

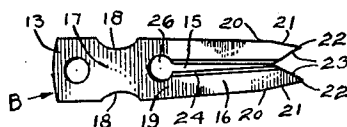
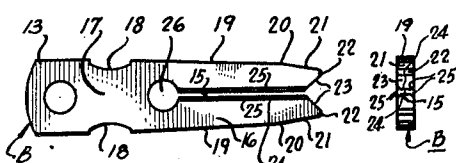
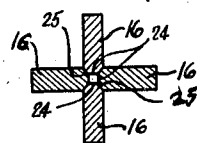
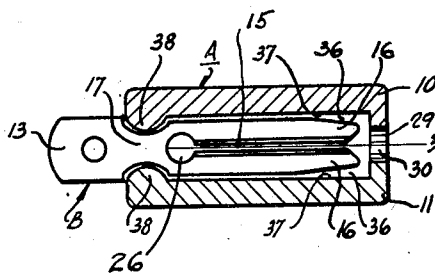
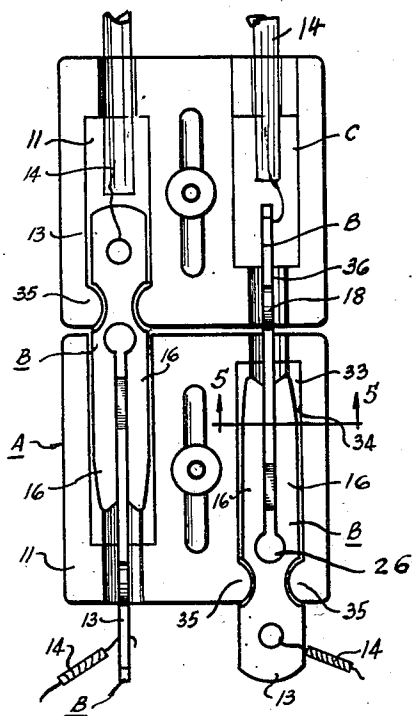
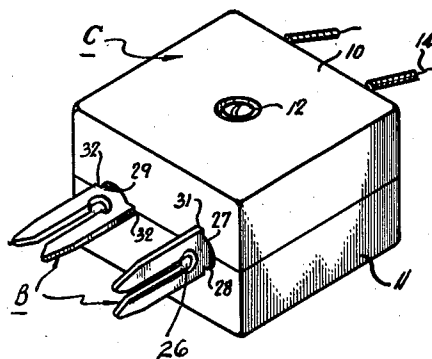
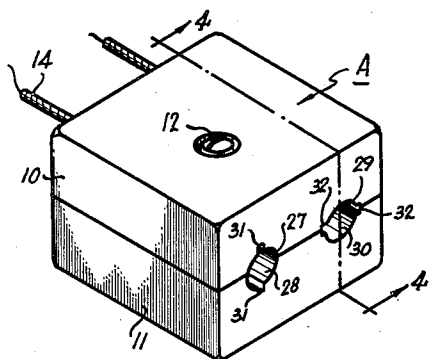
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2,828,474

MULTI-CONTACT CONNECTOR

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1

2,828,474

MULTI-CONTACT CONNECTOR

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4 Claims. (Cl. 339—185)

This invention relates to electrical connectors of the quick detachable, plug and socket type, and relates more particularly to the contact member thereof, the present invention being an improvement over the contact members disclosed in my Reissue Patent No. 23,547, granted on September 9, 1952, and in my co-pending application Serial No. 351,913, filed on April 29, 1953, now Patent No. 2,750,572, granted June 12, 1956.

In my said Patent No. 2,750,572, there is disclosed an electrical connector of the plug and socket type wherein the plug and the socket are both assembled from identically constructed parts. These parts comprise, in each case, a pair of separable casing members having opposed pairs of complementary contact receiving cavities in the opposed surfaces thereof, and identical, flat, bifurcated, electrical contact members in said cavities. The cavities are so arranged that one opposed pair of them receives a contact member in one plane, and another opposed pair of them receives an identical contact member in a second plane normal to the first mentioned plane. The cooperating pairs of cavities are also so formed and arranged that the contact members can be received therein either with the bifurcated ends thereof wholly within the assembled casings, in which case a female or socket member is provided, or with the bifurcated ends of the contacts extending out of the casings to thereby provide a male or plug member. Such plug and socket members can be brought into mating relation with each other to provide electrical coupling, the contacts of the plug and socket members straddling each other and engaging each other in crossed relation at their bifurcated ends to afford electrical contact. To insure electrical contact which is good and of low electrical resistance and to afford high current carrying capacity, the opposed edges at each bifurcation of the contact members are chamfered or tapered. This provides inclined surfaces of comparatively large area along which the contact members engage each other as shown, for example, in Fig. 14 of my above identified reissue patent. Thus, good electrical contact is provided from the instant that the contact members engage one another.

In the forms of contact members disclosed in my above-identified Patent No. 2,750,572, the legs of the contact members provided by the bifurcations therein are spaced from one another a distance such that the cooperating legs of a pair of crossed, mated contact members engage each other under tension to insure firm engagement between the contact members. Depending upon the characteristics of the material of which the contact members are made and the number of times cooperating contact members are engaged with and disengaged from each other, the tension sometimes is decreased to a point where the coupling is not as firm as might be desired. This difficulty I have now completely overcome by terminating the space between the legs of each contact member in a relatively large opening which acts as a sort of hinge to provide greater resiliency between the contact legs.

2

Thus, engagement of the crossed legs of any pair of mated contact members under suitable tension is always assured.

As shown in my above-identified Patent No. 2,750,572 the contact receiving cavities in the casing members and the contact members themselves are so shaped that the contact members are received fairly snugly in the cavities. It has been found that, in spite of care exercised in fabrication of these parts, difficulty is occasionally encountered in bringing cooperating contact members into mating relation. This may be due to such causes as binding of contact members, or slight misalignment between cooperating male and female contact members, which are rather firmly or rigidly seated in their cavities, and the entrance openings of cavities in which the female contact members are similarly seated. This difficulty I have also overcome by tapering the contact members so that they are floatingly seated in their respective cavities. Thus, binding of the contact members is avoided and a tolerable degree of misalignment of cooperating contact members is permitted without in any way reducing the efficiency of contact between cooperating contact members.

Thus, it is an object of my present invention to provide an improved electrical connector of the type described the plug and socket members of which can always be readily mated even if their contact members are initially misaligned somewhat.

Another object of my present invention is to provide an improved electrical connector as aforesaid the contacts of which will be free from binding and can be mated quickly and easily.

Another object of my present invention is to provide, for electrical connectors of the type described, improved electrical contact members which will always retain a sufficient degree of tension to insure firm engagement between two such contact members when they are mated and irrespective of the number of times such contact members may be joined or separated.

Another object of my present invention is to provide improved electrical contact members as aforesaid which are so constructed that, when they are arranged as male contacts in plug members, they will be readily received in the entrance openings of the associated socket members where they will be guided readily into mating relation with their associated female contacts.

Another object of my invention is to provide a socket casing of a plurality of parts wherein two complementary parts form openings through which a wire which joins the contacts passes so that the wire is clamped firmly by the casing parts which define the openings in order to relieve the strain imposed upon the wire.

Another object of my invention is to provide a bifurcated contact member wherein the spaced contact surfaces of the respective legs are constructed to taper with respect to one another so that, when the legs of a pair of such contact members are mated, the contact surfaces thereof will become substantially parallel one to the other to permit the ultimate or maximum contact areas between the mating legs of the contact members.

Other objects of my present invention are to provide improved electrical connectors of the character described which can be manufactured easily and economically, which can be assembled with great ease and speed, which are sturdy in construction, and which are highly efficient in operation.

With the above and related objects in view, my present invention consists in such details of construction and combination of parts as will be more fully understood from the following description, when read in conjunction with the accompanying drawing, in which:

Fig. 1 is a perspective view of a two-contact elec-

3

trical socket member of the quick detachable type in accordance with my present invention.

Fig. 2 is a perspective view of a two-contact plug member according to my present invention constructed to interfit with the socket member of Fig. 1 and made of identically constructed parts as those forming the socket member.

Fig. 3 is a plan view of a pair of mated plug and socket members such as those shown in Figs. 1 and 2 but with the top casing members of each removed.

Fig. 4 is a sectional view taken along the line 4—4 of Fig. 1.

Fig. 5 is a sectional view taken along the line 5—5 of Fig. 3.

Fig. 6 is an enlarged, plan view of a contact member according to my present invention.

Fig. 7 is an end view of this contact member as seen from the right of Fig. 6.

Fig. 8 is an exaggerated view showing the taper upon the legs of each contact.

Referring, now, in greater detail to the drawing wherein similar reference characters refer to similar parts, there is shown, in Fig. 1, a two-contact socket member, generally designated as A, which is adapted to be connected to one side of an electrical circuit. The socket member A is formed by assembling an upper cap or casing member 10 of electrical insulating material with a lower cap or casing member 11 of similar material, and a pair of identical, flat, electrically conductive contact members, generally designated as B. This assembly is held together by a bolt 12 and a nut (not shown) all as more fully described in my aforesaid Patent No. 2,750,572. In Fig. 2 is shown a plug member, generally designated as C, which is complementary to and cooperates with the socket member A. The plug member C is assembled from the same parts as the socket member A and also comprises an upper cap or casing member 10, a lower cap or casing member 11, and a pair of contact members B, these parts also being held together by a bolt 12 and an associated nut. However, whereas the contacts B have their circuit completing ends wholly within the casings 10 and 11 in the socket member A (see Figs. 3 and 4), the corresponding ends of the contacts B in the plug member C extend outwardly therefrom, as best seen in Figs. 2 and 3.

The contact members B are all identical and consist of flat members of copper or other suitable, electrically conductive material. Each contact member B has a terminal head 13 to which a lead or conductor 14 may be soldered for external connection. At the other end, each contact member is bifurcated by virtue of a slot 15 along the longitudinal center to provide a pair of contact legs 16 which are spaced from each other lengthwise of the contact by the slot or space 15. Between the head 13 and the legs 16, each contact member is formed with a constricted neck 17 by virtue of opposed, arcuate notches 18 in the outer edges thereof. Beginning at the notches 18, the outer edges of the legs 16 taper toward each other longitudinally on a relatively slight or gradual taper for a distance 19 of approximately three-fourths of their lengths to points 20. From the points 20, the outer edges of the legs 16 taper more sharply toward each other along portions 21 up to the extreme ends or tips 22 of the legs where the end portions 23 of the legs taper inwardly even more sharply for a short distance and meet the inner edges 24 of the legs 16 at the slot or space 15.

The inner edges 24 of the legs are chamfered or tapered in thickness at a 45 degree angle to present flat contact surfaces or areas 25. In mating position, the contact members B as above described lie in perpendicular planes, as seen in Figs. 3 and 5. The legs of one contact member straddle the legs of the other with the chamfered surfaces 25 thereof in engagement with each other to provide electrical contact of large area. The transverse dimension of each slot 15 (i. e., the distance between the

4

opposed inner edges 24 of each contact) is such that the contacts will engage each other under tension in order to provide firm electrical contact. To insure this at all times, the slot or space 15 terminates adjacent the base of the legs 16, where the legs 16 have their greatest overall, transverse dimension, in an enlarged, circular (or other suitably-shaped) opening 26 which has a diameter or corresponding transverse dimension which is appreciably greater than the transverse dimension of the slot 15. Thus, the opening 26 provides a hinge action which affords making the slot 15 slightly narrower than would otherwise be possible. As the two cooperating contacts are brought into mating relation, their respective legs 16 are spread apart slightly by virtue of the aforementioned hinge action to permit a smooth sliding action between the respective pairs of contact legs while still providing adequate tension to insure good electrical contact.

The insulated caps 10 and 11 have opposed, complementary cavities 27, 28 and 29, 30 in the opposed surfaces thereof. The cavities 27 and 28, which are spaced laterally from the cavities 29 and 30, are formed with vertically aligned slots 31 and are mirror images of each other. The cavities 29 and 30 are also mirror images of one another and are formed with horizontally aligned slots 32. The cavities 27, 28 are also formed with horizontal ledges or seats 33 on which a female contact member B is seated horizontally with its legs 16 wholly within the casing members 10, 11 (see Fig. 3). Each of the cavities 27, 28 is also formed with parallel, vertical side walls 34 at the ledges 33 and opposed, curved projections 35 which are received in the arcuate notches 18 for confining the contact on the ledges 33 against removal from the casings. The projections 35 are formed on a smaller radius of curvature than are the notches 18, and since the side edges 19, 21 of the legs are tapered as above described, it is clear that the contact is free to rock somewhat about the projections 35 and float on the seats or ledges 33.

To form a plug or male member C, a contact B may be similarly floatingly mounted in the vertically aligned slots 31 of the cavities 27, 28 with the legs 16 thereof extending out of the casings 10, 11, as seen in Figs. 2 and 3. This male contact member B may then be inserted into the vertical slots 31 of the socket member A to mate with the horizontal female contact member on the seats 33 of the socket member. Thus, the male and female contact members are mated in crossed relation, as shown in Figs. 3 and 5. The sharp taper at the contact leg portions 21 insure ready entrance of the male contact member into the slots 31. Furthermore, the sharp taper at the ends 23 of the contact members, coupled with their floating mountings, insures suitable alignment of the two cooperating contact members as they are brought into engagement with each other.

The cavities 29, 30 are formed with vertical ledges 36, horizontal walls 37 adjacent the ledges 36, and projections 38 which correspond, respectively, to the ledges 33, the side walls 34 and the projections 35 of the cavities 27, 28. Thus, within the socket member cavities 29, 30, a female contact member B is floatingly seated vertically (see Fig. 4). Within the cavities 29, 30 of the plug member C, on the other hand, the associated male contact member is floatingly mounted horizontally with its legs 16 extending therefrom. These latter two contact members can therefore also be mated in crossed relation similarly to those in the two sets of cavities 27, 28. This type of mounting, except for the floating action, is more particularly described in my above-identified Patent No. 2,750,572.

The cavities through which the insulated conductors 14 pass in the socket member A are of such dimension that the casing members 10 and 11 firmly clamp the insulation of the conductors so that they firmly clasp the

5

conductors to prevent them from being pulled away from the contact members B. This clamping action of the casing members serves to relieve the strain upon the conductors. It is further to be pointed out that the space 15 between the legs 16, 16 may taper somewhat. The widest part between the opposed edges 24 of each leg 16 is, in such case, adjacent the opening 26, and the narrowest part is adjacent the leg end portions 23, as shown in Fig. 8. This helps provide tension between a pair of mating contact members by reason of the spring action which takes place, the surfaces 24, 24 of the opposed legs becoming parallel to one another when the contact members are mated, although their original position in non-mating position was at an inclination one to the other.

Although my invention has been described in considerable detail, such description is intended as being illustrative rather than limiting, since the invention may be variously embodied.

I claim as my invention:

1. An electrical coupling device comprising, in combination, a pair of separable casing members adapted to be assembled in contacting relation and having opposed, complementary contact cavities in the opposed surfaces thereof for reception of a flat contact member therein, said cavities having cooperating, relatively elongated seats therealong, and a flat contact member mounted in said cavity and disposed on said seats lengthwise thereof, the outer edges of said contact member being tapered relative to the sides of said seats whereby said contact member is of smaller transverse dimension than said seats and therefore is free to float on said seats.

2. An electrical coupling device as set forth in claim 1 wherein said contact member and said cavities include cooperative means for loosely confining said contact member in said cavities against removal therefrom when said casing members are assembled therewith, the loose confinement of said contact member in said cavities affording freedom of said contact members to float in said seats.

6

3. An electrical contact device comprising a member having a slot extending from one end thereof to provide a pair of spaced legs and also having a discrete opening of greater transverse dimension than said slot, said slot terminating at said opening whereby to provide relatively great resiliency between said legs, and said member having opposed notches in the outer edges thereof to provide a constricted portion between said notches.

4. An electrical contact device comprising a member having a slot extending from one end thereof to provide a pair of spaced legs and also having a discrete opening near the base of said legs of greater transverse dimension than said slot, said slot terminating at said opening whereby to provide relatively great resiliency between said legs, and said member having opposed notches in the outer edges thereof beyond said base to provide a constricted portion beyond said opening.

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Disclaimer

2,828,474.—*Benjamin Fox*, Philadelphia, Pa. MULTI-CONTACT CONNECTOR. Patent dated Mar. 25, 1958. Disclaimer filed Feb. 28, 1966, by the assignee, *Elco Corporation*.
Hereby enters this disclaimer to claims 1 to 4 of said patent.
[*Official Gazette May 31, 1966.*]
