

Description

Busbar channel system for a low-voltage switching plant

The present invention relates to a low-voltage switching plant allowing the delivery and/or distribution of electrical energy including current collector bars which are arranged in a casing that has the form of a cabinet, and which are connected at least to one commutator provided with at least one switching device located on a withdrawable plug-in element, while the current collector bars present distributor bars arranged in a busbar channel system and being retained in the latter by means of support elements, the electrical connection from the distributor bars to the switching devices located on a plug-in element being established with the help of plugs, and while the busbar channel system presents a busbar channel, surrounding the distributor bars on three sides, and a bulkhead wall which is retained at the busbar channel in order to cover the distributor bars, and which provides at least one opening for the passage of the contact elements of a power current plug.

A low-voltage switching plant is known from SE 84 00 475-3 and it includes vertical distributor bars which are connected to horizontal main current collector bars situated above the distributor bars. The distributor bars are retained in an U-shaped busbar channel by means of support elements. The support elements are designed like a comb and they are suspended in corresponding openings which are shaped like key holes and located in the rear wall of the busbar channel. The distributor bars are retained between the fingers of the comb-like support element and screwed to the support element with the help of fixing bars. These fixing bars are fixed at one finger of the comb-like support element by means of a screw and they are designed in such

a way that they cover a part of the distributor bars located at the right-hand and left-hand side of the finger, entering into flush contact with these distributor bars. A free space remains between two neighbouring fixing bars, allowing for the reception of power current plugs.

Five fixing bars are required in order to retain the four distributor bars in a reliable way. These fixing bars are made of synthetic material and thus also fulfil the function of insulators. Two neighbouring fixing bars are linked by means of snap-in elements in order to cover the free space remaining between the fixing bars. The arrangement of the fixing bars in parallel with regard to one another and the bridging of the remaining free spaces by the snap-in elements result in an insulating bulkhead wall.

The busbar channel is designed as a right angle at its free longitudinal edge and it also provides boreholes for the reception of fixing devices.

This entire busbar channel system is fixed close to the rear wall of the casing of the low-voltage switching plant in such a way that plug-in units which include one or more switching devices can be installed in front of the busbar channel system. These plug-in units have their own casing and present pluggable power current plugs at their rear side. These plug-in units are pushed in corresponding support facilities in the casing of the low-voltage switching parts up to a distance at which the power current plugs are in contact with the distributor bars.

As described above, the low-voltage switching plant known from SE 84 00 475-3 consists of a large number of individual components which must be assembled. Preassembly is not possible especially since the distributor bars are suspended in a loose way in the rear wall of the busbar channel above the support elements without being secured in this place. This design excludes the transport of a prefabricated busbar channel system from one workplace to another right from the outset since the

fact that the support elements are only suspended with their T-shaped retaining pins resting in a loose way in corresponding keyhole-like openings in the rear wall of the busbar channel leads to the danger that the distributor bar and their support elements get out of this mounting during their transport and especially when the busbar channel system is transported in a horizontal position.

In addition to this, it is difficult to assemble the individual components in a prepared switch cabinet because assembly is carried out when the switch cabinet is in a vertical position. For this reason, the fitter has to adapt to a different working height for every element, while most of these working heights will put the body into a difficult position. Such an assembly is also expensive because the different parts have to be carried to the place of assembly in a time-consuming way.

In this context, the problem to be solved by the present invention is to create a low-voltage switching plant which can be manufactured in a cost-effective way and reduces the workload of the fitter.

In order to solve this problem, we propose to further develop the low-voltage switching part of the type mentioned at the beginning in such a way that the busbar channel, the bulkhead wall, and the support elements arranged between the latter and carrying the distributor bars present boreholes which are in alignment with one another in such a way that the busbar channel system is held together by a number of fixing devices which can be inserted across busbar channel, bulkhead wall and support elements.

A low-voltage switching plant designed according to this technical principle has the advantage that all individual components and in particular the busbar channel, the support elements, the distributor bars and the bulkhead wall are fixed and held together in a way which prevents accidental disassembly. This makes it possible to

transport the prefabricated busbar channel system from one place to another without running the risk that individual components of the busbar channel system will be disconnected again during the transport. In this way, it is possible to preassemble the busbar channel system designed for a low-voltage switching plant according to the present invention, and to carry it in a completely assembled condition to the client's place of assembly. This leads to considerable savings in costs since the tedious transport of the individual components to the place of assembly is reduced to the transport of the complete busbar channel system. Assembly time is reduced considerably in addition, and this also helps to reduce assembly costs.

An additional advantage of the busbar channel system according to the invention is the fact that it now can be assembled in a horizontal position because it is not necessary to install the busbar channel system in a low-voltage switching plant when the latter is in the vertical position.

Horizontal assembly enables the fitter to choose a working height which corresponds to his or her physiology, thus achieving considerably easier working conditions.

An additional advantage of horizontal assembly is the fact that the individual components can be placed in layers or, respectively, one above the other in the form of a sandwich. This means that the individual parts are placed or plugged together almost by layers and that the fixing device is only applied when all parts are plugged together. The details of the assembly process are described extensively further down.

As an additional solution for the above-mentioned problem, we propose to further develop the low-voltage switching plant of the type mentioned at the beginning in such a way that the busbar channel is followed by holding elements which present means to receive the plug-in elements.

A low-voltage switching plant designed according to this technical principle has the advantage that the holding elements for the plug-in elements and the plug-in elements themselves can be preassembled in addition to the busbar channel system, and that this assembly can be done in a horizontal position. In this way, this solution of the above-mentioned problem also presents the above-mentioned advantages.

An additional advantage of this technical principle is the fact that the arrangement of the holding elements at the busbar channel system considerably simplifies the design and setup of the casing of the low-voltage switching plant. The installation of the plug-in units directly on the busbar channel system makes it possible to omit the intermediate supports and fixing devices required otherwise at the casing. This leads to a considerable reduction in the number of components installed in the low-voltage switching plant and thus to a reduction of costs. The clearly simplified casing also allows a simpler and quicker assembly of the latter at the site of assembly of the low-voltage switching plant, and this fact also helps to reduce costs.

Preferred embodiments include a busbar channel which has a U-, C- or trough-shaped cross-section and which presents a rear wall and two lateral walls that are essentially located opposite with regard to one another. A design of this type guarantees that the busbar channel surrounds the distributor bars on three sides. The transition between the lateral walls and the rear wall can be continuous, as, e.g., in the embodiment which presents a C-shaped cross-section.

In order to achieve an even greater reduction in the number of components to be assembled, it is an advantage to design a lateral wall of the busbar channel and an adjacent holding element as a single component. This reduces both manufacturing and assembly costs.

In an especially preferred embodiment, the busbar channel or respectively its lateral wall or also the holding element adjacent to the latter, if applicable, present a connection strip which is bent almost at a right angle. Boreholes to receive fixing devices are located on this connection strip. It is preferred that these boreholes are prepared beforehand. This offers the advantage that additional components can be mounted on the connection strip in an easy way and that the busbar channel system can be fixed to the casing of the low-voltage switching plant directly or indirectly by means of the connection strip.

In an additional and especially preferred embodiment, the busbar channel and the two holding elements adjacent to it are designed as a single component. The busbar channel, the holding elements and the connection strips in particular are made of a metal sheet which is bent in a corresponding way and galvanized.

This offers the advantage that the number of individual components is reduced considerably once again and that the manufacture and assembly of this busbar channel (including holding element and connection strip) is done in a very cost-effective and efficient way.

An additional embodiment presents a bulkhead wall which is also designed as a single component and made of metal, i.e., preferably of galvanized sheet metal, in such a way that the above-mentioned advantages apply to this embodiment as well.

In another preferred embodiment, the holding element presents guiding projections which allow the reception of a guiding edge of the plug-in element, while at least two guiding projections located one above the other are provided for every plug-in element on every holding element. An advantageous design version includes three guiding projections for every guiding edge, while the guiding projections located above one another are each offset.

The guiding projections consist of projections which have been taken out of the holding element and present a triangular plan. A triangular guiding projection is achieved by the cutting or punching of two longitudinal slots arranged at a right angle with regard to one another and by subsequent outside bending.

These guiding projections make for the easier installation or respectively removal of the plug-in elements which carry the switching devices, while the plug-in elements also present guiding edges on the left and on the right side.

A plug-in element of such a kind is installed by first placing the front section of the guiding edge on the guiding projection at the front side. After this, the plug-in element is aligned horizontally and then it is pushed in between the holding elements up to a distance at which the power current plugs located on the plug-in element are in contact with the grounding/earthing bar.

The guiding projections allow the easy assembly and the quick and precise alignment of the plug-in elements.

In an additional and especially preferred embodiment, the distributor bars are retained by the support elements in such a way that the distributor bars are kept at a distance both with regard to the busbar channel and with regard to the bulkhead wall.

This presents the advantage that the short-circuit safety of the low-voltage switching plant is guaranteed and that it is no longer necessary to use insulating synthetic material to manufacture the bulkhead wall. This rather allows to manufacture the bulkhead wall using cheaper material and in particular galvanized sheet metal.

The above-mentioned arrangement of the distributor bars is achieved especially by the fact that two different support elements receive the distributor bars between

them. But the different support elements may also be of the same design. This version supports the above-mentioned layer or respectively sandwich design because this makes it possible to insert one support element in the rear wall of the busbar channel at first, and to place the distributor bar in this support element before the second support element is placed above in order to stabilize the distributor bars.

Finally, the bulkhead is placed into the busbar channel. Then, the fixing device, which preferably consists of a bolt, is inserted across all components and secured by means of a nut at the opposite side.

In this context, it is an advantage to provide at least one but preferably two fixing devices which can be inserted across the components for every pair of support elements.

It is preferred to use bolts, rivets, snap-in locks or similar devices for fixing.

An additional advantageous embodiment includes a PE bar which is shaped especially like an L, arranged at the front side of the bulkhead wall and allows the engagement of a polyethylene plug mounted on the plug-in element.

An advantageous embodiment includes at least two but preferably three transverse supports which are fixed at the rear wall of the busbar channel system and by means of which the busbar channel system is screwed to the frame of the casing of the low-voltage switching plant.

Additional advantages result from the description and from the enclosed drawing. The above-mentioned characteristics and those mentioned in addition can also be used individually or in any combination in accordance with the invention. The embodiments mentioned do not represent an exhaustive list. They shall rather serve as examples. The invention is represented in the drawing and it is described in detail referring to embodiment examples. The individual figures of the drawing are

explained briefly as follows:

- Figure 1 is a perspective view of a low-voltage switching plant with a busbar channel system according to the invention;
- Figure 2 is a exploded perspective view showing components of the busbar channel system of the low-voltage switching plant according to the invention;
- Figure 3 is a perspective view of the busbar channel system according to figure 2 in the assembled condition;
- Figure 4 is an enlarged perspective view showing a section of an holding element with guiding projections according to line IV-IV in figure 3; and
- Figure 5 is a exploded perspective view showing the components of a plug-in element of the low-voltage switching plant.

The individual figures of the drawing partly show the object of the invention in a very schematic way and they are not true to scale. In some cases, individual objects are represented beyond proportion in the figures in order to show their setup in a better way.

Fig. 1 shows an embodiment of a low-voltage switching plant 2 with main current collector bars 4 which are located above, run in a horizontal direction and are connected to vertical field collector or distributor bars 6a - 6d. The distributor bars 6a - 6d are placed in a busbar channel system 8 which is fixed to a frame 12 of a casing 14 of the low-voltage switching plant 2 by means of three transverse supports 10.

Several plug-in elements **16** including switching devices **17** are arranged on the busbar channel system **8** and are each connected to a commutator which is not represented in the drawing.

The casing **14** of the low-voltage switching plant **2** includes a frame **12** with hollow profiles which can be plugged in at their corner links **18** and which are held together at this place after assembly by means of fixing devices which are not shown in the drawing. A cabinet door **20** which closes the casing **14** is mounted in a swivelling position at the frame **12**. The other sides of the casing **14** are covered by panels fixed in a removable way at the frame **12** but not shown in the drawing.

Fig. 2 shows the components of the busbar channel system **8** in an exploded perspective view. The busbar channel system **8** includes three transverse supports **10** fixed at a rear wall **22** of a busbar channel **24**, the support elements **26**, carrying the distributor bars **6a - 6d**, a bulkhead wall **28**, and the fixing screws **30** which can be inserted across the busbar channel system **8**.

The assembly of the busbar channel system **8** is done in a horizontal position, i.e., the components are aligned horizontally in the direction of their longitudinal axis during assembly.

Prior to assembly, the transverse supports **10** are placed in a prefabricated negative mould (which is not shown in the drawing) in order to make certain that the arrangement of the transverse supports **10** is compatible with the corresponding fixing boreholes or respectively fixing devices arranged on the frame **12** of the casing **14**.

During this, the negative mould can be placed at a working height which is comfortable for the fitter. The busbar channel **24** is placed on the transverse supports **10** and screwed to the transverse supports **10** aligned in this way.

In addition to the rear wall 22, the busbar channel 24 includes two lateral walls 32, 34 which are essentially located opposite with regard to one another and which are followed without transition by holding elements 36, 38 allowing the reception of the plug-in elements 16 which carry the switching devices 17. The holding elements 36, 38 are bent at a right angle along their free longitudinal edge, thus forming the connection strips 40, 42. The connection strips 40, 42 present several boreholes arranged at an even spacing and allowing the reception of fixing devices. The busbar channel 24, the holding elements 36, 38, and the connection strips 40, 42 are formed of a single galvanized metal sheet, while the busbar channel 24 has a U-shaped cross-section.

The first support elements 26 are placed at an even distance in the rear wall 22 of the busbar channel 24 after having fixed the busbar channel 24 to the transverse supports 10. In this process, projections located at the rear side of the support element 26 are introduced into corresponding recesses in the rear wall 22 in order to maintain the support element 26 in a stable position.

After this, the four distributor bars 6a - 6d are placed into the support elements 26 preassembled in this way. The support elements 26 are designed for this purpose in such a way that the four distributor bars 6a - 6d are retained in parallel with regard to one another and vertically with regard to the rear wall 22. For this purpose, the distributor bars 6a - 6d are inserted into corresponding recesses arranged in the support elements 26 and partly extend out of the support element 26.

The second support elements 26 have the same design as the first support elements and they are placed on the distributor bars 6a - 6d preassembled in this way. During this, projections located at the support elements engage in corresponding recesses at the other corresponding support element 26 and thus secure both the support elements 26 and the distributor bars 6a - 6d in the proper position.

Subsequently, the bulkhead wall **28**, made of galvanized sheet metal and designed as a single component, is placed on the second support elements **26** in such a way that the projections located at the support elements **26** engage in corresponding recesses in the bulkhead wall **28**.

The projections arranged at the support elements **26** make certain that all components are placed in the proper position with regard to one another, and that the boreholes provided in the support elements **26**, in the rear wall **22** and in the bulkhead wall **28** are in alignment with regard to one another in order to receive the fixing screws **30** which can be inserted across all components in such a way that this insertion of the fixing screw **30** can now be carried out without any problem. After having inserted the fixing screw **30** across the components, a nut is screwed to it, thus securing the busbar channel system **8** in a durable way and without running the risk of accidental disassembly.

If necessary, the bulkhead wall **28** can also be screwed to the corresponding lateral wall **32**, **34** in an additional way in order to increase the stability of the busbar channel system **8** even more.

In order to conclude the process, a PE bar **46** which has an L-shaped cross-section is screwed to the front side of the bulkhead wall **28**, and insertion aids **48** are inserted into corresponding openings **50** in the bulkhead wall **28**.

Fig. 3 shows a perspective view of a completely assembled busbar channel system **8**. In this busbar channel system **8**, the distributor bars **6a - 6d** are kept at a distance both with regard to the busbar channel **24** and with regard to the bulkhead wall **28**, thus making the use of insulating material for these components obsolete.

Fig. 4 is an enlarged view showing a section of the holding element **36** with guiding

projections **52a - 52c**. The guiding projections **52a - 52c** consist of sheet metal elements bent out of the holding element **36, 38**, and they serve for the reception and guiding of a plug-in element **16**. The guiding projections **52a - 52c** are created by cutting or punching two slots arranged at a right angle with regard to one another and by bending out the triangular metal sheet created in this way. The hypotenuse of this triangle shall be horizontal as a general rule. Three guiding projections **52a - 52c** each form the reception for the plug-in element **16** in a holding element **36, 38** in the embodiment represented in the drawing. In this context, the guiding projections **52a** and **52b** are arranged below guiding projection **52c** and offset with regard to the latter.

Fig. 5 is an exploded perspective view showing the components of the plug-in element **16** without including a switching device **17**. The plug-in element **16** includes a plug reception **54**, a device carrier plate **56**, a setup plate **58** and four power current plugs **60a - 60d**, while the power current plugs **60a - 60c** are plugged on the current-carrying distributor bars **6a - 6c** and while the power current plug **60d** is plugged to the neutral conductor **6d**. The plug reception **54** presents two insertion bars **62, 64** with guiding edges **66, 68** which are formed on them and which are inserted into the guiding projections **52a - 52c** in order to maintain the plug-in element **16** in the holding elements **36, 38**. In addition to this, a PE plug **70** is screwed to the insertion bar **62**.

At least one switching device **17**, and especially a power switch, a protective motor switch, a contactor or a similar device is installed on the setup plate **58** in this plug-in element **16**. After this, the plug-in element **16** preassembled in this way can be inserted in a simple way and without problem into the low-voltage switching plant **2** shown in **fig. 1**. For this purpose, the front section of the guiding edges **66, 68** of the plug-in element **16** is placed on the corresponding guiding projections **52a** at first. After this, it is aligned horizontally and, finally, it is pushed in the direction of the

distributor bars **6a - 6d**. During insertion, the power current plugs **60a - 60d** are pushed through the corresponding openings **50** in the bulkhead wall **28** before being plugged on the distributor bars **6a - 6d**. The openings **50** are equipped with insertion aids **48** in order to allow the easier insertion of the power current plugs **60a - 60d** across the bulkhead wall **28**.

These insertion aids **48** have a narrow shape at the front side and become larger in the direction of the distributor bars **6a - 6d** in such a way that the power current plugs **60a - 60d** are directed in a continuous way until they reach the distributor bars **6a - 6d**.

The openings **50** in the bulkhead wall **28** are designed in a pin-safe way in accordance with the IP 20 safety standard. This also applies when the insertion aid **48** is not plugged into the opening **50**.

The entire low-voltage switching plant is designed for a short-circuit resistance of $75 \text{ kA}_{\text{eff}}$ in order to prevent accidents and/or dangerous situations.

List of Reference Numbers

2	Low-voltage switching plant	50	Openings
4	Main current collector bars	52a-c	Guiding projections
6a-d	Distributor bars	54	Plug reception
8	Busbar channel system	56	Device carrier plate
10	Transverse supports	58	Setup plate
12	Frame	60a-d	Power current plugs
14	Casing	62	Insertion bar
16	Plug-in element	64	Insertion bar
18	Corner link	66	Guiding edges
20	Cabinet door	68	Guiding edges
22	Rear wall	70	PE plug
24	Busbar channel		
26	Support element		
28	Bulkhead wall		
30	Fixing screw		
32	Lateral wall		
34	Lateral wall		
36	Holding element		
38	Holding element		
40	Connection strip		
42	Connection strip		
44	Borehole		
46	PE bar		
48	Insertion aid		

Claims:

1. Low-voltage switching plant allowing the delivery and/or distribution of electrical energy including current collector bars which are arranged in a casing (14) that has the form of a cabinet, and which are connected at least to one commutator provided with at least one switching device (17) located on a withdrawable plug-in element (16), while the current collector bars present distributor bars (6a - 6d) arranged in a busbar channel system (8) and being retained in the latter by means of support elements (26), the electrical connection from the distributor bars (6a - 6d) to the switching devices (17) located on a plug-in element (16) being pluggable, and while the busbar channel system (8) presents a busbar channel (24), surrounding the distributor bars (6a - 6d) on three sides, and a bulkhead wall (28) which is retained at the busbar channel (24) in order to cover the distributor bars (6a - 6d) and which provides at least one opening (50) for the passage of the contact elements of a power current plug, **wherein** the busbar channel (24), the bulkhead wall (28) and the support elements (26), arranged between them and carrying the distributor bars (6a - 6d), present boreholes which are in alignment with one another in such a way that the busbar channel system (8) is held together by a number of fixing devices (30) which can be inserted across the busbar channel (24), the bulkhead wall (28) and the support elements (26).

2. Low-voltage switching plant allowing the delivery and/or distribution of electrical energy including current collector bars which are arranged in a casing (14) that has the form of a cabinet, and which are connected at least to one commutator provided with at least one switching device (17) located on a withdrawable plug-in element (16), while the current collector bars present distributor bars (6a - 6d) arranged in a busbar channel system (8) and being retained in the latter by means of support-elements (26), the electrical connection from the distributor bars (6a - 6d) to the switching devices (17) located on a plug-in element (16) being pluggable, and while the busbar channel system (8) presents a busbar channel (24), surrounding the distributor bars (6a - 6d) on three sides, and a bulkhead wall (28) which is retained at the busbar channel (24) in order to cover the distributor bars (6a - 6d), and which provides at least one opening (50) for the passage of the contact elements of a power current plug, particularly as claimed in claim 1, **wherein** the busbar channel (24) is followed by holding elements (36, 38) which present means allowing the reception of the plug-in elements (16).
3. Low-voltage switching plant as claimed in at least one of the preceding claims, wherein the busbar channel (24) has a U-, C- or trough-shaped cross-section, while the busbar channel (24) presents a rear wall (22) and two lateral walls (32, 34) which are essentially located opposite with regard to one another.
4. Low-voltage switching plant as claimed in at least one of the preceding claims, wherein at least one lateral wall (32, 34) of the busbar channel (24) and one holding element (36, 38) are designed as a single component.

5. Low-voltage switching plant as claimed in at least one of the preceding claims, wherein the busbar channel (24) and/or the holding element (36, 38) present a connection strip (40, 42) which is bent almost at a right angle at least at one free longitudinal edge.
6. Low-voltage switching plant as claimed in claim 5, wherein the connection strip (40, 42) presents prepared boreholes (44) allowing the reception of fixing devices.
7. Low-voltage switching plant as claimed in at least one of the preceding claims, wherein the busbar channel (24) and the holding element (36, 38) are made of a single component.
8. Low-voltage switching plant as claimed in at least one of the preceding claims, wherein the bulkhead wall (28) is designed as a single piece.
9. Low-voltage switching plant as claimed in at least one of the preceding claims, wherein the bulkhead wall and/or the busbar channel (24) and/or the holding elements (36, 38) are made of metal.
10. Low-voltage switching plant as claimed in claim 9, wherein the busbar channel (24) and the holding elements (36, 38) are made of a single sheet metal bent in a corresponding way.

11. Low-voltage switching plant as claimed in at least one of the claims 9 through 10, wherein the busbar channel (24) and/or the holding element (36, 38) and/or the bulkhead wall (28) are galvanized.
12. Low-voltage switching plant as claimed in at least one of the preceding claims, wherein the holding element (36, 38) presents at least two guiding projections (52a - 52c) which are located one above the other for every plug-in element (16), and which allow the reception of a guiding edge (66, 68) of the plug-in element (16).
13. Low-voltage switching plant as claimed in claim 12, wherein the guiding projections (52a - 52c), which are located above one another, each are offset for the reception of a guiding edge (66, 68) of the plug-in element (16).
14. Low-voltage switching plant as claimed in at least one of the claims 12 and 13, wherein the guiding projection (52a - 52c) is formed out of the holding element (36, 38) by punching a part of it open and subsequently bending this part out of the holding element.
15. Low-voltage switching plant as claimed in at least one of the claims 12 through 14, wherein the guiding projection (52a - 52c) presents a triangular plan.

16. Low-voltage switching plant as claimed in at least one of the preceding claims, wherein the support elements (26) keep the distributor bars (6a - 6d) at a distance both with regard to the busbar channel (24) and with regard to the bulkhead wall (28).
17. Low-voltage switching plant as claimed in at least one of the preceding claims, wherein two support elements (26) each receive the distributor bars (6a - 6d) between themselves.
18. Low-voltage switching plant as claimed in claim 17, wherein the two support elements (26) carrying the distributor bars (6a - 6d) are of the same design.
19. Low-voltage switching plant as claimed in at least one of the preceding claims, wherein the busbar channel system (8) is retained by one or two fixing devices (30) for every support element (26) carrying the distributor bars (6a - 6d) or respectively for every pair of support elements (26) carrying the distributor bars (6a - 6d).
20. Low-voltage switching plant as claimed in at least one of the preceding claims, wherein bolts, rivets, snap-in locks or similar devices can be used as fixing devices (30).

21. Low-voltage switching plant as claimed in at least one of the preceding claims, wherein a PE bar (46) is installed on one front side of the bulkhead wall (28).
22. Low-voltage switching plant as claimed claim 21, wherein the PE bar (46) has an L-shaped design.
23. Low-voltage switching plant as claimed in at least one of the preceding claims, wherein the busbar channel system (8) is fixed to the casing (14) by means of at least two transverse supports (10).

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