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by
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Their Attorney.
In the manufacture of high-frequency cable with coaxial conductors, various ways have been tried to keep the inner conductor at a constant distance from the tube shaped outside conductor, so that the possibility of bending the cable under all circumstances is assured but the insulating parts of the cable are so constructed that a continuous manufacturing process is permitted. The distance pieces of insulating material are so shaped that they do not surround the inner conductor. Their longest dimensions are the same as the distance between the inner and outer conductors.

A further object of the invention is in the provision of a process for manufacturing such a cable. For instance the individual insulating bodies c can be shaped in the form of a cone and arranged on a band of conducting or non-conducting material. This band together with the insulating parts can be placed around the inner conductor in such a manner that the cone points are toward the inside and the band toward the outside. The spacing of the insulating parts on the band or the pitch can be so selected that in consecutive windings of the band the projections of the insulating parts along the axis of the cable do not extend in a longitudinal line but are displaced radially around the cable. In this way a greater flexibility of the cable is assured. The band may be made of paper, high quality insulating material, or of conducting material, for example, copper foil. In the present case the band forms a part of the tube-shaped outside conductor.

Another possibility of the continuous manufacture of the insulating parts consists in winding around the inner conductor a perforated band in a tube shaped formation. The band may consist of insulating or conducting material. Holes are arranged at regular distances on the band and have such a diameter that it is possible for the insulating parts to pass through them. In winding the band the supply reel as well as the take-up reel for the inner conductor rotate around the axis of the conductor while the supply reel for the band rotates on a fixed pivot. The individual insulating parts in the forward movement of the cable fall from a supply container through the holes or they may be passed through and held in position by means of a second imperforate band wound directly over the first band. In case none of the bands consists of conducting material the coaxial outside conductor follows and may consist of a number of flat wire strands wound with a long pitch spiral.

Another form of the process above described consists in the use of a band with small bulges instead of a perforated band. The insulating parts in this case are ball shaped and during the manufacture of the self-supporting hose are placed in position between the tube and inner conductor where they are held by means of the bulges in the tube.

Referring to the drawing Fig. 1 shows a cross-section through a cable made according to our invention; Fig. 2 shows a longitudinal section through the cable of Fig. 1, and Figs. 3 and 4 show longitudinal sections through modifications of the cable.

In the form of the invention shown by Figs. 1 and 2 an outer conductor b fitted with insulated cones c is wound spirally around an inner conductor a. The cones point toward the inner conductor and by making substantially point contact with the same act to support the outer conductor and at the same time present a minimum of dielectric material in contact with the inner conductor, thereby reducing dielectric losses. The insulating cones are so spaced on the conductor band that as the band is wound spirally around the inner conductor the cones are placed radially around the cable and, hence, increase the flexiblity of the cable. The radial arrangement is clearly shown by Fig. 1.

In the form of the invention shown by Fig. 3 the cones c are passed through holes formed in an insulating band d so that as the band is wound spirally around the inner conductor a the band is held in spaced relation to the conductor by the cones c. The cones c are held in position by a second insulating band e which is wound on the band d and engages the bases of the cones to hold them in position in the opening in the band d. The outer conductor of the high frequency cable is then wound on the insulating bands.
and may comprise a plurality of conducting bands \( h \) wound with a long pitch spiral. In this manner the spiral conductors are spaced from the tubular inner conductor by insulating pieces having point contact with the inner conductor and therefore a high frequency cable of low dielectric loss and a high degree of flexibility is obtained.

Fig. 4 shows another form of the invention similar to the construction of Fig. 3 but in which the insulating pieces take the form of balls \( g \) which are seated in bulges or depressions \( f \) formed in the outer insulating bands \( d \). The conducting bands \( h \) are wound with a long pitch spiral over the insulating casing formed by the bands \( d \).

According to the invention a cable of low dielectric loss is formed by radial spacing of the spaced insulating pieces which make point contact only with the inner conductor and the longitudinal spacing of the pieces insures adequate flexibility of the cable. The cable may be manufactured by a continuous process, one advantage of which resides in the fact that as the outer covering is spirally wound upon the inner conductor the insulating pieces are carried by the outer coverings into contact with the inner conductor and hence the coverings are held in spaced relation to the inner conductors by the winding operation.

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

1. An electric cable comprising an inner conductor, a tape having spaced holes wound spirally around and spaced from the inner conductor, cones of insulating material partially passing through said spaced holes and retained on said tape for engaging the inner conductor to secure it centrally of said tape, and an outer conductor wound around said tape.

2. The process of manufacturing a high frequency cable consisting of winding a tape with spaced holes around an inner conductor, simultaneously passing distance pieces of insulating material partially through said holes and securing them in position on said tape by a second imperforate band wound over the first tape and winding an outer conductor upon said tape.

3. A high frequency cable comprising an inner conductor, a tape having spaced holes wound spirally around and spaced from the inner conductor, cones of insulating material partially passing through said spaced holes and seated on said tape for engaging the inner conductor to secure it centrally of said tape, a band wound spirally around said tape and coating with said cones to retain them in said holes, and an outer conductor wound around said tape.

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