This invention has to do with improvements in connections for electric circuit extensions or what is known in the trade as attachment plugs and more particularly relates 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 which will eliminate arcing in making and breaking the connection, safeguard the operator against electric shock, and positively maintain a proper electrical connection with the separable parts of the connector securely held together against accidental disconnection.

Another object is to provide a connection of the character described in which the contact members thereof are effectively shielded at all times against being touched by the operator thereof and in such manner as to eliminate fire hazards.

A further object of the invention is to provide a connector of the character described in which the highly desirable "wipe" contact of the contact members thereof is provided for in a particularly safe and efficient manner and without arcing of said contact members.

Still another object is to provide a connector of the character described in which the contact members though automatically locking against unintentional displacement, may however be readily intentionally disconnected without manipulating an unlocking means and by intentionally and forcefully pulling the separable connector elements apart.

It is an additional object to provide a connector of the character described which will be comparatively simple as to construction, strong, durable, consist of few parts, reliable in operation and relatively inexpensive.

The invention is especially characterized by spring urged wiping contacts constructed and arranged to be separated from the other contacts with a quick spacing action avoiding arcing, and, arranged to be moved into position to insure a proper and non-arcing initial contacting action by a simple and easily operable means which has the added functions of effectively shielding the contacts at all times and providing for a secure telescopic union of the separable elements of the connector.

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 the drawing:

Figure 1 represents a longitudinal sectional view of the main element of the connector as when separated from and before adjustment thereof to prepare it for connection with the other element of the connector, which latter is shown in dotted lines.

Figure 2 is a fragmentary longitudinal sectional view of said main element as when adjusted preparatory to connection thereof with its companion element.

Figure 3 is a fragmentary longitudinal sectional view showing the complete connection as when in operative condition.

Figure 4 is an enlarged fragmentary sectional view showing the contact members in the position assumed at the completion of the snap quick spacing separation action thereof, particularly showing the construction providing for said action.

Figure 5 is an end view of the main element of the connector with the closure cap removed.

Figure 6 is a fragmentary sectional view of a modified form of the invention.

The present embodiment of the connector as shown in detail in the accompanying drawing is seen to comprise two elements or units 1 and 2 arranged to be separably joined to one another whereby an electrical connection may be made through contact members 3 and 4 respectively carried thereby. As here shown each unit carried four of the contact members aforementioned and it is obvious that this number may vary depending on the nature of the electrical circuit to be established.

The main unit 1 of the connector comprises a hollow body 5 of rectangular outlines in the present form, and made of suitable insulation material. Through this body are formed longitudinal bores 6 in which the contacts 3 are pivotally mounted with their outer ends extended outwardly from one end of said body. Connected as at 8 to the inner end of each contact 3 in the customary manner is a conductor 9. A closure cap 10 is secured by a fastening 11 upon and telescopes the end of the body 5 from which the conductors 9 extend, said conductors passing through the central aperture 12 of the cap. The cap pressing against the conductors adjacent the points of connection...
thereof with the contacts 3, holds the contacts against longitudinal displacement yet permits of pivotal movement of said conductors.

Each contact 3 is in elongated strip form with substantially flat sides and near its inner end has trunions 14 which are mounted in slots or grooves 15 formed in opposite sides of the bore 6 whereby the contact is pivotally held in place. The slots or grooves provide for the insertion of the contacts into the bores whereby to pivotally secure them therein, the inner ends of said slots acting as stops to determine the outward extent of said contacts. Fixed to each contact 3 at one end is a bowed leaf spring 17 arranged to urge the contacts laterally outwardly at all times whereby to provide for proper contactual engagement thereof with contacts 4.

The portion of the contacts 3 which are extended beyond the body 5 are of special formation to provide for effective contact and the interlocking thereof with the other contacts 4, said portions being of substantially sinusoid form longitudinally of contacts. With this formation it is seen that the extreme end of each contact is curved laterally inward as at 18 whereby the outer flat side is slightly rounded and forms a hump 19 contiguous with a concave portion 20 inwardly thereof on said flat side which latter is contiguous to another hump portion 21 inwardly thereof. The portion 21 is followed by another concave portion 22 inwardly thereof.

The outer connector unit 2 is in the form of a rectangular block 23 of insulation material having sockets 24 therein for reception of the contacts 3 and in which are exposed. The contacts 4 are curved inward as at 25 between their ends and have contiguous outwardly curved or flared free end portions 26. These curved portions 25 and 26 are embedded in the walls of the sockets 24 in such manner that the inner faces thereof are exposed and substantially flush with said surfaces of said walls. The walls from the outer ends of the contacts 4 that is, the portions 26, are curved outward and laterally away from said ends as at 27 as a continuation of the outward curve of portions 26. At the ends of the curved portions 27 are stop shoulders 27'. With this arrangement, when the contacts 3 are pulled off the contacts 4 they snap quickly away from the ends 26 and following the curved portions 27 are quickly spaced from contacts 3 in such manner as to positively prevent arcing, it being noted that this snap action is caused by the force of the springs 17.

It will now be apparent that inasmuch as the contacts 3 become displaced automatically when disengaged from contacts 4 as aforementioned, it is necessary to move the contacts 3 to a position such that on the joining of the connection units 1 and 2 the contacts will engage one another without arcing. Consequently, a sleeve 28 is slidably telescoped upon the body 5 which latter carries pins 29 engaged in grooves 30 in sleeve whereby to guide the sleeve and limit its movement. This sleeve is arranged to telescope the unit 2 and is of such length that in withdrawn as well as extended positions will cover and shield the contacts 3 whereby to eliminate shock and fire hazards.

Extending across the sleeve is a wall or partition 31 having openings 33 therein through which the contact members 3 extend. This partition serves as a shield or guard, acts as a stop to be engaged by the end of unit 3 of the connector whereby the sleeve is pushed back to retracted position automatically upon joining said units, and displaces said contacts 3 laterally and inwardly into position to be properly engaged with the contacts 4 when connecting the units 1 and 2.

With the parts in the position shown in Figure 1 it is necessary to slide the sleeve 28 outward into position shown in Figure 2 to prepare the contacts 3 of unit 1 for engagement with the contacts 4. On this extension of the sleeve the partitions 32 thereof engages and depresses inwardly the contacts 3 to position such that they will engage the inner sides of contacts 4 on the joining movement of the two units of the connector. The contacts 3 are held in said inwardly displaced position by the frictional contact thereof with the outer sides of the openings 33. The humps on the contacts act to prevent accidental movement of sleeve out of extended position.

Upon moving the unit 1, adjusted as shown in Figure 2, into coupled engagement with unit 2, the latter slides freely into the sleeve 28 and upon encountering partition 33 causes the sleeve 28 to be pushed back into position shown in Figure 1. As the sleeve moves back the partition 33 moves clear of the contacts 3 which latter are then urged laterally outwardly by the spring action of the humps 19 and the portion 21 is followed by another concave portion 22 inwardly thereof.

To the special terminal formation of the contacts 3 and 4 as hereinbefore described, said contacts engage so as to interlock against unintentional separation, whereby a good electrical connection is insured.

It is to be noted that the contacts 3 in being moved over surface 27 into engagement with or towards contacts 4, will be in such manner as to make the proper contact with or to properly disengage from contacts 4 without arcing. As shown in Figure 6, a modified form of the invention includes the contacts 3 and 4 which are employed in the same manner as contacts 3 and 4 of the first described form of the invention, but are of different formation at their contacting ends. The contact 4 lies on one side of a V-shaped hump 5 the other side 6 of which hump corresponds to the surface 27. The contact 3 is spring urged as are contacts 3, and has an outwardly bent end 8 which is adapted to lie against contact 3 to effect the interlocking engagement of the contacts. The end 9 will ride off the end of contact 4 which latter is at the apex of the hump 5, and onto the surface 6 which causes the contact 3 to move quickly clear of contact 4. The hump 5 acts also as a guide when moving the contact 3 into position to engage contact 4. The sharp angles of the hump 5 insures a quick snapping action of the contact 3 into and out of contacting position and at no time will the contact 3 remain or jam or stick on the apex of the hump, it being forced either into or out of contacting position. The spring action on contact 3 as is the case with contact 3 in the previously described form, causes it to be quickly forced in and out of maintained in contacting position.

It will now be seen that the connection hereinafore described, and as illustrated in the accompanying drawing, will provide for the ad-
vantages and objects hereinbefore noted in a particularly efficacious manner.

1. In a connector for extensions of an electric circuit, two body members, a pair of contact members insulated from each other carried by each of said body members and arranged to lie with the contact members of one body member in overlapping engagement with the contact members of the other body member upon bringing said body members together, spring means arranged to urge contacts on one body member laterally outward into engagement with the other contact members, a member slidable on one of said body members into and out of a position to engage and displace the spring urged contacts out of line with the other contact members and arranged to be engaged and pushed by the other body member into position to release the depressed contacts during movement of the contacts into engagement with one another, said slidable member being arranged to telescope both body members and covering the spring urged contact members at all times, the other contact members being counter sunk in the body members thereof.

2. In a connector, cooperating separable connector members, a contact element carried by one member, a resiliently displaceable contact element carried by the other member disposed in one position and with said members attached to contact with said first element, an offset portion on said second element, and a member slidably carried by one of the members and extensible and retractable with respect thereto, said member being disposed when extended to engage said offset portion to displace said second element from said position and displace said offset portion to laterally displace said second named contact member upon movement of said sleeve in one direction and to release said offset portion upon movement of said sleeve in the opposite direction.

3. In a connector for extensions of an electric circuit, a body member, a contact member on said body member, another body member, a contact member on the second named body member disposed for engagement with the first named contact and having an offset portion, a sleeve slidably mounted on one of said body members and having a portion disposed to engage said offset portion to laterally displace said second named contact member upon movement of said body member laterally into engagement with the other contact member, a member slidably mounted on said body member and housing and shielding said contact member in all positions, a spring urging said contact laterally and means on the sleeve disposed to engage and depress said contact against the action of said spring when the sleeve is extended and to release the contact when the sleeve is retracted.

4. In a connector for extensions of an electric circuit, a body member, a contact member carried by and extending from said body member, a spring urging said contact member laterally, a sleeve slidable on and extensible from said body, a partition member extending transversely of the sleeve and having an opening therein through which the contact member extends freely when the sleeve is retracted, said partition engaging and depressing said contact member when the sleeve is extended.

5. In a connector for extensions of an electric circuit, a body member of insulation material, a contact member carried by and extending from said body member, said contact member curved to provide an offset portion disposed to engage and be depressed by said partition when the sleeve is extended, another body member of insulation material removably telescoped in said sleeve and engaging said partition and moving the sleeve to retracted position when pushed home into the sleeve, and a contact member on the second named body member to be engaged by the first named contact when the sleeve is in retracted position.

6. In a connector for extensions of an electric circuit, separable body members, contacts carried by said body members and disposed to lie in overlapped engagement when the body members are brought together, a spring urging the contact on one body member laterally into engagement with the other body member having a laterally outwardly sloped insulated portion contiguous with the outer end of the contact member, upon which portion the free end of the spring urged contact is moved upon separation of the body members and disengagement of the contacts.
sulated portion contiguous with the outer end of the contact member thereon, onto which portion the free end of the spring urged contact is arranged to move upon separation of the body members and disengagement of the contacts and means on one of said members operative to move and maintain the spring urged contacts out of line with the other contacts.

11. In a connector for extensions of an electric circuit, separable body members, contacts carried by said body members and disposed to lie in overlapped engagement when the body members are brought together, a spring urging the contact on one body member laterally into engagement with the other contact, the other body member having a laterally recessed insulation portion contiguous with the outer end of the contact member thereon, onto which portion the free end of the spring urged contact is arranged to move under the action of said spring upon separation of said body members and disengagement of said contacts, and means on one of said members operative to move and maintain the spring urged contact from said recessed portion and into engagement with the other contact during movement of the body members together.

12. In an electric circuit closer, a body member, a fixed contact element carried by said body member, a contact element movable from and overlapped engagement with said first contact member to a position longitudinally displaced therefrom, said body member having an insulated recess portion receding from an end of said fixed element, and resilient means urging said movable element laterally into contact with said fixed element when the elements are engaged and into said recess portion upon disengagement of the elements.

13. In an electric circuit closer, a body member having an inclined surface thereon, a fixed contact member carried by said body member and disposed contiguous and substantially flush with and insulated from said surface, a movable contact member movable from engagement with said first contact member onto said surface, and a spring urging said movable contact member into engagement with said surface and said fixed contact member, said movable contact having a laterally outwardly bent terminal arranged to lie against the first named contact member.

14. In an electric circuit closer, a body member, a protuberance of insulation material on said body, a contact member slidable over the protuberance to lie on either side thereof, and having its free end directed outward to conform to and lie against one side of the protuberance, a fixed contact on the last named side of the protuberance and disposed contiguous and substantially flush with the outstanding extremity of said protuberance and disposed to be engaged by said free end, and spring means urging the slidable contact into engagement with said protuberance and fixed contact.

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