

CONNECTING SET FOR CABLE PAIRS OF THE TELECOMMUNICATION ENGINEERING

The invention relates to a connecting set for cable pairs of the telecommunication engineering according to the preamble of claim 1.

A connecting set of the type referred to is known in the art from DE 28 11 812. In this connecting set, the electrical connectors regularly adapted for ten cable pairs are provided, at their fronts, with holding slots, and the mounting frame is provided with two parallel lines of holding lugs engaging into said holding slots when plugging the electrical connectors on. The clamping slots with the contact slots of the cutting and clamping contact elements for the cable pairs are disposed in two parallel lines in regularly identical heights. The construction of the electrical connectors comprising each two plastic bodies of different configurations is described in more detail in DE 28 04 478. Herein, one line of cutting and clamping contact elements serves for terminating the incoming cable pairs, and the other line of cutting and clamping contact elements for terminating the outgoing cable pairs.

It is disadvantageous, in this prior art connecting set, that the incoming as well as the outgoing cable pairs have to be connected from the same side of the connecting set with the cutting and clamping contact elements, and that it is impossible to remove and replace individual faulty electrical connectors, without interfering with the remaining connectors.

It is therefore the object of the invention to provide a connecting set of the type referred to, wherein connection of the incoming and outgoing cable pairs is possible from different sides of the mounting

frame, and wherein, further, individual faulty electrical connectors can be removed and replaced, without interfering with the remaining connectors.

The solution of this object is achieved by the characterizing features of claim 1. By the symmetrical and identical design of the two partial bodies of each electrical connector and by their latchability with the openings of the mounting frame, the incoming cable pairs can be connected on one side of the mounting frame, and the outgoing ones on the other side. Further, groups of electrical connectors can be disposed in simple way on suitably punched mounting frames in an arbitrary arrangement. It is then possible to remove and replace individual faulty connectors, without interfering with the remaining connectors.

Further advantageous embodiments of the invention are defined in the further subclaims.

In the following, the invention will be described in more detail, with reference to a preferred embodiment of a connecting set for cable pairs of the telecommunication engineering represented in the drawings. There are:

- Fig. 1 a perspective view of the connecting set employing electrical connectors according to the invention,
- Fig. 2 an axial cross-section through a frame carrier forming part of the connecting set according to Fig. 1,
- Fig. 3 a side view of the frame carrier according to Fig. 2,
- Fig. 4 a front view of a frame carrier according to Fig. 1,
- Fig. 5 a front view of a mounting frame integrated in the set according to Fig. 1,

- Fig. 6 a side view of the mounting frame according to Fig. 5,
- Fig. 7 a top view of the mounting frame according to Fig. 6,
- Fig. 8 an enlarged horizontal cross-section of part of the connection between the frame carrier according to Fig. 2 and the mounting frame according to Fig. 5,
- Fig. 9 a perspective view of an electrical connector according to the invention,
- Fig. 10 a top view of the connector according to Fig. 9,
- Fig. 11 a top view of the connector according to Fig. 9,
- Fig. 12 a front view of the connector according to Fig. 9,
- Fig. 13 a cross-section along line 13-13 in Fig. 11,
- Fig. 14 a cross-section along line 14-14 in Fig. 12,
- Fig. 15 a perspective view of disconnect contacts to be mounted into the connector according to Fig. 9,
- Fig. 16 a perspective view of a connecting contact to be mounted into the connector according to Fig. 9,
- Fig. 17 a perspective view of a voltage surge protection to be mounted into the connector according to Fig. 9,
- Fig. 18 a side view of the voltage surge protection according to Fig. 17,

- Fig. 19 a cross-sectional view of the voltage surge protection according to Fig. 17 along line 19-19 in Fig. 17,
- Fig. 20 a perspective view of the internal components of the voltage surge protection according to Fig. 17,
- Fig. 21 a top view of a connecting element of the voltage surge protection,
- Fig. 22 a side view of the connecting element according to Fig. 21,
- Fig. 23 a front view of the connecting element according to Fig. 21,
- Fig. 24 a diagram of a first contact position, wherein a contact element of the voltage surge protection according to Fig. 17 is in engagement with two contact pairs of the connector according to Fig. 9,
- Fig. 25 a diagram of a second contact position, wherein a contact element of the voltage surge protection according to Fig. 17 is in engagement with one contact pair of the connector according to Fig. 9,
- Fig. 26 a diagram of a third contact position, wherein a contact element of the voltage surge protection according to Fig. 17 is in engagement with another contact pair of the connector according to Fig. 9,
- Fig. 27 a top view of a plurality of connecting sets disposed in a telecommunication column and having connectors inserted therein, voltage surge protections being provided at several of said sets.

Referring now to Fig. 1, there is a connecting set 10 shown, allowing the connection between cable pairs assigned to certain telephones or lines to an exchange office.

Connecting set 10 comprises a mounting frame 12 attached at a frame carrier 14, said mounting frame having a longitudinal U-shaped configuration.

From Figs. 5, 6 and 7, it can be seen in more detail that the mounting frame comprises a web area 16 extending in the longitudinal direction and having opposed lateral flanges 18, 20. Web area 16 is provided with two longitudinally extending lines of openings 22 of rectangular shapes. Openings 22 serve for receiving the electrical connectors 24 described below. That is, frame 12 receives two lines of said connectors, one besides flanges 18, 20 each.

Frame carrier 14 shown in Fig. 2 is adapted so to be inserted into base plate 28 of a telephone switch station normally resting on a bottom surface. Carrier 14 includes an upper portion 30 then being above base plate 28, and a downwardly extending cylindrical portion 32 accommodated by an opening 26 in base plate 28. A cable 34, e.g. an underground cable, extends upwardly through portion 32 into carrier 14. A hose 36 is shrunk onto the lower end of portion 32 and onto that portion of the cable by which it enters into portion 32 of the carrier. Hose 36 forms, together with a suitable sealing compound provided within carrier 14 (and in particular within portion 32 thereof), a seal for cable 34 at the entry position to carrier 14. The gap between the outside of portion 32 and the periphery of opening 26 is sealed by a resilient O-ring 40.

Cable 34 includes numerous cable pairs 42 extending through sealing compound 38 downwardly into carrier 14, so to establish connections with individual connectors 24 present at frame 12.

As can particularly be seen from Fig. 5, central web portion 16 comprises, at its lower end, a central cutout 44, so that the sections of web portion 14 extending on either side of said cutout form downwardly extending legs 46, 48.

At the upper portion 30 of frame carrier 14, at opposed sides thereof, holding elements 58, 60 cooperating with legs 46, 48 and fingers 50, 52 are provided, by means of said holding elements mounting frame 12 being loosenably fixed at frame carrier 14. Elements 58, 60 are adapted in substantially identical manner, and the description given with particular reference to Fig. 8, also applies to element 58, and identical reference numerals designate corresponding portions of the elements. Element 60 particularly comprises a horizontally extending, laterally open pocket 62, which is closed, however, at its upper, lower and inner ends by wall portions 62a, 62b, 62c of portion 30 of the frame carrier, as this is shown in broken lines in Fig. 3. Further, the pocket is closed, at both sides thereof, by an inner side wall portion 62d formed at portion 30, and by an outer side wall portion 62e formed at portion 30. Side wall portions 62d, 62e can best be seen in Fig. 8. A tongue 64 formed as one piece together with portion 30 of carrier 14 is connected with wall 62e at a position opposite to the laterally open entrance 62f (Fig. 8) of pocket 62. From this position, tongue 62 extends forwardly besides wall portion 62e, however spaced thereto, and terminates at an outer tongue end 64a.

The inner surface of tongue 64 includes a latch stop 64b, the distance between said latch stops 64b of the tongues of the two elements 58 and 60 being dimensioned such that when placing mounting frame 12 onto frame carrier 14, a latch connection will result. In Fig. 8, the arrangement of mounted frame 12 with respect to element 60 is shown in more detail. Finger 52 is formed according to the shape of pocket 62, and neatly rests in pocket 62, in this illustration. Simultaneously, tongue 64 extends through opening 56 in leg 48 of the frame. Stop 64b is in a position, where

a portion of leg 48 existing between cutout 56 and finger 52 is held between stop 64b and the "front" or outer end of end 65 of wall portion 62e at the entrance 62f of pocket 62.

The distance between stops 64b respectively assigned to elements 58 and 60 at tongues 64 is slightly smaller than distance "A" (Fig. 5) between the opposed inner edges of openings 54, 56. In order to therefore insert frame 12 into frame carrier 14, frame 12 is first uprightly mounted thereon, so that legs 46, 48 will be arranged externally besides the free ends 64a of tongues 64 at elements 58, 60. Then, frame 12 is moved horizontally towards frame carrier 14, the tongues 64 of elements 58, 60 entering into openings 54 or 56, resp., at legs 46, 48. Simultaneously, fingers 50, 52 are introduced into pockets 62 assigned to elements 58 or 60, resp. During the further course of this movement, the inner edges of openings 54, 56 will hit onto inclined inner surfaces 66 of stops 64b, thereby the outer ends of tongues 64 being bent up. This movement will continue, until legs 46, 48 have passed stops 64b, and come to stop at the outer ends 65 of wall portions 62e of the two elements 56, 60. Legs 48 pass stops 64b, and the outer ends of tongues 64 move, due to their natural elasticity, back towards each other into the position illustrated in Fig. 8, where legs 46, 48 are held in elements 58, 60.

For removing frame 12 from frame carrier 14, tongues 64 of the two elements 58, 60 are spread by hand, so that stops 64b can pass openings 54, 56, and frame 12 can be removed, simultaneously fingers 50, 52 being pulled out from tongues 62.

In the position of frame 12 mounted at carrier 14, fingers 50, 52 will provide for that mounting frame 12 is secured against larger movements relative to frame carrier 14. In particular, upwards movements of mounting frame 12 relative to frame carrier 14 are prevented by the engagement of fingers 50, 52 with respective wall portions 62a of elements 58, 60. In the same way, downwards movements are prevented by the

engagement between the fingers and wall portions 62b of elements 58, 60, whereas inwards or outwards movements relative to carrier 14 are excluded because of the described support of legs 46, 48 between stops 64b and outer ends 65 of walls 62e of the respective elements 58, 60.

Connector 24 illustrated in detail in Figs. 9 to 14 is composed of two electrically insulated partial bodies 24a, 24b being adapted as moulded plastic parts and being connected with each other. The mentioned plastic bodies have identical shapes, and are connected through a snap-in connection. In the following description, respectively identical portions of partial bodies 24a, 24b are provided with the same reference numerals. The partial bodies comprise a main body portion 70, with four guide portions in the form of guide projections 72, 74, 76, 78 projecting therefrom. From the cross-sectional representation of the connector can be seen that body portions 70 have a rectangular cross-section, corresponding to the rectangular cross-section of openings 72 in mounting frame 12, however with slightly smaller dimension, so that a connector 24 can be slid in the longitudinal direction of connector 24 - in Fig. 9 designated "x" axis - into the respective opening 22. Body portions 70 together form a housing 70 (Fig. 10) with projections 72, 74, 76, 78 projecting on either side therefrom.

The two partial bodies 24a, 24b are connected through means described below, body portions 70 resting against each other, so that projections 72, 74, 76 of said portions are directed away from the connection surface. The alignment of part 24b relative to part 24a existing in the assembled condition of the two partial bodies is illustrated with reference to the axes "x", "y" and "z", which are arranged vertically to each other, as can be seen in Fig. 9. As mentioned before, axis "x" corresponds to the extension direction of projections 72, 74, 76, 78. Axis "y" represents a "transverse direction" of the connector, whereas axis "z" is a vertical axis. If partial body 24a would be rotated by 180° about the shown "z" axis,

it would be aligned in the same way as partial body 24b in Fig. 9.

Body portions 70 are provided, at their inner ends, each with two flanges 80 extending transversely thereto in the same plane, one at the "upper" main surface and the other at the "lower" main surface. Flanges 80 of partial body 24a are arranged flush with flanges 80 of partial body 24b.

For mounting connector 24 at mounting frame 12, the connector is introduced through an opening 22 such that projections 72, 74, 76, 78 are first slid through said opening, at both ends of the connector, until flanges 80 come to rest against the respective partial body 24a or 24b at the surface of central web portion 16 surrounding said opening.

Partial bodies 24a, 24b are each provided on both sides with resiliently deformable latch elements 81 with a tongue 82. Said tongues have inclined outer surfaces 84. When sliding the connector into opening 22, the lateral surfaces of opening 22 will first come into contact with surface 84 of tongue 82 of that partial body 24a, 24b which is first introduced into opening 22, until they will have passed, during further inwards movements immediately before the position where flanges 80 come to rest against central web portion 16 of mounting frame 12, said opening so far that surfaces 84 have completely been moved through opening 22, and inwardly directed recesses 86 also pass said opening. Now tongues 82 can spring-act towards outside, since they are not held anymore by the side edges of the openings, and the connector is then held in its position by that part of web portion 16 surrounding opening 22 is held between shoulders 86 and flanges 80. Irrespective of whether partial body 24a or partial body 24b is first slid through opening 22, the same result will be obtained.

In order, however, to remove connector 24 again from the receiving opening, if necessary, and to draw it towards outside, the free ends 82a of tongues 82

opposite to surface 82 can be resiliently pressed inwardly towards each other, so that surfaces 84 also move inwardly, far enough to permit tongues 82 to pass opening 22.

As can particularly well be seen from Fig. 9, projections 72, 74, 76, 78 have a substantially rectangular cross-section, disposed, however, such that longitudinally extending side surfaces of the projections, e. g. side surfaces 72a, 74a, 76a, 78a are inclined by 45° , relative to the parallel upper and lower surfaces 90 and 92 of the respective body portion 70. Thereby a gap will result forming a clamping slot 94 between projections 72 and 74, and another gap forming another clamping slot 96 between projections 76, 78. Clamping slot 94 is limited by surfaces 72a, 74a, whereas clamping slot 96 is limited by surfaces 76a, 78a. Within said respective gaps are disposed electrically conductive contacts 98, 100.

Contacts 98, 100 are adapted in the form of "disconnect" contacts, as is shown in Fig. 15. Each contact has a plane cutting and clamping contact element 102, from the inner end of which opposed flanges 104, 106 extend laterally from the plane of cutting and clamping contact element 102, so that they have, together with plane cutting and clamping contact element 102, the illustrated substantially C-shaped cross-section. The free ends of flanges 104, 106 are arranged so that there is formed a gap 108 therebetween. Flanges 104, 106 form each the inner contact portion 105 of respective contact 98, 100, the purpose of which will be described below. Cutting and clamping contact element 102 is bifurcated with two parallel legs 102a, 102b, between which a longitudinal slot being open towards the end of the respective contact, i.e. towards the end opposed to flanges 104, 106, is formed.

Flanges 104, 106 and adjacent cutting and clamping contact element 102 are held within the main body portion 70b of the respective partial body 24a, 24b, cutting and clamping contact element 102 projecting

outwardly between pairs of projections 76, 78 or 72, 74, resp. The central plane of cutting and clamping contact element 102 of contacts 98, 100 extends in the direction of the Z axis specified in Fig. 9, is simultaneously, however, arranged at an angle of 45° relative to opposed flanges 72, 74; 76, 78, between which contacts 98, 100 extend. Thereby, aforementioned clamping slots 94, 96 formed by said surface pairs are also inclined at an angle of 45° to the central planes of cutting and clamping contact elements 102 of contacts 98, 100, and also at an angle of 45° to the horizontal central plane of connector 24. In order that contacts 98, 100 can be held in this way, projections 92, 94, 96, 98 are provided with longitudinal slots 118 (Fig. 13) for receiving the outside edges of cutting and clamping contact elements 102. In this way, contacts 98 are held in clamping slots 94, 96 at one end of connector 24, and contacts 100 are held in clamping slots 94, 96 at the other end of connector 24.

Cutting and clamping contact elements 102 of contacts 98, 100 are disposed in known manner in a fashion suitable for the connection with insulated electrical conductors, the connectors being inserted between a pair of projections 72, 74; 76, 78, and the wire extending, in the representation of Fig. 12, from the end of the connector parallelly to surfaces 72a, 74a; 76a, 78a, and contact slots 110 being dimensioned and legs 102a, 102b being adapted such that legs 102a, 102b will, when pressing the wire into contact slot 110, cut into the insulation of the wire and establish the electrical connection between contact 98, 100 and the wire. As mentioned above, clamping slots 94, 96 are formed between pairs of projections 72, 74; 76, 78, said clamping slots facilitating introduction of the wire into the respective contacts 98, 100. In order that the wire can be held more easily, opposed surfaces 72a, 74a; 76a, 78a of projections 72, 74; 76, 78 are each provided with clamping ribs 112 acting on opposed sides of the wire insulation. Practically, introduction of the wires is most suitably made by using the tool described in Australian patent No. 547,489.

By the described combination of the two partial bodies 24a, 24b, clamping slots 84, 96 at one end of connector 24 - viewed in the longitudinal direction of the connector (i.e. along the "x" axis) - extend at an angle of 90° to clamping slots 94, 96 at the other end. Thereby, torsional effects caused by disconnecting wires at the respective ends of the connector are compensated, since such torsional effects are transferred along contacts 98, 100 or along alternative contacts 120 described below.

The type of connection of the two partial bodies can particularly well be seen in Fig. 14. As described above, the two partial bodies 24a, 24b rest against each other with flanges 80. Main body portions 70 are provided with cutouts 88 at their main surfaces. Resilient latch tongues 91 project from sections 70; they have enlarged outwardly directed hook-type end sections 90a snapping at surfaces 90b behind transversely disposed latch portions 93 formed at sections 70 besides cutouts 88.

Snapping-in of partial bodies 24a, 24b is effected in a manner such that the two partial bodies are moved towards each other, and sections 90a of latch tongues 91 arrive at cutouts 88 and engage with transversely disposed latch portions 93 of the two partial bodies 24a, 24b. Inclined outer surfaces 97 of sections 90a come into engagement with inclined inwardly directed surfaces 95 of sections 93, and press the ends of the latch tongues by kind of a cam effect resiliently inwardly and towards each other, until sections 90a of latch tongues 91 pass, during the sliding movement of flanges 80 of the two partial bodies, transversely disposed latch portions 93, and the free ends of the latch tongues move back outwardly again, due to their natural elasticity, so that sections 90a snap behind transversely disposed latch portions 93. In assembled condition, partial bodies 24a, 24b are tensioned together by that a movement of the two partial bodies away from each other is limited by engagement of inwardly stepped surfaces 90b at latch sections 90a with transversely disposed latch portion

93, whereas a movement of the two partial bodies towards each other is excluded by the abutment of flanges 80 of the two partial bodies 24a, 24b.

Separation of the two partial bodies 24a, 24b is possible, however, by that end sections 90a of the two latches 91 are moved inwardly, in a suitable manner, so that the end sections are freed from openings 88, by a corresponding movement under transversely disposed latch portions 88.

Prior to the assembly of the two partial bodies 24a, 24b, contacts 98, 100 can be inserted from openings at the inner ends of portions 70 into the partial bodies, so that they project through openings 116 at the opposed end of the respective portion 70, that is from the end from which extend projections 72, 74, 76, 78. As described above, portions 102 of the contacts are then between the respective pairs of projections 72, 74 or 76, 78. Although the contacts slide in slots 118 in surfaces 72a, 74a, 76a, 78a of the projections, and are held there in their positions, they cannot fully leave said slots, since slots 118 terminate, as shown in Fig. 13, shortly before the free ends of the projections.

Inwardly, the movement of contacts 98, 100 is limited by locking portions 115 inserted on both sides of connector 24. Locking portions 115 are inserted, prior to the assembly of the two partial bodies, in openings besides openings receiving contacts 98 or 100 of one partial body 24a, 24b, and are then, during assembly of the two partial bodies for accomplishing the assembly group, slid into the respective openings at the respective other partial body. Sidewardly directed sections 115a provided at locking portions 115 will then come between the inner ends of aligned pairs of contacts 98, 100, and separate in this way the contacts of one pair.

Fig. 16 illustrates an alternative "connection" contact 120, which can be arranged in a connector 24, instead of the aforementioned pair of disconnect con-

tacts 98, 100. Contact 120 corresponds, in its basic design, to two disconnect contacts 98, 100 connected at their ends. Connection contacts 120 have, therefore, opposedly directed, plane portions 102, which are slotted, in the same way as portions 102 of contacts 98, 100, and include two pairs of flanges 104, 106 forming each a separate inner contact portion 105 of contact 120. At the inner ends, the two portions 102 are connected with each other, however, over an intermediate section 122 of connection contact 120. Between the free ends of flanges 104, 106, gaps 108 are formed in the same way as for the disconnect contacts. For disconnect contacts 98, 100 inserted into connector 24, there is no electrical connection between the individual contacts 98 and contacts 100 aligned therewith at the opposed end of the connector. When, however, a connection contact 120 is inserted, a connection is established between the electrical terminals generated at the opposed ends of connector 24. Either all pairs of contacts 98, 100 or individual pairs of contacts 98, 100 of connector 24 can be replaced by contacts 120.

Connector 24 includes a central longitudinally extending through-opening 124 extending along longitudinal axis 169 through opposed body portions 70 and terminating each in the surface sections between pairs of projections 74, 76. As can best be seen from Fig. 12, opening 124 is substantially symmetrical, however provided with opposed longitudinally extending slots 126 formed in its periphery on both sides illustrated in the view of Fig. 12, and further with opposed "upper" and "lower" slots 128 also extending in the longitudinal direction of the opening. The diameter of opening 124 is slightly larger than the distance between projections 74, 76, and is continued in the longitudinal direction at the opposed surfaces, by forming there concave cylindrical surfaces 130, 132. Furthermore, sections are formed in said surfaces which extend slots 126. Slots 128, however, terminate between projections 74, 76 in the front surfaces of section 70.

Slots 126 are aligned with gaps 108 between opposed flanges 104, 106 at contacts 98, 100 or 120, so that - as will be described below - electrical terminals for different purposes can be established at the contacts. Fig. 17 shows, in particular, an electrical component with a voltage surge protection unit 129, which can be connected in this way. Voltage surge protection unit 129 is substantially formed as a hollow, box-type housing 131, which may be formed, e.g., of two halves connected in a suitable manner, e.g. by snap connections.

From a surface of housing 131 extends a moulded projection 135 carrying an electrical contact element 134. Said element 134 is oblong and strip-type and - if viewed from the side - substantially U-shaped. This can best be seen in Figs. 19 and 20, in Fig. 20 the internal components of the voltage surge protection unit 129 being shown. Element 134 has, at its extreme end, an outwardly open slot 136, whereby at both ends of said slot, legs 134a, 134b are formed. Element 134 is adapted in slightly resilient manner, and is capable to receive one of flanges 18, 20 at mounting frame 12, and thus to establish an electrical terminal.

Within housing 131 a voltage surge protection device 140 is disposed such that two voltage surge protection devices 144, 146 are disposed longitudinally side by side. Contact element 134 is connected over a suitable electrical conductor 142 to the connection between the two devices 144, 146.

The ends of devices 144, 146 not connected to the conductor 142 are connected over special conductors 148, 150 through terminals 152, 154 of a connecting element 151. Element 151 comprises a mounting portion 156 and a longitudinal cylindrical portion 158 outwardly projecting therefrom. Mounting portion 156 serves as a support for housing 131, and is received in a complementary opening in the outer wall of housing 131. In this mounting position, projection 158 ex-

tends from the housing parallelly besides contact 134, however in a certain distance therefrom.

At projection 158, longitudinally opposed, oblong, rib-type lateral contact elements 160, 162 are provided, which are held in longitudinal slots provided at the outer surfaces and which establish the connection to the respective terminals 152, 154. As is illustrated in the drawing, the contact elements extend in the same way from the surface of projection 158 over the largest part of its length. Elements 160, 162 do not, however, project over the total length of the surface of projection 158. In particular, each element comprises a partial section 160a or 160b, resp., extending from the mounting portion 156 over approximately two thirds of the length of projection 158. At this position, there is in contact elements 160, 162 one cutout 160b, 162b each, where the contact elements do not project over the surface of projection 158. Subsequently to the cutouts, adjacent to the free end of projection 158, end sections 160c, 162c are provided, which again project from the outer surface of projection 158.

Furthermore, projection 158 has, at diametrically opposed positions and - if viewed in axial direction of the connecting element 151 - displaced by 90° relative to the positions of elements 160, 162, opposed, one-piece, non-conductive, rib-type, wedge-connection projections 180, 182, 184, 186, 188, 190. Projections 180, 182, 184 are longitudinally spaced on projection 158, approximately in the central third of the length of projection 158. Projections 186, 188 and 190 are arranged in the same way, however diametrically opposed to projections 180, 182, 184.

In the top view according to Fig. 17, the distance between axis 166 of projection 158 and axis 168 of element 134 are dimensioned so that it corresponds to the distance between the central plane of flanges 18, 20 at mounting frame 12 and axis 168 of opening 124 in connector 24, if the latter is in an opening 22 besides the respective flange 18, 20.

In a cross-section, projection 158 has at, e.g., a position, where both elements 160, 162 project from its surface and a pair of diametrically opposed projections 180, 186 or 182, 188 or 184, 190 are present, a cross-section being complementary to the cross-section of the aforementioned opening 124 in a connector 24. Thereby, unit 129 can be mounted at frame 12 such that unit 129 is moved towards the frame such that one of flanges 18, 20 is introduced into slot 136 in element 134, and is seized by element 134, whereas, simultaneously, projection 158 is introduced, while receiving elements 160, 162 are received in opposed slots 126 of opening 124, into opening 124, the groups of projections 180, 182, 184 or 186, 188, 190, resp., being received in sliding manner in the respective slots 128.

The thickness of elements 160, 162 is selected such that the elements each pass slot 108 between the opposed free ends of flanges 104, 106 of the two adjacent disconnect contacts 98, 100 of connection contact 120 in a connector 24, and can establish the electrical connection with the inner contact portions 105 of contacts 98, 100 or 120, by engaging at the free ends of flanges 104, 106 and bending them resiliently up. The precise arrangement of contact establishment can, however, be varied in that the press-in length of unit 129 in a connector, and thus the measure by which projection 158 is introduced into opening 124, is modified. In Figs. 24, 25 and 26 is shown which consequences different dimensions of the projections will have for two disconnect contacts 98, 100 arranged in line at one side of a connector 24. Clearly an identical connection would also be achieved with the arrangement of the two disconnect contacts at the other side of connector 24. Fig. 24 particularly shows the situation for a projection of smallest dimension. Herein, cutout 160b of element 160 is adjacent to flanges 104, 106 of a "front" disconnect contact 100 (i.e. of the contact at that end of connector 24, into which projection 158 has been introduced), whereas section 160c is pressed into the gap between the free ends of flanges 104, 106 of a "rear-side" disconnect

contact 100, and contact to such contact has been established. In this condition, one of the two voltage surge devices 144, 146 is connected in parallel with disconnect contact 100 and earth (i.e. frame 12), whereas no such connection exists from disconnect contact 98 over the other device 144, 146.

Fig. 25 shows a condition, where with further inwards movement of projection 158, cutout 160b will come to rest adjacent to flanges 104, 106 of the rear-side disconnect contact 100, whereas the contact is established between section 160a and front disconnect contact 98. In this way, then the other one of the two devices 144, 146 is connected with the disconnect contact and earth, whereas a corresponding connection to disconnect contact 100 is not established.

When finally projection 158 is fully pressed into connector 24, the slightly longer section 160a will establish the contact with the two disconnect contacts 98, 100, so that both devices 144, 146 are connected by disconnect contacts 98, 100 to earth.

Projections 180, 182, 184, 186, 188 and 190 serve, in conjunction with a (non-shown) latch within connector 24, for locking the three described positions.

The described arrangement permits the parallel connection of a multitude of connecting sets 100 in a circular pattern, as shown in Fig. 27. In this arrangement, the "rear-side" surfaces of frames 12 are showing towards inside and flanges 18, 20 towards outside. The connections from an exchange station over cable pairs 42 described above can be established at the rear-side surfaces of frames 12, in particular at the ends of connectors 24, which after mounting at the frame project through the latter towards inside. Then, at the "outer" surfaces of frames 12, bridging wires can be provided between contacts 98, 100 or 120 of the connectors. According to Fig. 1, U-shaped holding elements 170, 172 and a vertical stand 174 can be

provided for better holding the wires used for the establishment of the terminals described above.

In the described arrangement, frames 12 can be loosened from frame carriers 14 at the lower end, and be tilted towards outside by swinging them completely about their lower ends, so that the sides resting against the inner surfaces of the connector are easily accessible.

According to a non-shown alternative embodiment, carriers 12 are pivotingly connected at their lower ends with frame carriers 14.



PATENT CLAIMS

1. A connecting set for cable pairs of the telecommunication engineering, having electrical connectors each composed of two plastic bodies and cutting and clamping contact elements inserted therein, the contact slots of said electrical connectors projecting into clamping slots for said cable pairs, and having a mounting frame for receiving said electrical connectors,

wherein each partial body (24a, 24b) is formed in identical manner and receives a pair of cutting and clamping contact elements (102),

wherein each partial body (24a, 24b) has, on its base surface opposed to the clamping slots (94, 96), connecting elements (88, 91) for connecting two partial bodies (24a, 24b), thus forming a housing (75), and

wherein said housing (75) is provided with two opposed external surfaces with latch devices (81) and can loosenablely latched in an opening (22) of the mounting frame (12), so that the two partial bodies project on both sides from the mounting frame (12).

2. A connecting set according to claim 1,

wherein said housing (75) is formed of housing portions (70) connected with each other of said partial bodies (24a, 24b),

wherein said partial bodies (24a, 24b) are held together by the cooperating openings (88) and latch tongues (91) forming said connecting elements, and

wherein each partial body (24a, 24b) is provided with one opening (88) and with one latch tongue (91).



3. A connecting set according to claim 1 or 2, wherein said clamping slots (94, 96) for the cable pairs (42) are each formed between a pair of guide projections (72, 74; 76, 78) disposed at an angle of approximately 45° to a central plane ((14-14)/Fig. 12) extending in the longitudinal direction of the connector (24), so that the cutting and clamping contact elements (102) extend in parallel to the central plane of said connector (24).

4. A connecting set according to one of claims 1 to 3,

wherein said clamping slots (94, 96) each formed between one pair of guide projections (72, 74; 76, 78) extend at an angle of 90° to said clamping slots (96) each formed between the other pair of said guide projections.

5. A connecting set according to one of claims 1 to 4,

wherein in said housing (75) of the electrical connector (24) formed of said two partial bodies (24a, 24b), an opening (124) is provided, through which an electrical component with a projection (158) extending outwardly and carrying a lateral contact element (160) for establishing a connection with an internally provided contact portion (105) electrically coupled with at least one of said cutting and clamping contact elements (102) can be inserted.

6. A connecting set according to claim 5,

wherein said cutting and clamping contact elements (102) are disposed in the longitudinal direction of the electrical connector (24), and

wherein at said cutting and clamping contact elements (102) one internally provided contact portion (105) each is formed and positioned such that the lateral contact element (160) can optionally be contacted with one of said cutting and clamping contact elements (102) or with both cutting and clamping contact ele-



ments (102), depending on how far said projection (158) of the electrical component is inserted into the opening (124).

7. A connecting set according to one of claims 1 to 6,

wherein said mounting frame (12) is mounted in a vertically extending frame carrier (14) for receiving the cable pairs in turn being guided vertically to the electrical contacts (98, 100; 120) of the electrical connectors (24), and

wherein said mounting frame (12) can be pivoted, by bending the cable pairs (42) besides the frame carrier (14) and by loosening the connection between the mounting frame (12) and the frame carrier (14), whereby an electrical connection with the contact at the side opposed to said frame (12) is freely accessible from a point at one side of the connecting set (10).

8. A connecting set according to claim 7,

wherein at said frame carrier (14), laterally disposed holding elements (58, 60) for loosenablely receiving said mounting frame (12) are supported, the mounting frame (12) including downwardly extending legs (46, 48) with openings (54, 56) provided therein, and said holding elements (58, 60) including resilient tongues (64), which can be inserted by moving the mounting frame (12) into said openings (54, 56), whereby said tongues (64) are resiliently deformed, until a latch condition is achieved, wherein stops (64b) at said resilient tongues (64) lock the mounting frame (12) at said frame carrier (14).

9. A connecting set according to claim 8,

wherein said holding elements (58, 60) comprise pockets (62) and said mounting frame (12) is provided with fingers (50) which can, during the movement of the mounting frame (12) for inserting the tongues (64) into the openings (54, 56), be introduced into said



pockets (62) in the holding elements (58, 60), and thus fix the mounting frame (12) at said frame carrier (14).

10. A connecting set according to claim 9, wherein said mounting frame (12) has a channel-type shape and includes a central web portion (16) as well as opposed flanges (18, 20), said legs (46, 48) being formed on either side of a cutout (44) at one end of the mounting frame (12) and enclose sections of the web portion (16) of the mounting frame (12) disposed on either side of said cutout (44), and said openings (54, 56) being provided in said sections.

11. A connecting set according to claim 10, wherein said web portion (16) is bent off at opposed internal edges of the legs (46, 48) from the plane of the remaining sections of the web portion (16), in order to form fingers (50, 52) extending substantially parallelly to the flanges (18, 20), however at the side of the web portion (16) opposed to said flanges (18, 20).

12. A connecting set according to one of claims 7 to 11,

wherein in said web portion (16) of said mounting frame (12), fastening openings (22) are provided in a line-type pattern in the longitudinal direction of the mounting frame (12), one line each being disposed besides the flanges (18, 20), and the electrical connectors (24) being loosenably mounted in said fastening openings (22).

13. A connecting set according to one of claims 1 to 12,

wherein an electrical component for establishing an electrical connection with the cutting and clamping contact elements (102) of the connector (24) can be



connected at the flanges (18, 20) of said mounting frame (12),

wherein a projection (158) of said electrical component is inserted into the opening (124) and the connection is established by the contact of a lateral contact element (160) of said projection (158) of said electrical component with an internal contact portion (105) in the housing (75) of the connector (24), an adjacent flange (18, 20) of said mounting frame (12) being disposed, relative to the connector (24), such that during insertion, another electrical connection can be established by the respective flange (18, 20) coming into engagement with another contact element (134) provided at said electrical component.

14. A connecting set according to one of claims 1 to 13,

wherein said cutting and clamping contact elements (102) are formed at separated electrical contacts (98, 100) of the connector (24), at each of said contacts (98, 100) a corresponding contact portion (105) being formed.

15. A connecting set according to claim 14,

wherein the electrical component (129) can be positioned at said mounting frame (12) such that a flange (18, 20) is seized by the other contact element (134), and said projection (158) of said electrical component for establishing an electrical connection between the lateral contact element (160) at the projection of said electrical component and said contact portion (105) of the contact (98, 100) is introduced into the opening (124) of the connector (24).

16. A connecting set according to claim 15,

wherein said lateral contact element (160) is adapted in the form of a rib-type, longitudinally extending element with spaced sections (160a, 160c) in the extension direction of said projection (158) of said electrical component, by means of said sections



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(160a, 160c) of said lateral contact element, depending on the length by which the projection of said electrical component is introduced into the opening (124) of the electrical connector, a multitude of contact portions (105) disposed within the connector (24) and spaced to each other along the opening (124) being selectively contacted.

17. A connecting set according to claim 16,
wherein the electrical component (131) is composed of a voltage surge protection unit with at least one surge arrester (144, 166) being connected from said contact element (134) with said lateral contact element (160).