Feb. 20, 1940. C. G. OLSON 2,191,297

ELECTRICAL CONNECTOR DEVICE

Filed March 9, 1937

FIG. 1.

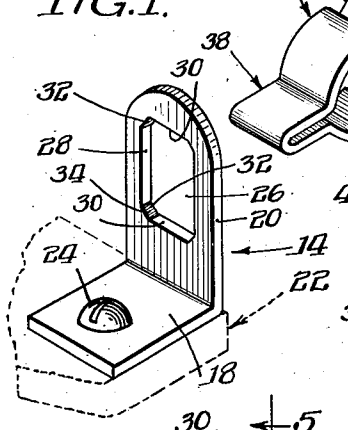


FIG. 2.

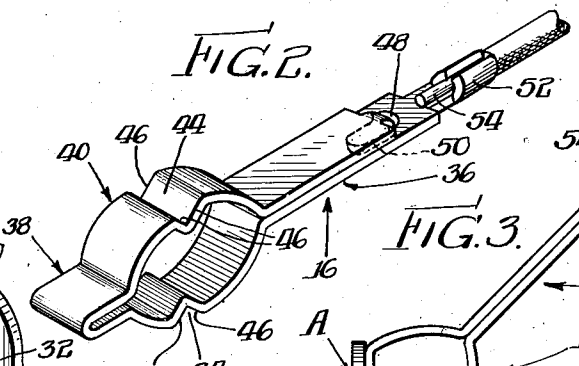


FIG. 3.

FIG. 4.

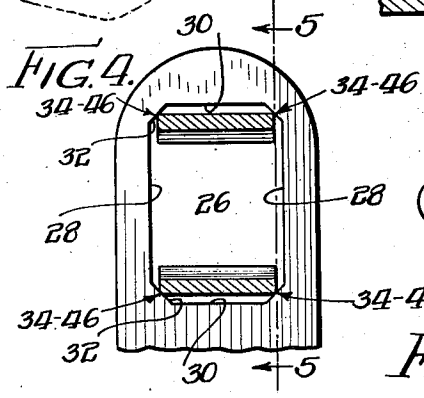


FIG. 5.

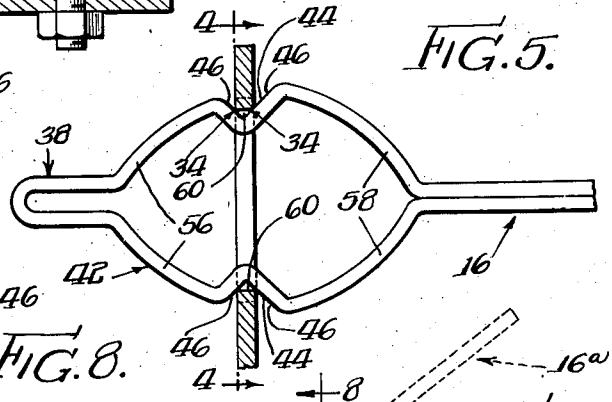


FIG. 8.

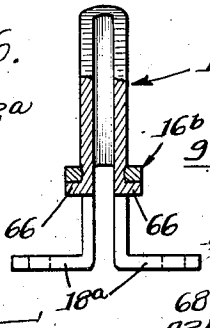


FIG. 7.

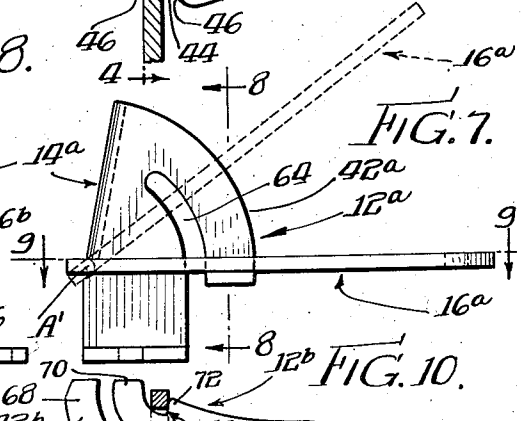


FIG. 6.

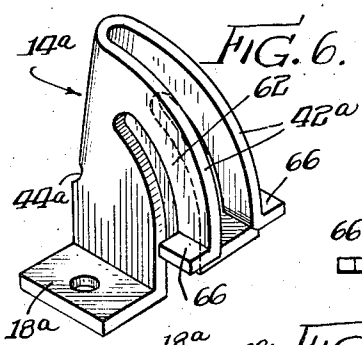


FIG. 10.

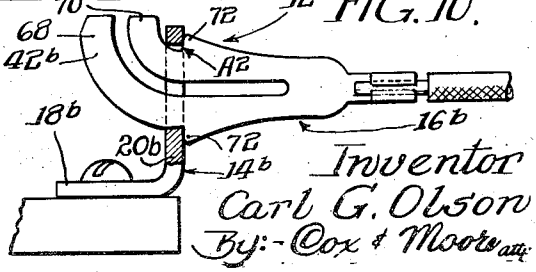
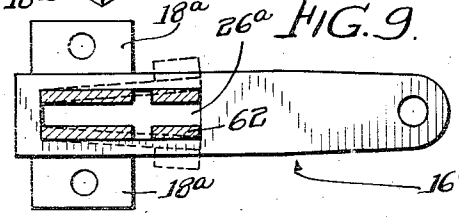


FIG. 9.



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Patented Feb. 20, 1940 2,191,297

UNITED STATES PATENT OFFICE

2,191,297

ELECTRICAL CONNECTOR DEVICE

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Application March 9, 1937, Serial No. 129,883

13 Claims. (Cl. 173—328)

This invention relates generally to electrical connectors, and more particularly to electrical connectors of the type which includes a connector or terminal post and a connector member adapted to be electrically coupled therewith.

Many of the conventional electrical connectors with which I am familiar present certain disadvantages. For example, certain types of connector or terminal arrangements necessitate the use of solder to insure proper connection. Others require manual manipulation of one of the elements in such a manner as to render the use thereof inconvenient. That is to say, electrical connection is not established by simply moving one of the parts into contacting relationship with the other, but rather by manual manipulation of both of the parts. The present invention contemplates an electrical connector arrangement wherein the aforesaid and other disadvantages and inconveniences are overcome, and to this end the invention contemplates a terminal post and connector member of such a construction as to enable contacting of the parts by simply moving one of them into operative association with the other.

More specifically, the present invention contemplates an arrangement wherein a connector element adapted to be secured to a flexible conductor may be moved into operative association with a complementary terminal post and the parts subjected to a predetermined relative movement which will serve to establish a relatively rigid coupling and good electrical contact.

It is an object of the invention to provide a connector arrangement, as set forth above, wherein a desired wiping and camming action takes place when the connector elements are relatively moved in contact with each other, whereby to insure perfect electrical contact and a coupling which will withstand severe vibrations without loosening.

A further object of the invention is to provide a device, as set forth above, wherein the resilient characteristics of at least one of the connector elements may be employed to insure the desired electrical contact and connection, and in which the constituent parts will not wiggle or shake even when subjected to very severe operating conditions.

The foregoing and other objects and advantages will be more evident from the following description when this description is considered with the accompanying drawing, wherein—

Figure 1 is a perspective view of a connector or terminal post constructed in accordance with the present invention;

Figure 2 is a perspective view of an electrical connector or terminal member secured to the free extremity of an electrical conductor, said device being adapted for coupling with the electrical terminal post of Figure 1;

Figure 3 discloses the device of Figure 2 in its initial operative association with the device of Figure 1, the dotted lines indicating the position occupied by the electrical connector element of Figure 2 when it has been shifted to its home or final position;

Figure 4 is an enlarged transverse sectional view taken substantially along the line 4—4 of Figure 5 disclosing the manner in which a four-point contact is made between the terminal post and connector element;

Figure 5 is a transverse sectional view taken substantially along the line 5—5 of Figure 4 disclosing the manner in which the four-point contact shown in Figure 4 is made on opposite sides of the upright terminal post;

Figure 6 is a perspective view of a modified electrical terminal post structure wherein the side walls thereof are adapted to yield when an apertured connector element is moved into operative association therewith;

Figure 7 is a side view of the electrical terminal member of Figure 6 with an apertured electrical connector element secured in operative association therewith, the inclined dotted lines indicating the initial position assumed by the connector element before it is shifted downwardly to its forward or home position indicated by the solid lines;

Figure 8 is a transverse sectional view of the associated electrical terminal and electrical connector elements of Figure 7, said view being taken substantially along the line 8—8 of Figure 7;

Figure 9 is a horizontal sectional view taken substantially along the line 9—9 of Figure 7; and

Figure 10 is a side view of a modified electrical connector arrangement with a portion of the electrical terminal post broken away to more clearly illustrate the manner in which the parts make electrical contact with each other.

Referring now to the drawing wherein like numerals have been employed to designate similar parts throughout the various figures, it will be seen that one embodiment of the present invention contemplates an electrical connector device

indicated generally by the numeral 12 in Figure 3. This connector device includes two elements—namely, a fixed electrical terminal member 14 and a shiftable electrical terminal or connector member 16. As more clearly illustrated in Figure 1, the terminal member 14 includes a base portion 18 and an integral upright section 20. The base 18 is secured in any suitable manner to a work piece 22 as by means of a screw 24. The upright terminal section 20 is provided with an aperture 26. In the embodiment disclosed in Figures 1 to 5, inclusive, this aperture 26 is surrounded by side walls 28 and upper and lower walls 30. These walls 28 and 30 are connected by angularly disposed or inclined contactor surfaces 32. Each of these contactor surfaces 32 is defined on opposite sides thereof by contactor edges 34, as will be more apparent from Figures 4 and 5.

The electrical terminal or connector member 16 is preferably formed from a single piece of strip spring stock, said strip being bent back upon itself so as to present a shank portion 36, a tip portion 38, and an intermediate resilient or cam portion 40. Particular attention is directed to the intermediate portion 40, which is symmetrical in longitudinal cross-section, and hence includes identical oppositely disposed resilient cam surfaces 42, which extend outwardly and rearwardly from the tip portion 38 to indentations 44. These indentations 44 are preferably of V-shaped cross-section and are bounded on opposite sides by contactor edges 46, which edges are companion to and adapted to engage the contactor corners or edges 34, as will be clearly apparent from Figure 5. The two sections of the strip stock forming the shank 36 may be secured together in any suitable manner. In the present embodiment one of the sections of the shank 36 is provided with an aperture 48 through which a tongue 50 on the other shank section is inserted and bent so as to firmly secure both of the shank sections together as a unit. The apertured shank section is provided with a conductor receiving split sleeve 52. This split sleeve 52 is adapted to be crimped or clamped against the free extremity of a flexible conductor 54, as indicated in Figures 2 and 3.

To couple the electrical terminal or connector member 16 with the terminal post 14, it is only necessary to insert the tip portion 38 of the connector member 16 within the terminal post aperture 26, as shown by the solid lines in Figure 3. This causes upper contactor edges 46 of the connector member 16 to rest against the complementary upper contactor edges 34 of the terminal post, and also positions the portion of the cam surface 42 adjacent the tip portion 38 against the lower complementary contactor edges 34 of the terminal post. By rotating the connector member 16 downwardly about a pivotal point or fulcrum A (Figure 3) presented by the engaging contactor edges 34—46, a wiping, camming action takes place between the lower contactor edges 34 and the opposite edges of the cam surface 42. It will be noted that the cam surface 42 is eccentric with respect to the fulcrum point A, the point or degree of maximum eccentricity being indicated by the letter B in Figure 3. Thus, as the connector member 16 shifts toward the dotted position shown in Figure 3, the surface 42 yields inwardly under the influence of the wiping, camming action and, when the connector reaches its final or home position indicated by dotted lines in Figure 3 and the solid lines in Figure 5, the indentations 44 register with the inclined walls or surfaces 32 of the terminal post 14. In this position the resiliency of the sections 56 and 58 of the intermediate connector portion 40 causes the contactor edges 46 to be urged outwardly into firm contact with the complementary contactor edges 34 of the terminal post member. It will be noted that the radius presented at the bottom of the indentations 44 is relatively small so as to provide a slight space 60 between the structure of the connector member and the terminal post member, thereby insuring positive independent contacting between the four contactor edges 34 and the contactor edges 46 on one side of the terminal post, and simultaneous similar contacting of the edges 34 and edges 46 on the opposite side of the terminal post member.

From the foregoing it will be apparent that, when the electrical connector member 16 is shifted about the fulcrum point A to the dotted position shown in Figure 3 and the solid line position shown in Figures 4 and 5, a four-point contact on each side of the terminal post is made by the complementary engaging edges 34—46. This eight-point contact not only insures perfect electrical contact, but also establishes a coupling between the parts which is sufficiently rigid to withstand vibration and shock without loosening. The coupling established between the parts may be correctly referred to as an "anti-wiggle" coupling—namely, a coupling which will positively prevent wiggling or shaking of the connector member 16 after it has been finally snapped into its home position. It is just as important from a practical standpoint to have an electrical terminal secure against wiggling as it is to have the electrical terminal make a perfect electrical contact. Devices of this nature are particularly adaptable for use with such apparatus as radio sets and similar electrical equipment wherein the slightest degree of wiggling or vibration experienced by an electrical connector associated therewith will render the functioning thereof most unsatisfactory. The device just described presents an arrangement which precludes the necessity of employing auxiliary locking devices for electrical connectors such as a threaded nut. Heretofore it has been common practice in many instances to use a connector device comprising an apertured electrical terminal member placed over a threaded shank and secured in position by a nut screwed upon the shank against the surface of the electrical terminal member. The present invention not only reduces the number of parts by eliminating the auxiliary clamping member or nut, but materially facilitates the ease with which contact may be established. In other words, the present invention provides a device in which only one element need be manipulated in making the connection—namely, the electrical connector member 16. Furthermore, the coupling, as well as the uncoupling of the connector parts contemplated by the present invention, may be accomplished with the same degree of ease. If it is desired to make a permanent electrical connection, the present invention also provides a very convenient device, to which solder may be applied after the parts have been clipped or snapped together. A globule of solder dropped into one of the indentations 44, after the parts have been coupled together, will render the coupling secure against unauthorized uncoupling thereof. However, unless the parts are to be secured against unauthorized disconnection, the use of solder may be dispensed with.

In Figures 6 to 9, inclusive, I have disclosed a modified electrical connector device indicated generally by the numeral 12a. This device 12a comprises a terminal post member 14a and an electrical connector or terminal member 16a. In the connector device 12 previously described the terminal member 14 is provided with an aperture 26 to receive the cam surface 42 of the connector member 16. In the embodiment of the invention disclosed in Figures 6 to 9, inclusive, however, the arrangement of cam and aperture structures has been reversed, in that the terminal member 14a is provided with resilient cam members or surfaces 42a, while the terminal member 16a is provided with a complementary recess 26a. Also, the terminal member 14a is provided with a notch or indentation 44a designed to receive the complementary portion of the connector member 16a at the left extremity of the aperture 26a, as viewed in Figures 7 and 9. The position occupied by the electrical contactor member 16a, when it is initially associated with the electrical terminal post 14a, is indicated by the dotted lines in Figure 7. As the electrical connector member 16a is moved downwardly about its pivotal point A' to its final position, indicated by the solid lines, the cam surfaces 42a are yieldably urged to the left and side surfaces 62 of the terminal post 14a are also urged inwardly. An arcuate recess 64 enables the cam surfaces 42a to yieldably shift to the left as the connector member 16a is moved to its final or home position. Suitable shoulders or abutments 66 limit the downward movement of the connector member 16a.

With the connector member 16a positioned as shown in Figures 7 and 9, the resilient side portions of the terminal member 14a will have been shifted from the dotted line to the solid line position indicated in Figure 9, and the connector member 16 will be secured against lateral movement or wiggling. Suitable base portions 18a of the terminal post 14a are apertured to facilitate mounting upon a work piece. The connector member 16a may be uncoupled from the terminal member 14a by exerting sufficient force at the free end thereof to overcome the resilient binding action of the terminal post.

In Figure 10 another modification of the invention is disclosed which comprises a connector device indicated generally by the numeral 12b. This device comprises a terminal post member 14b and an electrical connector member 16b. The terminal post member 14b includes a base section 18b and an upright section 20b, the upright section being apertured to receive bifurcated extremities 68 and 70 of the connector member 16b. The resilient member 68 is provided with a cam surface 42b, which is adapted to make a wiping contact with the portion of the terminal member in the vicinity of the lower end of the aperture therein. The connector member 16b is adapted to be fulcrumed about a point A2 in a manner similar to that described in connection with the device of Figures 1 to 5, inclusive. As the connector member 16b is moved to its final or home position, as shown in Figure 10, the frictional resistance between the cam surface 42b and the complementary portion of the terminal member 14b is increased so as to securely hold the connector member in position. Shoulders 72 on the connector member 16b coact with the outer surface of the terminal member in securing the parts in a predetermined relation.

From the foregoing description it will be apparent that my invention contemplates an improved electrical connector device which is particularly adaptable for use with a multi-sided opening, said multi-sided opening being provided either in the fixed electrical binder post or the shiftable electrical terminal or connector member. By this arrangement the parts are adapted to wedgingly engage each other at a plurality of points in such number and spacing as to render the device self-centering and self-balanced in the opening. Furthermore, the above described device is arranged so as to enable the convenient application of solder at the fulcrum point; for example, in Figure 5 a globule of solder may be dropped within one of the V channels presented at the upper side, this being a point where a light soldering connection may be easily broken in disassembling by simply applying rotary motion to the free extremity of the terminal or connector member. Furthermore, the wiping action which is experienced between the contacting points as the shiftable connector element is being moved into engagement with the companion element insures perfect electrical contact, because it serves to remove any corrosion or other surface material which might have a tendency to impair electrical contact.

It is to be understood that the invention is not limited in any sense to the specific structural features disclosed herein, but is capable of numerous other modifications and changes without departing from the spirit and scope of the appended claims.

Having thus described my invention, what I claim as new and desire to secure by Letters Patent is:

1. An electrical connector device including a connector member having an aperture, and a detachable complementary connector member adapted to be electrically connected therewith as an incident to relative movement of said members, interengaging means at a fixed point on each of said connector members for permitting interengagement of the connectors at said fixed point for providing a fulcrum point, said complementary connector member having a surface arranged eccentrically with respect to said interengaging means, the other connector having a contact surface provided by at least one edge of said aperture, said contact surface being arranged in the path of said eccentric surface when said complementary connector member is pivoted about said fulcrum whereby one member is adapted to fulcrum upon the other member whereby to establish resilient contact between said members in response to a pivotal movement through a given distance.

2. An electrical connector device including a connector member having an aperture, and a detachable complementary connector member adapted to be electrically connected therewith as an incident to relative movement of said members, interengaging means at a fixed point on each of said connector members for permitting interengagement of the connectors at said fixed point for providing a fulcrum point, said complementary connector member having a surface arranged eccentrically with respect to said interengaging means, the other connector having a contact surface provided by at least one edge of said aperture, said contact surface being arranged in the path of said eccentric surface when said complementary connector member is pivoted about said fulcrum whereby one member is adapted to fulcrum upon the other member whereby to establish resilient contact between

said members in response to a pivotal movement through a given distance, the contacting surfaces of said members being constructed and arranged to enable a wiping action therebetween during said pivotal movement.

3. An electrical connector device including a connector member having an aperture, and a detachable complementary connector member adapted to be electrically connected therewith as an incident to relative movement of said members, interengaging means at a fixed point on each of said connector members for permitting interengagement of the connectors at said fixed point for providing a fulcrum point, said complementary connector member having a surface arranged eccentrically with respect to said interengaging means and resiliently supported with respect to the fulcrum point, the other connector having a contact surface provided by at least one edge of said aperture, said contact surface being arranged in the path of said eccentric surface when said complementary connector member is pivoted about said fulcrum whereby one member is adapted to fulcrum upon the other member whereby to establish resilient contact between said members in response to a pivotal movement through a given distance, said complementary connector member having its interengaging means and eccentric surface formed on oppositely disposed yieldable sections adapted for engagement with complementary portions of the other connector member.

4. An electrical connector device including a connector member having an aperture, and a detachable complementary connector member adapted to be electrically connected therewith as an incident to relative movement of said members, interengaging means at a fixed point on each of said connector members at said fixed point for providing a fulcrum point, said complementary connector member having a surface arranged eccentrically with respect to said interengaging means and resiliently supported with respect to the fulcrum point, the other connector having a contact surface provided by at least one edge of said aperture, said contact surface being arranged in the path of said eccentric surface when said complementary connector member is pivoted about said fulcrum whereby one member is adapted to fulcrum upon the other member whereby to establish resilient contact between said members in response to a pivotal movement through a given distance, at least one of said interengaging means comprising an indentation to facilitate said pivotal movement.

5. An electrical connector device including a connector member having an aperture, and a detachable complementary connector member adapted to be electrically connected therewith as an incident to relative movement of said members, interengaging means at a fixed point on each of said connector members for permitting interengagement of the connectors at said fixed point for providing a fulcrum point, said complementary connector member having a surface arranged eccentrically with respect to said interengaging means and resiliently supported with respect to the fulcrum point, the other connector having a contact surface provided by at least one edge of said aperture, said contact surface being arranged in the path of said eccentric surface when said complementary connector member is pivoted about said fulcrum, said eccentric surface having an entering portion adapted to enter said aperture when said interengaging means are engaged and receding from said fulcrum point as it progresses from said entering portion for providing an increasing wiping engagement as the complementary connector member is pivoted whereby one member is adapted to fulcrum upon the other member whereby to establish resilient contact between said members in response to a pivotal movement through a given distance, one of said connector members having a free extremity adapted to receive a flexible electrical conductor.

6. An electrical connector device including a connector member having an aperture, and a detachable complementary connector member adapted to be electrically connected therewith as an incident to relative movement of said members, interengaging means on each of said connector members for permitting pivotal interengagement of the connectors at fixed points whereby to provide a fulcrum point, said complementary connector member having a pair of cam surfaces arranged eccentrically with respect to said interengaging means, the other connector having a contact surface provided by at least one edge of said aperture, said contact surface being arranged in the path of at least one of said cam surfaces when the said complementary connector member is pivoted about its fulcrum whereby one member is adapted to fulcrum upon the other member whereby to establish resilient contact between said members in response to a pivotal movement through a given distance, said cam surfaces being oppositely disposed and adapted to be resiliently urged toward each other during said pivotal movement.

7. An electrical connector device including a stamping of sheet metal providing a connector member having an aperture, and a detachable complementary connector member adapted to be electrically connected therewith as an incident to relative movement of said members, said complementary connector member having means engageable with said apertured connector member to provide a pivotal fulcrum connection, said second connector member being provided with a resilient cam surface cooperatively engageable with a complementary surface of the first connector member adjacent the aperture thereof, said cam surface being so formed as to reside an increasing distance away from the fulcrum in the direction of rotation about said fulcrum, whereby, when one of said connector members is turned with respect to the other, resilient contact may be established between said members.

8. An electrical connector device including a connector member having an aperture, and a detachable complementary connector member of resilient sheet stock adapted to be electrically connected therewith as an incident to relative movement of said members, said complementary connector member having means engageable with said apertured connector member to provide a pivotal fulcrum connection, said second connector member being provided with a resilient cam surface cooperatively engageable with a complementary surface of the first connector member adjacent the aperture thereof, said cam surface being so formed as to reside an increasing distance away from the fulcrum in the direction of rotation about said fulcrum, whereby, when one of said connector members is turned with respect to the other, resilient contact may be established between said members.

9. An electrical connector device including an apertured connector member, said aperture being

defined by wall portions terminating at opposed corners, and a detachable complementary connector member adapted to be electrically connected therewith as an incident to relative movement of said members, said second connector member having a resilient portion adapted to be interlocked with the aperture of the first connector member but being accommodated therein and having side walls forming corners, said connector members being arranged to interengage at said corners and without contact of the adjacent wall portions forming the corners when the connector members are interlocked whereby said connector members are adapted to make a plurality of point contacts with the first connector member in the vicinity of the aperture thereof in response to relative movement of said members into engagement with each other.

10. An electrical connector including a shank portion, means at one extremity of said shank portion for receiving the terminal of a flexible electrical conductor, and coupling means at the opposite extremity of said shank including oppositely disposed cam surfaces yieldable toward each other, interengaging means on said connector adapted to engage a complementary electrical connector pivotally to provide a fulcrum connection, said cam surfaces having an entering portion adjacent the end of the shank adapted to enter a complementary aperture, at least one of said cam surfaces receding away from said fulcrum point as it progresses away from said entering portion to enable pivotal insertion thereof within a complementary aperture and for providing an increased wiping engagement as the connector is pivoted within said aperture.

11. An electrical connector including a shank portion, means at one extremity of said shank portion for receiving the terminal of a flexible electrical conductor, and coupling means at the opposite extremity of said shank including oppositely disposed cam surfaces terminating in oppositely disposed indentations and yieldable toward each other to enable pivotal insertion thereof within a complementary aperture, said cam surfaces having an entering portion adjacent one end of the shank, said cam surfaces being spaced increasing distances from the opposed indentations as they recede from said entering portion whereby pivotal movement about said indentations causes an opposite cam surface to increasingly engage a portion of said complementary aperture.

12. An electrical connector device including a connector member having an aperture, said aperture being defined by intersecting wall portions providing a corner, and a detachable complementary connector member formed for accommodation within said aperture, said connector member having wall portions intersecting providing a corner on said second named connector member, said corners on said two connector members being adapted to be so situated when the said connector members are interlocked that the longitudinally extending corners on the respective connectors make point contact without permitting contact of any wall portions adjacent said corners.

13. An electrical connector device including a connector member having an aperture, said aperture being defined by wall portions extending transversely of the aperture and terminating at a longitudinally extending corner, and a detachable complementary connector member formed for accommodation within said aperture, said connector member having wall portions intersecting to provide corners on said second named connector member, said corners on said two connector members being adapted to be so relatively situated when the said connector members are interlocked that said corner edges on the complementary connector member extend in a direction axially of the aperture while being inclined with respect to said axis of the aperture whereby to make point contact with adjacent corners on the apertured connector.

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