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TRANSMISSION LINE
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Fig. 1

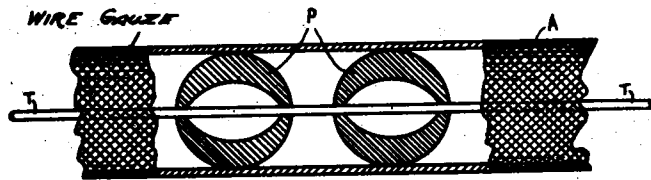
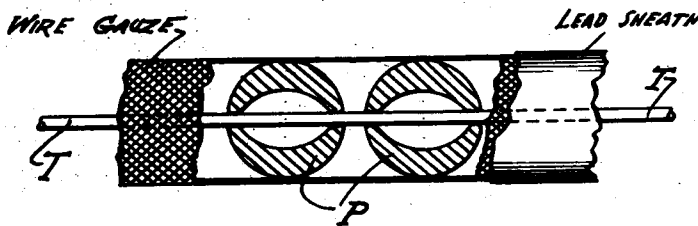


Fig. 2



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TRANSMISSION LINE

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7 Claims. (Cl. 173-265)

This invention relates to radio apparatus and in particular to high frequency cables to be used in signal transmission work.

In radio telegraphy installations the necessity arises quite often to transmit radio frequency energy with an incidental minimum amount of loss, for instance, in the connection of a transmitter with an aerial often located at a distance of several hundred meters. For this purpose, open wire lines have first been employed. But these involve the disadvantage that they radiate more or less markedly, and that they suffer supplementary losses by the influence of atmospheric agencies. On this ground, concentric copper tube lines have frequently been used though these are attended with mounting difficulties because of inherent rigidity, specially in broken country. Standard cables capable of being wound upon a drum of the kind used for audio frequency work are unserviceable for the transmission of very high frequencies because of unduly high dielectric losses.

According to the present invention insulation materials possessing very low losses are to be used for radio frequency cables. In order to be serviceable also for frequency between 3×10^4 and 3×10^8 cycles only an aggregate phase angle is admissible whose tangent at these frequencies is less than 20×10^{-4} . In order that the radio frequency line may not be rigid the insulation material must either be flexible or consist of short pieces of tubing or of beads. By choosing a suitable form for these beads it is also possible to make arrangements so that a minimum volume of dielectric material comes to be interposed between conductors. Quartz, steatite, glass, porcelain, etc., are good materials to be used for insulation.

A more complete understanding of the invention will be had from the following description and therefrom when read in connection with the drawing in which two modifications have been shown for purposes of illustration.

Referring to Figure 1, over a wire T a number of insulation beads P are shifted or threaded in close alignment. Placed over the string of beads is a wire netting or gauze, or a sheath or envelope consisting of metal foil, the assembly as stated, if desired, being wrapped with a sheath of lead pressed therearound as shown in Figure 2. What thus results is a concentric cable whose internal conductor consists of the wire T and whose outer conductor of the wire gauze or the foil envelope A. Both are insulated by means of the beads P having preferably a shape

such that at the points of maximum field intensity there is a minimum amount of dielectric material between the conductors, and that the contact surface between the beads and conductors, especially the inner conductor, is minimized. It is also possible to arrange a plurality of internal conductors having a string of beads disposed thereon inside a joint sheath or shell.

Having thus described my invention and the operation thereof, what I claim is:

1. A radio frequency cable comprising spaced inner and outer conductors means for spacing said conductors, said spacing means being in the form of spherical beads threaded over the inner conductor, said beads being of low loss material having apertures substantially equal at the ends of said apertures to the diameter of said inner conductor, but gradually increasing in diameter toward the center of said spacing means.

2. A radio frequency cable comprising spaced inner and outer conductors, the said outer conductor being of wire gauze, means for spacing said conductors, said spacing means being in the form of spherical beads threaded over the inner conductor, said beads being of low loss material having apertures substantially equal at the ends of said apertures to the diameter of said inner conductor, but gradually increasing in diameter toward the center of said spherical beads.

3. A radio frequency cable comprising spaced inner and outer conductors, means for spacing said conductors, said spacing means being in the form of spherical beads threaded over the inner conductor, said beads being of low loss material having ellipsoid shaped central apertures substantially equal at the ends of said apertures to the diameter of said inner conductor but gradually increasing in diameter toward the center of said spacing means.

4. A radio frequency cable comprising spaced inner and outer conductors, means for spacing said conductors, said spacing means being in the form of spherical beads threaded over the inner conductor, said beads being of low loss material having oval-shaped central apertures substantially equal at the ends of said apertures to the diameter of said inner conductor but gradually increasing in diameter toward the center of said spacing means.

5. A radio-frequency cable comprising spaced inner and outer conductors, means for spacing said conductors, said spacing means being in the form of spherical beads threaded over the inner conductor, said beads being of low loss material having central apertures the arc of which

when taken in longitudinal cross-section has a radius substantially equal to the radius of said beads, the radius of said arc having its center location offset from the center point of the radius of said spherical beads by a distance substantially equal to one-half that of said radius.

6. A radio-frequency cable comprising spaced inner and outer conductors, the outer conductor being of wire gauze, a lead sheath surrounding said gauze, means for spacing said conductors, said spacing means being in the form of spherical beads threaded over the inner conductor, said beads being of low loss material having apertures substantially equal at the ends of said apertures to the diameter of said inner conductor

but gradually increasing in diameter toward the center of said spherical beads.

7. A radio-frequency cable comprising spaced inner and outer conductors, the outer conductor being of wire gauze, a lead sheath surrounding said gauze, means for spacing said conductors, said spacing means being in the form of spherical beads threaded over the inner conductor, said beads being of low loss material having oval-shaped central apertures substantially equal at the ends of said apertures to the diameter of said inner conductor but gradually increasing in diameter toward the center of said spacing means.

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