

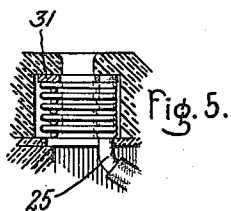
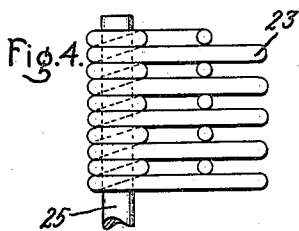
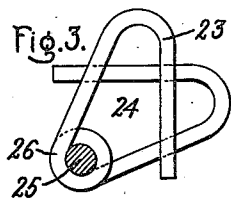
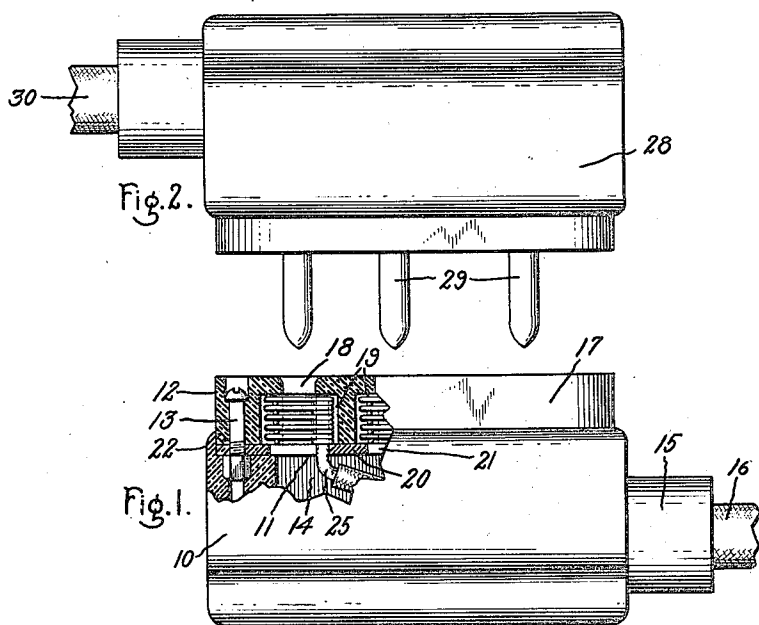
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A. L. R. ELLIS

PLUG RECEPTACLE

Filed March 5, 1921



Inventor:
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UNITED STATES PATENT OFFICE.

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PLUG RECEPTACLE.

Application filed March 5, 1921. Serial No. 449,950.

To all whom it may concern:

Be it known that I, ALVARADO L. R. ELLIS, a citizen of the United States, residing at Lynn, in the county of Essex, State of Massachusetts, have invented certain new and useful Improvements in Plug Receptacles, of which the following is a specification.

The present invention relates to plug receptacles such as are used in connection with contact plugs for connecting together one or a plurality of circuit wires, and, while the invention is well adapted for use where only one or two contacts are made by the plug and receptacle, it is more particularly intended for use where three or more contacts are to be made. In such cases difficulty is experienced in getting good connections for each contact because of inaccurate spacing of the plug contacts or the holes in the receptacle, or both. Or, if the plug contacts are correctly spaced originally, they may become slightly bent or displaced in use, so that when inserted into a plug receptacle some of them may not make good connection.

The object of my invention is to provide an improved structure and arrangement in a plug receptacle which will overcome the above difficulties and insure always a good connection for each plug contact irrespective of the number used or of slight inaccuracies in spacing, and for a consideration of what I believe to be novel and my invention, attention is directed to the accompanying Description and the claims appended thereto.

In the drawing Fig. 1 is a side elevation, partly in section, of a plug receptacle embodying my invention; Fig. 2 is a side elevation of a plug having contacts adapted to engage the contacts of the plug receptacle shown in Fig. 1; Fig. 3 is a plan view and Fig. 4 a side elevation of a plug receptacle contact as used in the plug receptacle shown in Fig. 1; and Fig. 5 is a detail view of a modification.

According to my invention, I provide a mounting block made of suitable insulating material and provided with spaced openings to receive the projecting contacts of a plug, and such openings are of a size or diameter enough greater than that of the contacts so all the contacts will readily enter them with reasonable accuracy in spacing. In other words, the receptacle openings are enough

over-size to insure easy admission of the plug contacts with a desired amount of clearance. I then provide a chamber in the mounting block beneath each opening with which the opening communicates, the chamber being larger in cross sectional area than the opening, and loosely mounted in such chamber is a specially constructed receptacle contact, so arranged that it can move transversely in the chamber to take a position in direct axial alignment with the plug contact. The receptacle contact comprises a stack of spring contact members or fingers which lie in planes parallel to the receptacle opening and arranged at angles to each other so as to define a socket adapted to receive a plug contact, each finger engaging the side of the plug contact to form an electrical connection therewith. The spring fingers may be formed from one continuous strip of suitable material, such as wire of suitable size, angularly bent upon itself, or the contact may be built up from a plurality of angularly bent strips or pieces of material stacked one on top of the other. In any case the stack of fingers are electrically and mechanically connected together by a suitable conductor soldered or welded to them leaving the fingers free to spread when engaged by the plug contact. The conductor connecting the fingers may have its other end fixed to a connector or binding screw on the mounting block, which connector or binding screw is adapted to receive a lead wire, or it may be the end of a lead wire itself.

Referring to the embodiment of my invention shown in the drawing, the mounting block comprises a base 10 in the form of a casing provided with an open side 11 over which is fastened a contact carrier 12 by screws 13, the base and contact carrier being both constructed of suitable insulating material. This forms a closed chamber 14 in the mounting block, and in one end of base 10 is a collar 15 having an opening through it which communicates with chamber 14, and serves as a passage for a multiple strand conductor 16. Contact carrier 12 comprises a body 17 provided with receptacle openings 18 which open into chambers 19. The side of body 17, opposite to that in which openings 18 are located, and which may be termed the inner side, is covered by a plate 20 having openings 21 therein for the passage of

a lead wire. Base 10 is provided with a flange 22 which receives the inner side of body 17 and positions it on the base, and screws 13 serve to hold both body 17 and plate 20 in place.

In the present instance the receptacle contact, shown in detail in Figs. 3 and 4, comprises a plurality of contact fingers 23, each bent in the form of a U or loop to present two sides for engagement with a plug contact. Fingers 23 are stacked on top of each other with a portion of one loop extending at substantially right angles to a corresponding portion of the adjacent loop, thereby forming a central plug contact receiving socket 24. The loops are electrically and mechanically fastened together at what may be considered one cover by a conductor 25 which is soldered, welded or otherwise fastened thereto. As shown in the drawing, the loops are formed in pairs by taking a wire of suitable length, bending it at its center to form a ring 26 and then doubling the ends of the wire on themselves to form the loops. A suitable number of the contact members thus formed are then threaded on the end of conductor 25 by passing rings 26 over the conductor after which they are permanently fastened thereto.

The stack of contact fingers are of a height approximately equal to the depth of chambers 19 but are smaller in area so the contact as a whole can move freely transversely in the chamber in any direction.

A plug suitable for use with the receptacle shown in Fig. 1, is illustrated in Fig. 2, and comprises a mounting block 28 carrying plug contacts 29 to which are connected the conductors of the lead 30. Contacts 29 are of a diameter greater than the transverse dimensions of sockets 24 so, when inserted into the sockets, the spring fingers will be spread apart and placed under tension so every finger will tightly engage the contact. Or, viewed from another aspect, the plug contact in being inserted between the arms of the loops which go to make up the receptacle contact, spreads such loops somewhat so the arms of the loops squeeze the contact. This involves a good electrical connection throughout the length of the contacts and the connection will not be appreciably impaired even though some of the fingers do not engage the contact.

Receptacle openings 18 are of greater diameter than plug contacts 29 so that with reasonably accurate spacing the contacts will enter the openings. For practical purposes the difference in diameters need not be great. The receptacle contacts can move transversely relatively to openings 18 and to insure that plug contacts 29 will always pass into sockets 24, I make the end of contacts 29 pointed. If, therefore, a receptacle

contact lies somewhat to one side of opening 18, the rounded end of the contact 29 will move it into axial alignment with contact 29 and guide contact 29 into socket 24.

Since the receptacle contacts are loose in chamber 19 and free to move transversely therein, when engaged by a plug contact, they will be moved directly in line with such contact so they will enter them straight. This insures that a good engagement will be obtained along the entire lengths of the contacts, and that the contacts will align themselves correctly irrespective of errors in spacing. The multiplicity of contact points between the plug contact and the receptacle contact insures a low resistance connection as a whole with consequent increase in current carrying capacity.

In the present instance the receptacle contacts are shown as being mounted directly on the ends of the lead wires, one of which is shown at 25, but it will be understood that other arrangements may be used. It will be understood, also, that a plug receptacle embodying any number of contacts found desirable may be built, and that they may be unequally spaced, as shown in the present instance, so as to insure the connection being made always the same way.

When used on circuits carrying considerable energy or at voltages high enough to cause destructive arcing when the contacts are broken, it is desirable to provide means to protect the contact fingers from damage which would be caused by such arcing, and for this purpose I may utilize the arrangement shown in Fig. 5 wherein a relatively heavy washer 31 is provided which is connected to wire 25 just in front of the plug receptacle opening. The hole in this washer is sufficiently large to permit the plug contact to pass freely through it. When the plug is removed from the contact the arc starting when the plug leaves the last contact finger will be immediately transferred to the metal washer, thereby protecting the contact fingers. The washer may be made large enough to meet the requirements met with in any particular case.

In accordance with the provisions of the patent statutes, I have described the principle of operation of my invention, together with the apparatus which I now consider to represent the best embodiment thereof, but I desire to have it understood that the apparatus shown is only illustrative and that the invention may be carried out by other means.

What I claim as new and desire to secure by Letters Patent of the United States, is:—

1. A contact for a plug receptacle comprising a plurality of U-shaped loops stacked on each other with the arms of successive loops extending crosswise of each

other, and a conducting wire electrically and mechanically connecting the loops together.

2. A contact for a plug receptacle comprising a plurality of U-shaped spring contact elements, each having a coil formed in its length substantially midway between its ends and having each leg bent back to cross the other leg above and below the knee formed by such bend, said elements being stacked one on the other to form a symmetrical structure embodying a multiple contact tunnel for a connector plug, and a conductor post forced through and secured to the coils of said elements to electrically connect them to said conductor post and to mechanically hold them in said stacked relation.

3. A receptacle contact for a plug connector, comprising a stack of duplicate spring contact elements of U-shape, uniting to form a multiple fingered contact tunnel, each of said elements having two free ends bent to cross each other at least once and a rigid conducting member to which said elements are electrically and mechanically connected, by which they are maintained in said stacked relation and through which they are connected to an external circuit.

4. A receptacle contact for a plug connector, comprising a stack of duplicate spring contact elements, each element being U-shaped with each arm thereof bent back to cross the other at least once whereby said elements form a multiple fingered contact

tunnel, a coil formed in each element midway between the bends in the arms, a ring concentric with the contact tunnel provided as a top for the stack of elements and a conducting wire passed successively through the coils of each element and secured at one end in the ring to mechanically maintain the elements and ring in said stacked relation and to provide an electrical connection with them and an external circuit of which it may form a part.

5. In a plug receptacle, a contact chamber having an opening for a plug contact and a receptacle contact loosely held therein comprising a multiplicity of contact elements of spring material each wound about a bare conductor wire one above the other to form a stack, each of said elements being U-shaped, with that portion of each which is wound about the conductor wire forming substantially the mid point of the U and each of said elements having its free ends bent toward and across one another substantially at right angles, one with respect to the other, to jointly form a contact tunnel with resilient walls within the stack, said conductor wire serving to hold the elements in stacked relation and the confines of the chamber serving to hold the elements in alignment about the contact tunnel.

In witness whereof, I have hereunto set my hand this 28th day of February, 1921.

ALVARADO L. R. ELLIS.