

[54] **PARTITIONED ELECTRICAL CONNECTOR**

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[52] U.S. Cl. .... **339/98**

[51] Int. Cl. .... **H01r 13/38**

[58] Field of Search ..... 339/95, 97-99,  
339/101, 103

[56] **References Cited**

**UNITED STATES PATENTS**

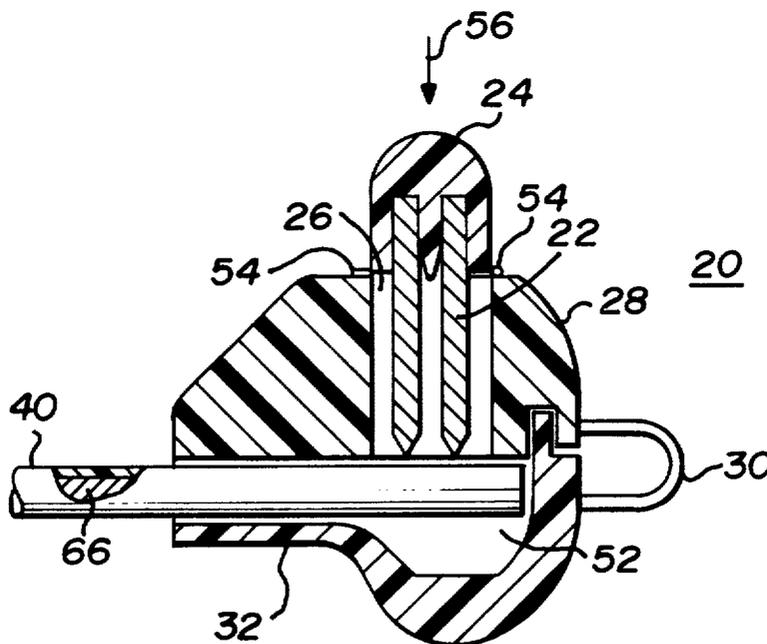
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Woldman

[57] **ABSTRACT**

A novel electrical connector comprises a slotted metallic contact disposed within a movable contact support preferably frangibly coupled to a cover portion adapted to lockingly mate with a base portion having partitioned wire receiving channels. To effect a connection, wires are inserted within the base portion wire receiving channels, the cover portion is lockingly snapped into place over the base portion, and the contact support then depressed inwardly causing the slotted metallic contact to engage the conductors to provide an interconnection therebetween in one safe, simple, and rapid operation. Frangible wall segments may be provided to permit the conductor to be inserted into the connector either from one or both sides of the wire receiving channel. Inspection ports may be provided to view the disposition of the conductors within the connector wire receiving channels during and after assembly. The channel partitions may be further provided with toothed portions to provide a restraint for the conductors engaged therebetween.

**11 Claims, 19 Drawing Figures**





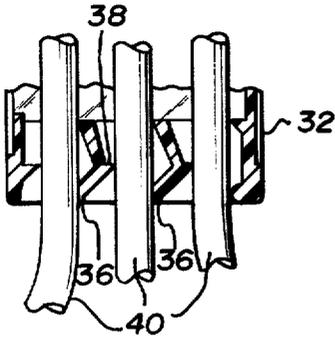


FIG. 4

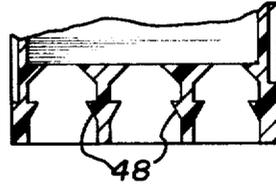


FIG. 5

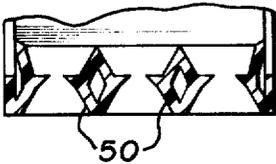


FIG. 6

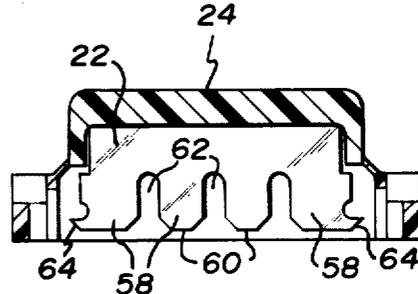


FIG. 7

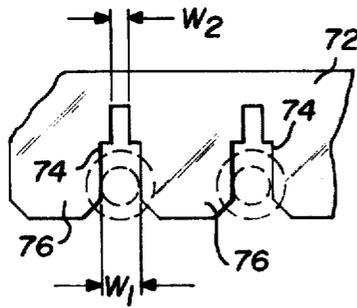


FIG. 8

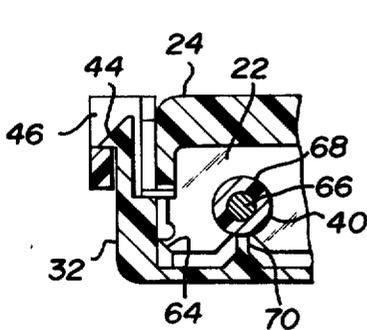


FIG. 9

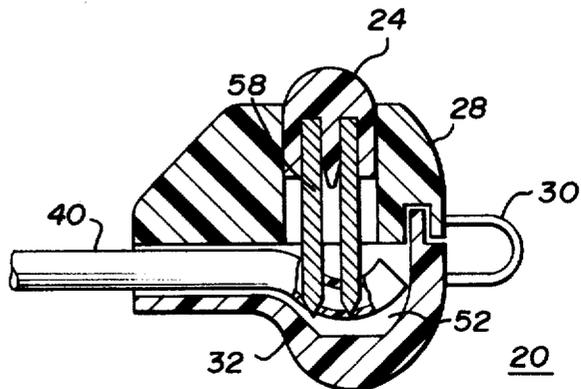
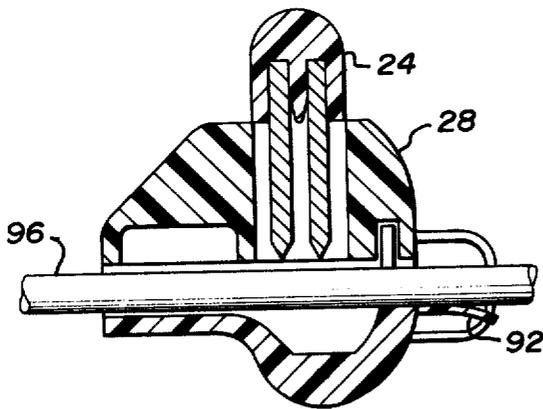
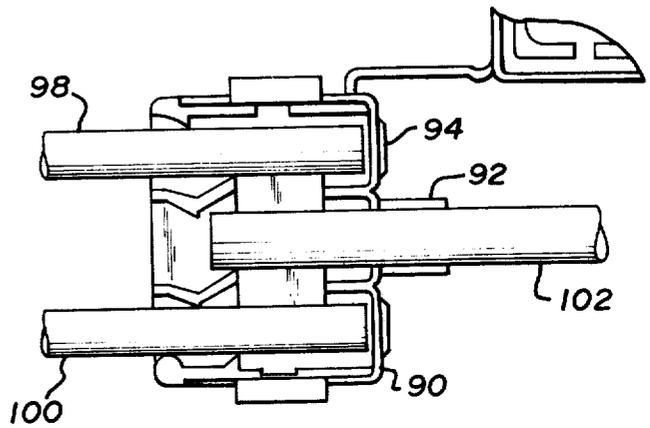
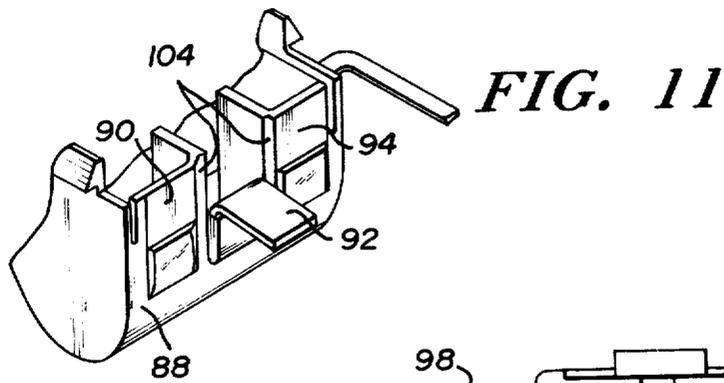
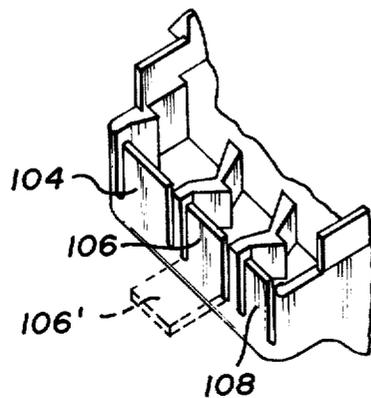
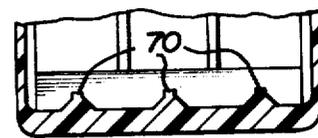
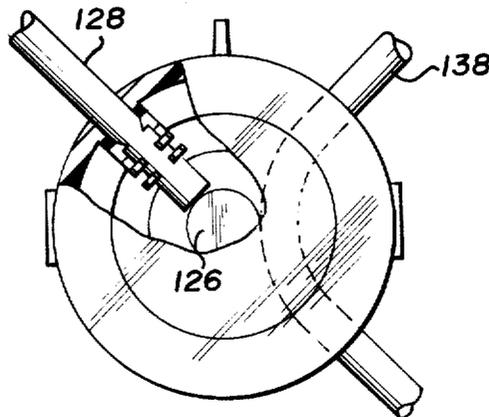
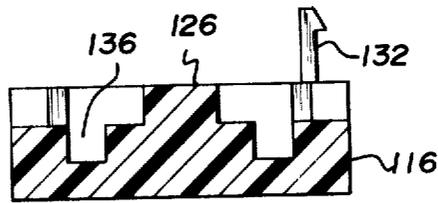
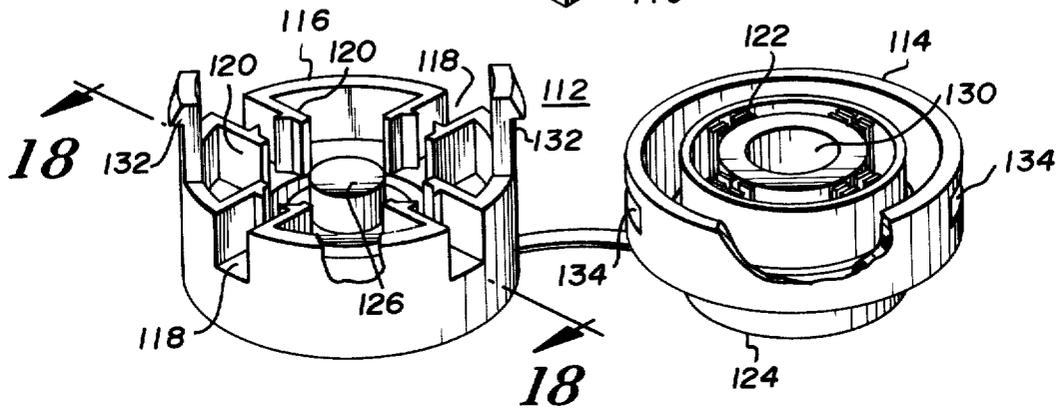
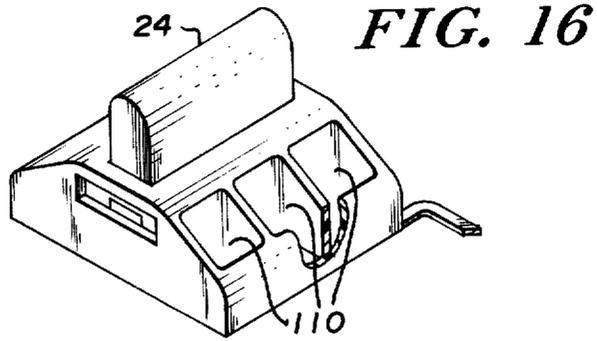


FIG. 10



**FIG. 12**





**PARTITIONED ELECTRICAL CONNECTOR****BACKGROUND OF THE INVENTION****1. Field of the Invention**

The invention is directed to the field of electrical connectors and principally to a means for interconnecting insulated conductors.

**2. Description of the Prior Art:**

Early prior art devices for joining two or more insulated conductors one to another generally comprised a tapered metallic ferrule disposed within an insulated housing and were commonly employed by electricians to provide a connection between the stripped ends of insulated conductors by inserting such ends into the connector and imparting a twist thereto to complete the assembly. This operation was generally cumbersome, time consuming, and often of doubtful permanency, particularly where relatively heavy gauge conductors were employed. Improvements over such devices generally comprised an insulated housing adapted to receive a slotted metallic contact which may be urged into the interior of the housing to engage respective conductors inserted therewith. Various devices of this nature are exemplified in U.S. Pat. No. 3,715,450 issued Feb. 6, 1973 to Harold W. Martin and assigned to the assignee of the instant invention; U.S. Pat. No. 3,609,644 issued Sept. 28, 1971 to William J. Seim; U.S. Pat. No. 3,576,518 issued Apr. 27, 1971 to James H. Bazille, Jr.; U.S. Pat. No. 3,573,713 issued Apr. 6, 1971 to Dennis J. Enright; and U.S. Pat. No. 3,388,370 issued June 11, 1968 to R. A. Elm. These devices feature either a rigidly mounted contact blade which is brought into contact with the conductor upon closure of a cover portion of the device, or separate blade members which must be manipulated into position after insertion of the wires into the connector and then brought into further engagement with respective conductors either manually or by closure of the cover portion of the device. A serious drawback in the design of such devices is the danger of exposing the user to direct contact with the bared ends of the conductors during the assembly operation in the event such conductors are inadvertently energized during the assembly operation. In many cases, the solderless junction boxes or connectors employing such contact means are adapted solely for joining a pair of wires, due principally to the configuration of the contact employed therewith, thereby precluding their use for joining three or more wires in a single connector, and seriously reducing the versatility thereof.

**SUMMARY OF THE INVENTION**

The invention overcomes the limitations and difficulties noted above with respect to prior art devices by providing a partitioned electrical connector which may be employed to interconnect a plurality of insulated conductors in a safer, more versatile, and more convenient manner than with such prior art devices. A slotted metallic contact member comprising juxtaposed deflectable blade members interconnected by a common web portion is fixedly attached to a displaceable contact support member movably coupled to a cover portion of a two-part housing in which the base portion is provided with partitioned wire receiving channels adapted to coincide with the slotted metallic contact upon disposition of the cover portion in overlying relationship with respect to the base portion. To effect

electrical contact between conductors inserted within the partitioned channels of the base portion, the cover portion is snapped into engagement with the base portion and the contact portion depressed inwardly towards the base portion sufficiently to permit the slotted contact member to engage the conductors seated therewithin. The contact support member may be connected to the cover portion by the employment of frangible segments or web portions designed to fracture under the pressure applied to the contact support during the assembly operation. Disposed between adjacent wire receiving channels are partitions which may be toothed or barbed to provide a restraint for the wires engaged therebetween. The wire receiving channels may be interrupted by a recessed portion in the base of the connector so that upon depression of the contact support member and engagement of the metallic contact with the corresponding conductors, the conductors are deformed downwardly into the base portion recess to provide additional strain relief means thereat. The base portion may be further provided with sidewalls having segments frangibly connected thereto for restricting entry to either one or both ends of the wire receiving channels, and adapted to be broken away from the remainder of the sidewalls to provide access to the interior of the base portion. Inspection ports, which may comprise preferably webbed chambers isolated from the interior of the cover portion, may be provided for viewing the relative disposition of the individual conductors within the connector. The connector may be formed to define either a rectangular or circular configuration, in plan view, each configuration providing distinct advantages in use. For convenience, the cover portion and base portion may be hingedly coupled to each other to insure that both portions remain together during handling and assembly. It is therefore an object of this invention to provide an improved electrical connector.

It is another object of this invention to provide a means for interconnecting unstripped insulated conductors.

It is yet another object of this invention to provide an electrical connector having contact means adapted to provide multiple contact engagement between a plurality of unstripped insulated conductors.

It is yet a further object of this invention to provide a partitioned electrical connector having frangible sidewall segments adapted to permit selective entry to the wire receiving channels therewithin.

It is still another object of this invention to provide a partitioned electrical connector adapted to simultaneously interconnect and selectively deform the unstripped ends of insulated conductors disposed therewithin.

It is yet a further object of this invention to provide an electrical connector having partitioned conductor receiving channels having toothed walls arranged to restrain the removal of said conductors therefrom.

Other objects and features will be pointed out in the following description and claims and illustrated in the accompanying drawings which disclose, by way of example, the principle of the invention and the best mode contemplated for carrying it out.

**BRIEF DESCRIPTION OF THE DRAWINGS:**

In the Drawings:

FIG. 1 is a perspective view of a partitioned electrical connector constructed in accordance with the concepts of the invention.

FIG. 2 is a perspective view of the device of FIG. 1 in a fully assembled condition.

FIG. 3 is a side elevational view, partly in section, of the device of FIG. 1 showing a conductor disposed within the wire receiving channel thereof.

FIG. 4 is a fragmentary top plan view, partly in section, of the wire receiving channel portion of the device of FIG. 1.

FIGS. 5 and 6 are fragmentary top plan views, partly in section, of further embodiments of the wire receiving channel portion of a partitioned electrical connector constructed in accordance with the concepts of the invention.

FIG. 7 is a front elevational view, partly in section, of the slotted metallic contact means of the device of FIG. 1.

FIG. 8 is a fragmentary front elevational view of a further embodiment of the contact means of a partitioned electrical connector constructed in accordance with the concepts of the invention.

FIG. 9 is an enlarged fragmentary front elevational view, partly in section, of a portion of the contact means illustrated in FIG. 7.

FIG. 10 is a side elevational view, partly in section, of the device of FIG. 3 showing the contact means thereof fully engaged with a conductor inserted therein.

FIG. 11 is a fragmentary perspective view showing a further embodiment of the side wall segments of a partitioned electrical connector constructed in accordance with the concepts of the invention, illustrating the manner in which a portion of the sidewall thereof may be displaced to provide entry to the connector.

FIG. 12 is a fragmentary top plan view of the base portion of the device of FIG. 1 showing a selective disposition of conductors therewithin.

FIG. 13 is a side elevational view, in section, illustrating a further application of a partitioned electrical connector constructed in accordance with the concepts of the invention.

FIG. 14 is a fragmentary front elevational view partly in section, showing a further embodiment of the base portion of a partitioned electrical connector constructed in accordance with the concepts of the invention.

FIG. 15 is a fragmentary perspective view showing a further embodiment of the sidewall segments of the base portion of a partitioned electrical connector constructed in accordance with the concepts of the invention.

FIG. 16 is a fragmentary perspective view, partly cut away and partly in section, of a further embodiment of the cover portion of a partitioned electrical connector constructed in accordance with the concepts of the invention.

FIG. 17 is a perspective view, partly cut away and partly in section, of another embodiment of a partitioned electrical connector constructed in accordance with the concepts of the invention.

FIG. 18 is an elevational view, partly in section, of the device of FIG. 17 taken along the line 18—18.

FIG. 19 is a top plan view, partly cut away and partly in section, of the device of FIG. 17 in a fully assembled state.

Similar elements are given similar reference characters in each of the respective drawings.

#### DESCRIPTION OF THE PREFERRED EMBODIMENTS:

Turning now to FIGS. 1, 2 and 3 there is shown a partitioned electrical connector 20 constructed in accordance with the concepts of the invention. A slotted metallic contact member 22 is disposed within a contact support means 24 movable within a transverse aperture 26 (FIG. 3) extending through a cover portion 28 flexibly coupled by means of a resilient strut 30 to a base portion 32 having wire receiving channels 34 separated from one another by partitions 36, 36'. The partitions 36, illustrated on the left hand side of the base portion 32 as viewed in FIG. 1, are provided with toothed portions 38 which, as illustrated in greater detail in FIG. 4, provide at least a partial restraint against the removal of conductors such as 40 inserted within the base portion 34. Extending upwardly from either end 42, 42' of the base portion 32 are locking means in the form of barbed protrusions 44, 44' adapted to engage mating recesses 46, 46' in the cover portion 28 in a manner illustrated more clearly in FIG. 2. The partitions 36 may be modified, as shown for example in FIGS. 5 and 6, to provide opposing toothed portions thereupon in either a single element such as 48, or dual elements such as 50. The dual elements 50 illustrated in FIG. 6 defining each of the partitioned walls may be resiliently deflected towards one another to provide a spring-like arrangement for at least partially restraining the conductor wires inserted within the wire receiving channels of the base portion of the connector. The interior of the base portion 32 is further provided with a recessed portion 52 adapted to provide a pocket for the conductors pierced by the contact members 22 in a manner illustrated in FIG. 10 and described in further detail hereafter. As shown in FIG. 3, the contact support member 24 is disposed in a first or initial position adjacent the aperture 26 in the cover 28 and may be frangibly connected thereto by means of segments 54 which may be readily fractured or broken by applying pressure to the contact support member 24 in a direction indicated by arrow 56. In this manner, the contact support member 24 and its associated metallic contact means 22 are urged into the interior of the cover portion 28 of the connector 20 to assume a position substantially as shown in FIG. 10. The individual blade members of the contact means 22 are thus caused to sever the outer insulation and engage the conductive portion of the insulated conductor 40, as will be described in further detail hereafter. As illustrated in FIG. 7, the contact means 22 comprises a series of individual blade members 58 each provided with a tapered end 60 and separated from one another by selectively formed slots 62. The distal ends of the contact means 22 are provided with hook-like projections 64 adapted to engage and bite into the inner surface of the base portion 32 as the contact support member 24 is driven in through the cover portion 28, as further illustrated in the enlarged view of FIG. 9. Accordingly, the projections 64 function to maintain the contact member 22 in intimate engagement with the conductor 40 after assembly.

It should be further noted that the projections 64 advantageously serve to stabilize the contact means 22 in the event pressure is applied to the contact support member 24 at other than its mid-point during the as-

sembly operation. In such case, one of the two projections 64 will be forced deeper into the base portion 28 than will the other projection 64, and will tend to lock the associated end of the contact means 22 in position while pressure is applied to the other end of the contact support member 24. Upon the application of suitable pressure to the other end of the contact support member 24, the second projection 64 is consequently forced into the base portion sufficiently to provide a generally symmetrical disposition of the contact means 22 within the base portion 32. The cover portion 28 is locked to the base portion 32 by the interengagement of the base portion toothed locking tangs 44, 44' with the cover portion recesses 46, 46', as further shown in FIG. 9. The width of the slots 62 are chosen to provide intimate engagement with the conductive portion 66 of the conductor 40 while severing the insulation 68 disposed thereabout. The contact means 22 thus serves as an insulation piercing and conductor engaging means to provide permanent and reliable electrical contact between each of the conductors inserted within the electrical connector 20. Although a series of paired blade members are shown, a single strip of such blade members may be employed in similar fashion without departing from the spirit of the invention and within the concepts herein disclosed. It has been found, however, that the paired arrangement increases the security and integrity of the connection and will be found particularly advantageous in those applications where the connector may be subjected to vibration or considerable handling after assembly. Additionally, in such arrangement, the contact means 22 may be fabricated from thinner stock than that which would be required where only single blade members are employed, thereby providing increasingly sharper edges for more efficient severing of the conductor insulation and engagement with the enclosed conductor.

As further illustrated in FIG. 10, the force of the contact blade members 58 engaging the conductors 40 causes them to be deformed downwardly into the recess portion 52 of the base portion 32 sufficiently to provide further resistance against removal of the conductors 40 from the electrical connector 20 after assembly. Such deformation of the conductors 40 also tends to relieve the strain upon the individual contact blade members 58 in the event the conductors 40 are subjected to forces tending to pull them away from the connector 20. The recessed portion 52 of the base portion 32 of the connector 20 may be further provided with raised portions such as 70 along the inner surface thereof, as shown in detail in FIG. 14, such raised portions 70 extending generally parallel to the direction of each of the wire receiving channels and transverse to the plane of the blade members 58 of the contact means 22. The raised portion 70 thus serve to provide a support for the underside of the conductors 40 as they are urged downwardly into the recessed portion 52 of the base portion 32, substantially as shown in FIG. 9, to insure that the conductors 40 are sufficiently engaged within the slots 62 of the contact member 22. Although the slots 62 illustrated in FIG. 7 are shown as having an essentially constant width throughout their length, they may be modified as illustrated for example in FIG. 8 where there is shown a contact member 72 having slots 74 selectively proportioned to have a first given width indicated as  $W_1$  extending a predetermined length from the free end of each of the contact blade

members 76, and a second given width indicated as  $W_2$  extending from  $W_1$  towards the interior of the contact means 72, the width  $W_2$  being selectively narrower than the width  $W_1$ , thus permitting increased blade deflection while maintaining the original depth of engagement between the conductors and the contact blade members 76.

Referring now to FIGS. 11, 12 and 13, the base portion 32 (FIG. 1) of connector 20 may be modified to provide a side wall 88 defining the right side of the base portion 32, as viewed in FIG. 1, substantially as shown in FIG. 11. In this case, each of the wire receiving channels 34 terminates in an associated side wall segment 90, 92 and 94 which may be frangibly connected to the remainder of the base portion so that any one or more of such side wall segments, such as 92, may be readily stripped away from its initial position and folded down, substantially as illustrated. Thus, in an initial position, each of the side wall segments 90, 92, and 94 effectively close off one end of a respective wire receiving channel while providing entry thereto when displaced essentially as shown. This arrangement may be advantageously utilized to provide for mid-span engagement of a conductor as illustrated for example in FIG. 13 where a conductor 96 is shown engaged at a desired point along its length remote from either end thereof. Thus, the connector may be employed either to provide an interconnection between the terminating end of one conductor and a mid-span portion of an adjacent conductor or, as a generally centrally located electrical splice mid-span of the length of a plurality of conductors commensurate with the number of wire receiving channels available in the particular connector employed. In an alternative application, as shown for example in FIG. 12, two conductors such as 98, 100 may be inserted from the left side of the base portion, as viewed in FIG. 12, while a third conductor 102 is inserted from the right side of the base portion as viewed in FIG. 12, entry to the right side of the base portion being provided by displacing the side wall segment 92 away from the remainder of the base portion substantially as shown. It will of course be clear that any one or both of the remaining side wall segments 90, 94, may also be so displaced to provide similar entry to the remaining wire receiving channels, where necessary or desirable. Further, the side wall segments 90, 92 and 94 may have a thinner cross section than the remainder of the side wall of the base portion to correspondingly decrease the force necessary to decouple such side wall segments away from the remainder of the base portion sidewall. A recess such as 104 (FIG. 11) may be provided between adjacent segments to either independently or additionally provide a weakened zone thereat. Similar frangibly connected side wall segments may be provided on the left side of the base portion 32, as viewed in FIG. 1, essentially as illustrated in FIG. 15, where there is shown a plurality of side wall segments 104, 106, and 108 each frangibly connected to the remainder of the base portion in a manner similar to that described with respect to the embodiment illustrated in FIG. 11, so that any one or more of such side wall segments 104, 106 and 108 may similarly be decoupled from the remainder of the base portion and folded downwardly, as shown by the dotted outline indicated as 106' to provide selective entry to the interior of the base portion. This arrangement may be found particularly advantageous where the connector is employed to

interconnect a plurality of conductors numbering less than the available wire receiving channels so that the unoccupied wire receiving channels are effectively protected from inadvertent contact, and protectively isolated from the surrounding environment. The cover portion of the electrical connector 20 may be further modified, as shown for example in FIG. 16, to provide window-like inspection ports such as 110 formed by reducing a portion of the cross sectional area of the cover portion overlying the respective wire receiving channels of the base portion of the connector to permit visual observation of the relative disposition of the individual conductors within the connector, both before and after assembly to insure that the conductors are properly located within the connector. Although the inspection ports 110 are shown disposed along a single side of the cover portion of the connector, additional ports 110 may be provided on one or more of the remaining sides of the cover portion to provide additional viewing areas.

Turning now to FIGS. 17, 18 and 19 there is shown a further embodiment of a partitioned electrical connector 112 constructed in accordance with the concepts of the invention and comprising a generally circular cover portion 114 adapted to mate with an appropriately dimensioned base portion 116. The base portion 116 comprises a plurality of wire receiving channels 118 each flanked by preferably toothed partitions 120, such elements being essentially duplicative of the wire receiving channels 34 and partitions 36 described hereinabove with respect to the embodiment illustrated in FIG. 1. Disposed within the cover portion is a generally annular contact means 122 comprising interconnected pairs of individual blade members which any be similar in construction to the embodiment described hereinabove, and disposed within a movable contact support means 124 preferably frangibly connected to the cover portion 114 substantially as described heretofore with respect to the contact support means 24. As illustrated in the sectional view of FIG. 18, the base portion 116 is provided with a generally centrally located stepped protrusion 126 to limit the insertion of the end of a conductor such as 128 (FIG. 19) within said connector 112. A generally axially extending recess 130 in the cover portion 114 of the connection 12 is adapted to accommodate the protrusion 126. Thus, the cover portion 114 may be initially disposed over the base portion 116 of the connector 112 and locked thereto by means of tangs 132 extending from the periphery of the base portion 116 for engagement with mating recesses 134 in the cover portion 114. Thereafter, one or more conductors such as 128 may be inserted within a respective one of the wire receiving channels 118 sufficiently to cause the end of each of such conductors to contact the protrusion 126, essentially as shown in FIG. 19 to insure that the conductor has been properly located within the assembled connector prior to depression of the contact support means 124. Intermediate the wire receiving channel 118 and the protrusion 126 is a generally annular recessed portion 136 essentially duplicative of the recessed portion 52 of connector 20 and similarly adapted to accept the individual blade members of the contact means 122. The connector 112 may also be employed as a mid-span connector for engagement about a portion of a conductor such as 138 remote from either end of such conductor in a manner substantially as shown in FIG.

19. To effect such assembly the conductor 138 is appropriately bent or deformed so as to coincide with two of the wire receiving channels 118 in the base portion 116 of the connector 112 and then inserted within the respective channels prior to the assembly of the cover portion 114 to the base portion 116. Thereafter the assembly procedure is substantially as described hereinabove so that a plurality of connections including both mid span and end connections may be obtained in a simple, efficient and reliable manner. It will also be readily appreciated that although only four wire receiving channels 118 are illustrated in FIG. 17, additional channels may be readily added thereto, where necessary or desirable. The button-like arrangement illustrated in FIGS. 17 through 19 may be found particularly advantageous in the communication and telephone industry where relatively small diameter insulated wires are employed and where it is desired to interconnect a substantial number of wires within a relatively small area in a rapid, efficient, and economical manner. It will also be appreciated by those skilled in the art that the elimination of the need for stripping an insulated conductor to effect the desired interconnection in the above described embodiments provides an added advantage in avoiding such problems as nicking or otherwise damaging the conductor as often occurs with the employment of devices requiring such procedure prior to assembly.

Although substantially rectangular and circular partitioned electrical connectors have been illustrated and described hereinabove, it will be immediately apparent to those skilled in the art that other suitable shapes may be similarly employed without departing from the spirit of the invention and within the concepts herein disclosed. For example, a highly effective and versatile connector may be fabricated in a polygonal shape (not shown) in which each of the faces thereof coincides with a respective wire receiving channel extending radially from the periphery of the connector inwardly in a manner similar to that described with respect to the connector 112 illustrated in FIGS. 17, 18 and 19. It will also be readily apparent to those skilled in the art that the cover and base portions of the connector may be fabricated from any one of a number of readily molded, inexpensive, and widely available suitable electrically insulating plastic materials.

The embodiment of the invention in which an exclusive property or privilege is claimed are defined as follows:

1. An electrical connector comprising: a base portion having wire receiving channels extending therewithin, and partitions selectively spaced from one another to define said wire receiving channels; a cover portion adapted to mate with and overlie said base portion, said cover portion having a selectively formed aperture extending generally transversely therethrough; means for locking said cover portion to said base portion; contact support means selectively movable from a first position to a second position transversely within said cover portion aperture and disposed in said cover portion in said first position generally adjacent said cover portion aperture; and slotted metallic contact means fixedly disposed within said contact support means and movable therewith, said contact means being aligned to intersect said wire receiving channels when said contact support portion is depressed within said cover portion aperture and moved from said first position to said second posi-

tion after said cover portion is disposed in selective overlying relationship with said base portion, whereby upon the selective placement of conductors within said base portion wire receiving channels, and the depression of said contact support means, said contact means is caused to engage such conductors to provide a connection therebetween, said connector further comprising frangible segments connecting said contact support means to said cover portion.

2. An electrical connector as defined in claim 1 wherein said partitions further comprise toothed portions having an inclined first surface communicating with a second surface thereof at a sharp edge to define a wedge shaped protusion adapted to provide unidirectional restraining means for conductors disposed within said base portion wire receiving channels.

3. An electrical connector as defined in claim 1 wherein said cover portion is hingedly coupled to said base portion.

4. An electrical connector as defined in claim 1 wherein said base portion further comprises wall segments each aligned with a respective one of said wire receiving channels, each of said wall segments having opposed edges frangibly connected to said base portion to permit selective displacement therefrom to provide access to at least one end of an associated wire receiving channel.

5. An electrical connector as defined in claim 1 wherein said cover portion further comprises at least one selected area of reduced thickness arranged to provide a generally translucent inspection port for viewing the disposition of conductors disposed within said electrical connector.

6. An electrical connector as defined in claim 1 wherein said base portion and said cover portion are formed from electrically insulating material.

7. An electrical connector as defined in claim 1 wherein said contact means comprises pairs of selectively spaced blade members, said contact means having slots separating adjacent pairs of said blade members, said slots extending longitudinally between adjacent blade members from the free ends thereof a first given distance at first given width and then a second given distance at a second given width less than said first given width.

8. An electrical connector as defined in claim 1 wherein said base portion further comprises an internal recessed portion coincident with said contact means to permit a section of a conductor engaged by said contact means to be depressed thereinto upon the displacement of said contact support means from said first position to said second position as said cover portion is cooperatively engaged with said base portion.

9. An electrical connector as defined in claim 8 wherein said recessed portion further comprises an inner surface having raised portions thereon, said raised portions being aligned in general coincidence with the slotted portions of said slotted contact means.

10. An electrical connector as defined in claim 1 wherein said wire receiving channels extend radially inwardly from the periphery of said base portion.

11. An electrical connector as defined in claim 10 further comprising stop means located generally centrally within said base portion for limiting the extent of insertion of conductors therewithin.

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