

ELASTIC PLUG-IN JAW STRUCTURE FOR TAP-OFF UNIT AND PLUG-IN STRUCTURE FOR BUSBAR TRUNKING SYSTEM

TECHNICAL FIELD

[0001] The present invention relates to an accessory for power transmission and distribution, and in particular, to an elastic plug-in jaw structure for a tap-off unit.

BACKGROUND

[0002] For compact busways, conductors are closely arranged in a busbar trunking system (also referred as a busway). However, there is usually a need to draw power from the conductors in the busway. A conventional method of power drawing generally includes providing plug-in openings at one side of the busway, respectively welding plug-in connectors on the phase conductors, and arranging a tap-off unit at the power drawing site. According to the existing method, the phase conductors are respectively welded with parallelly arranged plug-in connectors, and each plug-in connector is electrically connected to a corresponding plug-in phase conductor in the tap-off unit. In order to solve the creepage distance problem, due to compact arrangement of the phase conductors, the plug-in connectors of multiple phases can only be lined up transversely in one column, resulting in greater spacings among the plug-in phase conductors in the tap-off unit. Thus, the tap-off unit has a very large size, causing complicate process of manufacturing the whole structure, poor appearance, and high manufacturing cost. Besides, the design of the plug-in structure is unreasonable, plug-in frictional resistance is high, the plug-in action is laborious and time-consuming, and use effect is poor.

SUMMARY OF INVENTION

[0003] An objective of the present invention is to provide an elastic plug-in jaw structure for a tap-off unit which makes the tap-off unit small in overall size, low in manufacturing cost and high in plug-in reliability.

[0004] Another objective of the present invention is to provide a plug-in structure for a plug-in type busway which is compact in structure, small in overall size, simple in manufacturing process, low in cost and high in plug-in reliability, and saves both time and labor.

[0005] In order to solve the foregoing technical problem, one aspect of the present invention provides an elastic plug-in jaw structure for a tap-off unit, including a plug-in conductor and a flexible connector connected to the plug-in conductor. The plug-in conductor is connected to a lead-out conductor in the tap-off unit through the flexible connector. An elastic member is arranged at a rear end of the plug-in conductor. A pressing member abuts against a rear side of the elastic member. The pressing member is configured to elastically press against the plug-in conductor through the elastic member, to facilitate a direct electrical connection between the plug-in conductor and a busbar conductor.

[0006] As a preferred technical solution of the elastic plug-in jaw structure for the tap-off unit, a surface of the busbar conductor is fixedly covered by an insulation material.

[0007] As a preferred technical solution of the elastic plug-in jaw structure for the tap-off unit, the plug-in conductor is installed to a plug-in jaw base. The plug-in conductor is configured to cooperate with an insulated guide member on a busway. The insulated guide member is configured to act as a guide track for the plug-in conductor.

[0008] As a preferred technical solution of the elastic plug-in jaw structure for the tap-off unit, the pressing member includes a hinge with a fixed shaft at one end of the hinge and a pressing mechanism at the other end of the hinge. The pressing mechanism is configured to swing the hinge along the fixed shaft, to drive the plug-in conductor to be electronically connected to the busbar conductor.

[0009] As a preferred technical solution of the elastic plug-in jaw structure for the tap-off unit, the pressing mechanism is a cam mechanism.

[0010] As a preferred technical solution of the elastic plug-in jaw structure for the tap-off unit, an end face of the hinge is fixedly provided with a guide sleeve. The elastic member is a spring, and the spring is sleeved at the rear end of the plug-in conductor and contained within the guide sleeve.

[0011] As a preferred technical solution of the elastic plug-in jaw structure for the tap-off unit, the plug-in conductor and the flexible connector are connected by welding.

[0012] As a preferred technical solution of the elastic plug-in jaw structure for the tap-off unit, a front end of the plug-in conductor is provided with a U-shaped groove.

[0013] As a preferred technical solution of the elastic plug-in jaw structure for the tap-off unit, the pressing mechanism includes a screw.

[0014] Another aspect of the present invention provides a plug-in structure for a busway, including busbar conductors of multiple phases arranged side by side in the busway, and a tap-off unit having plug-in conductors of a plurality of phases. The busway is provided with plug-in openings, and the busbar conductor of each of the multiple phases has a corresponding plug-in opening. The plug-in conductor of each phase is directly plugged into the busway via one of the

plug-in openings and is electrically connected to a side surface of the busbar conductor of the corresponding phase. The plug-in conductor of each phase is connected to a flexible connector. The plug-in conductor of each phase is connected to a lead-out conductor of the corresponding phase in the tap-off unit via the corresponding flexible connector. A rear end of the plug-in conductor of each phase is provided with an elastic member. A rear side of each elastic member abuts against a pressing member. The pressing member is configured to press against the corresponding plug-in conductor through the elastic member, to enable direct electrical connection between the plug-in conductor of each phase and the busbar conductor of the corresponding phase.

[0015] As a preferred technical solution of the plug-in structure for the busway, the plug-in openings are arranged in a pattern of two ports and three ports in alternative columns, and the flexible connectors corresponding to the plug-in conductors arranged on the same column have a staggered layout.

[0016] As a preferred technical solution of the plug-in structure for the busway, surfaces of the busbar conductors are fixedly covered by an insulation material.

[0017] As a preferred technical solution of the plug-in structure for the busway, the plug-in conductor of each phase is installed through a plug-in jaw base. The plug-in openings are disposed on a plug-in opening base. The plug-in conductors are electrically connected to the corresponding busbar conductors after passing through the plug-in opening base.

[0018] As a preferred technical solution of the plug-in structure for the busway, the pressing member includes a hinge with a fixed shaft at one end of the hinge and a pressing mechanism at the other end of the hinge. The pressing mechanism is configured to swing the

hinge along the fixed shaft, to drive the corresponding plug-in conductor to be electronically connected to the corresponding busbar conductor.

[0019] As a preferred technical solution of the plug-in structure for the busway, the pressing mechanism is a cam mechanism.

[0020] As a preferred technical solution of the plug-in structure for the busway, an end face of the hinge is fixedly provided with a guide sleeve. The elastic member is a spring, and the spring is sleeved at the rear end of the corresponding plug-in conductor and is contained within the guide sleeve.

[0021] The present invention has the following beneficial effects: after the foregoing structure is applied, based on the configuration of the plug-in conductor being pressed by the pressing member and the elastic member, and based on the configuration of the plug-in conductor being connected to the flexible connector, the plug-in conductor can be electrically connected to the busbar conductor directly through an elastic pressing by the elastic member on the plug-in conductor. The plug-in conductor is simple in design, small in thickness, compact in overall structure. Plug-in cooperation is achieved without additional welding process on the plug-in opening corresponding to the busbar conductor, thus greatly reducing the overall size and lowering the processing and manufacturing cost. The plug-in cooperation can be realized by just using the surface of the busbar conductor, plug-in is very convenient, and plug-in/plug-out actions are also time-saving and effort-saving. Pressing driving force provided by the elastic member also effectively ensures sufficient contact pressure and provides high contact reliability.

[0022] After the foregoing structure is applied, based on the plug-in openings being disposed on the busway at locations corresponding to the busbar conductors of multiple phases, and based on configurations of the plug-in conductors of multiple phases having the same

spacings as the busbar conductors of the multiple phases, the plug-in conductors of multiple phases are densely arranged, and can be directly plugged into the busway via different plug-in openings and electrically connected to side surfaces of the busbar conductors of corresponding phases. Hence, conductors of each phase are closely arranged, heat dissipation of the busway is maintained and improved, and meanwhile a space occupied by the plug-in conductors of multiple phases is reduced, the whole scale of the tap-off unit is decreased and processing and manufacturing cost is lowered. Besides, the structure of the plug-in conductors being elastically pressed by the elastic members is skillfully arranged, which makes the plug-in action time-saving and labor-saving, makes the plug-in action occurs prior to the pressing action, and greatly improves the connection convenience and conductive reliability.

BRIEF DESCRIPTION OF THE DRAWINGS

[0023] The present invention will be further described in detail with reference to the drawings and embodiments.

[0024] Fig. 1 is a structure diagram of an elastic plug-in jaw for a tap-off unit according to an embodiment of the present invention.

[0025] Fig. 2 is a three-dimensional structure diagram of elastic plug-in jaws for a tap-off unit being plugged into a busway according to an embodiment of the present invention.

[0026] Fig. 3 is a three-dimensional structure diagram of a busway according to an embodiment of the present invention.

[0027] Fig. 4 is a sectional view in an N-N direction in Fig. 3.

[0028] Fig. 5 is a sectional view in an M-M direction in Fig. 3.

[0029] Reference numerals:

[0030] 1. Busway; 2. Busbar conductor; 3. Plug-in conductor; 4. Tap-off unit; 5. Plug-in opening; 6. Flexible connector; 7. Elastic member; 8. Pressing member; 9. Insulation material; 10. Plug-in jaw base; 11. Plug-in opening base; 12. Fixed shaft; 13. Hinge; 14. Pressing mechanism; 15. Lead-out conductor; 16. Guide sleeve.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

[0031] The technical solutions of the embodiments of the present invention will be further described in detail to make the solved technical problems, applied technical solutions and reached technical effects of the present invention clearer. Obviously, the described embodiments are only a portion of the embodiments, not all embodiments of the present invention. Based on the embodiments of the present invention, all other embodiments obtained by those skilled in the art without inventive activity belong to the scope of protection of the present invention.

[0032] In the description of the present invention, the terms "connected to", "connection" and "fixed to" shall be understood in a broad sense unless otherwise specified and defined clearly. For example, the terms may be understood as fixed connection, removable connection or integral connection; mechanical connection or electrical connection; or direct connection or indirect connection through an intermediate medium, or internal connection of two elements or interaction between two elements. Those of ordinary skill in the art can understand the specific meanings of these terms in the present invention according to actual application scenarios.

[0033] In the present invention, unless otherwise specified and defined, a first feature being "above" or "below" a second feature may indicate a direct contact between the first feature and the second feature, or may indicate a contact between the first feature and the second feature through an additional feature between them, instead of the direct contact. Moreover, the first

feature being "over", "above" and "on" the second feature may indicate that the first feature is directly above or diagonally above the second feature, or indicate that the first feature is higher in a horizontal level than the second feature. The first feature being "under", "below" and "beneath" the second feature may indicate that the first feature is directly below or diagonally below the second feature, or merely indicates that the first feature is lower in a horizontal level than the second feature.

[0034] Embodiment 1:

[0035] As shown in Fig. 1, an elastic plug-in jaw structure for a tap-off unit 4 according to the present invention, includes a plug-in conductor 3 (copper pin) and a flexible connector 6 welded and connected to the plug-in conductor 3. The plug-in conductor 3 can be connected to a lead-out conductor 15 in the tap-off unit 4 via the flexible connector 6. The plug-in conductor 3 is provided with a plug-in jaw base 10; a busway 1 is provided with a plug-in opening base 11. The plug-in conductor 3 is configured to cooperate with the plug-in opening base 11 on the busway 1, and is guided by the plug-in opening base 11. Specifically, the plug-in jaw base 10 is configured to position the plug-in conductor 3, and the plug base 11 is configured to act as a guide track for the plug-in conductor 3. A spring is provided at a rear end of the plug-in conductor 3. A pressing member 8 abuts against a rear side of the spring. As can be seen from the figures, a step is disposed at a rear section of the plug-in conductor 3, the spring is sleeved on the rear section of the plug-in conductor 3 and is position-limited by the step. The pressing member 8 is configured to press against the plug-in conductor 3 through an elastic member 7 so that the plug-in conductor 3 is electrically connected to a busbar conductor 2 directly. The busbar conductor 2 has a rectangular or elliptic structure. The structure arrangement allows direct conductive contact between the plug-in conductor 3 and the busbar conductor 2 without

additionally welding multiple plug-in connectors on the busbar conductor 2, thus decreasing an overall thickness and making spacing between plug-in phase conductors more compact, greatly decreasing the overall size, which achieves small space occupation and good appearance.

Moreover, the busbar conductor 2 is not separately manufactured so that the manufacturing process is simple, and the contact pressure is maintained by the spring so that reliability of the conductor is high.

[0036] Further, a front end of the plug-in conductor 3 is provided with a U-shaped groove. A surface of the U-shaped groove is a conductive contact surface. A side surface of the busbar conductor 2 is a conductive contact surface corresponding to the plug-in conductor 3. When the conductive contact surface of the plug-in conductor 3 is in contact with the side surface of the busbar conductor 2, a conductive connection is achieved. Other surfaces of the busbar conductor 2 is fixedly covered by an insulation material 9. The pressing member 8 comprises a hinge 13 with a fixed shaft 12 at one end and a pressing mechanism 14 arranged at the other end of the hinge 13. The pressing mechanism 14 is preferably a cam mechanism. The cam mechanism is configured to swing the hinge 13 along the fixed shaft 12 to drive the plug-in conductor 3 to be electrically connected to the busbar conductor 2.

[0037] The pressing mechanism 14 may adopt other pressing methods, such as a fastener or a locking element, etc. A guide sleeve 16 is fixedly installed onto the plug-in conductor 3 at a location corresponding to an end face of the hinge 13. The guide sleeve 16 is made from the insulation material 9. The spring is sleeved at the rear end of the plug-in conductor 3 and contained in the guide sleeve 16 through the step.

[0038] When the elastic plug-in jaw structure is in use, after the plug-in conductor 3 passes through a plug-in opening of the plug-in opening base 11 and contacts the busbar

conductor 2, the cam mechanism is rotated to drive the hinge 13 to compress the spring, and then the cam mechanism is fixed to maintain a contact pressure at the contact part between the plug-in conductor 3 and the busbar conductor 2. Therefore, a connection between an end of the plug-in conductor 3 and the busbar conductor 2 is achieved, one section of the flexible connector 6 may be adjusted up and down elastically, and another section of the flexible connector 6 that is in contact with the lead-out conductor 15 may remain rigid and stationary, to maintain contact pressure from the spring.

[0039] Embodiment 2:

[0040] As shown in Figs. 1-5, a plug-in structure for a busway 1 according to the present invention includes busbar conductors 2 of multiple phases which are closely arranged side by side in the busway 1, and a tap-off unit 4 having plug-in conductors 3 of a plurality of phases. The busbar conductor 2 of each phase has a corresponding plug-in opening 5 disposed in the busway 1. As can be seen from the figures, the plug-in openings 5 are disposed on a plug-in opening base 11. A spacing between the plug-in conductors 3 of two phases is equal to a spacing between the busbar conductors 2 of two phases. That is, the plug-in conductor 3 of each phase have a one-to-one correspondence with the busbar conductor 2 of the same phase. The plug-in conductor 3 of each phase is directly plugged into the busway 1 via a different plug-in opening 5 and is electrically connected to a side surface of the corresponding busbar conductor 2. Such structure arrangement achieves a reliable conductive connection by skillfully using the cooperation between a specific structure of the side surface of the busbar conductor 2 and the corresponding plug-in conductor 3 without increasing an overall structure size.

[0041] Further, the plug-in conductor 3 of each phase is connected to a flexible connector 6. The plug-in conductor 3 of each phase is connected to a lead-out conductor 15 of the

corresponding phase in a tap-off unit 4 via the corresponding flexible connector 6. A rear end of the plug-in conductor 3 of each phase is provided with an elastic member 7. The elastic member 7 is preferably a spring. A rear side of each elastic member 7 abuts against a pressing member 8. The pressing member 8 includes a hinge 13 hinged by a fixed shaft 12 at one end of the hinge 13 and a pressing mechanism 14 disposed at the other end of the hinge 13. The pressing mechanism 14 is preferably a cam mechanism, or may adopt other locking mechanisms, for example, a fixed connection method using a fastener such as a locking member or a bolt . An end face of the hinge 13 is fixedly provided with one or more guide sleeves 16. Each guide sleeve 16 is located at one side of the corresponding plug-in conductor 3. Each spring is sleeved at a rear end of the corresponding plug-in conductor 3 and the corresponding guide sleeve 16. The pressing mechanism 14 is configured to swing the corresponding hinge 13 along the fixed shaft 12 to drive the plug-in conductors 3 to be electrically connected to the busbar conductors 2. The pressing member 8 is configured to elastically press a corresponding plug-in conductor 3 by using the corresponding elastic member 7, to facilitate a direct electrical connection between the plug-in conductor 3 and the busbar conductor 2 of the corresponding phase.

[0042] The plug-in openings 5 are arranged in a pattern of two ports and three ports in alternative columns. That is, two columns may be arranged, two plug-in openings 5 are arranged side by side in one column, and three plug-in openings 5 are arranged side by side in the other column. In one embodiment, L1 and L3 ports are in one column located in front of another column containing ports PE, L2, and N. The arrangement of the pattern of the two and three ports in alternative columns, when compared with existing side by side arrangement in a same line and with same size requirements of the plug-in openings 5, can allow two sets of plug-in openings 5 placed side by side. The capacity of the tap-off unit 4 can be expanded by connecting

the two plug-in openings 5 in parallel. Further, the flexible connectors 6 corresponding to the plug-in conductors 3 arranged on the same column have a staggered layout, so that the different flexible connectors 6 are not interfered with each other, saving the overall space. In addition, a surface of each of the busbar conductors 2 is fixedly covered by an insulation material 9.

[0043] Further, the plug-in conductors 3 of a plurality of phases are installed through the plug-in jaw base 10. The plug-in conductors 3 of the plurality of phases are pre-assembled to the plug-in jaw base 10 during manufacture and then fixed on a body of the tap-off unit 4. The plug-in conductors 3 are electrically connected to the busbar conductors 2 after passing through the plug-in opening base 11. A front end of each of the plug-in conductors 3 is provided with a U-shaped groove. A surface of the U-shaped groove is a conductive contact plane. The side surfaces of the busbar conductors 2 serve as conductive contact planes corresponding to the plug-in conductors 3. All conductive part of the surfaces of the busbar conductors 2 are plated with silver. The conductive contact planes of the plug-in conductors 3 are in conductive contact with the side surfaces of the busbar conductors 2, thereby achieving connections between the conductors.

[0044] Further, in one embodiment, two plug-in openings 5 are placed in parallel, and just one of the plug-in openings 5 is used when a rated current is small. When the rated current of the tap-off unit 4 increases, a rated carrying capacity of the tap-off unit 4 can also be increased by connecting two plug-in conductors respectively corresponding to two plug-in openings 5 of the same phase in parallel through a connection bar inside the tap-off unit 4. In this way, the tap-off unit 4 can accommodate a full range of rated currents (40~1,000A). In the present disclosure, it can be understood that the orientation or positional relationship of the terms such as "up", "down", "left" and "right" are merely for describing and simplifying the operation, instead of

indicating or implying that the referred device or element must have specific orientation, or must be made and operated by the specific orientation, and thus cannot be understood as a limitation for the present invention. Besides, the terms "first" and "second" are merely for descriptive distinction, but do not have special meanings.

[0045] In the present disclosure, the description with reference to the terms "one embodiment" or "example" refers to that the specific features, structures, materials or characteristics in combination with the embodiment or example are included into at least one embodiment or example of the present invention. In the present disclosure, the illustrative expressions of the above terms do not necessarily refer to the same embodiment or example.

[0046] In addition, it should be appreciated that the present disclosure is described in accordance with the implementation, but not every implementation only includes one independent technical solution. The description herein is for clarity only. Those skilled in the art should treat the present disclosure as a whole, and the technical solutions in all embodiments may be properly combined to form other implementations that can be understood by those skilled in the art.

[0047] The technical principle of the present invention is described in combination with the specific embodiments. These descriptions are merely for explaining the principle of the present invention, but cannot be explained as the limit for the scope of protection of the present invention by any means. Based on the explanation here, those skilled in the art can think of other specific implementations of the present invention without the exercise of inventive faculty, and these implementations will fall into the scope of protection of the present invention.

CLAIMS

What is claimed is:

1. An elastic plug-in jaw structure for a tap-off unit (4), the elastic plug-in jaw structure comprising:

a plug-in conductor (3) and a connector (6) connected to the plug-in conductor (3), the plug-in conductor (3) is provided with a plug-in jaw base (10), wherein:

the plug-in conductor (3) is configured to be connected to a lead-out conductor (15) in the tap-off unit (4) through the connector (6), and to cooperate with a plug-in opening base (11) on a busway (1), and the plug-in opening base (11) is configured to act as a guide track for the plug-in conductor (3);

an elastic member (7) is arranged at a rear end of the plug-in conductor (3);

a pressing member (8) abuts against a rear side of the elastic member (7), the pressing member (8) comprises a hinge (13) with a fixed shaft (12) at one end of the hinge (13) and a pressing mechanism (14) at the other end of the hinge (13);

the pressing member (8) is configured to elastically press against the plug-in conductor (3) through the elastic member (7), to facilitate a direct electrical connection between the plug-in conductor (3) and a busbar conductor (2) and to swing the hinge (13) along the fixed shaft (12), to drive the plug-in conductor (3) to be electronically connected to the busbar conductor (2);

characterized in that

said connector (6) is a flexible connector.

2. The elastic plug-in jaw structure for the tap-off unit (4) according to claim 1, characterized in that, a surface of the busbar conductor (2) is fixedly covered by an insulation material (9).

3. The elastic plug-in jaw structure for the tap-off unit (4) according to claim 1, characterized in that, the pressing mechanism (14) is a cam mechanism.

4. The elastic plug-in jaw structure for the tap-off unit (4) according to claim 1 or 3, characterized in that:

an end face of the hinge (13) is fixedly provided with a guide sleeve (16); and

the elastic member (7) is a spring, and the spring is sleeved at the rear end of the plug-in conductor (3) and contained within the guide sleeve (16).

5. The elastic plug-in jaw structure for the tap-off unit (4) according to claim 4, characterized in that, the plug-in conductor (3) and the connector (6) are connected by welding.

6. The elastic plug-in jaw structure for the tap-off unit (4) according to claim 5, characterized in that, a front end of the plug-in conductor (3) is provided with a U-shaped groove.

7. The elastic plug-in jaw structure for the tap-off unit (4) according to claim 1, characterized in that, the pressing mechanism (14) includes a screw.

8. A plug-in structure comprising:

a busbar and an elastic plug-in jaw structure according to any of the preceding claims, said busbar having busbar conductors (2) of multiple phases arranged side by side in the busway (1);

wherein the busway (1) is provided with multiple plug-in openings respectively corresponding to the busbar conductors (2) of the multiple phases;

said elastic plug-in jaw structure having

a tap-off unit (4) having plug-in conductors (3) of a plurality of phases, and said plug-in conductor (3); wherein

the plug-in conductor (3) of each phase is directly plugged into the busway (1) via one of the plug-in openings (5) and is electrically connected to a side surface of the busbar conductor (2) of the corresponding phase, wherein the plug-in openings (5) are arranged in a pattern of two ports and three ports in alternative columns, and the connectors (6) corresponding to the plug-in conductors (3) arranged on the same column have a staggered layout;

the plug-in conductor (3) of each phase is connected to a connector (6);

the plug-in conductor (3) of each phase is connected to a lead-out conductor (15) of the corresponding phase in the tap-off unit (4) via the corresponding connector (6);

a rear end of the plug-in conductor (3) of each phase is provided with an elastic member (7);

a rear side of each elastic member (7) abuts against a pressing member (8); and

the pressing member (8) is configured to press against the corresponding plug-in conductor (3) through the corresponding elastic member (7), to enable direct electrical connection between the plug-in conductor (3) of each phase and the busbar conductor (2) of the corresponding phase.

9. The plug-in structure for the busway (1) according to claim 8, characterized in that, surfaces of the busbar conductors (2) are fixedly covered by an insulation material (9).

10. The plug-in structure for the busway (1) according to claim 8 or 9, characterized in that, the plug-in conductor (3) of each phase is installed through a plug-in jaw base (10), the plug-in openings (5) are disposed on a plug-in opening base (11), and the plug-in conductors (3) are electrically connected to the corresponding busbar conductors (2) after passing through the plug-in opening base (11).

11. The plug-in structure for the busway (1) according to claim 10, characterized in that, the pressing member (8) comprises a hinge (13) with a fixed shaft (12) at one end of the hinge (13) and a pressing mechanism (14) arranged at the other end of the hinge (13); and the pressing mechanism (14) is configured to swing the hinge (13) along the fixed shaft (12), to drive the corresponding plug-in conductor (3) to be electronically connected to the corresponding busbar conductor (2).

12. The plug-in structure for the busway (1) according to claim 11, characterized in that, the pressing mechanism (14) is a cam mechanism.

13. The plug-in structure for the busway (1) according to claim 11 or 12, characterized in that:

an end face of the hinge (13) is fixedly provided with a guide sleeve (16); and

the elastic member (7) is a spring, and the spring is sleeved at the rear end of the corresponding plug-in conductor (3) and is contained within the guide sleeve (16).