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TELESCOPING HIGH FREQUENCY ELECTRICAL CONDUCTOR

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Fig. 1

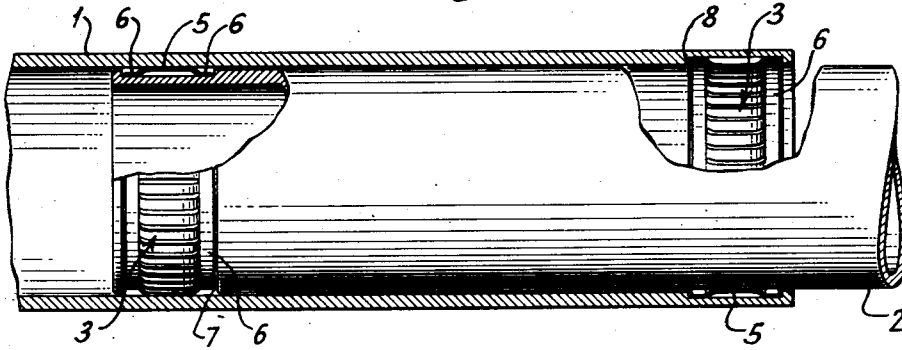


Fig. 2

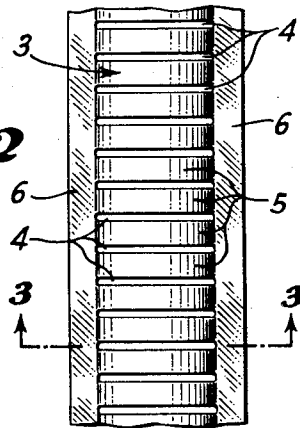


Fig. 3 



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TELESCOPING HIGH FREQUENCY
ELECTRICAL CONDUCTOR

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5 Claims. (Cl. 173—324)

The present invention relates to telescoping electrical conductors for the transmission of high frequency currents, and particularly to ways and means for maintaining good electrical contact and smooth sliding action between a pair of telescoping electrical conductors.

In the construction of modern high frequency radio equipment, pipe sections are often used and telescoped so that adjustments may be made in the overall length of the pipe sections. One example of the use of such telescoping pipe sections for radio equipment is found in ultra high frequency transmission lines. A desideratum for such telescoping conductors is that good electrical contact as well as smooth sliding action be obtained between the conductors. Heretofore, it has been customary to surround a portion of the conductor whose length it was desired to adjust with a split sleeve, but it was found that after such a sleeve had been used for a short time it would cause trouble by sliding too hard and sometimes even freezing (that is, refusing to move), or else the sleeve would provide poor electrical contact between itself and the conductor which it surrounds.

The foregoing difficulties are overcome by the present invention which provides an arrangement which always gives good electrical contact and at the same time provides very smooth sliding action between the telescoping conductors. In brief, the present invention consists in using between a pair of telescoping high frequency electrical conductors a ribbon or strip of sheet metal having transverse cuts and so formed as to produce a multiplicity of resiliently bulging contact areas. By arranging the metal ribbon or strip around the periphery of one of the telescoping conductors, with the end surfaces of the bulging contact areas engaging one of the conductors, and with the central areas engaging the other conductor, there is obtained both good electrical contact at numerous points between the telescoping conductors and also very smooth sliding or wiping action when it is desired to move one conductor relative to the other. Inasmuch as the resilient metal ribbon is entirely enclosed between the telescoping conductors, there is little danger of mechanical injury thereto or poor contact because of dirt and dust. It is preferred that this ribbon be made of a springy electrical conducting material such as bronze, which, if desired, can be coated with silver or gold to insure the best possible electrical contact between telescoping conductors.

The following is a more detailed description of

the invention in conjunction with a drawing, wherein like parts are designated by like reference numerals throughout the figures.

In the drawing:

Fig. 1 illustrates a pair of telescoping electrical conductors equipped with the resilient metal ribbon of the invention for insuring good contact and smooth sliding action between them;

Fig. 2 is a plan view of the resilient metal ribbon or strip; and

Fig. 3 is a cross-section of the ribbon of Fig. 2 along the line 3—3.

Referring more particularly to the drawing, there is shown in Fig. 1 a pair of hollow telescoping electrical conductors 1, 2 in the form of pipe sections, which method of construction is particularly common and of great usefulness in the transmission of very high frequency radio currents. In order to provide good electrical contact and smooth sliding action between the telescoping conductors there are provided between conductors 1 and 2 a pair of resilient metal ribbons or strips 3, each of which is provided with a multiplicity of transverse cuts 4 and so formed as to produce a multiplicity of resiliently bulging contact areas 5 (note Figs. 2 and 3). These bulging contact areas are terminated at their ends by flat contact surfaces or areas 6. We can describe the resilient metal ribbon or strip in another way by stating that it has the form of a shallow U in one cross-section, as indicated more clearly in Fig. 3, with oppositely extending flanges 6 at the open ends of the U, the ribbon or strip being slit at intervals along its length in the U-shaped portion only.

In arranging the resilient ribbon 3 between the telescoping conductors, it is preferred, though not essential, that it be bent around the periphery of the inner conductor 2 at one end of the inner conductor in the manner shown, so that the areas 5 bulge outward and the ends of the ribbon just about touch each other so as to form a continuous circularly arranged strip. The inner conductor 2 is undercut at 7 to keep the contact strip 3 in place. The flanges or flat surfaces 6 thus each make contact with the outer surface of conductor 2 along its entire periphery, while the resiliently bulging contact areas 5 make a multiplicity of contacts with the inner surface of the outer telescoping conductor 1 around its inner circumference. If desired, another resilient metal strip 3 can be placed at another location between the telescoping conductors but bent oppositely to the first ribbon so as to have the flange-like area 6 contact the inner surface of

the outer conductor 1 and the resilient bulging areas 5 contact the outer surface of the inner conductor 2, in the manner shown in Fig. 1. Outer conductor 1 is undercut at 3 to accommodate this last ribbon.

In assembling the telescoping conductors, the resilient ribbons should first be positioned within the respective undercuts of the conductors in the desired manner before the pipes are telescoped together.

By means of the arrangement above described, there is obtained very good electrical contact at all times between the telescoping conductors at a multiplicity of points, and also good sliding action as the conductors move over the resilient ribbons. Because of the fact that the resilient ribbons are completely enclosed between the telescoping conductors, the ribbons cannot be injured mechanically, once the conductors have been assembled, nor can dust or dirt enter between the conductors to interfere with the good electrical contact between the conductors.

In one embodiment actually tried out in practice, the telescoping conductor arrangement of the invention was employed daily for over five months on a 200 megacycle system, and functioned perfectly at all times.

What is claimed is:

1. A high frequency electrical conductor having, in combination, a pair of telescoping electrically conducting sections movable longitudinally relative to each other, and a resilient metallic ribbon located between said sections for assuring electrical contact therebetween, said ribbon extending substantially around the periphery of the inner section of said pair and having transverse slits along its length to provide a multiplicity of successive bulging contact areas adapted to make sliding contact with one of said sections, said multiplicity of contact areas being of sufficient number and closely spaced to provide a substantially uniform contact surface for the length of said ribbon.

2. A high frequency electrical conductor having, in combination, a pair of telescoping electrically conducting sections movable longitudinally relative to each other, and a ribbon of sheet metal extending substantially around the periphery of the inner section of said pair and located therebetween, said ribbon having transverse cuts intermediate the edges of the ribbon and so formed as to produce along the length of said ribbon a multiplicity of bulging contact areas, said multiplicity of contact areas being closely spaced and of sufficient number to provide a substantially uniform contact surface for the length of said ribbon, the edges of said bulging areas directly engaging one of said sections and said bulging areas directly engaging the other of said sections, whereby said ribbon provides good electrical contact between said sections and enables effective movement therebetween.

3. A high frequency electrical conductor hav-

ing, in combination, a pair of telescoping electrically conducting sections movable relative to each other, and a ribbon of sheet metal extending around the periphery of the inner section of said pair and located therebetween, said ribbon having substantially equal length transverse cuts intermediate the edges and so formed as to provide along the length of the ribbon a multiplicity of bulging contact areas terminated at the edges by flat flange-like surfaces, said surfaces directly engaging the inner section of said pair and said bulging areas directly engaging the outer section of said pair, said contact areas being closely spaced and of sufficient number to provide a substantially uniform contact surface around the periphery of said inner section.

4. A high frequency electrical conductor having, in combination, a pair of telescoping electrically conducting sections movable relative to each other, and a ribbon of sheet metal extending around the periphery of the inner section of said pair and located therebetween, said ribbon having substantially equal length transverse cuts intermediate the edges and so formed as to provide a multiplicity of bulging contact areas terminated at the edges by flat flange-like surfaces, said surfaces directly engaging the outer section of said pair and said bulging areas directly engaging the inner section of said pair, said contact areas being closely spaced and of sufficient number to provide a substantially uniform contact surface around the periphery of said inner section.

5. In a high frequency electrically conducting system, a cylindrical electrical conductor, an electrically conducting element adapted to engage said conductor and be movable relative thereto, a resilient metallic ribbon located between said conductor and said element, said ribbon having transverse cuts intermediate the edges and so formed as to produce along the length of said ribbon a multiplicity of centrally located bulging successive contact areas terminated at the edges by flat flange-like surfaces, said flange-like surfaces directly engaging the inner surface of said cylindrical conductor and said bulging areas directly engaging said element, said cylindrical conductor being undercut in its interior surface to accommodate the flat surfaces of said ribbon, said multiplicity of contact areas being of sufficient number and closely spaced to provide a substantially uniform contact surface around the periphery of said element, and another similarly constructed resilient ribbon also located between said cylindrical conductor and said conducting element but spaced apart from said first ribbon, the flange-like surfaces of said second ribbon directly engaging said element while the bulging areas of said second ribbon directly engage the inner surface of said cylindrical conductor, said element being undercut to accommodate the flat surfaces of said second ribbon.

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