Aug. 18, 1936. J. EVANS 2,051,520

CROSS TALK ELIMINATOR

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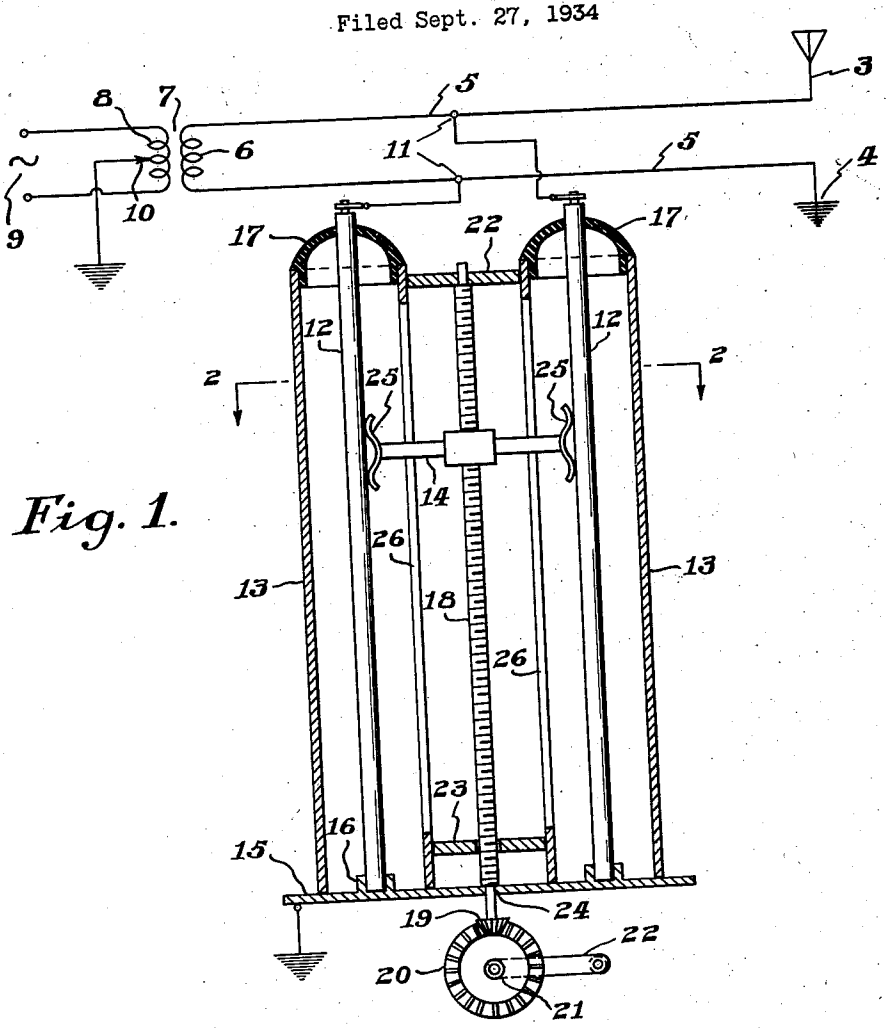


Fig. 1.

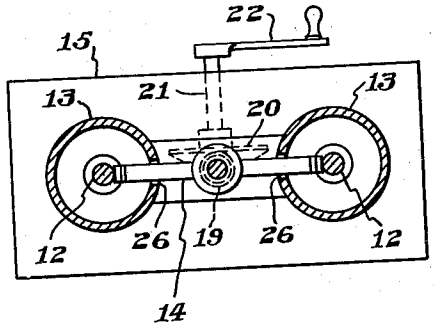


Fig. 2.

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CROSS TALK ELIMINATOR

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4 Claims. (Cl. 250—17)

This invention relates to apparatus for cross-talk elimination when used in connection with radio communication systems.

The device has particular utility in systems operated at ultra high frequencies. My cross-talk eliminator may be employed either at a radio transmitter or adjacent a receiver. In either case it is usually necessary to provide an electrical circuit of appreciable length between the antenna and the radio apparatus. If two or more ultra high frequency transmitters are located in close proximity to one another and their radiating frequencies happen to be sufficiently close so as to produce undesirable beats, due to rectification of energy in the plate circuits, it then becomes a problem how to avoid the deleterious effects of such mutual interference.

Accordingly, it is among the objects of my invention to provide a cross-talk eliminator which is adapted to be connected to the transmission lines ordinarily employed between an antenna and a radio apparatus such that interfering waves of a frequency other than the operating frequency of the radio apparatus will be substantially drained to ground or short-circuited before they can have any deleterious effect.

Another object of my invention is to provide a cross-talk eliminator having manually adjustable means for the introduction across the transmission lines to an antenna system of a low impedance path with respect to interfering waves of frequencies lower than the operating frequency of the system.

Another object of my invention is to provide adjustable means suitably shielded whereby two conductors of a transmission system may be interconnected, the interconnecting path being of substantially a half-wave length at the operating frequency of the system.

The foregoing and other objects and advantages of my invention will best be understood upon reference to the following detailed description in connection with the accompanying drawing, in which

Figure 1 shows partly diagrammatically and partly in cross section one embodiment of my cross-talk eliminator; and

Fig. 2 shows a sectional view of the device, the section being taken in the plane 2—2 of Fig. 1.

It is well known that when some definite frequency is being impressed upon a given two-wire transmission line, two points on said line may be selected which are electrically 180 degrees out of phase with one another and these points may be interconnected by a bridging conductor which, when adjusted to a half-wave length, offers practically an infinite impedance to alternating currents of said frequency, provided certain precautions are taken to minimize radiation losses. For stray frequencies other than the operating frequency in the transmission line, however, such a bridging conductor affords a very low impedance. It may readily be seen, therefore, that if I provide adjustable means for tuning the bridging connection between the two conductors of a transmission line, that I am able to suppress substantially all parasitic frequencies lower than the working frequency of the system.

Referring to Fig. 1, I show an antenna 3 and counterpoise or ground 4, to which are respectively connected the transmission wires 5. At the other ends of these wires I may connect the winding 6 of a transformer 7. The other winding 8 of this transformer may, if desired, be made the primary upon which is impressed electrical energy from any suitable source 9. The winding 8 preferably, but not necessarily, has a center tap 10 which is grounded. Along the transmission lines 5 suitable points 11 may be selected at which to connect my cross-talk eliminator. These points 11 may be selected at any convenient part of the transmission line, provided they are substantially side by side so as to have opposite polarity.

Connecting with the transmission lines at each of the points 11 is a rod-like conductor 12 substantially surrounded by and coaxially disposed with respect to the shielding members 13. The length of these conductors and cylindrically shaped shields is determined by the lowest frequency at which the radio and antenna system are to be operated. With the structure as shown it is essential that a path be provided through the conductors 12 and through a bridging member 14 interconnecting the same such that the path will have an electrical length of substantially a half-wave length between the points 11 on the transmission lines 5.

Within certain tolerances it appears to be desirable, in order to minimize the losses, that the outside diameter of the conductors 12 and the inside diameter of the cylindrical shields 13 bear a certain ratio to one another. This ratio is preferably of the order of 1:3.6.

The conductors 12 and shielding cylinders 13 may be mounted on and supported by any suitable non-ferrous metallic platform structure such as the member 15. Sockets 16 may be provided, one at the bottom of each conductor 12, for centering the same within the cylinder. For a like purpose an insulating member 17 may be

used at the top of each cylinder, these insulators having each a hole in the center through which the conductor 12 may project slightly.

Between the two conductor rods 12 the bridging member 14 is so disposed that it may be moved up and down, or longitudinally of the conductors 12. In this manner the effective length of the electrical path between the two points 11 may be adjusted. A convenient means for accomplishing this adjusting operation is shown, by way of illustration, as constituted by a threaded shaft 18 engaging with an internally threaded portion of the bridging member 14. At one end of the shaft 18 I preferably employ a bevel gear 19 which meshes with a driving gear 20 fixedly mounted on a shaft 21 which may be rotated in any suitable manner, as by means of a crank 22. The shaft 18 may be journaled at the upper end in a member 22 which spans the space between the two cylinders 13. The shaft 18 may also be journalled at the lower end as by a hole 24 in the base 15. A clearance hole is made in the cross-arm 23 to accommodate the shaft 18.

The conductive bridge 14 is provided with suitable resilient brushes 25 at each end whereby positive contact with the rods 12 may be assured. Slots 26 are provided in the cylindrical shields 13 so that the bridging member 14 may move up and down therein for contacting with the conductor bars 12 at any desired level. The slots in the cylinders also serve to restrain the bridging member 14 from turning when the threaded shaft 18 is rotated.

If my cross-talk eliminator is to be used in connection with a radio transmitter, it will be seen that oscillations of any desired carrier frequency may be generated at the source 9 and transmitted first through the transformer 7, and thence via the transmission lines 5 to the antenna 3 and counterpoise 4. At the chosen transmission frequency there will be two points 11. The conductors 12 when connected to these points 11 and when spanned by the adjusted bridging member 14 offer a conductive by-pass for frequencies lower than the operating frequency and at the same time offer a practically infinite impedance to currents of the operating frequency.

If my cross-talk eliminator is to be used in connection with a radio receiver its application and utility will readily be recognized in view of the foregoing description. In this case, however, the antenna 3 and counterpoise 4 will be viewed as the source of energy and the radio receiver will be assumed to occupy the position 9.

While I have shown but one embodiment of my invention by way of illustration, it will be understood by those skilled in the art that many modifications may be made without departing from the spirit and scope of the invention itself. I intend, therefore, that in carrying out my invention no limitations shall be imposed other than as expressed in the claims.

I claim as my invention:

1. A cross-talk eliminator for an ultra high frequency radio transmission system comprising, a pair of conductors, grounded cylindrical shielding means disposed about said conductors, the ratio of the outside diameters of said conductors to the inside diameters of said grounded shielding being substantially of the order of one to three and six tenths, a conductive bridge disposed in contact with said conductors, said bridge having an internally threaded portion, and means including an adjusting screw engaging with said internally threaded portion for varying the position of contact of said bridge across said conductors whereby the conductors and bridge are caused to provide a path of high impedance to electric waves of the operating frequency impressed upon said transmission system when said interference eliminator is connected across points of half-wave phase difference in said system.

2. In an ultra high frequency system, an antenna and counterpoise, radio apparatus, adjacently disposed conductors interconnecting said antenna and counterpoise with said apparatus, and an interference eliminating device connected to said conductors at points of substantially 180 degrees phase difference at the operating frequency of said apparatus, said device having a pair of electrically parallel rods, a pair of cylindrical conductive shields for said rods, the inside diameters of said shields being substantially three and one half times the outside diameters of said rods, an adjustable shorting member contacting at points longitudinally of said rods and means for moving said shorting member into suitable position for providing a path of low impedance through said parallel rods for stray currents of any frequency lower than the operating frequency of said radio apparatus.

3. A device in accordance with claim 2 characterized in that the last said means comprises a rotatable driving screw, a non-rotatable internally threaded portion of said shorting member, and manually operable gearing connected with said driving screw.

4. A device in accordance with claim 2 characterized in that each of said parallel rods is substantially inclosed by a metallic cylinder having means including an insulating member at least at one end of each cylinder for maintaining the rod and its cylinder coaxial and for insulating portions of each rod between the adjacently disposed conductors and the shorting member.

JOHN EVANS.