

Feb. 28, 1950

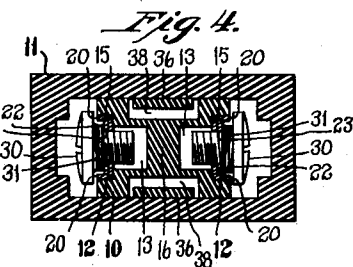
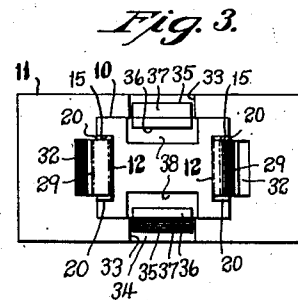
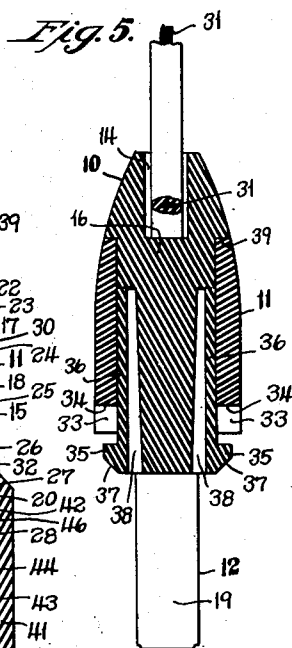
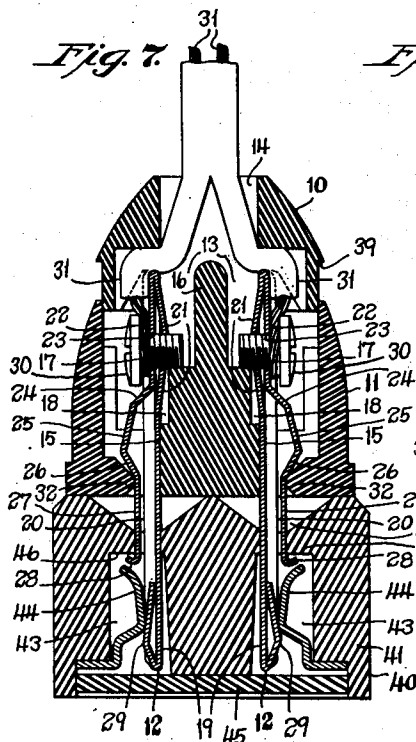
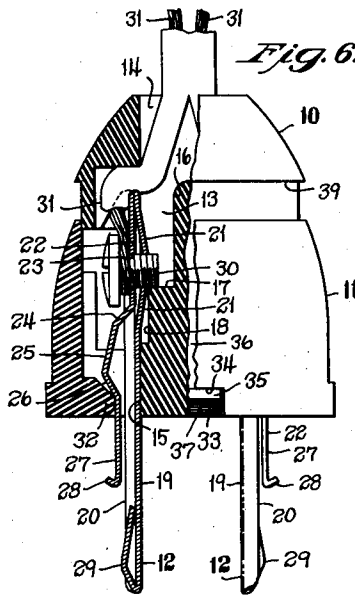
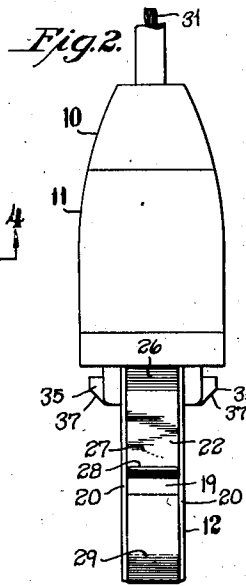
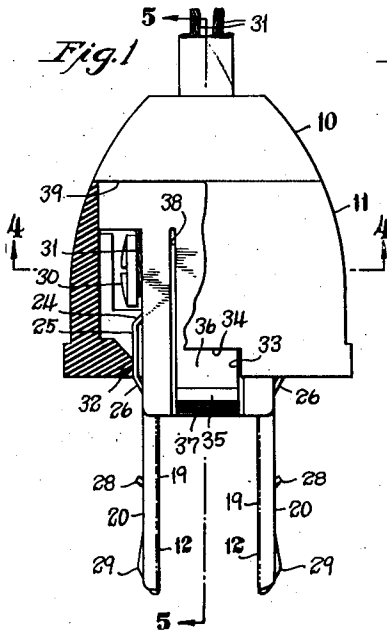
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2,498,743

SELF-LOCKING ELECTRICAL CONNECTOR

Filed Dec. 28, 1946

2 Sheets-Sheet 1



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2 Sheets-Sheet 2

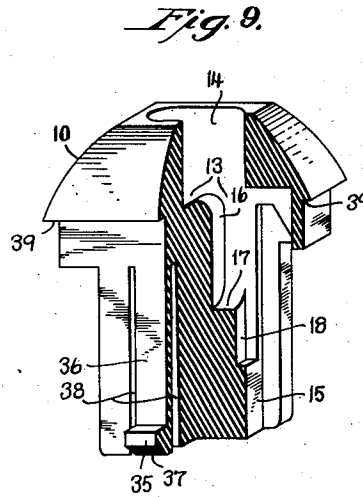
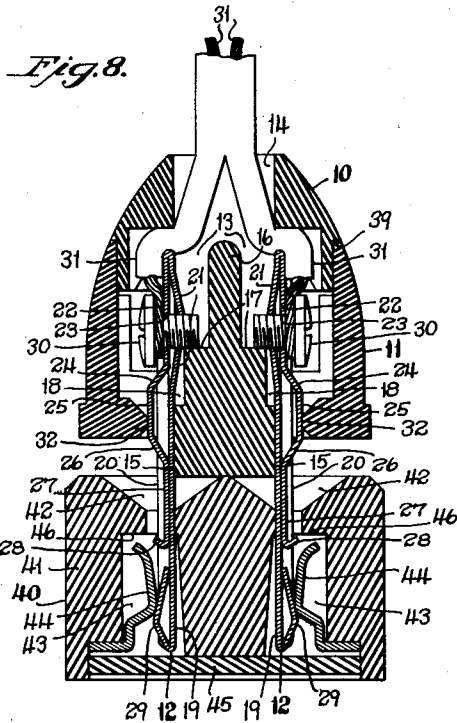


Fig. 11.

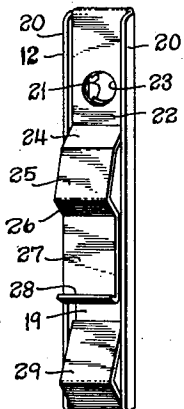


Fig. 12.

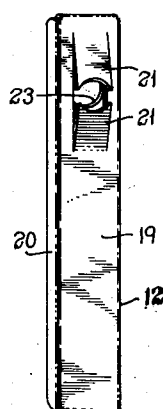
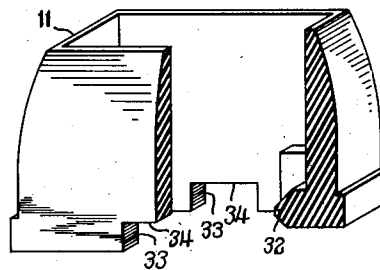


Fig. 10.



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UNITED STATES PATENT OFFICE

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SELF-LOCKING ELECTRICAL CONNECTOR

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Application December 28, 1946, Serial No. 719,049

5 Claims. (Cl. 173-361)

1

The present invention relates to improvements in electrical connectors and relates more particularly to improvements in self-locking electrical connectors which are designed and adapted for rapid connection to and disconnection from another electrical fitting.

Such an electrical connector, having related subject matter, is shown and described in my co-pending application, Serial No. 12,227.

While the self-locking electrical connectors of the present invention are available for many other uses, one of the main uses is in the form of a plug-member having one or more projecting blades or prongs which may form the terminal of one or more conductors leading to portable electrical devices such, for instance, as radios, toasters, heaters, etc.

One of the main objects of the present invention is to provide a superior electrical connector which may be produced at a low cost for manufacture and which embodies simple, convenient, effective means for releasably locking the connector to another electrical fitting such, for instance, as a wall outlet.

Another object of the present invention is to provide a superior self-locking electrical connector which may have its locking-means rendered effective and ineffective in a manner natural to and easily understood by unskilled users.

Another object of the present invention is to provide a superior electrical connector of the character referred to, which is simple to assemble and simple to disassemble for purposes of connecting one or more electrical conductors thereto.

Still another object of the present invention is to provide a superior self-locking electrical connector which is characterized by fewness of parts combined with reliable but readily releasable locking-means whereby the connector may be securely locked to a mating-member.

With the above and other objects in view, as will appear to those skilled in the art from the present disclosure, this invention includes all features in the said disclosure which are covered by the claims.

In the accompanying drawings, in which certain modes of carrying out the present invention are shown for illustrative purposes:

Fig. 1 is a view mainly in side elevation of one form of self-locking electrical connector embodying the principles of the present invention, but with the operating-sleeve partly in section and

2

with the locking-arms in their retired or non-locking position;

Fig. 2 is an edge view thereof;

Fig. 3 is a view looking toward the inner or blade-end of the connector;

Fig. 4 is a transverse sectional view taken on the line 4-4 of Fig. 1;

Fig. 5 is a central-longitudinal sectional view taken on the line 5-5 of Fig. 1;

Fig. 6 is a view similar to Fig. 1 but with a portion of the body-member and one of the blade-units in section and showing the locking-arms in their advanced or locking positions;

Fig. 7 is a sectional view taken through the major plane of the electrical connector and showing the same as engaged with and locked to an electrical outlet;

Fig. 8 is a similar view but showing the operating-slide moved outwardly to retract the locking-arms;

Fig. 9 is a perspective view partly in section of the body-member detached;

Fig. 10 is a similar view of the operating-slide;

Fig. 11 is a perspective view of one of the blade-units detached and looking mainly toward the outer face thereof; and

Fig. 12 is a similar view but looking mainly toward the inner face of the blade-unit.

The particular self-locking electrical connector herein chosen for purposes of illustrating a preferred form of the present invention, is in the form of a double-bladed plug-member of a type designed for connecting floor lamps, radios, toasters, etc., to a source of current supply.

The device illustrated includes a body-member generally designated by the reference character 10, reciprocating operating-sleeve generally designated by the reference character 11 and a pair of contact-blades respectively generally designated by the reference characters 12-12. The said body-member 10 and operating-sleeve 11 may be molded from any suitable insulating material such as hard rubber, soft rubber or any suitable thermoplastic or thermosetting resin.

The body-member 10 is suitably cored to provide in its interior, adjacent its inner end, a cavity 13 which is connected to the adjacent inner end of the said body-member by a passage 14. The said body-member is generally of rectangular form in cross section and is formed in its respective opposite side edges with longitudinal oppositely-facing blade-receiving grooves 15-15 respectively serving to receive the contact-blades 12-12 and to hold the same in laterally-spaced-apart relationship.

The body-member 10 is so formed that the outer portion of the cavity 13 is divided by a transverse web 16 and laterally intersects the respective upper ends of the blade-receiving grooves 15—15, as is especially well shown in Figs. 7, 8 and 9. By reference to the drawings, it will be seen that the bottom of the cavity 13 provides on each of the respective opposite sides of the web 16, upwardly-facing ledges 17—17, for purposes as will hereinafter appear. Beneath each of the ledges 17—17, the body-member is formed with one of two clearance-recesses 18—18 respectively communicating with the adjacent one of the blade-receiving grooves 15—15.

Each of the contact-blades 12—12 are of corresponding construction so that a detailed description of one thereof will serve for both.

In the instance shown, each contact-blade 12—12 is folded up from springy sheet metal and comprises a plate-like inner portion 19 which is formed along each of its respective opposite side edges with one of two parallel side-flanges 20—20 which extend substantially throughout the length of the portion 19. Adjacent its upper end, the plate-like inner portion 19 is pierced and struck outwardly to provide a pair of complemental screw-retaining fingers 21—21, for purposes as will hereinafter appear.

Formed integral with the upper edge of the plate-like inner portion 19 of each contact-blade 12, is a downwardly-extending locking-arm 22 which is sufficiently narrow to freely fit between the respective side-flanges 20—20, as is especially well shown in Fig. 11. In line with the substantially-circular gap between the ends of the screw-retaining fingers 21—21, the said locking-arm is formed with a clearance-opening 23 for the passage therethrough of a binding-screw, in the manner as will hereinafter appear.

Slightly below its clearance-opening 23, the locking-arm 22 is formed with an outwardly-and-downwardly-sloping portion 24 which, in turn, is integrally united with a substantially-flat dwell 25. Integral with the dwell 25 and sloping downwardly and inwardly therefrom, is a cam-portion 26 which, in turn, is integral with a downwardly-extending and substantially-flat portion 27. The extreme lower end of the portion 27 just referred to is bent outwardly (and preferably slightly upwardly) to provide a locking-finger 28, for purposes as will hereinafter appear.

The extreme lower end of the plate-like inner portion 19 of each of the contact-blades 12—12 is reversely bent and outwardly bowed, as at 29, to fit between the complemental side-flanges 20—20, as is especially well shown in Fig. 11.

Inserted through the clearance-opening 23 of a given contact-blade 12 and into threaded engagement with the adjacent spring-like screw-retaining fingers 21—21, is a binding-screw 30, as will be seen by reference to Figs. 6, 7 and 8.

Firmly clamped between the head of a given binding-screw 30 and the outer face of the upper portion of the complemental locking-arm 22, is the naked end of one of two similar conductors 31—31 extending into the cavity 13 of the body-member 10 through the passage 14.

The respective locking-arms 22—22 of the contact-blades 12—12 are movable between the positions respectively shown in Figs. 7 and 8 under the control of the operating-sleeve 11 before referred to. The said operating-sleeve laterally encircles the lower portion of the body-member 10 and reciprocates thereon.

Within its extreme lower end, the operating-sleeve 11 is formed with two tapered operating-lugs 32—32 extending in opposition to each other from the respective opposite end-walls of the said operating-sleeve. Each of the operating-lugs 32—32 is adapted to engage with the cam-portion 26 and the dwell 25 of the adjacent one of the contact-blades 12—12.

In the lower edges of its respective opposite side-walls, the operating-sleeve 11 is formed with one of two downwardly-opening notches 33—33 each having a downwardly-facing wall providing a retaining-abutment 34. Each of the retaining-abutments 34—34 is adapted on occasion to engage with the upper surface of the adjacent one of two similar rib-like retaining-fingers 35—35 respectively formed at the lower ends of two similar longitudinal retaining-arms 36—36.

Each of the retaining-fingers 35—35 above referred to has its lower outer corner sloped inwardly to provide it with a cam-surface 37 and the retaining-arm 36 of which it forms a part is flexible to permit the inward retirement of the retaining-finger, for purposes as will hereinafter appear.

Each of the retaining-arms 36—36 is adapted to flex in the adjacent one of two longitudinal channels 38—38 formed in the respective opposite side faces of the body-member 10. At their respective upper ends, the retaining-arms 36—36 are integral with the body-member 10 and their respective retaining-fingers 35—35 are adapted, under certain conditions, to be freely accommodated in the notches 33—33 in the lower edges of the opposite side-walls of the operating-sleeve 11. When the operating-sleeve 11 is moved downwardly to cause its notches 33—33 to fit over the respective retaining-fingers 35—35, the respective upper surfaces of the latter will engage with the retaining-abutments 34—34 and thus normally limit the downward movement of the said operating-sleeve.

The upward movement of the operating-sleeve 11 is limited by the engagement of its upper edge with a downwardly-facing stop-shoulder 39 formed upon the exterior of the body-member 10 and extending around all four faces thereof.

The projecting lower ends of the contact-blades 12—12 are designed and adapted for engagement with contact-members of another electrical connector and for purposes of illustration there is shown in Figs. 7 and 8 of the accompanying drawings, one such suitable type of electrical connector. The electrical connector last referred to is generally designated by the reference character 40 and includes a body-member 41 formed of insulating material and provided in its upper end with a pair of funnel-shaped passages 42—42 spaced from each other a distance which is substantially standard in the art and which corresponds to the spacing of the contact-blades 12—12.

The lower ends of the funnel-shaped passages 42—42 above referred to respectively lead into chambers 43—43 formed in the body-member 41 and respectively accommodating contact-members 44—44 which may have any suitable conductors (not shown) connected thereto and leading, for instance, from a source of electrical energy. The otherwise open lower ends of the chambers 43—43 are closed by a removable insulating plate 45, as is shown in Figs. 7 and 8.

The chambers 43—43 in the body-member 41 are larger than the inner or lower ends of the particular funnel-shaped passage 42 communi-

engaging therewith, with a result that there is formed in the said body-member 41 a pair of downwardly-facing locking-abutments 46—46 with which the locking-fingers 28—28 are respectively adapted to engage, under circumstances as will be hereinafter described.

In assembling the self-locking electrical connector illustrated in the drawings as a preferred embodiment of the present invention, the conductors 31—31 may be introduced into the cavity 13 in the body-member 10 through the passage 14 at the upper end of the said body-member and before the operating-sleeve 11 is installed on the body-member. The naked end of a given conductor 31 may now be clamped by one of the binding-screws 30 to the outer face of the upper portion of the adjacent locking-arm 22.

After a given conductor has been connected to a given contact-blade (or prior thereto if desired), the particular contact-blade may be installed in its appropriate blade-receiving groove 15 in the body-member 10 so that the inner end of the given binding-screw 30 rests upon the adjacent upwardly-facing ledge 17. Under these conditions, the given contact-blade 12 will be held against downward displacement by the engagement of its binding-screw 30 with the adjacent ledge 17 and will be prevented from undue upward movement by its conductor 31 which overlies the top of the blade and is engaged by the overhanging portion of the body-member 10, as is shown in Figs. 6, 7 and 8.

After each contact-blade 12 has had its conductor 31 connected thereto and has been mounted in its particular blade-receiving groove 15 in the body-member 10, the operating-sleeve 11 may be slipped up over the projecting lower ends of the said contact-blades 12—12 and the lower end of the body-member 10. During this installing movement of the operating-sleeve 11, the inner corners of its respective opposite side-walls will engage with the respective cam-surfaces 37 of the retaining-fingers 35—35 and will inwardly flex the retaining-arms 36—36. After the operating-sleeve has been raised sufficiently, the notches 33—33 therein will respectively register with the stop-fingers 35—35, thereby permitting the said stop-fingers to move outwardly into stopping positions under the urge of the flexible retaining-arms 36—36.

When the operating-sleeve 11 is moved into its uppermost position in which its upper edge engages with the stop-shoulder 39 on the body-member 10, the operating-lugs 32—32 will respectively ride up the inclined cam-portion 26 and onto the dwell 25 of the adjacent one of the locking-arms 22 to thereby inwardly flex and hold the said locking-arm into the space between the side-flanges 20—20 of the complementary contact-blade. Under these conditions, the locking-fingers 28—28 of the respective locking-arms 22—22 will be retired into their inoperative positions, as is shown in Figs. 1, 3 and 8.

When the operating-sleeve 11 is moved downwardly to the limit of its movement in that direction, its operating-lugs 32—32 will ride clear of the dwells 25 and the cam-portions 26 of the adjacent contact-blades and will thereby permit each of the said locking-arms to spring outwardly into the positions in which they are shown in Figs. 6 and 7.

When it is desired to couple the improved self-locking electrical connector of the present invention to another electrical connector such as 40, the operating-sleeve 11 may be at either of

its two extreme positions and the projecting ends of the contact-blades 12—12 may be inserted into the passages 42—42 in the mating electrical connector 40 so that the said contact-blades respectively engage with the contact-members 44—44.

Usually a person in engaging the improved electrical connector with another electrical connector will grasp the operating-sleeve so that the very act of making the connection will serve to force the said operating-sleeve downwardly and release the two locking-arms 22—22 from outward flexure.

When the improved self-locking electrical connector is engaged with the mating electrical connector 40, the respective locking-fingers 28—28 will be located outwardly in position to engage with the adjacent one of the locking-abutments 46 in the connector 40 to thereby prevent the unintentional separation of the two electrical connectors.

When it is desired to separate the self-locking electrical connector of the present invention from another electrical connector such as 40, the user may grasp the operating-sleeve 11 and pull outwardly and this very act will cause the said operating-sleeve to move upwardly relative to the body-member 10. The described upward movement of the operating-sleeve 11 will cause the operating-lugs 32—32 thereof to ride up the respective cam-portions 26—26 of the locking-arms 22—22 to thereby flex each of the said locking-arms inwardly into their retired positions, as shown in Figs. 1, 3 and 8.

The inward flexure of the locking-arms 22—22 as above described will, of course, retire their respective locking-fingers 28—28 and permit the separation of the electrical connectors, in the manner illustrated in Fig. 8.

When it is desired to remove the operating-sleeve 11 from the body-member 10, the retaining-fingers 35—35 may be jointly forced inwardly against the tension of their respective retaining-arms 36—36 following which the said operating-sleeve may be slipped off of the lower end of the body-member 10.

The invention may be carried out in other specific ways than those herein set forth without departing from the spirit and essential characteristics of the invention, and the present embodiments are, therefore, to be considered in all respects as illustrative and not restrictive, and all changes coming within the meaning and equivalency range of the appended claims are intended to be embraced therein.

I claim:

1. A self-locking electrical connector, including in combination: a body-member provided with a yielding retaining-arm united to the said body-member adjacent one of its ends and having a stop-finger adjacent its opposite end; a contact-member carried by the said body-member; an advanceable-and-retirable locking-member also carried by the said body-member and constructed and arranged to engage with another electrical-member to releasably couple the connector thereto; a reciprocating operating-sleeve laterally encircling the exterior of the said body-member and slidable thereon into and out of engagement with the stop-finger of the said yielding retaining-arm, the said operating-sleeve being operatively associated with the said locking-member to move the same in one direction between its retired and advanced positions; and means controlled by the said operating-

sleeve for moving the said locking-member in the opposite direction.

2. A self-locking electrical connector, including in combination: a body-member; a sheet-metal combined contact-and-locking blade carried by the said body-member and having its respective opposite edges bent to provide spaced-apart side flanges, the said blade including a portion projecting from one end of the said body-member and a portion extending within the same, a resilient locking-arm formed integral with and projecting outwardly from the portion of the blade within the said body-member and fitting between the said side-flanges, the said locking-arm being provided in turn with an integral locking-finger adapted to engage with another electrical-member to releasably couple the connector thereto; and means carried by the said body-member for flexing the said resilient locking-arm to retire its said integral locking-finger.

3. A self-locking electrical connector, including in combination: an inner body-member; a linear contact-member carried by and projecting from the said body-member; an advanceable-and-retractable locking-member also carried by and projecting from the said body-member to one side of the said contact-member and having a locking-finger adjacent its outer end constructed and arranged to engage with another electrical-member to releasably couple the connector thereto; an operating-sleeve mounted upon and substantially completely laterally encircling the exterior of the said body-member and slidable with respect thereto in a direction substantially lengthwise of the said contact-member and also with respect to the said locking-member, the said operating-sleeve having interior cam-means independent of and movable with respect to the said contact-member and locking-member, and constructed and arranged to move the latter laterally with respect to the said contact-member in one direction between its retired and advanced positions; and means controlled by the said cam-means of the operating-sleeve for moving the said locking-member laterally in the opposite direction with respect to the said contact-member.

4. A self-locking electrical connector, including in combination: an inner body-member; a linear contact-member carried by and projecting from the said body-member; an advanceable-and-retractable locking-finger located adjacent the projecting portion of the said contact-member laterally and movable laterally with respect thereto and constructed and arranged to engage with another electrical-member to releasably couple the connector thereto; a spring-member carried by the said contact-member and projecting from the said body-member to one side

of the said contact-member, the said spring-member in turn carrying the said locking-finger and pre-set to yieldingly urge the latter laterally away from the said contact-member; and a reciprocating operating-sleeve mounted upon and substantially completely laterally encircling the exterior of the said body-member and slidable with respect thereto in a direction substantially lengthwise of and also with respect to the said contact-member and spring-member, the said operating-sleeve having interior cam-means independent of and movable with respect to the said contact-member and spring-member and constructed and arranged to move the latter in the direction to move its said locking-finger laterally toward the said contact-member.

5. A self-locking electrical connector, including in combination: a body-member; a sheet-metal combined contact-and-locking blade carried by the said body-member and having its respective opposite edges bent to provide spaced-apart side-flanges, the said blade including a portion projecting from one end of the said body-member and a portion extending within the same, a resilient locking-arm attached to the portion of the blade within the said body-member and projecting from the said body-member and movable between the said side-flanges, the said locking-arm being provided adjacent its projecting outer end with a locking-finger constructed and arranged to engage with another electrical-member to releasably couple the connector thereto; and means carried by the said body-member for flexing the said resilient locking-arm to retire its said integral locking-finger between the said side-flanges.

LUCIEN THERIAULT.

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