state, in other words, the latch assembly 232 is in a locked state. In the foregoing embodiment, the movable contact 2411 rotates counterclockwise around the point O, that is, a rotating shaft center O' of the movable contact 2411 overlaps the point O. Certainly, in another embodiment, the rotating shaft center O' of the movable contact 2411 may also not overlap the point O.

[0066] Still refer to FIG. 21. When the circuit breaker 20 is in a switch-off state, the operating handle 22 is pushed along the height h direction to perform a switch-on operation. When the operating handle 22 is pushed downward, the operating handle 22 rotates clockwise around the point R. During rotation of the operating handle 22, the driving piece BQ is pulled to rotate clockwise, so that the point B moves downward along the height h direction. After the point B moves from one side of the point C along the height h direction to the other side, the driving piece BQ applies pulling forces to the connecting bar assembly 231 and the latch assembly 232. In this case, the point B of the connecting bar assembly 231 moves leftward under a pulling force of the driving piece BQ, to pull the first connecting bar AB to move leftward. The first fastening bar OA is subject to a pulling force of the first connecting bar AB at the point A, so that the first fastening bar OA drives the case 2412 to rotate clockwise around the point O. During rotation of the case 2412, the movable contact 2411 is subject to a pushing force of the case 2412, so that the movable contact 2411 rotates clockwise around the point O, and the movable contact 2411 is in contact with the stationary contact 242, implementing switch-on. In addition, the latch assembly 232 is still in a locked state, so that the latch CDF, the tripping bar GH, the rotating fastening bar KIJ, and the rotating half shaft LM each are in a static state.

[0067] As shown in FIG. 5 and FIG. 21, in an embodiment, along the height h direction, the first copper bar 244 and the second copper bar 245 may be located on two sides that are of the arc extinguishing chamber 25 and that are opposite to each other. The tripping control assembly 26 is disposed close to the first copper bar

244, and the movable contact assembly 241 is disposed close to the second copper bar 245; or the tripping control assembly 26 is disposed close to the second copper bar 245, and the movable contact assembly 241 is disposed close to the first copper bar 244. In the second layer (the operating layer), the latch assembly 232 may be located above the driving piece BQ along the height h direction, and the controller is located above the operating handle 22 along the height h direction. FIG. 22 is another diagram of the circuit breaker according to this embodiment of this application. As shown in FIG. 22, in another embodiment, the first copper bar 244 and the second copper bar 245 may be located on a same side of the arc extinguishing chamber 25. In other words, along the height h direction, the first copper bar 244 and the second copper bar 245 may be located above the arc extinguishing chamber 25, or the first copper bar 244 and the second copper bar 245 may also be located below the arc extinguishing chamber 25. For example, the first copper bar 244 and the second copper bar 245 are located below the arc extinguishing chamber 25. Still refer to FIG. 22. The second copper bar 245 is disposed close to the arc extinguishing chamber 25, and the first copper bar 244 is located on a side that is of the second copper bar 245 and that is away from the arc extinguishing chamber 25. The stationary contact 242 is disposed on a surface of a side that is of the second copper bar 245 and that faces the arc extinguishing chamber 25, and the movable contact 2411 is configured to be in contact with a surface of a side that is of the stationary contact 242 and that faces the arc extinguishing chamber 25. The tripping control assembly 26 is disposed close to the first copper bar 244. In this way, in the third layer (the through-current layer), the tripping control assembly 26 is located below the movable contact assembly 241 along the height h direction. In this embodiment of this application, relative positions of the backup protector 261 and the transformer 262 along the height h direction may be exchanged. In other words, the backup protector 261 may be located on a side that is of the transformer 262 and that is away from the movable contact assembly 241, or the transformer 262 may be located on a side that is of the backup protector 261 and that is away from the movable contact assembly 241. In the fourth layer (the arc extinguishing layer), the multiple arc extinguishing sheets 251 in the arc extinguishing chamber 25 are distributed in an arc shape along a direction away from the second copper bar 245. The first arc guiding sheet 2512 is connected to an OE segment of the movable contact 2411, and is connected to the first copper bar 244 through the conducting wire 243. In this embodiment, the conducting wire 243 may also be connected to the first copper bar 244 through a welding copper bar 2441 (omitted in FIG. 22). In the second layer (the operating layer), the latch assembly 232 may be located below the driving piece BQ along the height h direction. The controller is located at an operating mechanism layer. Specifically, the controller is disposed on a periphery of the operating mechanism 23. In other words, the controller may be placed above or below the operating mechanism 23 along the height h direction; or the controller may be placed on the left side or the right side of the operating mechanism 23 along the width w direction. A specific position of the controller at the second layer (the operating layer) is not limited in embodiments of this application.

[0068] In the embodiment shown in FIG. 22, the staff pushes the operating handle 22 along the height h direction through a manual operation. Specifically, when the circuit breaker 20 is in the switch-on state, the operating handle 22 is pushed along the height h direction to perform a switch-off operation. When the operating handle 22 is pushed downward, the operating handle 22 rotates clockwise around the point R. During rotation of the operating handle 22, the driving piece BQ is pulled to rotate clockwise, so that the point B moves downward along the height h direction. After the point B moves from one side of the point C along the height h direction to the other side, the driving piece BQ applies pulling forces to the connecting bar assembly 231 and the latch assembly 232. In this case, the point B of the connecting bar assembly 231 moves rightward under a pulling force of the driving piece BQ, to pull the first connecting bar AB to move rightward. The first fastening bar OA is subject to a pulling force of the first connecting bar AB at the point A, so that the first fastening bar OA drives the case 2412 to rotate clockwise around the point O. During rotation of the case 2412, the contact point E between the case 2412 and the movable contact 2411 is subject to a pushing force, so that the movable contact 2411 rotates clockwise around the point O, and the movable contact 2411 is separated from the stationary contact 242, implementing switch-off. In addition, in the latch assembly 232, the latch CDF is subject to torque of counterclockwise rotation under a pulling force of the driving piece BQ. However, because clasping between the rotating half shaft LM and the rotating fastening bar KIJ is in a locked state, clasping between the rotating fastening bar KIJ and the tripping bar GH, and clasping between the tripping bar GH and the latch CDF cannot be unlocked, so that the latch CDF remains in a static state, in other words, the latch assembly 232 is in a locked state.

[0069] Still refer to FIG. 22. When the circuit breaker 20 is in a switch-off state, the operating handle 22 is pushed along the height h direction to perform a switch-on operation. When the operating handle 22 is pushed upward, the operating handle 22 rotates counterclockwise around the point R. During rotation of the operating handle 22, the driving piece BQ is pulled to rotate counterclockwise, so that the point B moves upward along the height h direction. After the point B moves from one side of the point C along the height h direction to the other side, the driving piece BQ applies pulling forces to the connecting bar assembly 231 and the latch assembly 232. In this case, the point B of the connecting bar assembly 231 moves leftward under a pulling force of the driving piece BQ, to pull the first connecting bar AB to move leftward. The first

fastening bar OA is subject to a pulling force of the first connecting bar AB at the point A, so that the first fastening bar OA drives the case 2412 to rotate counterclockwise around the point O. During rotation of the case 2412, the movable contact 2411 is subject to a pushing force of the case 2412, so that the movable contact 2411 rotates counterclockwise around the point O, and the movable contact 2411 is in contact with the stationary contact 242, implementing switch-on. In addition, the latch assembly 232 is still in a locked state, so that the latch CDF, the tripping bar GH, the rotating fastening bar KIJ, and the rotating half shaft LM each are in a static state.

[0070] The foregoing descriptions are only specific implementations of this application, but are not intended to limit the protection scope of this application. Any variation or replacement readily figured out by a person skilled in the art within the technical scope disclosed in this application shall fall within the protection scope of this application. Therefore, the protection scope of this application shall be subject to the protection scope of the claims.

Claims

1. An electric power device, comprising a cabinet, and multiple circuit breakers and multiple power modules that are located in the cabinet, wherein the multiple circuit breakers are sequentially disposed in the cabinet along a width direction of the cabinet, a height direction of the circuit breaker is the same as the width direction of the cabinet, a width direction of the circuit breaker is the same as a height direction of the cabinet, and a depth direction of the circuit breaker is the same as a depth direction of the cabinet;

   the circuit breaker comprises a housing, an operating handle, an operating mechanism, a through-current assembly, and an arc extinguishing chamber, wherein the operating mechanism is connected to the operating handle; and at least a portion that is of the operating handle and that is close to the operating mechanism, the operating mechanism, the through-current assembly, and the arc extinguishing chamber are sequentially disposed in the housing along the depth direction of the circuit breaker;
   the through-current assembly comprises a movable contact assembly and a stationary contact, the movable contact assembly comprises a movable contact, and the movable contact is capable of rotating relative to the housing;
   the operating mechanism is connected to the movable contact assembly, and is configured to drive the movable contact assembly to move, so that the movable contact is in contact with or is separated from the stationary contact;
   the operating handle is configured to control the operating mechanism to drive the movable contact assembly to move, so that the movable contact is in contact with or is separated from the stationary contact;
   the arc extinguishing chamber is configured to extinguish an electric arc generated when the movable contact is separated from the stationary contact; and
   the circuit breaker further comprises a tripping control assembly, wherein the tripping control assembly is disposed on a side of the movable contact assembly along the height direction of the circuit breaker, and is in transmission connection to the operating mechanism; and the tripping control assembly is configured to: when a fault current is detected, control the operating mechanism to drive the movable contact assembly to move, so that the movable contact is separated from the stationary contact.

2. The electric power device according to claim 1, wherein the operating mechanism comprises a connecting bar assembly, a latch assembly, and a driving piece; and
   the connecting bar assembly is connected to the movable contact assembly, the latch assembly and the driving piece each are connected to an end that is of the connecting bar assembly and that is away from the movable contact assembly, an end that is of the latch assembly and that is away from the connecting bar assembly is in transmission connection to the tripping control assembly, and an end that is of the driving piece and that is away from the connecting bar assembly is connected to the operating handle; the latch assembly is configured to drive the driving piece to move under control of the tripping control assembly; the driving piece is configured to drive, when driven by the tripping control assembly, the connecting bar assembly to move, so that the movable contact is separated from the stationary contact; and the driving piece is further configured to drive, when driven by the operating handle, the connecting bar assembly to move, so that the movable contact is in contact with or separated from the stationary contact.

3. The electric power device according to claim 2, wherein the housing is provided with a first rotating shaft and a second rotating shaft, the latch assembly comprises a latch and a tripping bar, the latch is sleeved on the first rotating shaft and rotates around the first rotating shaft, and the tripping bar is sleeved on the second rotating shaft and rotates around the second rotating shaft; one end of the latch is connected to the connecting bar assembly, and the other end of the latch clasps the tripping bar, and an end

point at which the latch clasps the tripping bar is located on a side that is of the second rotating shaft and that is away from the operating handle; and the tripping bar is configured to limit a rotation stroke of the latch; and

the tripping control assembly is configured to: control the latch and the tripping bar to be unlocked, and drive, when driven by the driving piece, the connecting bar assembly to move, so that the movable contact is separated from the stationary contact.

4. The electric power device according to claim 3, wherein along the height direction of the circuit breaker, the tripping bar is located on a side that is of the latch and that is away from the operating handle.

5. The electric power device according to claim 3 or 4, wherein the latch assembly further comprises a rotating fastening bar and a rotating half shaft, the rotating fastening bar clasps an end that is of the tripping bar and that is away from the latch, and the rotating half shaft clasps an end that is of the rotating fastening bar and that is away from the tripping bar; and the tripping control assembly is configured to drive the rotating half shaft to rotate, to sequentially unlock the rotating half shaft and the rotating fastening bar, the rotating fastening bar and the tripping bar, and the tripping bar and the latch, so that the latch rotates when driven by the driving piece.

6. The electric power device according to any one of claims 2 to 5, wherein the connecting bar assembly comprises a first fastening bar, a first connecting bar, and a second connecting bar; the first fastening bar is connected to the movable contact assembly, the first fastening bar is connected to the first connecting bar; an end that is of the first connecting bar and that is away from the first fastening bar is rotatably connected to the second connecting bar; an end that is of the second connecting bar and that is away from the first connecting bar is rotatably connected to the latch; one end of the driving piece is connected to the operating handle, and the other end of the driving piece is connected to the end that is of the first connecting bar and that is away from the first fastening bar; and the connecting bar assembly is configured to drive, when driven by the driving piece, the movable contact assembly to rotate.

7. The electric power device according to any one of claims 1 to 6, wherein the tripping control assembly comprises a backup protector and a magnetic attraction bar, the magnetic attraction bar is capable of rotating relative to the housing; the backup protector magnetically attracts the magnetic attraction bar, and the magnetic attraction bar is in transmission connection to the operating mechanism; and the backup protector is configured to magnetically attract the magnetic attraction bar when the fault current is detected, to drive the operating mechanism to move.

8. The electric power device according to any one of claims 1 to 7, wherein the tripping control assembly comprises a thermal-magnetic release body, a thermally deformable metal piece, and an electromagnetic clutter part; the thermal-magnetic release body is located on a side of the operating mechanism along the width direction of the circuit breaker; the thermally deformable metal piece is connected to the thermal-magnetic release body; and the thermally deformable metal piece and the electromagnetic clutter part each are rotatably connected to the housing, and the thermally deformable metal piece and the electromagnetic clutter part each are in transmission connection to the operating mechanism; and

the thermal-magnetic release body is configured to: when a first fault current is detected, the thermally deformable metal piece generates thermal deformation and drives the operating mechanism to move; or when a second fault current is detected, the thermal-magnetic release body magnetically attracts the electromagnetic clutter part, so that the electromagnetic clutter part drives the operating mechanism to move.

9. The electric power device according to any one of claims 1 to 8, wherein the circuit breaker further comprises a controller, and the controller is disposed on a side of the operating mechanism along the width direction of the circuit breaker; and

the tripping control assembly comprises a transformer and a magnetic flux part, wherein the transformer and the magnetic flux part each are electrically connected to the controller; the transformer is disposed on a side of the movable contact assembly along the height direction of the circuit breaker, and is configured to send a fault current signal to the controller when the fault current is detected; the magnetic flux part is located between the controller and the operating mechanism, and is in transmission connection to the operating mechanism; and the controller is configured to control, based on the fault current signal, the magnetic flux part to drive the operating mechanism to move.

10. The electric power device according to any one of claims 1 to 9, wherein the movable contact assembly further comprises a case and a first spring located in the case, and the case is rotatably connected to the housing, and is in transmission connection to the operating mechanism; the stationary contact is located on a side that is of the case and that is away from the operating mechanism, the movable contact is located in the case and extends out of the case

along a direction away from the operating mechanism, an end that is of the movable contact and that is located in the case is rotatably connected to the housing, one end of the first spring is connected to the movable contact, and the other end of the first spring is connected to the case; and the case is configured to push, when driven by the operating mechanism, the movable contact to rotate.

11. The electric power device according to any one of claims 1 to 10, wherein the through-current assembly further comprises a conducting wire, and a first copper bar and a second copper bar that are disposed opposite to each other along the height direction of the circuit breaker, and the first copper bar and the second copper bar extend to two sides of the arc extinguishing chamber along the depth direction, or the first copper bar and the second copper bar extend to a same side of the arc extinguishing chamber along the depth direction; an end that is of the first copper bar and that is close to the operating mechanism is electrically connected to the movable contact through the conducting wire, and a first connector is disposed at an end that is of the first copper bar and that is away from the operating mechanism; and the stationary contact is disposed on the second copper bar and is electrically connected to the second copper bar, and a second connector is disposed at an end that is of the second copper bar and that is away from the operating mechanism.

12. The electric power device according to claim 11, wherein the movable contact comprises a rotating bar and a contact, the rotating bar is located in the case and is rotatably connected to the housing, an end that is of the rotating bar and that is away from the operating mechanism extends out of the case, the contact is connected to a side that is of the rotating bar and that is away from the operating mechanism, and the conducting wire is connected to the rotating bar.

13. The electric power device according to claim 11 or 12, wherein the first connector comprises two first metal pressing sheets that are disposed opposite to each other and a first elastic retaining piece; the two first metal pressing sheets are connected to a side that is of the first copper bar and that is away from the operating mechanism, ends that are of the two first metal pressing sheets and that are away from the first copper bar form a first socket, and a first cable is inserted into the first socket; and the first elastic retaining piece is connected to the two first metal pressing sheets, and is configured to keep the two first metal pressing sheets press-fitting facing each other; and

the second connector comprises two second metal pressing sheets that are disposed opposite to each other and a second elastic retaining piece; the two second metal pressing sheets are connected to a side that is of the second copper bar and that is away from the operating mechanism, ends that are of the two second metal pressing sheets and that are away from the second copper bar form a second socket, and a second cable is inserted into the second socket; and the second elastic retaining piece is connected to the two second metal pressing sheets, and is configured to keep the two second metal pressing sheets press-fitting facing each other.

14. The electric power device according to claim 11 or 12, wherein the first connector comprises a first transfer copper bar, and the first transfer copper bar is located on a side that is of the first copper bar and that is close to the arc extinguishing chamber and is fastened to the first copper bar; and the second connector comprises a second transfer copper bar, and the second transfer copper bar is located on a side that is of the second copper bar and that is close to the arc extinguishing chamber and is fastened to the second copper bar; and

the circuit breaker further comprises a first clamp and a second clamp, wherein

the first clamp is disposed close to the first transfer copper bar and is fastened to the housing; and the first clamp comprises an I-shaped first metal piece, the first transfer copper bar is inserted into an opening at one end of the first metal piece, and a first cable is inserted into an opening at the other end of the first metal piece; and

the second clamp is disposed close to the second transfer copper bar and is fastened to the housing; and the second clamp comprises an I-shaped second metal piece, the second transfer copper bar is inserted into an opening at one end of the second metal piece, and a second cable is inserted into an opening at the other end of the second metal piece.

15. The electric power device according to any one of claims 1 to 14, wherein an arc outlet is disposed at an end that is of the housing and that is away from the operating handle, and the arc outlet is disposed along the depth direction; and the arc extinguishing chamber is located between the arc outlet and the through-current assembly.

16. The electric power device according to claim 15, wherein the circuit breaker further comprises an arc suppression module, the arc suppression module is disposed, along the depth direction of the circuit breaker, on a side that is of the arc outlet and that is away from the arc extinguishing chamber, and the arc suppression module is configured to

purify a gas emitted from the arc outlet.

17. A circuit breaker, comprising a housing, an operating handle, an operating mechanism, a through-current assembly, and an arc extinguishing chamber, wherein the operating mechanism is connected to the operating handle; and at least a portion that is of the operating handle and that is close to the operating mechanism, the operating mechanism, the through-current assembly, and the arc extinguishing chamber are sequentially disposed in the housing along a depth direction of the circuit breaker;

the through-current assembly comprises a movable contact assembly and a stationary contact, the movable contact assembly comprises a movable contact, and the movable contact is capable of rotating relative to the housing;
the operating mechanism is connected to the movable contact assembly, and is configured to drive the movable contact assembly to move, so that the movable contact is in contact with or is separated from the stationary contact;
the operating handle is configured to control the operating mechanism to drive the movable contact assembly to move, so that the movable contact is in contact with or is separated from the stationary contact;
the arc extinguishing chamber is configured to extinguish an electric arc generated when the movable contact is separated from the stationary contact; and
the circuit breaker further comprises a tripping control assembly, wherein the tripping control assembly is disposed on a side of the movable contact assembly along a height direction of the circuit breaker, and is in transmission connection to the operating mechanism; and the tripping control assembly is configured to: when a fault current is detected, control the operating mechanism to drive the movable contact assembly to move, so that the movable contact is separated from the stationary contact.

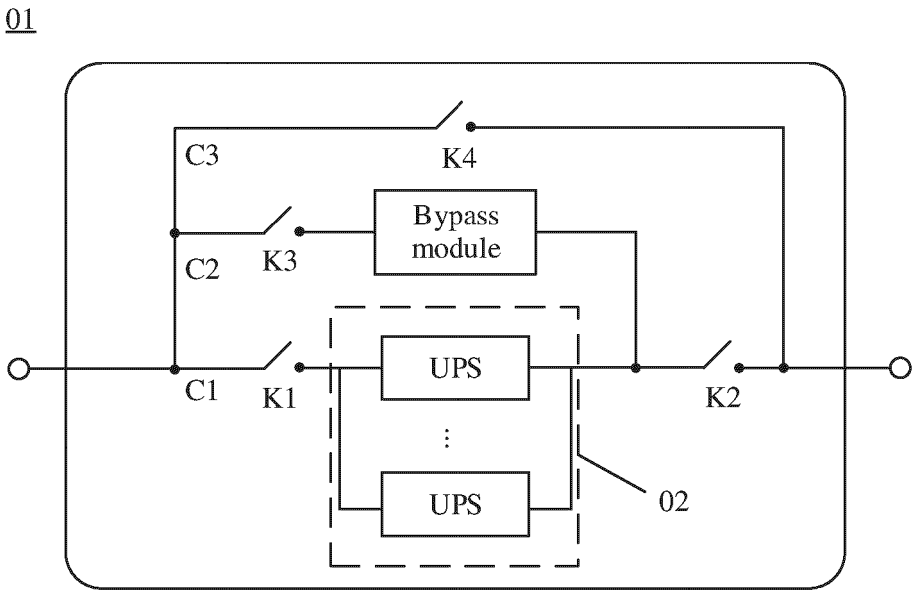


FIG. 1

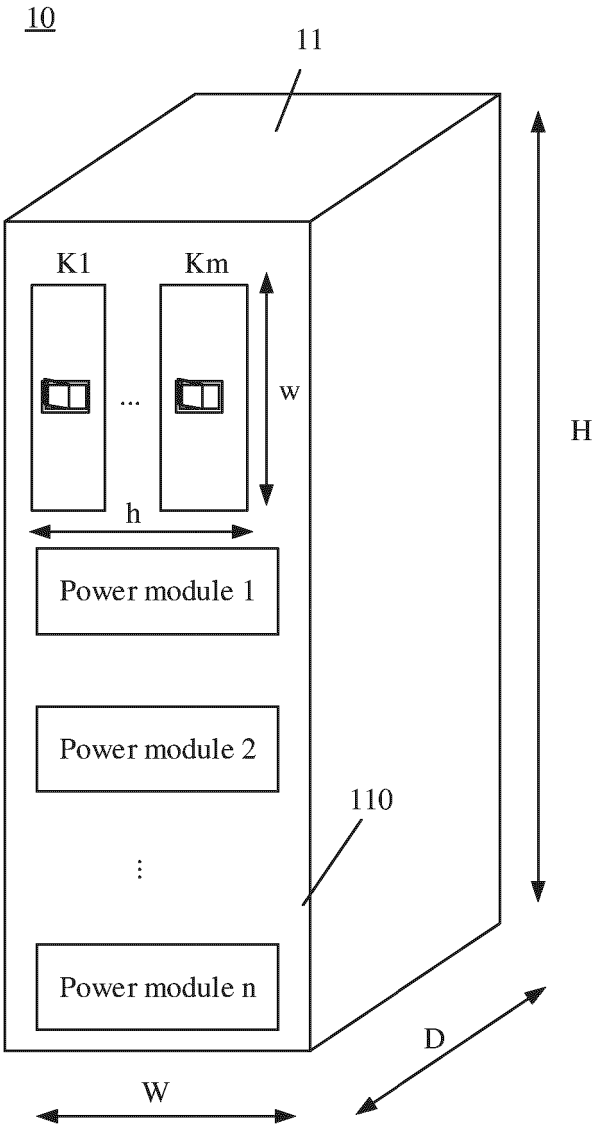

10
11
K1
Km
w
...
H
h
Power module 1
Power module 2
110
Power module n
D
W

FIG. 2

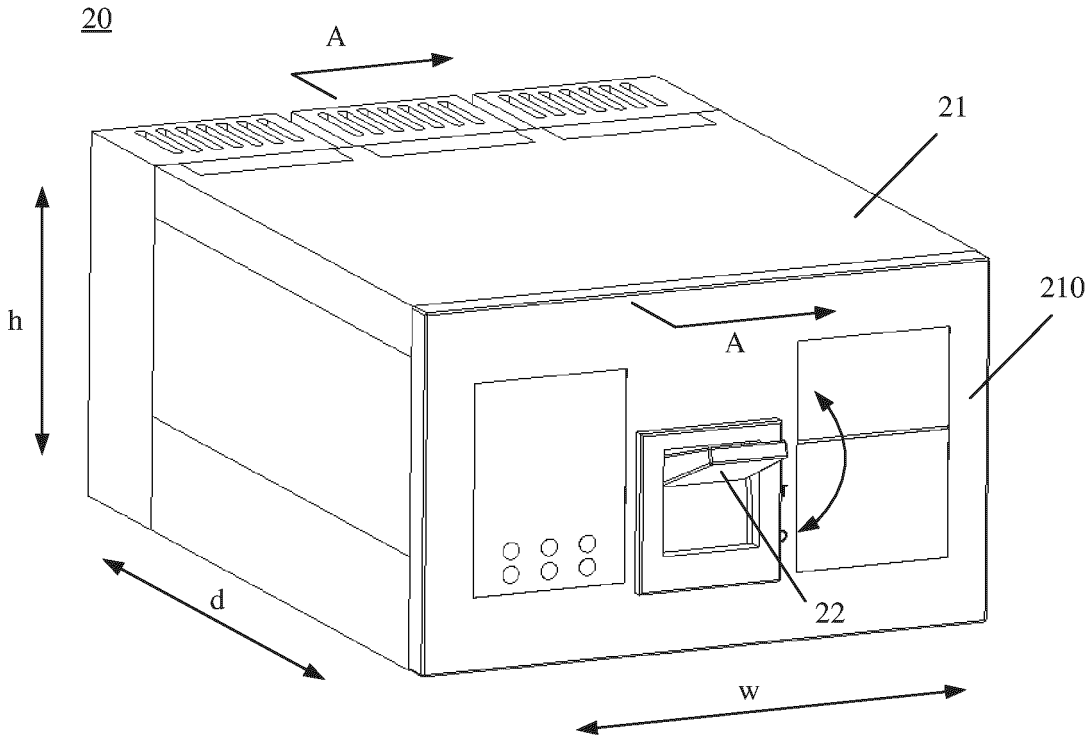


FIG. 3

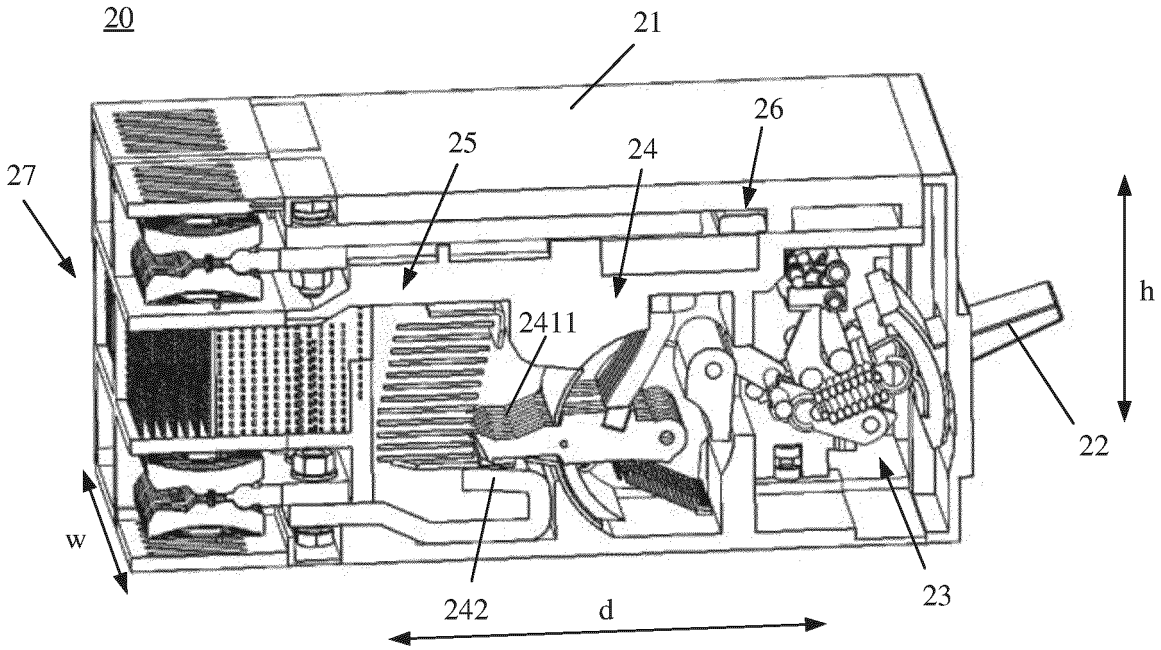
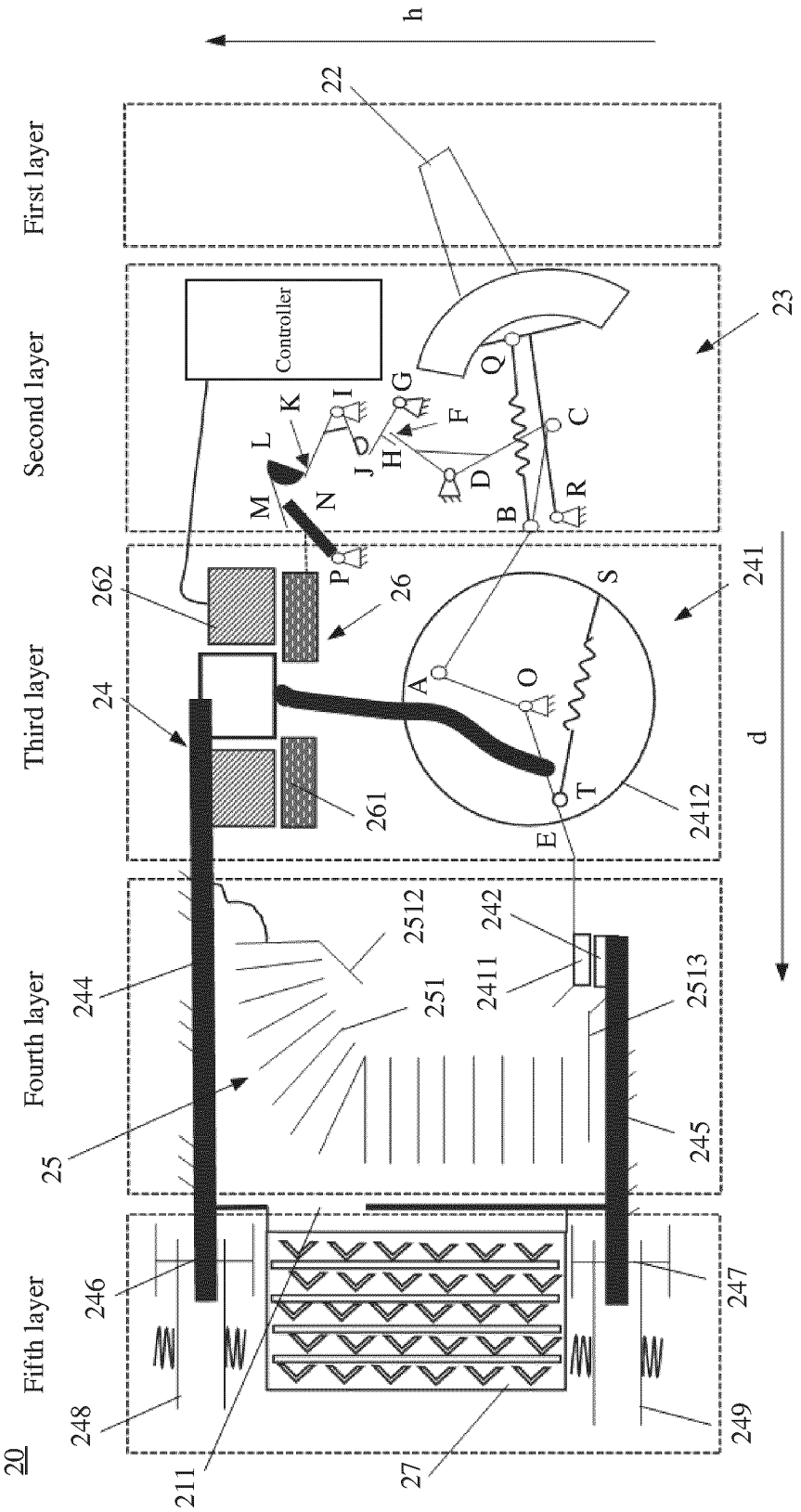


FIG. 4


h
First layer
Second layer
Third layer
Fourth layer
Fifth layer
20
22
23
Controller
A
B
C
D
E
F
G
H
I
J
K
L
M
N
O
P
Q
R
S
T
24
25
26
241
2412
242
2411
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245
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251
2512
2513
261
262
211
27
d

FIG. 5

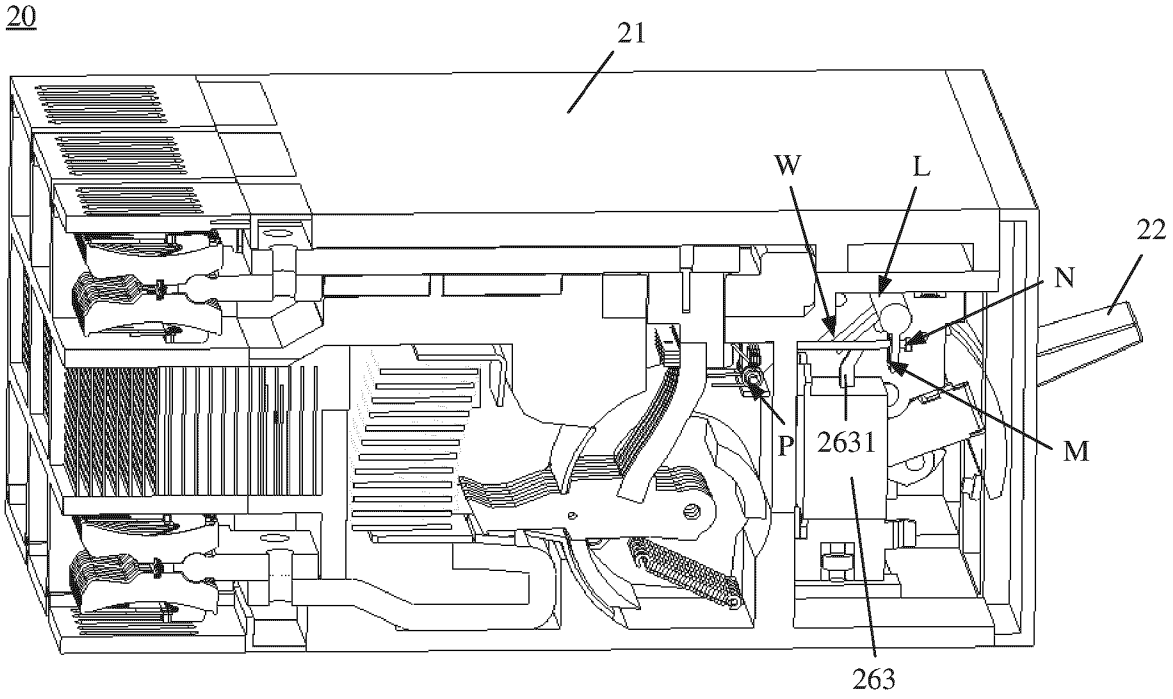

FIG. 6

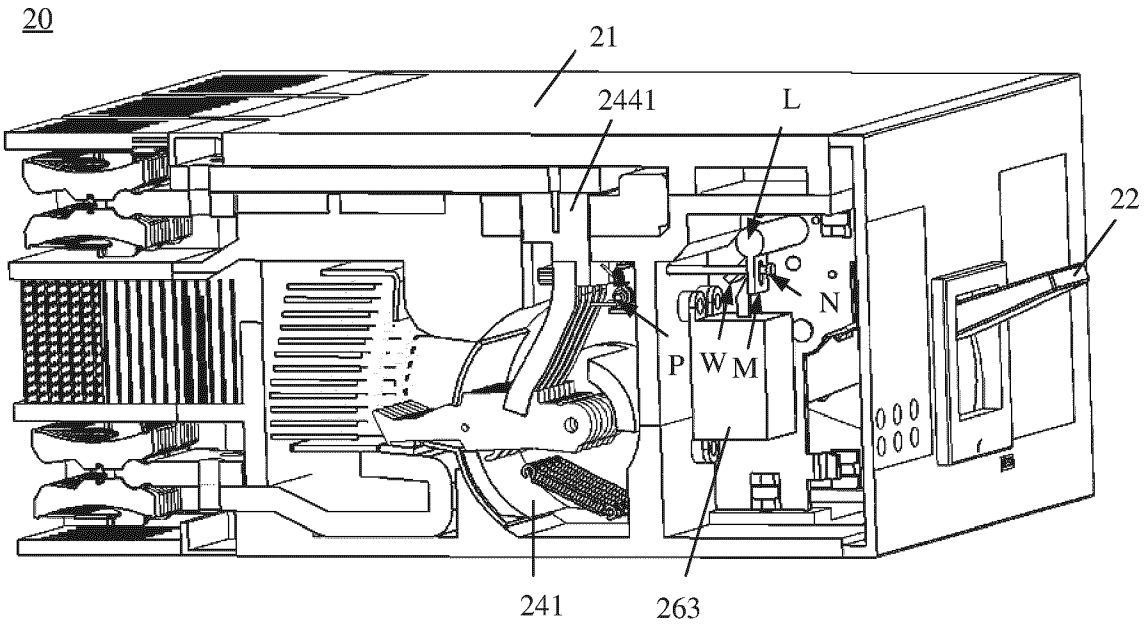

FIG. 7

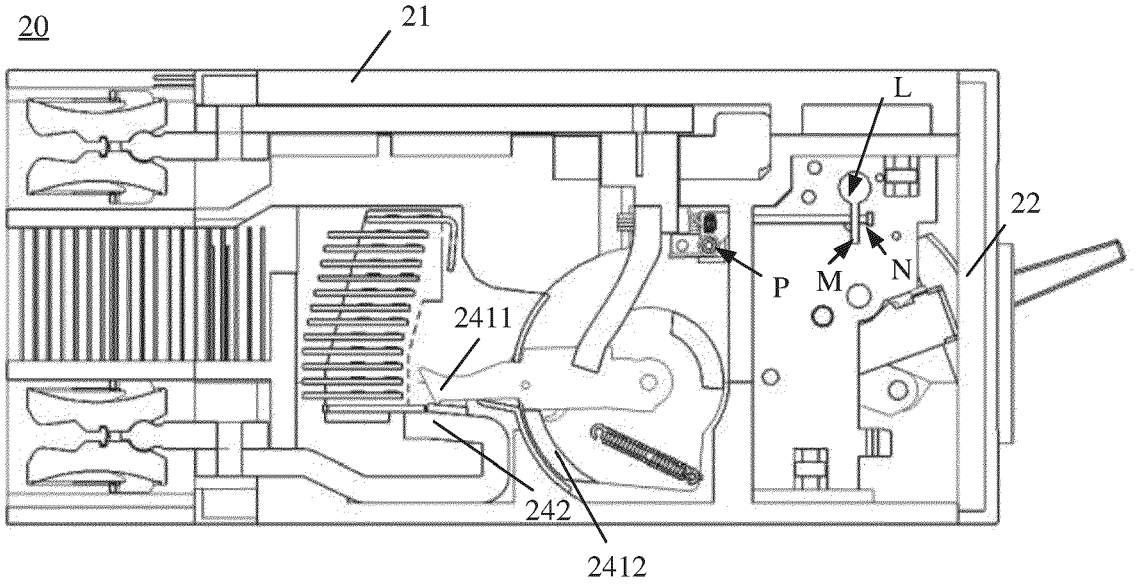

FIG. 8

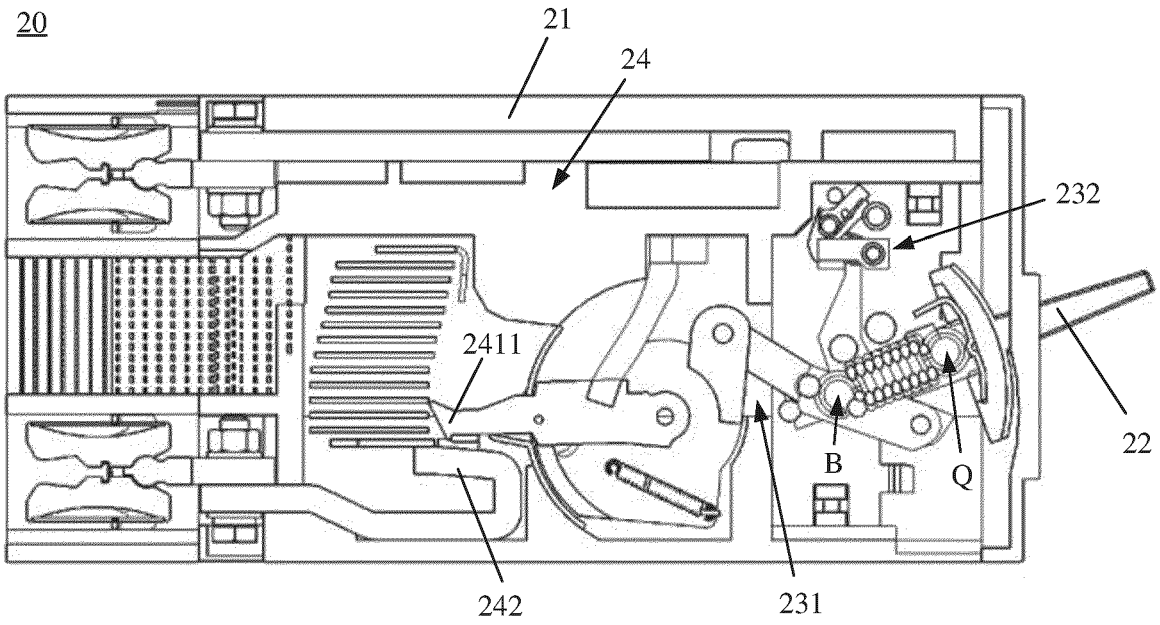

FIG. 9

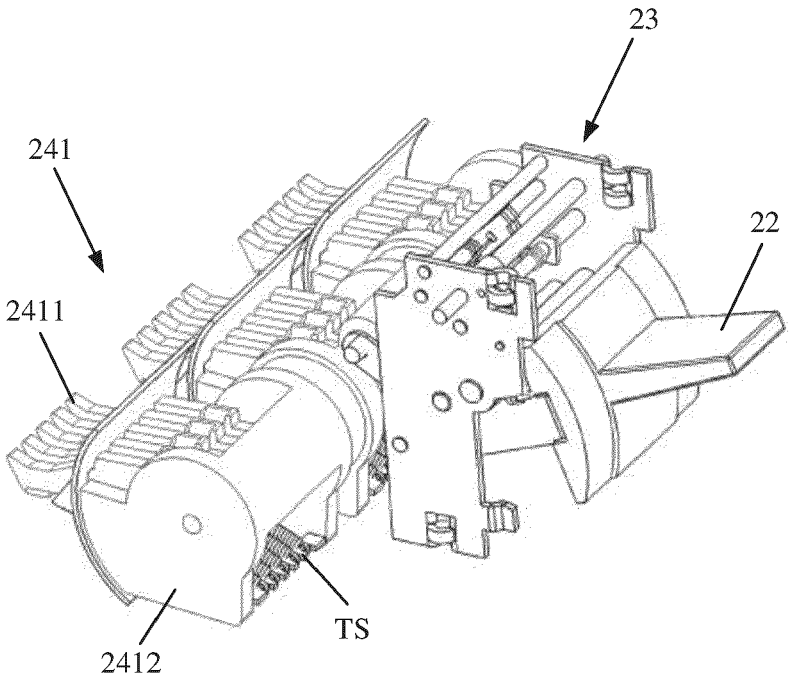

FIG. 10

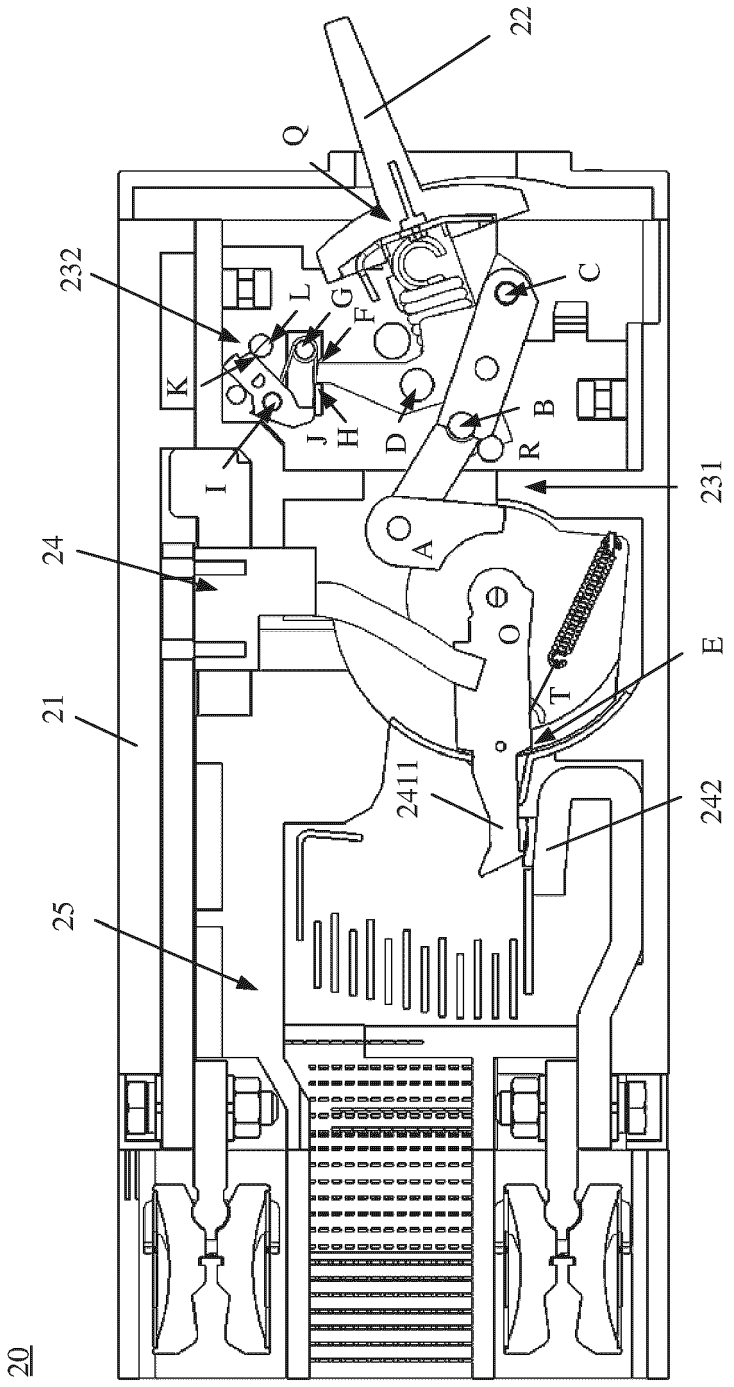

FIG. 11

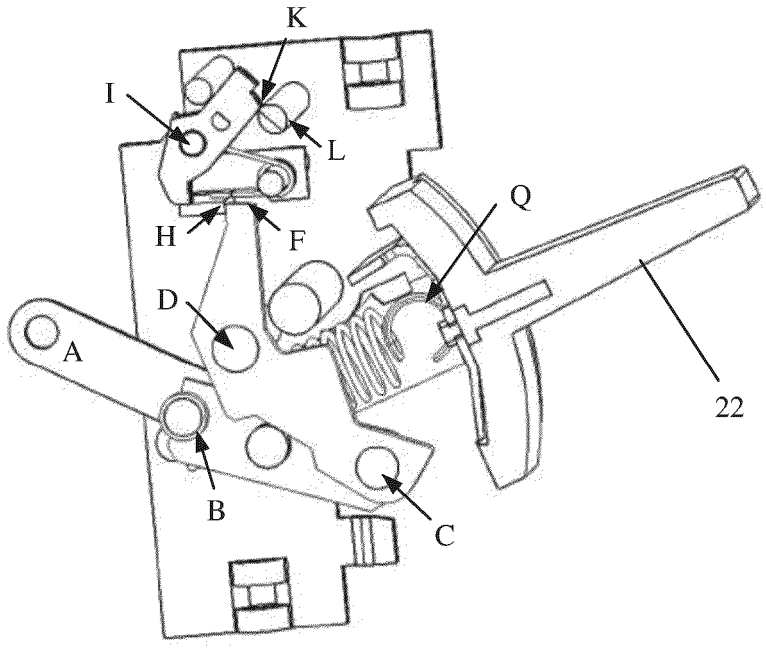

FIG. 12

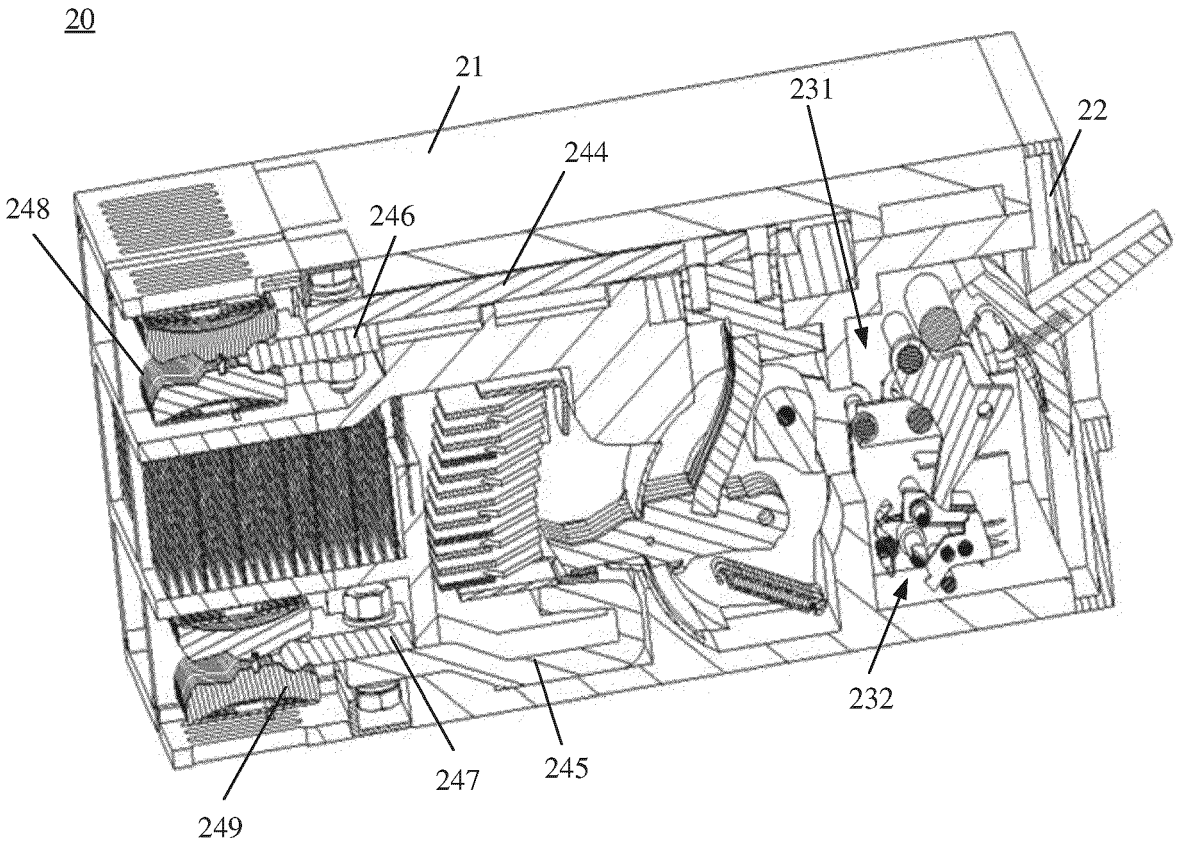

FIG. 13

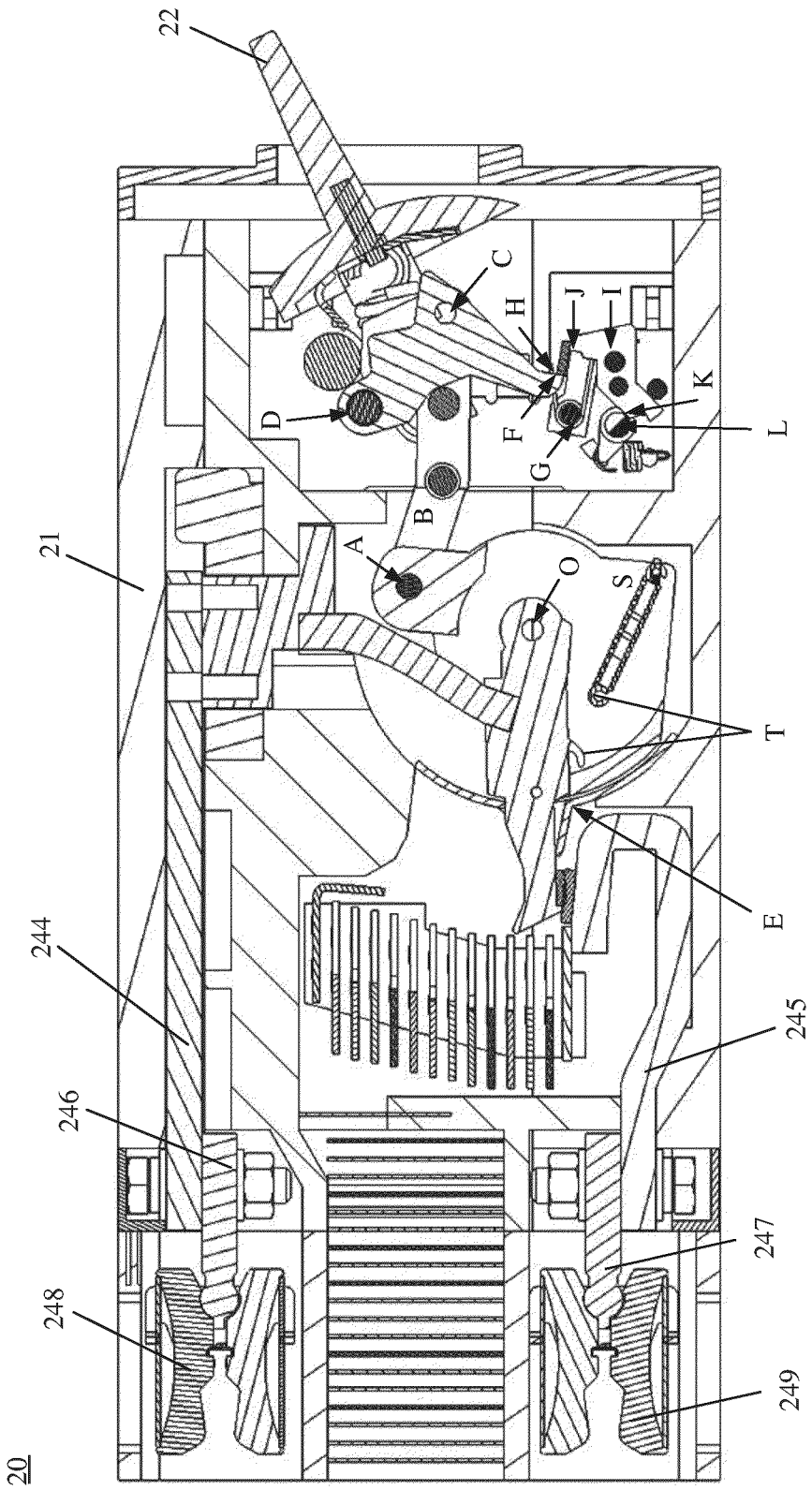

FIG. 14

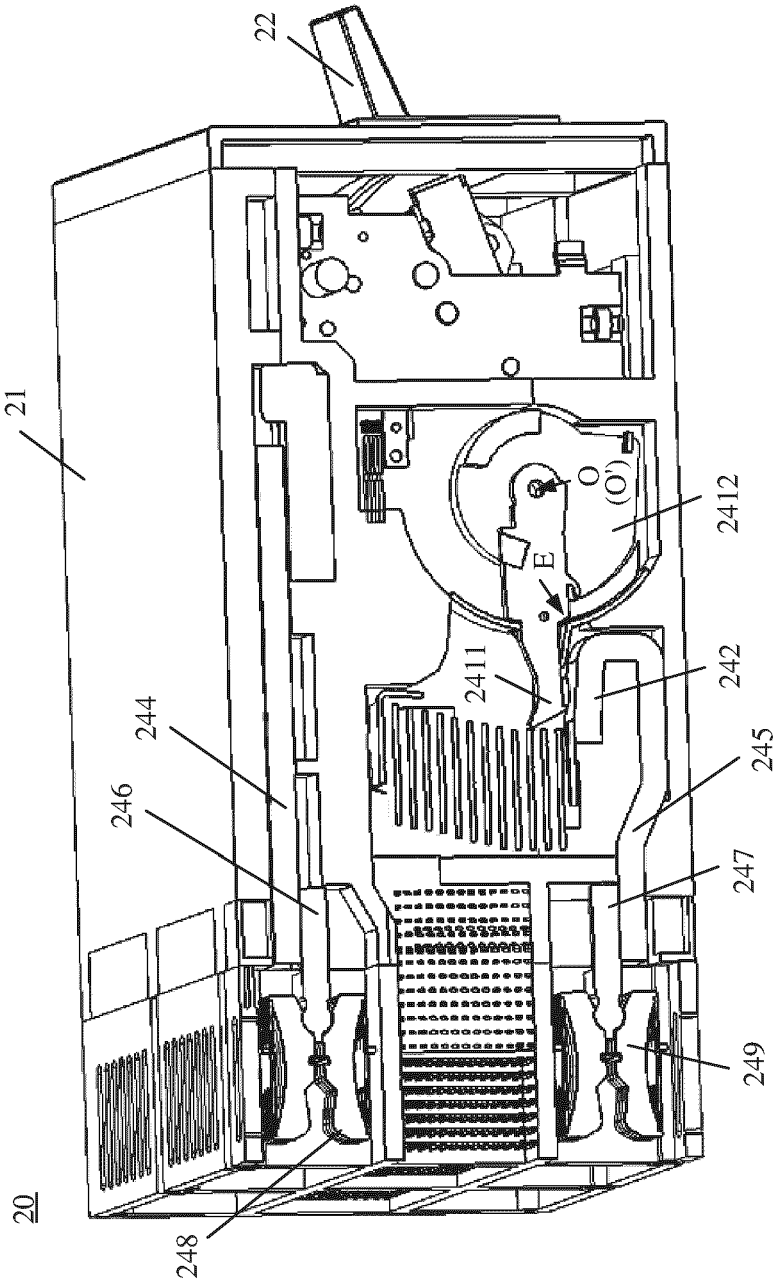

FIG. 15

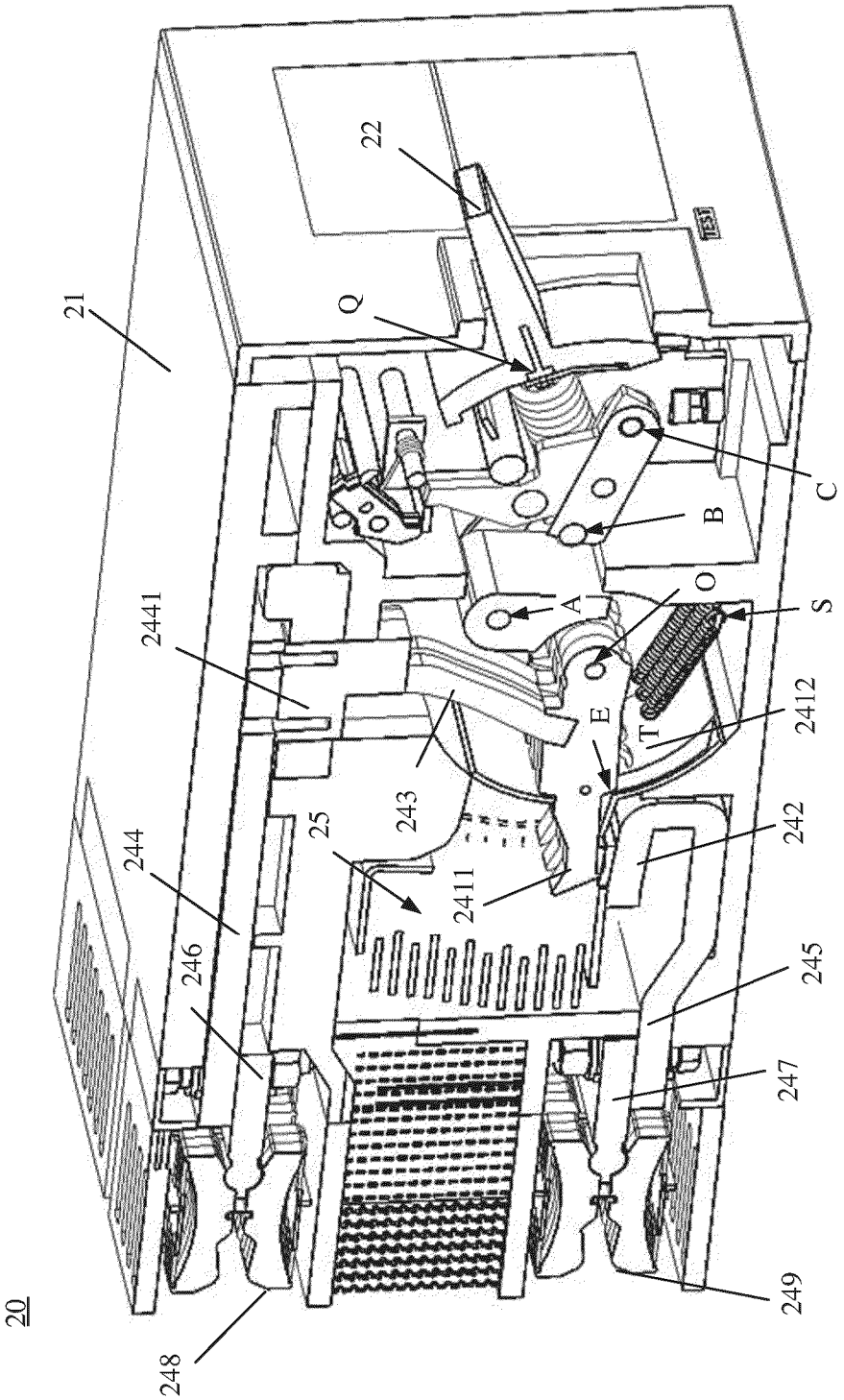
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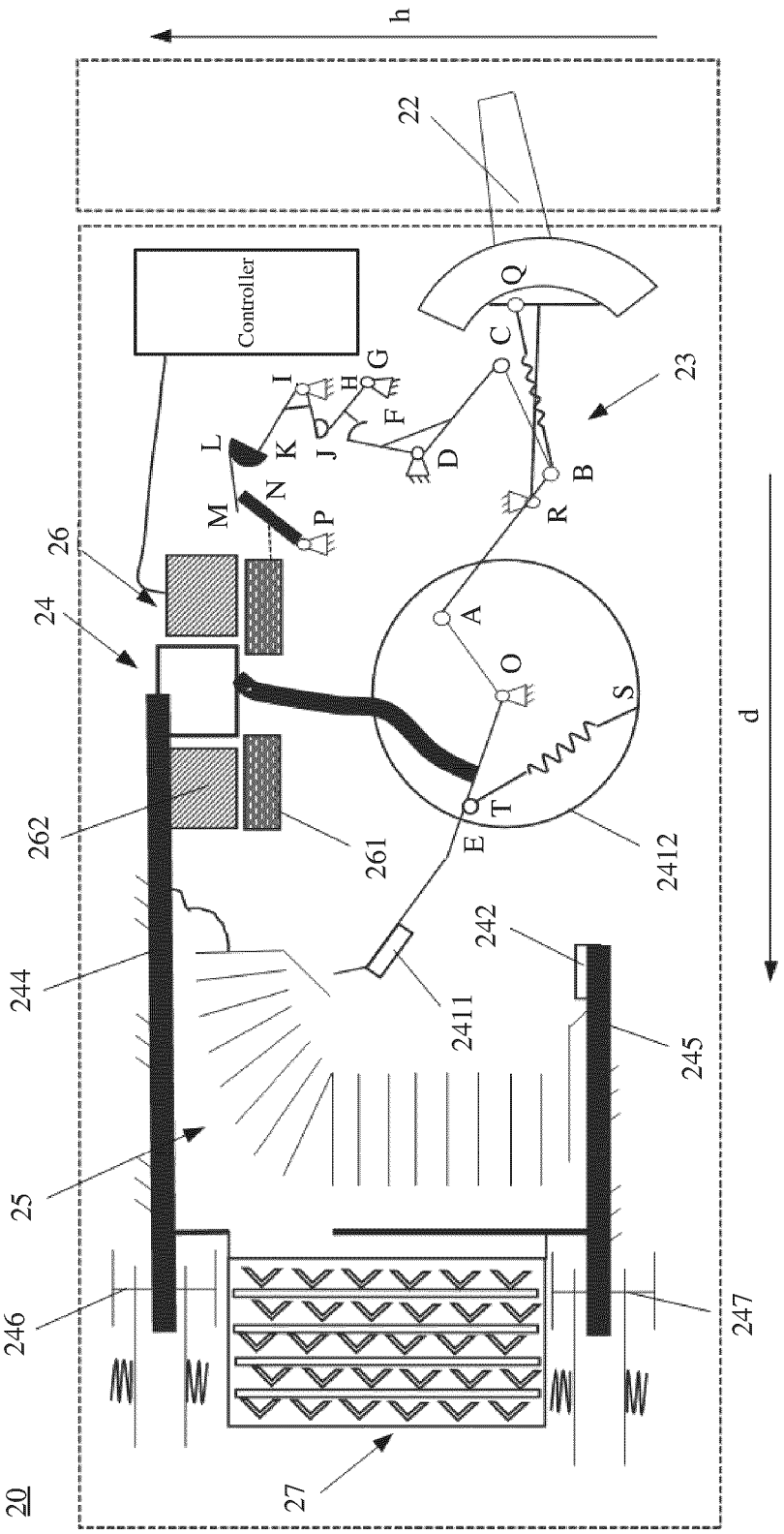
FIG. 16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Controller
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FIG. 17

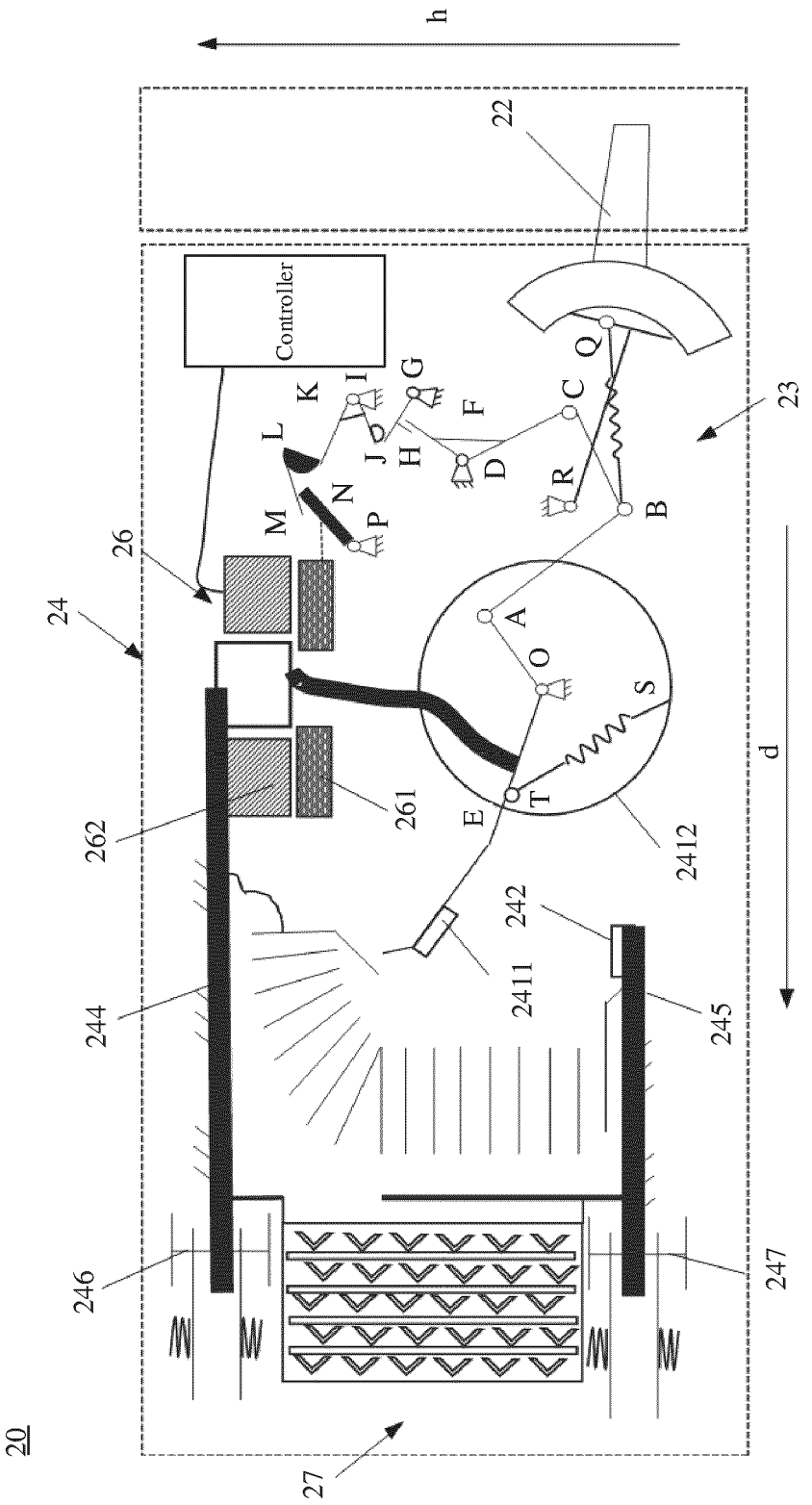
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FIG. 18

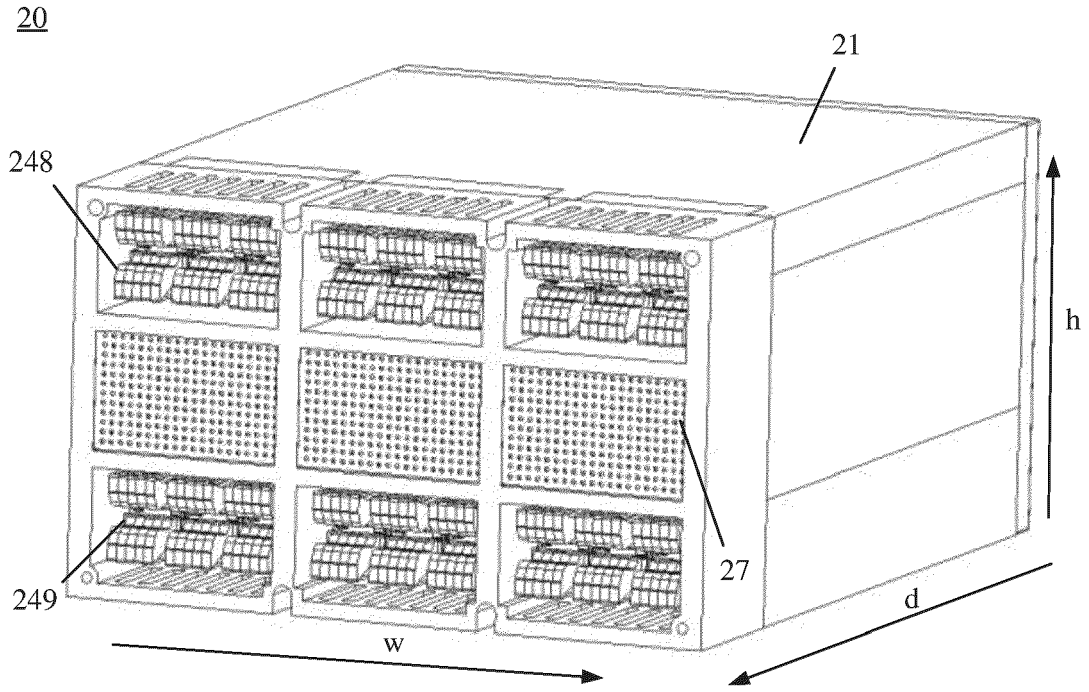


FIG. 19

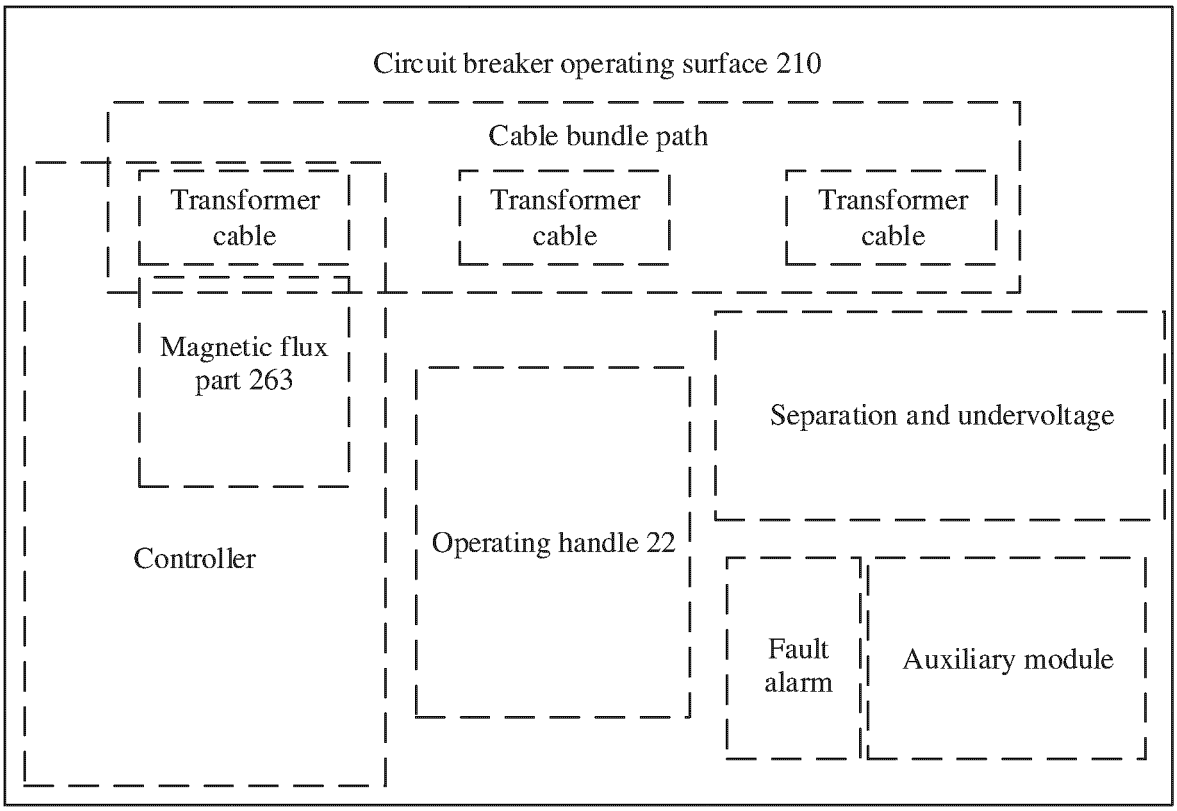
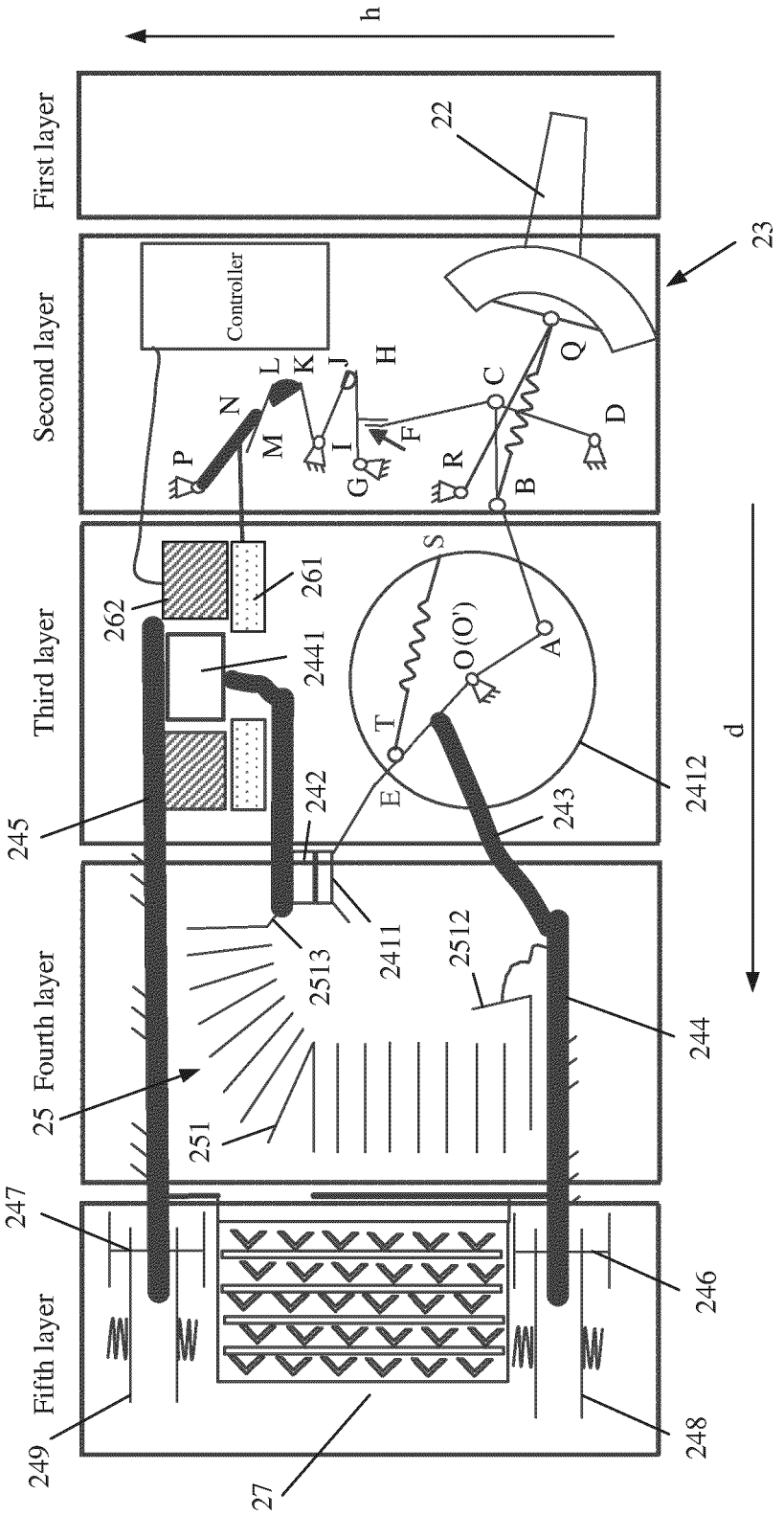

Circuit breaker operating surface 210
Cable bundle path
Transformer cable
Transformer cable
Transformer cable
Magnetic flux part 263
Separation and undervoltage
Operating handle 22
Controller
Fault alarm
Auxiliary module

FIG. 20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Second layer
Third layer
Fourth layer
Fifth layer
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FIG. 21

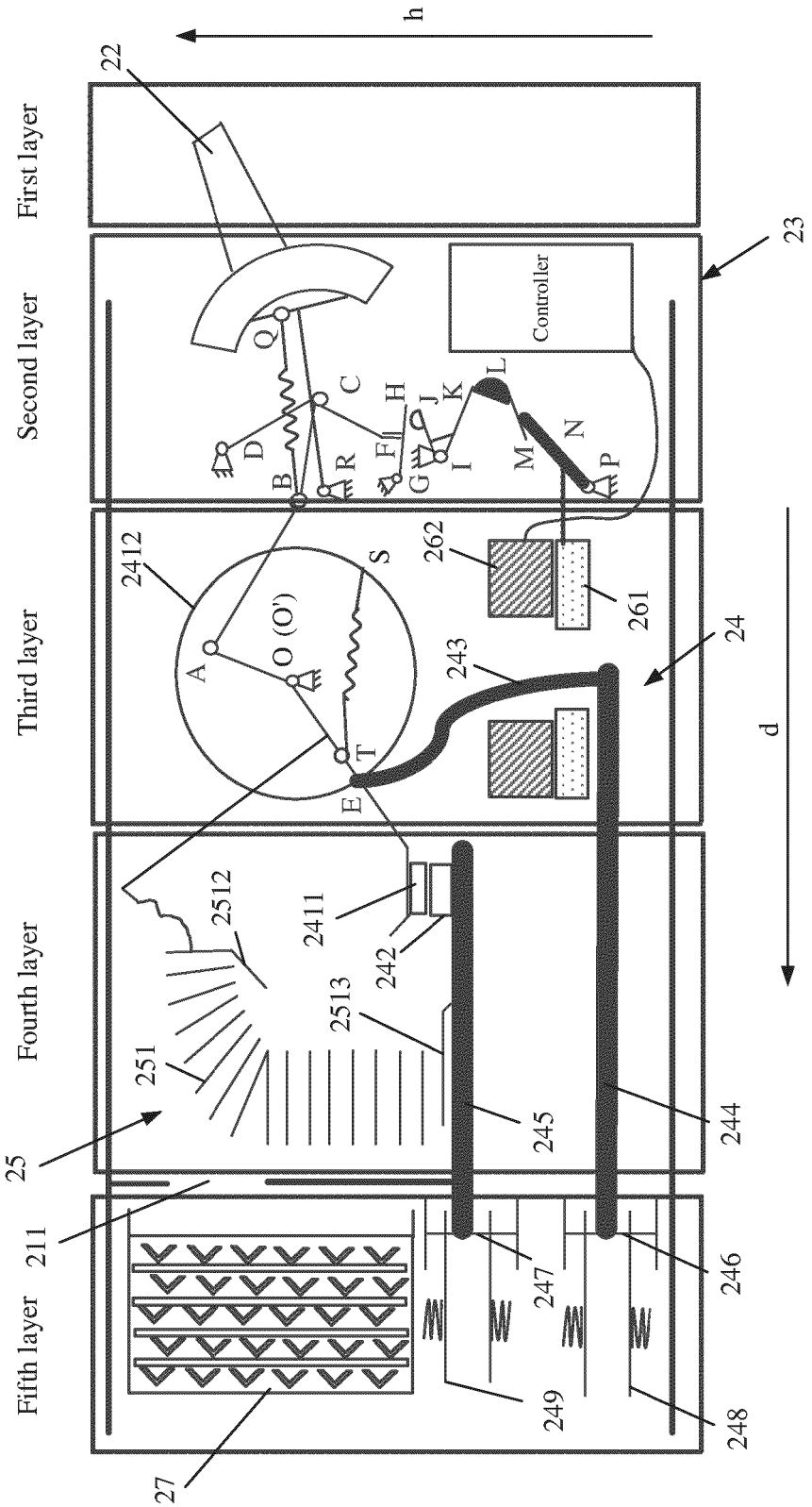
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FIG. 22

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EUROPEAN SEARCH REPORT

Application Number
EP 24 20 4050

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The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
Munich	12 February 2025	Nieto, José Miguel

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