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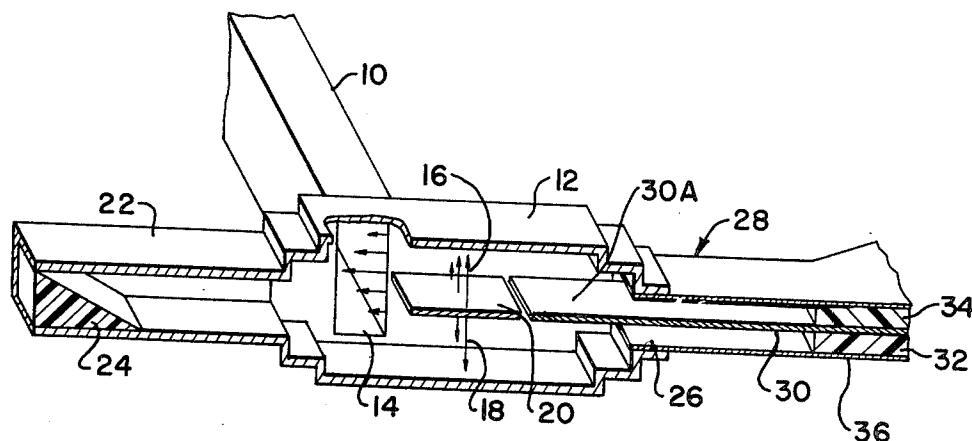
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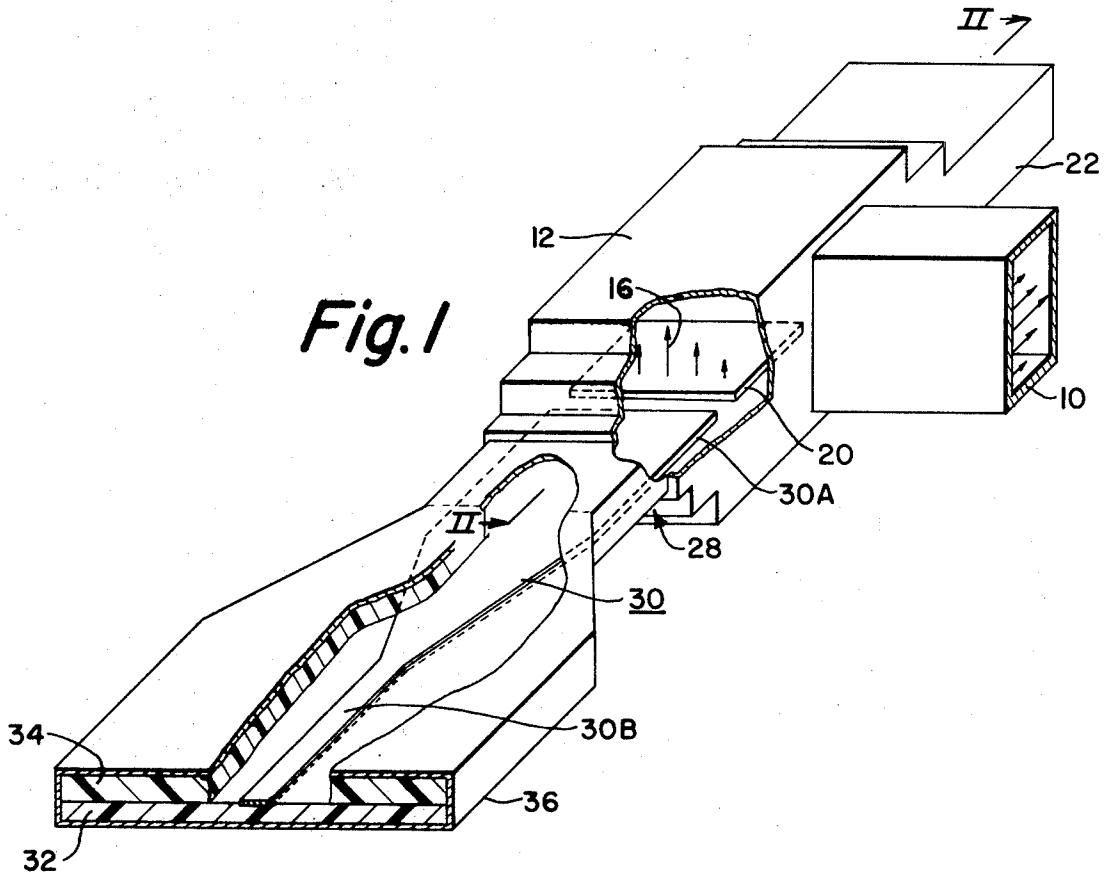
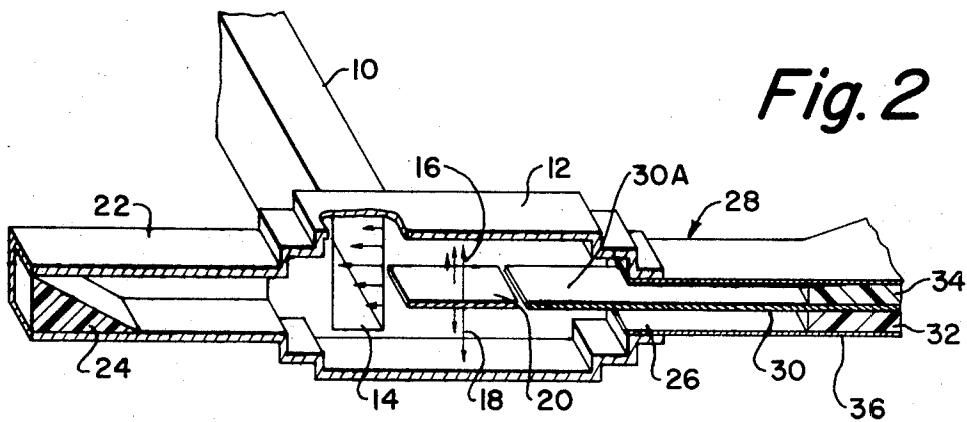
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[54] **WAVEGUIDE TO STRIPLINE TRANSITION**
MEANS
 5 Claims, 2 Drawing Figs.

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ABSTRACT: Described is apparatus for translating electromagnetic wave energy traveling in the TE_{10} mode in a rectangular waveguide to the TEM mode in a stripline transmission line or vice versa. This is accomplished by means of an E-plane folded tee connection having an input port connected to a waveguide and a stripline transmission line connected to a double output port of the folded tee.





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WAVEGUIDE TO STRIPLINE TRANSITION MEANS

BACKGROUND OF THE INVENTION

As is known, stripline wave energy transmission lines have become increasingly important in cases where low power wave energy is to be transmitted at a savings in weight and volume over a conventional waveguide system. The stripline, similar in operation to a coaxial transmission line, comprises a center conductor sandwiched between dielectric slabs covered with conducting material forming a ground plane. In certain cases, it becomes necessary to couple a waveguide to a stripline transmission line or vice versa. This may be accomplished by means of a probe connected to the center conductor of the stripline transmission line and extending into the waveguide. In certain cases, however, this arrangement is not altogether satisfactory.

SUMMARY OF THE INVENTION

As an overall object, the present invention seeks to provide a new and improved system for connecting a waveguide to a stripline transmission line.

More specifically, an object of the invention is to provide a waveguide to stripline transition for converting wave energy in the TE_{10} mode to the TEM mode or vice versa, wherein the coupling element between the two comprises a folded tee connection.

In accordance with the invention, a apparatus for coupling electromagnetic wave energy from a rectangular waveguide to a stripline transmission line or vice versa is provided comprising a folded tee junction having an input port connected to a waveguide conveying wave energy in the TE_{10} mode and a pair of parallel superimposed output ports disposed at right angles to the input port and separated by a wall between the pair. The waves in the respective output ports are 180° out of phase with respect to each other. A stripline wave energy transmission line is coupled to the parallel output ports and includes an inner conductor sandwiched between dielectric slabs and having outer layers of electrical conducting material on either side of the inner conductor. By connecting the outer conductive material of the stripline transmission line to the wall of the folded tee junction, and by connecting the inner conductor of the stripline transmission line to the common wall between the parallel waveguide output ports, the complete transition from waveguide to stripline is effected. Preferably a matched load is disposed on the side of the input port of the folded tee opposite the parallel output ports.

The above and other objects and features of the invention will become apparent from the following detailed description taken in connection with the accompanying drawings which form a part of this specification, and in which:

FIG. 1 is a perspective view of the transition means of the invention; and

FIG. 2 is a broken-away perspective view of the transition means of FIG. 1 taken substantially along line II-II of FIG. 1.

With reference now to the drawings, the embodiment of the invention shown includes an input port 10 adapted for connection to a rectangular waveguide conveying wave energy in the TE_{10} mode, meaning that all of the electric vectors are perpendicular to the long transverse dimension of the waveguide and that a half wave pattern of the electric field exists along the short dimension of the guide through the center of the cross section. The port 10 comprises part of a folded tee junction 12 having an input opening 14 communicating with the port 10 and a pair of output ports 16 and 18 separated by a

common wall 20 which, like the side walls of the coupler 12, is grounded. Disposed on the side of the input opening 14 opposite the output ports 16 and 18 is a short waveguide section 22 which carries a matched terminating load impedance 24. The wave energy patterns, as they appear in the two openings 16 and 18, are 180° out of phase with respect to each other.

At the side of the wall 20 opposite the opening 14 is an opening 26 which receives the end of a stripline electromagnetic wave transmission line 28. As shown, the transmission line 28 comprises a center conductor 30 which is connected to the wall 20 separating the two output ports 16 and 18. The center conductor 30 is sandwiched between dielectric slabs 32 and 34 which may, for example, be formed from Teflon (trademark) or the like. As best shown in FIG. 1, the center conductor 30 is provided with a relatively wide tongue 30A which tapers down to a much narrower section 30B. The Teflon slabs 32 and 34 are encased by means of a metallic casing 36 which may comprise a cladding or be formed by vapor deposition techniques.

With the arrangement shown, the wave energy patterns on either side of the wall 20, being 180° out of phase with respect to each other, will be coupled to the center conductor 30 where the wave energy now travels along the stripline conductor in the TEM mode, in much the same manner as wave energy traveling along a coaxial line. Conversely, wave energy in the TEM mode fed into the folded tee 12 will appear at port 10 in the TE_{10} mode.

The present invention thus provides a new and improved means for coupling a rectangular waveguide to a stripline transmission line or vice versa. Although the invention has been shown in connection with a certain specific embodiment, it will be readily apparent to those skilled in the art that various changes in form and arrangement of parts may be made to suit requirements without departing from the spirit and scope of the invention.

I claim:

1. Apparatus for coupling electromagnetic energy from a rectangular waveguide to a stripline transmission line comprising a folded tee junction having an input port connected to a waveguide, a pair of parallel superimposed output ports disposed at right angles to said input port and separated by a wall between the two, the wave energy in the respective output ports being 180° out of phase with respect to each other, a stripline transmission line comprising an inner conductor sandwiched between the dielectric slabs and having an outer layer of electrical conducting material on either side of said inner conductor, means connecting said outer layers of said stripline transmission line to the wall of said tee junction, said inner conductor of the stripline transmission line lying in essentially the same plane as the wall between said parallel output ports, and a load impedance disposed on the side of said input port of the folded tee junction opposite said parallel output ports.

2. The apparatus of claim 1 wherein wave energy in said rectangular waveguide is propagated in the TE_{10} mode.

3. The apparatus of claim 1 wherein said wall separating said parallel output ports is grounded.

4. The apparatus of claim 1 wherein said inner conductor of the stripline transmission line has a width adjacent said wall between the output ports substantially equal to that of the wall but tapers down to a width less than that of the wall.

5. The apparatus of claim 1 wherein wave energy is propagated through said stripline transition line in the TEM mode.