

March 28, 1939.

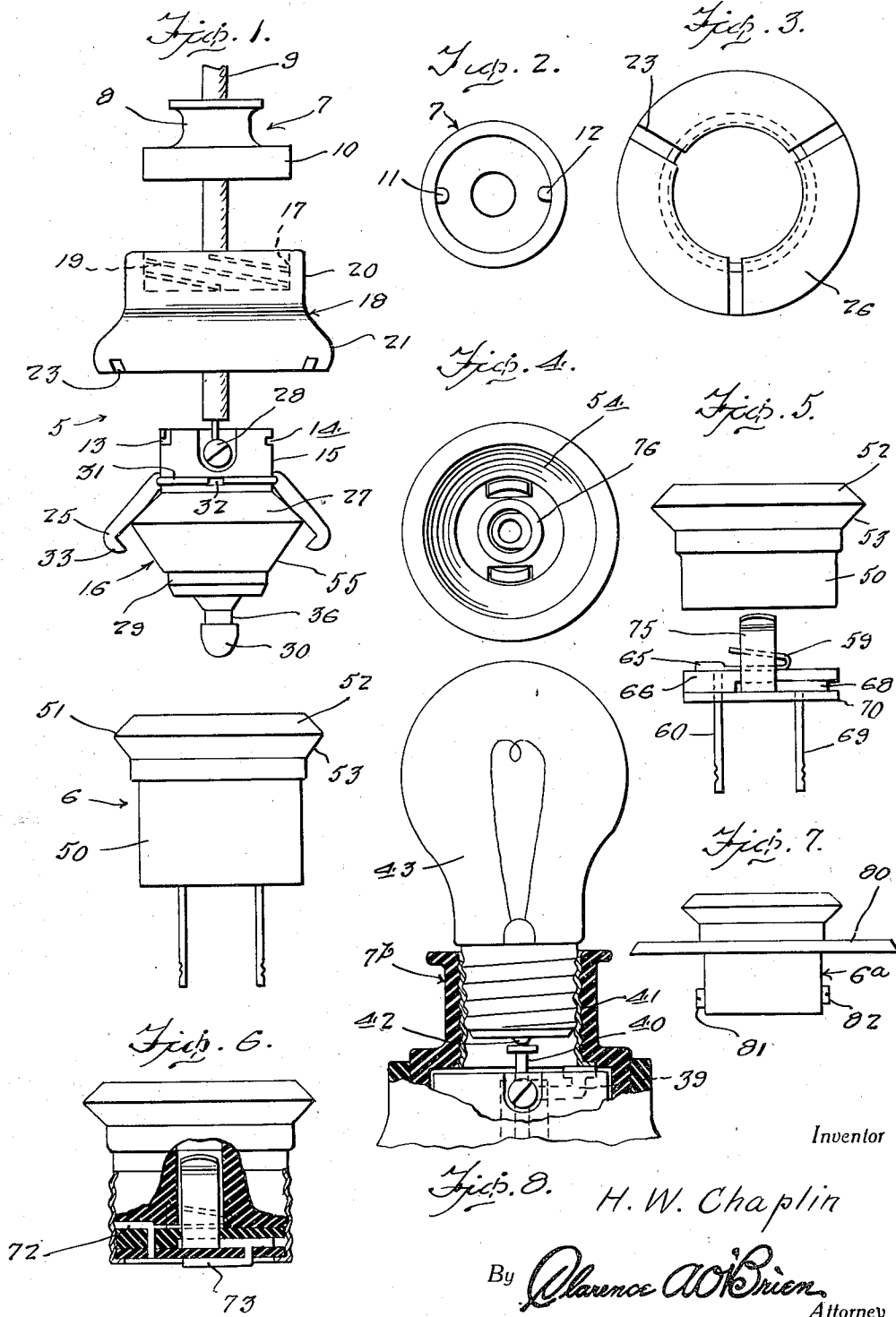
H. W. CHAPLIN

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ELECTRICAL CONNECTOR

Filed March 28, 1935

2 Sheets-Sheet 1



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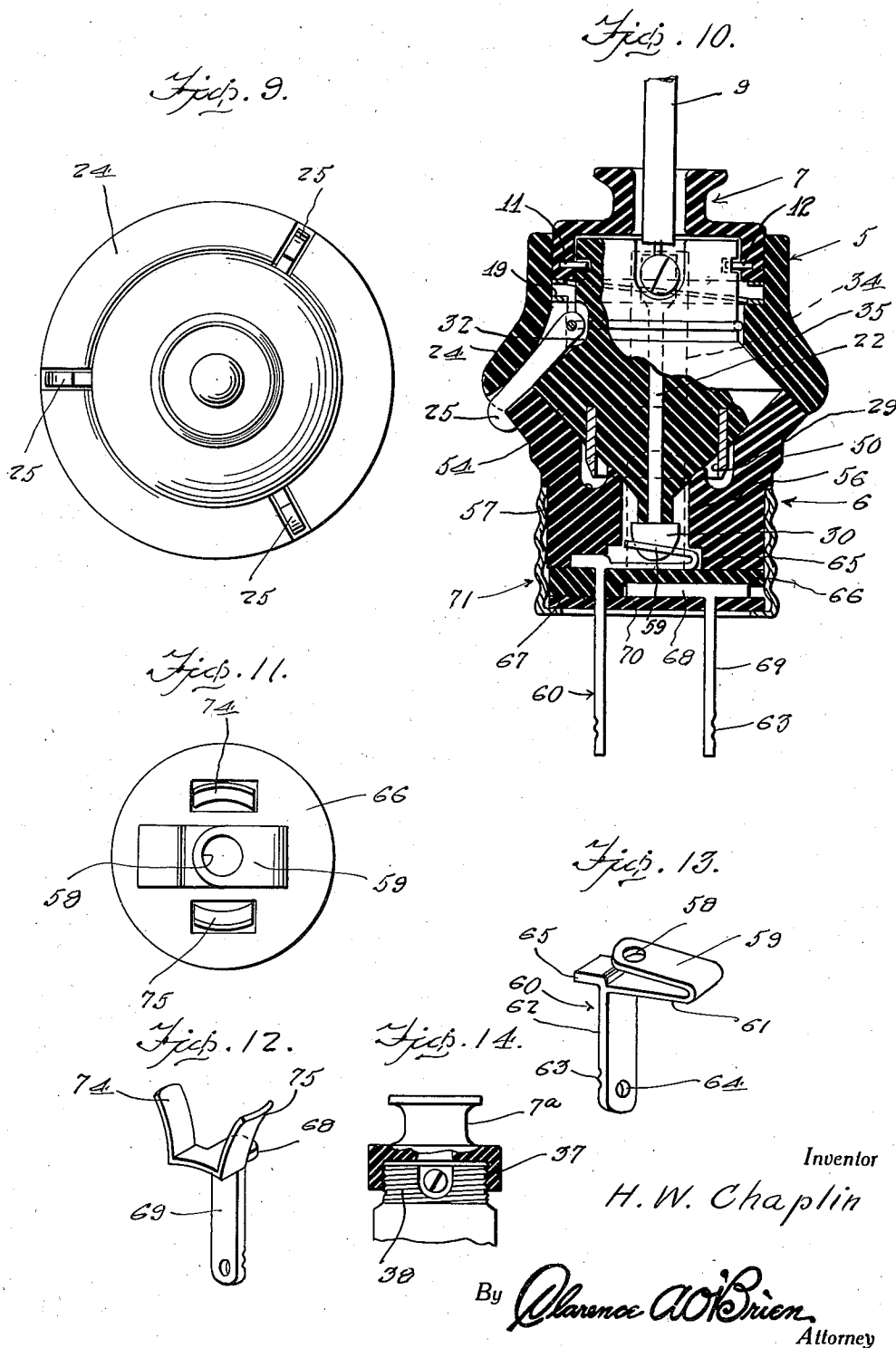
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## UNITED STATES PATENT OFFICE

2,151,897

## ELECTRICAL CONNECTOR

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11 Claims. (Cl. 173—343)

My invention relates generally to means for connecting electrical conductors, and particularly to a quick-separable connector especially adapted for use with, although not restricted to, domestic appliances and current outlets, and an important object of my invention is to provide a separable connector of the character indicated which is composed of a receptor element which may be in the form of such conventional arrangements as floor, wall, ceiling, or other outlets and receptacles, and a plug element which may be in the form of a terminal of a connector cord or in the form of a bulb socket and the like.

Another important object of my invention is to provide a connector of the character indicated which is composed of a plug element which may be entered and engaged with the receptor element without requiring initial centering and aligning of the plug element with the receptor element, but which is self-centering and self-aligning.

Another important object of my invention is to provide means in a connector of the character indicated for interengaging the plug element and the receptor element in such a way that the plug element and the receptor element are sufficiently strongly engaged to preserve perfect electrical contact therein in all ordinary circumstances, but which is arranged to instantaneously separate and break the electrical contact when an extraordinary pull or other lateral strain is exerted upon either element, so as to prevent breakage of either element or of the cord or appliance which may be mounted thereon.

Another important object of my invention is to provide in an organization of the type described above means for producing an early contact of the engageable electrical elements in the plug element and in the receptor element as the same are brought together to be connected.

Another important object of my invention is to provide in an organization of the character indicated above means for interengaging and holding the plug element and the receptor element, which means is positively guarded against being disengaged and disconnected by contact therewith of outside objects.

Another important object of my invention is to provide in an organization of the type described above interengaging and holding means for operatively connecting the plug element and the receptor element, which becomes more completely and strongly engaged so as to strengthen the connection of the said elements when a pull is exerted on the connector cord or on the appli-

ance attached to the plug element, but which instantly releases when the pull is exerted instead directly upon a portion of the plug element.

Another important object of my invention is to provide in an organization of the type recited above positive isolation of the various contacts so that said contacts cannot be bridged or inadvertently touched by any ordinary manipulation of either the plug element or the receptor element during the handling thereof whether connected or unconnected.

Other important objects of my invention will be apparent from a reading of the following description in connection with the drawings, wherein for purposes of illustration I have shown preferred embodiments of my invention.

In the drawings:

Figure 1 is an elevational view of an embodiment of the invention showing the main parts thereof in longitudinally extended unconnected relation.

Figure 2 is a bottom plan view of the cap.

Figure 3 is a bottom plan view of the collar shown below the cap in Figure 1.

Figure 4 is a top plan view of the receptor element.

Figure 5 is a side elevational view of the receptor element arranged with connector blades, the blade assembly being shown separated from the body of the plug receptor.

Figure 6 is a side elevational partly broken away view of another form of the receptor element showing the same provided with a bottom contact and a threaded shell for engagement in a threaded socket and devoid of contact blades.

Figure 7 is an end or edge elevational view of an adaptation of the receptor element in a wall or base receptacle.

Figure 8 is a transverse vertical sectional view through the upper part of an adaptation of the structure shown in Figure 1 wherein the cap is provided with a bulb socket instead of a connection for an appliance cord or the like.

Figure 9 is a bottom plan view of the plug element.

Figure 10 is a transverse vertical sectional view taken through the structure shown in Figure 1 assembled.

Figure 11 is a top plan view of the structure shown in the lower part of Figure 5.

Figure 12 is a perspective view of one of the contacts in the structure shown in the lower part of Figure 5.

Figure 13 is a perspective view of the remain-

ing contact of the structure shown in the lower part of Figure 5.

Figure 14 is an elevational sectional view showing a variation of the cap shown in Figure 1, the said variation being threadably connected instead of connected by a bayonet and slot arrangement as obtains in the embodiment shown in Figure 1.

Referring in detail to the drawings, the numeral 5 generally designates the plug element of the present embodiment of the invention, and the numeral 6 generally designates the receptor element thereof.

The plug element comprises the cap 7 which consists of the tubular neck 8 through which the conduit 9 carrying the conductors passes and the enlarged lower portion having the circular wall 10 which is provided at diametrically opposite points with bayonets 11 and 12 which are arranged to engage the bayonet slots 13 and 14 which are located in the upper cylindrical part 15 of the body 16 whereby the cap 7 and the body 16 are rigidly connected together in a readily separable manner.

The cap 7 seats down in a conforming circular recess 17 in the top of the collar which is generally designated 18 and upon the upper side of a helical spring 19 which, when the cap and the body 16 are connected operates to draw the body 16 into the collar 18 by its action upon the underside of the cap 7.

The collar 18 has the upper cylindrical part 20 from the lower end of which depends the outwardly flaring bell portion 21 and the downwardly and outwardly sloping undersurfaces 22 of the bell portion are provided at equally circumferentially spaced distances with slots 23 which are rounded so as to present a bearing point approximately indicated by the numeral 24 on a point of the top of the arms 25 which is located substantially inwardly of the radially outward ends of the arms for a purpose to be indicated below. The comparatively straight beveled portion of the underside of the bell which is generally designated by the numeral 26 is comparatively plain so as to rest conformably on and flush with the correspondingly beveled surface 27 on the body 16 above which rises the uniformly cylindrical portion 15 already alluded to. Binding posts 28 located in recesses in the portion 15 at diametrically opposite points connect the conductors in the conduit 9 to the contact ring 29 and the contact head 30 of the body 16.

An expansible and contractible broken ring 31 is mounted in a receiving groove 32 in the lower part of the cylindrical portion 15 and forms the pivot for the three equally circumferentially spaced arms 25, suitable recesses 32 being formed adjacent the radially inward end of these arms to permit the same to work freely and comparatively loosely on the ring 31. The collar prevents contact by outside objects with the arms.

Each arm comprises an elongated portion which extends laterally outwardly of and below the lower end of the beveled surface 27 as clearly shown in Figures 1 and 10 and at the lower end thereof the arm has a right angularly arranged hook 33 which is to engage a portion of the receptor element to be described. The numeral 34, in Figure 10, designates a connector strip extending from the contact ring 29 to the appropriate binding post 28, while a conductive rod 35 extends from the contact head 30 to the remaining binding post 28.

The contact ring 29 is set into a receiving

groove in the lower end of the body 16 and within this ring the body 16 has a depending reduced portion 36 to the lower end of which is abutted the contact head 30.

The plug element of the present embodiment is assembled by bringing the body 16 up into the collar 18 and then bringing the cap 7 into the upper part of the collar and then engaging the bayonets of the cap with the bayonet slots of the body 16, the arms 25 having been in the process located in the radial slots 23, so that the surface 26 of the bell portion of the cap rests on the correspondingly beveled surface 27 of the body 16 and the indicated point in the bottom of the slots 23 rests on a radially inward point of the corresponding arms 25.

In the cap arrangement shown in Figure 14 the cap is provided with interior screw-threads 37 instead of the bayonets and the upper part of the cylindrical portion 15 of the body 16 is exteriorly threaded as indicated at 38 instead of being provided with bayonet slots. Otherwise the construction is identical to that described in connection with Figure 1.

With respect to the cap arrangement shown in Figure 8, the binding posts 28 are provided with suitable extensions 39 and 40, the first connecting with the threaded ferrule 41 and the second to be engaged by the center contact 42 of the bulb 43 or the like which is seated in the upper end of the cap 7b which is suitably enlarged for the purpose, but is otherwise unchanged from the forms of the cap illustrated in Figures 1 and 14. It is obvious that some other electrical element other than the bulb 43 may be engaged with the socket provided by the cap 7b and that a bladed connection might be provided for in such a cap instead of the socket device.

The receptor element which is generally designated 6 comprises the socket element 50 which is provided on its upper end with a double beveled shoulder 51 presenting the upper angulated surface 52 and the lower angulated surface 53, the angulation of the lower surface 53 corresponding with the angulation of the hooks 33 on the arms 25, and the angulation of the upper surface 52 corresponding to the angulation of the plain surface 22 on the underside of the bell of the collar 18.

The interior of the body 50 is conically hollowed out as indicated at 54 so that the walls thereof correspond in angulation to the large lower beveled surface 55 of the body 16. Centrally the body 50 is provided with a bore 56 which extends through the lower end thereof as indicated in Figure 10 to provide proper positioning of the contact head 30. A circular groove 57 at the bottom of the angulated wall 54 in the interior of the body 50 surrounds the bore 56 and provides free positioning of the lower end of the contact ring 29 when the plug element and the receptor element are engaged as they are shown in Figure 10.

The contact head 30, in the position of the element shown in Figure 10, seats in an opening 58 in an upwardly angulated bar 59 of the contact which is generally designated 60, the angulated arm being return bent from the outward end of a horizontal arm 61 which is on the upper end of the standard 62 which acts also as a connector blade and has one side crimped as indicated at 63 for superior engagement with the contact element on the base plug or other outlet to which the same may be connected. The usual connector hole 64 is provided in the lower end

of the standard 62. On the side of the standard 62 opposite the arm 61 is the slightly elevated lateral plate 65. The position of the contact 60 is in suitable receiving opening 65 in the lower end of the body 50 as clearly illustrated in Figure 10. A suitable dielectric washer 66 is placed over the standard 62 to engage the lower end of the body 50, one side of this washer being thickened as indicated at 67 to compensate for the plate portion 68 of the contact 69. A second dielectric washer 70 is engaged with the lower side of the plate portion 68 of the contact 69 and against the lower side of the washer 66, and these arrangements are connected to the body in their proper places by a suitably crimped ferrule 71 which the bladed connector arrangement shown in Figure 10 has plain, but which in the arrangement shown in Figure 6 is threaded. It is to be noted that the arrangement shown in Figure 6 has the same type of contacts as are shown in Figures 12 and 13, but the standard portions of these contacts are brought in the one case to connect with the threaded ferrule as indicated by the numeral 72 and in the other case to provide the center bottom contact 73.

The contact 69 includes the plate portion 68 from one end of which rises the laterally divergent curved contact arms 74 and 75 which are located at diametrically opposite points in the groove 37 and rise therein. However, the upper ends of the arms 74 and 75 are below the upper end of the cup 76 which is defined by the inner side of the groove 57 so as to prevent contact in ordinary circumstances with the contact arms 74 and 75 should a finger be inserted by accident in the receptor element.

It is to be observed that the contact head 30 in engaging the contact part 59 may by being pressed sufficiently downwardly engage also the horizontal part 61 whereby a double contact is achieved. However, should the engagement be only with the element 59 sufficient electrical contact will be made.

In Figure 7 is shown a wall plate or the like mounting 80 in which a receptor arrangement generally designated 6a is mounted with wire connections 81 and 82 behind the plate 80, the purpose of this figure being to illustrate in general terms the application of the invention to different types of mountings and for different purposes.

To illustrate the action of the embodiment it may be supposed that a pull is exerted upon the conduit 9 in Figure 10. Such a pull will increase the grip of the hooks 33 of the arms 25 on the shoulder 51 of the receptor element so as to increase the engagement of the elements until a certain degree of pull is reached which is just short of sufficient pull to break either the conduit or one of the elements, when the hooks will be caused to climb over the shoulder 51 and disengage the elements.

No such great pull is received to separate the plug element and receptor element under ordinary circumstances. Simply pulling on the collar 18 will result in compression of the spring 19 with the effect of loosening the bearing of the portion 24 of the bell of the collar on the arms 25, so that the spring ring 31 may contract to its initial and original position and cause a certain upward movement of the arms which will practically completely release the hook portions thereof from the shoulder 51, thereby resulting in instantaneous disengagement of the plug element and receptor element. As the plug element

and receptor element are brought together to be interengaged and connected, as when connecting up an electrical appliance, and the rounded noses of the hooks 33 are engaged with the upper beveled surface 52 on the shoulder 51, the arms are caused to move radially outwardly in bearing against the point 24 on the bell and at the same time to spread the ring 31 so as to put a tension on the arms. For a certain period before the hooks slide over and engage around the shoulder 51, the spring 19 causes the body 16 to move ahead of the collar 18 so that the contact head 30 is made to engage with the contact 50 prior to that instant at which the plain under surface 22 of the collar engages with the surface 27 of the body 16 and the surface 52 on the receptor, thereby achieving an early contact. This early contact also applies to the engagement of the contact ring 29 with the contact parts 74 and 75; and these early contacts are maintained and held by the immediately following hooking engagement of the arms with the shoulder 51 wherein the plug element and receptor element are locked together and releasable only on the conditions explained above.

Although I have shown and described herein preferred embodiments of my invention, it is to be definitely understood that I do not desire to limit the application of the invention thereto, and any change or changes may be made in the materials, and in the structure and arrangement of the parts, within the spirit of the invention and the scope of the subjoined claims.

What is claimed is:

1. A plug connector comprising a plug portion and a receptacle portion, a spring ring encircling a part of said plug portion, arms pivoted on said ring and extending in laterally outward directions from said plug portion, a lateral annular flange on said receptacle portion, terminals on the laterally outward ends of said arms, said terminals being laterally inwardly directed, spring means on said plug portion operatively engaging said arms and yieldably urging said terminals into holding relation behind said lateral annular flange for maintaining said plug portion and said receptacle portion in assembled relation, said plug portion and receptacle portion being adapted to be separated only by the exertion of sufficient force in opposite directions to overcome the action of said spring means and the frictional engagement of said terminals with the surface of said lateral annular flange.

2. In a plug connector comprising a male member and a female member, a sleeve on and movable along said male member, latches pivoted at their radially inward ends on the male member and extending laterally therefrom, said latches operatively engaged by said sleeve, said latches having lateral terminals on their free ends, an annular part formed on said female member behind which terminals engage to hold the male and female members in assembled relation, spring means on said male member urging said sleeve in latch operating direction, said sleeve being manually movable along said male member in an opposite direction to compress said spring means and enable said latches to be moved in a laterally outward direction by said shoulder so as to free said terminals from a position behind said shoulder on the female member, by pulling said male and female members in opposite directions with sufficient force.

3. In a plug connector comprising a male member and a female member, a sleeve on and

movable along said male member, latches pivoted at their radially inward ends on the male member and extending laterally therefrom, said latches having laterally directed terminals, an annular portion formed on said female member behind which said terminals engage to hold the male and female members in assembled relation, said sleeve being operatively engaged with said latches to hold said terminals behind said annular portion of the female member, spring means on said male member urging said sleeve in latch operating direction, said annular portion of the female member being beveled to cam said terminals in a laterally outward direction from behind said annular portion when the male and female members are strongly pulled in opposite directions, said female member comprising a receptacle adapted for wall and ceiling mounting.

4. In a plug connector comprising a male member and a female member, a sleeve on and movable along said male member, latches pivoted on the male member and extending laterally therefrom, said latches having laterally directed terminals on their laterally outward ends, an annular portion formed on said female member behind which said terminals engage to hold said male and female members in assembled relation, said sleeve being operatively engaged with said latches to hold said terminals behind said annular portion, spring means on said male member urging said sleeve in latch operating direction, said annular portion being beveled to cam the terminals in a laterally outward direction to disengage them from behind said annular portion when the male and female members are strongly pulled in opposite directions, said female member including a threaded ferrule for engaging a threaded receptacle.

5. In a plug connector comprising a male member and a female member, a sleeve on and movable along said male member, latches pivoted at their inner ends on the male member and extending laterally therefrom, said latches having laterally directed terminals on their free ends, an annular shoulder formed on said female member behind which said terminals engage to hold said male and female members in assembled relation, said sleeve being operatively engaged with said latches to hold said terminals and said latches behind said annular shoulder on said female member, spring means on said male member urging said sleeve in latch operating direction, said shoulder on the female member being formed with a beveled surface to cam said terminals in a laterally outward direction and from behind said shoulder, when the male and female members are pulled with sufficient force in opposite directions to overcome the resistance of said spring means and the frictional engagement of said terminals on said beveled surface, said female member including prongs for engaging a correspondingly slotted receptacle.

6. In a plug connector comprising a male member and a female member, a sleeve on and movable along said male member, latches pivoted at their inner ends on the male member and having laterally directed terminals at their free ends, an annular part formed on said female member behind which said terminals engage to hold the male and female members in assembled relation, said sleeve being operatively engaged with said latches to hold said terminals in engagement with said annular part of said female member, spring means on said male member urging said sleeve in latch operating direction, said annular part of the

female member being beveled on the side thereof remote from said sleeve to cam said terminals in a laterally outward direction to disengage said terminals from said annular part, when the male and female members are strongly pulled in opposite directions, said male member having a separable cap, threaded thereon, and retaining said spring means in place.

7. In a plug connector comprising a male member and a female member, a sleeve on and movable along said male member, latches pivoted at their inner ends on the male member and extending laterally therefrom, said latches having laterally directed terminals on their free ends, an annular shoulder means formed on said female member, and behind which said terminals engage to hold the male and female members in assembled relation, said sleeve being operatively engaged with said latches to hold said terminals in engagement behind said shoulder means, spring means on said male member urging said sleeve in latch operating direction, said shoulder means of the female member being formed with a beveled surface adapted to cam the terminals in a laterally outward direction to disengage said terminals from said shoulder means when the male and female members are sufficiently strongly pulled in opposite directions to overcome the resistance of said spring means and the frictional engagement of said terminals with said beveled surface, said male member including a separable cap, bayonet and slot means separably connecting said cap to said male member, said cap acting to hold said spring means in place.

8. In a plug connector comprising a male member and a female member, a sleeve on and movable along said male member, latches pivoted at their inner ends on the male member and extending laterally outwardly therefrom, said latches having laterally directed terminals at their free ends, an annular part formed on said female member behind which said terminals engage to hold the male and female members in assembled relation, said sleeve being operatively engaged with said latches to hold said terminals behind said annular part of said female member, spring means on said male member urging said sleeve in latch operating direction, said annular part of the female member having a beveled surface adapted to cam said terminals in a laterally outward direction so as to disengage the terminals from said annular part when the male and female members are strongly pulled in opposite directions, said male member including a separable cap acting to hold said spring means in place, said cap embodying a bulb or connector receiving portion.

9. In a plug connector comprising a male member and a female member, a sleeve on and movable along said male member, latches pivoted on the male member and extending laterally outwardly therefrom, said latches being formed with laterally directed terminals on their laterally outward ends, an annular shoulder means formed on said female member behind which said terminals engage to hold the male and female members in assembled relation, said sleeve being operatively engaged with said latches to hold said terminals behind said shoulder means, spring means on said male member urging said sleeve in latch operating direction, said shoulder means of the female member being formed with a beveled surface with which said terminals engage, said beveled surface acting to cam said latches in a radially outward direction so as to disengage the terminals from said shoulder means when the

male and female members are sufficiently strongly pulled in opposite directions to overcome the resistance of said spring means and the frictional engagement of said terminals with said beveled surface, said sleeve having a flange overlying and protecting the laterally inward portions of said latches.

10 In a plug connector comprising a male member and a female member, a sleeve on and  
movable along said male member, latches pivoted at their inner ends on said male member and extending laterally outwardly therefrom, said latches having laterally directed terminals at their free ends, an annular shoulder means  
15 formed on said female member behind which said terminals engage to hold the male and female members in assembled relation, said sleeve being operatively engaged with said latches to hold said terminals behind said shoulder means, spring means on said male member urging said sleeve  
20 in latch operating direction, said shoulder means of the female member being formed with a beveled surface with which said terminals engage, said beveled surface acting to cam said latches  
25 in a laterally outward direction so as to disengage the same from said shoulder means when the male and female members are sufficiently strongly pulled in opposite directions to over-

come the resistance of said spring means and the frictional engagement of said terminals with said beveled surface, said male member having a conical part and said female member having a conical recess enabling assembling said members without initially centering and aligning the same.

11. A plug connector comprising a plug portion and a receptacle portion, arms freely pivoted at their inner ends on the exterior of said plug portion and extending laterally outwardly therefrom, said arms having laterally directed hooks on their free ends, an annular part formed on said receptacle portion and extending laterally therefrom and having oppositely beveled top and bottom surfaces, a collar along said plug portion and engageable with said arms, spring means urging said collar in a direction to normally maintain said arms engaged with said top beveled surface with the hooks engaged behind the bottom beveled surface, said plug portion and said receptacle portion being adapted to be separated by the exertion of sufficient force thereon in opposite axial directions so as to overcome the frictional engagement between the hooks and the said bottom beveled surface of said annular part.

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