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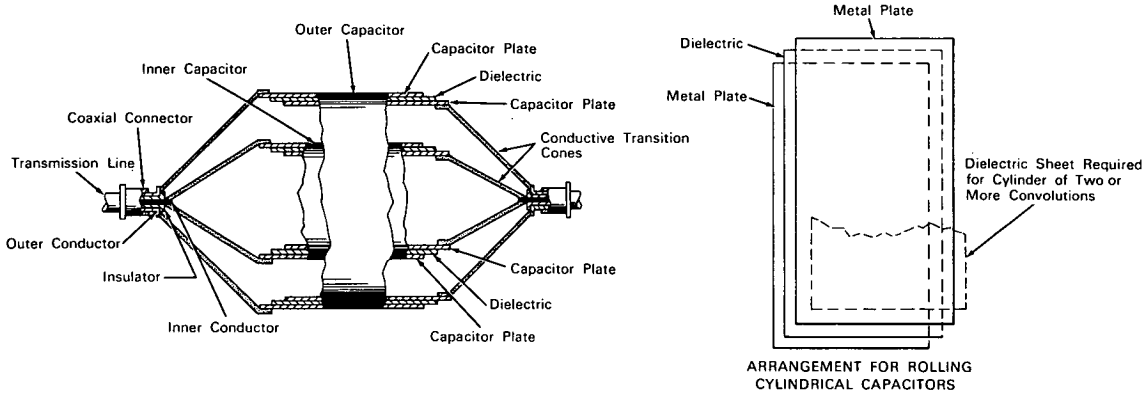
NASA TECH BRIEF

This NASA Tech Brief is issued by the Technology Utilization Division to acquaint industry with the technical content of an innovation derived from the space program.

High-Pass RF Coaxial Filter Rejects D C and Low Frequency Signals



The problem: To design a low-loss RF filter element for coaxial transmission lines that will provide complete d c isolation and reject low-frequency signals without affecting the characteristic impedance of the transmission line. The shape and dimensions of the filter must be compatible with standard coaxial cables and connectors.

The solution: A filter incorporating two coaxial cylindrical capacitors with conical transition pieces and coaxial connectors that permit direct connection of the filter in an RF transmission line.

How it's done: In forming each capacitor, a sheet of dielectric material is positioned between two metal plates (as shown in the illustration) and this arrangement is rolled into a cylinder of the desired diameter. The mating metal margins extending longitudinally along each cylinder are joined by soldering.

Coaxial connectors, constituting input and output terminals, are joined by conductive transition cones to the cylindrical capacitor plates in the following manner. The inner conductors of the two coaxial connectors are respectively joined to opposite plates of the inner cylindrical capacitor, and the outer conductors of the coaxial connectors are respectively joined to opposite plates of the outer cylindrical capacitor. This arrangement ensures complete d c isolation, a very high degree of audiofrequency rejection, and a very low impedance to RF signals.

The characteristic impedance of the filter is matched to that of the coaxial transmission line by (1) appropriately fixing the ratio of the inner diameter of the outer capacitor to the outer diameter of the inner capacitor and (2) fixing the taper between the walls of the inner and outer transition cones so that at any point along the transition the ratio of the diameters (lying in a plane normal to the axis) of the cones is the same as the ratio of the diameters of the cylindrical capacitors.

Notes:

1. The filter is a reciprocal device, i.e., either end may be considered an input or an output terminal.

(continued overleaf)

2. Modified standard coaxial connectors (such as BNC or type-N connectors) may be used for the filter.
3. Although the metal plates and dielectric sheet are shown in the illustration as rolled into a cylinder of only one convolution, they may be rolled into a cylinder of more than one convolution depending upon the capacitance value that is desired for a capacitor of given diameter. In forming a cylinder of more than one convolution, a dielectric sheet must be placed on the upper metal plate, in addition to the sheet between the metal plates, to ensure adequate insulation between the plates.
4. Inquiries concerning this invention may be directed to:

   Technology Utilization Officer
   Goddard Space Flight Center
   Greenbelt, Maryland, 20771
   Reference: B64-10173

Patent status: NASA encourages the immediate commercial use of this invention. Inquiries about obtaining rights for its commercial use may be made to NASA Headquarters, Washington, D.C., 20546.

Source: James W. Bailey and Donald F. McAfee (GSFC-73)