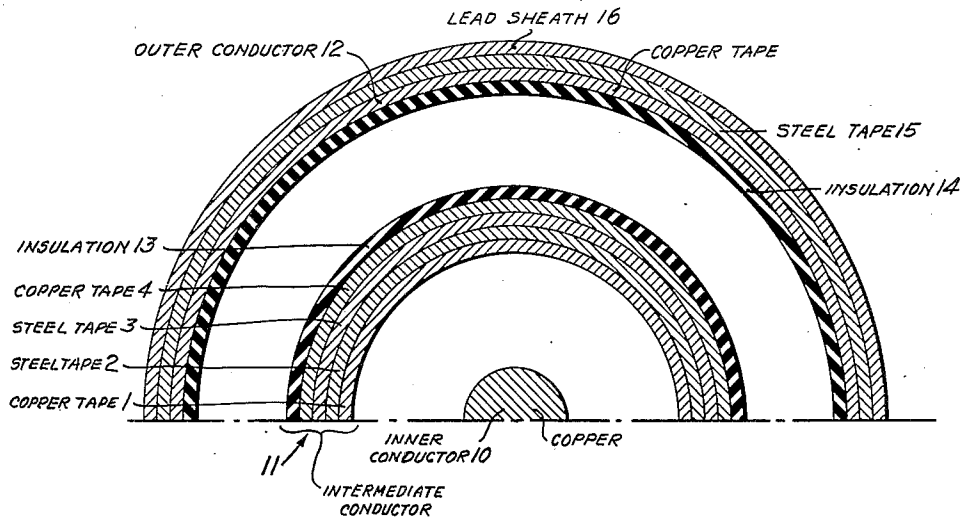
Nov. 27, 1951 W. K. WESTON ET AL 2,576,163

CONCENTRIC CONDUCTOR ELECTRIC CABLE WITH MAGNETIC SCREEN

Filed May 8, 1948



INVENTORS
WILLIAM K. WESTON
ERIC BAGULEY
BY Thomas A. Frey Jr.
ATTORNEY

Patented Nov. 27, 1951

2,576,163

UNITED STATES PATENT OFFICE

2,576,163

CONCENTRIC CONDUCTOR ELECTRIC CABLE WITH MAGNETIC SCREEN

William Kirby Weston and Eric Baguley, London, England, assignors to International Standard Electric Corporation, New York, N. Y.

Application May 8, 1948, Serial No. 25,886
In Great Britain May 10, 1945

6 Claims. (Cl. 174—28)

1

This invention relates to concentric conductor cables of the kind in which there is a central conductor, an intermediate tubular conductor concentric with the central conductor and an outer tubular conductor concentric with the central and intermediate conductors.

In such a cable it is possible to use the circuit formed by the outer and intermediate conductors as one communication channel and simultaneously to use the circuit formed by the intermediate and central conductors as a second communication channel.

It is well known that the high frequency signaling currents used in concentric conductor cable circuits are subject to skin effect, that is to say they are largely confined to those surface layers of the two conductors forming a circuit which are nearest together, the proportion of the total current carried by a specified thickness of the conductor being dependent on the frequency, and the dimension and electrical properties of the conductors.

Signaling currents of both circuits in the above case will therefore be carried in the intermediate conductor but will be at least partially separated from each other by the action of skin effect. However if the frequency bands employed in the two circuits overlap the amount of interference between the circuits may become appreciable and special measures are then desirable to eliminate or reduce this interference.

According to the invention we provide a concentric conductor cable comprising a central conductor, an intermediate conductor and an outer conductor, all coaxial, in which the intermediate conductor is divided into inner and outer conductors separated by a thin magnetic screen, thus affording electromagnetic screening between the currents transmitted over the inner concentric conductor cable constituted by the central conductor and the inner portion of the intermediate conductor and those transmitted over the outer concentric conductor cable constituted by the outer portion of the intermediate conductor and the outer conductor.

The invention will be better understood from the following description taken in conjunction with the accompanying drawings in which the single figure is an enlarged cross sectional view of part of one form of intermediate conductor in a concentric conductor cable according to the invention.

In the figure is shown a double concentric conductor cable with a central conductor 10 and an intermediate conductor 11 having a composite

2

structure forming an electromagnetic screen. This screen consists of an inner copper layer 1, which may be formed of a multi-copper tape spiral having a long lay or of a tube formed of a single tape folded into a tube with the edges abutting and having projections thereon. In the present case the projections on the tape would be formed so as to overlie the edges. Outside this are two layers 2 and 3 of steel tape spirals laid with a short lay and having opposite directions of lay. Or there may be one layer only of such steel tape spiral. Outside this again is the inner conductor 4 of the outer concentric conductor line formed in either of the ways above described for the layer 1, except that if the conductor 4 is formed of the tape with projections along its edges, these projections are caused to underlie the opposite edge. The construction above described forms an electromagnetic screen between the inner and outer concentric-conductor lines and prevents any mutual disturbances between the transmission currents along the respective lines.

The conductor thus described forms the intermediate conductor of a double concentric conductor cable for land use having mainly air spacing between the several conductors. This intermediate conductor is held in spaced relation from the innermost conductor by means of spacing washers slotted for application to the innermost conductor by a sideways movement.

Immediately over the intermediate conductor is applied a thin covering 13 of insulating material, for example, a solid polymer of ethylene which serves to hold the copper tapes in position. Over this insulating covering are applied at intervals slotted washers of the same insulating material. These washers are enclosed within an extruded tube of insulating material 14 over which is formed the outer conductor which consists of copper tapes 12 laid up side by side with a long lay to form a tube.

These copper tapes are held together by an outer winding of steel tape 15 laid up with a short lay to form an electromagnetic screen. The cable is completed by an outer lead sheath 16.

What is claimed is:

1. A flexible triple coaxial conductor of the type including concentrically arranged inner, intermediate and outer conductors with the inner and intermediate conductors comprising a first transmission circuit and the intermediate and outer conductors comprising a second and independent transmission circuit, the said intermediate conductor being a composite stratified

structure of which each of the outer layers is a longitudinally folded copper tape constituting one conductor each of each circuit, and at least one layer is of longitudinally folded steel tape between the outer layers of said stratified structure, whereby electromagnetic interference of one circuit with the other is minimized.

2. A flexible triple coaxial conductor system of the type defined in claim 1, further characterized in that the intermediate conductor comprises a layer of insulating material on the outermost layer of folded copper tape whereby the tape is held in folded arrangement without impairing the flexibility of the conductor.

3. A flexible triple coaxial conductor system of the type defined in claim 1 further characterized in that the intermediate conductor comprises overlaying layers of longitudinally folded steel tapes helically wound in long lay and laid in opposite directions, disposed between the outer layers of longitudinally folded copper tape.

4. A flexible triple coaxial conductor cable of the type including concentrically arranged inner, intermediate and outer conductors arranged so that the inner and intermediate conductors can comprise a first transmission circuit and the intermediate and outer conductors can comprise a second and intermediate transmission circuit, the said intermediate conductor being a composite stratified structure of which each of the outer layers is a longitudinally folded copper tape constituting one conductor each of each

circuit, and at least one layer is of longitudinally folded steel tape between the outer layers of said stratified structure, whereby electromagnetic interference of one circuit with the other is minimized.

5. A flexible triple coaxial conductor cable of the type defined in claim 4 further characterised in that the intermediate conductor comprises a layer of insulating material on the outermost layer of folded copper tape whereby the tape is held in folded arrangement without impairing the flexibility of the conductor.

6. A flexible triple coaxial conductor cable of the type defined in claim 4, further characterised in that the intermediate conductor comprises overlying layers of longitudinally folded steel tapes helically wound in long lay and laid in opposite directions, disposed between the outer layers of longitudinally folder copper tape.

WILLIAM KIRBY WESTON.
ERIC BAGULEY.

REFERENCES CITED

The following references are of record in the file of this patent:

UNITED STATES PATENTS

Number	Name	Date
1,037,522	Von Pindtershafen	Sept. 3, 1912
1,854,255	Green	Apr. 19, 1932
2,092,023	Rost	Sept. 7, 1937
2,319,744	Mongey	May 18, 1943