

Patent Abstracts

These Patent Abstracts of recently issued patents are intended to provide the minimum information necessary for readers to determine if they are interested in examining the patent in more detail. Complete copies of patents are available for a small fee by writing: U.S. Patent and Trademark Office, Box 9, Washington, D.C. 20231.

4,775,845

Oct. 4, 1988

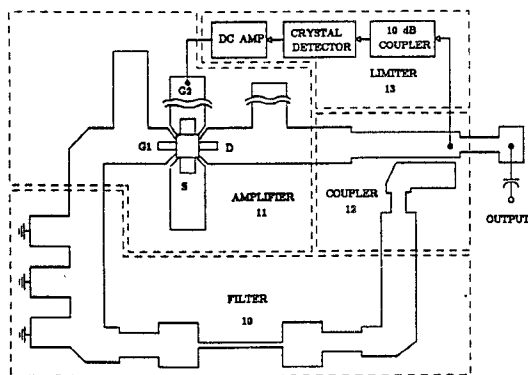
Microwave Oscillator with External Feedback

Inventor: Jody A. McCoy.

Filed: Apr. 24, 1987.

Abstract—The present invention provides an alternative circuit for microwave oscillators. The invention consists of an amplifier, signal divider, filter(s), and optional limiter. The feedback path is external to the amplifier, allowing direct access and control of the loop phase and loop gain. Control of the loop gain can be used for applications such as amplitude modulation of the oscillator's output or control of the oscillator's output power. Control of the loop phase can be used to frequency modulate the oscillator or to create a voltage-controlled oscillator. Dynamic control of the loop gain with a limiter enables one to maintain linear operation throughout the oscillator. Linear operation is often desirable to eliminate the $1/f$ noise contributions at the frequency of operation and to enable the use of small signal s -parameters in the design and analysis.

20 Claims, 7 Drawing Sheets



4,775,847

Oct 4, 1988

Tunable Resonant Cavity Filter Structure with Enhanced Ground Return

Inventors: Robert L. Epsom, Terry K. Mansfield, Anthony M. Pirih, Scott J. Propp, and Thomas L. Spicer.

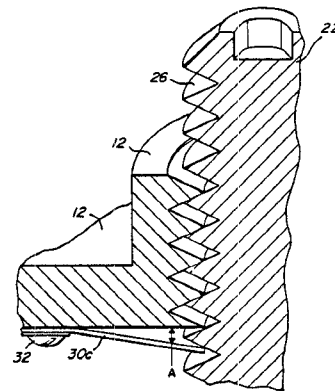
Assignee: Motorola, Inc.

Filed: Dec. 9, 1986.

Abstract—A tunable resonant cavity filter structure is disclosed which includes an enhanced ground return internal to the cavity which effectively eliminates generation of deterioration wide band noise and optimizes unloaded Q as well as rendering resonant frequency stable with vibration. In its preferred form, the enhanced ground return is in the form of a ground return clip with resilient radial projections that mate with the threads of the threadable tuning element used to determine final operating frequency. The radial projec-

tions are deflected in cantilever fashion so as to generate sufficient pressure to break through any oxides in the tuning element threads and ensure metal-to-metal contact

19 Claims, 2 Drawing Sheets



4,776,657

Oct. 11, 1988

Electro-Optic Phase Shifter with Reduced Input Capacitance

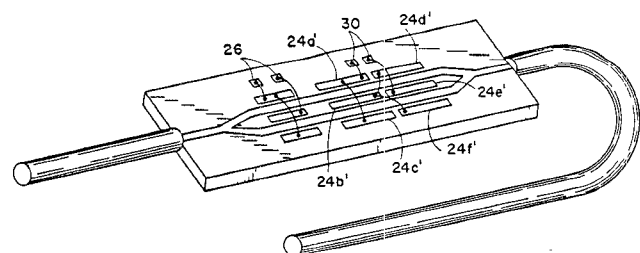
Inventor: Thomas M. Reeder.

Assignee: Tektronix, Inc.

Filed: Mar. 25, 1986.

Abstract—An optical phase shifter comprises an optical waveguide of electro-optic material and an electrode structure associated with the waveguide for imposing an electrical field on the waveguide. The electrode structure comprises at least two groups of electrodes, each group having at least first and second electrodes between which the waveguide passes. The first electrode of one group and the second electrode of the other group are on opposite respective sides of the waveguide and are connected to respective input terminals for receiving an electrical signal. The second electrode of the one group is connected to the first electrode of the other group.

4 Claims, 1 Drawing Sheet



4,776,660

Oct. 11, 1988 4,777,456

Oct. 11, 1988

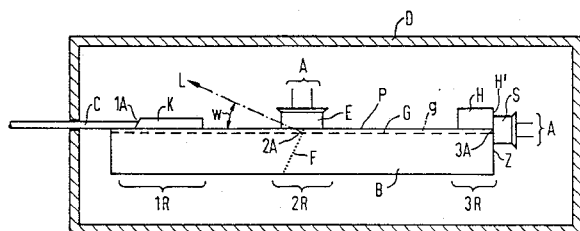
Light Diplexer of a Communication System Comprising Three Light Connections

Inventors: Hans F. Mahlein, Herbert Michel, Achim Reichelt, and Gerhard Winzer.

Assignee: Siemens Aktiengesellschaft.

Filed: Jan. 27, 1987.

Abstract—A light branching element or diplexer comprising a first bidirectional light connection and a second and third unidirectional light connection. The unit is formed by a block having a straight surface groove with an embedded glass fiber which fiber is interrupted by a partially transmissive mirror lying on a slanting plane relative to the axis of the fiber. The light sensitive location of a light receiving semiconductor element is secured to the block adjacent to the mirror and the plane of the mirror is selected so that its normal extends out of the block at an angle of incidence smaller than 45° to the axis of the fiber to reduce reflections from the semiconductor member back to the mirror and into the fiber.



4,777,454

Oct. 11, 1988

Switchable Dielectric Waveguide Circulator

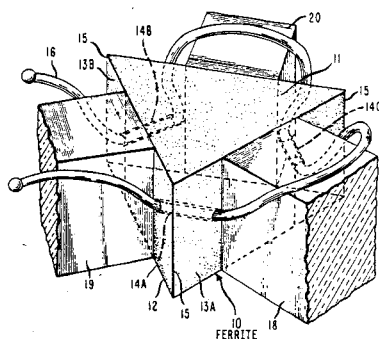
Inventors: Richard A. Stern and Richard W. Babbitt.

Assignee: The United States of America as represented by the Secretary of the Army.

Filed: July 6, 1987.

Abstract—A switchable dielectric waveguide circulator is provided for millimeter wave frequency applications comprising a ferrite right prism having two polygonal prism bases and at least three lateral prism faces. A control wire is threaded through a number of bores formed in the prism in a plane between the bases. Each of the bores is spaced a distance from a different one of the apices of the prism so that a control current passing through the control wire creates a circular magnetic field about each bore which combine to form a resultant magnetic field between the prism bases which cause the prism faces to act as circulator ports. The rotational direction of circulator coupling action is reversed by reversing the direction of the control current. Both Y-junction and T-junction circulator configurations are shown.

6 Claims, 2 Drawing Sheets



Microwave Attenuator

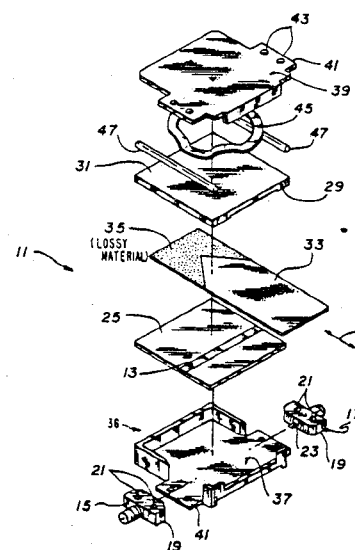
Inventors: Charles P. Andrikian and James K. Shimizu.

Assignee: Hughes Aircraft Company.

Filed: Aug. 10, 1987.

Abstract—A high-performance, low-cost variable attenuator is disclosed with minimal size and weight requirements. The variable microwave attenuator of the present invention includes a microwave stripline transmission line connecting the input and the output thereof; first and second ground planes are disposed on opposite sides of the transmission line; and a dielectric card having a metallization pattern is disposed on at least a portion thereof. The card is adapted for variable interposition between the transmission line and the first ground plane to provide variable attenuation of microwave energy. A specific teaching of the invention relates to the design of the metallization pattern to provide vernier attenuation.

9 Claims, 2 Drawing Sheets



4,777,457

Oct. 11, 1988

Directional Coupler for Separation of Signals in Two Frequency Bands While Preserving Their Polarization Characteristics

Inventors: Subir Ghosh and Aluizio Prata, Jr.

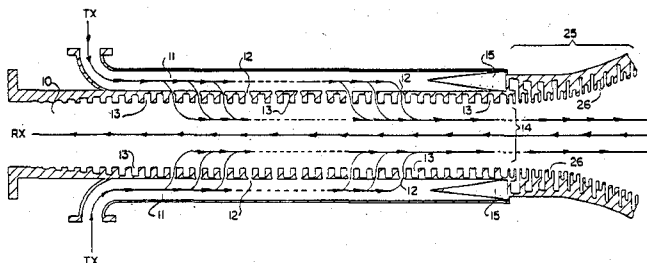
Assignee: Telecomunicacoes Brasileiras S/A- Telebras.

Filed: July 27, 1987.

Abstract—A directional coupler is provided which has an appropriately dimensioned principle waveguide with a frequency dependent reactive boundary interior surface such that the principle waveguide is suitable to simultaneously: (i) support, without depolarization, effective propagation of first signals in a high frequency band at a HE₁₁ mode with greater concentration of energy near the axis of the principle waveguide than near the interior surface and no effective propagation of first signals at any unwanted mode, and (ii) support, without depolarization, effective propagation of second signals in a lower frequency band at EH₁₁ mode having a greater concentration of energy near the interior surface of the principle waveguide than near the axis and no effective propagation of second signals at any unwanted mode. Four identical secondary waveguides are placed symmetrically at equal radial intervals about

the outside perimeter of the principle waveguide with the longitudinal axis of each of the secondary waveguides running parallel to the longitudinal axis of the principle waveguide. A plurality of coupling units are disposed at longitudinal intervals along the principle waveguide with each coupling unit comprising four aperture-like structures interconnecting a respective one of the secondary waveguides and the principle waveguide for exchanging energy in the first signals between the secondary waveguides and the principle waveguide. This structure provides a directional coupler for separation of signals in the first and second frequency bands while preserving their polarization characteristics.

15 Claims, 5 Drawing Sheets



4,777,459

Oct. 11, 1988

Microwave Multiplexer with Multimode Filter

Inventor: Thomas Hudspeth.

Assignee: Hughes Aircraft Company.

Filed: June 8, 1987.

Abstract—A microwave multiplexer has a set of independently tuneable signal channels coupled to a common waveguide. Each of the channels has input and output 3 dB couplers which are joined by cylindrical radiators carrying circularly polarized waves. Both TE and TM waves are propagated within a plurality of resonant cavities within each of the filters. Coupling between the cavities is provided by an array of slots and an array of probes wherein the slots couple TE waves and the probes couple TM waves. Adjustment of the slots and the probes provides for independent coupling coefficients for the two propagation modes. A set of coaxial line probe structures connect between the input and output couplers to end cavities of a filter for the launching of TM waves, there being discs in the end cavities adjacent the probes for converting energy of a TM wave to a TE wave, thereby providing both the TM and the TE wave propagation. There results a greater versatility in the coupling allowing for greater compaction of signal channel with reduced weight and bulk to the multiplexer.

20 Claims, 2 Drawing Sheets

4,777,458

Oct. 11, 1988

Thin-Film Power Coupler

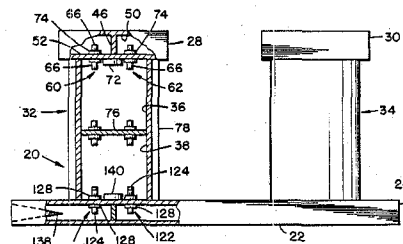
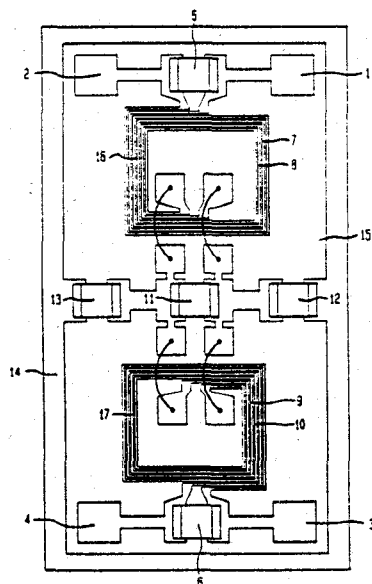
Inventor: Rossano Pardini.

Assignee: GTE Telecomunicazioni S.p.A.

Filed: Mar. 31, 1986.

Abstract—A thin-film power coupler, in particular, a 3 dB and 90 degree power divider, is fabricated of lumped circuit elements. The main characteristics of the coupler is in having achieved the coupled inductances by mutual induction. Such an achievement has been obtained with 2 microstrip lines facing each other and wrapped in a square shaped spiral. Another important characteristic of the power coupler is the presence of a capacitor in the circuit which joins the two branches of the coupler, with sufficient tolerance to obtain the wanted coupling and to recover possible tolerances incurred by manufacturing the thin-film inductors.

14 Claims, 2 Drawing Sheets



4,779,064

Oct. 18, 1988

Radio Frequency Coaxial Cable

Inventor: George J. Monser.

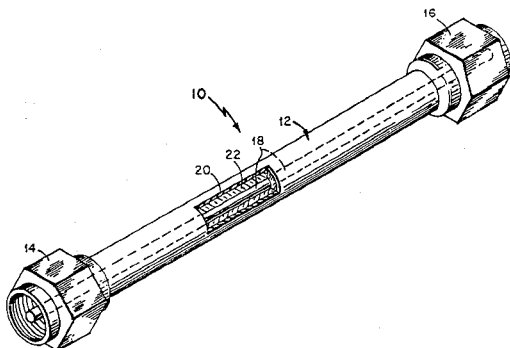
Assignee: Raytheon Company.

File: Apr. 1, 1987.

Abstract—A coaxial cable for coupling radio frequency (RF) signals therethrough with a predetermined, nominal attenuation comprising a center conductor selected to maintain the attenuation of the coaxial cable at substantially the nominal attenuation substantially independently of the frequency of the RF signals over a predetermined frequency range, such as from 2 to 18 GHz. In a preferred embodiment of the invention, the center conductor is selected having a nominal volume resistivity (ρ) and a nominal permeability (μ), with the volume resistivity-permeability product thereof substantially varying inversely with changes in frequency of RF signals coupled through the cable. With such arrangement, a lossy coaxial cable providing substantially constant attenuation over a broad range of frequencies, such as greater than three octaves, is provided having reduced size, complexity and VSWR from conventional lossy cable assemblies comprising a conventional coaxial cable coupled in series with an attenuator. Also, the frequency response attenuation characteristics of the coaxial cable are readily and consistently reproducible.

thereby providing a plurality of such cables with "conformal" loss characteristics over the operating bandwidth to facilitate interchangeability of such coaxial cables. Further, the electrical lengths of a plurality of coaxial cables may be phase-matched to a relatively tight tolerance.

17 Claims, 3 Drawing Sheets



4,779,065

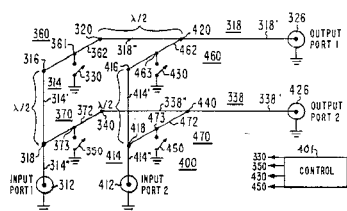
Oct. 18, 1988

Microwave Signal-Routing Matrix

Inventors: Allen Katz and Michael W. Moreken.
Assignee: General Electric Company.
Filed: Apr. 28, 1987.

Abstract—An $N \times M$ signal routing matrix has low loss. The N input ports are connected to N input transmission lines, and the M output ports are connected to M output transmission lines. A plurality of interconnects interconnect the input and output transmission lines at their crossing points. The points of connection of the interconnects to any one of the input or output transmission lines are spaced $\lambda/2$ (or multiples thereof) apart along the transmission line. Each interconnect includes a transmission line at least $\lambda/2$ long, and each includes a short-circuiting switch arrangement capable of short-circuiting the interconnecting transmission line at point(s) $\lambda/4$ (or odd multiples thereof) from the ends of the interconnecting transmission line. In order to form a path for the flow of signal between a selected input port and a selected output port, the switching arrangement of that one interconnect which interconnects the input and output transmission lines corresponding to the selected ports is not short-circuited, and all other switching arrangements of interconnects terminating on one of the corresponding transmission lines are short-circuited. In some embodiments, multiple independent signal paths are available. In some embodiments, redundant paths are provided.

10 Claims, 7 Drawing Sheets



4,779,066

Oct. 18, 1988

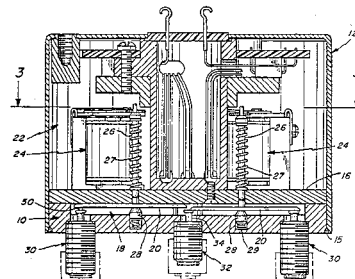
Multiposition Switch

Inventor: Harry F. Chapell.
Assignee: Sage Laboratories, Inc.
Filed: Apr. 20, 1987.

Abstract—In a multiposition microwave switch, a terminating impedance is associated with the center conductor of each port of the switch. When a port is

selected, the resistor is pushed into the conductor by the blade completing the RF path to the selected position. When the position is not selected, the resistor is pushed out of the conductor until it contacts a grounded portion of the switch. An alternate embodiment of the invention employs a flexible terminating impedance secured to the blade.

48 Claims, 5 Drawing Sheets



4,779,067

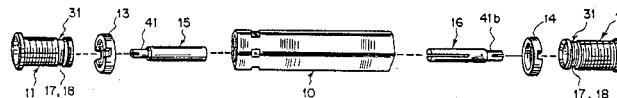
Oct. 18, 1988

Microwave Phase Trimmer

Inventor: John E. Johanson, deceased.
Assignee: Johanson Manufacturing Corporation.
Filed: Nov. 14, 1985.

Abstract—An adjustable coaxial cable connecting means is provided for serially connecting the adjacent ends of two cables. A turnbuckle sleeve having an open interior cylindrical wall surface, with opposite open ends of the interior wall surface having threads of equal but opposite pitch. A central coaxial conductor comprising telescoping male and female connectors slidably connecting at their central inner most ends, the male and female connectors each having means for connection to one of the central conductors of a coupled coaxial cable. These are the components needed in order to alter the electrical length of the coupler by rotational adjustment of the turnbuckle sleeve. The electrical length of the coupler may be altered by rotational adjustment of said turnbuckle sleeve.

4 Claims, 2 Drawing Sheets



4,780,691

Oct. 25, 1988

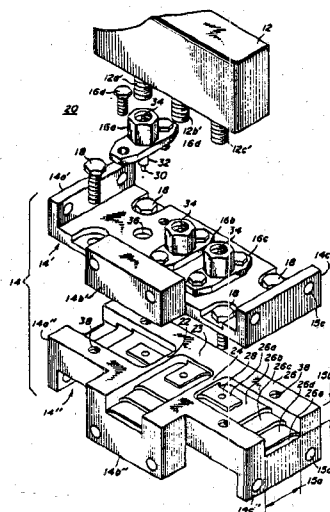
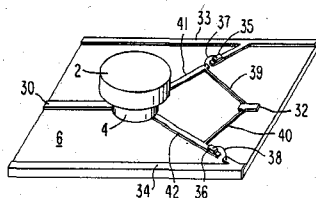
Dielectric Resonator Frequency Discriminator for Stabilizing Oscillator Frequency

Inventor: Slawomir J. Fiedziuszko.
Assignee: For Aerospace & Communications Corporation.
Filed: Aug. 3, 1987.

Abstract—A frequency discriminator (1) stabilizes a voltage controlled oscillator (5), particularly one operating at microwave frequencies. A single dielec-

tric resonator (2), typically positioned within a housing (8), is excited by an RF input (30). The dielectric resonator (2) generates in response to the excitation first and second orthogonal modes of RF electromagnetic energy at slightly different frequencies. The two orthogonal modes are converted to dc output signals (39, 40) of opposite polarity and substantially the same magnitude, e.g., by diodes (35, 36). Frequency offsets are obtained by tuning screws (43, 44) and/or by changing the amount of dielectric (2) in the path of the characterizing vector corresponding to the mode being frequency-offset.

8 Claims, 2 Drawing Sheets



4,780,693

Oct. 25, 1988

Probe Coupled Waveguide Multiplexer

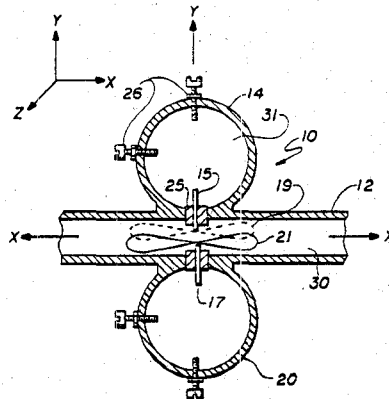
Inventors: Joseph A. Elliott and Rolf Kich.

Assignee: Hughes Aircraft Company.

Filed: Nov. 12, 1986.

Abstract—A probe coupled waveguide multiplexer is provided including a first waveguide which serves as a multiplexing manifold; a second waveguide, having a cavity, typically a filter, which is probe coupled to the first waveguide; and a third waveguide which has a cavity and is probe coupled to the first waveguide such that the probe of said third waveguide is diametrically opposed to the probe of said second waveguide and the second and third waveguides are mounted in the same transverse plane in co-planar relation. The probe coupling method and apparatus disclosed herein allows the waveguide filters to be mounted on the manifold in a close physical relation thereby minimizing the length of the manifold and associated costs.

2 Claims, 3 Drawing Sheets



4,780,692

Oct. 25, 1988

Cableless Switching Element for Waveguide Having Low Loss and Fast Switching Speed

Inventor: Paul A. Kiedrowski.

Assignee: Motorola, Inc.

Filed: May 4, 1987.

Abstract—An improved switching arrangement 10 for waveguide is disclosed which comprises in combination, a coaxial switch 12 and a unified, multi-port, waveguide interface 14. The coaxial switch 12 has coaxial connectors of a first type (12a, 12b, 12c) mounted in a parallel pattern with a preestablished center-to-center spacing. The waveguide interface 14 includes flanges (14a, 14b, 14c), and is preferably formed as a waveguide housing having a transition plate portion and a cover plate portion. Each port of the unified waveguide interface includes internal waveguide-to-coax transitions for coupling to a respective external connector of a second type. The external coaxial connectors (16a, 16b, 16c) are configured in a parallel pattern with center-to-center spacings equal to the preestablished center-to-center spacings of the coaxial switch connectors (12a, 12b, 12c) such that these connectors mate directly with those of the unified waveguide interface. By so doing, intervening coaxial cables or adaptors are eliminated and relatively low insertion loss and fast switching speed are exhibited over a relatively broad bandwidth.

35 Claims, 3 Drawing Sheets