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[54] COAXIAL CABLE INNER CONDUCTOR

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[51] **Int. Cl.**.....**H01b 5/14**

[58] **Field of Search.**174/107, 106 R, 126 C, 126 CP, 174/128, 131 A, 130, 105 R, 36

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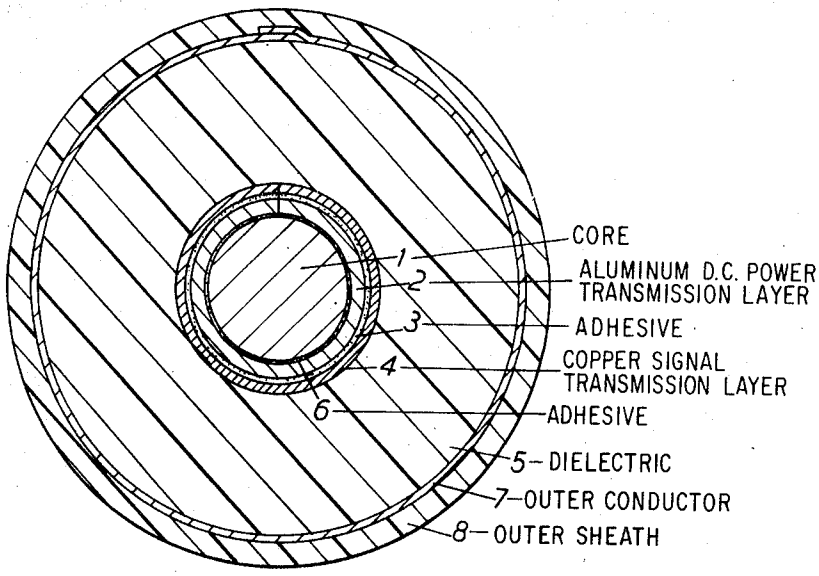
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[57] **ABSTRACT**

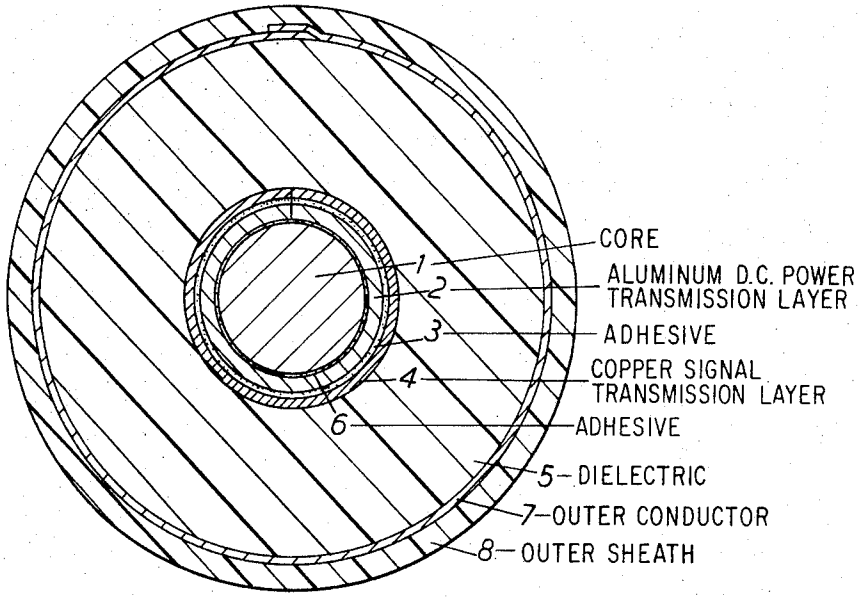
A laminate structure for the inner conductor of a coaxial cable includes a thin outer copper layer and an inner aluminum layer over a central core. The outer layer is used for signal transmission and the inner layer for direct current, with adhesives bonding the layers together and to the core. A dielectric layer and outer conductor and sheath are added to complete the cable structure. Use of copper in the inner conductor is reduced without increasing high frequency attenuation and direct current resistance.

7 Claims, 1 Drawing Figure



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COAXIAL CABLE INNER CONDUCTOR

BACKGROUND OF THE INVENTION

1. Field of the Invention

This invention relates to coaxial cables and, in particular, to inner conductors of submarine cables.

2. Description of the Prior Art

The thickness of the inner conductor of a submarine coaxial cable, which generally comprises a metal tape wrapped around a central strength member core, is determined by two factors. Firstly, the minimum operating frequency of the frequency range, the higher the frequency the thinner the tape, and secondly the d.c. voltage drop along the cable. The inner conductor transmits high frequency signals and also d.c. power to feed the repeaters provided at intervals along the length of the cable. The higher the frequencies used, the shorter is the distance between the repeaters, and, consequently, the lower the d.c. voltage drop required. This is achieved by utilizing a thicker tape. The two factors governing the thickness of the inner conductor tape are, therefore, in direct opposition.

Another requirement for submarine coaxial cables is that it must be possible to transfer the tension in the strength member core to the surface of the cable, for example at the point of entry of the cable into a repeater, by means of the adhesion between the various layers constituting the cable.

From the signal transmission point of view the best available metal for the inner conductor is copper. This is, however, wastefully expensive for the transmission of d.c. power.

SUMMARY OF THE INVENTION

It is the object of the present invention to provide an alternative less costly more efficient construction for the inner conductor of submarine coaxial cables.

According to the present invention there is provided a submarine coaxial cable including a central strength member core and an inner conductor tape longitudinally wrapped around the core, wherein the inner conductor tape comprises a laminate of a first metal bonded to a second metal by an adhesive, the first metal, which is outermost when the laminate is wrapped around the core, being used for signal transmission purposes and comprising a metal strip of a thickness which is the minimum compatible with the minimum operating frequency of the cable, the second metal being used for d.c. power transmission and comprising a metal strip of a thickness dictated by the voltage drop required between repeaters positioned at intervals along the length of the cable, and wherein the second metal layer is bonded to the core to transmit interlayer strength.

BRIEF DESCRIPTION OF THE DRAWING

An embodiment of the invention will now be described with reference to the accompanying drawing which shows a section (not to scale) through a submarine coaxial cable employing the inventive form of inner conductor.

DESCRIPTION OF THE PREFERRED EMBODIMENT

An inner conductor according to the invention basically comprises a laminate consisting of a layer of a first metal and a layer of a second metal bonded to one another by a layer of an adhesive substance. The first metal is suitable for high frequency signal transmission and it is of the minimum thickness compatible with the minimum operating frequency for which the cable is intended. The second metal is suitable for the transmission of d.c. power for operating the repeaters, and is of a thickness compatible with the required voltage drop between the repeaters.

In the drawing the laminate, which comprises layers **2**, **3** and **4** (layer **2** being the second metal) in the form of a strip, is longitudinally wrapped around a central strength member core **1**, comprising either a solid rod or a stranded bunch of wires, with the longitudinal edges of the tape abutting. The laminate is held in position whilst dielectric **5** is extruded over it in a conventional manner. After cooling of the dielectric, and core shaving if necessary, an outer conductor (return) tape **7** is then longitudinally wrapped with the overlap around the dielectric **5**, and an outer protective insulating sheath **8** extruded over it.

In order for it to be possible to transfer the tension in the strength member core to the outer surface of the cable there must be adhesion between the various layers constituting the cable. An adhesion improving substance, for example an adhesive layer **6** is thus provided between the metal layer **2** and the core **1**, and another adhesive layer **3** may also be employed between metal layers **2** and **4** of the cable.

In a preferred embodiment the first metal, that is the signal transmitting layer **4**, is copper and the second metal, that is the d.c. power transmission layer **2**, is aluminum, it being cheaper than copper. A suitable adhesive for bonding the first and second metal layers together is a copolymer, and a suitable adhesive for bonding the second metal layer to the strength member core is an epoxy resin.

Whilst the invention has been described with the laminate tape wrapped around the core **1** with its longitudinal edges abutting, it is possible for the laminate tape to be applied with its longitudinal edges overlapping, or with the butting edges of the two tape layers displaced circumferentially.

The inner conductor laminate provides a method of reducing the inner conductor cost without increasing the cable high frequency attenuation or increasing the inner conductor direct current resistance.

What is claimed is:

1. A cable comprising a central strength member core and an inner conductor tape longitudinally wrapped around said core, said inner conductor tape including a laminate of a first outer metal layer, a second inner metal layer and an adhesive layer between said first and second layers, said first outer metal layer being of a material of lower resistivity than said second inner metal layer and being adapted for signal transmission, said first outer metal layer being of a minimum thickness in accordance with the minimum operating frequency of the cable, said second inner metal layer being adapted for direct current power transmission and being of a thickness in accordance with a predeter-

mined voltage drop between intervals along the length of the cable and being bonded to said core for interlayer strength.

2. The cable as claimed in claim 1, wherein the first outer metal layer is of copper and the second inner metal layer is of aluminum.

3. The cable as claimed in claim 2, wherein said laminate is wrapped around the core with the longitudinal edges overlapping.

4. The cable as claimed in claim 2, wherein said laminate is wrapped around the core with its longitudinal edges abutting.

5. The cable as claimed in claim 2, including an adhesive layer bonding said second metal layer to said core, said core being of metal.

6. The cable as claimed in claim 5, wherein said adhesive layer is of epoxy resin.

7. The cable as claimed in claim 5, including a dielectric layer over said outer metal layer, an outer conductor tape around said dielectric layer and an outer insulating sheath around said outer conductor tape.

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