

WIRE CONNECTOR FOR CABLE WIRES

The invention relates to a wire connector for cable wires, in particular for the telecommunication, according to the preamble of claim 1.

A wire connector of the mentioned species is known in the art from DE-23 28 505 A1. Therein, cutting and clamping contacts are inserted, in the longitudinal centre of the lower housing portion, into two parallel guide channels. Further, two upper housing portions are provided, being connected to the lower housing portion over film hinges, said upper housing portions pressing, when latching with the lower housing portion, the cable wires inserted into the contact slots of the cutting and clamping contacts by means of the press-in webs into the contact slots of the cutting and clamping contacts. In this way, either a connecting splice between two cable wires passing through the wire connector, or a branching splice can be formed, wherein only one cable wire passes through the wire connector, whereas the other cable wire has to be cut off outside the wire connector.

For generating a connecting splice from this branching splice, the other cable wire has, then, also to be cut off, behind the cutting and clamping contact.

It is disadvantageous, herein, that for cutting the cable wires off, special cutting tools are required, and that there is a risk of short-circuits when cutting-off.

Furthermore, another wire connector for telecommunication cables is known from DE 32 00 213 A1, wherein separating knives are assigned to the cutting and clamping contacts. When closing the wire connector

by means of the upper housing portion, the cable wires are, on one hand, pressed into the contact slots of the cutting and clamping contacts by press-in webs, and are, on the other hand, cut off to length by means of the separating knives. It is disadvantageous, herein, that both cable wires are cut simultaneously off, such that only one connecting splice can be formed.

It is therefore the object of the invention to provide a wire connector of the kind referred to, which can be used for forming a connecting splice as well as for forming a branching splice, without the need of special tools for cutting the cable wires off.

The solution of this object is achieved by the characterizing features of claim 1. By using an upper housing portion being latchable in two different positions with the lower housing portion, it is possible to form, on one hand, a connecting splice, and on the other hand, a branching splice, the separating webs cooperating with the separating knives in only one position of the upper housing portion to form the connecting splice, and not cooperating with the separating knives in the other position of the upper housing portion such that the cable wires are not cut off for forming a branching splice.

For converting a branching splice into a connecting splice, an additional separating element is placed on the lower housing portion, said separating element being provided with separating webs for separating the cable wires passing through the wire connector. In this way, a conversion of a branching splice into a connecting splice is possible without the use of tools.

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 three embodiments of a wire connector for cable wires represented in the drawings. There are:

- Fig. 1 an in part broken top view of the first embodiment of the wire connector as a connecting splice,
- Fig. 2 a longitudinal section according to line II-II in Fig. 1,
- Fig. 3 an in part broken top view of the first embodiment of the wire connector as a branching splice,
- Fig. 4 a longitudinal section according to line IV-IV in Fig. 3,
- Fig. 5 an in part broken top view of the first embodiment of the wire connector as a branching splice, converted into a connecting splice by means of a separating element,
- Fig. 6 a longitudinal section according to line VI-VI in Fig. 5,
- Fig. 7 the bottom part of the upper housing portion and of the separating element in the first embodiment,
- Fig. 8 an in part broken top view of the second embodiment of the wire connector as a connecting splice,
- Fig. 9 the view A in Fig. 8,
- Fig. 10 a longitudinal section through the wire connector forming a connecting splice according to Fig. 8,
- Fig. 11 a longitudinal section through the wire connector forming a branching splice according to Fig. 8,
- Fig. 12 a longitudinal section through the wire connector according to Fig. 8 with additionally snapped-on separating element for convert-

ing the branching splice into a connecting splice,

Fig. 13 a longitudinal section through the wire connector according to Fig. 8 forming a connecting splice, in the third embodiment, and

Fig. 14 a longitudinal section through the wire connector according to Fig. 13.

In the first embodiment according to Figs. 1 to 7, the wire connector consists of a lower housing portion 1, an upper housing portion 2 latchable onto said lower housing portion 1, and a separating element 3 also latchable onto said lower housing portion 1, of cutting and clamping contacts 5 inserted into the guide channels 4 of the lower housing portion 1, and of separating knives 6. The lower housing portion 1, the upper housing portion 2, and the separating element 3 are made of plastic. The cutting and clamping contacts 5 and the separating knives 6 are made of electrically conductive, metal material.

The lower housing portion comprises four adjacent guide channels 4 for introduction and connection of two pairs of cable wires 7, 8. The cutting and clamping contacts 5 and the separating elements 6 arranged spaced to each other in a guide channel 4 are connected to each other over a web 9 (Fig. 2). In each guide channel 4, a support wall 10, 11 each for the cable wires 7, 8 is formed before and behind the cutting and clamping contacts 5 or the separating knives 6, resp. The cutting and clamping contacts 5 of two adjacent guide channels 4 are electrically conductively connected to each other.

The cutting and clamping contacts 5 are arranged at an angle α between 30° and 60° with respect to the longitudinal axis of the guide channels 4, two adjacent cutting and clamping contacts being arranged at opposed angles α and staggered to each other in longitudinal direction of the guide channels 4.

The upper housing portion 2 is latchable in two different positions with respect to the lower housing portion 1; for this purpose, the upper housing portion 2 has to be turned by 180° about its vertical axis, with respect to the lower housing portion 1. The upper housing portion 2 is provided, on its underside, with press-in webs 12 for the cable wires 7, 8, said press-in webs 12 extending in parallel to the guide channels 4. The press-in webs 12 form cross slots for the area of the cutting and clamping contacts 13, said cross slots 13 allowing the penetration of the cutting and clamping contacts 5 under simultaneous pressing-in of the cable wires 7, 8 into the contact slots of the cutting and clamping contacts 5. The press-in webs 12 form, with their extensions, separating knives 14 with separating slots 15, into which the separating knives 6 engage.

For forming the wire connector as a connecting splice, the upper housing portion is snapped, according to Figs. 1 and 2, onto the lower housing portion 1 such that the separating slots 15 can accommodate the separating knives 6, and that the cross slots 13 can accommodate the cutting and clamping contacts 5. The cable wires 7, 8 to be connected are inserted into the guide channels 4 of the lower housing portion 1, and are, when pressing-on and latching the upper housing portion 2 by means of the press-in webs 12, pressed into the contact slots of the cutting and clamping contacts 5, and are simultaneously cut off by means of the separating webs 14 at the separating knives 6, such that a connecting splice is formed between the pairs of cable wires 7, 8. The support walls 10 within the guide channels 4 are deformed during this action, as shown in Fig. 2.

In Figs. 3 and 4, the wire connector is shown in the first embodiment as a branching splice. For this purpose, the upper housing portion 2 is latched with the lower housing portion 1 in a position turned by 180° about its vertical axis. As shown in Fig. 4, the separating webs 14 do not come into engagement with the separating knives 6, but the separating webs 14 do

press only the cable wires 7, 8 into the lower housing portion 1. On the longitudinal side of the upper housing portion 3, opposite to the separating webs 14 and separating slots 15, further separating webs 16 with separating slots 17 formed as one piece with the upper housing portion 1 are provided for every second guide channel 4, said separating webs 16 coming into engagement with every second cable wire 7, 8, and cutting them off. For the two other cable wires 7, 8, elastic lugs 20 only are shaped at the upper housing portion 2, said lugs 20 just holding the cable wires in the lower housing portion 1, without being capable, however, to press the cable wires 7, 8 against the separating knives 6. Thus, only the cable wires 8 are cut off by means of the additional separating webs 16, whereas the cable wires 7 are passed through the wire connector without being separated. Thereby results a branching splice between the passed-through cable wire 7 and the cut-off cable wire 8 being electrically connected to the cable wire 7.

Figs. 5 and 6 show the conversion of the branching splice according to Figs. 3 and 4 into a connecting splice. For this purpose, the separating element 3 is, in addition to the upper housing portion 2, snapped onto the lower housing portion 1. The separating element 3 exhibits additional separating webs 18 with separating slots 19 and cuts 21 between the separating webs 18, into which the additional separating webs 16 of the upper housing portion 2 penetrate. By means of the additional separating webs 18 of the separating element 3, now the cable wires 7 are cut off, too, the separating webs 18 engaging with their separating slots 19 over the separating knives 6, as shown in Fig. 6. Thereby results a connecting splice between the respective adjacent cable wires 7 and 8.

Fig. 7 shows a bottom view of the upper housing portion 2 and the separating element 3 of the wire connector. Approximately in the centre of the combination of upper housing portion 2 and separating element 3 being in operational position, the alternately staggered cross slots 13 are disposed, into

which penetrate the cutting and clamping contacts 5. In Fig. 7, on the right-hand side of the press-in webs 12, the separating webs 14 with the separating slots 15 are disposed, and on the left-hand side of the press-in webs 12, the separating webs 16 with the separating slots 17 are disposed. The two additional separating webs 16 are accommodated by the cuts 21 of the separating element 3. The respective lugs 20 arranged alternately to the additional separating webs 16 at the upper housing portion 2 cover the separating webs 18 with the separating slots 19 of the separating element 3. As shown in Fig. 6, the lugs 20 are driven away by the separating webs 18 of the separating element 3, so that the separating slots 19 of the separating webs 18 can come into operational connection with the separating knives 6.

The upper housing portion 2 includes, on its two narrow sides, two snap-in webs 22 each, capable to engage into correspondingly adapted snap-in slots 23 of the lower housing portion 1, and latching therein. Correspondingly, the separating element 3 includes, on both narrow sides, one snap-in web 24 each, also engaging into the snap-in slots 23 of the lower housing portion 1 in latching manner.

The second embodiment of the wire connector is shown in Figs. 8 to 10. It consists of a lower housing portion 31 and of two identical upper housing portions 32 latchable with the lower housing portion 31, and of a separating element 33 latchable with the lower housing portion 31. The lower housing portion 31, the upper housing portions 32 and the separating element 33 are made of plastic. In the lower housing portion 31, four rectilinearly passing, groove-type guide channels 34 for cable wires 37, 38 are provided. To the guide channels 34, tongues 45 on the narrow sides of the lower housing portion 31 are assigned for holding the cable wires 37, 38 inserted into the guide channels 34.

In the centre area of the rectilinearly passing, groove-type guide channels 34, two cutting and clamping contacts 35 each are inserted in two parallel rows

40, 41, the connecting webs 39 of which forming separating knives 36 in the longitudinal centre of the guide channels 34. The cutting and clamping contacts 35 arranged at angles α between 30° and 60° with respect to the longitudinal axis of the guide channels 34 are formed by two legs, between which the actual contact slot extends. Both legs are supported in the side walls of the guide channels 34. The separating knives 36 are formed by lugs extending rectangularly from the connecting webs 39. The two cutting and clamping contacts 35 of each row 40, 41, the centrally disposed separating knife 36 and the connecting webs 39 are, thus, formed as one piece of metal, electrically conductive material. The row of separating knives 36 is, then, disposed accurately centrally between the rows 40, 41 of the cutting and clamping contacts 35.

In its cross-section, each upper housing portion 32 is approximately U-shaped and latchable by means of snap-in hooks 46 behind latches 47 on the lower housing portion 31. On its inner side, each upper housing portion 32 comprises press-in webs 42 with cross slots 43, into which the cutting and clamping contacts 35 can penetrate when snapping the upper housing portion 32 on. The press-in webs 42 disposed on both sides of the cross slots 43 press onto the cable wires 37, 38, in order to press them into the contact slots of the cutting and clamping contacts 35. One the longitudinal side wall of each upper housing portion 32 forms a shear-off edge 48, which may rest against the separating knives 36. Thus, the distance between the longitudinal side wall of the upper housing portions 32 forming the shear-off edge 48 and the centre of the cross slots 43 for accommodation of the cutting and clamping contacts 35 of each upper housing portion 32 is identical to the distance of the row of separating knives 36 to the two rows 40, 41 of the cutting and clamping contacts 35. The distance of the other longitudinal side walls of each upper housing portion 32 to the cross slots 43 is considerably smaller.

Each upper housing portion 32 includes, further, on its upper side grooves 49 extending obliquely to the longitudinal side wall provided with the shear-off edge 48 for guiding branched cable wires 37, 38. Further, on the underside of the lower housing portion 31, a web 50 with a through-opening 51 for a cable binder is formed.

The described wire connector in the second embodiment is used, under reference to Figs. 8 to 10, for generating a connecting splice as follows. First, the cable wires 37 of a cable to be connected are inserted into the guide channels 34 of the left-hand section of the lower housing portion 31, the holding tongues 45 fixing the cable wires 37, and the cable wires 37 being, further, laid over the contact slots of the cutting and clamping contacts 35 of the left-hand row 40 and over the separating knives 36. Subsequently, the upper housing portion 32 represented in the left-hand side of Fig. 8, is latched on, the press-in webs 32 pressing the cable wires 37 into the contact slots of the cutting and clamping contacts 35, the cutting and clamping contacts 35 engaging into the cross slots 43 of the upper housing portion 32, and further, the shear-off edge 48 of the upper housing portion 32 cutting the free ends of the cable wires 37 at the separating knives 36 smoothly off. Subsequently, the right-hand upper housing portion 32 is placed on in the same manner, the cable wires 38 of the further cable to be connected being contacted with the cutting and clamping contacts 35 of the right-hand row 41, and being, simultaneously, cut off at the separating knives 36. Over the connecting webs 39 of each pair of cutting and clamping contacts 35, thus, associated pairs of cable wires 37, 38 are conductively connected. Several cable connectors can be connected to each other by means of a plastic strip as a cable binder being pulled through the through-openings 51 of each lower housing portion 31.

In the following, based on Figs. 11 and 12, the generation of a branching splice with the wire connector in the second embodiment is described in more de-

tail. Herein, the cable wires 37 of the cable to be connected are connected in the same way by means of the left-hand cover part 32, as it has been described for generating a connecting splice based on Figs. 8 to 10. The cable wires 38 of the further cable to be connected are then placed over the left-hand upper housing portion 32 being already snapped-in, said cable wires 38 being guided through the grooves 49 on the upper side of the left-hand upper housing portion 32. The cable wires 38 are, then, conductively connected to the cutting and clamping contacts 35 of the right-hand row 41 by means of the further upper housing portion 32, being, however, in contrast to Figs. 8 to 10, turned by 180° about its vertical axis, latched with the lower housing portion 31, such that the longitudinal side wall of the right-hand upper housing portion 32 provided with the shear-off edge 48, is arranged spaced to the centre row of separating knives 36. In this way, a branching splice is formed, in which the ends of the cable wires 37 are electrically connected to the passing-through cable wires 38.

For generating a by-pass splice, now, from the branching splice again a connecting splice can be formed. For this purpose, into the free space formed by the distance 52 between the two upper housing portions 32, the separating element 33 is inserted, said separating element 33 being provided with a shear-off edge 53 cooperating with the row of separating knives 36. In this way, the cable wires 38 of the right-hand side can be smoothly cut off, too. The separating element 3 can, in a manner not shown in detail here, be fastened to the upper housing portion 32 by means of a film hinge.

The wire connector in the third embodiment according to Figs. 13 and 14 is, basically, identical to the wire connector in the second embodiment. In contrast hereto, however, in the longitudinal centre of the lower housing portion 51, two rows of separating knives 55 are formed, which, in turn, are formed as lugs of one piece together with the webs 69 of the cutting and clamping contacts 65. The cutting

and clamping contacts 65 are inserted into the guide channels 64 of the lower housing portion 61. In contrast to the second embodiment, at the undersides of the separating webs 74, one separating slot 75 each is formed, cooperating with one of the two rows of separating knives 66, in order to separate a cable wire 67, 68. Additionally, at the longitudinal side wall assigned to the separating slots 75 of each upper housing portion 62, a spring-elastic cover lug 70 is mounted, being formed as one piece with the upper housing portion 62.

Fig. 13 shows the embodiment of a connecting splice, wherein the two upper housing portions 62 each cooperate, with their separating slots 75, with the separating knives 66 of the two rows, the spring-elastic lugs 70 closing the free space between the upper housing portions 62.

In Fig. 14, the wire connector in the third embodiment is shown as a resolved branching splice. Herein, the upper housing portion 62 shown on the left-hand side is latched on in the same way as the upper housing portion 62 represented in Fig. 13. The upper portion shown on the right-hand side of Fig. 14 is, turned by 180° about its vertical axis, latched onto the lower housing portion 61, the separating slots 75 not coming into engagement with the right-hand side of the separating knives 66. Between the two upper housing portions 62, there is a larger distance 82, into which the separating element 63 is inserted, said separating element 63 being latched with the lower housing portion 61 in the same way as the upper housing portions 62. On the underside of the separating element 63, a separating slot 77 is formed, cooperating with the row of separating elements 66 remaining free, in order to cut off, here, a cable 68 first passed-through for forming the connecting splice. The separating element 63, too, is provided with elastic cover lugs 60 being formed on either side of the separating element 63.



PATENT CLAIMS

1. A wire connector for cable wires, in particular for the telecommunication, comprising a lower housing portion (1, 31, 61) with at least two guide channels (4, 34, 64) for the cable wires (7, 8; 37, 38; 67, 68), at least one upper housing portion (2, 32, 62) to be snapped-in into the lower housing portion (1, 31, 61), cutting and clamping contacts (5, 35, 65) inserted into the guide channels (4, 34, 64) of the lower housing portion (1, 31, 61) and provided with contact slots, the cutting and clamping contacts of two correlated guide channels (4, 34, 64) being electrically connected to each other, and press-in webs (12, 42) for the cable wires formed at the underside of the upper housing portion (2, 32, 62) and cooperating with the contact slots of the cutting and clamping contacts (5, 35, 65),

characterized by that in each guide channel (4, 34, 64), a separating knife (6, 36, 66) for the cable wires (7,8; 37, 38; 67, 68) is arranged,

that the upper housing portion (2, 32, 62) comprises separating webs (14, 16, 18; 74) at its underside, and

that the upper housing portion (2, 32, 62) is latchable in two different positions with respect to the lower housing portion (1, 31, 61), the separating webs 14, 16, 18; 74) cooperating in one position only with the separating knives (6, 36, 66).

2. A wire connector according to claim 1, characterized by that the upper housing portion (2, 32, 62) turned by 180° about its vertical axis is latchable with the lower housing portion (1, 31, 61).

3. A wire connector according to claim 1 or 2, characterized by that the cutting and clamping contacts (5, 35, 65) and the separating knives (6, 36,



66) are formed as one piece from electrically conductive, metal material.

4. A wire connector according to one of claims 1 to 3,

characterized by that the cutting and clamping contacts (5, 35, 65) are inserted into the guide channels (4, 34, 64) at an angle α with respect to the longitudinal axis of said guide channels.

5. A wire connector according to claim 4, characterized by that the angle α is between 30° and 60°.

6. A wire connector according to one of claims 1 to 5,

characterized by that two adjacent cutting and clamping contacts (5, 35, 65) are arranged at opposed angles α and are staggered to each other in the longitudinal direction of the guide channels (4, 34, 64).

7. A wire connector according to one of claims 1 to 6,

characterized by that the press-in and separating webs (12, 14, 16, 18; 42; 74) are formed from longitudinal webs arranged on the underside of the upper housing portion (2, 32, 62), said longitudinal webs being provided approximately in the longitudinal centre with slots (13, 43) for engagement of the cutting and clamping contacts (5, 35, 65) and at their ends with slots (15, 17, 19; 75, 77) for engagement of the separating knives (6, 36, 66).

8. A wire connector according to claim 7, characterized by that every second longitudinal web is replaced at one end of the upper housing portion (2, 32, 62) by an elastic lug (20, 70).



9. A wire connector according to one of claims 1 to 8,

characterized by that a separating element (3, 33, 63) is provided for latching with the lower housing portion (1, 31, 61) after snapping the upper housing portion (2, 32, 62) on, and is formed with two press-in webs (18, 74) provided with slots (19, 77) for engagement of the separating knives (6, 36, 66), said press-in webs (18, 74) being provided for every second guide channel (4, 34, 64) only.

10. A wire connector according to one of claims 1 to 9,

characterized by that the guide channels (34, 64) for two cable wires (37, 38; 67, 68) are arranged in the longitudinal direction of the lower housing portion (31, 61) axially behind each other,

that the cutting and clamping contacts (35, 65) are arranged in two spaced rows (40, 41) extending transversely over the lower housing portion (31, 61),

that in the lower housing portion (31, 61), transversely to the longitudinal axis of the guide channels (34, 64), between the two rows (40, 41) of cutting and clamping contacts (35, 65), at least one row of separating knives (36, 66) is arranged,

that to each row of cutting and clamping contacts (35, 65), one upper housing portion (32, 62) is assigned, and

that the upper housing portions (32, 62) are latchable with the lower housing portion (31, 61) in two different positions above the respective row (40, 41) of cutting and clamping contacts (35, 65).

11. A wire connector according to claim 10, characterized by that to each upper housing portion (32, 62), a shear-off edge (48) to be set to the row of separating knives (36, 66) is assigned.



12. A wire connector according to claim 11, characterized by that the shear-off edge (48) is formed at one longitudinal side wall of the upper housing portions (32, 62).

13. A wire connector according to claim 11, characterized by that the shear-off edge (48) is formed at a separating element (33, 63) insertable between a longitudinal side wall of an upper housing portion (32, 62) and the row of separating knives (36, 66).

14. A wire connector according to one of claims 11 to 13, characterized by that the separating element (33, 63) is fastened by means of a film hinge to the longitudinal side wall of the upper housing portion (32, 62).

15. A wire connector according to one of claims 10 to 14, characterized by that the separating knives (36, 66) are arranged at the connecting web (39, 69) of the cutting and clamping contacts (35, 65).

16. A wire connector according to one of claims 10 to 15, characterized by that on the upper sides of the upper housing portion (32, 62), grooves (49) extending obliquely to the longitudinal side wall provided with the shear-off edge (48) are formed for guiding branched cable wires (37, 38; 67, 68).

17. A wire connector according to one of claims 10 to 16, characterized by that in the lower housing portion (31, 61), transversely to the longitudinal axis of the guide channels (34, 64) between the two rows (40, 41) of cutting and clamping contacts (35, 65),



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two spaced rows of separating knives (36, 66) are arranged, and that on the underside of each upper housing portion (32, 62), a separating slot (75, 77) to be pressed onto the rows of separating knives (36, 66) is arranged.

18. A wire connector according to claim 17, characterized by that the separating slot (75, 77) is arranged on the underside of a separating element (33, 63) to be placed between two upper housing portions (32, 62) on a row (40, 41) of cutting and clamping contacts (35, 65).

19. A wire connector according to one of claims 17 or 18,

characterized by that at the side wall of each upper housing portion (32, 62) assigned to the separating slot (75, 77), a spring-elastic lug (70) is arranged.

20. A wire connector according to claim 18, characterized by that on both side walls of the separating element (33, 63), elastic lugs (70) are arranged.