Dec. 22, 1953 J. F. BIANCO 2,663,754

SLOTTED DIELECTRIC COAXIAL LINE
AND PROCESS FOR MAKING SAME
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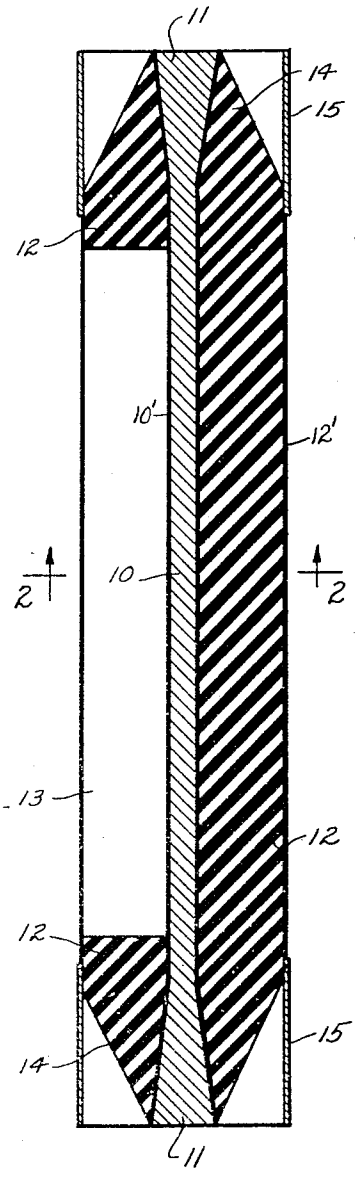
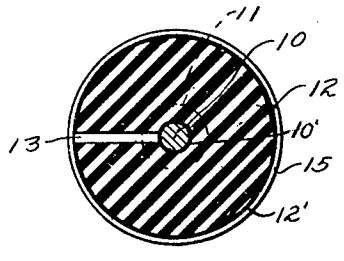


FIG. 1

FIG. 2



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SLOTTED DIELECTRIC COAXIAL LINE AND PROCESS FOR MAKING SAME

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5 Claims. (Cl. 174—102)

(Granted under Title 35, U. S. Code (1952), sec. 266)

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The invention described herein may be manufactured and used by or for the Government for governmental purposes without payment to me of any royalty thereon.

This invention relates to a slotted dielectric coaxial line of the kind used in radio, radar and television laboratories to measure the wave lengths of high frequency currents passing through it or along it.

A novel, expeditious and precise method for making the line forms a part of the invention.

Briefly stated, the line comprises a centerless-ground and electroplated central conductor, which may be of steel and which has reverse tapered ends; a cast or injection-molded dielectric about the central conductor, which dielectric is machined to size, including tapers, and then electroplated; force fit tubing on the ends of the dielectric; an electrically conductive surface plated on the dielectric and a narrow longitudinal machined or molded slot for the accommodation of a probe.

One object of the invention is the provision of a precision coaxial line for close measurement of wave lengths.

Another object is the reduction of machining time, the elimination of joints, the establishment of a close, airfree junction of the conductor and the dielectric and the elimination of inside machined taper with consequent increase in the precision of the machining operations.

Another object is the provision of a particularly efficient manufacturing method for making the line.

Referring now to the drawings, Fig. 1 is a longitudinal section taken through the slot and the solid parts of the line.

Fig. 2 is a cross section of the line taken on the line 2—2 of Fig. 1.

10 is a central conductor which may be of copper, brass, steel or equivalent metal. If of steel, it is copper or brass-plated as indicated by the heavy line 10'. At its ends 11 the diameters are reverse-tapered at an angle of about 10°, giving sufficient enlargement to hold a dielectric 12 tightly on the conductor 10 without the possibility of removal over the ends.

The dielectric is electroplated after molding or casting by coating its exterior with a highly conductive material, for example a paste or liquid made of finely divided graphite or copper powder plus a vehicle. Such compositions are well known. The coating may be accomplished by spraying, brushing or dipping. The electroplating is accomplished in the conventional manner,

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using available techniques to insure that the deposited material is not stressed.

The dielectric is a low-loss mechanically stable synthetic resin which may be of either the kind which must be cast or the kind which may be injection molded and plated with copper or brass, preferably, as indicated by the heavy line 12'. General Electric phenolic resin Textolite is an example of the first, while polystyrene (the preferred material) is an example of the second. The depth of dielectric may be widely varied as long as it is sufficient to prevent puncture by sparks or arcs resulting from high voltages.

As shown by the drawings, the cable has a long slot 13 intermediate the ends thereof for the reception of a probe. In practice, the slot 13 is about $\frac{3}{16}$'' wide and extends to the bare conductor. It may be produced by milling or molding. Other widths may be used. It is as long as the frequency range to be covered requires without interfering with the dielectric ends 14. These are tapered outwardly at an angle approximating 45° which however, is not critical. An air termination, which is desirable, is thereby produced. Thin metal ends 15 made of tubing and attached with a press fit are used to complete the cable, these being preferably brass, which may be nickel or chrome plated. Standard coaxial cable fittings may be used to join pieces of cable of the above description. The dielectric of different pieces may be cemented together and electrical connections may be aided by applying conductive pastes (which are known) to the junctions to make the connections electrically good. Irregular bends may be molded into the cable if required. Special tapers may also be employed.

The method of using the cable and probe to measure wave lengths is conventional, so will not be described.

What I claim is:

1. A coaxial cable comprising a central conductor, reverse tapered ends on said conductor, a plating of a highly conductive metal on said conductor and ends and a dielectric tightly molded about said conductor and ends to the furthest extremities thereof, said dielectric being electroplated on its outer surface and having a narrow longitudinal slot substantially deep enough to reach the conductor.

2. A coaxial cable according to claim 1 having in addition tapered ends on said dielectric and cylindrical tubing surrounding the tapered portion thereof, said tubing being attached to the outer surface of said dielectric with a press fit.

3. A coaxial cable having a central conductor of exact predetermined diameter, reversely tapered ends on said conductor, an envelope of dielectric over said conductor and ends, a thin coat of highly conductive metal over said dielectric, tapered ends on said dielectric, and metallic tubing ends over said tapered ends, said tubing ends being in good electrical contact with said metal coat.

4. The process of making a coaxial cable which comprises centerless grinding a steel conductor with reverse tapered ends, electroplating the entire conductor with a highly conductive metal, molding a covering of dielectric about the conductor, said covering consisting of a mechanically stable, low electrical loss synthetic resin and then electroplating the outer surface of said covering with a highly conductive metal.

5. The process set forth in claim 4 and in addition the steps of molding tapered ends and a longitudinal slot in the cable and attaching highly conductive tubing ends to the cable over the tapered ends with a tight fit over the plated dielectric.

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