COMPACT LOW-VOLTAGE CABINET

[0001] The present application claims the priority to Chinese Patent Application CN202420803734.2 filed on April 17, 2024, which is incorporated herein by reference in its entirety.

FIELD OF THE INVENTION

[0002] The present invention relates to the field of low-voltage electrical appliances, and more particularly, to a compact low-voltage cabinet.

BACKGROUND OF THE INVENTION

[0003] At present, among complete sets of low-voltage cabinets on the market, a multi-loop feeder cabinet scheme generally has the disadvantages of large overall dimension of a cabinet body, large busbar consumption and poor heat dissipation. The traditional schemes are as follows: circuit breaker contacts are centered and symmetrical and of equal length. A vertical busbar is disposed on the left or right side of a circuit breaker, and a width direction of the side vertical busbar is parallel to a plane of a circuit breaker panel. The connection between the circuit breaker and the vertical busbar must be realized through an adapter busbar. Due to long distances between the vertical busbar and the circuit breaker contacts, a busbar connection path is relatively long, which is called a side vertical busbar scheme. A feeder busbar is located at the rear of a cabinet body and connected to the circuit breaker contacts. A cable connection hole is reserved at an end of the feeder busbar. A cable is fixed through a bolt to transmit electric energy to the next level of electrical equipment. Since the feeder busbar and the vertical busbar are relatively independent in space, two busbar modules occupy a relatively large cabinet space.

SUMMARY OF THE INVENTION

[0004] An object of the present invention is to overcome at least one defect of the prior art and provide a compact low-voltage cabinet.

[0005] In order to achieve the above object, the technical scheme adopted in the present invention is as follows:

[0006] a compact low-voltage cabinet, which is used for mounting a plurality of switchgears and comprises a cabinet body, a vertical busbar module and a feeder busbar

module, the vertical busbar module comprises a multi-phase first vertical busbar, and the feeder busbar module comprises a multi-phase feeder busbar; a multi-phase incoming contact configured to be correspondingly connected to the multi-phase first vertical busbar and a multi-phase outgoing contact configured to be correspondingly connected to the multi-phase feeder busbar are provided at the rear of each switchgear; the vertical busbar module and the feeder busbar module are disposed at the rear of the switchgear; a width direction of each first vertical busbar extends in a front-rear direction, and a length direction of the first vertical busbar extends in a vertical direction; a width direction of each feeder busbar extends in a vertical direction, and a length direction of the feeder busbar extends in a front-rear direction; and the multi-phase first vertical busbars and the multi-phase feeder busbars are alternately arranged in a left-right direction.

[0007] Optionally, a width direction of an incoming end of the incoming contact for connection with the first vertical busbar extends in a vertical direction, and a length direction thereof extends in a front-rear direction; a width direction of an outgoing end of the outgoing contact for connection with the feeder busbar extends in the vertical direction, and a length direction thereof extends in the front-rear direction; the incoming end of the multi-phase incoming contact and the outgoing end of the multi-phase outgoing contact are arranged vertically between the corresponding phases; and the corresponding phases at the outgoing end of the multi-phase outgoing contact and at the incoming end of the multi-phase incoming contact are arranged in a left-right direction in a staggered manner, and are stacked on a side of the feeder busbar in the corresponding phase one by one.

[0008] Optionally, the incoming end of the incoming contact protrudes in the front-rear direction backward from the outgoing end of the outgoing contact and is stacked on a side of the first vertical busbar in the corresponding phase.

[0009] Optionally, the outer surfaces of the incoming contact and the outgoing contact each have a graphene coating.

[0010] Optionally, the vertical busbar module further comprises a multi-phase second vertical busbar with the same number of phases as the first vertical busbar; a width direction of the second vertical busbar extends in the front-rear direction, and a length direction of the second vertical busbar extends in the vertical direction; the length of the second vertical busbar is less than the length of the first vertical busbar; the second vertical busbar and a current starting end of the first vertical busbar in the corresponding phase are stacked at intervals to form a mounting gap; and the corresponding incoming contact is placed in the mounting gap.

[0011] Optionally, a plurality of switchgears and a plurality of feeder busbar modules are arranged; the plurality of switchgears are arranged sequentially in the vertical direction; and the plurality of feeder busbar modules are arranged sequentially in the vertical direction and correspond to the plurality of switchgears.

[0012] Optionally, the vertical busbar module also comprises an insulating support plate and at least one first busbar clamp; the insulating support plate is provided with a busbar slot; the first busbar clamp is provided with a plurality of first clamping grooves; a current terminal of the first vertical busbar is inserted into the busbar slot; and a side edge of the first vertical busbar in each phase is inserted into the corresponding first clamping groove.

[0013] Optionally, the feeder busbar module also comprises at least one second busbar clamp, the second busbar clamp is provided with a plurality of second clamping grooves, and a side edge of the feeder busbar in each phase is inserted into the corresponding second clamping groove.

[0014] Optionally, the incoming end of the incoming contact is stacked on a side of the first vertical busbar in the corresponding phase and fixed by an incoming fixing bolt; the multi-phase first vertical busbar comprises an A-phase first vertical busbar, a B-phase first vertical busbar, a C-phase first vertical busbar and an N-phase first vertical busbar which are arranged sequentially in a left-right direction at intervals; the multi-phase incoming contact comprises an A-phase incoming contact, a B-phase incoming contact, and a C-phase incoming contact which are arranged sequentially in a left-right direction at intervals; the outgoing end of the outgoing contact is stacked on a side of the feeder busbar in the corresponding phase and fixed by an outgoing fixing bolt; the multi-phase feeder busbar comprises an A-phase feeder busbar, a B-phase feeder busbar, a C-phase feeder busbar and an N-phase feeder busbar which are arranged sequentially in a left-right direction at intervals; and the multi-phase outgoing contact comprises an A-phase outgoing contact, a B-phase outgoing contact and a C-phase outgoing contact which are arranged sequentially in a left-right direction at intervals.

[0015] Optionally, the N-phase feeder busbar is stacked on a side of the N-phase first vertical busbar and fixed by an N-phase fixing bolt.

[0016] Optionally, a dimension of the cabinet body in the left-right direction is W, where 400 mm≤W≤600 mm.

[0017] Optionally, a dimension W of the cabinet body in the left-right direction is 400 mm, or 450 mm, or 500 mm, or 550 mm, or 600 mm.

[0018] Optionally, the vertical busbar module and/or the feeder busbar module comprise(s) a busbar fixing device; and the busbar fixing device comprises:

[0019] a third busbar clamp, which is provided with a fixed channel, wherein an inner side wall of the fixed channel is provided with a plurality of clamping members along a height direction of the fixed channel;

[0020] a fixing member, which comprises a fixing portion and first clamping portions disposed on both opposite sides of the fixing portion, wherein the fixing portion is located in the fixed channel and capable of moving along the height direction of the fixed channel, and the first clamping portions are capable of being clamped into the corresponding clamping members.

[0021] Optionally, the busbar fixing device also comprises a fastening member detachably connected to the fixing portion; and the fastening member is used to fasten a busbar of the vertical busbar module or the feeder busbar module in the width direction of the fixed channel.

[0022] Optionally, the fastening member comprises a fastening portion, a sliding portion and third clamping portions; the third clamping portions are disposed on both opposite sides of the fastening portion, respectively; the third clamping portions are capable of being clamped into the corresponding clamping members; the sliding portion is disposed at one end of the fastening portion; an end of the fixing portion is provided with a sliding groove; the sliding portion is inserted into the sliding groove; the other end of the fastening portion is provided with a fastening groove; the width of the fastening groove is adapted to the width of the busbar of the vertical busbar module or the feeder busbar module; and the busbar of the vertical busbar module or the feeder busbar module is inserted into the fastening groove.

[0023] Optionally, the busbar fixing device also comprises a cushion block; the cushion block is clamped between the busbar of the vertical busbar module or the feeder busbar module and an inner side wall of the fixed channel in the width direction of the fixed channel; the cushion block is provided with a fourth clamping portion; and the fourth clamping portion is in clamping fit with the clamping member.

[0024] Optionally, the vertical busbar module and/or the feeder busbar module comprise(s) a fourth busbar clamp; the fourth busbar clamp comprises a busbar clamp body and a busbar perforation hole formed in the busbar clamp body; the busbar clamp further comprises protrusion structures; a hole wall of the busbar perforation hole along a first direction and/or a second direction is provided with the plurality of protrusion structures at

intervals; the busbar perforation hole is used to allow the busbar of the vertical busbar module or the feeder busbar module to passed through; and the plurality of protrusion structures are used to abut against the busbars of the vertical busbar module or the feeder busbar module.

[0025] Optionally, the protrusion structures are detachably disposed on the hole wall of the busbar perforation hole;

[0026] the hole wall of the busbar perforation hole is provided with limiting holes;

[0027] each protrusion structure comprises an adjusting column and a protrusion platform, wherein one end of the adjusting column is connected to the protrusion platform, the other end of the adjusting column is inserted into the corresponding limiting hole, and the adjusting column is screwed with the limiting hole.

[0028] The compact low-voltage cabinet of the present invention is used for mounting the switchgears; and by means of the alternating arrangement, the vertical busbar module and the feeder busbar module can be uniformly disposed at the rear of the switchgears, thereby forming a unique staggered compact busbar system. This system greatly reduces a space occupied by the busbars in the cabinet body, solves the problem that the traditional side vertical busbar occupies the width of the cabinet body, saves the space to the maximum extent, and reduces an overall dimension of the low-voltage cabinet, while also ensuring that the electrical isolation between the two busbar modules can be realized by increasing an electrical clearance and a creepage distance.

[0029] In addition, the extension arrangement of an incoming contact and an outgoing contact in the same direction and the left-right staggered arrangement achieve a compact structure, save the occupied space, and also facilitate the direct connection with the busbars; and an adapter busbar structure is canceled to save the busbar consumption.

[0030] In addition, the first vertical busbar is directly connected to the lengthened incoming contact, without the adapter busbar extending towards the incoming contact, which shortens a busbar path, thereby reducing the busbar consumption and the production cost. On the other hand, busbar adapter points are reduced, that is, the number of heat generation points is reduced, which is conducive to reducing the temperature rise of the cabinet body.

[0031] In addition, the second vertical busbar is set shorter than the first vertical busbar, which is in line with the principle of economy and practicality and saves the number of busbars.

[0032] In addition, a third busbar clamp is provided with a fixed channel for fixing the

busbar, and an inner side wall of the fixed channel is provided with a clamping member along a height direction of the fixed channel. A fixing member includes a fixing portion and first clamping portions disposed on both opposite sides of the fixing portion. The fixing portion is placed in the fixed channel and can move along the height direction of the fixed channel. After the position of the fixing portion in the fixed channel is adjusted, the first clamping portions are clamped onto the corresponding clamping members to fix the busbars in the height direction, and the installation stability is relatively high. The position adjustment of the fixing portion may be applicable to the installation of busbars with different heights, which improves the universality of the fixing member, reduces the number of busbar clamps, and reduces the mold opening cost, thereby reducing the cost of the whole fixing device.

[0033] In addition, a fourth busbar clamp includes a busbar clamp body and protrusion structures. The busbar clamp body is provided with a busbar perforation hole, and the busbar perforation hole is provided with a plurality of protrusion structures at intervals along a hole wall in a first direction and/or a second direction. The busbar perforation hole is used for the busbar to pass through, and the plurality of protrusion structures are used for abutting against the busbars. The busbar clamp body is an insulator. When the busbar is inserted into the busbar perforation hole, an outer peripheral wall of the busbar abuts against the protrusion structure in the busbar perforation hole, which reduces an abutting area between the busbar and an inner peripheral wall of the busbar perforation hole, thereby facilitating the heat dissipation of the busbar.

BRIEF DESCRIPTION OF THE DRAWINGS

[0034] FIG. 1 is a front view of a low-voltage cabinet of the present invention;

[0035] FIG. 2 is a three-dimensional view of a low-voltage cabinet of the present invention;

[0036] FIG. 3 is a perspective view of switchgears, vertical busbar module and feeder busbar module in the present invention;

[0037] FIG. 4 is another perspective view of switchgears, vertical busbar module and feeder busbar module in the present invention;

[0038] FIG. 5 is a schematic structural diagram of a switchgear in the present invention;

[0039] FIG. 6 is a schematic structural diagram of vertical busbar module in the present invention;

[0040] FIG. 7 is a schematic structural diagram in which a feeder busbar module lacks an N-phase feeder busbar in the present invention;

[0041] FIG.8 is an exploded view of a fixing member, a fastening member, a first sliding member and a second sliding member in the present invention;

[0042] FIG. 9 is a schematic structural diagram of a third busbar clamp in the present invention;

[0043] FIG. 10 is a locally enlarged view at Part I in FIG. 9;

[0044] FIG. 11 is a locally enlarged view at Part II in FIG. 9;

[0045] FIG. 12 is a schematic structural diagram of a cushion block, a boss and a buckle in the present invention;

[0046] FIG. 13 is a schematic structural diagram of a busbar fixing device in the present invention;

[0047] FIG. 14 is a locally enlarged view at Part III in FIG. 13;

[0048] FIG. 15 is a schematic structural diagram of a fourth busbar clamp in the present invention; and

[0049] FIG. 16 is a schematic structural diagram of a protrusion structure in the present invention.

[0050] Reference symbols represent the following components: 1-cabinet body; 11-panel; 2-vertical busbar module; 21-first vertical busbar; 211-A-phase first vertical busbar; 212-B-phase first vertical busbar; 213-C-phase first vertical busbar; 214-N-phase first vertical busbar; 22-second vertical busbar; 221-A-phase second vertical busbar; 222-B-phase second vertical busbar; 223-C-phase second vertical busbar; 224-N-phase second vertical busbar; 23-mounting gap; 24-insulating support plate; 241-busbar slot; 25-first busbar clamp; 251-first clamping groove; 252-first clamping strip; 253-first connecting rod; 3-feeder busbar module; 31-feeder busbar; 311-A-phase feeder busbar; 312-B-phase feeder busbar; 313-C-phase feeder busbar; 314-N-phase feeder busbar; 32-second busbar clamp; 321-second clamping groove; 322-second clamping strip; 323-second connecting rod; 33-cable fixing bolt; 34-current transformer; 35-N-phase fixing bolt; 4-switchgear; 41-incoming contact; 411-A-phase incoming contact; 412-B-phase incoming contact; 413-C-phase incoming contact; 42-outgoing contact; 421-A-phase outgoing contact; 422-B-phase outgoing contact; 423-C-phase outgoing contact; 43-incoming fixing bolt; and 44-outgoing fixing bolt;

[0051] 5-third busbar clamp; 51-fixed channel; 52-clamping member; 53-mounting hole; 54-connecting groove; 55-fixing groove; 6-fixing member; 61-fixing portion;

611-sliding groove; 62-first clamping portion; 7-fastening member; 71-fastening portion; 711-fastening groove; 72-sliding portion; and 73-third clamping portion;

[0052] 8-fourth busbar clamp; 81-busbar clamp body; 811-busbar perforation hole; 82-protrusion structure; 821-adjusting column; 822-protrusion platform; X-first direction; and Y-second direction; and

[0053] 9-cushion block; 91-fourth clamping portion; 92-boss; and 93-buckle.

DETAILED DESCRIPTION OF SOME EMBODIMENTS

[0054] The specific implementation of a compact low-voltage cabinet of the present invention will be further described below with reference to the embodiments given in accompanying drawings. The compact low-voltage cabinet of the present invention is not limited to the description of the following embodiments.

[0055] As shown in FIGS. 1-4, the compact low-voltage cabinet in the present embodiment is used to mount one or more switchgears 4 and includes a cabinet body 1, a vertical busbar module 2 and a feeder busbar module 3, wherein the vertical busbar module 2 includes a multi-phase first vertical busbar 21, and the feeder busbar module 3 includes a multi-phase feeder busbar 31; a multi-phase incoming contact 41 configured to be correspondingly connected to the multi-phase first vertical busbar 21 and a multi-phase outgoing contact 42 configured to be correspondingly connected to the multi-phase feeder busbar 31 are disposed at the rear of the corresponding switchgear 4; the vertical busbar module 2 and the feeder busbar module 3 are disposed at the rear of the corresponding switchgear 4; a width direction of each first vertical busbar 21 extends in a front-rear direction, and a length direction of the first vertical busbar extends in a vertical direction; a width direction of each feeder busbar 31 extends in a vertical direction, and a length direction of the feeder busbar extends in a front-rear direction; and the multi-phase first vertical busbars 21 and the multi-phase feeder busbars 31 are alternately arranged in a left-right direction. The compact low-voltage cabinet in the present embodiment is used for mounting the switchgears 4; and by means of the alternating arrangement, the vertical busbar module 2 and the feeder busbar module 3 can be uniformly arranged at the rear of the switchgears 4, thereby forming a unique staggered compact busbar system. This system greatly reduces a space occupied by the busbars in the cabinet body 1, solves the problem that the traditional side vertical busbar occupies the width of the cabinet body 1, saves the space to the maximum extent, and reduces an overall dimension of the low-voltage cabinet, while also ensuring that the electrical isolation between the two busbar modules can be

realized by increasing an electrical clearance and a creepage distance.

[0056] The low-voltage cabinet in the present embodiment is a multi-loop feeder cabinet, in which electric energy is input from the vertical busbar module 2, transferred through the switchgears 4, and finally allocated to the plurality of feeder busbar modules 3. Of course, the low-voltage cabinet in the present embodiment may also be an incoming cabinet with multi-loop collecting, or an incoming and feeder hybrid cabinet, etc. Each switchgear shown in the figures of the present embodiment is a frame circuit breaker. Of course, it may also be a miniature air circuit breaker, a molded case circuit breaker, a universal circuit breaker, a disconnecting switch, a knife switch and other switchgear. It should be noted that in the present embodiment, the orientation description is based on the front of a panel 11. As shown in FIGS. 1-2, a height direction of the cabinet body 1 is a vertical direction, a width direction of the cabinet body 1 is a left-right direction, and a depth direction of the cabinet body 1 is a front-rear direction.

[0057] As shown in FIG. 5, a width direction of an incoming end of the incoming contact 41 for connection with the first vertical busbar 21 extends in the vertical direction, and a length direction thereof extends in the front-rear direction; a width direction of an outgoing end of the outgoing contact 42 for connection with the feeder busbar 31 extends in the vertical direction, and a length direction thereof extends in the front-rear direction, that is, the incoming end of the incoming contact 41 is parallel to the outgoing end of the outgoing contact 42; the incoming end of the multi-phase incoming contact 41 and the outgoing end of the multi-phase outgoing contact 42 are arranged vertically between the corresponding phases; and the corresponding phases at the outgoing end of the multi-phase outgoing contact 42 and at the incoming end of the multi-phase incoming contact 41 are arranged in a left-right direction in a staggered manner, and are stacked on a side of the feeder busbar 31 in the corresponding phase one by one. The extension arrangement of the incoming contact 41 and the outgoing contact 42 in the same direction and the left-right staggered arrangement achieve a compact structure, save the occupied space, and also facilitate the direct connection with the busbars; and an adapter busbar structure is canceled to save the busbar consumption. Specifically, a three-phase incoming contact 41 and a three-phase outgoing contact 42 are disposed at the rear of the corresponding switchgear 4, and the incoming contacts 41 and the outgoing contacts 42 which are connected to a circuit in the same phase (corresponding phase) are disposed in a left-right direction in a staggered manner and are in one-to-one correspondence with each other. In some embodiments, the outgoing contact 42 is located above the incoming contact 41 connected to the circuit in the

same phase. In some embodiments, as shown in FIG. 5, the outgoing contact 42 is located on the left side of the incoming contact 41 connected to the circuit in the same phase, that is, the outgoing contact 42 is located on the upper left side of the corresponding incoming contact 41. In other embodiments, the outgoing contact 42 may also be located below the incoming contact 41 connected to the circuit in the same phase, and the outgoing contact 42 may be located on the right side of the incoming contact 41 of the circuit in the same phase. The three-phase incoming contacts 41 may be disposed in rows at the same height or staggered in the vertical direction. The three-phase outgoing contacts 42 may be disposed in rows at the same height or staggered in the vertical direction. A spacing between the incoming contact 41 in each phase and its adjacent incoming contact 41 in the left-right direction and a spacing between the incoming contact 41 in each phase and its corresponding outgoing contact 42 in the left-right direction are both greater than a safety electrical clearance.

[0058] As shown in FIG. 5, the structures of the incoming contact 41 and the outgoing contact 42 in the present embodiment are shown. One end of the incoming contact 41 is an incoming end for connection with the first vertical busbar 21, a fixed end at the other end of the incoming contact 41 is fixed on a body of the switchgear 4, and the fixed end and the incoming end of the incoming contact 41 are integrally connected in a T-shape. One end of the outgoing contact 42 is an outgoing end for connection with the feeder busbar 31, a fixed end at the other end of the outgoing contact 42 is fixed on the body of the switchgear 4, and the fixed end and the outgoing end of the outgoing contact 42 are integrally connected in an L-shape. Of course, the incoming contact 41 may also be of a straight or L-shaped structure, etc.; and the outgoing contact 42 may also be of a straight or T-shaped structure, etc. The fixed end of the incoming contact 41 and the fixed end of the outgoing contact 42 which are connected to the circuit in the same phase are disposed correspondingly in the vertical direction, and the incoming end of the incoming contact 41 and the outgoing end of the outgoing contact 42 which are connected to the circuit in the same phase are staggered in the left-right direction.

[0059] Preferably, as shown in FIG. 3 and FIG. 5, the incoming end of the incoming contact 41 protrudes in the front-rear direction backward from the outgoing end of the outgoing contact 42 (i.e., the length of the incoming end of the incoming contact 41 is greater than the length of the outgoing end of the outgoing contact 42) and is stacked on a side of the first vertical busbar 21 in the corresponding phase. The first vertical busbar 21 is directly connected to the lengthened incoming contact 41, without an adapter busbar

extending towards the incoming contact 41, which shortens a busbar path, thereby reducing the busbar consumption and the production cost. On the other hand, busbar adapter points are reduced, that is, the number of heat generation points is reduced, which is conducive to reducing the temperature rise of the cabinet body 1. In addition, the outer surfaces of the incoming contact 41 and the outgoing contact 42 each have a graphene coating. The graphene coating on the outer surfaces of the contacts of the switchgear 4 improves the electrical conductivity, reduces the heat generation, and reduces the temperature rise of the whole cabinet. In the present embodiment, the graphene coating on the outer surfaces of the incoming contact 41 and the outgoing contact 42 is made by means of a graphene electroplating process. Of course, other processes may also be used. It should be noted that the graphene electroplating process used in the present embodiment is the prior art.

[0060] As shown in FIGS. 1-4, the compact low-voltage cabinet in the present embodiment is used to mount a plurality of switchgears 4 and is provided with a plurality of feeder busbar modules 3. The plurality of switchgears 4 are arranged sequentially in the vertical direction. The plurality of feeder busbar modules 3 are arranged sequentially in the vertical direction and correspond to the plurality of switchgears 4. Each feeder busbar module 3 is located at the rear of the corresponding switchgear 4. Each feeder busbar module 3 includes a multi-phase feeder busbar 31. The multi-phase first vertical busbar 21 extends to the rear of the plurality of switchgears 4 at the same time and is connected to the incoming contacts 41 of the plurality of switchgears 4. A plane where the multi-phase first vertical busbar 21 is located and a plane where the multi-phase feeder busbar 31 is located are basically parallel to each other. There may be some bends as required, and there may also be some bends and protrusions on the sides, but the sides corresponding to the connection positions of the incoming contacts 41 and the outgoing contacts 42 are basically parallel to each other.

[0061] In the present embodiment, preferably, three circuit breakers, of course, two, four or more circuit breakers may be disposed. A dimension of the cabinet body 1 in the left-right direction, i.e. the width of the cabinet body 1, is W, where 400 mm≤W≤ 600 mm. The dimension W of the cabinet body 1 in the left-right direction is preferably 400 mm or 450 mm or 500 mm or 550 mm or 600 mm.

[0062] As shown in FIGS. 3-4 and 6, in the present embodiment, the vertical busbar module 2 further includes a multi-phase second vertical busbar 22 with the same number of phases as the first vertical busbar 21; the width direction of the second vertical busbar 22 extends in the front-rear direction, and the length direction thereof extends in the vertical

direction; the length of the second vertical busbar 22 is less than the length of the first vertical busbar 21; the second vertical busbar 22 and a current starting end of the first vertical busbar 21 in the corresponding phase are stacked at intervals to form a mounting gap 23; and the corresponding incoming contact 41 is placed in the mounting gap 23. It should be noted that the end of the vertical busbar module 2 connected to power supply equipment is the current starting end (i.e., the top end as shown in FIGS. 3-4 and FIG. 6). Since the current is the largest at the current starting end, the current becomes smaller and smaller after the electric energy is gradually distributed through loads, and the current carried at the end is relatively small. Therefore, the total cross-section of the busbar at the end of the vertical busbar may be set smaller, and the second vertical busbar 22 is set shorter than the first vertical busbar 21, which is in line with the principle of economy and practicality and saves the number of busbars. Of course, according to actual needs, the second vertical busbar 22 may also be arranged with the same length as the first vertical busbar 21. In addition, the vertical busbar module 2 in the present embodiment may also be provided with a vertical busbar module housing, and the first vertical busbar 21 and the second vertical busbar 22 are installed in the vertical busbar module housing to improve the electrical isolation performance between the vertical busbar module 2 and the feeder busbar module 3.

[0063] As shown in FIGS. 3-4 and FIG. 6, the vertical busbar module 2 in the present embodiment also includes an insulating support plate 24 and at least one first busbar clamp 25; the insulating support plate 24 is provided with a busbar slot 241; the first busbar clamp 25 is provided with a plurality of first clamping grooves 251; a current terminal (i.e., a bottom end shown in FIGS. 3-4 and FIG. 6) of the first vertical busbar 21 is inserted into the busbar slot 241 of the insulating support plate 24; and a side edge of the first vertical busbar 21 in each phase is inserted into the corresponding first clamping groove 251; and a side edge of the second vertical busbar 22 in each phase is also inserted into the corresponding first clamping groove 251. The busbar clamp is used to clamp and fix the busbar to ensure a busbar clearance and an interphase distance and prevent the busbar from shifting. The insulating support plate 24 supports the gravity of the busbar and prevents the busbar from shifting. Specifically, the first busbar clamp 25 includes two first clamping strips 252 and at least two first connecting rods 253. The two first clamping strips 252 are disposed symmetrically, the first clamping grooves 251 are correspondingly formed in opposite sides of each first clamping strip, and both ends of each of the two first clamping strips 252 are respectively connected through the first connecting rods 253 to form a

frame-shaped space for accommodating the first vertical busbar 21 and the second vertical busbar 22. Correspondingly, both sides of the first vertical busbar 21 or the second vertical busbar 22 are correspondingly clamped into the first clamping grooves 251 on the opposite sides of each of the two first clamping strips 252, thereby achieving clamping and fixing of the busbar through the busbar clamp. The first connecting rod 253 is also disposed in a gap between two adjacent first vertical busbars 21 to reinforce the first busbar clamp 25. The connection between the first connecting rod 253 and the first clamping strip 252 may be realized by inserting both ends of the first connecting rod 253 into insertion holes of the two first clamping strips 252.

[0064] As shown in FIGS. 3-4 and FIG. 7, the feeder busbar module 3 in the present embodiment also includes at least one second busbar clamp 32, the second busbar clamp 32 is provided with a plurality of second clamping grooves 321, and a side edge of the feeder busbar 31 in each phase is inserted into the corresponding second clamping groove 321. The second busbar clamp supports the gravity of the busbar, ensures the busbar clearance and interphase distance, and prevents the busbar from shifting. The second busbar clamp 32 includes two second clamping strips 322 and at least two second connecting rods 323. The two second clamping strips 322 are disposed symmetrically, the second clamping grooves 321 are correspondingly formed in opposite sides of each second clamping strip, and both ends of each of the two second clamping strips 322 are respectively connected through the second connecting rods 323 to form a frame-shaped space for accommodating the feeder busbars 31 in respective phases. Correspondingly, both sides of each feeder busbar 31 are correspondingly clamped into the second clamping grooves 321 on the opposite sides of each of the two second clamping strips 322, thereby achieving clamping and fixing of the busbar through the busbar clamp. The second connecting rod 323 is also disposed in a gap between two adjacent feeder busbars 31 to reinforce the second busbar clamp 32. The connection between the second connecting rod 323 and the second clamping strip 322 may be realized by inserting both ends of the second connecting rod 323 into insertion holes of the two second clamping strips 322.

[0065] As shown in FIGS. 3-4 and FIG. 7, a current terminal of the feeder busbar 31 away from the outgoing contact 42 is provided with a cable connection hole, which cooperates with a cable fixing bolt 33 to fix a cable. The cable is fixed by tightening the cable fixing bolt in the cable connection hole, so as to transmit the electric energy to the next level of electrical equipment. The feeder busbar module 3 also includes current transformers 34 for detecting a current condition when the feeder busbar 31 is running.

Further, a plurality of current transformers 34 are disposed. The single current transformer 34 is of a ring-shaped structure and is fitted over the single-phase feeder busbar 31, and every two adjacent current transformers 34 are staggered in the front-rear direction. Preferably, as shown in FIG. 7, three current transformers are disposed, wherein the current transformers 34 on both sides are disposed in a front row, and the middle current transformer 34 is disposed in a rear row. The current transformers 34 are staggered so that an arrangement gap between the feeder busbars 31 is reduced, so the layout is compact, and the occupied space is saved.

[0066] In a specific embodiment, the incoming end of the incoming contact 41 is stacked on a side of the first vertical busbar 21 in the corresponding phase and fixed by an incoming fixing bolt 43. The incoming ends of the incoming contacts 41 of the switchgears 4 which are disposed oppositely at the current starting end of the first vertical busbar 21 are disposed in the mounting gap 23 between the first vertical busbar 214 and the second vertical busbar 22 in the corresponding phase and are fixed by the incoming fixing bolt 43. The multi-phase first vertical busbar 21 includes an A-phase first vertical busbar 211, a B-phase first vertical busbar 212, a C-phase first vertical busbar 213 and an N-phase first vertical busbar 214 which are arranged sequentially in the left-right direction at intervals; the multi-phase second vertical busbar 22 includes an A-phase second vertical busbar 221, a B-phase second vertical busbar 222, a C-phase second vertical busbar 223 and an N-phase second vertical busbar 224 which are arranged sequentially in the left-right direction at intervals; and the multi-phase incoming contact 41 includes an A-phase incoming contact 411, a B-phase incoming contact 412 and a C-phase incoming contact 413 which are arranged sequentially in the left-right direction at intervals. The outgoing end of the outgoing contact 42 is stacked on a side of the feeder busbar 31 in the corresponding phase and fixed by an outgoing fixing bolt 44. The multi-phase feeder busbar 31 includes an A-phase feeder busbar 311, a B-phase feeder busbar 312, a C-phase feeder busbar 313 and an N-phase feeder busbar 314 which are arranged sequentially in the left-right direction at intervals. The multi-phase outgoing contact 42 includes an A-phase outgoing contact 421, a B-phase outgoing contact 422 and a C-phase outgoing contact 423 which are arranged sequentially in the left-right direction at intervals. The N-phase feeder busbar 314 is stacked on a side of the N-phase first vertical busbar 214 and fixed by an N-phase fixing bolt 35.

[0067] As shown in FIGS. 8-10, the busbar fixing method for the vertical busbar module 2 and/or the feeder busbar module 3 also has a variety of implementations. As a

preferred method, the vertical busbar module 2 and/or the feeder busbar module 3 in the present embodiment include(s) a busbar fixing device, and the busbar fixing device includes a third busbar clamp 5 and a fixing member 6. The third busbar clamp 5 is provided with a fixed channel 51, and an inner side wall of the fixed channel 51 is provided with a plurality of clamping members 52 along a height direction of the fixed channel 51. The fixing member 6 includes a fixing portion 61 and first clamping portions 62 disposed on both opposite sides of the fixing portion 61; the fixing portion 61 is located in the fixed channel 51 and capable of moving along the height direction of the fixed channel 51; and the first clamping portions 62 are capable of being clamped into the corresponding clamping members 52.

[0068] Specifically, the height direction of the fixed channel 51 is an AB direction in the figures, and the width direction of the fixed channel 51 is a CD direction in the figures. The third busbar clamp 5 has a fixed channel 51 for fixing the busbar of the vertical busbar module 2 or the feeder busbar module 3. When the third busbar clamp 5 is used for fixing the busbar of the vertical busbar module 2 (including the first vertical busbar 21 and the second vertical busbar 22); and the height direction of the fixed channel 51 is the front-rear direction in FIG. 4, that is, the width direction of the busbar of the vertical busbar module 2. The width direction of the fixed channel 51 is the left-right direction in FIG. 4, that is, a thickness direction of the busbar of the vertical busbar module 2. When the third busbar clamp 5 is used for fixing the busbar (i.e., the feeder busbar 31) of the feeder busbar module 3, the height direction of the fixed channel 51 is the vertical direction in FIG. 4, that is, a width direction of the busbar of the feeder busbar module 3. The width direction of the fixed channel 51 is the left-right direction in FIG. 4, i.e., a thickness direction of the busbar of the feeder busbar module 3. The busbar of the vertical busbar module 2 or the feeder busbar module 3 has excellent conductivity as a conductor and has the thinnest thickness of only 3 mm. The ultra-thin structure is improved such that its surface area increases, and the cross-sectional area is greatly reduced while ensuring the current carrying capacity. Both side walls of the fixed channel 51 are provided with a plurality of clamping members 52, which form a sawtooth structure, thereby ensuring the structural strength of the third busbar clamp 5 without damaging the integrity of the third busbar clamp 5. The fixing member 6 is made of a high-strength insulating material, e.g., polyethylene, polypropylene or other polymer material, as well as glass, ceramics or other non-metallic material. The fixing member 6 has high strength, which ensures that the fixing member 6 itself will not loosen and fall after the current is energized. At the same time, the

fixing member 6 has a certain plasticity, which ensures that the fixing member 6 can be smoothly clamped into the third busbar clamp 5. A first clamping portion 62 is respectively disposed on both opposite sides of the fixing portion 61, and the first clamping portion 62 has an elastic structure and is integrally formed with the fixing portion 61.

[0069] The fixing portion 61 is placed in the fixed channel 51 and can move along the height direction of the fixed channel 51. After the position of the fixing portion 61 in the fixed channel 51 is adjusted, the fixing portion 61 is located at the top end of the third busbar clamp 5. The first clamping portions 62 on both sides are pressed by hand or a tool, and the fixing portion 61 slides up and down in the fixed channel 51 along the height direction of the third busbar clamp 5. When the fixing portion 61 abuts against the busbar of the vertical busbar module 2 or the feeder busbar module 3, the first clamping portion 62 is loosened, such that the first clamping portion 62 clamps the corresponding clamping member 52 and fix it relative to the third busbar clamp 5, so as to fix the busbar of the vertical busbar module 2 or the feeder busbar module 3 in the height direction, and the installation stability is relatively high. The position adjustment of the fixing portion 61 may be suitable for the installation of the busbars of the vertical busbar module 2 or the feeder busbar module 3 with different heights, which improves the universality of the fixing member 6, reduces the number of the third busbar clamps 5, and reduces the mold opening cost, thereby reducing the cost of the whole fixing device. Optionally, for the busbars of the vertical busbar module 2 or the feeder busbar module 3 with different heights, in addition to changing the installation position of the fixing member 6 as described above, the number of the fixing members 6 may also be changed to match the installation of the busbars of the vertical busbar module 2 or the feeder busbar module 3 with different heights.

[0070] Further, referring to FIG. 8, the busbar fixing device also includes a fastening member 7 detachably connected to the fixing portion 61; and the fastening member 7 is used to clamp the busbar of the vertical busbar module 2 or the feeder busbar module 3 in the width direction of the fixed channel 51. Specifically, the fastening member 7 is detachably connected to the fixing portion 61. In some embodiments, when the thickness of the busbar of the vertical busbar module 2 or the feeder busbar module 3 is slightly less than the width of the fixed channel 51, the fastening member 7 is removed from the fixing member 6, and the busbar of the vertical busbar module 2 or the feeder busbar module 3 may be fixed only under the action of the fixing member 6. When the thickness of the busbar of the vertical busbar module 2 or the feeder busbar module 3 is much less than the width of the fixed channel 51, the fastening portion 7 is installed on the fixing portion 61 to

clamp both sides of the busbar of the vertical busbar module 2 or the feeder busbar module 3 under the action of the fastening portion 7. Different clamping members 7 are replaced for fixing the busbars of the vertical busbar module 2 or the feeder busbar module 3 with different thicknesses, which further improves the universality of the fixing member 6, reduces the number of the third busbar clamps 5, and reduces the mold opening cost, thereby reducing the cost of the whole fixing device.

[0071] Further, referring to FIG. 8, the fastening member 7 includes a fastening portion 71, a sliding portion 72 and third clamping portions 73; the third clamping portions 73 are disposed on both opposite sides of the fastening portion 71, respectively; the third clamping portions 73 are capable of being clamped into the corresponding clamping members 52; the sliding portion 72 is disposed at one end of the fastening portion 71; an end of the fixing portion 61 of the fixing member 6 is provided with a sliding groove 611; the sliding portion 72 is movably inserted into the sliding groove 611; the other end of the clamping portion 71 is provided with a fastening groove 711; the width of the fastening groove 711 is adapted to the width of the busbar of the vertical busbar module 2 or the feeder busbar module 3; and the busbar of the vertical busbar module 2 or the feeder busbar module 3 is inserted and fastened into the fastening groove 711. Specifically, the third clamping portion 73 has an elastic structure and is integrally formed with the fastening portion 71. In some embodiments, a longitudinal section shape of the sliding groove 611 may be set as a T-shaped structure, and the sliding portion 72 matching the sliding groove is in a T-shaped structure. The fastening portion 7 and the fixing member 6 are installed fixedly through the sliding connection between the sliding portion 72 and the sliding groove 611 of the fixing portion 61. According to matching requirements between the thickness of the busbar of the vertical busbar module 2 or the feeder busbar module 3 and the width of the fixed channel 51, the fastening member 7 is removed or installed to clamp and fix the busbar of the vertical busbar module 2 or the feeder busbar module 3. The fastening portion 71 is provided with a fastening groove 711, and the width of the fastening groove 711 corresponds to the thickness of the busbar of the vertical busbar module 2 or the feeder busbar module 3, that is, the fastening portion 7 corresponding to the matching clamping groove 711 is selected according to the thicknesses of the busbars of different vertical busbar module 2 or feeder busbar module 3. The sliding portion 72 is inserted into the sliding groove 611 of the fixing portion 61 so as to clamp and fix both sides of the busbar of the vertical busbar module 2 or the feeder busbar module 3 under the action of the fastening portion 71. Meanwhile, the third clamping portions 73 on both sides of the

fastening portion 71 are clamped into the corresponding clamping members 52 and used for clamping and fixing the busbar of the vertical busbar module 2 or the feeder busbar module 3.

[0072] Further, referring to FIG. 9 and FIG. 11, a side wall at one end of the fixed channel 51 in the height direction is provided with a fixing groove 55. The fixing groove 55 is in a stepped structure and used to allow one end of the busbar of the vertical busbar module 2 or the feeder busbar module 3 to be inserted. The fixing member 6 or the fastening member 7 is used for connection with the other end of the busbar of the vertical busbar module 2 or the feeder busbar module 3. Specifically, the fixing groove 55 which has the stepped structure is formed in the bottom of the third busbar clamp 5. When the thickness of the busbar of the vertical busbar module 2 or the feeder busbar module 3 is less than the width of the fixed channel 51, one end of the busbar of the vertical busbar module 2 or the feeder busbar module 3 is inserted into the fixing groove 55, and the other end of the busbar of the vertical busbar module 2 or the feeder busbar module 3 is clamped and fixed by the fastening member 7. For the busbars of the vertical busbar module 2 or the feeder busbar module 3 with different thicknesses, the fixing groove 55 has a plurality of stepped grooves with different width combinations so as to adapt to the installation of the busbars of the vertical busbar module 2 or the feeder busbar module 3 with different thicknesses. The number of the third busbar clamps 5 and the mold opening cost are reduced, thereby reducing the cost of the whole fixing device.

[0073] Further, referring to FIG. 12 and FIG. 13, the busbar fixing device also includes a cushion block 9; the cushion block 9 is clamped between the busbar of the vertical busbar module 2 or the feeder busbar module 3 and an inner side wall of the fixed channel 51 in the width direction of the fixed channel 51; the cushion block 9 is provided with a fourth clamping portion 91; and the fourth clamping portion 91 is in clamping fit with the clamping member 52. Specifically, a plurality of fourth clamping portions 91 are disposed. The plurality of fourth clamping portions 91 form a sawtooth structure, and an opening direction of the fourth clamping portion 91 and an opening direction of the clamping member 52 are opposite to each other, so that the fourth clamping portion 91 can be clamped and fixed in cooperation with the clamping member 52. The cushion block 9 is provided with a boss 92 and at least two buckles 93. The two buckles 93 are respectively disposed at upper and lower edges of the cushion block 9 along the height direction of the fixed channel 51, and the boss 92 is located between the upper and lower buckles 93 of the cushion block 9. The boss 92 can increase the overall strength of the cushion block 9. The

inner side wall of the fixed channel 51 is provided with a mounting hole 53 and connecting grooves 54. The connecting grooves 54 are communicated with a groove between the two adjacent clamping members 52 along the width direction of the fixed channel 51. There are two connecting grooves 54, which are respectively in one-to-one correspondence with the two buckles 93 on the cushion block 9. The mounting hole 53 is located between the two connecting grooves 54 and corresponds to the boss 92. The boss 92 is inserted into the mounting hole 53, and the buckles 93 are clamped into the connecting grooves 54, so that the cushion block 9 can be installed more firmly. Whether to install the cushion block 9 and select the cushion blocks 9 of different sizes may be selected according to the busbars of the vertical busbar module 2 or the feeder busbar module 3 with different thicknesses. When the thickness of the busbar of the vertical busbar module 2 or the feeder busbar module 3 is equal to the width of the fixed channel 51, the fastening portion 7 and the cushion block 9 are not required, and the busbar of the vertical busbar module 2 or the feeder busbar module 3 is fixed and clamped only under the action of the fixing member 6. When the thickness of the busbar of the vertical busbar module 2 or the feeder busbar module 3 is less than the width of the fixed channel 51, the fastening member 7 and the fixed groove 55 having the stepped structure are used to clamp the busbar of the vertical busbar module 2 or the feeder busbar module 3 in the vertical direction. At the same time, under the action of the boss 92 inserted into the mounting hole 53 and the buckles 93 clamped into the connecting grooves 54, the cushion block 9 is fixed between the inner side wall of the fixed channel 51 and the side wall of the busbar of the vertical busbar module 2 or the feeder busbar module 3 and used for fixing and clamping the busbar of the vertical busbar module 2 or the feeder busbar module 3. Preferably, along the height direction of the fixed channel, a plurality of cushion blocks 9 are disposed between the busbar of the vertical busbar module 2 or the feeder busbar module 3 and the inner side wall of the fixed channel 51 to further improve the stability of the busbar of the vertical busbar module 2 or the feeder busbar module 3 relative to the third busbar clamp 5. The busbars of the vertical busbar module 2 or the feeder busbar module 3 with different thicknesses can be fixed by replacing the cushion blocks 9 and the fastening members 7 of different sizes, thereby greatly reducing the number of the third busbar clamps 5 and the mold opening cost.

[0074] Further, referring to FIG. 13 and FIG. 14, a plurality of fixed channels 51 are disposed. The plurality of fixed channels 51 are distributed in a matrix. Specifically, the third busbar clamp 5 can fix and clamp the busbars of the vertical busbar module 2 or the feeder busbar module 3 with different heights and thicknesses through the plurality of fixed

channels 51, achieving a wide range of applications.

[0075] Further, referring to FIG. 9, the third busbar clamp 5 is made of a piezochromic material. When the third busbar clamp 5 cracks and other damages occur, the color of the third busbar clamp 5 will change obviously, which is convenient to find the damaged position of the third busbar clamp 5 in time and facilitate timely maintenance or replacement. Optionally, materials that can meet the requirements of high strength, high temperature resistance, and obvious color changes at the damaged position can be used.

[0076] As shown in FIGS. 15-16, another preferred method for fixing the busbar of the vertical busbar module 2 and/or the feeder busbar module 3 is that the vertical busbar module 2 and/or the feeder busbar module 3 in the present embodiment include(s) a fourth busbar clamp 8. The fourth busbar clamp 8 includes a busbar clamp body 81 and protrusion structures 82. The busbar clamp body 81 is provided with a busbar perforation hole 811, and the busbar perforation hole 811 is provided with a plurality of protrusion structures 82 at intervals along a hole wall in a first direction X and/or a second direction Y. The busbar perforation hole 811 is used for the busbar of the vertical busbar module 2 or the feeder busbar module 3 to pass through, and the plurality of protrusion structures 82 are used for abutting against the busbars of the vertical busbar module 2 or the feeder busbar module 3. The busbar clamp body 81 is an insulator. The first direction X is perpendicular to the second direction Y. When the busbar of the vertical busbar module 2 or the feeder busbar module 3 is inserted into the busbar perforation hole 811, an outer peripheral wall of the busbar of the vertical busbar module 2 or the feeder busbar module 3 abuts against the protrusion structure 82 in the busbar perforation hole 811, which reduces an abutting area between the busbar of the vertical busbar module 2 or the feeder busbar module 3 and an inner peripheral wall of the busbar perforation hole 811, thereby facilitating the heat dissipation of the busbars of the vertical busbar module 2 or the feeder busbar module 3.

[0077] Specifically, when the busbar is inserted into the busbar perforation hole, the first direction X is consistent with the thickness direction of the busbar, and the second direction Y is consistent with the width direction of the busbar. When the fourth busbar clamp 8 is used for fixing the busbar of the vertical busbar module 2 (including the first vertical busbar 21 and the second vertical busbar 22), the first direction X is the left-right direction in FIG. 4, that is, the thickness direction of the busbar of the vertical busbar module 2; and the second direction Y is the front-rear direction in FIG. 4, that is, the width direction of the busbar of the vertical busbar module 2. When the fourth busbar clamp 8 is used for fixing the busbar (i.e., the feeder busbar 31) of the feeder busbar module 3, the

first direction X is the left-right direction in FIG. 4, that is, the thickness direction of the busbar of the feeder busbar module 3; and the second direction Y is the vertical direction in FIG. 4, that is, the width direction of the busbar of the feeder busbar module 3.

[0078] Optionally, the plurality of protrusion structures 82 are detachably disposed on both side walls of the busbar perforation hole 811 along the first direction X. In the present embodiment, the protrusion structures 82 may be detachably connected, so that the protrusion structures 82 with different thicknesses may be selected according to the thicknesses of the busbars of the vertical busbar module 2 or the feeder busbar module 3, so that the fourth busbar clamp may be applicable to the busbars of the vertical busbar module 2 or the feeder busbar module 3 with different thickness specifications. Specifically, the protrusion structure 82 is made of an insulating material.

[0079] Optionally, the busbar perforation hole 811 is provided with limiting holes which are formed in both side walls at intervals in the first direction X. Each protrusion structure 82 includes an adjusting column 821 and a protrusion platform 822, wherein one end of the adjusting column 821 is connected to the protrusion platform 822, the other end of the adjusting column 821 is inserted into each of the plurality of limiting holes in a one-to-one correspondence manner, and the adjusting column 821 is screwed with the limiting hole. In the present embodiment, since the protrusion structures 82 are disposed on both side walls of the busbar perforation hole 811 along the first direction X, a spacing between the protrusion structures 82 on both side walls of the busbar perforation hole 811 along the first direction X may further be adjusted by adjusting the relative position of the adjusting column 821 to the busbar clamp body 81 along an axial direction of the limiting hole, so as to adapt to the installation and fixing of the busbars of the vertical busbar module 2 or the feeder busbar module 3 with different thicknesses. Specifically, the limiting hole may be a threaded hole, and the adjusting column 821 may be a stud. The relative position of the protrusion platform 822 to the busbar clamp body 81 can be adjusted by screwing the adjusting column 821 in an adjusting hole. Specifically, the protrusion platform 822 may be made of insulating rubber to increase the pressure and friction on the busbar of the vertical busbar module 2 or the feeder busbar module 3, or may be made of insulated hard plastic in other embodiments.

[0080] It should be explained that, in the description of the present invention, the terms such as "up", "down", "left", "right", "inner" and "outer" indicating the directional or positional relations on the basis of the directional or positional relations shown in the drawings are only used for conveniently describing the present invention and simplifying

the description, not indicate or imply that the referred devices or elements must have a specific orientation; therefore, they cannot be construed as a limitation on the present invention.

[0081] We have made further detailed description of the present invention mentioned above in combination with specific preferred embodiments, but it is not deemed that the specific embodiments of the present invention is only limited to these descriptions. A person skilled in the art can also, without departing from the concept of the present invention, make several simple deductions or substitutions, which all be deemed to fall within the protection scope of the present invention.

CLAIMS

1. A compact low-voltage cabinet, which is used for mounting a plurality of switchgears (4) and comprises a cabinet body (1), a vertical busbar module (2) and a feeder busbar module (3), wherein the vertical busbar module (2) comprises a multi-phase first vertical busbar (21), and the feeder busbar module (3) comprises a multi-phase feeder busbar (31); a multi-phase incoming contact (41) configured to be correspondingly connected to the multi-phase first vertical busbar (21) and a multi-phase outgoing contact (42) configured to be correspondingly connected to the multi-phase feeder busbar (31) are provided at the rear of each switchgear (4); the vertical busbar module (2) and the feeder busbar module (3) are disposed at the rear of the switchgear (4); a width direction of each first vertical busbar (21) extends in a front-rear direction, and a length direction of the first vertical busbar extends in a vertical direction; a width direction of each feeder busbar (31) extends in a vertical direction, and a length direction of the feeder busbar extends in a front-rear direction; and the multi-phase first vertical busbars (21) and the multi-phase feeder busbars (31) are alternately arranged in a left-right direction.

2. The compact low-voltage cabinet according to claim 1, wherein a width direction of an incoming end of the incoming contact (41) for connection with the first vertical busbar (21) extends in a vertical direction, and a length direction thereof extends in a front-rear direction; a width direction of an outgoing end of the outgoing contact (42) for connection with the feeder busbar (31) extends in the vertical direction, and a length direction thereof extends in the front-rear direction; the incoming end of the multi-phase incoming contact (41) and the outgoing end of the multi-phase outgoing contact (42) are arranged vertically between the corresponding phases; and the corresponding phases at the outgoing end of the multi-phase outgoing contact (42) and at the incoming end of the multi-phase incoming contact (41) are arranged in a left-right direction in a staggered manner, and are stacked on a side of the feeder busbar (31) in the corresponding phase one by one.

3. The compact low-voltage cabinet according to claim 2, wherein the incoming end of the incoming contact (41) protrudes in the front-rear direction backward from the outgoing end of the outgoing contact (42) and is stacked on a side of the first vertical busbar (21) in the corresponding phase.

4. The compact low-voltage cabinet according to claim 1, wherein the vertical busbar module (2) further comprises a multi-phase second vertical busbar (22) with the same number of phases as the first vertical busbar (21); a width direction of the second vertical

busbar (22) extends in the front-rear direction, and a length direction of the second vertical busbar (22) extends in the vertical direction; the length of the second vertical busbar (22) is less than the length of the first vertical busbar (21); the second vertical busbar (22) and a current starting end of the first vertical busbar (21) in the corresponding phase are stacked at intervals to form a mounting gap (23); and the corresponding incoming contact (41) is placed in the mounting gap (23).

5. The compact low-voltage cabinet according to claim 1, wherein a plurality of switchgears (4) and a plurality of feeder busbar modules (3) are arranged; the plurality of switchgears (4) are arranged sequentially in the vertical direction; and the plurality of feeder busbar modules (3) are arranged sequentially in the vertical direction and correspond to the plurality of switchgears (4).

6. The compact low-voltage cabinet according to claim 1, wherein the vertical busbar module (2) also comprises an insulating support plate (24) and at least one first busbar clamp (25); the insulating support plate (24) is provided with a busbar slot (241); the first busbar clamp (25) is provided with a plurality of first clamping grooves (251); a current terminal of the first vertical busbar (21) is inserted into the busbar slot (241); and a side edge of the first vertical busbar (21) in each phase is inserted into the corresponding first clamping groove (251); and/or

the feeder busbar module (3) also comprises at least one second busbar clamp (32), the second busbar clamp (32) is provided with a plurality of second clamping grooves (321), and a side edge of the feeder busbar (31) in each phase is inserted into the corresponding second clamping groove (321).

7. The compact low-voltage cabinet according to claim 1, wherein the incoming end of the incoming contact (41) is stacked on a side of the first vertical busbar (21) in the corresponding phase and fixed by an incoming fixing bolt (43); the multi-phase first vertical busbar (21) comprises an A-phase first vertical busbar (211), a B-phase first vertical busbar (212), a C-phase first vertical busbar (213) and an N-phase first vertical busbar (214) which are arranged sequentially in a left-right direction at intervals; the multi-phase incoming contact (41) comprises an A-phase incoming contact (411), a B-phase incoming contact (412), and a C-phase incoming contact (413) which are arranged sequentially in a left-right direction at intervals; the outgoing end of the outgoing contact (42) is stacked on a side of the feeder busbar (31) in the corresponding phase and fixed by an outgoing fixing bolt (44); the multi-phase feeder busbar (31) comprises an A-phase feeder busbar (311), a B-phase feeder busbar (312), a C-phase feeder busbar (313) and an

N-phase feeder busbar (314) which are arranged sequentially in a left-right direction at intervals; and the multi-phase outgoing contact (42) comprises an A-phase outgoing contact (421), a B-phase outgoing contact (422) and a C-phase outgoing contact (423) which are arranged sequentially in a left-right direction at intervals.

8. The compact low-voltage cabinet according to claim 7, wherein the N-phase feeder busbar (314) is stacked on a side of the N-phase first vertical busbar (214) and fixed by an N-phase fixing bolt (35).

9. The compact low-voltage cabinet according to any one of claims 1 to 8, wherein a dimension of the cabinet body (1) in the left-right direction is W, where 400 mm≤W≤600 mm; and the outer surfaces of the incoming contact (41) and the outgoing contact (42) each have a graphene coating.

10. The compact low-voltage cabinet according to claim 1, wherein the vertical busbar module (2) and/or the feeder busbar module (3) comprise(s) a busbar fixing device; and the busbar fixing device comprises:

a third busbar clamp (5), which is provided with a fixed channel (51), wherein an inner side wall of the fixed channel (51) is provided with a plurality of clamping members (52) along a height direction of the fixed channel (51); and

a fixing member (6), which comprises a fixing portion (61) and first clamping portions (62) disposed on both opposite sides of the fixing portion (61), wherein the fixing portion (61) is located in the fixed channel (51) and capable of moving along the height direction of the fixed channel (51), and the first clamping portions (62) are capable of being clamped into the corresponding clamping members (52).

11. The compact low-voltage cabinet according to claim 10, wherein the busbar fixing device also comprises a fastening member (7) detachably connected to the fixing portion (61); and the fastening member (7) is used to fasten a busbar of the vertical busbar module (2) or the feeder busbar module (3) in the width direction of the fixed channel (51).

12. The compact low-voltage cabinet according to claim 11, wherein the fastening member (7) comprises a fastening portion (71), a sliding portion (72) and third clamping portions (73); the third clamping portions (73) are disposed on both opposite sides of the fastening portion (71), respectively; the third clamping portions (73) are capable of being clamped into the corresponding clamping members (52); the sliding portion (72) is disposed at one end of the fastening portion (71); an end of the fixing portion (61) is provided with a sliding groove (611); the sliding portion (72) is inserted into the sliding groove (611); the other end of the fastening portion (71) is provided with a fastening

groove (711); the width of the fastening groove (711) is adapted to the width of the busbar of the vertical busbar module (2) or the feeder busbar module (3); and the busbar of the vertical busbar module (2) or the feeder busbar module (3) is inserted into the fastening groove (711).

13. The compact low-voltage cabinet according to claim 10, wherein the busbar fixing device also comprises a cushion block (9); the cushion block (9) is clamped between the busbar of the vertical busbar module (2) or the feeder busbar module (3) and an inner side wall of the fixed channel (51) in the width direction of the fixed channel (51); the cushion block (9) is provided with a fourth clamping portion (91); and the fourth clamping portion (91) is in clamping fit with the clamping member (52).

14. The compact low-voltage cabinet according to claim 1, wherein the vertical busbar module (2) and/or the feeder busbar module (3) comprise(s) a fourth busbar clamp (8); the fourth busbar clamp (8) comprises a busbar clamp body (81) and a busbar perforation hole (811) formed in the busbar clamp body (81); the busbar clamp further comprises protrusion structures (82); a hole wall of the busbar perforation hole (811) along a first direction (X) and/or a second direction (Y) is provided with the plurality of protrusion structures (82) at intervals; the busbar perforation hole (811) is used to allow the busbar of the vertical busbar module (2) or the feeder busbar module (3) to passed through; and the plurality of protrusion structures (82) are used to abut against the busbars of the vertical busbar module (2) or the feeder busbar module (3).

15. The compact low-voltage cabinet according to claim 14, wherein the protrusion structures (82) are detachably disposed on the hole wall of the busbar perforation hole (811);

the hole wall of the busbar perforation hole (811) is provided with limiting holes; and

each protrusion structure (82) comprises an adjusting column (821) and a protrusion platform (822), wherein one end of the adjusting column (821) is connected to the protrusion platform (822), the other end of the adjusting column (821) is inserted into the corresponding limiting hole, and the adjusting column (821) is screwed with the limiting hole.