

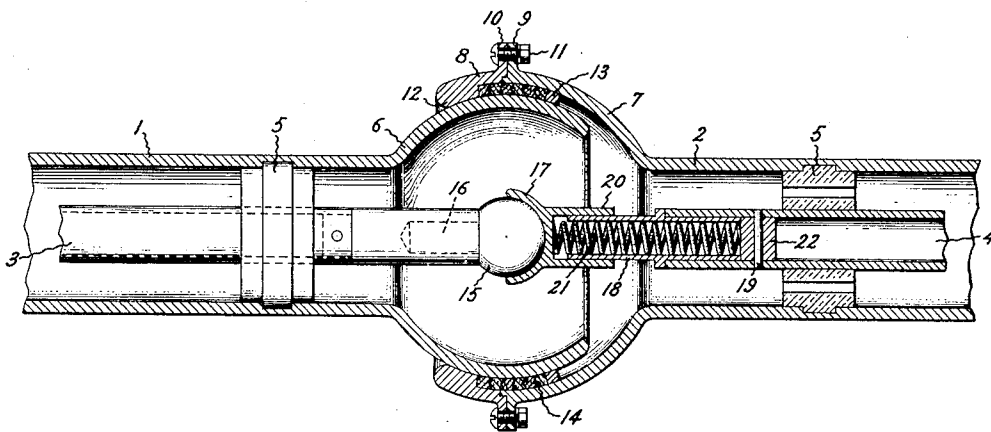
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ROTATABLE JOINT FOR COAXIAL CABLES

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ROTATABLE JOINT FOR COAXIAL CABLES

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My invention relates to a transmission line for high frequency currents and it has for its object to provide a new and improved rotatable joint for a transmission line of the concentric conductor type.

In ultra-high frequency signalling apparatus, and in particular, apparatus which employs a rotatable antenna for either directing or receiving signals, it is desirable to transmit, without reflection, signals between the antenna and high frequency apparatus connected therewith. It is known in such systems to use a coaxial transmission line which provides shielded transmission of high frequency currents and, in many instances where higher voltages are employed, such transmission lines are filled with a gaseous medium to prevent discharge between the conductors thereof.

It is an object of the present invention to provide a new and improved rotatable joint for a concentric transmission line of the gas-filled type.

The features of my invention which I believe to be novel are set forth with particularity in the appended claims. My invention itself, however, both as to its organization and method of operation, together with further objects and advantages thereof, may best be understood by reference to the following description taken in connection with the accompanying drawing, in which the single figure is a longitudinal view, partly in section, showing a portion of a concentric transmission line employing the rotatable joint of my invention.

Referring to the drawing, I have shown two adjacent sections of a concentric transmission line comprising, respectively, tubular outer conductors 1, 2 and centrally disposed inner conductors 3, 4. The inner conductors are shown as hollow tubes, although solid conductive rods may be employed instead. The inner conductors are maintained in a central position within the outer conductors by means of a plurality of insulators 5. The outer conductor 1, at its right-hand end, is provided with a spherical end member 6 and the outer conductor 2, at its left-hand end, is provided with a similar spherical end member which fits over the end member 6 and comprises a hemispherical portion 7 attached to the conductor 2 and a zone-shaped portion 8 which slips over the spherical member 6. The portions 7 and 8 are provided with opposed flanges 9, 10 and are clamped together by means of a plurality of bolt and nut combinations 11. The zone-shaped portion 8, at its left-hand end,

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is provided with a shoulder portion 12 machined to fit the outer surface of the spherical member 6 to obtain good conductive connection therewith.

A contact ring 13 is attached to the inner surface of the hemispherical portion 7, as by welding or brazing, and provides a conductive connection between the part 7 and the member 6. Interposed between the contact rings 12, 13 is a packing material 14, illustrated as of the chevron type, for preventing leakage of gas from the transmission line.

A rotatable conductive connection between the inner conductors of the members 3, 4 of the transmission line is provided and comprises a spherical member 15 having a threaded stud 16 for attachment to the conductor 3, and a hemispherical contact member 17 conductively connected to the inner conductor 4 by means of a tubular plug 18 which extends within the conductor 4 and is fastened thereto by means of a pin 19. The tubular plug 18 is adapted to fit within a sleeve portion 20 attached to the hemispherical contact member 17. The resilient member or spring 21 located within the tubular plug 18 engages a base portion 22 of the plug, maintaining the member 17 in contact with the spherical member 15. When the rotatable joint is used in a gas-filled transmission line, the insulators 5 may have a plurality of longitudinal holes 23 to permit free communication of gas between the adjacent sections of the transmission line.

In the operation of the rotatable joint, the spring member 21 assures positive contact between the rotatable portions of the inner conductor and the rings 12, 13 assure good electrical conduction between the adjacent sections of the outer conductors. To assure continuity of the impedance characteristic throughout the structure, the ratio of the diameter of spherical member 15 to the diameter of the spherical member 6 is made equal to the ratio of the diameter of the inner conductor 3 to the diameter of the outer conductor 1. The same ratio exists between the diameters of hemispherical members 17 and the parts 7 and 8. Such a construction provides uniform impedance characteristic throughout the transmission line and provides a rotatable joint which permits considerable rotation of the sections of the coaxial transmission line over a range of about 60 degrees without introducing any electrical discontinuities in the system.

While I have shown a particular embodiment of my invention, it will of course be understood that I do not wish to be limited thereto since various modifications may be made, and I contemplate by

the appended claims to cover any such modifications as fall within the true spirit and scope of my invention.

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

1. A rotatable joint of the universal type for connecting adjacent sections of a coaxial transmission line having a tubular outer conductor and a centrally disposed inner conductor comprising overlapping spherical parts attached to the outer conductors of said sections, the inner conductor of one of said sections having a spherical end member attached thereto, a hemispherical member movably contacting said end member, the ratio of the inner diameter of the inner of said overlapping parts to the outer diameter of said end member being equal to the ratio of the inner diameter of said tubular conductor to the outer diameter of said inner conductor, and means including a resilient member conductively connecting said hemispherical member to the inner conductor of the other of said sections.

2. A rotatable joint of the universal type for connecting adjacent sections of a coaxial transmission line having a tubular outer conductor and a centrally disposed inner conductor comprising overlapping spherical parts attached to the outer conductors of said sections, said parts being provided with contact rings for maintaining continuous conduction therebetween, the inner conductor of one of said sections having a spherical end member attached thereto, a hemispherical member movably contacting said end member, the ratio of the inner diameter of the inner of said overlapping parts to the outer diameter of said end member being equal to the ratio of the inner diameter of said tubular conductor to the outer diameter of said inner conductor, and means including a resilient member conductively connecting said hemispherical member to the inner conductor of the other of said sections.

3. A rotatable joint of the universal type for connecting adjacent sections of a gas-filled co-

axial transmission line having a tubular outer conductor and a centrally disposed inner conductor comprising overlapping spherical parts attached to the outer conductors of said sections, the outer of said parts being provided with a plurality of rings contacting the outer surface of the inner of said parts for maintaining continuous conduction between said sections, a gas-sealing means confined between said parts and said rings, the inner conductor of one of said sections having a spherical end member attached thereto, a hemispherical member movably contacting said end member, and means including a resilient member conductively connecting said hemispherical member to the inner conductor of the other of said sections, the ratio of the inner diameters of the outer and inner overlapping parts respectively to the outer diameters of said hemispherical and spherical members being equal to the ratio of the inner diameter of said outer conductor to the outer diameter of said inner conductor.

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