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CROSS CONNECTOR FOR MODULAR TERMINAL BLOCKS

The invention relates to a cross connector for a modular terminal block, comprising a connecting arm portion on which spaced portions arranged to extend to bus bars of the modular terminal block are mounted by way of predetermined fracture positions with screws held in the spaced portions.

Pre-assembled cross connectors of this kind for modular terminal blocks have the advantage of easy assembly in comparison with non-pre-assembled individual components with which a cross connection can also be made, because, after the pre-assembled cross connector has been fitted onto the row of terminals in question, the respective screws only have to be screwed into the corresponding threaded bores in the bus bar of the respective terminal in question. Those ones of the spacer portions which are not required, corresponding to those terminals which are not to be connected to the potential in question, are removed by being broken off at the respective predetermined fracture position.

In a previously proposed cross connector, described in German Published Specification No. 23 57 052, the connecting arm portion is a connecting strip which virtually completely fills the receiving space or chamber provided for the cross connector in the terminals, and the spacer portions which are suspended thereto are sleeves which are formed from two bar members and which are open at two points, the deformation of the bar members being to such an extent that the sleeve-like portions bear resiliently against the screw which is inserted through a bore in the connecting strip. This construction is a very complicated bent and punched member. Long screws which extend from the connecting strip to the bus bars are required, and further steps which additionally complicate the

bent and punched member must be taken in order to ensure that, when the screw is tightened, the sleeve-like portions are only deformed towards the screw, and are therefore not for example spread away therefrom, in which case they lose their holding or guiding function for the screw.

5 According to the invention there is provided a cross connector for a modular terminal block, comprising a connecting arm portion on which spaced portions arranged to extend to bus bars of the modular terminal block are mounted by way of predetermined fracture positions with screws held in the spaced portions, in which the connecting arm portion is formed
10 by a conductive bridging strip, each of the spaced portions is a strip member having a bus bar contacting limb and a connecting limb angled away from the bus bar contacting limb, the connecting limb connects the bus bar contacting limb to the bridging strip by way of the respective predetermined fracture position, the respective screw passes through the bus bar
15 contacting limb, and retaining means are provided to retain the screw in position even when not engaged with a corresponding threaded aperture in the respective bus bar.

Such a cross connector can be easy to produce and can permit easy assembly for various forms of cross connections.

20 Each strip member, or clip, may have a further limb angled away from the bus bar contacting limb such that it is of an approximately U-shaped configuration and the retaining means may be formed by shaping of the connecting limb and further limb.

25 Alternatively each strip member may be of an L-shaped configuration and the retaining means may comprise a holder member which engages over the screw from above and is provided with a screwdriver opening, the holder members of the various spaced portions being connected to a connecting bar portion which is common thereto.

30 The connecting arm portion which is formed as a bridging strip with the spaced portions suspended therefrom, in the form of the U-shaped or L-shaped spaced portions, can be a bent and punched member which is easy to produce. The screws are carried at the bottom in the bus bar contacting limb of the L-shaped or U-shaped strip members or clips. It is therefore possible to use screws with a very short shank, and in any case the
35 arrangement can ensure that no plastics portion of the respective modular terminal in question can be subjected to the screw force. In fact, the screw

head only ever presses directly, by way of the bus bar contacting limb, onto the bus bar of the respective terminal in question.

5 The fact that the connecting arm member is in the form of a narrow bridging strip has the result that it only fills one side of the receiving or mounting means which is normally provided in the terminals for cross connectors of this kind, while the other side of the receiving or mounting means is free. Therefore, if required, a further cross connector can be inserted at that position, so that a modular terminal block arrangement can be connected to two different potentials.

10 In addition, in the embodiment having the U-shaped strip members or clips, and with shaping thereof for the purposes of forming the screw retaining means, the bent and stamped or punched member is not noticeably complicated by the screw-retaining shaping. The desired effect can be achieved by simple impressed portions or stamped or punched portions.

15 The L-shaped spaced portions can result in a bent and stamped or punched member which is particularly easy to produced and which no longer performs any function, except for providing simple insertion openings for receiving the screws. For retaining the screws in such a way that they cannot be lost, the holder members are fitted thereto, are disposed on a common connecting bar portion and can be mounted in the simplest possible manner together with the common connecting bar portion.

20 The common connecting bar portion of the holder members can be formed as an insulating sleeve which encloses the metal bridging strip. This arrangement therefore provides insulation in the gripping region of the cross connector, to ensure good protection from contact. Fitting of the pre-assembled cross connector is overall a very simple operation. For example, the screws can be automatically dropped into the short bus bar contacting limbs of the

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L-shaped spacer portions, and then the connecting arm portion with the L-shaped strip members connected thereto, and the screws disposed therein, is simply inserted from below into the member of insulating material, comprising the sleeve-like common connecting bar portion and the holder means
5 connected thereto, the holder means thus fitting over the screws.

The invention is diagrammatically illustrated by way of example in the accompanying drawings, in which:-

Figure 1 shows a side view of a first embodiment of a cross
10 connector according to the invention;

Figure 2 shows a front view of the cross connector of Figure 1;

Figure 3 shows a side view of a second embodiment of a cross connector according to the invention;

Figure 4 shows a plan view of a modular terminal arrangement
15 incorporating two cross connectors of the kind shown in Figures 1 to 3, with certain ones of the strip members having been broken off;

Figure 5 shows a side view on a larger scale of a third embodiment of a cross connector according to the invention;

Figure 6 shows a simplified plan view of a part of the cross
20 connection of Figure 5;

Figure 7 shows a front view of a part of a fourth embodiment of a cross connector according to the invention; and

Figure 8 shows a sectional view taken on line VIII-VIII of Figure
7.

25 The cross connector shown in Figures 1 and 2 has a conductive bridging strip or bar portion 1 which serves as a connecting arm portion extending transversely over the modular terminals arranged in a row (not shown). For reasons of giving protection from contact, the strip 1 is enclosed
30 by a sleeve 2 of insulating material.

Arranged on one edge of the bridging strip 1, by way of predetermined or desired fracture positions 3, are spaced portions comprising substantially U-shaped clips formed by strip members 4 which are provided with two upright limbs and a lower

transverse limb. The strip members 4 are so dimensioned that they extend in the respective terminals as far as the bus bars thereof, to which the cross connector is secured. The strip members 4 are suspended by means of the upper edge of one of their upright limbs to the bridging strip 1. Screws 5 for screwing into the threaded bores in the bus bars of the respective modular terminals are disposed in the base region of the U-shaped strip members 4 in a corresponding receiving opening in the transverse limb, against which the screw head bears. Short screws can be used. The screw force can nowhere be applied to a plastics portion of the respective terminal in question, the receiving space or chamber of which is indicated by dash-dotted lines in Figure 1. The screw force goes directly by way of the transverse limb to the bus bar. The screw force also does not apply any twisting or deformation force to the strip members 4, particularly not when the transverse limb thereof is flat, at least in a portion thereof which is the size of the screw head.

It should also be pointed out that the strip members 4 extend downwardly to a sufficient depth, that is to say, the metal bridging strip 1 is disposed at such a height, that it does not bear against a separating wall region of the insulating housing of the modular terminal, when the bridging strip 1 extends from terminal to terminal. This can also be very clearly seen for example from the view shown in Figure 8.

In order for the screws 5 to be non-losably held in the strip members 4, in order to facilitate the operation of screwing the screws in, the upright limbs of the strip members 4 have inwardly projecting bent portions 6, in the embodiment shown in Figure 1. The portions 6 are disposed at such a height above the lower transverse limb that, if necessary, the screw 5 can still be screwed out of the threaded hole in the bus bar of the respective terminal in question, but otherwise it is then non-losably held in position by the portions 6.

In the embodiment shown in Figure 3, the screws 5 are non-losably retained in the respective lower transverse limb of the strip

members 4', which are once again of a U-shaped configuration, in that, instead of the bent portions 6, inwardly projecting punched or stamped tabs 6' are provided in the upright limbs of strip members, at a suitable position in respect of height above the lower transverse limb.

The dimensions of the U-shaped members 4, 4' are advantageously so selected that they can be inserted into the receiving openings in the series terminals, with a slight resilient action, for example by being slightly compressed. After the cross connector has been fitted, this arrangement provides a certain degree of pre-fixing in the terminals, and that facilitates screwing up the screws, particularly when working overhead is involved.

The cross connector shown in Figures 5 and 6 again embodies the design principle of the U-shaped strip members. Figures 5 and 6 show U-shaped strip members 4'' which particularly provide for good fixing of the screws 5 and good secure preliminary fixing of the strip members 4'' in the receiving or mounting means of the series terminals, as is desirable in difficult situations of assembly - reference is again made to overhead fittings. Provided in the upright limbs of the members 4'', in the middle region thereof, are outwardly curved portions 6'' which form enlarged portions 7 in the form of a portion of a cylinder in the space within the U-shaped configuration, the enlarged portions 7 being delimited at the top by material which has remained in place and which has not been curved outwardly, in the upright limbs, in the form of abutments 8. This arrangement therefore provides properly defined guide paths for the screw head. The abutments 8 are once again disposed at such a height that the screws 5 can just be screwed out of the threaded hole in the bus bar.

The outwardly curved portions 6'' are also enlarged on their outward side by detent knobs 9 which can snap with a detent action into corresponding recesses in the adjoining wall portion of the housing, which comprises insulating material, of the series terminals in question, and thereby provide a particularly secure preliminary fixing action.

In the embodiment shown in Figures 7 and 8, the spacer portions are in the form of L-shaped strip members having an upright limb 4a and a lower transverse limb 4b. Once again, the spacer portions are connected to the connecting arm portion, in the form of the narrow metal gripping bar portion 1, by way of the predetermined fracture position 3. The screws 5 which once again are only short are disposed in corresponding insertion openings in the lower transverse portion 4b. In this case also, the screw force is transmitted directly by way of the screw head to the transverse limb 6b and the bus bar which is disposed directly therebelow. In this case also the transverse limb is flat, at least in a region thereof corresponding to the size of the screw head. The L-shaped members 4a and 4b also extend downwardly to such an extent that, in conjunction with receiving slots 10 provided in the underside of the gripping bar portion 1, the metal gripping bar portion cannot bear against a separating wall portion (shown in dash-dotted lines in Figure 8) of the series terminal housing, as the bar portion 1 extends from terminal to terminal.

For the purposes of non-losably retaining the screws 6 in the lower transverse limbs 4b of the strip members, provided in the embodiment shown in Figures 7 and 8, for each of the strip members 4a and 4b and thus for each of the screws 5, are holder members 11 which comprise insulating material and which are formed integrally with a common connecting bar portion in the form of a sleeve 2'. In this arrangement, the holder members 11 are connected by their top edges (see Figure 2) to the common lower edge of the sleeve 2'. The sleeve 2' is of such a design that it can completely accommodate the metal gripping bar 1 therein, so that the metal gripping bar 1 is protected from contact.

In this arrangement, the connecting region 12 between the holder members 11 and the sleeve 2' is so narrow that it can be considered as a predetermined fracture position. If necessary therefore, it is not only possible for the L-shaped members 4a and 4b which are not required to be used to be broken off the gripping bar portion 1 at the necessary locations, but it is also possible

for the associated holder members 11 to be broken off the sleeve 2' without difficulty.

In the illustrated embodiment, the individual holder members 11 are hollow members of square or rectangular cross-section. The lower region of each such member is open downwardly and forms a receiving space or chamber 13, which is of square or rectangular cross-section, for the head of the screw 5. A screwdriver opening 14 is disposed adjoining the space 13 in an upward direction, and opens into the space 13. The opening 14 is of circular cross-section and is of such a size that at the same time it forms a screwdriver guide means, which greatly facilitates tightening the screw. The diameter of the screwdriver opening 14 is also of such a size that the screw 5 with its screw head 4 cannot fall out, and is thus held in position in such a way that it cannot be lost.

As can be seen in particular from Figure 7, receiving slots 15 are also provided in the sleeve 2 which serves as a connecting bar portion for the holder members 11, in the region of the separating or partitioning walls of the series terminals of a series terminal arrangement. The slots 15 are of such a size that they can receive the upper region of the above-mentioned walls, with a slight clamping action. Thus, when dealing with an overhead arrangement, it is possible for the cross connector to be held in place on the row of terminals, in such a way that the screw cannot drop out, even if no screw has yet been screwed into a bus bar of a terminal.

The cross connector shown in Figures 7 and 8 is mounted by the screws 5 first being inserted into the transverse limbs 4b, for example automatically, and the metal portion comprising the gripping bar portion 1 and the strip members 4a, 4b connected thereto, with the screws 5 inserted therein, being inserted into the separate integral plastics portion comprising the sleeve 2' with the holder members 11, whereupon the holder members then engage over the heads of the screws 5 and hold them in place so that they cannot come loose.

For making a secure connection between the gripping bar

portion 1 and the sleeve 2' of insulating material, a plurality of detent openings 16 are advantageously provided in the gripping bar portion 1, while detent knobs 17 are formed or moulded on the inside wall surfaces of the sleeve 2' and engage with a snap action into the detent openings 16, in the assembled condition.

The views shown in Figures 1, 3, 5 and 8 show that the narrow gripping bar portion 1 with its sleeve 2 or 2' occupies only one side of the recesses which are normally provided in the terminals for the cross connectors. The other side of the recesses is still free. Accordingly, it is possible for the terminals of a row to be connected to two different potentials, by two cross connectors of this kind with the U-shaped or L-shaped strip members, being inserted in mirror image relationship to each other. The strip members which are not required to be used are broken off in the usual manner, at the fracture position 3. Figure 4 for example shows such an arrangement in respect of the U-shaped strip members, wherein the first and the third terminals are connected to a common potential by the cross connectors which are on the right, with the gripping bar portion 1, while the second and fourth terminals can be connected to a second, different potential by the other cross connectors which are on the left, with the gripping bar portion 1.

When using the L-shaped strip members 4a, 4b, two cross connectors of this kind can be readily inserted with their gripping bar portions disposed opposite each other, in such a way as to provide a double cross connection for the terminals, in which case all terminals involved are connected with two cross connectors. Such a cross connection could be loaded for example with the full rated current of the terminals.

It is also possible, when using the U-shaped strip members 4, 4' and 4'', for one free upright limb which is not connected to the gripping bar portion 1 to be joined to the lower transverse limb which forms the base portion of the arrangement, by way of a weakened or predetermined fracture position. If necessary, that further upright limb could also be removed relatively easily. The U-shaped strip member would then form an L-shaped strip member which

would then make it possible to produce the above-mentioned double cross connection, so that the cross connection can be loaded with the full rated current of the terminals.



CLAIMS

1. A cross connector for a modular terminal block, comprising a connecting arm portion on which spaced portions arranged to extend to bus bars of the modular terminal block are mounted by way of predetermined fracture positions with screws held in the spaced portions, in which the
5 connecting arm portion is formed by a conductive bridging strip, each of the spaced portions is a strip member having a bus bar contacting limb and a connecting limb angled away from the bus bar contacting limb, the connecting limb connects the bus bar contacting limb to the bridging strip by way of the respective predetermined fracture position, the respective
10 screw passes through the bus bar contacting limb, and retaining means are provided to retain the screw in position even when not engaged with a corresponding threaded aperture in the respective bus bar.
2. A cross connector according to claim 1, in which each strip member
15 has a further limb angled away from the bus bar contacting limb such that the strip member is of approximately U-shaped configuration and the retaining means is formed by shaping of the connecting limb and the further limb.
3. A cross connector according to claim 1, in which each strip member
20 is of a L-shaped configuration and the retaining means comprises a holder member which engages over the screw and which is provided with an opening for a screwdriver, and wherein each holder member of the various spaced portions is connected to a connecting bar portion which is common to the
25 holder members.
4. A cross connector according to any one of claims 1 to 3, in which the
30 bus bar contacting limb of each strip member is flat at least for a portion thereof corresponding in size to the dimensions of the head of the screw.
5. A cross connector according to claim 2, in which the further limb of each U-shaped strip member is connected to the bus bar contacting limb by way of a weakened fracture position or predetermined fracture position.



6. A cross connector according to claim 2, in which said shaping comprises bent portions in the connecting limb and the further limb of the U-shaped strip member which face inwardly of the strip member for retaining the screw but allowing sufficient freedom of movement for the screw to be fully unscrewed from the threaded aperture in the terminal block.

7. A cross connector according to claim 2, in which said shaping comprises punched-in tab portions which are provided in the connecting limb and further limb and which project inwardly of the U-shaped strip member.

8. A cross connector according to claim 2, in combination with a modular terminal block, and in which the U-shaped strip members are of such a dimension, in relation to receiving openings in the modular terminal block, that they can be fitted therein by being slightly resiliently compressed.

9. A cross connector according to claim 2, in which said shaping comprises enlargement portions which are each in the shape of part of a cylinder and are formed, in the space within the U-shaped strip member in the connecting limb and the further limb thereof, by outwardly directed curved portions, acting as guide means for the head of the screw, and which are delimited in an abutment-like manner so as to retain the screw in position.

10. A cross connector according to claim 9, in which detent projections are provided externally on the curved portions.

11. A cross connector according to claim 3, in which the common connecting bar portion of the holder members is formed as a sleeve of insulating material which is disposed around the bridging strip.

12. A cross connector according to claim 3, in which the holder members are formed integrally with the common connecting bar portion and are each connected thereto by way of a predetermined fracture position.

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13. A cross connector according to claim 11, in which detent openings are provided in the bridging strip and detent projections are formed on at least one of the inside wall surfaces of the sleeve at a suitable position.

14. A cross connector according to claim 3, in combination with a modular terminal block, and in which receiving slots are provided in the common connecting bar portion in the region of the partitioning walls of a row of the terminal block, said slots being so dimensioned that they receive the partitioning walls with a slight clamping action.

15. A cross connector according to claim 3, in which the holder members are hollow members of square or rectangular cross-section, are each connected at one end to the common connecting bar portion, and each include an aperture for the respective screw to pass through at the other end.

16. A cross connector according to claim 3, in which the screwdriver opening is in the form of a screwdriver guide means which is of circular cross-section and the diameter of which is less than the largest diameter of the screw head.

17. A cross connector according to claim 16, in which the screwdriver guide means opens into a receiving space within the holder member and which is of square or rectangular cross-section, for receiving the screw head.

18. A cross connector substantially as hereinbefore described and illustrated with reference to the accompanying drawings.
