

MECHANICAL ASSEMBLY DEVICE WITH SELF-CENTERING OF ELECTRICAL SWITCHGEAR MODULES

The invention relates to a mechanical assembly device of a plurality of adjoined modules, with moulded insulating cases housing electrical switchgear, comprising a clip-on connecting part made of insulating material which can be inserted in a slide of two adjoined cases, to cooperate by latching with fixed retaining edges, said part straddling the interface of the two cases in the clipped-on position.

A device of this kind is described in French Patent 2,550,907 filed by the applicant. The connecting part is formed by a movable sliding block housed in a groove in the form of a slideway located transversely over the whole width of the case. The depth of the slideway is small, and the sliding block is slid into place in the adjoining direction of the modules. The mechanical resistance of this device is limited, and the space required on the narrow side face increases the dimensions of the cases.

The document FR-2,499,308 describes a connecting bracket made of elastic wire straddling the interface of the two modules to be assembled. The ends of the bracket are arranged as eyelets, each eyelet being housed in a distinct groove located in the centre part of the associated case. An edge remains between the groove and each large side face of the case. Fitting the bracket enables the two conjugate edges to be held elastically without providing centering and positive locking of the two modules.

The document FR-2,5662,170 refers to a mechanical assembly device of modular elements comprising a removable connecting part capable of engaging in conjugate recesses located facing one another when the two modules are brought together. The part has no positive locking lugs, and can be disassembled by the

user.

The object of the invention consists in improving the mechanical resistance of electrical switchgear modules.

The mechanical assembly device according to the invention is characterized by the fact that the case of each module comprises a pair of symmetrical notches which emerge out on the opposite large side faces of the case, adjoining two modules causing two conjugate notches to come to face one another at the interface level to form a common groove constituting said slideway, and that the connecting part is arranged as a rider having a centering heel capable of fitting in the groove, and a pair of fixing lugs passing through said groove to positively lock said modules together, so as to make the rider unremovable.

Fitting the rider provides both automatic centering and mechanical connection of the modules, without having recourse to centering pins and positioning holes on the adjoined large side faces.

The ends of the rider fixing lugs are shaped as hooks cooperating with the latching protrusions comprising two edges arranged symmetrically with respect to the interface plane inside juxtaposed housings, containing connecting terminals.

Each fixing lug hook comprises a bevelled ridge to make it easier to fit the rider on an internal shoulder of the case disposed, in the insertion direction, between the groove and the corresponding latching edge.

The rider fixing lugs comprise a rigid front part close to the heel, having parallel bearing surfaces designed to straddle the conjugate surfaces of the shoulder with no clearance in the clipped-on position of the rider, and an elastic rear part

allowing expansion of the lugs when the hooks move along the shoulder.

Other advantages and features will become more clearly apparent from the following description of an illustrative embodiment of the invention, given as a non-restrictive example only and represented in the accompanying drawings, in which :

- Figure 1 is a perspective view of three modules of a three-phase circuit breaker, in the course of assembly;
- Figure 2 is a partial plan view of two modules, before and after fitting of the connecting rider according to the invention;
- Figure 3 represents a profile view of the rider according to figure 2.
- Figure 4 is a side view of a module.

In the figures, a modular electrical switchgear device, notably a miniature three-phase circuit breaker 10 is formed by side-by-side assembly of several modules 12, 14, 16 each comprising a moulded insulated case 18 housing the parts making up a breaking pole. The different adjoining and assembled modules 12, 14, 16 form a multipole unit clipped by its rear face 20 onto a support rail (not shown). Each module 12, 14, 16 is equipped on the front face 22 with a manual operating handle 24, and with a pair of connecting terminals 26, 28 disposed on the narrow opposing side faces 30, 32 of the case 18. Successive modules are adjoined by their large side faces 34, 36, and can in addition comprise single-pole switch units, and auxiliary tripping, signalling and control units.

Each insulated case 18 of a breaking pole has a standard outline, formed by fitting two U-shaped half-shells joined together by fixing parts, notably metal rivets or plastic studs.

The trace junction plane 38 of the two half-shells of a case 18 is identical with the longitudinal centre plane of the pole, and the connecting terminals 26, 28 are positioned in the conjugate housings 40 of the case 18. Modular systems of this kind are well-known in the art, and there is no point describing them in greater detail here.

On the narrow side face 30, 32 of each case 18 there is located a pair of notches 42, 44, symmetrical with respect to the trace centre plane 38, arranged above the terminals 26, 28 in a perpendicular direction to the large side faces 34, 36. Each half-open notch 42, 44 extends over a fraction of the width of a half-shell, and gives out directly on the corresponding large side face 34, 36.

When the large side faces 34, 36 of two successive modules are adjoined, the conjugate notches 42, 44 are disposed facing one another to form a rectangular groove 46, enabling access to be had to two adjacent internal housings 40 (see figure 2). Each groove 46 is associated with two narrow side faces 30 or 32, of two juxtaposed modules 12, 14; 14, 16, and enables a rider 48 to be inserted according to the direction of the arrow F to assemble said modules.

The rider 48 made of plastic insulating material is fork-shaped having a centering heel 50 to which a pair of fixing lugs 52, 54 are connected the ends of which are shaped as clipping hooks 56, 58 designed to cooperate by elastic deformation with retaining edges 60 provided inside the housings 40 in the inside walls of the adjoined large side faces 34, 36. In the inserted position of the connecting rider 40, the lugs 52, 54 hook onto the edges 60 being symmetrical with respect to the joining plane of two modules 12, 14; 14, 16, and being oriented towards the rear wall of the housings 40 in a perpendicular direction to the narrow side faces 30, 32. The length of the fixing lugs 52, 54 is

smaller than the depth L of the housings 40. The heel 50 has a rectangular shape which fits in the conjugate groove 46 ensuring automatic centering of the adjoined modules.

The rider 48 has a dual function of centering and mechanical connection of the modules, and straddles the interface between two adjoining cases 18.

The first centering function by the heel 50 is completed by the second mechanical connection function by means of the lugs 52, 54. Each clipping hook 56, 58 comprises a bevelled ridge 62 to make it easier to insert the rider 48 on the central boss 64 of the groove 46. The second mechanical connection function is achieved by the engagement with no clearance of the parallel bearing surfaces 66, 68 of the lugs 52, 54 on the conjugate surfaces of the boss or shoulder 64, followed by locking by the hooks 56, 58. The front part of the fixing lugs 52, 54 presents a rigidity along the heel 50 and the parallel bearing surfaces 66, 68, whereas the decrease in width (see figure 3) towards the hook 56, 58 gives the rear part a preset elasticity allowing elastic deformation of the lugs 52, 54 when the rider 48 is fitted.

The use of an insulating interpole connection part enables the rider 48 to be incorporated in the housing 40 of the connecting terminals. In the inserted position of the rider 48, the heel 50 blanks off the groove 46, without protruding outwards.

The interpole connection rider 48 is mounted anchored by clipping of the hooks 56, 58 onto the retaining edges 60 of the adjoined cases 18. Assembly of the poles or modules can take place in the factory or by the user, and the modules can be adjoined either on the large left-hand side face 34 or the large right-hand side face 36.

In the inserted position in the groove 46, each assembly rider 48 cannot be grasped or disassembled by the user.

For a three-phase circuit breaker with three modules 12, 14, 16, two riders are required on each narrow side face 30, 32. Two other additional riders 48 can still be inserted in grooves 46 arranged in the rear faces 20 of the modules.

Figure 4 represents the positioning of the assembly riders 48 in the junction plane of two adjoined cases 18. The two riders 48 associated with the narrow side faces 30, 32 are aligned according to the x axis in the longitudinal direction of the modules. The third rider 48 located on the rear face 20 of the modules is on the y axis extending in the depthwise direction of the modules. The transverse z axis perpendicular to the x and y axes extends in the joining direction of the modules. The presence of the three assembly riders 48 in the junction plane of two cases 18 ensures both securing of the modules with no clearance by immobilization in the z axis, and centering of the modules with respect to one another by preventing any translation movement according to the x and y axes, and any rotation around the z axis.



CLAIMS

1. A mechanical assembly device of a plurality of adjoined modules (12, 14, 16), with moulded insulating cases (18) housing electrical switchgear, comprising a clip-on connecting part (48) made of insulating material which can be inserted in a slide (46) of two adjoined cases (18), to cooperate by latching with fixed retaining edges, said part straddling the interface of the two cases (18) in the clipped-on position, characterized in that the case (18) of each module (12, 14, 16) comprises a pair of symmetrical notches (42, 44) which emerge out on the opposite large side faces (34, 36) of the case (18), adjoining two modules (12, 14; 14, 16) causing two conjugate notches (42, 44) to come to face one another at the interface level to form a common groove (46) constituting said slideway, and that the connecting part is arranged as a rider (48) having a centering heel (50) capable of fitting in the groove (46), and a pair of fixing lugs (52, 54) passing through said groove (46) to positively lock said modules together, so as to make the rider (48) unremovable.

2. The mechanical assembly device according to claim 1, characterized in that the ends of the fixing lugs (52, 54) of the rider (48) are shaped as hooks (56, 58) cooperating with the latching protrusions comprising two edges (60) arranged symmetrically with respect to the interface plane inside juxtaposed housings (40), containing connecting terminals (26, 28), and that the length of each fixing lug (52, 54) is smaller than the depth of the corresponding housing (40).

3. The mechanical assembly device according to claim 2, characterized in that each hook (56, 58) of the fixing lugs (52, 54) comprises a bevelled ridge (62) to make it easier to fit the rider (48) on an internal shoulder (64) of the case (18) disposed, in the insertion direction, between the groove (46)



and the corresponding latching edge (60).

4. The mechanical assembly device according to claim 3, characterized in that the fixing lugs (52, 54) of the rider (48) comprise a rigid front part close to the heel (50), having parallel bearing surfaces (66, 68), designed to straddle the conjugate surfaces of the shoulder (64) with no clearance in the clipped-on position of the rider (48), and an elastic rear part allowing expansion of the lugs (52, 54) when the hooks (56, 58) move along the shoulder (64).

5. The mechanical assembly device according to claim 4, characterized in that the groove (46) is rectangular, and that the heel (50) blanks off the groove (46) in the clipped-on position of the rider (48) without protruding outwards beyond the narrow side faces (30, 32).

6. The mechanical assembly device according to one of the claims 1 to 5, characterized in that the rider (48) has a fork-shaped outline.

7. The mechanical assembly device according to one of the claims 1 to 6, characterized in that the interface of two adjoined cases (18) has three assembly riders (48) located on the opposite narrow side faces (30, 32) and on the rear face (20) opposite the handles (24) in such a way as to ensure that the modules are both secured and centered in all three dimensions.