

Description

This invention relates to electrical connectors of the type in which multiple electrical conductors or wires are respectively connected to multiple terminals enclosed within a housing, and in particular to methods and apparatus for making such electrical connections.

Manufacturers of electrical connectors for use in electronic circuitry such as computers typically provide their customers (e.g., computer manufacturers) with separate connector components such as terminals and terminal housings. United States patent specifications US 3,430,185 and US 3,582,863 both disclose such arrangements wherein the terminal housing and terminals are supplied separately. The customer electrically and mechanically connects each terminal to an electrical conductor (e.g., a wire) and inserts the terminal in the terminal housing. This can be a costly and troublesome process for the customers because of the difficulties associated with handling the relatively small terminals and especially inserting the terminals in the terminal housing.

United States patent specification US 4,411,484 discloses an arrangement wherein the terminal may be partially inserted into the housing prior to the connection of the conductor to the terminal. However, the terminals and housings are still supplied separately and it is the customer who must insert the terminals into the housing.

United States patent specification US 4,214,361 discloses an arrangement wherein the terminal is partially retained within the terminal housing and the conductor is crimped to the terminal prior to full insertion in the housing. However, with this arrangement the terminal is permanently held in the housing and cannot be removed, even when only partially inserted in the housing. Such an arrangement may not always be convenient.

In view of the foregoing, it is an object of this invention to provide improved methods and apparatus for assembling electrical connector terminals in terminal housings and making electrical connections between conductors and said terminals.

Viewed from one aspect the present invention provides a partially pre-assembled electrical connector comprising: a housing having a plurality of longitudinal, laterally adjacent, substantially parallel apertures, each aperture extending all the way through the housing between front and rear surfaces of the housing; a plurality of flexible latches disposed on one side of said housing in corresponding one-to-one relationship with said apertures, each latch having a nose portion which extends into its associated aperture; a longitudinal metal terminal partially inserted in each aperture at the rear surface of said housing in a direction substantially parallel to the longitudinal axis of the associated aperture, each ter-

terminal having a front disconnect portion with a downwardly bowed spring member and an uncrimped rear wire crimp portion, the disconnect portion being disposed in the aperture and at least a portion of the wire crimp portion being outside the housing to the rear of the rear surface, the nose portion of each latch being in biased contact with the bowed spring member of the disconnect position of the associated terminal to a degree sufficient to retain said terminal against inadvertent withdrawal, but not sufficient to permanently latch said terminal in the housing.

When the electrical conductors (wires) are to be connected to the terminals, each terminal is partially ejected from the housing so that the appropriate conductor can be placed in the terminal. The terminal is then crimped around the conductor and pushed all the way back into the housing where it is latched in place.

Preferably the housing is such that a push-out mandrel may be inserted into each aperture from the front surface of the housing to engage the front face of the terminal partially inserted in the aperture to push the terminal part-way out of the housing.

Viewed from another aspect the present invention provides a method of making electrical connections to an electrical connector comprising the steps of: providing a partially pre-assembled connector including a housing having a plurality of longitudinal, laterally adjacent, substantially parallel apertures, each aperture extending all the way through the housing between front and rear housing surfaces, and a longitudinal metal terminal partially inserted in each aperture substantially parallel to the longitudinal axis of the associated aperture, each terminal having a front disconnect portion and an uncrimped rear wire crimp portion, the disconnect portion being disposed in the aperture and at least a portion of the wire crimp portion being outside the housing to the rear of the rear surface; at least partially withdrawing each terminal from the associated aperture to completely expose the uncrimped wire crimp portion; placing a wire in the exposed uncrimped wire crimp portion of each terminal; crimping the exposed wire crimp portion of each terminal around the associated wire to secure the wire to the terminal; and fully re-inserting the terminal in the associated aperture.

Viewed from another aspect the present invention provides apparatus for assembling and making electrical connections to a partially pre-assembled connector including a housing having a plurality of longitudinal, laterally adjacent, substantially parallel apertures, each aperture extending all the way through the housing between front and rear housing surfaces, and a longitudinal metal terminal partially inserted in each aperture substantially parallel to the longitudinal axis of the associated aperture, each terminal having a front disconnect portion and an uncrimped rear wire crimp portion, the disconnect portion being disposed in the aperture and at least a portion

of the wire crimp portion being outside the housing to the rear of the rear surface, comprising : means for at least partially withdrawing each terminal from the associated aperture to completely expose the uncrimped wire crimp portion ; means for crimping the exposed wire crimp portion of each terminal around an associated wire placed in the wire crimp portion ; and means for fully re-inserting the terminal in the associated aperture.

This invention has particular application to electrical connectors of the type shown in US-A-3781760. As shown in that patent, a female terminal is disposed in a connector block so that a flexible latch is behind a disconnect portion of the terminal. The uninsulated end of a conductor is engaged by a wire crimp portion of the terminal. The end of the insulation on the conductor is similarly engaged by an insulation crimp portion of the terminal. The disconnect portion has a transverse cross section which is generally the shape of a hollow rectangle. A spring, which bows downwards, is provided in the upper part of the hollow rectangle. The disconnect portion is adapted to receive a male connector which is a square metal pin. When a pin is in the disconnect portion the spring is deflected upwardly by the pin. This assures good electrical contact and good mechanical engagement between the male and female connector elements. Any number of such terminals can be arranged side by side in the connector block.

Heretofore, connector blocks and terminals have been sold separately by the manufacturers of such apparatus. The purchaser has had to apply the terminals to the ends of the wires terminating at the connector, and has then had to insert the terminals in the connector block.

An embodiment of the invention will now be described by way of example with reference to the accompanying drawings in which :

Figure 1 is a perspective view of an illustrative embodiment of a partially pre-assembled electrical connector,

Figure 2 is a cross-sectional view taken along the line 2-2 in Figure 1,

Figure 3a is a schematic partial plan view of an embodiment of apparatus for completing assembly of the connector of Figures 1 and 2, Figure 3a shows the apparatus at a first stage in its operating cycle.

Figure 3b is a schematic partial elevational view of the apparatus of Figure 3a, Figure 3a shows only the portion of the apparatus above the line A-A in Figure 3b. Figures 3a and 3b are sometimes referred to collectively as Figure 3,

Figures 4-12 (each including an "a" view similar to Figure 3a and a "b" view similar to Figure 3b) show successive stages in the operating cycle of the apparatus of Figure 3. Figures 6c and 7c are partial elevational views taken along the lines 6c-

6c and 7c-7c in Figures 6b and 7b, respectively. Associated "a", "b" and "c" views are sometimes referred to collectively by the Figure number alone (e.g., "Figure 4" refers to Figures 4a and 4b collectively). Figures 4-12 are somewhat simplified as compared to Figure 3. For example, the track on which the connector rests is not repeated in Figures 4-12, and the details on the top surface of the connector are also not repeated in Figures 4-12.

Figure 13 is a cross sectional view taken along the line 13-13 in Figure 6a,

Figure 14 is a cross sectional view taken along the line 14-14 in Figure 7a,

Figure 15 is a cross sectional view taken along the line 15-15 in Figure 10a.

Referring firstly to Figures 1 and 2 there is shown a partially pre-assembled electrical connector. The connector comprises a housing having a plurality of longitudinal, laterally adjacent, substantially parallel apertures, each aperture extending all the way through the housing between front and rear surfaces of the housing. Within each aperture there is partially inserted a longitudinal metal terminal substantially parallel to the longitudinal axis of the associated aperture. Each terminal comprises a disconnect portion disposed in the aperture and a wire crimp portion a portion at least part of which is outside of the housing to the rear of the rear surface. Terminals 110 a-j (similar to the terminals in the above-mentioned US-A-3781760, but with wire crimp portion 112 and insulation crimp portion 114 uncrimped) are partially pre-inserted in terminal housing 150 (similar to the connector block in US-A-3781760) to produce a partially pre-assembled connector 100 having the configuration shown in Figures 1 and 2. Each terminal 110 is preferably inserted far enough into terminal housing 150 so that the associated latch 152 (similar to the latches in US-A-3781760) lightly and releasably engages the terminal. In the depicted embodiment, terminals 110 a-j are inserted until uncrimped insulation crimp portions 114 contact the rear of terminal housing 150 and thereby prevent further insertion of each terminal. In this position, the free end or nose portion 154 of each latch 152 bears on the top of the disconnect portion 116 of associated terminal 110 (similar to the disconnect portion in US-A-3781760). In particular, each nose portion 154 preferably enters the gap 118 above the center of spring 120 in associated terminal 110 to a slight degree, which is not sufficient to permanently latch the terminal in housing 150, but which does increase the terminal's resistance to inadvertent withdrawal from the housing.

Further, to complete the assembly of the above-described partially pre-assembled connectors 100 each terminal 110 is partially withdrawn from the rear of housing 150, as shown, for example, in figure 4, to

expose at least wire crimp portion 112 (in addition to insulation crimp portion 114). The end of the wire 180 to be connected to the terminal is placed in the terminal so that an uninsulated end portion of the wire is adjacent wire crimp portion 112, and so that the end portion of the insulation is adjacent insulation crimp portion 114 as shown in Figures 6 and 13. Wire crimp portion 112 is then crimped on the uninsulated end portion of the wire, and insulation crimp portion 114 is crimped on the end of the insulation as shown, for example, in Figures 7 and 14. the terminal is then fully inserted into terminal housing 150 so that the associated latch 152 drops into the notch 122 behind disconnect portion 116, as shown, for example, in Figure 15, to permanently secure the terminal in housing 150 in the manner taught by US-A-3791760.

An embodiment of apparatus 200 for carrying out the foregoing method is shown in Figures 3-15. With apparatus 200 in the initial condition as shown in Figure 3, partially assembled connector 100 is placed on stationary track 210 with the first of terminals 110 (i.e., terminal 110a) coaxial with push-out mandrel 220. Connector 100 is held on track 210 by one or more resilient hold-down fingers 212.

Actuator 222, which may be a conventional double-acting hydraulic or pneumatic linear actuator or an equivalent device, is then operated as shown in Figure 4 to drive push-out mandrel 220 part way into housing 150. The leading portion 220a of push-out mandrel 220 enters the disconnect portion 116 of terminal 110a (see Figure 13). Thereafter the shoulder 220b behind leading portion 220a contacts the front face of terminal 110a and pushes the terminal part way out of housing 150 (refer again to Figure 4). The rear surface of terminal 110a contacts wire grippers 230a and 230b. Wire grippers 230 therefore act as a stop for terminal 110a and ensure that leading portion 220a is fully inserted in disconnect portion 116. When terminal 110a is thus partially ejected from housing 150, wire crimp portion 112 and insulation portion 114 are both exposed and positioned over stationary anvil 240. Terminal 110a is held in this position by the snug fit of leading portion 220a in disconnect portion 116.

The next step in the operation of the apparatus is movement of wire grippers 230 away from terminal 110a along an axis parallel to the longitudinal axis of the terminal (see Figure 5). This is accomplished by operation of actuator 250, which may be a conventional device similar to actuator 222. Actuator 250 reciprocates actuator carrier 260, on which are mounted actuators 262 and 264. Actuator 262, which may be another conventional device similar to actuator 222, can vertically reciprocate actuator carrier 270 as described in detail below. Actuator 272, which may be another conventional device similar to actuator 222, is mounted on carrier 270. Actuator 272 can reciprocate wire grippers 230a and 230b toward or away from one another as described in detail below. Accordingly,

wire grippers move horizontally with actuator carrier 260 in response to operation of actuator 250.

The next step in the operation of the apparatus is placement of wire 180a in terminal 110a as shown in Figures 6 and 13. It should be noted that a portion of wire 180a is between wire grippers 230a and 230b.

After wire 180a is in place as described above, crimper 280 is lowered by operation of actuator 282, which can be another conventional device similar to actuator 222 (see Figures 7 and 14). Crimper 280 cooperates with anvil 240 to crimp wire crimp portion 112 on the uninsulated end portion of wire 180a and to crimp insulation crimp portion 114 on the end of the insulation of wire 180a.

After terminal 110a has thus been mechanically and electrically connected to wire 180a, the following operations take place: (1) actuator 282 is operated again to raise crimper 280; (a) actuator 272 is operated to move wire grippers 230a and 230b toward one another so that wire 180a is gripped between grippers 230; and (3) actuator 264 is operated to raise latch 266 into recess 224 in mandrel 220 (see Figure 8).

Following the above-described operations, actuator 250 is operated again to move actuator carrier 260 horizontally toward housing 150 (see Figure 9). Wire grippers 230, with wire 180a gripped between them, move with actuator carrier 260 toward housing 150. Accordingly, wire grippers 230, acting through wire 180a, push terminal 110a fully into housing 150. Mandrel 220 travels with wire grippers 230 by virtue of the presence of latch 266 in recess 224. Actuator 222 idles during this motion of mandrel 220. Accordingly, mandrel 220 is retracted relative to housing 150 at the same time as and at the same rate that wire grippers 230 are pushing terminal 110a into housing 150.

After terminal 110a has been fully pushed into housing 150 as described above, actuator 222 is operated again to fully withdraw mandrel 220 from housing 150 (see Figures 10 and 15). In addition, actuator 262 is operated to lower wire grippers 230 below the horizontal plane in which wire 180a lies.

The processing of terminal 110a and wire 180a is now complete and the apparatus is ready to begin processing of the next terminal 110b. Accordingly, actuator 290, which may be similar to actuator 222, is operated to push housing 150 along track 210 until terminal 110b is coaxial with mandrel 220 (see Figure 11). Actuator 264 is also operated again to lower latch 266 so that the latch no longer extends into recess 224.

When the foregoing operations have been performed, actuator 262 is operated again to raise wire grippers 230 so that they intersect the horizontal plane in which wire 180a lies (see Figure 12). It will be noted that the condition of the apparatus in Figure 12 is the same as the condition of the apparatus in Figure 3 except that terminal 110a has been completed in Fig-

ure 12 and housing 150 has been shifted one terminal spacing along track 210. Accordingly, the above-described operating cycle of the apparatus begins again and is repeated until all of terminals 110 have been wired and fully inserted in housing 150. Thereafter, the fully assembled connector can be removed from the apparatus and is ready for use.

Although the embodiment described refers to connectors having female terminals 110, it will be understood that the method and apparatus is equally applicable to connectors having male terminals. In that event, the leading portion of push-out mandrel 220 would be modified to include a socket for receiving a male terminal pin. In other respects the method and apparatus would be as described above.

Claims

1. A partially pre-assembled electrical connector comprising : a housing (150) having a plurality of longitudinal, laterally adjacent, substantially parallel apertures, each aperture extending all the way through the housing (150) between front and rear surfaces of the housing (150); a plurality of flexible latches (152) disposed on one side of said housing (150) in corresponding one-to-one relationship with said apertures, each latch (152) having a nose portion (154) which extends into its associated aperture; a longitudinal metal terminal (110) partially inserted in each aperture at the rear surface of said housing (100) in a direction substantially parallel to the longitudinal axis of the associated aperture, each terminal (110) having a front disconnect portion (116) with a downwardly bowed spring member (120) and an uncrimped rear wire crimp portion (112), the disconnect portion (116) being disposed in the aperture and at least a portion of the wire crimp portion (112) being outside the housing (150) to the rear of the rear surface, the nose portion (154) of each latch (152) being in biased contact with the bowed spring member (120) of the disconnect position (116) of the associated terminal (110) to a degree sufficient to retain said terminal against inadvertent withdrawal, but not sufficient to permanently latch said terminal (110) in the housing (150).

2. A connector according to claim 1, wherein the front disconnect portion (116) has a transverse cross-section which is generally in the shape of a hollow rectangle the upper side of said rectangle comprising said bowed spring (120) which bends downwardly, said nose portion (154) of each latch (152) contacting said bowed spring (120).

3. A connector according to claim 1 or claim 2, wherein the portion of the uncrimped wire portion (112) which is outside the housing (150) is two large to fit in the associated aperture while uncrimped.

4. A connector according to any one of the pre-

ceding claims, wherein said portion outside the housing (100) includes an insulation crimp portion (114).

5. A connector as claimed in any one of the preceding claims, wherein after a wire (180) is crimped to the wire crimped portion (112), further insertion of said terminals (110) will cause the nose portion (154) of each latch (152) to drop into a notch (122) at the rear of the disconnected portion (116) to latch the terminals (110) in the housing (150).

6. A method of making electrical connections to an electrical connector comprising the steps of : providing a partially pre-assembled connector including a housing (150) having a plurality of longitudinal, laterally adjacent, substantially parallel apertures, each aperture extending all the way through the housing (150) between front and rear housing surfaces, and a longitudinal metal terminal (110) partially inserted in each aperture substantially parallel to the longitudinal axis of the associated aperture, each terminal (110) having a front disconnect portion (116) and an uncrimped rear wire crimp portion (112), the disconnect portion (116) being disposed in the aperture and at least a portion of the wire crimp portion (112) being outside the housing (150) to the rear of the rear surface; at least partially withdrawing each terminal (110) from the associated aperture to completely expose the uncrimped wire crimp portion (112); placing a wire (180) in the exposed uncrimped wire crimp portion (112) of each terminal (110); crimping the exposed wire crimp portion (112) of each terminal (110) around the associated wire (180) to secure the wire to the terminal; and fully re-inserting the terminal (110) in the associated aperture.

7. A method according to claim 6 wherein each terminal (110) is at least partially withdrawn from the housing (150) in the rearward direction.

8. A method according to claim 6 or 7 wherein a portion of each terminal (110) remains in the associated aperture at all times during performance of the method.

9. A method according to claim 6, 7 or 8 further comprising the step of latching each fully re-inserted terminal (110) in the housing (150).

10. A method according to any of claims 6 to 9 wherein each terminal (110) has a female disconnect portion (116) and wherein the step of least partially withdrawing each terminal (110) comprises the steps of : inserting a pin (220) in the disconnect portion (116) of each terminal (110) to stabilize the terminal during the subsequent wire placement and terminal crimping steps; and pushing on the front edge of the disconnect portion (116) of each terminal (110) to at least partially push the terminal (110) from the associated aperture in the rearward direction.

11. A method according to claim 10 wherein the pin (220) is inserted in the disconnect portion (116) of each terminal (110) via the front portion of the associated aperture.

are 12 and housing 150 has been shifted one terminal spacing along track 210. Accordingly, the above-described operating cycle of the apparatus begins again and is repeated until all of terminals 110 have been wired and fully inserted in housing 150. Thereafter, the fully assembled connector can be removed from the apparatus and is ready for use.

Although the embodiment described refers to connectors having female terminals 110, it will be understood that the method and apparatus is equally applicable to connectors having male terminals. In that event, the leading portion of push-out mandrel 220 would be modified to include a socket for receiving a male terminal pin. In other respects the method and apparatus would be as described above.

Claims

1. A partially pre-assembled electrical connector comprising : a housing (150) having a plurality of longitudinal, laterally adjacent, substantially parallel apertures, each aperture extending all the way through the housing (150) between front and rear surfaces of the housing (150); a plurality of flexible latches (152) disposed on one side of said housing (150) in corresponding one-to-one relationship with said apertures, each latch (152) having a nose portion (154) which extends into its associated aperture; a longitudinal metal terminal (110) partially inserted in each aperture at the rear surface of said housing (100) in a direction substantially parallel to the longitudinal axis of the associated aperture, each terminal (110) having a front disconnect portion (116) with a downwardly bowed spring member (120) and an uncrimped rear wire crimp portion (112), the disconnect portion (116) being disposed in the aperture and at least a portion of the wire crimp portion (112) being outside the housing (150) to the rear of the rear surface, the nose portion (154) of each latch (152) being in biased contact with the bowed spring member (120) of the disconnect position (116) of the associated terminal (110) to a degree sufficient to retain said terminal against inadvertent withdrawal, but not sufficient to permanently latch said terminal (110) in the housing (150).

2. A connector according to claim 1, wherein the front disconnect portion (116) has a transverse cross-section which is generally in the shape of a hollow rectangle the upper side of said rectangle comprising said bowed spring (120) which bends downwardly, said nose portion (154) of each latch (152) contacting said bowed spring (120).

3. A connector according to claim 1 or claim 2, wherein the portion of the uncrimped wire portion (112) which is outside the housing (150) is too large to fit in the associated aperture while uncrimped.

4. A connector according to any one of the pre-

ceding claims, wherein said portion outside the housing (100) includes an insulation crimp portion (114).

5. A connector as claimed in any one of the preceding claims, wherein after a wire (180) is crimped to the wire crimped portion (112), further insertion of said terminals (110) will cause the nose portion (154) of each latch (152) to drop into a notch (122) at the rear of the disconnected portion (116) to latch the terminals (110) in the housing (150).

6. A method of making electrical connections to an electrical connector comprising the steps of : providing a partially pre-assembled connector including a housing (150) having a plurality of longitudinal, laterally adjacent, substantially parallel apertures, each aperture extending all the way through the housing (150) between front and rear housing surfaces, and a longitudinal metal terminal (110) partially inserted in each aperture substantially parallel to the longitudinal axis of the associated aperture, each terminal (110) having a front disconnect portion (116) and an uncrimped rear wire crimp portion (112), the disconnect portion (116) being disposed in the aperture and at least a portion of the wire crimp portion (112) being outside the housing (150) to the rear of the rear surface; at least partially withdrawing each terminal (110) from the associated aperture to completely expose the uncrimped wire crimp portion (112); placing a wire (180) in the exposed uncrimped wire crimp portion (112) of each terminal (110); crimping the exposed wire crimp portion (112) of each terminal (110) around the associated wire (180) to secure the wire to the terminal; and fully re-inserting the terminal (110) in the associated aperture.

7. A method according to claim 6 wherein each terminal (110) is at least partially withdrawn from the housing (150) in the rearward direction.

8. A method according to claim 6 or 7 wherein a portion of each terminal (110) remains in the associated aperture at all times during performance of the method.

9. A method according to claim 6, 7 or 8 further comprising the step of latching each fully re-inserted terminal (110) in the housing (150).

10. A method according to any of claims 6 to 9 wherein each terminal (110) has a female disconnect portion (116) and wherein the step of least partially withdrawing each terminal (110) comprises the steps of : inserting a pin (220) in the disconnect portion (116) of each terminal (110) to stabilize the terminal during the subsequent wire placement and terminal crimping steps; and pushing on the front edge of the disconnect portion (116) of each terminal (110) to at least partially push the terminal (110) from the associated aperture in the rearward direction.

11. A method according to claim 10 wherein the pin (220) is inserted in the disconnect portion (116) of each terminal (110) via the front portion of the associated aperture.



12. A method according to any of claims 6 to 11 wherein the fully re-inserting step comprises the steps of: gripping each wire (180) to the rear of the associated crimped wire crimp portion (112); and pushing the gripped wire (180) toward the housing (150).

13. A method according to claim 12 when dependent on claim 11 further comprising the step of withdrawing the pin (220) from each fully re-inserted terminal (110).

14. A method according to any of claims 6 to 13 wherein the terminals (110) are processed one at a time in succession in accordance with the foregoing steps, and wherein the method further comprises the step of moving the connector after each terminal (110) is processed to position the connector for processing of the next terminal (110).

15. Apparatus for assembling and making electrical connections to a partially pre-assembled connector including a housing (150) having a plurality of longitudinal, laterally adjacent, substantially parallel apertures, each aperture extending all the way through the housing (150) between front and rear housing surfaces, and a longitudinal metal terminal (110) partially inserted in each aperture substantially parallel to the longitudinal axis of the associated aperture, each terminal (110) having a front disconnect portion (116) and an uncrimped rear wire crimp portion (112), the disconnect portion (116) being disposed in the aperture and at least a portion of the wire crimp portion (112) being outside the housing (150) to the rear of the rear surface, comprising: means for at least partially withdrawing each terminal (110) from the associated aperture to completely expose the uncrimped wire crimp portion (112); means for crimping the exposed wire crimp portion (112) of each terminal (110) around an associated wire (180) placed in the wire crimp portion (112); and means for fully re-inserting the terminal (110) in the associated aperture.

16. Apparatus according to claim 15 wherein each terminal (110) has a female disconnect portion (116) and wherein the withdrawing means comprises: a pin (220) having an initial end portion which is removably receivable in the disconnect portion (116) of each terminal (110) and a remaining portion which is larger in cross section than the disconnect portion (116) but smaller in cross section than the front portion of the associated aperture; and means for reciprocating the pin (220) into the aperture so that the initial end portion enters the disconnect portion (116) and so that the remaining portion pushes the terminal (110) from the apertures in the rearward direction.

17. Apparatus according to claim 16 wherein the initial end portion of the pin (220) fits sufficiently securely in the disconnect portion (116) of the terminal (110) to releasably retain the terminal (110) on the pin (220) and to substantially prevent rotation of the ter-

minal (110) about the longitudinal axis of the pin.

18. Apparatus according to claim 15, 16 or 17 wherein said crimping means comprises: anvil means (240) disposed adjacent one side of the exposed wire crimp portion (112); and crimp means (280) for crushing the exposed wire crimp portion against the anvil means.

19. Apparatus according to any of claims 15 to 18 wherein the re-inserting means comprises: means (230) for gripping the wire (180) to the rear of the associated wire crimp portion and pushing the wire toward the housing (150).

20. Apparatus according to any of claims 15 to 19 wherein the terminals (110) are processed one at a time in succession and wherein the apparatus further comprises: means (290, 210) for moving the housing (150) after each terminal (110) has been processed to position the housing (120) for processing of the next terminal (110).

Ansprüche

1. Teilweise vormontierter, elektrischer Verbind-
der, welcher aufweist: ein Gehäuse (150), das eine
Mehrzahl von in Längsrichtung verlaufenden, in Quer-
richtung benachbarten, im wesentlichen parallelen
Öffnungen aufweist, wobei jede Öffnung sich insge-
samt durch das Gehäuse (150) zwischen einer vorder-
en und einer hinteren Fläche des Gehäuses (150)
erstreckt; eine Mehrzahl von flexiblen Rastungen
(152), die auf einer Seite des Gehäuses (150) einzeln
den Öffnungen zugeordnet angeordnet sind, wobei
Jede Verrastung (152) einen Nasenabschnitt (154)
hat, welcher sich in die zugeordnete Öffnung
erstreckt; einen in Längsrichtung verlaufenden
Metallanschluß (110), der teilweise die jeweilige Öff-
nung an der hinteren Fläche des Gehäuses (100) in
einer Richtung im wesentlichen parallel zur Längs-
achse der zugeordneten Öffnungen eingesetzt ist,
wobei jeder Anschluß (110) einen vorderen Trennab-
schnitt (116) mit einem nach unten gekrümmten
Federteil (120) und einen unumgebogenen hinteren
Drahtumbiegeabschnitt (112) hat, wobei der Tren-
nabschnitt (116) in der Öffnung angeordnet ist und
wenigstens ein Teil des Drahtumbiegeabschnittes
(112) außerhalb des Gehäuses (150) von der hinteren
Fläche nach hintenweisend vorgesehen ist, und
wobei der Nasenabschnitt (154) jeder Verrastung
(152) vorbelastet in Kontakt mit dem gekrümmten
Federteil (120) des Trennabschnitts (116) des zuge-
ordneten Anschlusses (110) in einem so ausreichen-
den Maße ist, daß der Anschluß entgegen einem
unbeabsichtigten Abziehen festgelegt ist, aber diese
Vorbelastung nicht so ausreichend bemessen ist, daß
der Anschluß (110) in dem Gehäuse (150) ständig
verrastet ist.

2. Verbinder nach Anspruch 1, bei dem der vor-



der Trennabschnitt (116) einen Querschnitt hat, der im allgemeinen der Form eines hohlen Vierecks entspricht, wobei die obere Seite des Vierecks die gekrümmte Feder (120) aufweist, welche nach unten gekrümmt ist, und wobei der Nasenabschnitt (154) jeder Verrastung (152) die gekrümmte Feder (120) berührt.

3. Verbinder nach Anspruch 1 oder Anspruch 2, bei dem der Abschnitt des unumgebogenen Drahtabschnitts (112), der außerhalb des Gehäuses (150) ist, zu groß bemessen ist, um in die zugeordnete Öffnung im unumgebogenen Zustand zu passen.

4. Verbinder nach einem der vorangehenden Ansprüche, bei dem der Abschnitt außerhalb des Gehäuses (110) einen Isolierungsumbiegeabschnitt (114) umfaßt.

5. Verbinder nach einem der vorangehenden Ansprüche, bei dem nach dem Umbiegen eines Drahtes (180) an dem Drahtummbiegeabschnitt (112) das weitere Einschieben der Anschlüsse (110) bewirkt, daß der Nasenabschnitt (154) jeder Verrastung (152) in eine Ausnehmung (122) an der Rückseite des Trennabschnitts (116) fällt, um die Anschlüsse (110) in dem Gehäuse (150) zu verrasten.

6. Verfahren zum Herstellen von elektrischen Verbindungen mit einem elektrischen Verbinder, welches die Schritte aufweist: Vorsehen eines teilweise vormontierten Verbinders mit einem Gehäuse (150), das eine Mehrzahl von in Längsrichtung verlaufenden, in Querrichtung benachbarten, im wesentlichen parallelen Öffnungen aufweist, wobei jede Öffnung insgesamt durch das Gehäuse (150) zwischen einer vorderen und einer hinteren Gehäusefläche geht, und mit einem in Längsrichtung verlaufenden Metallanschluß (110), der teilweise in die jeweilige Öffnung im wesentlichen parallel zu der Längsachse der zugeordneten Öffnung eingesetzt ist, wobei jeder Anschluß (110) einen vorderen Trennabschnitt (116) und einen unumgebogenen, hinteren Drahtummbiegeabschnitt (112) hat, der Trennabschnitt (116) in der Öffnung angeordnet ist und wenigstens ein Teil des Drahtummbiegeabschnitts (112) außerhalb des Gehäuses (150) an der Rückseite der hinteren Fläche vorgesehen ist; wenigstens teilweises Abziehen des jeweiligen Anschlusses (110) von der zugeordneten Öffnung, um den unumgebogenen Drahtummbiegeabschnitt (112) vollständig freizulegen; Einbringen eines Drahtes (180) in den freigelegten, unumgebogenen Drahtummbiegeabschnitt (112) jedes Anschlusses (110); Umbiegen des freigelegten Drahtummbiegeabschnitts (112) des jeweiligen Anschlusses (110) um den zugeordneten Draht (180), um den Draht fest mit dem Anschluß zu verbinden; und vollständiges Wiedereinsetzen des Anschlusses (110) in die zugeordnete Öffnung.

7. Verfahren nach Anspruch 6, bei dem jeder Anschluß (110) wenigstens teilweise von dem Ge-

häuse (150) in Richtung nach hinten abgezogen wird.

8. Verfahren nach Anspruch 6 oder 7, bei dem ein Teil jedes Anschlusses (110) in der zugeordneten Öffnung ständig während der Durchführung des Verfahrens bleibt.

9. Verfahren nach Anspruch 6, 7 oder 8, bei dem ferner der Schritt vorgesehen ist, gemäß dem jeder vollständig in das Gehäuse (150) wiedereingesetzte Anschluß (110) verrastet wird.

10. Verfahren nach einem der Ansprüche 6 bis 9, bei dem jeder Anschluß (110) einen Aufnahmetrennabschnitt (116) hat, und bei dem der Schritt zum wenigstens teilweisen Abziehen jedes Anschlusses (110) die folgenden Schritte aufweist: Einführen eines Stifts (220) in den Trennabschnitt (116) jedes Anschlusses (110), um den Anschluß während des anschließenden Drahteinbringens und des anschließenden Schritts zum Umbiegen des Anschlusses zu stabilisieren; und Drücken auf die vordere Kante des Trennabschnitts (116) jedes Anschlusses (110), um wenigstens teilweise den Anschluß (110) von der zugeordneten Öffnung in Richtung nach hinten zu drücken.

11. Verfahren nach Anspruch 10, bei dem der Stift (220) in den Trennabschnitt (116) jedes Anschlusses (110) über den vorderen Teil der zugeordneten Öffnung eingeführt wird.

12. Verfahren nach einem der Ansprüche 6 bis 11, bei dem der Schritt zum vollständigen Wiedereinsetzen die folgenden Schritte aufweist: Ergreifen jedes Drahtes (180) an dem hinteren Teil des zugeordneten, umgebogenen Drahtummbiegeabschnitts (112); und Drücken des ergriffenen Drahtes (180) in Richtung auf das Gehäuse (150).

13. Verfahren nach Anspruch 12 in Abhängigkeit von Anspruch 11, bei dem ferner der Schritt vorgesehen ist, gemäß dem der Stift (220) von dem jeweils vollständig wiedereingesetzten Anschluß (110) abgesogen wird.

14. Verfahren nach einem der Ansprüche 6 bis 13, bei dem die Anschlüsse (110) einzeln aufeinanderfolgend nach Maßgabe der vorstehend genannten Schritte bearbeitet werden, wobei das Verfahren ferner den Schritt aufweist, gemäß dem der Verbinder bewegt wird, nachdem jeder Anschluß (110) bearbeitet ist, um den Verbinder zum Bearbeiten des nächsten Anschlusses (110) zu positionieren.

15. Vorrichtung zum Montieren und Herstellen von elektrischen Verbindungen mit einem teilweise vormontierten Verbinder mit einem Gehäuse (150), das eine Mehrzahl von in Längsrichtung verlaufenden, in Querrichtung benachbarten, im wesentlichen parallelen Öffnungen hat, wobei jede Öffnung insgesamt durch das Gehäuse (150) zwischen der vorderen und der hinteren Gehäusefläche geht, und einen in Längsrichtung verlaufenden Metallanschluß (110) hat, der teilweise in die jeweilige Öffnung im wesentlichen parallel zu der Längsachse der zugeordneten



Öffnung eingesetzt ist, wobei jeder Anschluß (110) einen vorderen Trennabschnitt (116) und einen unumgebogenen, hinteren Drahtumbiegeabschnitt (112) hat, der Trennabschnitt (116) in der Öffnung angeordnet ist und wenigstens ein Teil des Drahtumbiegeabschnittes (112) außerhalb des Gehäuses (150) an der Rückseite der hinteren Fläche vorgesehen ist, und wobei die Vorrichtung aufweist: eine Einrichtung zum wenigstens teilweisen Abziehen jedes Anschlusses (110) von der zugeordneten Öffnung, um den unumgebogenen Drahtumbiegeabschnitt (112) vollständig freizulegen; eine Einrichtung zum Umbiegen des freigelegten Drahtumbiegeabschnittes (112) jedes Anschlusses (110) um einen zugeordneten Draht (180), der in den Drahtumbiegeabschnitt (112) eingelegt ist; und eine Einrichtung zum vollständigen Wiedereinsetzen des Anschlusses (110) in die zugeordnete Öffnung.

16. Vorrichtung nach Anspruch 15, bei der jeder Anschluß (110) einen Aufnahmetrennabschnitt (116) hat, und bei der die Abzugseinrichtung aufweist: einen Stift (220), der einen Anfangsendabschnitt hat, der lösbar in dem Trennabschnitt (116) jedes Anschlusses (110) aufnehmbar ist und einen Restteil hat, der im Querschnitt größer als der Trennabschnitt (116), aber im Querschnitt kleiner als das vordere Teil der zugeordneten Öffnung bemessen ist; und eine Einrichtung zum hin- und hergehenden Bewegen des Stifts (220) in der Öffnung derart, daß der Anfangsendabschnitt in den Trennabschnitt (116) eintritt und daß der restliche Teil den Anschluß (110) aus den Öffnungen in Richtung nach hinten drückt.

17. Vorrichtung nach Anspruch 16, bei der der Anfangsendabschnitt des Stifts (220) ausreichend fest sitzend in den Trennabschnitt (116) des Anschlusses (110) paßt, um den Anschluß (110) an dem Stift (220) lösbar festzuhalten und um im wesentlichen ein Verdrehen des Anschlusses (110) um die Längsachse des Stiftes zu verhindern.

18. Vorrichtung nach Anspruch 15, 16 oder 17, bei der die Umbiegeeinrichtung aufweist: eine Amboßeinrichtung (240), die in der Nähe einer Seite des freigelegten Drahtumbiegeabschnittes (112) angeordnet ist; und eine Umbiegeeinrichtung (280), welche den freigelegten Drahtumbiegeabschnitt gegen die Amboßeinrichtung quetscht.

19. Vorrichtung nach einem der Ansprüche 15 bis 18, bei der die Wiedereinsetzungseinrichtung aufweist: eine Einrichtung (230) zum Ergreifen des Drahtes (180) am hinteren Teil des zugeordneten Drahtumbiegeabschnittes und zum Drücken des Drahtes in Richtung des Gehäuses (150).

20. Vorrichtung nach einem der Ansprüche 15 bis 19, bei der die Anschlüsse (110) einzeln aufeinanderfolgend bearbeitet werden, und bei der die Vorrichtung ferner aufweist: eine Einrichtung (290, 210) zum Bewegen des Gehäuses (150), nachdem jeder Anschluß (110) bearbeitet worden ist, um das Gehä-

se (120) für die Bearbeitung des nächsten Anschlusses (110) zu positionieren.

5 Revendications

1. Un connecteur électrique partiellement préassemblé et comprenant: un boîtier (150) muni d'une pluralité d'ouvertures longitudinales, latéralement adjacentes et sensiblement parallèles, chaque ouverture s'étendant en continue à travers le boîtier (150) entre les surfaces frontale et arrière du boîtier (150) et une pluralité de verrous flexibles (152) disposés d'un côté dudit boîtier (150) en relation de correspondance individuelle avec lesdites ouvertures, chaque verrou (152) comportant une partie de bec (154) qui s'étend dans son ouverture associée, une borne métallique longitudinale (110) partiellement insérée dans chaque ouverture à la surface arrière dudit boîtier (100) dans une direction sensiblement parallèle à l'axe longitudinal de l'ouverture associée, chaque borne (110) présentant une partie frontale de déconnexion (116) munie d'un organe élastique arqué vers le bas (120) et une partie arrière de sertissage de fil non sertie (112), la partie de déconnexion (116) étant disposée dans l'ouverture et au moins une portion de la partie de sertissage de fil (112) étant à l'extérieur du boîtier (150) à l'arrière de la surface arrière, la partie de bec (154) de chaque verrou (152) étant en contact élastique avec l'organe élastique arqué (120) de la partie de déconnexion (116) de la borne associée (110) à un niveau suffisant pour retenir ladite borne à l'encontre d'un retrait intempestif, mais qui n'est pas suffisant pour verrouiller de façon permanente ledit borne (110) dans le boîtier (150).

2. Un connecteur selon la revendication 1, dans lequel la partie de déconnexion frontale (116) présente une section transversale qui est généralement en forme de rectangle creux, la face supérieure dudit rectangle comprenant ledit ressort arqué (120) qui se cambre vers le bas, ladite partie de bec (154) de chaque verrou (152) venant en contact avec ledit ressort arqué (120).

3. Un connecteur selon la revendication 1 ou la revendication 2, dans lequel la portion de la partie de fil non sertie (112) qui est à l'extérieur du boîtier (150) est trop grande pour s'ajuster dans l'ouverture associée lorsqu'elle n'est pas sertie.

4. Un connecteur selon l'une quelconque des revendications précédentes, dans lequel ladite partie à l'extérieur du boîtier (100) comporte une partie (114) de sertissage de l'isolant.

5. Un connecteur selon l'une quelconque des revendications précédentes, dans lequel, après qu'un fil (180) ait été sertie à la partie de sertissage de fil (112), l'insertion supplémentaire desdites bornes (110) oblige la partie de bec (154) de chaque verrou (152) à tomber dans une encoche (122) à l'arrière de



la partie de déconnexion (116) pour verrouiller les bornes (110) dans le boîtier (150).

6. Un procédé pour réaliser des connexions électriques sur un connecteur électrique comprenant les étapes consistant à : prévoir un connecteur partiellement préassemblé comprenant un boîtier (150) muni d'une pluralité d'ouvertures longitudinales, latéralement adjacentes et sensiblement parallèles, chaque ouverture s'étendant à travers le boîtier (150) entre les surfaces du boîtier avant et arrière, et une borne métallique longitudinale (110) partiellement insérée dans chaque ouverture sensiblement parallèle à l'axe longitudinal de l'ouverture associée, chaque borne (110) présentant une partie frontale de déconnexion (116) et une partie arrière de sertissage de fil non sertie (112), la partie de déconnexion (116) étant disposée dans l'ouverture et au moins une portion de la partie de sertissage de fil (112) étant à l'extérieur du boîtier (150) à l'arrière de la surface arrière ; à retirer au moins partiellement chaque borne (110) de l'ouverture associée pour découvrir complètement la partie de sertissage de fil non sertie (112) ; à placer un fil (180) dans la partie découverte de sertissage de fil non sertie (112) de chaque borne (110) ; à sertir la partie découverte de sertissage de fil (112) de chaque borne (110) autour du fil associé (180) pour fixer le fil à la borne ; et à réinsérer complètement la borne (110) dans l'ouverture associée.

7. Un procédé selon la revendication 6, dans lequel chaque borne (110) est au moins partiellement retirée du boîtier (150) dans la direction arrière.

8. Un procédé selon la revendication 6 ou 7, dans lequel une partie de chaque borne (110) reste dans l'ouverture associée en permanence au cours de la mise en oeuvre du procédé.

9. Un procédé selon la revendication 6, 7 ou 8, comprenant en outre l'étape consistant à verrouiller dans le boîtier (150) chaque borne (110) complètement réinsérée.

10. Un procédé selon l'une quelconque des revendications 6 à 9, dans lequel chaque borne (110) comporte une partie de déconnexion femelle (116) et dans lequel l'étape consistant à retirer au moins partiellement chaque borne (110) comporte les étapes consistant à : insérer une tige (220) dans la partie de déconnexion (116) de chaque borne (110) pour stabiliser la borne au cours des étapes suivantes de mise en place du fil et de sertissage de la borne ; et à pousser sur le bord frontal de la partie de déconnexion (116) de chaque borne (110) de façon à au moins partiellement repousser la borne (110) de l'ouverture associée dans la direction arrière.

11. Un procédé selon la revendication (10), dans lequel la tige (220) est insérée dans la partie de déconnexion (116) de chaque borne (110) via la partie frontale de l'ouverture associée.

12. Un procédé selon l'une quelconque des revendications 6 à 11, dans lequel l'étape de réinser-

tion complète comprend les étapes consistant à : saisir chaque fil (180) à l'arrière de la partie associée de sertissage de fil sertie (112) ; et à pousser le fil saisi (180) en direction du boîtier (150).

13. Un procédé selon la revendication 12 dépendante de la revendication 11, comprenant en outre l'étape consistant à retirer la tige (220) de chaque borne (110) complètement réinsérée.

14. Un procédé selon l'une quelconque des revendications 6 à 13, dans lequel les bornes (110) sont traitées une à la fois en succession selon les étapes précédentes, et dans lequel le procédé comprend en outre l'étape consistant à déplacer le connecteur après que chaque borne (110) ait été traitée pour mettre en position le connecteur afin de traiter la borne suivante (110).

15. Appareil pour assembler et réaliser des connexions électriques sur un connecteur partiellement préassemblé, comprenant un boîtier (150) muni d'une pluralité d'ouvertures longitudinales, latéralement adjacentes et sensiblement parallèles, chaque ouverture s'étendant à travers le boîtier (150) de la surface avant jusqu'à la surface arrière du boîtier, et une borne métallique longitudinale (110) partiellement insérée dans chaque ouverture sensiblement parallèle à l'axe longitudinal de l'ouverture associée, chaque borne (110) comportant une partie frontale de déconnexion (116) et une partie arrière de sertissage de fil non sertie (112), la partie de déconnexion (116) étant disposée dans l'ouverture et au moins une portion de la partie de sertissage de fil (112) étant à l'extérieur du boîtier (150), à l'arrière de sa surface arrière, comprenant : des moyens pour au moins partiellement retirer chaque borne (110) de l'ouverture associée de façon à découvrir complètement la partie de sertissage de fil non sertie (112) ; des moyens pour sertir la partie de sertissage de fil découverte (112) de chaque borne (110) autour d'un fil associé (180) placé dans la partie de sertissage de fil (112) ; et des moyens pour réinsérer complètement la borne (110) dans l'ouverture associée.

16. Appareil selon la revendication 15, dans lequel chaque borne (110) comporte une partie de déconnexion femelle (116) et dans lequel les moyens de retrait comprennent : une tige (220) munie d'une partie d'extrémité initiale qui est susceptible d'être reçue de façon amovible dans la partie de déconnexion (116) de chaque borne (110) et une partie restante qui présente une section transversale plus large que la partie de déconnexion (116) mais plus réduite que la partie frontale de l'ouverture associée ; et des moyens pour faire avancer la tige (220) dans l'ouverture, de façon que la partie d'extrémité initiale pénètre dans la partie de déconnexion (116) et que la partie restante repousse ainsi la borne (110) hors de l'ouverture dans la direction arrière.

17. Appareil selon la revendication 16, dans lequel la partie d'extrémité initiale de la tige (220)



s'ajuste de façon suffisamment rigide dans la partie de déconnexion (116) de la borne (110) pour retenir de façon amovible la borne (110) sur la tige (220) et pour empêcher sensiblement la rotation de la borne (110) autour de l'axe longitudinal de la tige.

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18. Appareil selon la revendication 15, 16 ou 17, dans lequel lesdits moyens de sertissage comprennent : des moyens d'enclume (240) disposés adjacents à une face de la partie de sertissage de fil découverte (112) ; et des moyens de sertissage (280) pour écraser la partie de sertissage de fil découverte sur les moyens d'enclume.

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19. Appareil selon l'une quelconque des revendications 15 à 18, dans lequel les moyens de réinsertion comprennent : des moyens (230) pour saisir le fil (180) à l'arrière de la partie de sertissage de fil associée et pour repousser le fil en direction du boîtier (150).

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20. Appareil selon l'une quelconque des revendications 15 à 19, dans lequel les bornes (110) sont traitées une à la fois en succession et dans lequel l'appareil comprend en outre : des moyens (290, 210) pour déplacer le boîtier (150) après que chaque borne (110) ait été traitée de manière à positionner le boîtier (120) pour le traitement de la borne suivante (110).

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