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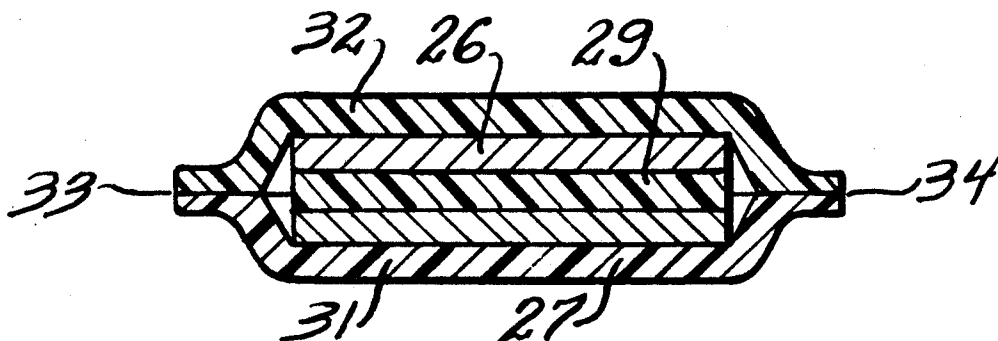
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[73] Assignee **The United States of America as**
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[56] **References Cited**
UNITED STATES PATENTS
2,676,309 4/1954 Armstrong 174/117 X
3,004,229 10/1961 Stearns 338/84 (M)
3,158,181 11/1964 Gore 174/117 UX
3,260,972 7/1966 Pusch 333/84 (M)
3,304,364 2/1967 Hetherington 174/117 X
FOREIGN PATENTS
712,656 6/1965 Canada 174/117

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[54] **FLEXIBLE STRIPLINE TRANSMISSION LINE**
4 Claims, 3 Drawing Figs.
[52] U.S. Cl. 174/117
FF, 333/84 M
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[50] Field of Search 333/84, 84
M; 74/117, 117.1, 117.11

ABSTRACT: A stripline transmission line is constructed so that the individual conducting and insulating portions of the stripline are free to move relative to each other. This form of construction permits the stripline to be bent to a very small radius without distortion or degradation of its electrical characteristics.



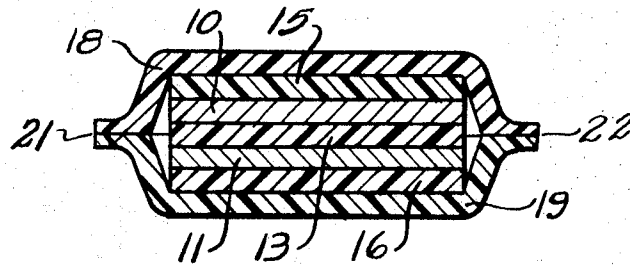


Fig. 1

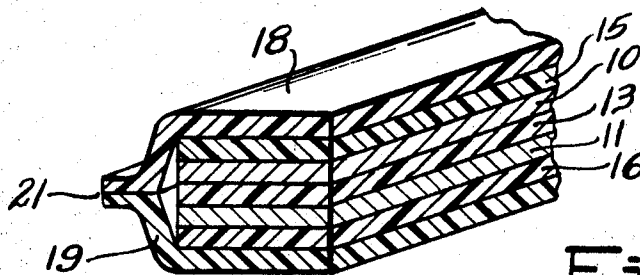


Fig. 2

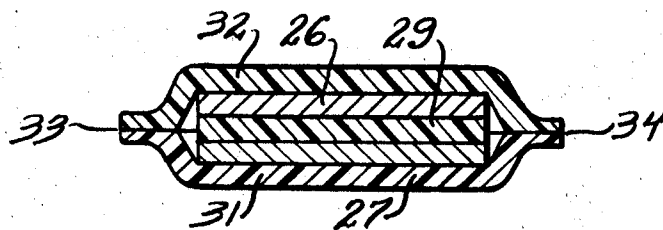


Fig. 3

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FLEXIBLE STRIPLINE TRANSMISSION LINE

CONTRACTUAL ORIGIN OF THE INVENTION

The invention described herein was made in the course of, or under, a contract with The United States Atomic Energy Commission.

BACKGROUND OF THE INVENTION

In order to construct the miniature electronic equipment in use today it is desirable to have conductors and transmission lines which can be bent to very small radii without degradation of their electrical characteristics. In particular stripline, as presently manufactured, is flexible only to a limited degree. Since the parallel wires of stripline must be held in a fixed relationship to obtain the desired impedance, it is important that bends in the stripline do not cause distortion of the dielectric and relative displacement of the parallel conductors. If a bend is too sharp, the parallel conductors can be displaced and this displacement may result in transmission line discontinuities which cause reflections and standing waves, thereby degrading the electrical performance of the transmission line. Thus stripline has a minimum bending radius which precludes its use in very small spaces or in the manufacture of small components such as the windings of a small pulse transformer.

It is therefore an object of this invention to provide an improved form of stripline transmission line.

Another object of this invention is to provide a stripline transmission line which is flexible.

Another object of this invention is to provide a stripline capable of being bent to a small radius without degradation of its electrical properties.

SUMMARY OF THE INVENTION

In practicing this invention a stripline is provided comprising a pair of flat conductive strips of equal width. A first insulator equal in width to the flat conductive strips positions the pair of flat conductive strips in a parallel spaced apart relationship. A second insulator is disposed about the pair of conductive strips and the first insulator to hold the same in a restraining engagement.

The first and second insulators are not fastened to the conductive strips so that the insulators and conductive strips are free to move with respect to each other. Thus, when the stripline is bent to a small radius, the conductive strips and insulators move with respect to each other to permit flexure of the stripline transmission line without distortion of the line damaging to its electrical characteristics. In order to decrease the friction between the conductive and insulating strips, the insulating strips may be made from a polytetrafluoroethylene such as TEFLON.

BRIEF DESCRIPTION OF THE DRAWINGS

The invention is illustrated in the drawings of which:

FIG. 1 is a cross-sectional view of the stripline transmission line of this invention;

FIG. 2 is an isometric cross-sectional view of the stripline of FIG. 1; and

FIG. 3 is a cross-sectional view of another embodiment of the stripline transmission line.

DETAILED DESCRIPTION OF THE INVENTION

Referring to FIGS. 1 and 2 there is shown a cross section and isometric cross section view of the stripline transmission line of this invention. Identical portions of FIGS. 1 and 2 have the same reference numbers. The stripline consists of a pair of flat metallic conductors 10 and 11 separated by an insulator 13. The insulator 13 is not mechanically secured to either of the metallic conductors and therefore the conductors are free

to slide over the insulator.

Insulator 15 is positioned adjacent conductor 10 so that conductor 10 is between insulators 13 and 15. Insulator 16 is positioned adjacent conductor 11 so that conductor 11 is between insulators 13 and 16. Neither insulators 15 nor 16 are secured to the conductor adjacent thereto so that conductors 10 and 11 are free to move relative to the insulators on each side and to each other. In order to permit this movement to take place more easily insulators 13, 15 and 16 may be made from a material having a low coefficient of friction such as the polytetrafluoroethylene TEFLON.

The conductors 10 and 11 and the insulating strips 13, 15 and 16 are made in the form of flat, thin flexible strips arranged in the rectangular configuration shown. Covers 18 and 19 of flexible insulating material surround the conductors and insulating strips to hold them in the proper relationship. Covers 18 and 19 are joined at 21 and 22 to form a sealed enclosure for the stripline.

In FIG. 3 there is shown a cross-sectional view of another embodiment of this invention. Conductors 26 and 27 are separated by insulator 29 in the same manner as conductors 10 and 11 are separated by insulator 13. The insulating strips 15 and 16 of FIGS. 1 and 2 are not used and covers 31 and 32 are positioned directly adjacent conductors 26 and 27. Covers 31 and 32 are free to move relative to the conductors 26 and 27 and are joined at 33 and 34 to form a sealed enclosure for the stripline. Covers 31 and 32 may be formed of a polytetrafluoroethylene material. As an example, stripline having the features illustrated in FIGS. 1 to 3 has been constructed with a thickness of approximately 0.025 inch and a width of from 0.025 to 0.125 inch.

Since the elements of the stripline are free to move relative to each other when the line is bent to a small radius the elements of the stripline do not distort to form discontinuities in the transmission line. Thus the electrical characteristics of the line are not degraded when the line is used in equipment where it must be bent to a small radius.

It will be understood that the invention is not to be limited to the details given herein but that it may be modified within the scope of the appended claims.

The embodiments of the invention in which an exclusive property or privilege is claimed are defined as follows:

I claim:

1. A stripline, including in combination, a pair of bare electrical conductors positioned in parallel relationship, first insulator means slidably positioned between and in direct contact with said conductors, said conductors and said first insulator means being formed of flexible material of substantially equal width forming a rectangular configuration, and second insulator means disposed about said pair of conductors and said first insulator means in a restraining slidable engagement with said pair of conductors.

2. The stripline of claim 1 wherein, said second insulator means includes a pair of insulating strips each positioned adjacent and in direct contact with a separate one of said electrical conductors to position each of said electrical conductors between said first insulator means and one of said pair of insulating strips, said pair of insulating strips being in slidable engagement with said electrical conductors, said second insulator means further including cover means surrounding said electrical conductors, said first insulator means and said pair of insulating strips and holding the same in desired relationship.

3. The stripline of claim 2 wherein, said electrical conductors, said pair of insulating strips and said first insulator means are formed of flexible material of substantially equal width forming a rectangular configuration.

4. The stripline of claim 3 wherein, said first insulator means and said pair of insulating strips are formed of polytetrafluoroethylene.