

[54] **TERMINALS AND CONNECTORS FOR INTERCONNECTING CONDUCTORS AND MALE CONTACTS**

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[52] U.S. Cl. **339/217 S, 339/258 R, 339/277 R**

[51] Int. Cl. **H01r 9/08**

[58] **Field of Search** 339/192 R, 192 T, 339/217 R, 217 S, 217 PS, 219 R, 219 F, 223 R, 223 S, 194 R, 194 N, 241, 243, 252 R, 252 F, 252 P, 252 T, 252 S, 256 R, 256 C, 256 A, 256 S, 256 SP, 256 T, 258 R, 258 A, 258 C, 258 F, 258 P, 258 R, 258 S, 258 T, 258 TC, 257, 276 F, 277 RL

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[57]

ABSTRACT

A generally dish-shaped terminal includes female contact structure for receiving a projecting male terminal and includes a wire gripping portion. The contact structure includes two or more arms integral at both ends with a planar portion of the terminal, and each arm carries a contact segment interfacing with similar contact segments to receive male terminals of different shapes, including blade terminals and round and square post or pin terminals, with an interference fit. Connectors including terminals mounted in cavities in insulating housings are used when covering or protecting of the terminals is desired.

13 Claims, 16 Drawing Figures

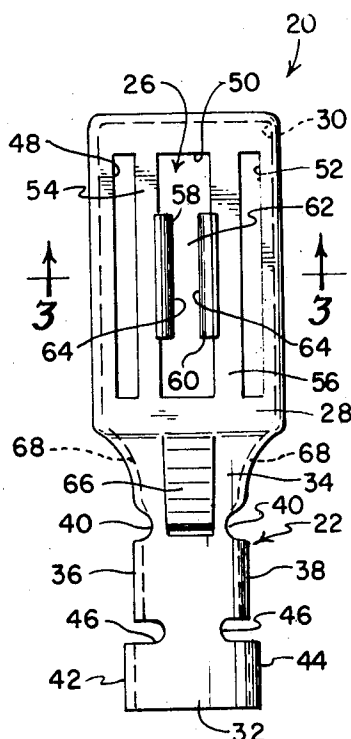


FIG 1

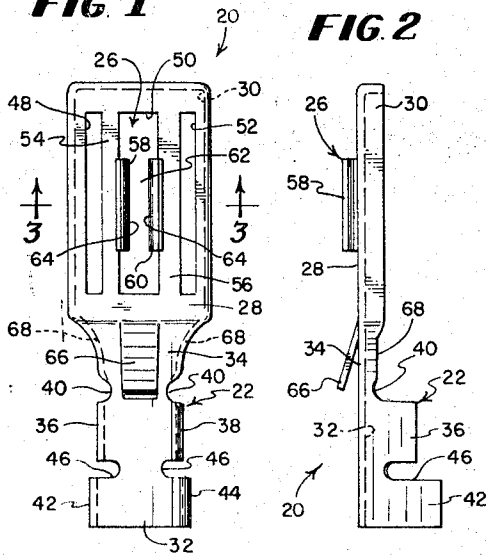


FIG 2

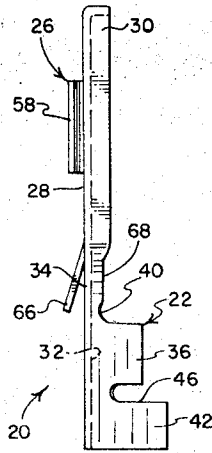


FIG 5

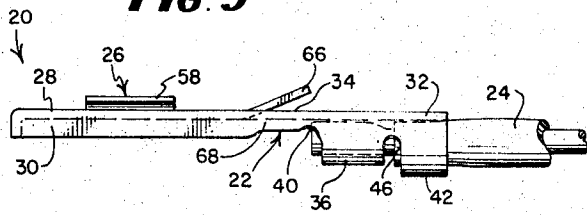


FIG 3

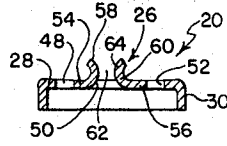


FIG 4

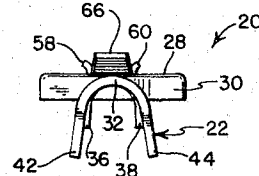


FIG 6

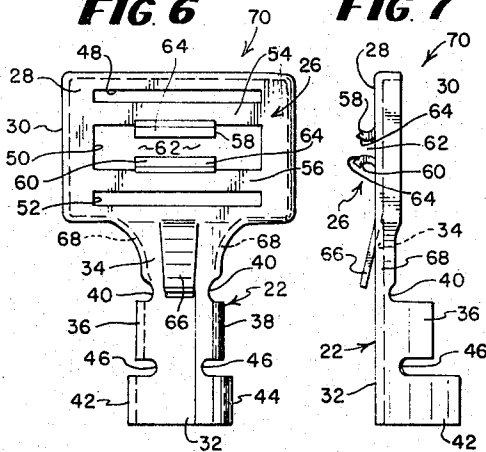


FIG 7

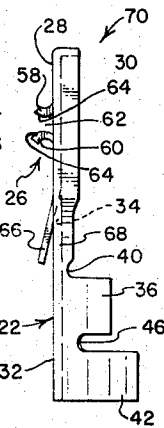


FIG 8

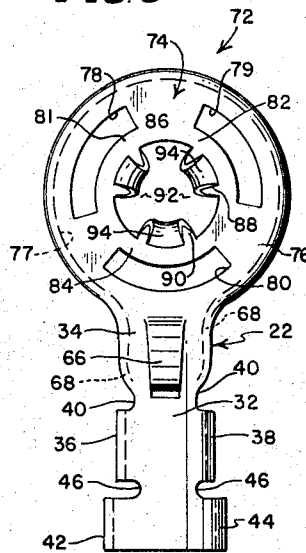


FIG 9

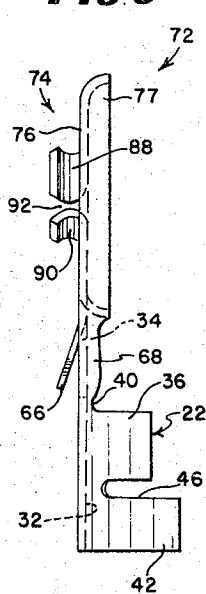


FIG 10

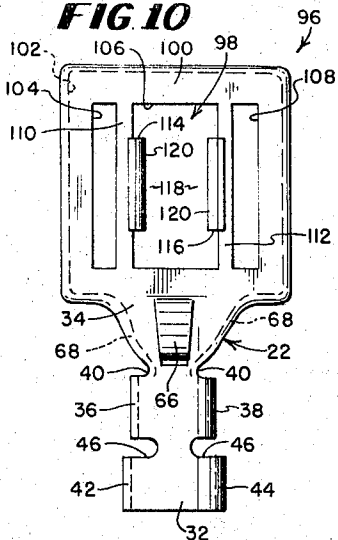


FIG 11

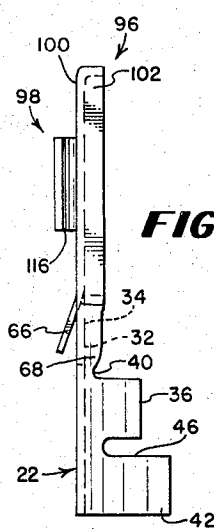


FIG 12

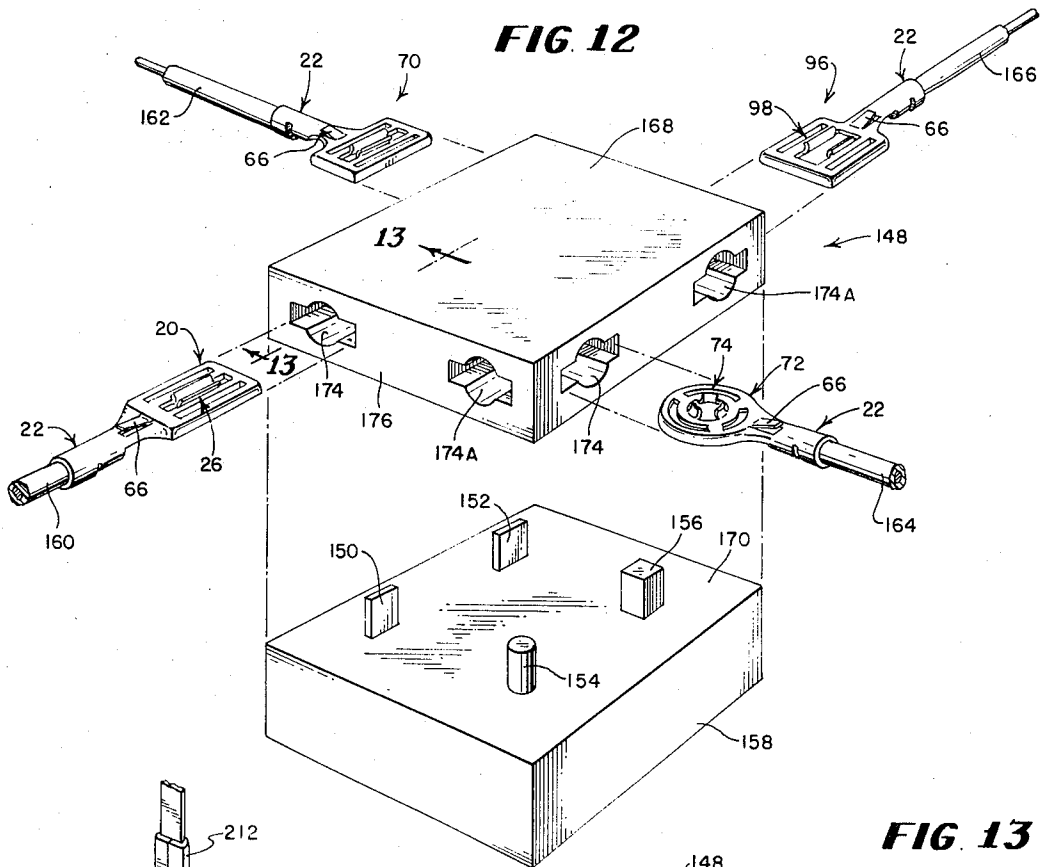


FIG 13

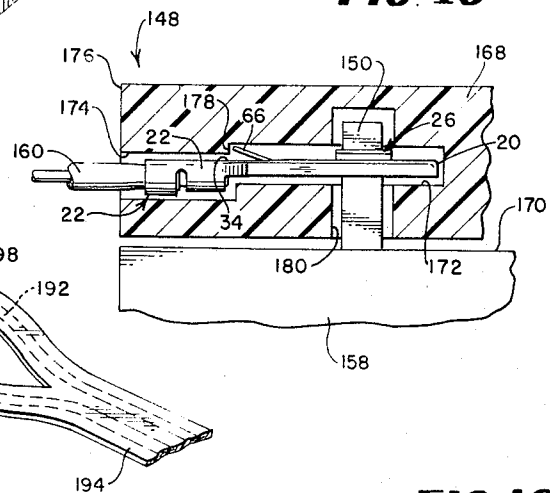


FIG 14

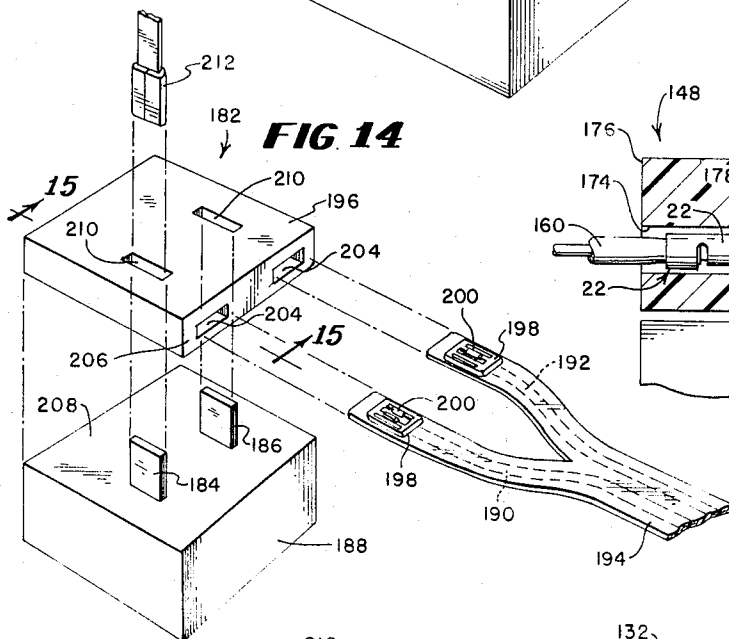


FIG 15

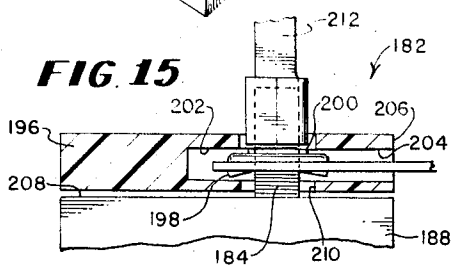
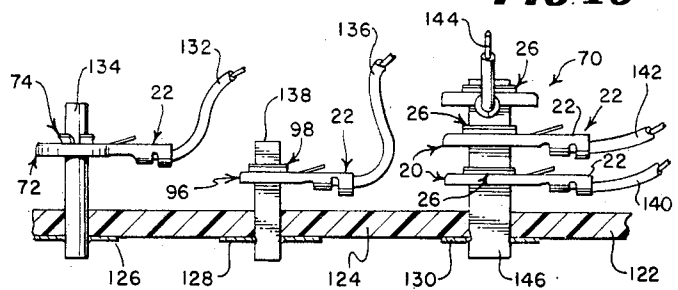


FIG 16



TERMINALS AND CONNECTORS FOR INTERCONNECTING CONDUCTORS AND MALE CONTACTS

The present invention relates to improved terminals and connectors, and more particularly to terminals and connectors useful for connecting conductors such as wires to male terminals.

In the assembly of electrical circuits it is often necessary to provide connections between projecting terminals, such as blades, pins or posts, and insulated wire conductors. Due to the expense and difficulty of providing such connections by soldering, screw fasteners or the like, conductive terminals of many types have been developed for this purpose. Such terminals may be formed of stamped sheet metal and include a portion adapted to be attached to a wire and another portion releasably and frictionally engageable with the male contact. Terminals developed in the past have suffered from disadvantages such as large size, unsatisfactory electrical contact with the male terminal, inconvenience in use, and expense of manufacture.

My copending application Ser. No. 272,441, filed July 17, 1972 discloses terminals useful for interconnecting flexible circuits and other electrical devices having male contacts. It has been found that the improved contact structure of the terminals disclosed in that application may also be used with advantage in terminals for interconnecting wires and male contacts.

In some instances it is desirable to provide a connector including a male contact engaging terminal mounted within an insulating housing. For example, it may be desired to avoid the presence of exposed conductive elements where a shock hazard might be present. Moreover, a housing can serve the purpose of protecting the terminal from being dislodged or being damaged.

Objects of the present invention are to provide improved terminals for interconnecting wires and male terminals; to provide terminals having extremely small size and having excellent electrical contact properties; to provide terminals overcoming the above noted and other disadvantages of known structures; and to provide terminals which are both convenient to use and economical to manufacture. An additional object of the invention is to provide improved connectors including terminals and housings, and in particular to provide connectors having great versatility in use.

Briefly, the above and other objects and advantages of the present invention are achieved by providing a terminal fabricated of conductive metal and including a generally planar portion surrounded by a rim portion to create a sturdy dish-shaped configuration. In accordance with a feature of the invention, there is provided a female contact structure adapted to receive a projecting male terminal. The planar portion of the body is provided with slots or apertures defining spaced, relatively narrow arms each of which is integral at both ends with the body. Contact portions shorter than the arms are formed as integral lateral projections of the arms and face centrally to define a contact space smaller than the corresponding dimension of the male contact to which a connection is to be made. The contact structure may be adapted to receive a variety of male terminal shapes including spade terminals as well as round and square post or pin terminals. When a male terminal is received in the contact space, an in-

terference fit with the contact portions results in displacement of the contact portions due to twisting or torsion in the arms and due to cantilever action of the contact portions. As a result a reliable, intimate electrical contact is achieved. The terminal is provided with a wire gripping portion at least partly generally coplanar with the planar portion of the terminal for attachment of the terminal to a stripped end portion of a wire conductor.

In accordance with another aspect of the invention, there is provided a connector including a terminal having a female contact structure. The terminal includes conductor gripping means for fastening the terminal to a conductor such as either a wire conductor or a conductor of a flexible circuit. An insulating housing includes a cavity for containing the terminal and a first passage in the housing leads from the cavity to permit insertion of the terminal into the cavity after attachment of the terminal with a conductor. A second passage leads from the cavity to receive a male contact engaged with the terminal.

The invention together with the above and other objects and advantages may be best understood from the following detailed description of embodiments of the invention shown in the accompanying drawings, wherein:

FIG. 1 is a top view of a terminal embodying features of the present invention;

FIG. 2 is a side view of the terminal of FIG. 1;

FIG. 3 is a sectional view of the terminal taken along the line 3—3 of FIG. 1;

FIG. 4 is an end view of the terminal of FIG. 1;

FIG. 5 is a side view of the terminal of FIG. 1 illustrating the terminal after attachment to a wire conductor;

FIG. 6 is a top view of a terminal comprising an alternative embodiment of the invention;

FIG. 7 is a side view of the terminal of FIG. 6;

FIG. 8 is a top view of a terminal comprising another alternative embodiment of the invention;

FIG. 9 is a side view of the terminal of FIG. 8;

FIG. 10 is a top view of a terminal comprising another alternative embodiment of the invention;

FIG. 11 is a side view of the terminal of FIG. 10;

FIG. 12 is a perspective view of a connector embodying features of the invention and illustrating the connector prior to assembly with an electrical device;

FIG. 13 is an enlarged sectional view of part of the connector of FIG. 12 after assembly, and taken along the line 13—13 of FIG. 12;

FIG. 14 is a perspective view of a connector comprising an alternative embodiment of the invention and illustrating the connector prior to assembly with an electrical device;

FIG. 15 is an enlarged sectional view of the connector of FIG. 14 illustrating the connector after assembly and taken along the line 15—15 of FIG. 14; and

FIG. 16 is a side view partly in section illustrating another use of terminals of the present invention.

With reference now to the drawings, in FIGS. 1-5 there is illustrated a terminal generally designated by the reference numeral 20 and embodying features of the present invention. The terminal 20 in general includes a wire gripping portion designated as a whole by the reference numeral 22 for attaching the terminal 20 to a wire conductor such as the conductor 24 illustrated in FIG. 5, as well as a female contact structure

designated as a whole by the reference numeral 26 for engagement with a projecting male terminal. Among the advantages of the terminal 20 are its extremely small size and good electrical conduction characteristics made possible by the contact structure 26.

The terminal 20 preferably comprises a unitary metal body which may be formed in an automatic operation from sheet stock by means of suitable sequential press operations. The terminal 20 is of generally rectangular shape and includes a generally flat or planar body portion 28 surrounded throughout most of its periphery by a continuous relatively narrow lip 30. The flat portion 28 and lip 30 cooperate to provide a generally dish-shaped body configuration having substantial strength and resistance to bending or twisting even though relatively thin metal is used.

In order to provide for a very low profile of the terminal 20, the wire gripping portion 22 extends laterally or directly to the side from the planar portion 28, and preferably at least part of the wire gripping portion 22 is generally coplanar with the planar portion 28. Prior to attachment to a wire, the wire gripping portion as illustrated best in FIG. 4 is generally U-shaped and includes a base or bight portion 32 comprising a continuation of the planar portion 28. Adjacent the planar portion 28, the base portion 32 forms a neck section 34. A first pair of gripping flanges 36 and 38 extend from the base 32 and are spaced from the neck section 34 by a pair of notches 40. Flanges 36 and 38 as illustrated in FIG. 5 are crimped around the exposed end portion of the wire conductor 24.

Spaced outwardly from the first pair of flanges is a second pair of gripping flanges 42 and 44 separated from the first pair of flanges by notches 46. Preferably flanges 42 and 44 are somewhat larger than flanges 36 and 38 and serve upon crimping to grasp an insulated portion of the wire conductor 24. Since the wire gripping portion 22 is in part coplanar with the portion 30 of the terminal and extends laterally from the terminal, as can be seen in FIG. 5 the overall vertical height of the terminal 20 after attachment to a wire is extremely small.

In accordance with a feature of the invention, the terminal 20 is provided with the contact structure 26. More specifically, the flat portion 28 of the terminal 20 is provided with three slots or apertures 48, 50 and 52 serving to define two elongated narrow spaced arms 54 and 56. The arms are integral at each end with the body of the terminal 20.

Each arm 54 and 56 is provided with a central contact portion 58 and 60 respectively. As best shown in FIGS. 1 and 3, the contact portions 58 and 60 project from the arms 54 and 56 toward one another in interfacing relation to provide a contact receiving space designated by the reference numeral 62. The contact portions 58 and 60 may be located and dimensioned to accommodate many types of male contact structures with an interference fit. As illustrated in FIGS. 1-5, the distance between the contact portions is selected to be smaller than the corresponding dimension of a male spade or blade type terminal. Thus, upon entry of a contact blade, there exists an interference fit between the blade and contact portions 58 and 60. In order to facilitate both insertion and withdrawal of a terminal blade and in order to permit insertion of the terminal blade from either direction relative to the terminal 20, the contact portions are curved or rounded

to present smooth curved surfaces 64 interfacing in the contact space 62.

As best seen in FIG. 1, the contact portions 58 and 60 are shorter in length than the arms 54 and 56 and are located substantially in the center of the arms 54 and 56. Thus, the arms 54 and 56 include end portions of relatively narrow width extending between the contact portions and the main body of the terminal 20. Upon insertion of a male blade terminal with an interference fit between the contact portions 58 and 60, the arms 54 and 56 twist as a torsional stress is placed upon the arms. Moreover, to some degree the contact portions 58 and 60 serve as short cantilever beams placed in bending stress by insertion of a male contact. The overall effect of the torsional stress and the bending stress in the arms 54 and 56 and in the contact portions 58 and 60 is to provide a firm resilient biasing of the smooth curved surfaces 64 intimately against the male contact. In this manner there is provided a reliable low resistance electrical connection between the contact portions 58 and 60 and the surfaces of an inserted terminal. Moreover, this reliable electrical connection is maintained even after many insertions and withdrawals of a male contact.

It has been found that close production tolerances are not necessary since the contact design affords substantial variation in contact spacing while still providing good electrical contact. In addition, twisting and/or skewing of an inserted contact in the terminal 20 does not interfere with the electrical connection. The contact structure 26 as best seen in FIGS. 2 and 3 also has an important advantage in that it requires extremely little vertical space.

In order to facilitate incorporation of the terminal 20 into an electrical connector such as the electrical connector described below in connection with FIGS. 12 and 13, the terminal is provided with a resilient locking tab 66. Preferably tab 66 is formed by striking out a portion of the terminal in the neck section 34. The tab 66 as best seen in FIGS. 2 and 5 slopes upwardly and rearwardly at an angle from the plane of the flat portion 28. The resiliency of the tab is such that it can be depressed when the terminal 20 is inserted into a housing as discussed hereinafter. In order to strengthen the region of the neck 34 containing the tab 66, the lip 32 surrounding the planar portion 30 of the terminal includes integral extensions 68 disposed along the edges of the neck 34.

The female contact structure can be adapted to cooperate with male terminals of various types. In order to illustrate a few of the many arrangements made possible by the invention, terminals comprising alternative embodiments of the invention are described with reference to FIGS. 6 and 7, FIGS. 8 and 9, and FIGS. 10 and 11.

First referring to FIGS. 6 and 7, there is illustrated a terminal generally designated as 70 and comprising one alternative embodiment of the invention. Terminal 70 is similar in many respects to terminal 20 described above and is also adapted to be used with a spade or blade type male terminal. Similar reference numerals are used to designate identical portions of the terminals 70 and 20.

Terminal 70 differs from terminal 20 in that the wire gripping portion 22 of the terminal 70 extends in a direction generally normal to rather than parallel to the major cross sectional axis of the contact receiving

space 62. In some arrangements, depending upon space requirements and terminal configurations, terminal 70 may be more convenient to use than terminal 20.

With reference now to FIGS. 8 and 9, there is illustrated another terminal generally designated by the reference numeral 72 comprising yet another alternative embodiment of the invention. Terminal 72 is similar in many respects to the terminal 20 described above, and is adapted to be used with a pin or post terminal having a circular cross section rather than with a blade or spade type contact. In general, the terminal 72 includes a female contact structure generally designated as 74 as well as a wire gripping portion. Since the wire gripping portion of the terminals 20 and 72 are similar, each is designated by the reference numeral 22 and similar reference numerals are used to identify the identical portions thereof.

Like the terminal 20, the terminal 72 is preferably formed in a series of automatic press operations from a unitary sheet metal blank and includes a generally flat or planar body portion 76 surrounded by a continuous lip 77 giving the terminal 72 a rigid and strong dish-shaped body configuration. The flat portion 76 of the terminal 72 is provided with generally arcuate slots or apertures 78, 79 and 80 defining elongated narrow spaced arms 81, 82 and 84 each provided with generally spaced arms 81, 82 and 84 each provided with a central contact portion 86, 88 and 90. The contact portions 86, 88 and 90 interface and provide a generally circular contact receiving space designated by the reference numeral 92. This space is somewhat smaller than the corresponding dimension of a pin or post with which the terminal 72 is used in order to provide an interference fit. In order to facilitate both insertion and withdrawal of a male terminal and to permit insertion from either direction, the contact portions 86, 88 and 90 are curved or rounded to present smooth curved surfaces 94 interfacing in contact space 92.

As appears best in FIG. 8, the contact portions 86, 88 and 90 are shorter than the arms 81, 82 and 84. Upon insertion of a pin or post terminal with an interference fit between the contact portions, the arms twist as a torsional stress is applied. Moreover, to some degree the contact portions serve as cantilever beams placed in bending stress by insertion of a terminal. The result of the combined torsional and bending stress is a firm resilient biasing of the contact surfaces 94 intimately against an inserted terminal, even after multiple insertions and withdrawals.

With reference now to FIGS. 10 and 11, there is illustrated yet another embodiment of the present invention in the form of a terminal generally designated as 96. In many respects the terminal 96 is similar to the terminal 20 described above, and it is intended for use with a pin or post terminal having a square cross section. The terminal 96 includes a female contact structure generally designated by the reference numeral 98. The terminal 96 also includes a wire gripping portion identical to the wire gripping portion 22 of the terminal 20, and similar reference numerals are used for identical parts thereof.

Like the terminal 20, the terminal 96 is preferably formed in a series of automatic press operations from a unitary sheet metal blank and includes a generally flat or planar body portion 100 surrounded by a continuous lip 102 strengthening the terminal 96 and giving it a generally dish-shaped body configuration. The terminal

96 is generally square in outline and is complementary in shape to a square pin or post contact.

The contact structure 98 of the terminal 96 comprises one type of female contact structure which can be adapted for use with terminals of the present invention. The flat portion 100 of the terminal 96 is provided with slots or apertures 104, 106 and 108 defining a pair of elongated narrow spaced arms 110 and 112 each provided with a central contact portion 114 and 116. The contact portions 114 and 116 face toward one another and provide a contact receiving space designated by the reference number 118. This space is somewhat smaller in width than the dimension of the sides of a square pin or post terminal in order to provide an interference fit. In order to facilitate both insertion and withdrawal of a male contact and to permit insertion from either direction, the contact portions are curved or rounded to present smooth curved surfaces 120 interfacing in the contact space 118.

As appears best in FIG. 10, the contact portions 114 and 116 are shorter than the arms 110 and 112. Upon insertion of a male contact with an interference fit between the contact portions 114 and 116, the arms twist as a torsional stress is applied. Moreover, to some degree the contact portions serve as cantilever beams placed in bending stress by the insertion of a contact. The result of the combined torsional and bending stress is a firm resilient biasing of the contact surfaces 120 intimately against an inserted contact, even after multiple insertions and withdrawals.

Terminals constructed in accordance with the features of the present invention such as the terminals 20, 70, 72 and 96 described in detail above can be used to interconnect wires with any type of electrical device having projecting male terminals. One example of the many uses to which the terminals can be put appears in FIG. 16 wherein there is illustrated an electrical device in the form of a printed circuit board 122. The board 122 includes an insulating layer 124 carrying a plurality of conductive layers 126, 128 and 130.

In order to establish an electrical connection between the conductive layer 126 and a wire 132, a circular pin or post type male terminal 134 is received in an opening in the board 122, as by press fitting, staking or the like. An electrical connection is established between the terminal 134 and the conductive layer 126, for example by soldering. The wire gripping portion 22 of a terminal 72 is attached by crimping to the wire 132, and the terminal 72 is engaged with the post 134 with the contact structure 74 establishing an electrical contact with the post.

In order to establish an electrical connection between a wire 136 and the conductive layer 128, a square post or pin type male terminal 138 is received in the board 122 and is electrically connected to the conductive layer 128. The wire gripping portion 22 of a terminal 96 is attached to the wire 136, and the terminal 96 is engaged with the terminal 138 so that the contact structure 98 establishes an electrical connection with the post 138.

Electrical connections are established between the conductive layer 130 and wires 140, 142, and 144 through the use of terminals 20 and 70 and a blade or spade type male terminal 146 mounted on the board 122 and electrically connected to the conductive layer 130. More specifically, the wire gripping portions 22 of a pair of terminals 20 are attached to the wires 140 and

142. The terminals 20 are engaged with the blade terminal 146, and the contact structures 26 thereof establish electrical connections to the blade terminal. Similarly, the wire gripping portion 22 of a terminal 70 is attached to the wire 144, and the terminal 70 is mounted on the blade terminal 146 so that its contact structure 26 establishes an electrical connection.

The convenience in use and versatility of the terminals provided in accordance with the present invention is well illustrated in FIG. 16. The terminals are adapted to be used with projecting male terminals of many configurations. In addition, as appears best in the connections made to the terminal 146, the extremely compact size and low profile of the terminals permits many connections to be made to a single projecting male terminal.

In accordance with another aspect of the present invention, terminals such as the terminals 20, 70, 72 and 96 can be associated with an insulating housing in order to provide a novel electrical connector for making connections with projecting male terminals. Referring now more specifically to FIGS. 12 and 13, there is illustrated a connector generally designated by the reference numeral 148 constructed in accordance with principles of the present invention. The connector 148 serves to establish electrical connections between projecting male terminals 150, 152, 154 and 156 of an electrical device 158 and wire conductors 160, 162, 164 and 166. The device 158 illustrated in block form is intended to represent any type of electrical device such as a control device, a switching device, or the like.

Although in view of the preceding discussion it will be apparent that connections to the male terminals of the device 158 may be made with terminals of the present invention directly without the use of an insulating housing, in some instances the use of an insulating housing provides certain advantages. For example, in some installations where a shock hazard or a fire hazard or the like is present, it is desirable to avoid the existence of exposed conductive circuit elements. In addition, in some environments where the terminals might be subjected to vibration, impacts or other external forces, it is desirable to protect the terminals from becoming dislodged or damaged.

The connector 148 illustrated as one typical arrangement includes an insulating housing 168 together with a terminal 20, a terminal 70, a terminal 72, and a terminal 96. The housing 168 includes an arrangement of internal cavities and passageways for receiving the terminals 20, 70, 72 and 96 in covered and protected regions therein. After insertion of the terminals into the housing 168, the housing is adapted to be engaged against a surface 170 of the device 200 from which the male terminals 150, 152, 154 and 156 project. Passages are provided in the insulating housing 168 to permit the projecting male terminals to engage the terminals of the connector 148.

Referring now to FIG. 13, the structure of the insulating housing 168 is illustrated in more detail. The housing is provided with a cavity 172 for receiving the terminal 20 which is secured to the wire 160 by crimping of its wire gripping portion 22. A passage 174 extends from the cavity 172 in a generally horizontal direction as illustrated to a side wall 176 of the housing 168.

As best appears in FIG. 12, the passage 174 has a configuration similar in shape and slightly larger than the end profile of the terminal 20 after attachment to

the wire 160. Thus it is possible to inset the terminal 20 into the passage 174 and thence into the cavity 172. After insertion, the wire 160 extends outwardly through the passage 174.

In order to retain the terminal 20 in position in the housing 210 after insertion, there is provided a locking shoulder 178 associated with the cavity 172 and passage 174. As the terminal 20 is inserted through the passage 174, the resilient locking tab 66 engages the top of the passage 174 and is resiliently depressed downwardly toward the surface of the neck section 34. As soon as the tab 66 clears the shoulder 178, the tab snaps away from the neck 34 and lockingly engages the shoulder 178 to prevent inadvertent withdrawal of the terminal 20 from the recess 172.

After insertion of the terminal 20 into the cavity 172, the connector housing 168 can be engaged against the surface 170 of the device 158. The housing 168 is provided with another passage 180 extending in what is illustrated as the vertical direction, and thus normal to the passage 174. The passage 180 is generally similar in shape to the projecting male blade or spade type terminal 150, and intersects the cavity 172 in the region of the contact structure 26 of the terminal 20. Thus, when the housing 168 is moved toward the surface 170, the male terminal 150 extends into the passage 180 and engages the terminal 20.

Although the cavities for receiving the terminals 70, 72 and 96 are not illustrated and although the passages associated therewith are illustrated only in part in FIG. 12, it will be understood that such passages and cavities may be similar to the cavity 172 and the passage 174 and 180 illustrated in FIG. 13. The configuration of each passage 174 and cavity 172 is such as to slidably receive the corresponding terminal 70, 72 or 96, and each such passage and cavity is provided with a locking shoulder 178 for engagement by the locking tab 66 of the terminal. Moreover, each such cavity 172 is provided with a passage 180 for receiving the corresponding male terminal 152, 154 and 156 for making an electrical connection with the terminal 70, 72 or 96.

Added versatility is achieved in accordance with the invention through the use of alternate passages for the insertion of terminals into the connector housing 168. For example, with reference to the terminal 72 illustrated in FIG. 12, there is provided not only the passage 174, but also an alternate passage 174A extending in the same plane but transverse thereto. Except for its orientation, the passage 174A is similar to the passage 174, and as a result the terminal 72 can be inserted into its corresponding internal cavity 172 in either of two directions. A similar alternate passage 174A is provided for the terminal 96 as can also be seen in FIG. 12. Similar alternate passages although not illustrated may be provided for the terminals 20 and 70 so that, for example, a terminal 70 may be used to make a connection to the terminal 150 through a passage 174A, or alternatively a terminal 20 may be inserted into the housing 168 in another direction to make a connection to the terminal 152.

Another connector generally designated as 182 and comprising an alternative embodiment of the invention is illustrated in FIGS. 14 and 15. This connector is adapted to establish electrical connections between a pair of projecting male terminals 184 and 186 associated with an electrical device 188, and a pair of conductors 190 and 192 of a flexible circuit or cable 194.

In general, the connector 182 includes an insulating connector housing 196 and a pair of terminals 198 adapted to be attached to the conductors 190 and 192 and to be engaged by the projecting male terminals 184 and 186. Each of the terminals 198 includes a conductor engaging structure (not shown) and a female contact structure 200 for engagement with the projecting male terminals 184 and 186. Although the terminals 198 are not illustrated in detail herein, reference may be had to my copending application Ser. No. 272,441, filed July 17, 1972 for a complete description of the structure, use, and operation of the terminals 198.

As illustrated in FIG. 15, the housing 196 of the connector 182 is provided with an internal cavity 202 for receiving each of the terminals 198. A passage 204 extends laterally from the cavity 202 to a side wall 206 of the housing 196, and after attachment of the terminal 198 to the circuit conductor 190, the terminal can be inserted through the passage 204 and into the cavity 202.

After the terminal 198 is received in the cavity 202, the housing 196 is moved into engagement with a surface 208 of the device 188 from which the terminals 184 and 186 extend. The housing 196 is provided with transverse passages 210 for reception of the terminals 184 and 186, and these passages 210 intersect the cavity 202 in the region occupied by the contact structure 200 of the terminals 198. A locking method to hold the terminal in the housing may also be incorporated.

Due to the low profile of the terminals of the connectors of the present invention, it is possible if desired to make multiple connections to projecting male terminals of electrical devices. This is illustrated in FIGS. 14 and 15, where it may be noted that the passages 210 extend through the entire width of the insulating housing 196. Thus, the male terminals 184 and 186 are accessible at the side of the housing 196 opposite the device 188. Other connectors, for example a slip on terminal member 212, may be used to make a connection to a projecting male terminal such as the terminal 184.

Although the invention has been described with reference to details of the illustrated embodiments, it should be understood that the invention is not limited to such details, but rather is defined by the scope of the following claims.

What is claimed and desired to be secured by Letters Patent of the United States is:

1. A terminal for interconnecting an insulated wire and a male contact comprising a sheet metal body including a planar portion surrounded at least in part by a rim, at least three apertures in said planar portion defining at least two arms integral at both ends with said body, a contact segment extending laterally from each said arm, said contact segments interfacing to define a contact receiving region sized to receive the male contact with an interference fit, said contact portions being shorter than said arms to permit the portions of said arms between the contact portions and the ends of said arms to flex in torsion, and a wire gripping structure extending laterally from said planar portion and disposed at least in part generally in the plane of said planar portion, said wire gripping portion including first crimping flange means engageable with a stripped end portion of the wire and second crimping flange means engageable with an insulated portion of the wire.

2. The terminal claimed in claim 1 including two said arms generally parallel with each other for receiving a male contact with parallel sides.

3. The terminal claimed in claim 1 including at least three said arms arranged generally on a circle for receiving a circular male contact.

4. The terminal of claim 1, each said contact portion being integral with one arm and being rounded in shape to present a smooth contact receiving surface.

5. The terminal of claim 1, said rim extending around the periphery of said planar portion and including portions extending from said planar portion outwardly along opposite edges of said wire gripping portion.

6. The terminal of claim 5, a resilient locking tab formed in said wire gripping portion in the region between said rib portions.

7. The terminal of claim 1, a resilient locking tab formed in said wire gripping portion.

8. A connector for interconnecting a male terminal and a conductor, said connector comprising a sheet metal terminal including a planar portion surrounded at least in part by a rim, at least three apertures in said planar portion defining at least two arms integral at both ends with said body, a contact segment extending laterally from each said arm, said contact segments interfacing to define a contact receiving region sized to receive the male contact with an interference fit, said contact portions being shorter than said arms to permit the portions of said arms between the contact portions and the ends of the arms to flex in torsion, conductor gripping means for fastening the terminal to the conductor, an insulating housing having a cavity therein for containing said terminal, a first passage in said housing extending from said cavity in a first direction to the exterior of the housing for receiving the conductor, said first passage having a cross sectional configuration complementary with the profile of the terminal to permit insertion of the terminal through the first passage into said cavity after fastening of the terminal to the conductor, and a second passage in said housing extending from said cavity in a second direction to the exterior of said housing for receiving the male contact engaged with said terminal.

9. The connector of claim 8, said conductor gripping means including means for attachment to a flexible circuit conductor.

10. The connector of claim 8, said conductor gripping means including a wire gripping portion disposed at least in part in the plane of said planar portion and including first and second crimping flange means for attachment to a stripped end portion and an insulated portion respectively of an insulated wire.

11. The connector of claim 10, said cavity and said first passage defining a shoulder, and a resilient locking tab on said terminal engageable with said shoulder upon insertion of the terminal into said cavity.

12. The connector of claim 8, said second passage extending in said second direction entirely through said housing to permit connections to the male contact at either side of said housing.

13. The connector of claim 8, said housing including a third passage generally coplanar with said first passage and disposed generally normal thereto extending from said cavity to the exterior of said housing, said third passage having a configuration complementary with the profile of said terminal.

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