

May 14, 1940.

H. K. KRANTZ

2,200,794

ELECTRICAL CONNECTOR

Filed May 8, 1937

2 Sheets-Sheet 1

FIG. 1

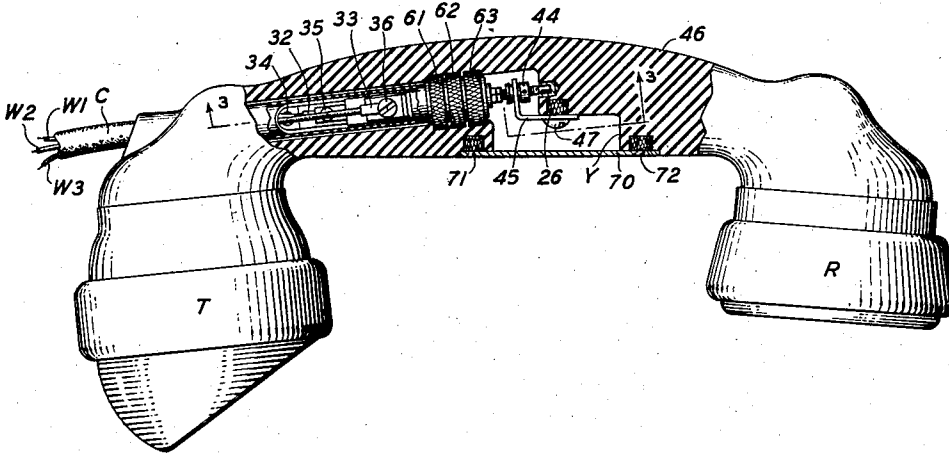


FIG. 2

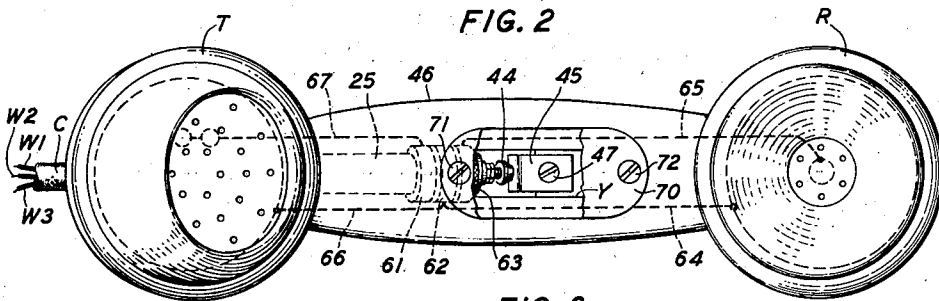
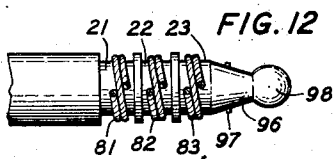
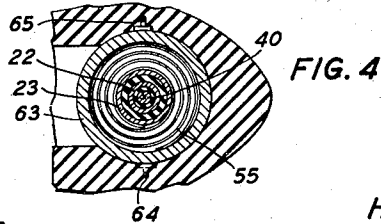
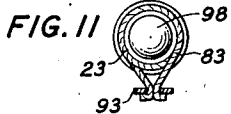
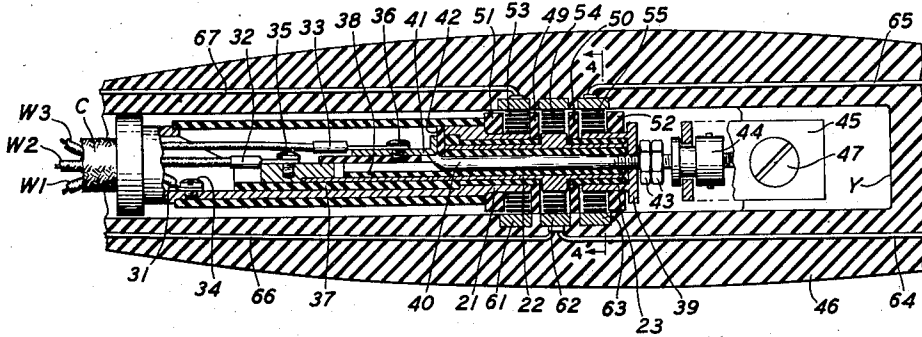


FIG. 3



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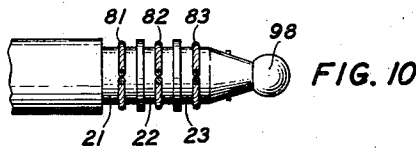
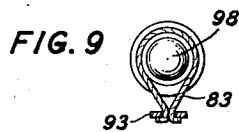
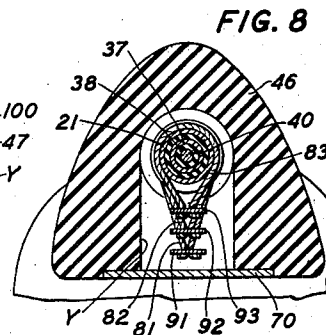
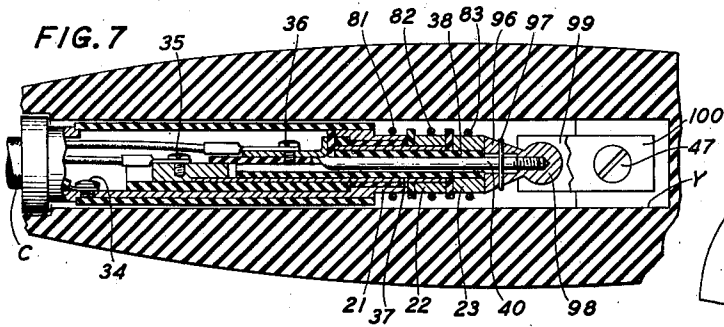
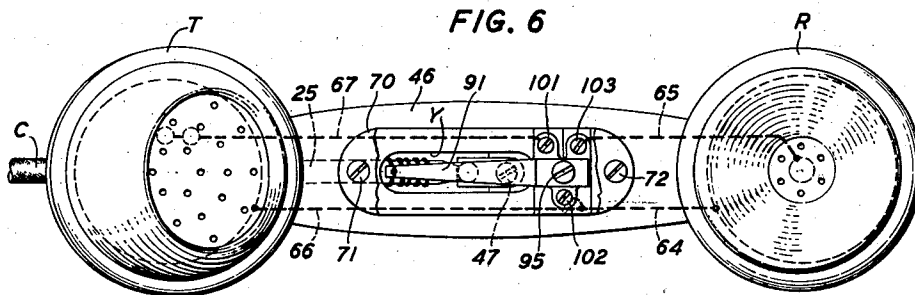
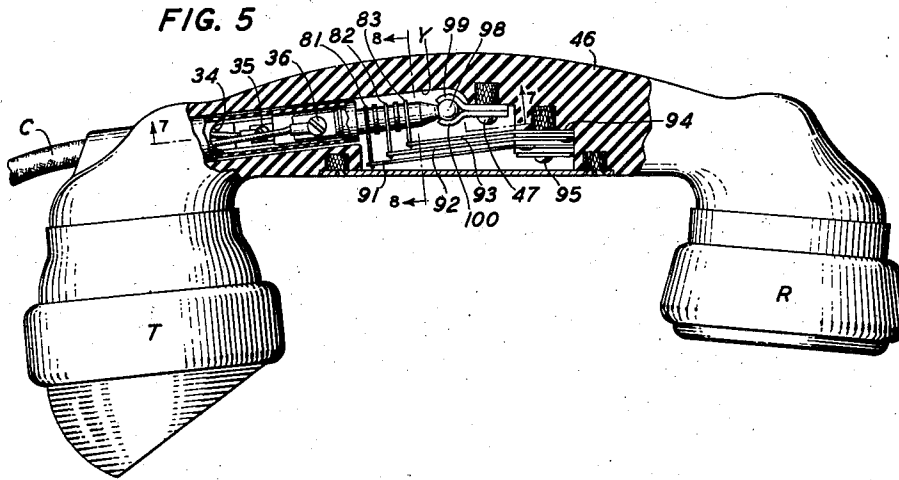
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ELECTRICAL CONNECTOR

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Application May 8, 1937, Serial No. 141,429

2 Claims. (Cl. 173—324)

This invention relates to electrical connectors for interconnecting conductors having motion relative to each other.

Its object is to produce a device of this character which will provide a low-friction electrical connection which is non-microphonic.

The electrical connector of this invention comprises relatively movable conductors, one of these conductors being sufficiently flexible to conform to the surface of the other conductor and slidably embracing such conductor.

The invention is particularly well adapted for use with cords associated with telephone apparatus; for example, handsets, although it has many other applications. Heretofore numerous attempts have been made to prevent the twisting of cords in handsets by the use of devices known as "swivel connectors." While such connectors have been found to be satisfactory in so far as preventing the twisting of the cord is concerned, it was found that objectionable microphonic noises were generated in the telephone talking circuit during the relative movement of the rotor and stator elements of the connector, and that such noises were due to the constant changes in resistance of the contacting area between these two elements irrespective of the accuracy at which these contacting surfaces were made.

The invention, for purposes of illustration, is shown as embodied in a telephone handset, and the connector is shown within the handset. In this embodiment, a flexible conductor slidably embraces a cylindrical contact member. The embracing conductor being flexible and tensioned conforms exactly with the periphery of the cylindrical contact member during the rotation of said member caused by relative movement between the handset and the cord. The low-friction characteristic of the connector prevents twisting of the cord and the non-microphonic characteristic prevents the generation of noises in the telephone talking circuit.

Other novel features and advantages of the invention will appear from the following description and by the claims appended thereto, reference being had to the accompanying drawings in which:

Fig. 1 is a side view of a telephone handset showing the handle and a number of operating parts in section;

Fig. 2 is a front view of the telephone handset shown in Fig. 1 showing a cover plate with portions cut away;

Fig. 3 is a longitudinal section of the handset taken in line 3—3 of Fig. 1;

Fig. 4 is a cross-sectional view taken on line 4—4 of Fig. 3;

Fig. 5 is a side view of a telephone handset partly in section showing a modification of the connector shown in Fig. 1;

Fig. 6 is a front view of the modification shown in Fig. 5 showing the cover plate with portions cut away;

Fig. 7 is a longitudinal section of the handset taken on line 7—7 of Fig. 5;

Fig. 8 is a cross-sectional view taken on line 8—8 of Fig. 5;

Fig. 9 is an end view of the rotor and stator contact elements, the support for the flexible contact element being shown in section;

Fig. 10 is a view showing the rotor and stator contact elements in engaged relation;

Fig. 11 is a view similar to Fig. 9 showing one of the contact elements modified; and

Fig. 12 is a view showing the modified contact element in engaged relation with its associated contacts.

Referring to Figs. 1, 2 and 3, the cord wires W1, W2 and W3 are electrically connected to bushings 21, 22 and 23 through terminals 31, 32 and 33 by screws 34, 35 and 36, respectively, the bushings 21, 22 and 23 being insulated from each other by concentrically disposed insulating sleeves 37 and 38.

The conducting bushing 23 is formed integrally with a disc portion 39 which is screw-threaded for engaging a rod 40 formed or welded to the conducting portion 41, which serves for receiving the screw 36 for electrically connecting the wire W3 to the bushing 23. An insulating piece 42 is provided for insulating the sleeve 22 from the end of conducting portion 41 and this insulating piece cooperates with bushing 23 for holding the bushings 21 and 22 and their insulating sleeves in assembled relation, counter nuts, as 43, being provided for preventing the loosening of conducting bushing 23 on the rod 40.

A collar 44 secured on the rod 40 engages a forked member 45 and cooperates therewith for holding the stator assembly thus formed against longitudinal movement in the telephone handle 46, the forked member 45 being secured by a screw 47 engaging a bushing 26 embedded in the handle.

The bushings 21, 22 and 23 are insulated in end-to-end relation by disc members 49 and 50 and these disc members cooperate with disc members 51 and 52, shown in Fig. 3, for holding spirally wound conductors 53, 54 and 55 against sidewise movement on the conducting bushings

21, 22 and 23 and in engaged relation with the inner peripheries of conducting rings 61, 62 and 63 which are embedded in the handle 46, and have connections with the receiver R and the transmitter T of the handset through conductors 64—65 and 66—67 embedded in the handle and connecting with the rings 61, 62 and 63 by soldered connections, as shown in Figs. 2 and 3.

The diameter of the inner disposed convolution of each of the spirally wound conducting members 53, 54 and 55 is such that these convolutions frictionally engage their associated conducting bushings 21, 22 and 23 through the medium of their own tension, while the outer convolutions of the conducting members 53, 54 and 55 likewise frictionally engage their associated rings 61, 62 and 63 so that the handset 46 is free to rotate relative to the cord C without twisting it, the spiral conductors 53, 54 and 55 remaining positively in contacting relation with their bushings 21, 22 and 23, and rings 61, 62 and 63, respectively.

In the connector illustrated in Figs. 1 to 4, due to the fact that the spiral conductors 53, 54 and 55 are made of resilient metallic strip, maximum contact surface is maintained during the relative movement of the handset with respect to the telephone cord irrespective of the minor irregularities and eccentricities of the surfaces of the bushings and rings, and therefore microphonic noises in the telephone circuit are effectively avoided.

The plate 70, which is held securely on the handle 46 by screws 71 and 72, shown in Figs. 1 and 2, is provided for preventing the entrance of dust and other foreign particles into the cavity Y formed in the handle and onto the contact devices, while facilitating access to the operating parts of the connector for adjustments and repairs. Instead of using screws to fasten the plate 70 on the handset it may be sealed thereto.

In the modification of the invention, shown in Figs. 5 to 10, inclusive, flexible, irrisilient wires 81, 82 and 83, preferably stranded, are wound over bushings 21, 22 and 23 and the ends of these wires are secured to the free ends of spring arms 91, 92 and 93, insulated from each other and secured by a screw 95 in a pile-up arrangement on a shoulder portion 94 in the cavity Y formed in the handle 46.

In the modification shown in Figs. 11 and 12, the flexible, irrisilient wires 81, 82 and 83 are wound around the bushings 21, 22 and 23 and the ends of the wires are secured to their spring arms 91, 92 and 93, in a manner similar to the modification shown in Fig. 5. On the end of rod 40 is screwed an end-piece 96 which serves for holding bushings 21, 22 and 23 in assembled relation and a pin 97, shown in Fig. 7, is provided for preventing the loosening of end-piece 96 on the rod 40, this end-piece being provided with a spherical portion 98 disposed in engaged relation with two complementary curved arms 99 and 100, shown in Figs. 5 and 7, for preventing longitudinal movement of the bushing assembly relative to the handle 46 while permitting the free rotary movement of the handset with respect to the cord.

The connections between the spring arms 91, 92 and 93 to the conducting wires 64, 65, 66 and 67, which are embedded in the handle, are effected by terminals carried by the spring arms, and screws 101, 102 and 103 engaging respective bushings embedded in the handle 46 to which these conductors are secured, as by welding.

In these modifications, the tension of each spring arm 91, 92 and 93 is such as to permit relative movement between the bushings 21, 22 and 23 forming the stator element and the wires 81, 82 and 83 without causing the twisting of the cord, the wires 81, 82 and 83 being sufficiently flexible and irrisilient to conform at all times with the periphery of the bushings, irrespective of minor surface unevenness and eccentricities of these bushings, thus maintaining positive contact between the stator and rotor and effectively preventing microphonic noise in the talking circuit of the telephone line.

While the invention has been illustrated as applied to a connector that will prevent the twisting of the extension cords of telephone handsets, it should be understood that its application is not so limited, but it is equally applicable to other electrical devices, not necessarily of a portable nature or equipped with cordage but wherein electrical connection is made between conducting elements capable of motion relative to each other, such as, for instance, cord reels, machine switching apparatus, etc.

What is claimed is:

1. A non-microphonic connector device for the cord of a telephone handset, said handset having a longitudinal bore adjacent the transmitter end thereof, a multicontact plug having insulated rings contiguous to each other longitudinally loosely engaging the bore, means carried by the handset cooperating with means carried by said plug for preventing longitudinal movement of said plug relative to the handset and holding it in centered position relative to the bore for permitting free rotation therein, a plurality of connectors secured to the handset one for each of said rings, and flexible conductors connecting respectively said rings to said connectors, the flexible conductors having portions disposed concentric to and frictionally engaging substantially the entire periphery of the corresponding rings of the plug.

2. A non-microphonic electrical swivel connector device for the cord of a telephone handset, the handset having a longitudinal bore, of a plurality of rings of conducting material embedded in the handset and having their inner faces exposed in said bore, conductors embedded in said handset and connecting said rings to the transmitter and receiver at the ends of the handset, a plug mounted for rotary movement in the bore of the handset, said plug consisting of a centrally disposed conductor member formed with a sleeve portion at one end thereof, a plurality of concentrically disposed insulating and conducting bushings mounted on said conductor member, said conductor member and said conducting bushings having means for securing the wire conductors of the telephone cord thereto, a second sleeve mounted on the end of said centrally disposed conductor member opposite the first-mentioned sleeve portion, conducting springs frictionally engaging said rings, metallic bushings and the last-mentioned sleeve for establishing electrical connections between the conducting wires of the cord and the transmitter and receiver of the handset and means secured to said centrally disposed conductor engaging means secured to the handset for holding said plug against longitudinal movement in the bore of the handset.

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