

March 26, 1963

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3,083,344

COMBINATION ELECTRIC PLUG AND SOCKET

Filed Nov. 13, 1959

2 Sheets-Sheet 1

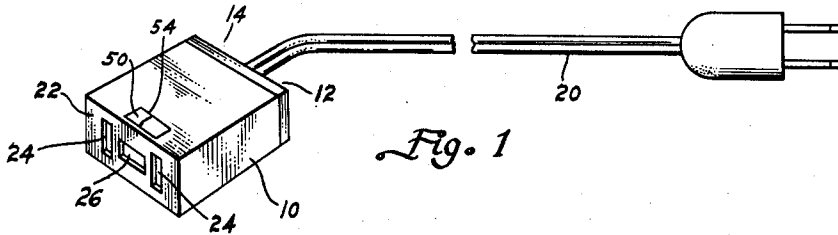


Fig. 1

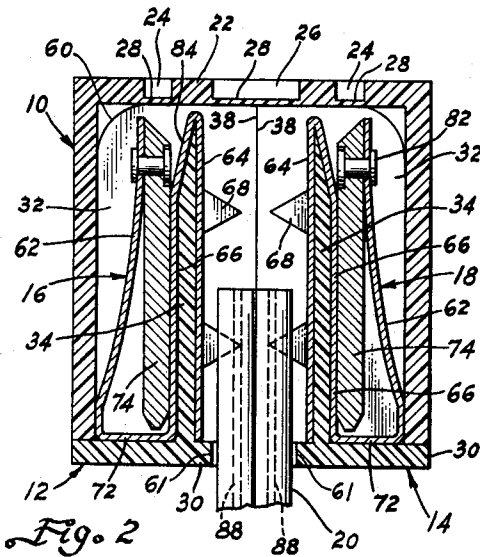


Fig. 2

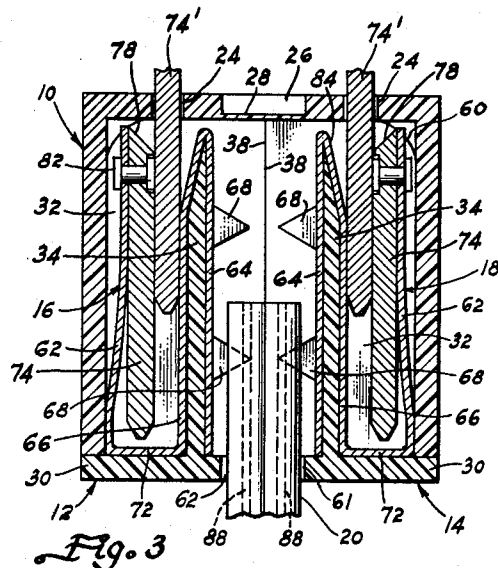


Fig. 3

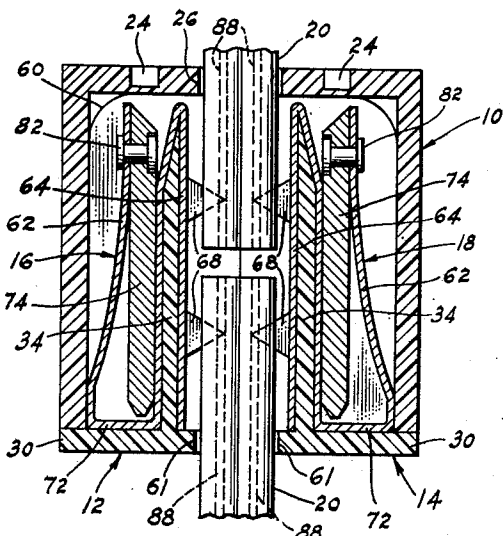


Fig. 4

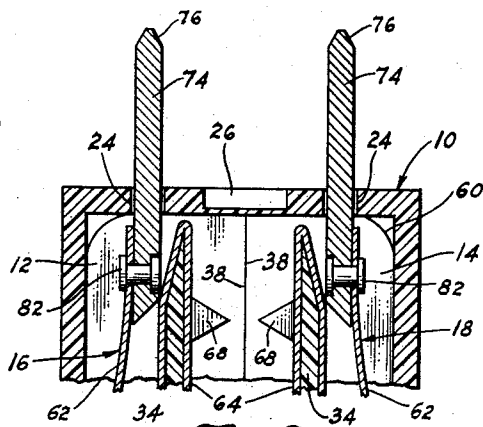


Fig. 5

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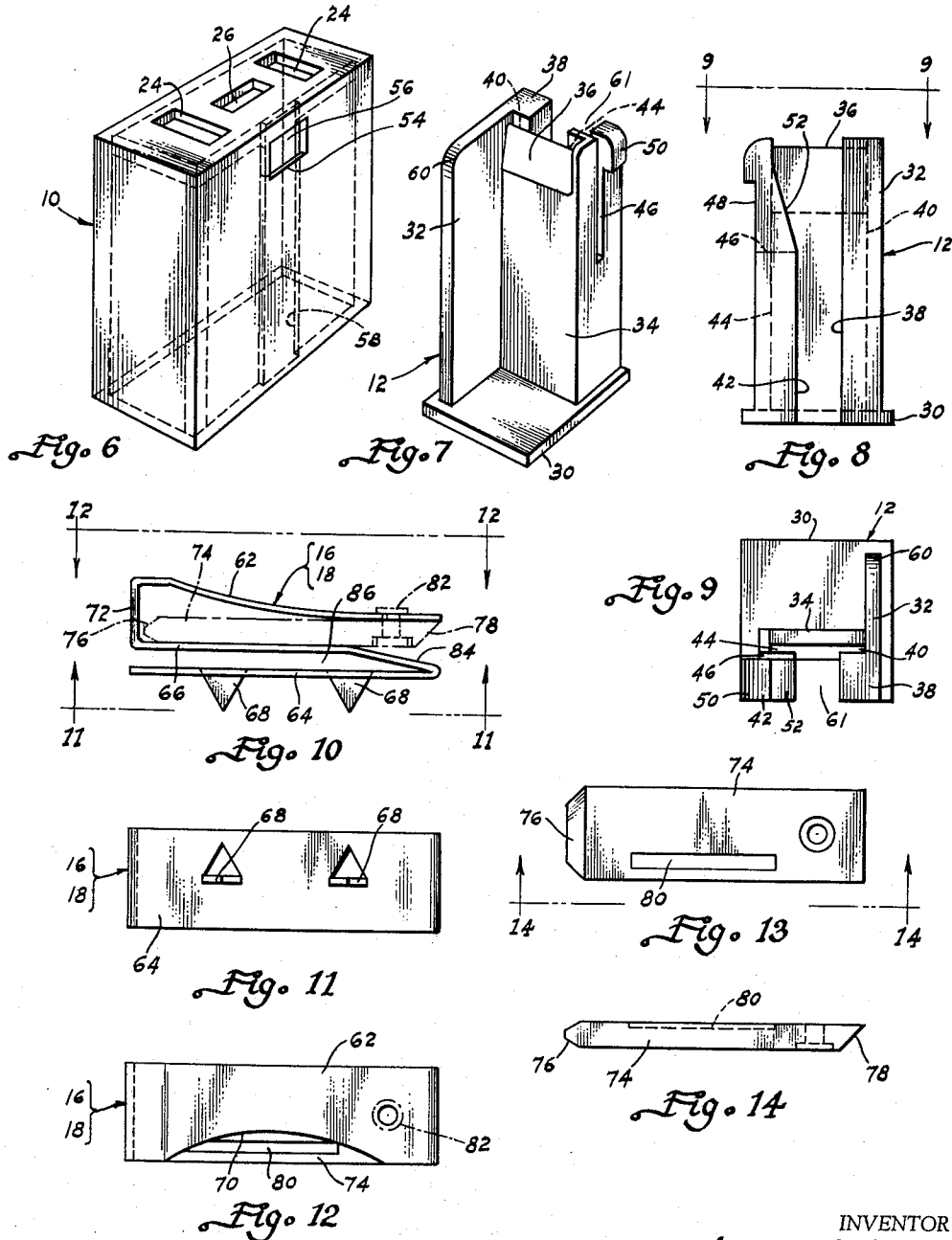
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COMBINATION ELECTRIC PLUG AND SOCKET

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2 Sheets-Sheet 2



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COMBINATION ELECTRIC PLUG AND SOCKET
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The present invention relates to a combination electric plug and socket and, more particularly, to a combination electric plug and socket in which blade members are movably positionable selectively relative to a housing in order that the housing may serve either as an electric plug or an electric socket, as desired by the user.

It is conventional practice at present in regard to electrical fittings to provide either electric plugs or electric sockets capable of receiving the blades or prongs of such electric plugs. Said plugs and sockets are capable of being connected in various ways to the end of an electrical conductor which usually comprise flexible wire means covered by insulation material and usually including a pair of wire means held in spaced and insulated relationship to each other by the insulation covering. The principal disadvantage of providing separate plug and socket means is that double inventory has to be maintained by dealers and appliance manufacturers, for example, depending upon whether given needs require either an electric plug or an electric socket for a particular electric appliance for example.

Attempts have been made previously to provide combination electric plug and socket structures but of those within the knowledge of the present inventor, the same generally have been objectionable due to either large and bulky size which render the same cumbersome to handle, or complexity of structure which rendered the same not only difficult to use but also expensive to manufacture.

It is the principal object of the present invention to provide a compact and relatively inexpensive combination electric plug and socket which, in its preferred embodiment, comprises an insulation housing, a pair of electrical adaptor units each including a preferably pivotally connected blade which may be positioned either in retracted or projected position depending upon whether the units are to serve as an electric socket or plug, supporting means preferably formed from insulation material for supporting the adaptor units within the housing, and means on the adaptor units arranged to engage the electric wires of an electric conductor when inserted into the housing, the latter means preferably comprising a quick-connection type preferably including piercing prongs which extend through the insulation covering of the electric conductor so as to permit engagement of the wires of the conductor by said prongs.

Another object of the invention is to provide details of construction in the aforementioned adaptor units whereby pairs of opposed surfaces respectively are provided which are substantially parallel to each other when the combination plug and socket is to serve as a socket, whereby projecting blades of another electric plug may be received respectively between said pairs of opposed surfaces, the adaptor units also including means by which said pairs of opposed surfaces respectively are urged firmly toward each other for firm frictional engagement with the blades of said other electric plug connected thereto.

A further object of the invention is to provide interfitting and interengaging latch means between said insulation supports and housing, whereby said supports may be positioned operatively relative to an electrical conductor and such preliminary sub-assembly then may slidably positioned within the insulation housing so as to quickly connect the completed assembly in operative position and in condition for immediate use of the assembly either

as an electric plug or electric socket, all preferably without requiring the use of tools of any type.

Still another object of the invention is to provide the housing with diaphragm means which may be punched out selectively to provide openings to the interior of the housing, depending upon whether the assembly is to serve as an electric plug, an electric socket, or an electric connector for the ends of two electric conductors which are to be connected together electrically, whereby the present invention is capable of serving selectively in any one of said three different capacities.

One further object of the invention is to provide an insulation housing and support structure which readily may be molded inexpensively from suitable insulation material such as synthetic resin and the adaptor units and blades are designed to be stamped inexpensively from strip metallic stock by automatic machines, whereby the entire manufacturing cost of the assembled structure is relatively low and such assembly operations are required to place the various elements of the assembly in co-operative relationship with each other are minimum. A still further object of the invention is to provide a combination electric plug and socket in which the interfitting relationship between the various elements thereof principally are relied upon to maintain said elements assembled and positioned operatively relative to each other, and otherwise the parts are also designed and arranged to be durable and capable of long life.

Details of the foregoing objects and of the invention, as well as other objects thereof, are set forth in the following specification and illustrated in the accompanying drawings comprising a part thereof.

In the drawings:

FIG. 1 is an exemplary perspective view illustrating a combination electric plug and socket embodying the principles of the present invention as one of the same appears when connected to one end of an electric conductor.

FIG. 2 is an enlarged longitudinal sectional view of the combination electric plug and socket illustrated in FIG. 1 showing details of the same when arranged to serve as an electric socket.

FIG. 3 is a view similar to FIG. 2 but showing the prong-like blade members of an electric plug inserted into said socket.

FIG. 4 is a view similar to FIGS. 2 and 3 but illustrating the combination electric plug and socket when serving as a connecting unit for ends of two electric conductors.

FIG. 5 is a fragmentary view showing the outer end portion of the combination electric plug and socket illustrated in FIGS. 2 through 4 but with the blade members of the unit projected to render the same in condition to serve as an electric plug.

FIG. 6 is a perspective view showing an exemplary housing within which the various elements of the combination electric plug and socket are enclosed in operative position.

FIG. 7 is a perspective view of an insulation support comprising one of a pair of complementary supports which are insertable into the housing shown in FIG. 6 for purposes of supporting the adaptor units within said housing.

FIG. 8 is an end elevation of the support shown in FIG. 7 as seen from the right-hand end thereof, particularly for purposes of illustrating the flexible latch member included thereon.

FIG. 9 is a top plan view of the support shown in FIG. 7.

FIG. 10 is an edge view of one of a pair of adaptor units included in the combination electric plug and socket, said view illustrating the blade of such unit in broken

lines and positioned in retracted position as when the unit is arranged to serve as a socket.

FIG. 11 is a plan view of one face of the adaptor unit shown in FIG. 10 as seen from the line 11—11 of FIG. 10.

FIG. 12 is a plan view of the opposite face of the adaptor unit shown in FIG. 10 as seen from the line 12—12 of FIG. 10.

FIG. 13 is a top plan view of the blade shown in broken lines in FIG. 10.

FIG. 14 is an edge view of the blade shown in FIG. 13, as seen from the line 14—14 of FIG. 13.

The combination electric plug and socket embodying the principles of the present invention comprises essentially the following elements or units; a housing 10, support means of which one type is illustrated as a left-hand support 12 and a right-hand support 14, a left-hand adaptor unit 16, and a right-hand adaptor unit 18. All of said elements and units are interfitted and assembled so as to engage the end of one or more electric conductors 20.

The housing 10 preferably is formed by molding from synthetic resin so as to provide electrical insulation. One end of the housing 10 is open, while the opposite end 22 is provided with a pair of similar apertures 24 and an additional aperture 26. All of said apertures initially are provided with frangible diaphragms 28 which provide temporary closure means until it is determined which of the apertures 24 and 26 are to be employed for the combination electric plug and socket. The apertures 24 extend preferably transversely to the housing 10 as best shown in FIG. 1, while the aperture 26 extends longitudinally of the end 22.

In the preferred embodiment of construction of the supports 12 and 14, the same are preferably formed by molding from synthetic resin, whereby production thereof is maintained minimum in cost, yet exact copies thereof are formed. Said supports 12 and 14 respectively are left-hand and right-hand and are complements of each other. Only the left-hand support is shown in detail in FIGS. 7 through 9 and it is to be understood that the right-hand support substantially is a mirror image of the left-hand support 12 shown in said figures. Referring to these figures particularly, it will be seen that the support 12 comprises a flanged end 30 and a pair of positioning means which, specifically, are panels 32 and 34 extend transversely from one surface thereof and are integral therewith. As viewed in FIG. 7, the upper end 36 of panel 34 preferably is tapered. Also as viewed in said figure, the right-hand edge of panel 32 is provided with an elongated rib 38 which is spaced from the panel 34 so as to provide a slot 40.

One edge of panel 34 is integral with panel 32, while the opposite edge of panel 34 is provided with an elongated rib 42 and is spaced from the panel 34 to provide an additional slot 44 which is within the same plane as slot 40 and is opposite thereto, for purposes to be described. Another slot 46 extends downwardly from the upper end of elongated rib 42 to provide a flexible latch 48, the upper end of which has a latch projection 50 extending laterally therefrom. To render the latch 48 flexible, the upper inner end of the latch member 48 is provided with a taper 52 which is best shown in FIG. 8.

The periphery of the flanged ends 30 of the left-hand and right-hand supports 12 and 14 respectively abut the open end of the housing 10 when said supports have been fully inserted therein, to the limit illustrated for example in FIGS. 2 through 5. Such abutment is illustrated also in FIG. 1. Upon said supports being fully inserted into the housing 10, the lower lateral edge of the latch projection 50 on each of the supports engages the lower edge 54 of locking aperture 56 which is formed in one wall of housing 10 as best shown in FIG. 6. During such insertion, the flexible latches 48 of the supports will be flexed inwardly, whereupon the latch projections 50 will ride within internal groove 58 of the housing as shown

in FIG. 6. Insertion of the supports 12 and 14 also is facilitated by the rounded corner 60 on panel 32 of each of the supports. It further will be understood that the outer surfaces of the elongated ribs 38 and 42 of the left-hand and right-hand supports respectively abut each other during the insertion of the supports into the housing. Said supports also respectively are provided with complementary notches 61 through which the electric conductor 20 is introduced into the housing 10 for purposes of being engaged by penetrating prongs on the adapter units which will now be described.

Although the adapter units 16 and 18 appear to be respectively left-hand and right-hand, they actually are the same but merely are disposed in the relative positions illustrated for example in FIGS. 2 through 5. Said units 16 and 18 are substantially N-shaped and comprise outer legs 62 and 64 and intermediate legs 66. The adaptor units 16 and 18 preferably are formed from metallic strip stock of spring brass, bronze, or the like, it being understood that steel or any other suitable spring material likewise may be used if desired. The spring stock is bent into the configuration best shown in FIG. 10 after certain preliminary stamping operations have been effected such as the formation of the piercing prongs 68 which extend laterally outward from outer leg 64, and the provision preferably of an arcuate notch 70 in one edge of the outer leg 62. In the preferred embodiment of the invention, the outer leg 62 is connected to the intermediate leg 66 by a transverse web 72 which is substantially longer than the thickness of the blades 74.

Each of the units 16 and 18 carries a single blade 74 preferably having a pyramidally tapered end 76 and the opposite end thereof has a simple angular taper 78, for purposes to be described. A finger nail receiving notch 80 extends inwardly from one face of each blade 74 and is disposed so as to be engageable by means of the arcuate notch 70 when the blade 74 is disposed in the retracted position thereof as illustrated in FIG. 10, for example. The end of the blade 74 having the taper 78 thereon is secured pivotally by a rivet 82 to the outer end of the outer leg 62 of the units 16 and 18. It will further be seen from FIG. 10 particularly that one end of the intermediate leg 66 is provided with an angular portion 84, whereby the space 86 between the intermediate leg 66 and outer leg 64 is substantially complementary to the panel 34 of the left-hand and right-hand supports 12 and 14, including the tapered upper end 36 thereof.

One of the adaptor units 16 and 18 is mounted on each of the left-hand and right-hand supports 12 and 14 as clearly shown in FIGS. 2 through 5. When said adaptor units are mounted thereon, the panels 34 are fully received within the spaces 86 of the adaptor units. Further, the transverse webs 72 will abut the inner surfaces of the flanged ends 30 of the left-hand and right-hand supports 12 and 14, whereby firm positioning of the adaptor units 16 and 18 upon the supports 12 and 14 is provided both during assembly of the various components of the combination electric plug and socket as well as during operation thereof.

During such assembly, the opposite edges of the outer legs 64 are closely and preferably firmly received respectively within the opposed slots 40 and 44 of the supports 12 and 14, thereby further aiding in positioning the adaptor units upon said supports as well as securing the same thereto. Such arrangement amply backs up the piercing prongs when penetrating the insulation covering of the conductors 20 incident to finally assembling the supports 12 and 14 within the housing 10.

It is preferred that the combination electric plug and socket comprising the present invention be sold in assembled condition so as to prevent the various components from becoming disassembled relative to each other and possibly lost. However, removal of the supports 12

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and 14, as well as the adaptor units respectively carried thereby, from the housing 10 readily is effected merely upon pressing inwardly upon the latch projections 50 which extend into the locking aperture 56 and then pulling upon the peripheries of the flanged ends 30. If it is desired to connect the assembly to one end of an electrical conductor 20 so as to serve as an electric socket, the blades 74 will remain in retracted position such as that shown in FIGS. 2 through 4, whereupon the abutting surfaces of the blades 74 and intermediate leg 66 will comprise opposite surfaces which respectively slidably and frictionally engage opposite surfaces of the blades 74' of another electric plug, as shown in FIG. 3. The appreciable length of the transverse web 72 of each of the adaptor units readily permits movement apart of the blades 74 relative to the intermediate legs 66, laterally, while said blades and legs remain parallel to each other so as to afford maximum engagement thereof with the opposite surfaces of the blades 74' of such additional electric plug.

Prior to inserting supports 12 and 14 into the housing 10, said supports with the adaptor units 16 and 18 respectively assembled therewith are pressed onto opposite surfaces of one end of an electrical conductor 20, as shown in FIGS. 2 and 3, whereby one pair of the piercing prongs 68 will penetrate the insulation covering of the conductor 20 in order that the prongs 68 may engage the conducting wires 88 within the conductor 20. The conductor 20 is received within the complementary notches 62 of the supports 12 and 14. As illustrated, the piercing prongs 68 are substantially parallel to the opposite wide, flat surfaces of the housing 10 but, if desired, it is to be understood that said prongs may be disposed angularly to the plane of said sides or even transverse thereto.

When the assembled combination electric plug and socket is to serve as a socket, it is necessary simply to punch out the frangible diaphragms 28 of apertures 24 by the prongs 74' of another plug for example at the time of connecting said other plug to the socket assembly comprising the present invention. Under such circumstances, the diaphragm 28 within the aperture 26 will remain intact and only the diaphragms 28 of the apertures 24 will be punched out.

When it is desired that the assembled combination electric plug and socket shall serve as a connector for the ends of two electric conduits 20, as shown in FIG. 4, the diaphragm 28 of the aperture 26 is punched out in order that one end of the second electric conductor 20 may be inserted therethrough so as to be engaged by one pair of prongs 68 on the legs 64 of the adaptor units, while the opposite pair of piercing prongs 68 thereon engage the inner end of the other electric conductor 20. Such piercing prongs 68 will penetrate the insulation covering of both of said conductors so as to physically engage the conducting wires 88 respectively therein. Under such circumstances, the blades 74 will remain in retracted or tucked position as clearly shown in FIG. 4.

Under circumstances where it is desired to have the assembled combination electric plug and socket serve as a plug, at the time of assembling the various components, the blades 74 are pivotally moved to the projecting position thereof shown in FIG. 5, whereupon when the supports 12 and 14 with the adaptor units connected thereto are being pressed into the open end of the housing 10, the outer ends of the prongs 74 will engage the diaphragms 28 of the apertures 24 and push the same outwardly so as to open said apertures and permit the blades 74 to be projected therethrough.

From the foregoing, it will be seen that the present invention provides a simple and highly effective combination of elements comprising a combination electric plug and socket having movable blades thereon which respectively may be folded into retracted position, whereupon the assembly may serve as an electric socket, or

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said blades may be pivotally moved to projecting position, whereupon the assembly may serve as an electric plug, or still further, the blades preferably may remain folded in retracted position and the assembly may be connected to a pair of electric conductors so as to constitute an electric connector therefor. The assembly of all of the various components of the combination electric plug and socket readily and quickly may be achieved incident to connecting certain of said components to one or more electric conductors.

Although a plurality of supports 12 and 14 are illustrated and described herein, such structure is primarily one of convenience especially to provide one means of effecting piercing of the insulation covering of the electric conductors 20 by the prongs 68. It is considered to be within the purview of the present invention however that a single support may be used if desired and suitably formed to support both of the adaptor units 16 and 18, for example, or at the least, a pair of blades 74, in electrically insulated relationship to each other. Such single support preferably could be formed by molding from suitable insulation material such as synthetic resin and suitable connections could be provided between the wires of the electric conductors 20 and the blades 74 or adaptor units, either the piercing prong type as illustrated or otherwise such as conventional threaded screws or the equivalent. Further, it is to be understood that, if desired, other latching means that the illustrated flexible latches 48 and projections 50 may be used to secure together the support means and housing 10, or simple screws or bolts may be used for such purpose.

While the invention has been described and illustrated in its several preferred embodiments, it should be understood that the invention is not to be limited to the precise details herein illustrated and described since the same may be carried out in other ways falling within the scope of the invention as claimed.

I claim:

1. An electrical connector convertible to a plug or socket comprising a housing having a plurality of blade-receiving openings in one end thereof; a plurality of combination adaptor units positioned within said housing and each comprising a flexible N-shaped metallic member providing oppositely opening longitudinally extending spaces, one of said spaces comprising a socket operable to receive a blade of an electric plug, a blade movably carried by each unit and positionable selectively relative to said unit for projection from said housing and containment therein; positioning means within said housing received within the other spaces of each unit; and means on said housing operable to receive electric conductor means and connect the same electrically to said adaptor units.

2. The electrical connector set forth in claim 1 further characterized by said blade being pivotally connected to one leg of said N-shaped member and another leg thereof nearest the center of said housing having prongs thereon arranged to pierce the sheath of an insulated electric conductor and engage the wire thereof.

3. An electrical connector convertible to a plug or socket comprising a housing having a plurality of blade-receiving openings in one end thereof; a plurality of combination adaptor units supported within said housing and each comprising a flexible metallic socket-forming member comprising a pair of legs flexibly connected at one end and a blade movably supported by one of said legs of each unit and positionable selectively relative to said unit for projection from said housing and retracted containment therein, said connected legs of said socket-forming member of each unit being transversely expandable to receive a blade of another electric plug therebetween, and means on said housing operable to receive electric conductor means and connect the same electrically to said adaptor units.

4. The electrical connector set forth in claim 3 further

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characterized by said blades being positioned between the legs of said socket-forming members when positioned within said housing in retracted containment therein and cooperating with said one leg of each of said members to comprise sockets operable to receive blades of another electric plug frictionally therein.

5. The electrical connector set forth in claim 3 further including pivot means within said housing extending transversely to said blades and engaging one end of each blade to support the same pivotally for movement between projecting and retracting positions relative to said housing.

6. An electrical connector convertible to a plug or socket and comprising a housing, means in said housing to receive one end of electric conductor means, elongated and transversely spaced insulating support means mounted within said housing, a plurality of blades, flexible contact means engaging said support means within said housing for support thereby and extending longitudinally for frictional slidable engagement by the blades of another plug when said connector is serving as a socket, means pivotally connecting one end of each of said blades to said flexible contact means for support thereby selectively for positioning said blades within said housing when said connector is serving as a socket and projecting from one end of said housing when said connector is serving as a plug, and means within said housing operable to interconnect said blades and flexible contact means to electric conductors means when one end of said conductor means is received within said housing.

7. The electrical connector set forth in claim 6 further

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characterized by said elongated insulated support means comprising panel-like members substantially parallel to each other and spaced transversely apart within said housing, and said flexible contact means each having at least pairs of legs connected at one end and flexibly separable transversely and receiving therebetween said panel-like supporting members to position said contact means operatively within said housing.

8. The electrical connector set forth in claim 6 further characterized by said housing being hollow and provided with an opening in one wall, said support means also being insertable longitudinally into and removable from said housing through said opening therein, and said connector including means releasably to secure said support means connected to said housing.

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