May 5, 1942. W. A. WULLE ET AL 2,281,654

CONNECTOR

Filed Dec. 19, 1940

Fig. 1.

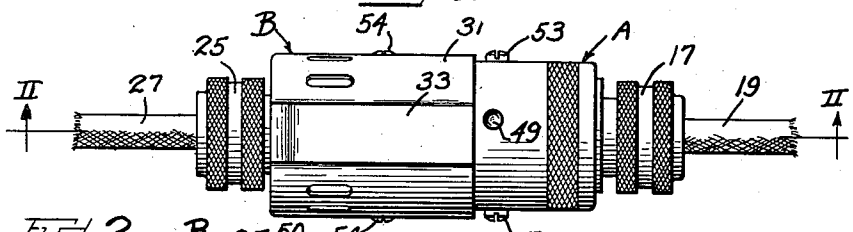


Fig. 2.

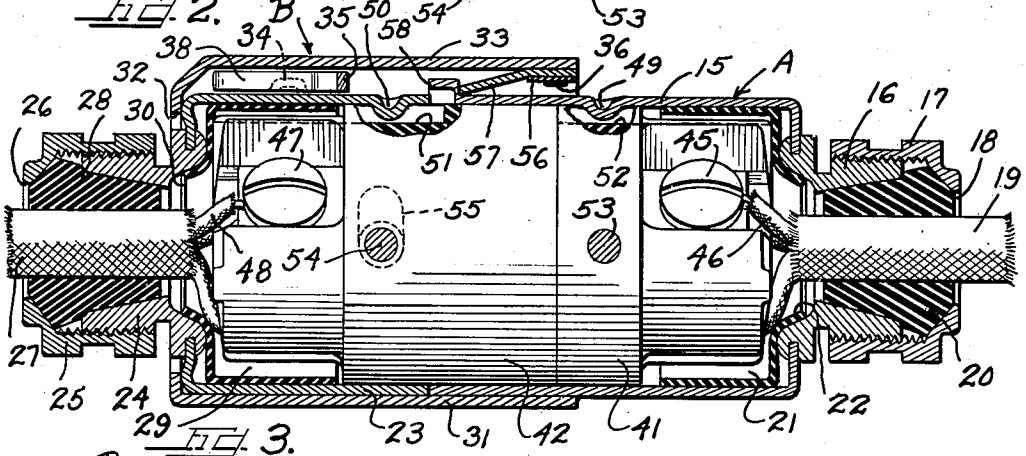


Fig. 3.

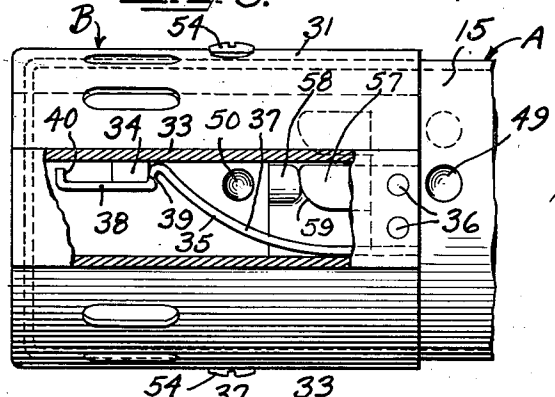
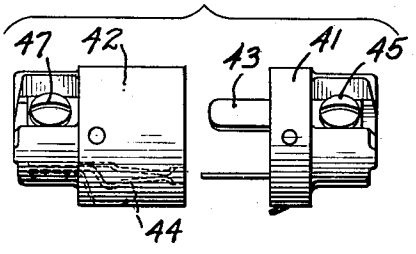


Fig. 5.



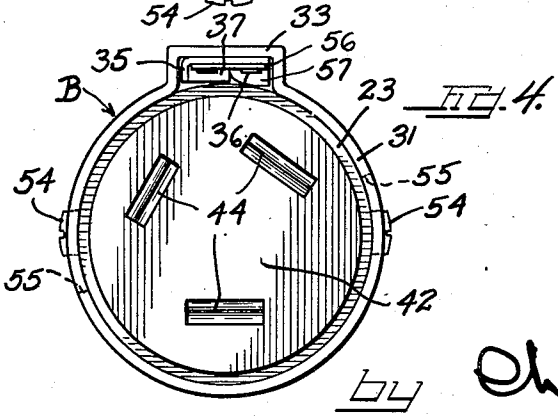


Fig. 4.

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Patented May 5, 1942

2,281,654

UNITED STATES PATENT OFFICE

2,281,654

CONNECTOR

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Application December 19, 1940, Serial No. 370,750

1 Claim. (Cl. 173—328)

The present invention relates generally to connectors and is concerned more particularly with electrical connectors of the separable type having means for automatically locking the parts together when the contacts are moved into fully engaged position.

The invention is herein illustrated and described as applied to an attachment plug and receptacle, but it may be utilized with connectors generally.

It is a primary object of the hereindescribed invention to provide improved means for automatically locking together the separable parts.

A further object is to provide an improved separable connector in which the locked parts may be released readily by a simple manual manipulation or the locked parts may be separated by the application of increased pulling forces tending to separate the parts by a rectilinear movement in an endwise direction.

A still further object of the invention is to provide a separable connector having component parts assembled in a novel manner, and in which certain of these parts are automatically interlocked upon movement to assembled relation.

Another object of the invention is to provide a separable connector having male and female connecting parts containing interchangeable plug and receptacle elements.

Still another object of the herein described invention is to provide in electrical connectors of the separable type, novel means for resiliently mounting the contacts of one of the connector parts and utilizing this resilient mounting for effecting actuation of the locking elements when the connector parts are moved into connected relation.

The above, other and further objects of the invention will be apparent from the following description and accompanying drawing and the appended claim. On the drawing:

Figure 1 is an elevational view of a separable connector made in accordance with the principles of the present invention and showing the two parts or members in connected or engaged position.

Figure 2 is an enlarged longitudinal view showing in section certain elements of the connector, and showing in elevation certain other elements, taken substantially on line II—II of Figure 1.

Figure 3 is an enlarged fragmentary plan view of one of the connector members, portions being cut away to show details of the locking parts.

Figure 4 is an enlarged end view looking toward the connectable end of one of the connector members and showing the contact members therein in spaced relation.

Figure 5 is a composite view of the interchangeable plug and socket units for the connector members, these units being shown in disconnected relation.

The connectors as herein illustrated generally comprise a male member A and a female member B arranged to be connected together in end-to-end relation and separated by rectilinear movement.

In the embodiment shown in Figures 1, 2 and 3, the male member includes a metallic casing 15 of cylindrical construction and closed at one end except for an opening in which is inserted a metal nipple 16 through which electrical conductors for the connector member may pass. The metal nipple is threaded on its exterior to receive a cap 17 which is apertured at 18 for entrance of a conductor 19. A tapered resilient bushing 20 of rubber or other suitable material is inserted in the nipple to receive the conductor and be compressed by screwing the cap onto the nipple to compress the bushing against the conductor and thus prevent movement of the conductor in the connector member.

The closed end of the casing 15 is provided with an insulating liner 21 of generally cup-shaped formation, this liner being provided with an opening 22 for receiving the conductor 19 therethrough.

The other connector member B includes a metallic casing 23 which is likewise of cylindrical construction and has an opening at one end for receiving a nipple 24. This nipple is exteriorly threaded for receiving a screw cap 25 having an opening 26 for the passage of an electric conductor 27 for this connector member. A tapered resilient bushing 28 is contained within the nipple to receive the conductor 27 and to be compressed by screwing the cap 25 thereagainst.

The closed end of the casing 23 is provided with an insulating liner 29 of generally cup-shaped construction and having a bottom opening 30 for receiving the conductor 27 into the connector interior.

The sleeve 31 surrounds the casing 23 and is of such length as to project beyond the open end of the casing 23 to guidingly receive therein the open end of the casing 15 of the connector member A.

The sleeve 31 is apertured at its other end as shown at 32 to enable passage of this end of the sleeve over the nipple 24 and cap 25 when the sleeve and casing are assembled in nested rela-

tion with the closed end of the sleeve abutting the closed end of the casing 23.

The sleeve 31 is provided with a longitudinally extending outwardly offset portion constituting a hood 33, the outer end of which is open for the entrance of an outwardly struck projecting portion 34 on the casing 23, when the casing and sleeve are assembled in nested relation. During the assembly of these parts, the projection 34 engages a leaf spring 35. This spring is anchored at the open end of the hood 33 as by rivets 36 or other suitable means. From its anchored end, the spring 35 is longitudinally curved to form a portion 37 which connects with a deflected generally U-shaped end portion 38 which defines spaced abutments 39 and 40. Movement of the casing 23 and sleeve 31 into nested relation causes the projection 34 to move along the curved portion of the spring, and in fully nested position, the projection 34 moves into the U-shaped portion 38 allowing the spring to move the abutment 39 behind the projection and thus interlock and retain the casing and sleeve in nested relation. With this arrangement, it will be noted that the casing and sleeve may be relatively rotated within the limits of movement of the projection 34 transversely of the hood 33, and that the action of the spring 35 tends to resiliently retain the sleeve at one limit of its rotative movement relative to the casing 23. In order to disassemble the casing and sleeve it is necessary to depress or move the spring 35 laterally sufficiently to move the abutment from behind the projection 34 and thus permit relative axial movement of the sleeve and casing.

The casings 15 and 23 are provided with interchangeable insulating bodies 41 and 42 within which there are mounted respectively a plurality of blade-type plug contacts 43 and socket-type contacts 44. The blade contacts are provided with terminal screws 45 for connection of electrical wires 46 forming a part of conductor 19, and the socket contacts are provided with terminal screws 47 for connection to electrical wires 48 forming a part of conductor 21. Irrespective of which insulating body is mounted in the respective casings, the blade contacts 43 will in no case project beyond the open end of the casing 15 or the sleeve 33 and will thus always be protected.

The provision of interchangeable contact assemblies is of particular advantage in connection with connectors of this type, since the electric code provides that exposed contacts must always be dead, when disconnected. It is therefore always possible to adapt the connector parts, whether utilized on an extension cord or connected to a power device so that this code may be complied with.

While for purposes of illustration, we have disclosed three sets of contacts within the circumference of the insulating bodies, it is possible to utilize two, three, four or more sets of contacts and secure the required spacing even though these contacts be unsymmetrically spaced so that the contacts will be engageable only in a specified and predetermined order. In order to carry out such purpose it becomes necessary to orient the insulating bodies 41 and 42 in the casings 15 and 23 in a circumferential direction. Thus, the casing 15 is provided with an inwardly struck projection 49 and the casing 23 with an inwardly struck projection 50 which projection may be longitudinally receivable in a slot or groove 51 in the insulating body 42 or a slot or groove 52 in the insulating body 41, depending upon the particular casings within which these insulating bodies are disposed. The insulating body disposed in the casing 15 is held by diametrically disposed screws 53, whereas the insulating body disposed within the casing 23 would be retained by diametrically disposed screws 54—54. In the case of the screws 54, the heads of these screws are disposed in elongate openings 55 formed in the sleeve 31, these openings permitting the previously described rotative movements of the sleeve.

It will be noted that the casings 15 and 23 are of the same diameter and that when the connector members are in connected relation, as shown in Figure 2, the open end of casing 21 will slidingly fit within the projecting open end of the sleeve 31 to bring the casings into end-to-end abutting relation and the contacts into connected relation.

Within the hood 33, and against the under side thereof, at the entrance end of the hood, is secured, as by the rivets 36 the head 56 of an L-shaped detent member 57. The detent member is illustrated as consisting of a springy finger which is flat and with its free end bent or curved to extend out of the plane of the fixed head or head 56, and in normal position to lie as shown in Figure 2 with its free end spaced from the top wall of the hood 33 of the sleeve. The free end of the detent 57 is likewise spaced from the end wall of the hood.

Secured to the casing 15 of connector member A is an outwardly struck projecting portion 58 disposed to be aligned with the hood 33 and underlie the detent member 57 when the two parts are moved together for connection. Entry of the projection 58 into the hood 33 serves to guide the connector members A and B respectively into proper position for connecting the proper blade and socket contacts of the connectors.

As the connector members A and B are moved together by rectilinear or endwise movement, the casing 15 is entered into the open end of the sleeve 31 with the projection 58 entering the hood 33. As soon as the projection 58 enters the hood 33, the blade contacts enter the socket contacts and thus aid in guiding the two parts together as the same are forced together by rectilinear movement. During the movement of the two parts towards each other, the projection 58 slides underneath the spring detent 57 displacing it from normal position, until the contacts reach fully engaged position, whereupon the projection 58 passes the extremity of the detent 57 which then snaps behind the projection and locks the two parts together against endwise separation.

It will be noted that the connection of the connector members A and B in the manner stated is effected without imparting rotation to the sleeve 31.

To unlock the connector members A and B, this may be accomplished manually by the operator grasping these parts and twisting the sleeve 31 to rotate it against the spring 35 sufficiently to move the detent 57 from behind the projection 58, whereupon the parts may be separated by a pulling endwise movement. Figure 3 illustrates the detent 57 lying behind the projection 58 in locking engagement, and also indicates in dotted lines the position of the detent 57 when the sleeve 31 is rotated to free the detent from locking engagement with the projection 58.

The locking means for the separable connector, just described, prevents separation of the parts

by pulling force, except by rotation of the sleeve 31 about the casing 23. In some installations it is desirable that the locking means be so arranged that abnormal pulling strain imposed on the connected members will act to automatically separate the members to prevent injury to some of the parts or to persons, for example, where tripping over a conductor having the connectors therein.

Where such automatic disconnection is desired, this is easily accomplished in the previously described construction by merely rounding of one corner of the free end of the detent 57 as shown at 59 to form a cam surface which will act upon abnormal pulling forces on the connector members A and B to laterally shift the detent and rotate the sleeve 31 sufficiently to permit disengagement of the projection 58.

From the foregoing description, it will be apparent that the present invention provides improved means for automatically locking together the separable parts of an electrical connector; which provides an improved separable connector in which the locking parts may be released readily by a simple manual manipulation or automatically separated when subjected to increased pulling forces in a separating direction; a separable connector wherein the component parts are assembled in a novel manner, and in which certain of the parts are automatically locked upon movement into assembled relation; which utilizes interchangeable plug and receptacle elements; and which embodies an improved novel construction for resiliently mounting the contacts of one of the connector parts, and which may be utilized for effecting actuation of the locking elements when the connector parts are moved into connected relation.

The invention has been described herein more or less precisely as to details, yet it is to be understood that the invention is not to be limited thereby, as changes may be made in the arrangement and proportion of parts, and equivalents may be substituted without departing from the scope and spirit of the invention.

We claim as our invention:

An electric connector comprising a pair of members carrying plug and socket contacts, respectively, and adapted for connection and disconnection by endwise relative movement, an elongated sleeve on one of said members, locking means for normally locking said members in assembled relation and comprising cooperable locking elements, one of said elements being carried by said elongated sleeve, a projection on said one member and abutments on said sleeve for limiting the rotational movement of said sleeve on said one member, a spring extending longitudinally between said sleeve and said one member and achored at its outer end to said sleeve, said spring at its free end having an abutment engageable by said projection to lock said sleeve against axial removal from said one member, and another abutment on said spring engageable with said projection for normally holding said sleeve with said locking means effective to lock said members in assembled relation and whereby said spring will resist rotational movement of said sleeve to unlock said locking means.

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