

CIRCUIT BREAKER

TECHNICAL FIELD

The utility model relates to the field of low-voltage apparatuses, and in particular, to a circuit breaker.

BACKGROUND

Circuit breakers are of an important part of the electrical industry and have been widely used. When a circuit operates normally, the circuit breaker can achieve the functions of power failure, power supply and circuit conversion, etc., by powering on/off the circuit for supplying power. When the circuit is under overload, voltage loss, undervoltage or short circuit failure, the circuit breaker can automatically power off the circuit, to avoid the harms to the safety of the staff and the normal operation of the equipment caused by the circuit failure. The existing circuit breaker needs to be provided with an enclosure therein for protection of a circuit board to provide electromagnetic shielding protection for the circuit board. However, the existing enclosure is time-consuming and effort-consuming in assembly, resulting in cumbersome manufacturing processes and higher manufacturing cost for the circuit breaker. In addition, in the circuit breaker shared by a terminal board base and a rear terminal board base, in order to satisfy the requirement that the bases can be used both for wiring in front of and on the back of a board, an insulating device is usually added to a terminal of the base, but the assembly process is relatively cumbersome and is relatively high in cost.

SUMMARY OF THE DISCLOSURE

An objective of the utility model is to overcome the defects of the prior art and provide a circuit breaker which is simple in structure, high in reliability and convenient to assemble.

To fulfill said objective, the utility model adopts the following technical solution.

A circuit breaker comprises a base 1 and a cover plate, wherein a first counterbore 31 is formed in the front surface of the end to be wired of the base 1, a ring-shaped second counterbore 32 is formed in the bottom surface of the end to be wired of the base 1; a hollow lug boss 3a is formed between the first counterbore 31 and the second counterbore 32, and the first counterbore 31 is located on the lug boss 3a; when the circuit breaker is used for front-panel wiring, a terminal screw is placed in the first counterbore 31 for performing

electric insulation; when the circuit breaker is used for back-panel wiring, the lug boss 3a falls off by means of an external force, and a terminal screw is placed in the second counterbore 32 to perform electric insulation.

Optionally, in the front surface of the end to be wired of the base 1, a ring-shaped fourth counterbore 34 is also provided between the first counterbore 31 and the second counterbore 32 for facilitating the shedding of the boss 3a.

Optionally, the base 1 further comprises a third counterbore 33 provided in the front surface of the end to be wired, a connecting part 3b is formed between the third counterbore 33 and the second counterbore 32, the first counterbore 31 is provided in the third counterbore 33, and a step surface is formed between the third counterbore 33 and the first counterbore 31.

Optionally, the ring-shaped fourth counterbore 34 is provided in the third counterbore 33 for facilitating the shedding of the boss 3a, and the fourth counterbore 34 is positioned in the root of the step surface between the third counterbore 33 and the first counterbore 31.

Optionally, the lug boss 3a between the first counterbore 31 and the second counterbore 32 has a wall thickness of 0.75 mm-1.0 mm.

Optionally, an axial cross section of the second counterbore 32 is in a “└” shape, and a height of the lug boss 3a is lower than an in-bore height of the second counterbore 32.

Optionally, an axial cross section of the lug boss 3a is in the shape of an isosceles trapezoid whose diameter gradually decreases from the front surface to the back surface of the end to be wired of the base 1.

Optionally, an axial cross section of the first counterbore 31 is in the shape of an isosceles trapezoid whose diameter gradually decreases from the front surface to the back surface of the end to be wired of the base 1.

Optionally, a cross section of the first counterbore 31 perpendicular to the axial direction is circular, a cross section of the second counterbore 32 perpendicular to the axial direction is ring-shaped, and the first counterbore 31 and the second counterbore 32 are coaxial; a cross section of the third counterbore 33 perpendicular to the axial direction is circular, and the third counterbore 33 and the first counterbore 31 are coaxial; a cross section of the fourth counterbore 34 perpendicular to the axial direction is ring-shaped, and the fourth counterbore 34 and the third counterbore 33 are coaxial.

Optionally, the inner diameter R_2 of the outer wall of the second counterbore 32 is greater than the inner diameter r_3 of the third counterbore 33, and the outer diameter r_2 of the

inner wall of the second counterbore 32 is smaller than the inner diameter r_3 of the third counterbore 33; the inner diameter R_4 of the outer wall of the fourth counterbore 34 is equal to the inner diameter r_1 of the first counterbore 31, and the outer diameter r_4 of the inner wall of the fourth counterbore 34 is greater than the inner diameter r_1 of the first counterbore.

According to the circuit breaker of the utility model, the first counterbore 31 is formed in the front surface of the end to be wired of the base 1 and the ring-shaped second counterbore 32 is formed in the bottom surface of the end to be wired of the base 1, wherein the hollow lug boss 3a is formed between the first counterbore 31 and the second counterbore 32. When the circuit breaker is used for wiring in front of the board, the lug boss 3a is used for performing electric insulation on the terminal screw. When the circuit breaker is used for wiring on the back of the board, the lug boss 3a falls off by means of an external force, and the terminal screw is placed in the second counterbore 32 to perform electric insulation. Therefore, the circuit breaker of the utility model has the characteristics of compact structure and low production cost, can also reduce the stock preparation during working, and also has a better insulation effect.

BRIEF DESCRIPTION OF THE DRAWINGS

Fig. 1 is a schematic assembly diagram of a base and a circuit board enclosure of the utility model;

Fig. 2 is a stereoscopic schematic diagram of the base of the utility model;

Fig. 3 is a schematic structural diagram of the circuit board enclosure of the utility model;

Fig. 4 is another schematic structural diagram of the base of the utility model;

Fig. 5 is a stereoscopic diagram of the back surface of the base of the utility model; and

Fig. 6 is a sectional view of the base of the utility model.

DETAILED DESCRIPTION

The specific embodiments of a circuit breaker of the utility model are further described below with reference to the embodiments shown in Figs. 1 to 6. The circuit breaker of the utility model is not limited to the description of the following embodiments.

A circuit breaker comprises a base 1 and a cover plate, wherein the cover plate is provided on the base 1 to form a housing of the circuit breaker. The circuit breaker further comprises a contact system, a tripping system, an operating mechanism, a wiring device and

a circuit board module which are arranged in the base 1. The contact system is connected with the operating mechanism. The operating mechanism drives a movable contact of the contact system to swing to be in contact with and separated from a static contact to realize power-on and power-off of the circuit. The tripping system is connected between the contact system and the wiring device to avoid the harms caused by faults.

As shown in Figs. 1 to 3, a circuit board enclosure 2 which has a cuboid structure and is provided as a modularized protection structure and an electromagnetic shielding structure of a circuit board is provided in the base 1, and a cavity 22 for accommodating a circuit board module of the circuit breaker is provided in the enclosure. According to the circuit breaker of the utility model, by providing the circuit board enclosure 2 around the circuit board module, the damage to the circuit board module during installation or debugging can be avoided, and the electromagnetic shielding protection of the circuit board module can also be implemented, so that the working performance of the circuit breaker is more stable. A dovetail rib 21 having a lug boss structure is provided outside the sidewall of the circuit board enclosure 2, a dovetail groove 11 which has the same shape as the dovetail rib 21 and is matched with the dovetail rib 21 to each other is formed inside the sidewall of the base 1, and the circuit board enclosure 2 is internally connected and fixed to the inner side of the sidewall of the base 1 by plugging the dovetail rib 21 to the dovetail groove 11. According to the circuit breaker of the utility model, by fixing the enclosure 2 on the sidewall of the base 1, the assembly structure and the assembly steps of the circuit breaker are optimized. The circuit board enclosure 2 is fixed by plugging the dovetail rib 21 into the dovetail groove 11, such that the assembly of the circuit board enclosure 2 is facilitated. In addition, the number of screw holes formed in a bottom plate of the base 1 may be reduced, and the production cost of the circuit breaker can also be reduced while the mechanical strength of the base 1 is improved.

Specifically, a groove opening of the dovetail groove 11 is oriented horizontally, wherein the dovetail groove 11 is open on the side close to the upper edge of the sidewall of the base 1 so as to push the dovetail rib 21 from this side into the dovetail groove 11 and close this side by the sidewall of a cover plate mounted above the base 1. After the dovetail rib 21 is mounted in the dovetail groove 11, the circuit board enclosure 2 is internally connected and fixed in the base 1 through close fitting of the surface connection between the dovetail rib 21 and the dovetail groove 11, and the circuit board module is covered within the cavity 22 of the circuit board enclosure 2. During specific assembly, the dovetail rib 21

is aligned with the dovetail groove 11, and the cavity 22 of the circuit board enclosure 2 is aligned with the circuit board module in the base 1, the circuit board enclosure 2 is pushed to the base 1 from the top to bottom, such that the dovetail rib 21 is plugged into the dovetail groove 11 to cooperate with each other. At the same time, the circuit board enclosure 2 is sleeved around the circuit board module. Of course, the cases where the dovetail groove 11 is designed on the circuit board enclosure and the dovetail rib 21 is provided on the sidewall of the base 1 belong to an equivalent solution of the present embodiment, and the same objective can also be achieved.

Preferably, in the present embodiment, the cross-sectional shapes of the dovetail rib 21 and the dovetail groove 11 in the horizontal direction of the bottom plate of the base 1 both adopt an isosceles trapezoidal structure, so that the dovetail rib 21 and the dovetail groove 11 have the advantages of being more convenient in processing and low in precision requirement. In addition, the dovetail rib 21 and the dovetail groove 11 can be stressed more uniformly, and the operation is more reliable and the lifetime is longer. In specific implementation, as other embodiments of the utility model, the cross-sectional shapes of the dovetail rib 21 and the dovetail groove 11 in the horizontal direction of the bottom plate of the base 1 can also adopt other trapezoidal or trapezoid-like structures, such as a cross-shaped structure or a T-type structure, which will not be specifically limited here.

In the present embodiment, there may be a plurality of dovetail ribs 21 outside the sidewall of the circuit board enclosure 2. For example, two dovetail ribs 21 may be provided outside the sidewall of the circuit board enclosure 2 side by side along the horizontal direction of the bottom plate of the base 1. At the same time, dovetail grooves 11 having the same number as the dovetail ribs 21 are provided on the upper edge outside the sidewall of the base 1. In addition, as another specific embodiment, a plurality of dovetail grooves 11 not corresponding to the dovetail ribs 21 one by one may be pre-arranged on the upper edge inside the sidewall of the base 1, and a dovetail groove 11 which is matched with the plurality of dovetail ribs 21 is provided inside the sidewall of the base 1. Therefore, it is possible to select the dovetail groove 11 in which the circuit board enclosure 2 is mounted according to specific needs to adjust a mounting position of the circuit board enclosure 2. The number of the dovetail ribs 21 and the dovetail grooves 11 will not be specifically limited here.

As shown in Figs. 1 to 3, the circuit board enclosure 2 is of a square structure, for example, a cube or a cuboid, and one side of the circuit board enclosure 2 is open outwardly to form a cavity 22 inside for accommodating a circuit board module. There is a certain

distance between the dovetail groove 11 and the base plate of the base 1, and the dovetail rib 21 and the circuit board enclosure 2 are integrally formed. Therefore, it is possible to ensure that the circuit board enclosure 2 is more firmly fixed inside the sidewall of the base 1 to provide a better protection effect. When the dovetail groove 11 and the dovetail rib 21 are matched, the outer side of the sidewall, which is provided with the dovetail groove 11, of the circuit board enclosure 2 is in surface connection with the inner side of the sidewall of the base 1. Therefore, the circuit board enclosure 2 can be internally connected to the inner side of the sidewall of the base 1 more stably.

In addition, as another specific embodiment (not shown in the drawings), a first dovetail groove and a second dovetail groove are symmetrically provided on the upper edge inside the sidewall of the base 1 of the circuit breaker and the lower edge inside the sidewall of the cover plate of the circuit breaker, respectively. When the cover plate covers the base 1, groove openings of the first dovetail groove and the second dovetail groove are connected to each other. In practical operation, the shape of the dovetail rib 21 is the same as the overall shape of the space in the groove when the first dovetail groove and the second dovetail groove are connected, and at the same time are matched with the first dovetail groove and the second dovetail groove, respectively. By means of the arrangement of the first dovetail groove and the second dovetail groove, the stability of the circuit board enclosure 2 in the base 1 can be improved, and the dovetail rib 21 on the circuit board enclosure 2 can also play guiding and pre-positioning roles when the cover plate is mounted. The number of the dovetail ribs 21 and the dovetail grooves 11 will not be specifically limited here.

Figs. 4 to 6 illustrate a wiring assembly structure on the base of the circuit breaker of the utility model. A first counterbore 31 is formed in the front surface of the end to be wired of the base 1, a ring-shaped second counterbore 32 is formed in the bottom surface of the end to be wired of the base 1, wherein a hollow lug boss 3a is formed between the first counterbore 31 and the second counterbore 32, and the first counterbore 31 is located on the lug boss 3a. When the circuit breaker is used for front-panel wiring, a terminal screw is placed in the first counterbore 31 for performing electric insulation. When the circuit breaker is used for back-panel wiring, the lug boss 3a falls off by means of an external force, and a terminal screw is placed in the second counterbore 32 to perform electric insulation. By means of the arrangement of the first counterbore 31, the second counterbore 32 and the lug boss 3a, the circuit breaker of the utility model can meet the wiring requirements in front of and on the back of the board at the same time. In addition, the circuit breaker of the utility

model also has the advantages of reducing the cost and facilitating the assembly and is also advantageous to reduce the stock preparation.

Specifically, the first counterbore 31 has a structure in which an axial cross section is circular. The ring-shaped second counterbore 32 is provided on the bottom surface of the base 1 in a manner of facing the first counterbore 31 and surrounds the outside of the circumferential wall of the first counterbore 31. At the same time, the lug boss 3a for accommodating and insulating a terminal screw is formed between the first counterbore 31 and the second counterbore 32. The second counterbore 32 has a ring-shaped cross section in the horizontal section and a “└” cross section in the axial direction, and the height of the lug boss 3a is lower than the in-bore height of the second counterbore 32, so that the lug boss 3a can be prevented from falling off due to improper operation during installation or debugging.

As shown in Figs. 4 to 6, on the front surface of the end to be wired of the base 1, a ring-shaped fourth counterbore 34 is further provided between the first counterbore 31 and the second counterbore 32 for facilitating the shedding of the boss 3a. By means of the arrangement of the fourth counterbore 34, the other organizational structure surface can be prevented from being broken due to the falling of the first counterbore 31 while the structural strength of a connecting part 3b is ensured, and the appearance of burrs and ridges at the connecting part 3b when the first counterbore 31 falls off can be avoided. The base 1 further comprises a circular third counterbore 33 provided in the front surface of the end to be wired, the first counterbore 31 is provided in the third counterbore 33, and a step surface between the third counterbore 33 and the first counterbore 31 is used for accommodating a terminal nut. The fourth counterbore 34 is provided in the third counterbore and is positioned in the root of the step surface between the third counterbore 34 and the first counterbore 31. By means of the arrangement of the third counterbore 33, the connecting part 33b is formed between the third counterbore 33 and the second counterbore 32 and located between the lug boss 3a and the base 1. Therefore, the lug boss 3a will fall off along the connecting part 3b after being knocked by the external force. In addition, through the arrangement of the connecting part 3b, the minimum external force required for the lug boss 3a to fall off can be controlled conveniently.

It should be noted that, in the present embodiment, in order to facilitate the processing and molding, the above-mentioned counterbores all circular counterbores arranged coaxially. However, in the specific implementation, according to the actual working needs,

other structures and setting manners can also be selected for the counterbores, for example, the third counterbore 33 adopts a regular hexagonal shape whose axial cross section is matched with the terminal nut, which will not be specifically limited herein.

Specifically, as shown in Fig. 6, a cross section of the first counterbore 31 perpendicular to the axial direction is circular, a cross section of the second counterbore 32 perpendicular to the axial direction is ring-shaped, and the first counterbore 31 and the second counterbore 32 are coaxial. A cross section of the third counterbore 33 perpendicular to the axial direction is circular, and the third counterbore 33 and the first counterbore 31 are coaxial. A cross section of the fourth counterbore 34 perpendicular to the axial direction is ring-shaped, and the fourth counterbore 34 and the third counterbore 33 are coaxial. In the present embodiment, the inner diameter R_2 of the outer wall of the second counterbore 32 is greater than the inner diameter r_3 of the third counterbore 33, and the outer diameter r_2 of the inner wall of the second counterbore 32 is smaller than the inner diameter r_3 of the third counterbore 33, and therefore it is possible to ensure that the connecting part 3b having a reasonable structure is formed between the second counterbore 32 and the third counterbore 33. In addition, the inner diameter R_4 of the outer wall of the fourth counterbore 34 is equal to the inner diameter r_1 of the first counterbore 31, and the outer diameter r_4 of the inner wall of the fourth counterbore 34 is greater than the inner diameter r_1 of the first counterbore, and therefore the fourth counterbore 34 can take a better protection effect when the first counterbore 31 falls off.

Optionally, the lug boss 3b in the present embodiment has a wall thickness of 0.75 mm to 1.00 mm. Therefore, the insulation performance of the lug boss 3a can be ensured while the weight of the circuit breaker is lightened. An axial cross section of the lug boss 3a is in the shape of an isosceles trapezoid whose diameter gradually decreases from the front surface to the back surface of the end to be wired of the base 1, such that the lug boss 3a can be knocked off conveniently. An axial cross section of the first counterbore 31 is in the shape of an isosceles trapezoid whose diameter gradually decreases from the front surface to the back surface of the end to be wired of the base 1.

The above content is a further detailed description of the utility model in combination with specific preferred embodiments, and it cannot be confirmed that the specific implementation of the utility model is limited to these descriptions. For an ordinary person skilled in the art, it is also possible to make a number of simple deductions or substitutions

without departing from the concept of the utility model, which all should be regarded to fall into the protection scope of the utility model.

CLAIMS

1. A circuit breaker, comprising a base (1) and a cover plate, wherein a first counterbore (31) is formed in the front surface of the end to be wired of the base (1), a ring-shaped second counterbore (32) is formed in the bottom surface of the end to be wired of the base (1); a hollow lug boss (3a) is formed between the first counterbore (31) and the second counterbore (32), and the first counterbore (31) is located on the lug boss (3a); when the circuit breaker is used for front-panel wiring, a terminal screw is placed in the first counterbore (31) for performing electric insulation; when the circuit breaker is used for back-panel wiring, the lug boss (3a) is removed by means of an external force, and a terminal screw is placed in the second counterbore (32) to perform electric insulation.

2. The circuit breaker according to claim 1, wherein in the front surface of the end to be wired of the base (1), a ring-shaped fourth counterbore (34) is also provided between the first counterbore (31) and the second counterbore (32) for facilitating the shedding of the boss (3a).

3. The circuit breaker according to claim 1, wherein the base (1) further comprises a third counterbore (33) provided in the front surface of the end to be wired, a connecting part (3b) is formed between the third counterbore (33) and the second counterbore (32), the first counterbore (31) is provided in the third counterbore (33), and a step surface is formed between the third counterbore (33) and the first counterbore (31).

4. The circuit breaker according to claim 3, wherein the ring-shaped fourth counterbore (34) is provided in the third counterbore (33) for facilitating the shedding of the boss (3a), and the fourth counterbore (34) is positioned in the root of the step surface between the third counterbore (33) and the first counterbore (31).

5. The circuit breaker according to claim 1, wherein the lug boss (3a) between the first counterbore (31) and the second counterbore (32) has a wall thickness of 0.75 mm-1.0 mm.

6. The circuit breaker according to claim 1, wherein an axial cross section of the second counterbore (32) is in a “┐” shape, and a height of the lug boss (3a) is lower than an in-bore height of the second counterbore (32).

7. The circuit breaker according to claim 6, wherein an axial cross section of the lug boss (3a) is in the shape of an isosceles trapezoid whose diameter gradually decreases from the front surface to the back surface of the end to be wired of the base (1).

8. The circuit breaker according to claim 1 or 7, wherein an axial cross section of the first counterbore (31) is in the shape of an isosceles trapezoid whose diameter gradually decreases from the front surface to the back surface of the end to be wired of the base (1).

9. The circuit breaker according to claim 4, wherein a cross section of the first counterbore (31) perpendicular to the axial direction is circular, a cross section of the second counterbore (32) perpendicular to the axial direction is ring-shaped, and the first counterbore (31) and the second counterbore (32) are coaxial; a cross section of the third counterbore (33) perpendicular to the axial direction is circular, and the third counterbore (33) and the first counterbore (31) are coaxial; a cross section of the fourth counterbore (34) perpendicular to the axial direction is ring-shaped, and the fourth counterbore (34) and the third counterbore (33) are coaxial.

10. The circuit breaker according to claim 9, wherein the inner diameter R2 of the outer wall of the second counterbore (32) is greater than the inner diameter r3 of the third counterbore (33), and the outer diameter r2 of the inner wall of the second counterbore (32) is smaller than the inner diameter r3 of the third counterbore (33); the inner diameter R4 of the outer wall of the fourth counterbore (34) is equal to the inner diameter r1 of the first counterbore (31), and the outer diameter r4 of the inner wall of the fourth counterbore (34) is greater than the inner diameter r1 of the first counterbore.