

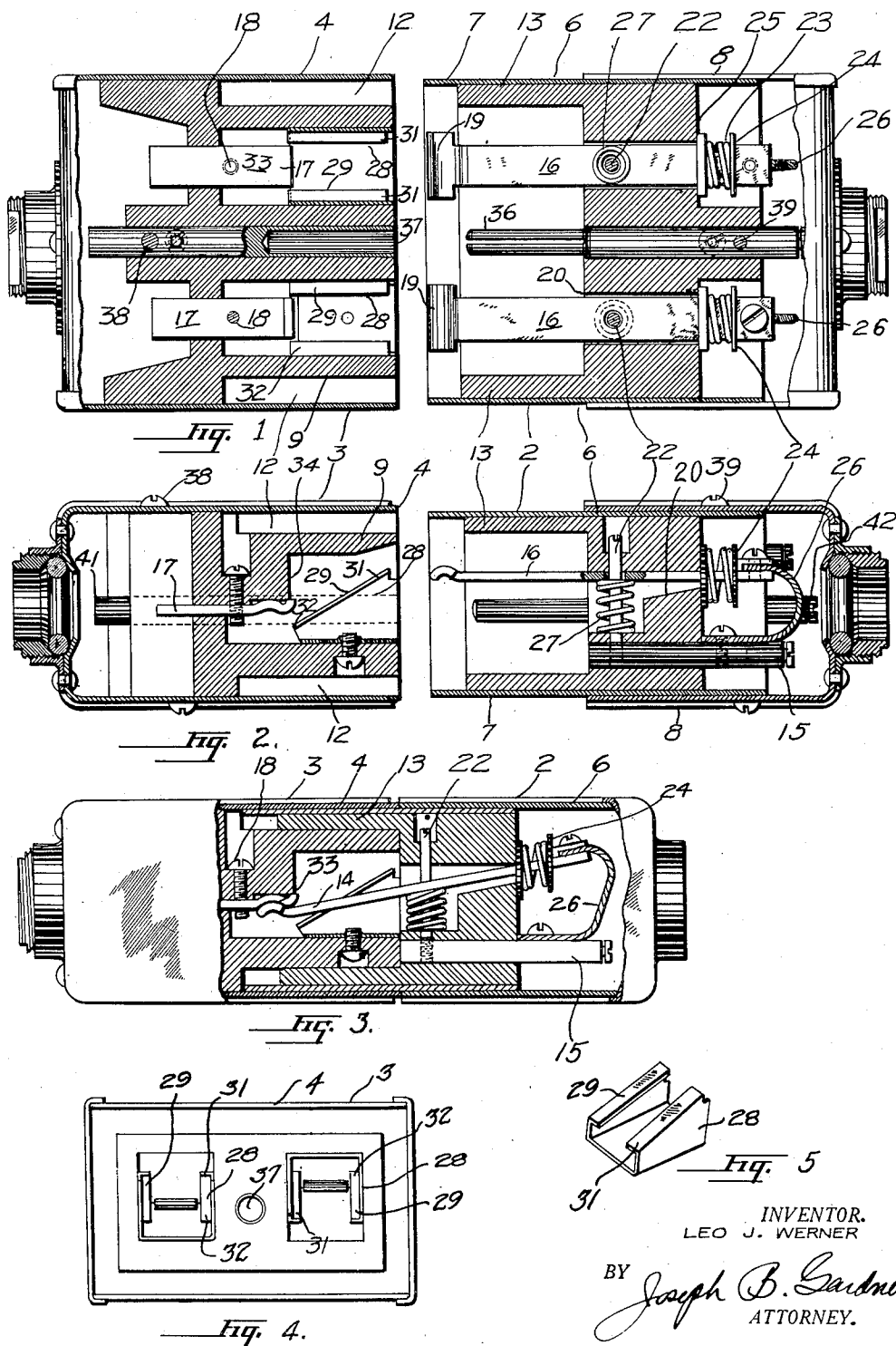
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ELECTRICAL CONNECTER

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ELECTRICAL CONNECTER

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The invention relates to improvements in connections for electric circuit extensions or what is generally known as attachment plugs, and relates more particularly in the present embodiment of the invention to a heavy duty connector designed for use in making portable extensions of the higher voltage or power circuits.

An object of the invention is to provide a connector of the character described by which, in a particularly efficient manner, the making of electrical contact may be effected not only with greater speed than the movement of pushing the connector sections into operative position, but at a speed which is predetermined and not subject to variations by the operator in effecting the connection of said sections.

Another object of the invention is to provide a connector of the character described in which the immediate making of the electrical connection and the quick movement of the contacts while spaced and in arcing distance of each other during the making and breaking operations are effected automatically and out of control of the operator.

A further object of the invention is to provide a connector of the character wherein the aforesaid automatic movements of the contacts into and out of engagement during the making and breaking of electrical connection constitute a complete cycle of operations which cannot be reversed by the operator, and in this way making it impossible for the latter to effect a reestablishment of the electrical contact once the same is broken or to break the contact once it is made, without strictly following the operations of the cycle.

Another object of the invention is to provide a connector in which the quick make aforesaid will be effected with all portions of the cooperating engaging surfaces of the contact elements simultaneously brought into substantially full and complete contactual engagement on the initial engagement of the elements.

An additional object of the invention is to provide a connector of the character described by which the breaking as well as the making of electrical contact may be effected with such speed and in such manner that arcing will be practically eliminated.

A still further object of the invention is to provide a connector in which a contact means for making and maintaining an electrical connection before and after other electrical connections are made through the plug, will in addition pre-

vide a guiding means for insuring the engagement of the proper contacts.

A further object of the invention is to provide a connector wherein the connection and disconnection of the electric contact members may be effected in a substantially gas proof receptacle and with portions of the electric circuit having a difference of potential substantially sealed from each other.

Yet another object of the invention is to provide a connector with the aforementioned features, which is extremely compact and of simple design, is safe and positive in operation, and may be manufactured at low cost.

The invention possesses other objects and features of advantage, some of which, with the foregoing, will be set forth in the following description of the preferred form of the invention which is illustrated in the drawing accompanying and forming part of the specification. It is to be understood, however, that variations in the showing made by the said drawing and description may be adopted within the scope of the invention as set forth in the claims.

Referring to said drawing:

Figure 1 is a longitudinal sectional view of the connector with the connecting members in detached relation.

Figure 2 is a longitudinal sectional view of the connector with the members positioned as in Figure 1, but taken in a plane at right angles.

Figure 3 is a view similar to Figure 2, but showing the connector members in operative relation.

Figure 4 is an end view of the socket member of the connector, viewing the same from the receiving or open end.

Figure 5 is a perspective view of a part used on one of the members for deflecting one of the contacts of the other member.

As illustrated in the drawing the connector of my invention comprises a plug member 2 and a socket member 3 which are arranged for detachable connection for establishing electrical contact between suitable conductors. Each of the members is formed of a body of insulating material, which in the instance of member 3 is enclosed within a metal shell 4 whereas in the case of member 2 is incased in a shell 6 which as here shown includes sections 7 and 8, the former of which is arranged to telescope with and fit within the shell 4 when the members are engaged. Preferably a portion 9 of the body of member 3 is spaced from the shell 4 so as to provide a peripheral chamber 12 in which the section 7 and a portion 13 of the body of member 2 is arranged

to slidably fit whereby an effective and practically air tight and gas proof connection between the members will be had while the members are moved into or out of engagement or disposed in operative position.

In the form of the invention illustrated, the connector is adapted for effecting a multi-wire electrical connection, and is therefore provided with a plurality of sets 14 of contact elements 16 and 17. The elements 17 are carried within recesses 5 provided by the member 3 and are preferably held in fixed position as by means of screws 18, while the elements 16 are mounted within a recess 10 provided by the member 2 and mounted for movement relative thereto. As clearly shown in Figures 2 and 3, each of the elements 16 is formed with an engaging head 19 and is pivoted or otherwise mounted for movement in the member whereby the head may be displaced transversely thereof. Substantial pivotal connection of the element 16 is here shown effected by positioning the same for free movement in a tapering opening 20 of the body and retaining the element therein by engagement thereof with a pin 22. A spring 23 interposed between an end wall 25 of the body and a stop 24 anchored to the element, serves to hold the element steady. Connection between each contact 16 and its associated terminal post 15 provided in a suitable terminal recess 15' is through means of a flexible conductor 26. A sealing washer 21 preferably surrounds each element and is pressed into sealing engagement with the end wall 25 by the spring 23 thereby preventing communication of the opening 20 with the terminal recess 15'. The element is also engaged by a spring 27 which as here shown encircles the pin 22 and serves to yieldingly retain the element in an inoperative normal position.

It will be understood that engagement of the cooperating elements is arranged to be effected when the members are drawn together, and means is provided for causing the element 16 to be successively displaced and released during the engaging operation of the members whereby the head 19 when approaching within arcing distance of element 17 will be moved into contact with such element 17 not only at a much faster rate than and entirely independent of the rate of the movement of the members together but in a manner entirely automatic and beyond the control of the operator. In the present embodiment of the invention said means is in the form of a deflecting plate 28 fixed to the member 3 in insulated relation to the contacts 17 and the shell 4 and having a deflecting portion 29 which is positioned so as to lie in the path of head 19 when the member 2 is moved into operative engagement with member 3. As will be clear from Figure 2, when the section 7 and portion 13 of member 2 are inserted into the chamber 12 of member 3, the head 19 will about the same time engage the rear end 31 of the deflecting portion 29. As the members are then moved together, the element 16 is displaced transversely against the resistance of spring 27 until the section 7 and portion 13 nearly reach the limit of their inward movement, at which time the head 19 reaches the far end 32 of the portion 29 whereby on the final closing movement of the members the head will under the force of spring 27 snap into full engagement with element 17, it being noted that the latter is so positioned transversely of the members as to lie intermediate the points assumed by the head in the normal and in the most displaced positions. It

will thus be evident that when the head is moved past the deflector and into engagement with the contact 17, it will firmly and resiliently press against the contact and insure an efficient electrical connection. It will be noted that since contact between the elements is effected by moving the cooperating engaging surfaces of the elements together while such surfaces are in substantially direct opposed relation, a practically full contact over the entire inter-engaging area of the elements is obtained at the initial instant of contact. Preferably the side of the head 19 arranged to engage the contact 17 is formed convex, and the coacting face of the latter is formed with a corresponding concavity 33 which provides a ready seat for the head when the contacts are in engagement. As will be clear from Figures 1 and 5, the head 19 is extended transversely and it is this extension thereof which engages the deflector 29 whereby the contiguous portion of the element 16 is free to move opposite the deflector when the head 19 passes to the rear of the latter. In the present embodiment the head is extended transversely on both sides thereof and each deflector plate is provided correspondingly with two of the deflector portions 29. It should now be clear that since the action of contact 16 is entirely automatic once it leaves the deflector for contact 17, the operator cannot retract contact 16 and thus endanger the parts while the contacts are within arcing distance. This feature forms an important part of my invention and adds much to the safety and efficiency of operation of the connector.

Disconnection of the members is arranged to be effected in a manner insuring a quick break of the electrical connection and without the undesirable arcing. As before noted, the contact 17 is positioned to lie at a point between the limits of the transverse positioning of the head while in the member 3. In this manner while the elements are in contact, the elements 16 will under the urge of spring 27, seek to assume its fully retracted or normal position. To this end, the body of the member 3 is cut away adjacent the forward extremity of contact 17 so that when the members are drawn apart, the head 19 will forcibly and abruptly leave contact 17 and thereby permit contact 16 to return to normal position as soon as engagement between the contacts is ended. To facilitate the quick separation of the contacts, the forward end of contact 17 is curved or otherwise sloped so that the pressure of the head thereagainst assists in forcing the members apart. After the contacts are thus separated and the member 2 retracted, the head may readily ride over the rear side of the deflector and the complete detachment of the members effected. It is to be noted that since the making and breaking of the contact between elements 16 and 17 always takes place while the section 7 and body portion 13 are sealed in the chamber 12, any possible arcing produced during said action will be completely confined to the interior of the connector.

One of the main features of my invention is that reestablishment of contact between the elements when once the contact is broken, cannot be accomplished until substantially complete detachment of the members shall have been first effected and the connector sections thereafter again brought into full engagement to permit the contact 16 to traverse the deflector in the manner before described. In other words once the the electrical connection is broken, reestablish-

ment may be effected only after the full cycle of operations of disconnecting and reconnecting the sections is completed. In this manner, there is no possibility of arcing due to "inching" on the part of the operator—that is the act of breaking connection and then while the contacts are still in arcing distance, making contact between the line and load sides. An important part of my invention is the simple and efficient manner in which such feature is afforded. It will be seen, as aforesaid, that as soon the members are drawn apart sufficient to permit disengagement of the contacts, the contact 16 will immediately return to its normal inoperative position with the head 19 back of the deflector 29, and it will thus be evident that with the head 19 thus disposed, any attempt to move the member 2 inward to effect reengagement of the elements will merely result in bringing the head 19 against the solid wall 34 of the insulated body. Contact therefore, between the elements, can only be effected when the head 19 is first caused to ride over the forward face of the deflector as hereinbefore explained.

In the form of the invention illustrated, the connector is adapted for electric circuits entailing a ground connection. Accordingly the members 2 and 3 are provided with coating contact elements 36 and 37, the former of which is the form of a split pole whereas the latter comprises a socket member arranged for the reception of the pole. Preferably the socket member 37 is housed in a centrally disposed portion 35 of the member 3, while the pole 36 is extended centrally from the member 2 and into the recess 10. With the contact elements 36 and 37 operatively engaged and with the members 2 and 3 pressed to a closed position, the end 40 of the portion 35 engages the surface 45 of the member 2 to effect a substantial separation of the recesses 5. With the members 2 and 3 operatively engaged it will thus be clear that the contacts 16 and 17 which have impressed thereon a difference of potential will be substantially sealed from each other. Suitable grounding connection of the contacts 36 and 37 with the respective shells 4 and 6 is afforded through means of screws 38 and 39 which also serve to secure the shell portions to the insulated bodies of the members, while connection with ground line may be had at the terminals 41 and 42 of the contacts. The contact elements 36 and 37 are so positioned that operative engagement thereof will take place before corresponding engagement is had between the elements 16 and 17, and furthermore contact between elements 36 and 37 will be retained after engagement between elements 16 and 17 has ceased. In this manner, and since the pole is arranged to fit firmly in the socket member when engaged therein, the elements 36 and 37 will supplement the telescoping shell and body portions in guiding the members into and out of operative relation. Furthermore the elements 36 and 37 are positioned out of center of the members so that it will be impossible to place the members in engagement to bring in contact the unassociated pairs of the contacts 16 and 17.

Preferably each set of contact elements 16 and 17 is reversely disposed in the members with respect to the positioning of the other set of such elements. In this way the parts may be more compactly arranged in the members and the connector thereby reduced in size.

It will now be seen that the connector hereinbefore described, and as illustrated in the ac-

companying drawing, will provide for the advantages and objects hereinbefore noted in a particularly efficacious manner.

I claim:

1. In an electrical connector, separable connector members movable into and out of engagement with each other, a contact element in one member, a contact element pivotally connected to the other member, a spring urging said second element to a normal position, an obliquely disposed deflector plate on said first element to engage and deflect the second element to a position transversely opposed to the first element when the members are moved into engagement, said plate being of a length as to disengage said second element upon substantially complete engagement of the members whereby said second element under the action of said spring may move into engagement with said first element.

2. In an electric connector, a connector member having a recess opening to an end thereof, a contact element mounted in said recess, a second connector member, a second contact element resiliently mounted on said second member and movable into and out of said recess and engagement with said first element, a deflecting member in said recess and disposed to engage and deflect said second element upon movement thereof into said recess, said deflecting member being of a formation as to position said second element upon movement thereof into said recess into laterally opposed relation to said first element and thereupon disengage said second element.

3. An electric connector comprising a pair of releasably attached casings, one of said casings having a recess opening to an end thereof, a contact element mounted in said recess, said recess being formed with an offset portion adjacent said element and opening to said end, a contact element on the other of said casings and movable therewith into and from said recess for engagement with and disengagement from said first element, and means urging said second named contact element in the direction of said offset portion whereby on withdrawal thereof from engagement with said first element said second element will be moved into said offset portion under the action of said means.

4. An electric connector comprising a pair of telescopically attached casings, one of said casings having a recess opening to an end thereof, a contact element mounted in said recess, said recess being formed with a substantially right angularly offset portion adjacent said element and opening to said end, a spring pressed contact element on the other of said casings and movable therewith into said recess for engagement with said first element, and urged in the direction of said offset portion whereby on withdrawal thereof from engagement with said first element the same will be moved into said offset portion under the action of said spring.

5. An electric connector comprising a pair of connector members, a contact element on one of said members, said last named member being provided with a laterally offset portion adjacent an end of said element, a second contact member mounted on the other member and movable therewith into engagement with said first element, means urging said last element in the direction of said offset portion whereby upon withdrawal thereof from engagement with said end of said first element the same will be moved into said offset portion under the urge of said means.

6. An electric connector comprising a pair of connector members, a contact element on one of said members, said last named member being formed with a laterally offset portion adjacent said element, a second contact element mounted on the other member and movable therewith into engagement with said first element, means urging said last element in the direction of said offset portion whereby on withdrawal thereof from engagement with said first element the same will be moved into said offset portion under the urge of said means, a deflecting guide on said first member extending from within said offset portion into laterally opposed relation to said first element and arranged to engage and deflect said second element against the resistance of said means upon movement of the element thereover to engagement with said first element and arranged to disengage said second element upon movement thereof into said laterally opposed relation with said first element to thereby permit movement of said second element to engage said first element under the urge of said means.

7. An electric connector comprising a pair of attachable connector members, one of said members having a pair of recesses opening to an end thereof and an end wall intermediate and surrounding said recesses, contact elements in said recesses, a pair of contact elements carried by the other of said members and advanceable into said recesses for engagement with said first contact elements, and an end wall on said last named casing intermediate and surrounding said second named contact elements and disposed upon movement of said members to attached position to engage said first named end wall and form therewith a seal between said recesses.

8. An electric connector comprising a pair of telescopically engaged casings movable from a detached to a closed position with one casing within the other and formed to provide a substantially gas tight seal between said casings, one of said casings having a pair of recesses opening to an end thereof and an end wall intermediate and separating said recesses, contact elements in said recesses, a pair of contact elements carried by the other of said casings and advanceable into said recesses for engagement with said first contact elements, and an end wall on said last named casing intermediate and separating said second named contact elements and disposed upon movement of said casings to closed position to engage said first named end wall and form therewith a seal between said recesses.

9. An electric connector comprising a pair of connector members, a contact element on one of said members, the other member having an opening therethrough, a second contact element mounted in said opening and disposed for engagement with said first element, means for retaining said second element against longitudinal displacement in said opening and providing for transverse movement of said second element, said second element extending through said opening and from a wall of said last named member, and means for pivotally mounting said second element comprising a washer surrounding said second element and abutting said wall, and a spring carried by said second element and urging said washer against said wall.

10. An electric connector comprising a pair of telescopically engaged casings movable from a detached to a closed position with one casing disposed within the other, one of said casings having a pair of recesses opening to an end

thereof and an end wall intermediate and separating said recesses, contact members in said recesses, the other casing having a pair of tapered openings therethrough divergently opening to a forward wall thereof and convergently opening to a rear wall thereof and disposed with said casings in closed position to register with said recesses, said forward wall being disposed with said casings in closed position to engage said end wall and form therewith a seal between said recesses and openings, a pin transversely mounted within and across each opening, elongated contact members disposed through said openings and slidably mounted on said pins, helical springs surrounding said pins and engaging said contact members, a sealing ring on each of said last named contact members abutting said rear wall, and a spring carried by each of said last named contact members urging said ring into sealing engagement with said rear wall.

11. An electric connector comprising, a pair of engageable body members slidably movable relative to each other from detached to fully attached position, a contact element on one of said members, a guide on said last named member and extending obliquely to the axis of movement of said members with an end thereof disposed in spaced laterally opposed relation to said element, a contact element on the other body member, spring means urging said last named element to position engaging said guide and in the lateral direction of said first element on engagement of said members whereby on movement of said body members towards attached position said second element will be displaced laterally against the action of said means, said second element having a widened head portion, and said guide being arranged to engage exclusively the side edges of said head portion whereby on movement of said portion from said guide end on movement of said members to fully attached position said second element will be completely disengaged from said guide and free to move to engage said first element under the urge of said means.

12. An electrical connector comprising a body member having a recess opening to an end thereof with a side of the recess provided with an offset portion extending to said end, a contact element positioned in said recess inwardly of and with an end thereof substantially contiguous with the inner wall of said offset portion, a guide member extending inwardly and obliquely through said recess from said offset portion and adjacent said body end into spaced laterally opposed relation to said element, a second body member slidably engaging said first body member and movable thereon from a detached to a fully attached position, a contact element carried by said second member, spring means urging said last named element to position in the plane of said offset portion for engagement with said guide on engagement of said members and movable over said guide against the action of said means and into engagement with said first element on movement of said members to fully attached position, said second element being urged by said means from the end of said first element and into said offset portion on movement of said members from fully attached position and co-operating with said portion inner wall to prevent reengagement with said first element without first further detaching the members and engaging said second element with said guide as aforesaid.

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