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 [21] Appl. No. **79,458**
 [22] Filed **Oct. 9, 1970**
 [45] Patented **Jan. 11, 1972**
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[54] **CONNECTING DEVICE**
9 Claims, 9 Drawing Figs.

[52] U.S. Cl. **174/88 R,**
174/92, 339/98
 [51] Int. Cl. **H02g 15/08**
 [50] Field of Search **174/88 R,**
84 S; 339/95, 97 R, 98, 99

[56]

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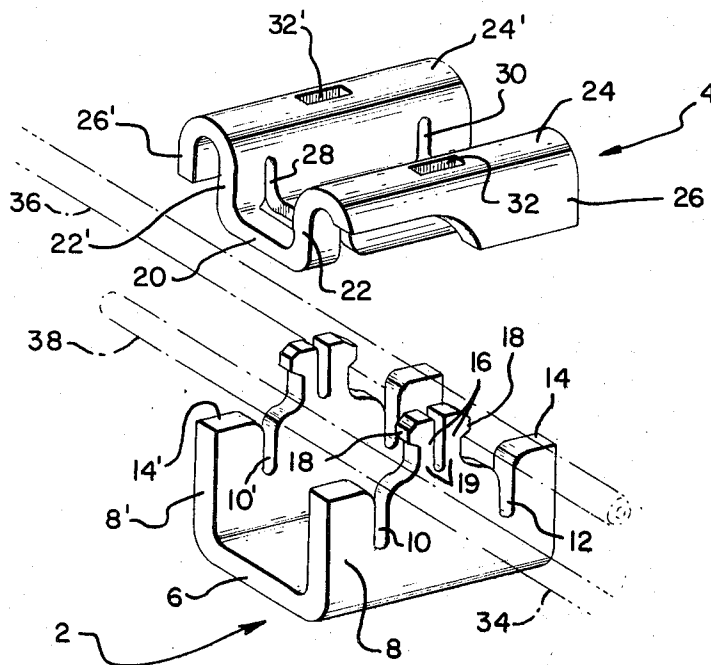
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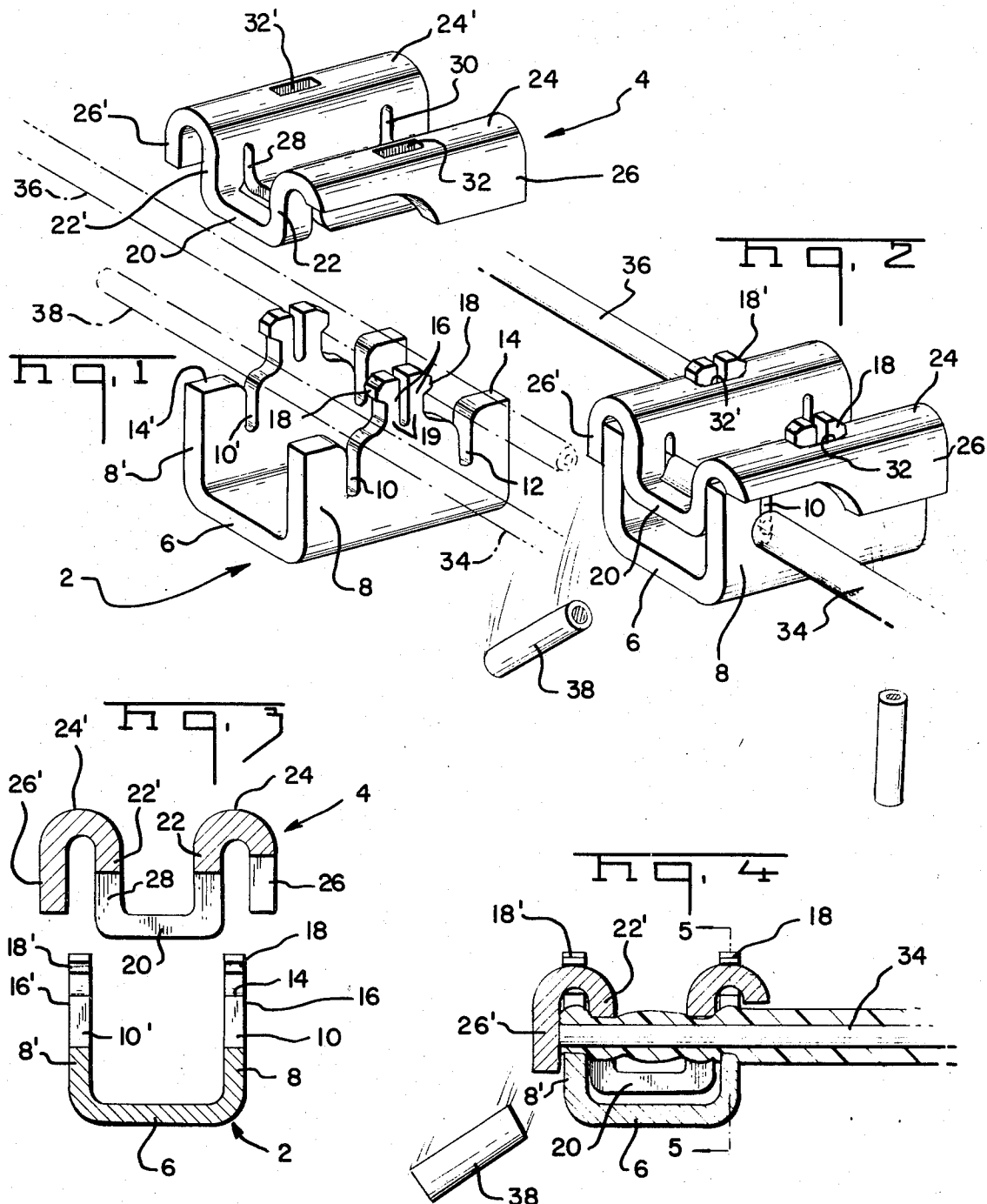
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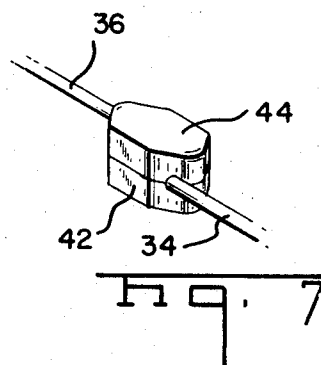
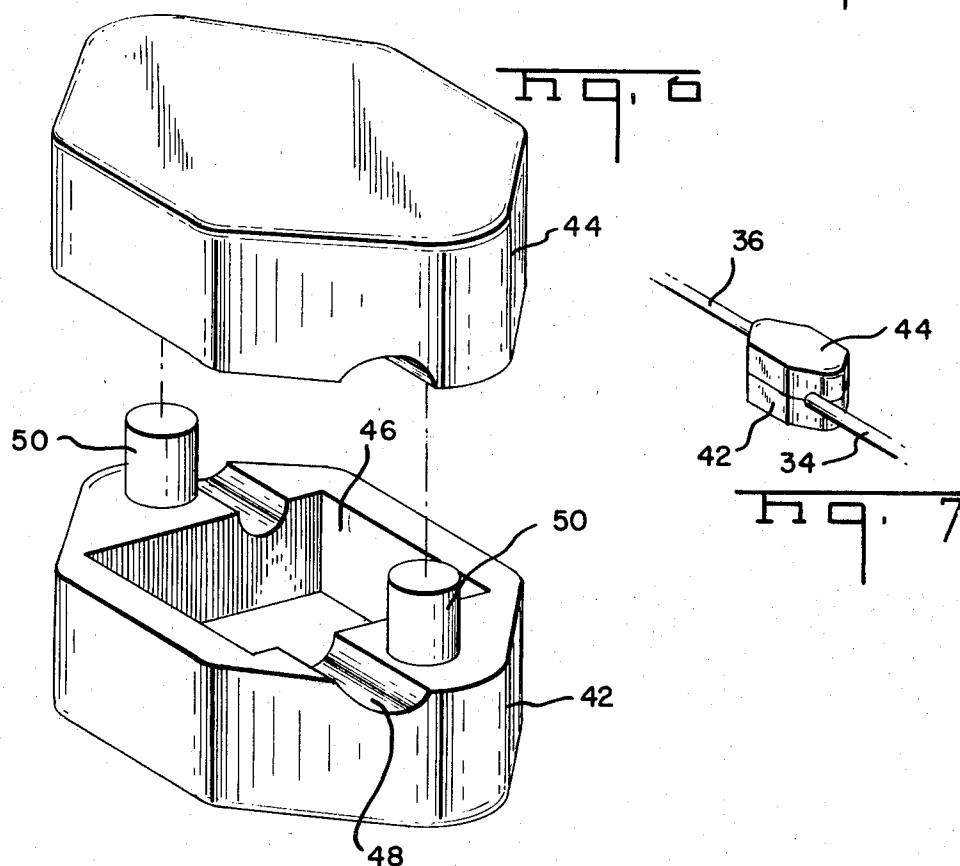
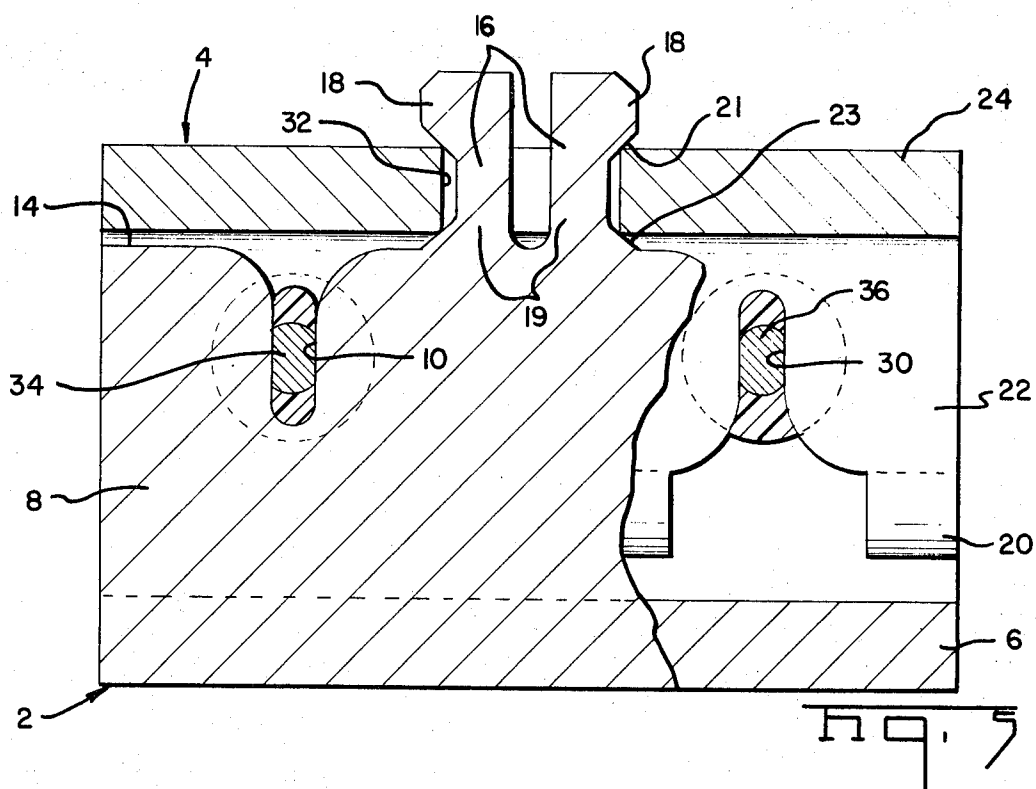
Primary Examiner—Darrell L. Clay

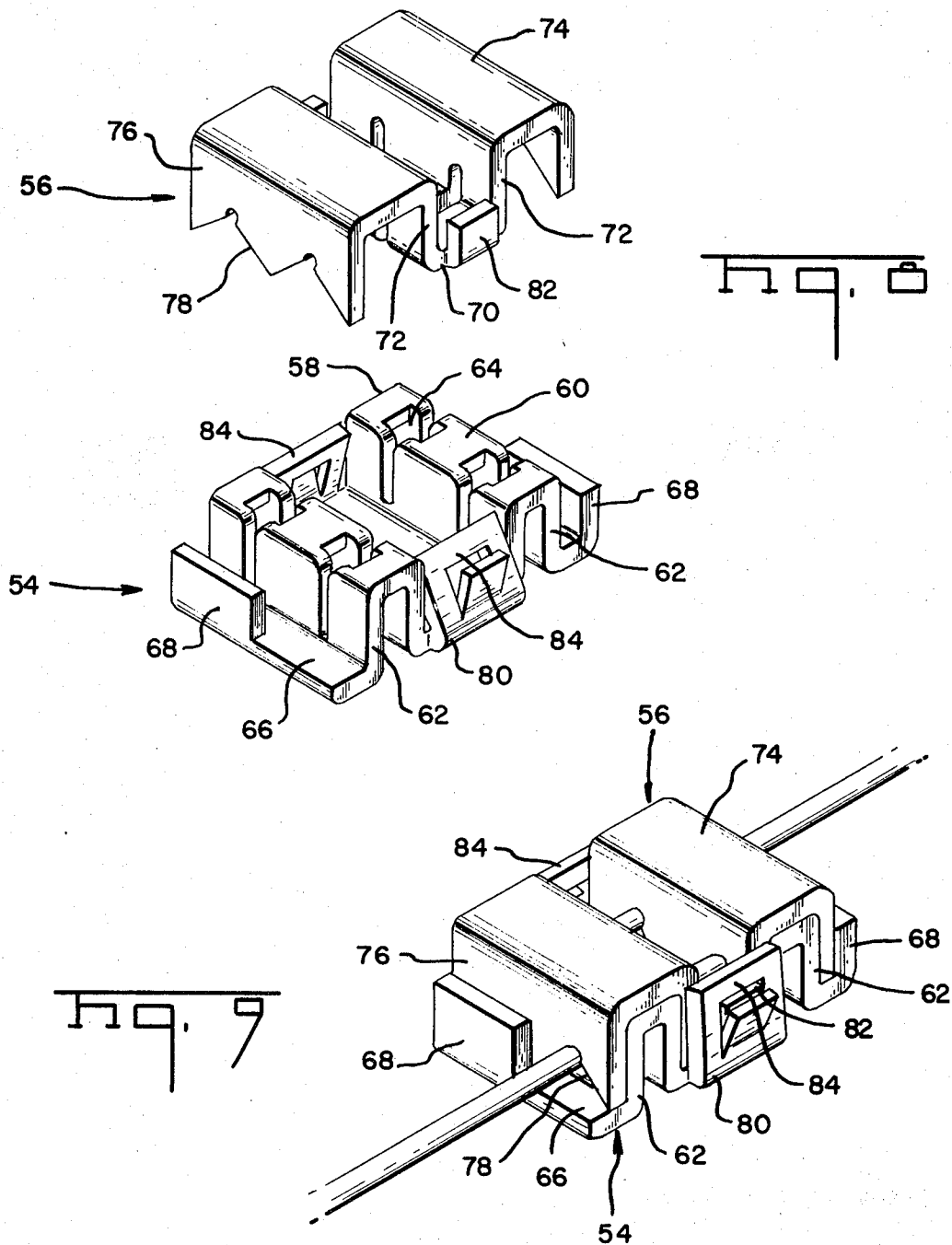
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ABSTRACT: Connecting device for connecting insulated wires to each other comprises U-shaped base section and U-shaped cap section which nests within the base section. Electrical contact to wires is established by aligned slots in base and cap sections into which the wires are moved when parts are assembled. Cap section has severing means which trims projecting ends of wires at time of assembly.









CONNECTING DEVICE

BACKGROUND OF THE INVENTION

A variety of slotted plate-type connecting devices are presently available which comprises a plate having a wire-receiving slot and means for forcing the wire into the slot. During movement of the wire, the edges of the slot penetrate the insulation of the wire and establish electrical contact with the conducting core thereof. Connecting devices of this general type are being used to an increasing extent for connecting wires of the types used in telephone cables and under other circumstances.

The instant invention is directed to the achievement of an improved slotted plate-type connecting device which overcomes certain shortcomings of present devices of the same general type and which provides some advantages which are not generally available in connecting devices of this type.

It is accordingly an object of the invention to provide an improved slotted plate-type electrical connecting device. It is a further object to provide a connecting device which can be manufactured in a relatively small size with respect to the size of the wires connected. It is a further object to provide a connecting device having repeatedly redundant contacts between the connecting device and the wire to which a connection is being made. It is a further object to provide a connecting device having repeatedly redundant contacts between the connecting device and the wire to which a connection is being made. It is a further object of the invention to provide a slotted plate-type connecting device having positive means for retaining the wire or wires in the slotted plates of the connector. A further object of the invention is to provide an improved slotted plate-type connecting device having wire trimming means thereon. It is a further object to provide a device which can be insulated if desired.

These and other objects of the invention are achieved in a preferred embodiment thereof which is briefly described in the foregoing abstract, which is described in detail below, and which is shown in the accompanying drawings in which:

FIG. 1 is a perspective exploded view of a connecting device in accordance with the invention showing the positions of the parts prior to forming an electrical connection between two wires.

FIG. 2 is a perspective view of the connecting device after assembly of the parts to each other and achievement of the electrical connection.

FIG. 3 is a sectional side view of the connecting device with the parts exploded from each other.

FIG. 4 is a sectional side view of the parts after assembly and showing the cross section of a completed electrical connection.

FIG. 5 is a view taken along the lines 5—5 of FIG. 4.

FIG. 6 is a perspective exploded view of an insulating housing which can be used to insulate the connecting device as shown in FIG. 2.

FIG. 7 is a perspective view of an insulated electrical connection between two wires in accordance with the invention.

FIG. 8 is a perspective view of an alternative embodiment with the parts exploded from each other.

FIG. 9 is a perspective view of the embodiment of FIG. 8 applied to two wires.

A connecting device in accordance with the invention as shown in FIG. 1 comprises a first part in the form of a generally U-shaped base section 2 and a second part in the form of a U-shaped cap section 4 which is dimensioned to nest within the base section as shown in FIG. 2 and as will be described more fully below. The base section comprises a web 6 and parallel sidewalls 8, 8' which have wire receiving slots 10, 12, 10', 12' extending downwardly from their upper edges 14, 14'. The width of these slots should be slightly less than the diameter of the conducting cores of the wires being connected so that as the wires are pressed into the slots, the edges of the slots will penetrate the insulation of the wires to establish electrical contact.

A pair of latching fingers 16 extend upwardly from the edge 14 between the slots 10, 12 and a similar pair of fingers 16' extend upwardly from the sidewall 8'. These fingers have laterally directed upper end portions 18 and are slightly flexible towards each other so that they function to latch the cap portion of the connecting device to the base portion as is apparent from FIG. 2.

The cap portion 4 has a web 20 and sidewalls 22, 22'. Outwardly extending flanges 24, 24' are provided on the upper ends of these sidewalls and depending lips, which function as shearing members 26, 26' extend downwardly from the flanges 24, 24' at opposite ends of the cap section. Centrally located openings 32, 32' in the flanges 24, 24' are adapted to receive the fingers 16, 16' of the base section and are sufficiently wide to permit passage of the enlarged upper ends 18, 18' of these fingers when the fingers are flexed towards each other. As shown clearly in FIG. 5, the enlarged upper ends of the fingers 16 are connected to the upper edges 14, 14' of the base section by intermediate shank portions 19 which have parallel sides. The length of these shank sections 19 is less than the thickness of the metal stock from which the connector is formed and the outwardly facing sides of the shank portions merge with obliquely extending and outwardly facing edges 21, 23 so that when the cap is assembled to the base, the edges of the openings 32, 32' bear against the obliquely extending surfaces. This latching arrangement secures the parts to each other in a manner such that relative movement of either part with respect to the other is precluded so that the electrical connections are extremely stable and are not subject to momentary interruption when the connector is vibrated.

Wire receiving slots 28, 30 extend transversely across the web 20 and partially up the sidewalls 22, 22', these slots being spaced apart by a distance equal to the spacing between slots 10 and 12 of the base section and having a width, as discussed above, such that the wires can be forced into the slots to establish electrical contact with the cores of the wires.

As is apparent from FIG. 2, the distance between the outwardly facing surfaces of the sidewalls 22, 22' is substantially equal to the distance between the opposed surfaces of the sidewalls 8, 8' so that the cap section will nest snugly within the base section. As is also apparent from FIGS. 4 and 5, the depth of the slots 10, 12, 10', 12' in the base section and the height of the slots 28, 30 in the sidewalls of the cap section are such that when the parts are assembled to each other as shown in FIGS. 2 and 5, the wires will be confined between the inner ends of the slots in the base section and the upper ends of the slots in the sidewalls of the cap section. Finally it should be noted that the severing lips 26, 26' have lower edges which move past the inner ends of the slots 12 and 10' when the cable is assembled to the base.

The formation of an electrical connection between two wires 34, 36 merely requires that the wires be placed on the upper edges 14, 14' of the base section in approximate alignment with the slots 10, 10' and 12, 12' as illustrated by the phantom lines in FIG. 1. The projecting end portions 38, 40 of the wires will then extend beyond the sidewalls as illustrated. The cap section is then aligned with the base section and pressed downwardly until it is assembled to the base section as shown in FIG. 2. The fingers 16, 16' will be cammed inwardly until their enlarged ends 18, 18' pass through the openings 32, 32' at which time they will return to their normal positions and latch the cap section to the base section so that no relative movement of these parts with respect to each other can take place. During such assembly of the parts to each other, the wires 34, 36 move relatively into the slots 10, 10', 28 (in the case of the wire 34) and 12, 12', 30 (in the case of the wire 36). Electrical contacts between the wires and the parts of the connecting device are established upon such relative movement of the wires as discussed above. When the lower ends of the severing lips 26, 26' move past the inner ends of the slots 12, 10' the projecting end portions of the wires are trimmed in the planes of the external surfaces of the sidewalls as also indicated in FIG. 2.

Connecting devices of the type shown in FIGS. 1 and 2 can be inexpensively manufactured by conventional stamping and forming methods and can be of any suitably conductive metal such as 70-30 brass or plated steel.

Connecting devices in accordance with the invention offer several advantages which have not been heretofore available in previously available slotted plate-type connectors. For example, by virtue of the fact that the cap section, as well as the base section, is of conductive metal, and by virtue of the fact that both the cap section and the base section are provided with slots, redundant electrical contact is established between each section of the connector and the wires. Thus the wire 34 is in electrical contact with the sidewall 8, with the sidewall 22, with the sidewall 22', and with the sidewall 8' by virtue of the fact that it extends through slots in all of these sidewalls. The wire 36 is similarly in electrical contact with both sidewalls of the base section and the cap section. It follows that two separate electrical circuit paths are provided between the sidewalls and each path has two points of contact with each wire.

A further advantage of the invention from an electrical standpoint is that the possibility of intermittent contact with either of the conductors is vastly reduced for the reason that each part of the connector functions to force the wires into the other part and to retain the wires in the slots of the other part. The wires are thus prevented from moving laterally of their axes out of any of the slots in which they are received. Since the parts are positively latched together, the benefits which the two connector parts confer on each other cannot be degraded by any loosening of the parts. The wire-severing function of the cap piece is achieved by the simple provision of the depending severing lips 26 and severing of the wire ends takes place evenly because of the fact that the wire being severed are forced into the inner ends of the slots 10', 12 during the seeing operation, the edges of these slots serving as one of the severing members.

Connectors in accordance with the invention can be made of relatively thin stock metal and in extremely small sizes because of the fact that the two parts of the connector are positively latched together as discussed above. By virtue of this fact, the parts are efficiently stressed when they are applied to wires and it is not necessary to resort to extremely heavy stock metal, as with some prior art slotted plate connectors, in order to ensure a reliable and long lived electrical connection.

Connectors in accordance with the invention can be readily insulated by the use of a housing as shown in FIGS. 6 and 7 which comprises a pair of similar housing parts 42, 44 each of which has a generally rectangular recess 46 which is adapted to receive one of the connector parts. Wire-positioning surfaces 48 are provided at each end of each housing part for the accommodation of the inner wires and the parts of the housing can be held in assembled relationship by posts 50 in part 42 and openings in upper housing part 44. These posts and openings can be provided with interengaging means to secure the parts in assembled relationship to the connector or can be cemented to each other as desired. Housings of the type shown in FIG. 6 can be applied to the completed connection after the metallic connector parts have been applied to the wires. Alternatively and as noted above, the connector parts can be mounted in the housing parts so that the electrical connection is made with preinsulated housings.

It will be apparent that one of the wire-severing members 6 can be eliminated from the cap piece 4 to permit the achievement of an electrical connection between a through wire and a tap wire as is common practice in the telephone industry. In accordance with this modification, the through wire would be forced down into slots in the sidewalls but not severed, the tap wire would be pressed in the slots and have its end portion rimmed by the single cutting skirt provided on the cap piece.

It will also be apparent that a number of pairs of wire-receiving slots greater than two can be provided in the connector of FIG. 1 if desired. On the other hand, the connection

concept of FIG. 1 can be used on a conventional terminal, say a ring tongue type terminal, rather than on a wire-splicing device as shown. The ring tongue could be formed integrally with the base section 2 which would have only one pair of aligned slots so that a wire could be connected to the terminal by merely locating it in alignment with these slots and assembling the cap section to the base section.

FIGS. 8 and 9 show an alternative embodiment of the invention comprising a base section or first piece 54 and a cap section or second piece 56. The base section has a central U-shaped portion comprising a web and sidewalls 58 which are bent outwardly and downwardly as shown at 60 to define depending sidewall sections 62. The wire-receiving slots 64 extend downwardly through both of these metal thicknesses of each sidewall further increasing the redundancy of electrical contact between the wires and the connecting device. The external sidewall sections 62 have laterally outwardly extending flanges 66 on their ends and cutter bars 68, formed integrally with these flanges extending upwardly on one side of each flange.

The cap section 56 is generally U-shaped in its central portions and comprises a web 70 and sidewalls 72. These sidewalls also have outwardly extending flanges 74 and depending skirts 76 which are spaced from the sidewalls by a distance such that the cap section can nest in the base section as shown in FIG. 9. The lower edges of the skirts 76 are provided with V-shaped notches 78 to accommodate the wires as shown in FIG. 9. Trimming of the wire ends is accomplished when the skirts move past the wire-severing members 68.

The cap section and base section are latched together by means of tongues 82, 84 which project upwardly from the ends of the webs of the cap section and base section respectively. The tongues 84 on the base section are formed inwardly and have centrally struck out lances which define openings adapted to receive the tongues 82 of the cap section. When the cap section is assembled to the base section the tongues 84 are flexed outwardly until the tongues 82 enter the openings at which time the tongues 84 return to their normal positions to secure the parts together.

The embodiment of FIG. 9 may be found to be advantageous for use under some circumstances in that the upper surface of the completed connection is smooth and uninterrupted, the latching means being provided at the ends of the webs and on each side of the completed connection.

Changes in construction will occur to those skilled in the art and various apparently different modifications and embodiments may be made without departing from the scope of the invention. The matter set forth in the foregoing description and accompanying drawings is offered by way of illustration only.

What is claimed is:

1. An electrical connection between a connecting device and an insulated wire comprising
 - first and second metallic connector parts, each of said parts having a portion having a U-shaped cross section comprising a bight and sidewalls,
 - said second part being nested within said first part with said sidewalls of said second part disposed against said sidewalls of said first part
 - at least one wire-receiving slot in each of said sidewalls of said first part, said slots being in alignment with each other, and
 - wire-receiving slot means extending transversely across said bight of said second part and partially up the sidewalls thereof,
 - said wire extending through said wire-receiving slot of one of said sidewalls of said first part, through said wire-receiving slot means of said second part, and through said wire-receiving slot of the other one of said sidewalls of said first part, edge portions of said slots and said slot means penetrating the insulation of said wire and being in electrical contact with the core thereof.

2. A device as set forth in claim 1 including interengaging latch means on said parts holding said parts in assembled relationship to each other.

3. A device as set forth in claim 2 wherein said sidewalls of said second part have laterally outwardly extending flanges on the ends thereof, said latch means comprising finger means extending upwardly from the ends of said sidewalls of said first part and openings in said flanges of said second part, said finger means extending through said openings to latch said parts together.

4. A device as set forth in claim 3 wherein said finger means on each of said sidewalls of said first part comprises a pair of spaced-apart fingers having enlarged ends, said fingers of each pair being flexible towards each other to permit movement thereof through one of said openings.

5 A device as set forth in claim 2 including laterally outwardly extending flanges on the ends of said sidewalls of said second part, depending wire-severing means extending from, and integral with, at least one of said flanges, said severing means extending only partially along the length of said one flange and transversely past said slot means in said second part, said severing means being spaced from said sidewall by a distance equal to the thickness of the sidewalls of said first part whereby said wire was severed by said severing means when said parts

were applied to said wire.

6. A device as set forth in claim 5 including severing means on both of said sidewalls of said second part.

7. A device as set forth in claim 2 wherein said latch means comprises

first tongue means extending upwardly from the ends of said bight of said first part,

second tongue means extending upwardly from the ends of said bight of said second part,

10 said first and second tongue means being interengaged to hold said parts together.

8. A device as set forth in claim 1 wherein said sidewalls of said first part are reversely folded and comprise a double thickness of metal, said sidewalls of said second part having laterally outwardly extending flanges on the upper ends thereof and depending skirts on the ends of said flanges, said skirts being spaced from said sidewalls of said second part by a distance equal to the thickness of said sidewalls.

15 9. A device as set forth in claim 8 wherein said sidewalls of said second part have laterally extending flanges at their lower ends, and severing means extending upwardly from at least one of the flanges, said severing means having cooperated with one of said skirt means to sever said wire when said parts were applied to said wire.

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