Nov. 16, 1954 H. J. ROWLAND 2,694,796

MODE SUPPRESSOR FOR COAXIAL TRANSMISSION LINES

Filed Dec. 11, 1945

FIG. 1

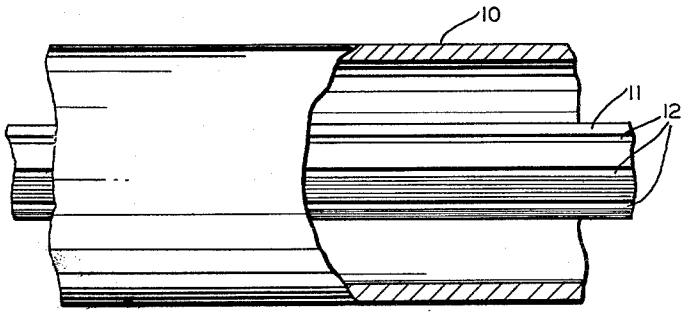
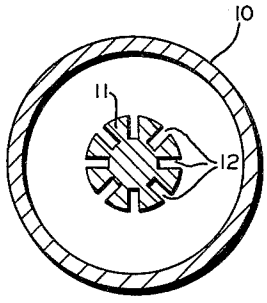


FIG. 2



INVENTOR
HOWARD J. ROWLAND
BY M. O. Hayes

ATTORNEY

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MODE SUPPRESSOR FOR COAXIAL TRANSMISSION LINES

Howard J. Rowland, Brookline, Mass., assignor, by mesne assignments, to the United States of America as represented by the Secretary of the Navy

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2 Claims. (Cl. 333—96)

This invention relates to suppressors for coaxial transmission lines and more particularly, to those for suppressing higher modes.

In the operation and testing of antennas fed through a coaxial transmission line it has been found that the radiation patterns contained irregular lobes of varying size and area due to circumferential currents from spurious modes in the coaxial line. In order to obtain a more uniform radiation pattern the elimination of these spurious modes in the transmission line is necessary.

In the present invention a novel use is made of slots for introducing a high impedance into a coaxial line to suppress these unwanted higher modes.

A principal object of this invention is to provide means for suppressing spurious modes in a coaxial transmission line.

Another object of this invention is to provide by means of slots in the inner conductor of a coaxial transmission line suppression of spurious modes.

A further object of this invention is to provide, by means of longitudinally disposed slots in a coaxial transmission line, a high impedance to undesired modes of transmission.

These and other objects will be apparent from the following specification when taken with the accompanying drawings, in which:

Fig. 1 is a longitudinal section of a coaxial transmission line with a slotted inner conductor; and

Fig. 2 is a cross-section of the coaxial transmission line of Fig. 1.

In Figs. 1 and 2 an embodiment of the invention is illustrated. Outer conductor **10** of the coaxial transmission line has not been altered. Inner conductor **11** has a plurality of slots **12** equally spaced about its circumference and paralleling the longitudinal axis. Circumferential currents, as from spurious modes in the coaxial line, are prevented by these longitudinal grooves **12** in inner conductor **11** which present a high impedance to the undesired modes and yet do not interfere with the longitudinal currents of the primary mode of the coaxial line. In this arrangement, the slots **12** are not resonant. Inner conductor **11** is preferably slotted for approximately three wave lengths, beginning at a point near the antenna feed and extending back along the coaxial transmission line.

The data collected in tests run comparing the variation in power ratio (watts received) in the desired azimuth area from a slotted antenna designed for a uniform azimuth pattern and fed by a coaxial line having an unslotted inner conductor with that from the same slotted antenna fed by a coaxial line having a slotted inner conductor shows the maximum variation in power ratio using the unslotted inner conductor to be 150, and the maximum variation in power ratio using the slotted inner conductor to be 1.74.

This is a very substantial advantage in favor of the system using a slotted inner conductor.

The position, direction and length of the slots will be determined by the type of modes to be suppressed and the kind of coaxial transmission line used.

While there is shown an embodiment of this invention, it will be understood that many modifications may be made without departing from the spirit thereof, and it is contemplated by the appended claims to cover any such modifications as fall within the true spirit and scope of this invention.

What is claimed is:

1. A mode suppressor for a wave guide transmission line of the coaxial type propagating electromagnetic wave energy in at least two modes of electric and magnetic field distributions, one of which causes current flow in a circumferential direction in said line, comprising, an inner conductor, a concentric outer conductor, and a plurality of nonresonant slots, said slots being cut in said inner conductor at equally spaced intervals about the circumference thereof and extending parallel to the longitudinal axis of said conductor for a predetermined short portion of the length of said line to present a high impedance to modes of propagation having field distribution causing circumferential currents while offering substantially no impedance to the propagation of a wave in a mode causing longitudinal currents.

2. A mode suppressor for a wave guide transmission line of the coaxial type propagating electromagnetic wave energy in at least two modes of electric and magnetic field distributions, one of which causes current flow in a circumferential direction in said line, comprising, an inner conductor, a concentric outer conductor, and a plurality of nonresonant slots, said slots being cut in said inner conductor at equally spaced intervals about the circumference thereof and extending parallel to the longitudinal axis of said conductor for a distance substantially equal to three wave lengths of the wave being propagated to present a high impedance to modes of propagation having field distribution causing circumferential currents while offering substantially no impedance to the propagation of a wave in a mode causing longitudinal currents.

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