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 is 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.

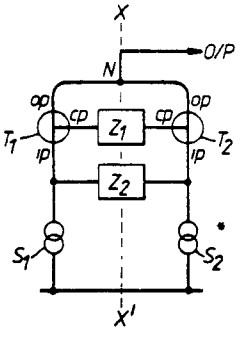
4,810,976 Mar. 7, 1989

Frequency Doubling Oscillator and Mixer Circuit

Inventors: Nicholas P. Cowley, Rodney J. Lawton and Thomas D. S.McClelland.
Assignee: Plessey Overseas Limited.
PCT Filed: Oct. 21, 1986.

Abstract—An oscillator of balanced design in which a resonant impedance network is connected between the control ports of two matched transistors, and a capacitance is connected in parallel, across the two inputs of these transistors. The inputs of the transistors are connected each to a matched current source. The signals at the transistor outputs are summed together at a common node. Signals of resonant frequency in each arm of the oscillator are equal in magnitude but opposite in phase. Signals at resonant frequency thus cancel whereas signals at the second harmonic frequency add constructively and are thus enhanced. The effect is a net frequency doubling. For high frequency operation, bipolar transistors are utilized. The current sources can be modulated and an IF mixer output derived. Signal of resonant frequency can be extracted and used for signal prescaling. In an equivalent arrangement, an inductance and resonant network replace the resonant network and capacitance just mentioned.

7 Claims, 2 Drawing Sheets



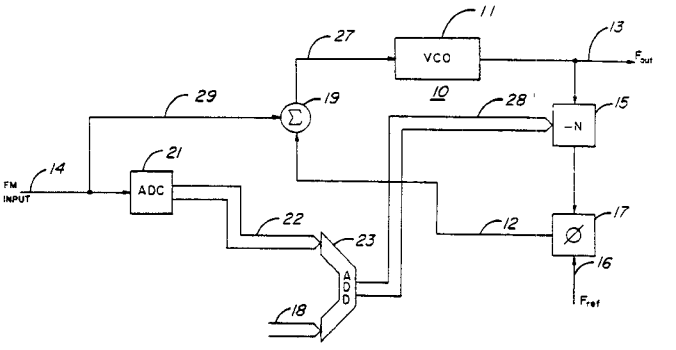
4,810,977 Mar. 7, 1989

Frequency Modulation in Phase-Locked Loops

Inventors: Ben Flugstad, Raymond L. Fried, Alan Hedge, Barton L. McJunkin, and Mark D. Talbot.
Assignee: Hewlett-Packard Company.
Filed: Dec. 22, 1987.

Abstract—A phase-locked loop (PLL) frequency synthesizer having an analog, out-of-band component path and a digital, in-band component path to provide frequency modulation (FM) of the synthesized output signal is described. The in-band FM component is octave scaled by an analog scaling means and coupled to an analog-to-digital converter to provide a digital number to be decade added to the PLL divide number to change the PLL frequency in response to the in-band FM signal. The out-of-band FM component is also scaled and applied to a loop summing node and summed with the PLL error signal to vary the PLL frequency. The scaling in both the in-band component path and out-of-band component path is equalized to provide a flat frequency response. Additional, the in-band component is scaled to allow use of the analog-to-digital converter over its maximum range to maintain a high signal-to-noise ratio.

5 Claims, 2 Drawing Sheets



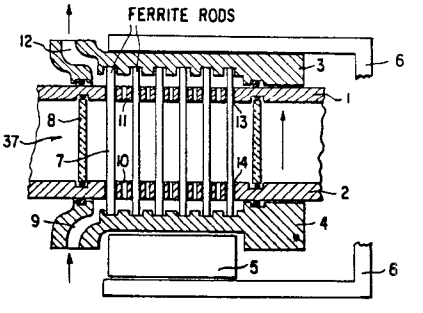
4,810,979 Mar. 7, 1989

Microwave Junction Circulator

Inventors: Günter Mörz, Wolfgang Weiser, Sigmund Lenz, and Erich Pivit.
Assignee: Ant Nachrichtentechnik GmbH.
Filed: Oct. 2, 1987.

Abstract—A junction circulator suitable for high power, high-frequency use has a microwave junction zone which is penetrated by a static magnetic field. Disposed in the microwave junction zone is a ferromagnetic resonator composed of different dielectric media, at least one of which has ferromagnetic characteristics. The interfaces between the various dielectric media form three-dimensional bodies which extend over the entire height of the junction zone and which have cross sections that do not change in the direction of the static magnetic field. These interfaces may be provided by parallel ferrite rods, or a ferrite body with parallel bores.

23 Claims, 2 Drawing Sheets



4,810,980 Mar. 7, 1989

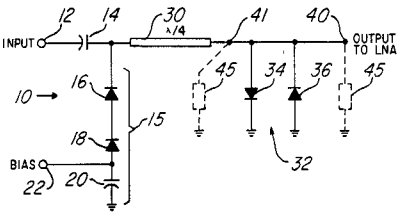
Matched Variable Attenuation Switched Limiter

Inventors: David D. Heston, David J. Seymour, and Randall E. Lehmann.

Assignee: Texas Instruments, Inc.
Filed: June 4, 1987.

Abstract—This invention provides a switched limiter with variable attenuation designed with monolithic GaAs p-i-n diodes. Greater than 30 dB of small-signal variable attenuation is achieved at X band frequencies, with a minimum insertion loss of 0.5 dB. The variable attenuation switched limiter provides 15 dB of isolation to a +30 dBm input signal. Under bias conditions that result in variable attenuation the variable attenuation switched limiter input impedance remains matched. When used as a passive limiter, 7 dB of limiting has been achieved for a +30 dBm input signal at 10 GHz.

10 Claims, 7 Drawing Sheets



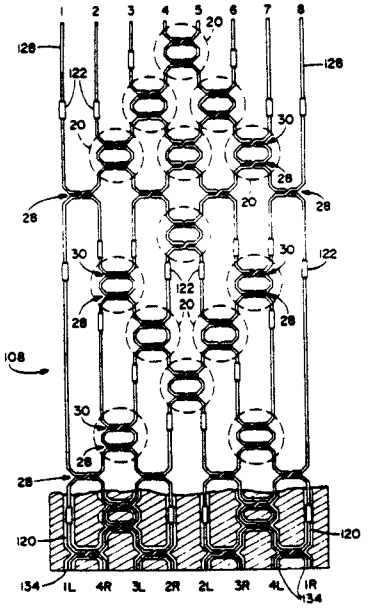
4,810,982 Mar. 7, 1989

Coaxial Transmission-Line Matrix Including In-Plane Crossover

Inventor: Mon N. Wong.
Assignee: Hughes Aircraft Company.
Filed: Oct. 23, 1987.

Abstract—An assembly of coaxial transmission lines and coupling devices, formed of closely spaced center conductors of the coaxial lines, is formed within a planar configuration. The coupling devices are arranged either singly, or in pairs with one coupling device behind the other coupling device, to provide for a division of power between transmission lines and to provide for a crossing over of power from one transmission line to another transmission line. The transmission-line assembly is reciprocal in operation so that the singly arranged coupling devices may be employed for a distribution as well as for a combination of electromagnetic waves. Phase shifters may also be included to provide a desired phase relationship among waves outputted by various ones of the transmission lines. The transmission lines, the coupling devices and the phase shifters may all be fabricated in a parallel array within a common metallic plate by automated milling machines for facile, accurate, and reproducible manufacture of the transmission-line assembly. The assembly including the matrix of coaxial lines for electromagnetic waves is readily structured to serve as a Butler matrix.

15 Claims, 8 Drawing Sheets



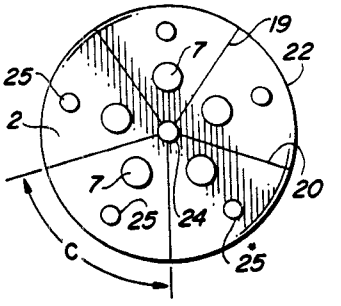
4,810,984 Mar. 7, 1989

Dielectric Resonator Electromagnetic Wave Filter

Inventors: Pitt W. Arnold and Kevin M. Gaukel.
Assignee: Celwave Systems Inc.
Filed: Sept. 4, 1987.

Abstract—A dielectric resonance electromagnetic filter for selection of a resonance frequency of a high frequency electromagnetic wave having the dielectric resonator attached directly to the shield. The filter is tunable using a tuning cylinder which moves through a cavity in the center of the resonator. The tuning cylinder is hollow and is designed to expand thermally during heatup to counter thermal changes in the resonance frequency. The tuning cylinder may be metal or dielectric material or may have sections of both materials. A shield geometry has been described which enables filter clusters to occupy a minimum volume.

4 Claims, 2 Drawing Sheets



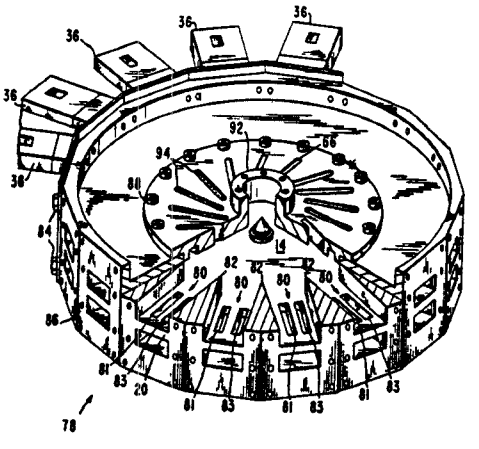
4,812,782 Mar. 14, 1989

Nonreactive Radial Line Power Divider/Combiner with Integral Mode Filters

Inventor: James S. Ajioka.
Assignee: Hughes Aircraft Company.
Filed: Aug. 31, 1987.

Abstract—Disclosed is a parallel plate radial transmission line having parallel plate spacing of less than $\lambda/2$ and which utilizes a specific higher order mode, preferably the first higher order circumferential mode. Undesired modes are suppressed by mode suppression slots formed in one or both of the parallel plates and which are oriented parallel to the current flow lines of the particular mode that is used. These slots have a negligible effect on the mode being used but they couple out other modes that are generated by means such as by imperfections and imbalances in any active devices coupled to the radial line. A centrally located feed is used to launch circularly polarized energy of the TE_{11} mode in the particular circumferential mode in the radial line. The feed may also receive circularly polarized energy of the particular circumferential mode in the radial line, linearly polarize that received energy and conduct it in the TE_{11} mode.

33 Claims, 4 Drawing Sheets



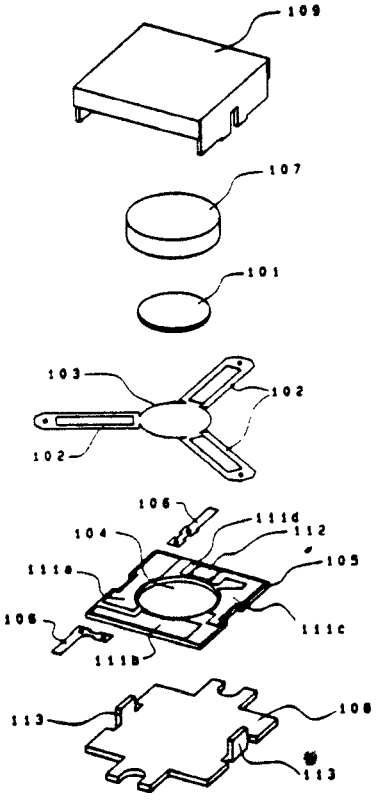
4,812,787 Mar. 14, 1989

Lumped Constant Nonreciprocal Circuit Element

Inventors: Kenji Kuramoto and Manabu Yumoto.
Assignee: Nippon Ferrite, Ltd.
Filed: Oct. 20, 1987.

Abstract—A lumped constant non-reciprocal circuit element such as a circulator or an isolator comprising a set of mutually insulated central conductors, a garnet plate not more than 0.6 mm in thickness, a ceramic substrate having a central bore for accommodating the garnet plate and patterned electrodes formed thereon, and a permanent magnet for applying a dc magnetic field to the garnet plate. Because of this structure, this circuit element is very thin with good insertion loss properties.

3 Claims, 4 Drawing Sheets



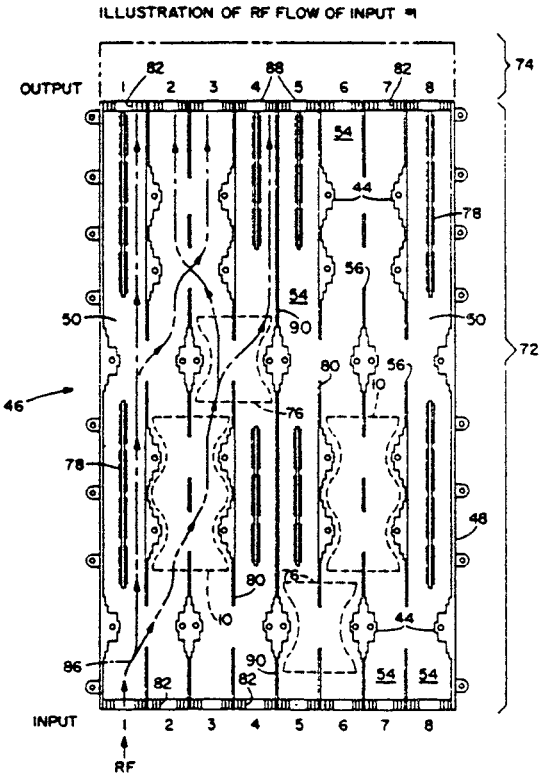
4,812,788 Mar. 14, 1989

Waveguide Matrix Including In-Plane Crossover

Inventors: Mon N. Wong, Robert J. Patin, Theodore S. Fishkin, and Donald C. D. Chang.
Assignee: Hughes Aircraft Company.
Filed: Nov. 2, 1987.

Abstract—An assembly of waveguides and coupling apertures located within walls separating the waveguides is formed within a planar configuration. The coupling apertures are arranged either singly or in pairs, with one coupling aperture behind the other coupling aperture, to provide for a division of power between waveguides and to provide for a crossing over of power from one waveguide to another waveguide. The waveguide assembly is reciprocal in operation so that the single coupling apertures may be employed for a distribution as well as for a combination of electromagnetic waves. Phase shifters may also be included to provide a desired phase relationship among waves outputted by various ones of the waveguides. The waveguides, the walls separating the wavedguides, the coupling apertures and the phase shifters may all be fabricated in a parallel array within a common metallic plate by automated milling machines for facile, accurate, and reproducible manufacture of the waveguide assembly. The waveguide assembly including the matrix of passages for electromagnetic waves is readily structured to serve as a Butler matrix.

10 Claims, 4 Drawing Sheets



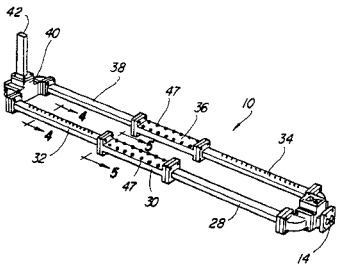
4,812,789 Mar. 14, 1989

Ridged Waveguide Wide-Band Diplexer with Extremely Sharp Cutoff Properties

Inventor: Kuan M. Lee.
Assignee: Hughes Aircraft Company.
Filed: Jan. 20, 1988.

Abstract—A wide-band balanced diplexer splits an incoming wide-band microwave frequency signal into separate upper and lower frequency outputs and possesses a sharp band cutoff to increase effective bandwidth. The diplexer includes a pair of waveguide assemblies for separating the upper frequency band from the incoming signal. Each waveguide assembly includes a tunable, ridged waveguide phase shifter for shifting the phase of the lower frequency band, a reference waveguide for inserting a delay onto the upper frequency signal in order to compensate for the effects of the phase shifter in the other waveguide assembly, and a high pass filter. The high pass filter includes a ridged waveguide having tapered ends of a shape comprising an exponential function raised to a cosine squared power to increase the bandwidth of the upper frequencies and to provide a sharper frequency cutoff.

26 Claims, 2 Drawing Sheets



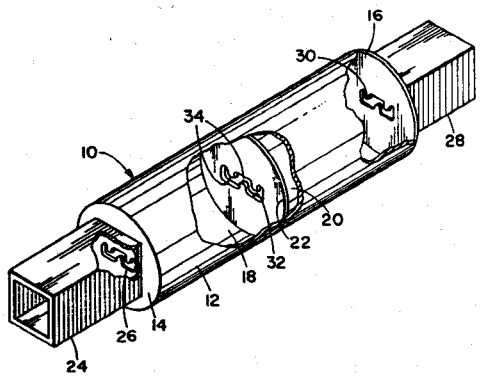
4,812,790 Mar. 14, 1989

Toothed Coupling Iris

Inventors: Paul J. Tatomir and Martin B. Hammond.
Assignee: Hughes Aircraft Company.
Filed: Feb. 16, 1988.

Abstract—An iris is located in a common wall separating two microwave enclosures such as waveguides and cavities for coupling electromagnetic power between the two enclosures. The iris is formed of an aperture elongated in one direction to define a longitudinal axis of the aperture with opposed first and second sides parallel to the axis. Portions of the common wall at peripheral regions of the aperture are extended from the first and second sides towards the iris and perpendicularly thereto to form teeth, there being an array of teeth extending from the first side and an array of teeth extending from the second side. The teeth are readily polarized as magnetic dipoles by surface currents induced in the wall by electromagnetic waves for increased coefficient of coupling of electromagnetic field components through the iris.

9 Claims, 1 Drawing Sheet



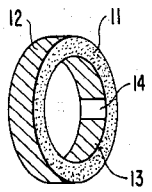
4,812,791 Mar. 14, 1989

Dielectric Resonator for Microwave Band

Inventors: Mitsuo Makimoto and Motoi Ohba.
Assignee: Matsushita Electric Industrial Co. Ltd.
Filed: Feb. 18, 1987.

Abstract—A resonator for microwave or VHF-UHF bands has a ring dielectric plate, one surface of which is metalized to make a resonant line, and at least one of other surfaces of which is also metalized to make a grounded or earth conductor. The resonator is very small in size and has a large unloaded Q value. Several embodiments are disclosed.

13 Claims, 4 Drawing Sheets



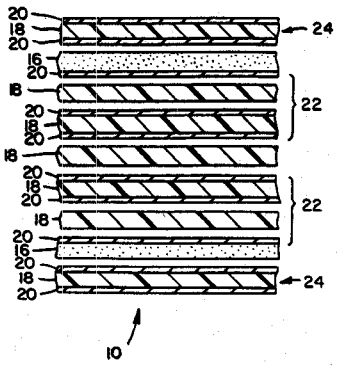
4,812,792 Mar. 14, 1989

High-Frequency Multilayer Printed Circuit Board

Inventor: Joseph D. Leibowitz.
Assignee: TRW Inc.
Filed: May 1, 1987.

Abstract—A circuit board having multiple layers of a dielectric material, multiple layers of a conductive metal and multiple layers of graphite bonded together to form a composite multilayer printed circuit board having a desired coefficient of expansion and having strip and microstrip transmission lines for electrically connecting very high frequency electronic components mounted on the circuit board. The multiple layers of graphite are positioned in a symmetrical manner with respect to the thickness of the circuit board and selected in number to provide the circuit board with a desired coefficient of expansion. In addition, at least some of the layers of graphite are positioned in close proximity to some of the layers of conductive metal to provide enhanced thermal conduction from the mounted components.

18 Claims, 2 Drawing Sheets



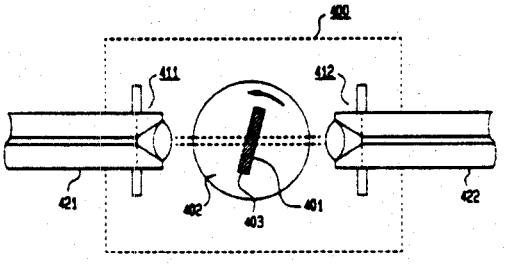
4,813,756 Mar. 21, 1989

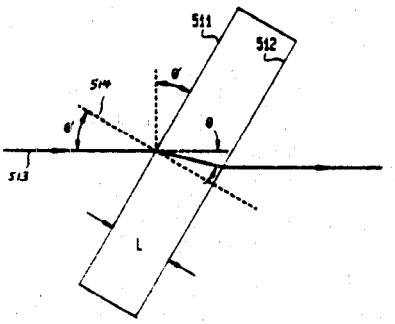
Etalon Filters for Optical Channel Selection in Wavelength Division Multiplexed Fiber Systems

Inventors: Anatoly Frenkel and Chinlon Lin.
Assignee: Bell Communications Research, Inc.
Filed: Jan. 25, 1988.

Abstract—Filter arrangements (400,500,600) are disclosed for tunable channel selection in optical wavelength division multiplexed systems. Each filter arrangement has an etalon device (e.g. 401–403) as a simple, compact, in-line component which is rotatably adapted for interposing between the ends of fiber optic cables for interconnecting the cables. An optical beam emanating from a free end of each cable end is focused and directed to the etalon device by a collimated lensed connector (e.g. 411). Identical etalon devices may be stacked and ganged for rotation in unison to increase the number of system channels that may be propagated. Nonidentical etalon devices may be stacked and made independently rotatable to increase the free spectral range of the system.

12 Claims, 3 Drawing Sheets





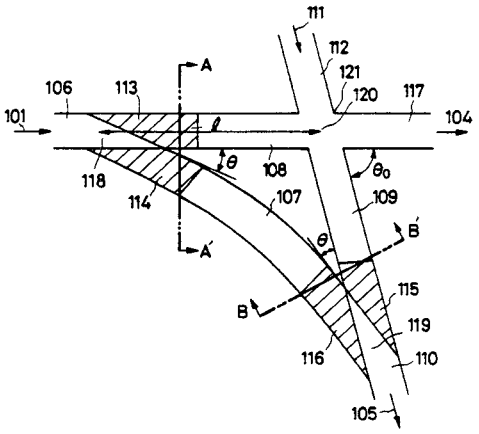
4,813,757 Mar. 21, 1989

Optical Switch Including Bypass Waveguide

Inventors: Shinji Sakano, Hiroaki Inoue, Hiroyoshi Matsumura, Hitoshi Nakamura, Toshio Katsuyama, and Naoki Chinone.
Assignee: Hitachi, Ltd.
Filed: Nov. 18, 1987.

Abstract—Herein disclosed is a branch type optical switch having three or more optical waveguides capable of being coupled to one another in a coupling region, in which is formed a refractive index changing portion for effecting the function of the branch type optical switch by changing the refractive index thereof. This optical switch has a small coupling loss and an excellent extinction ratio. Also disclosed is an intersection type optical switch having two or more optical waveguides intersecting each other. The input optical waveguide and the output waveguide are connected at their intersection by means of a bypass optical waveguide to construct the above-specified branch type optical switch in the coupling regions of the bypass optical waveguides and the input and output optical waveguides, and the bypass optical waveguide has a curved or polygonal shape. Thus, it is possible to provide a small-sized optical switch which has an excellent extinction ratio and little variability in characteristics.

3 Claims, 3 Drawing Sheets



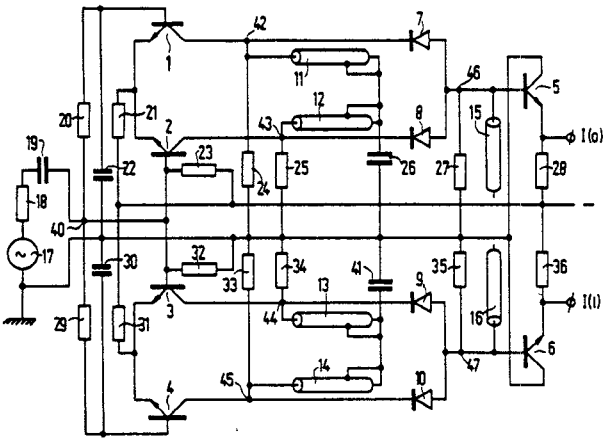
4,814,717 Mar. 21, 1989

FSK Frequency Discriminator for a Coherent Optical Transmission System

Inventor: Pieter W. Hooijmans.
Assignee: U.S. Philips Corporation.
Filed: Nov. 20, 1987.

Abstract—A frequency discriminator for an optical coherent transmission system, wherein FSK signals having the frequencies $F(1)$ and $F(2)$ are processed. The discriminator comprises a first series arrangement of a differential stage, a filter and a full-wave rectifier for processing the signal having the frequency $F(1)$ and a second series arrangement of a differential stage, a filter and a full-wave rectifier for processing the signal having the frequency $F(2)$. The discriminator is extremely fit for use at frequencies > 1 GHz and it is easy to integrate.

2 Claims, 1 Drawing Sheet



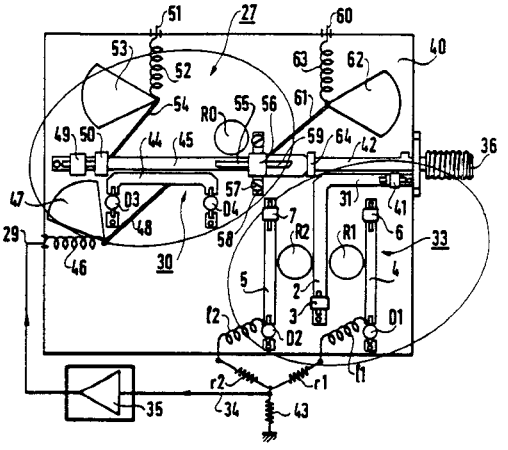
4,814,718 Mar. 21, 1989

Microwave Discriminator and Demodulator/Receiver Using the Same

Inventors: Lazare Argintaru and Denis Hebrard.
Assignee: Alcatel Thomson Faisceaux Hertziens.
Filed: Aug. 7, 1987.

Abstract—A microwave frequency discriminator, i.e., an electronic device for directly transforming frequency modulation on a microwave carrier into a demodulated lower frequency signal. The discriminator is similar to a Travis discriminator and includes an inlet microstrip line, two resonant circuits (R_1, R_2) constituted by dielectric resonators and coupled to said inlet microstrip line to receive the modulated microwave signal, two outlet microstrip lines coupling each resonator to a respective microwave detector circuit, said detector circuits including loads (r_1, r_2) in series-opposition in the manner of a Travis discriminator. The microwave frequency discriminator can be used in a demodulator and/or receiver for frequency-modulated microwaves.

7 Claims, 6 Drawing Sheets



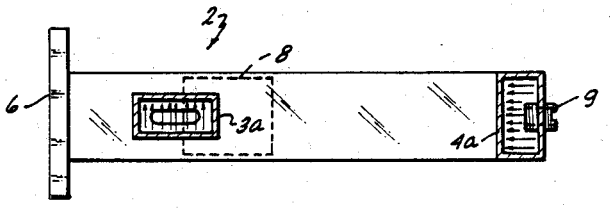
4,816,786 Mar. 28, 1989

Polarizer

Inventors: Günter Möhring and Detlef Block.
Assignee: Kabelmetal Electro GmbH.
Filed: Nov. 14, 1983.

Abstract—A polarizer for connection to a first and a second waveguide includes a feed tube and the first wave guide connected laterally to the feed tube whereby a long dimension of the wave guide extends in the direction of the axis of the feed tube. A short circuiting element is disposed in the feed tube between the connection of the first wave guide and one end of the feed tube. The second wave guide extends parallel to the first one and is laterally connected with a wide side to that one end of the feed tube, closing the same. The wide dimensions of the two wave guides are turned by 90°. The second wave guide is short circuited at its end, and a trimming pin is disposed on the second wave guide in axial alignment with the axis of the tube. The other end of the feed tube is connected to a single wave guide. The wave guides may have rectangular or elliptical cross section.

11 Claims, 1 Drawing Sheet



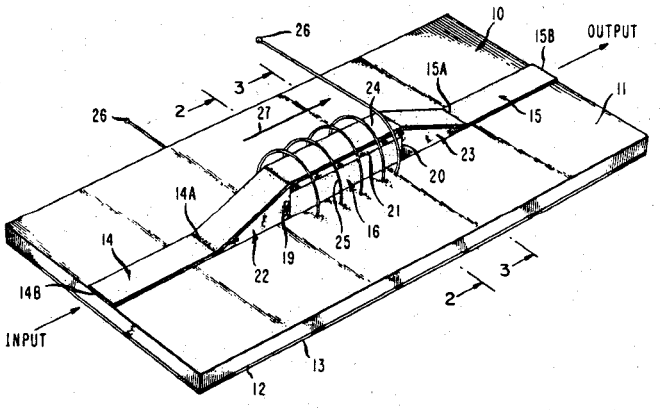
4,816,787 Mar. 28, 1989

Millimeter-Wave Microstrip Phase Shifter

Inventors: Richard A. Stern and Richard W. Babbitt.
Assignee: The United States of America as represented by the Secretary of the Army.
Filed: Feb. 3, 1988.

Abstract—A microstrip reciprocal phase shifter is provided comprising a rectangular ferrite rod having an upwardly sloping ramp member at one end thereof and a downwardly sloping ramp member at the other end thereof. The ramp members are made of dielectric waveguide having a dielectric constant substantially the same as the dielectric constant of the rod. The rod and ramp members are disposed on one surface of a microstrip dielectric substrate having a dielectric constant substantially lower than the dielectric constant of the ramp members and a ground plane on the other surface thereof. Input and output sections of microstrip conductor are placed on the surface of the substrate in axial alignment with the rod and ramp members. A dielectric plate having a dielectric constant substantially less than the rod is placed on top of the rod and another section of microstrip conductor is placed on top of the dielectric plate and the two ramp members and is electrically interconnected with the input and output microstrip conductors. A helical coil is arranged to surround the rod and plate to produce a unidirectional magnetic field along the longitudinal axis of the rod to thereby cause the rod to act as a Reggia–Spencer type of ferrite phase shifter.

4 Claims, 1 Drawing Sheet



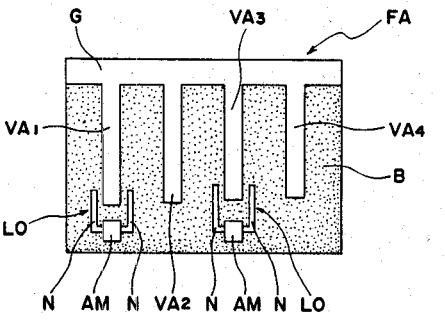
4,816,788 Mar. 28, 1989

High-Frequency Band-Pass Filter

Inventors: Youhei Ishikawa and Hiroaki Tanaka.
Assignee: Murata Manufacturing Co., Ltd.
Filed: June 30, 1987.

Abstract—A high frequency band-pass filter which includes a single resonator or a plurality of resonators adapted to pass a high frequency signal of a predetermined frequency band region, and an active element device electrically coupled with one or the plurality of the resonators so as to present a negative resistance when the resonator is in a resonant state.

25 Claims, 6 Drawing Sheets



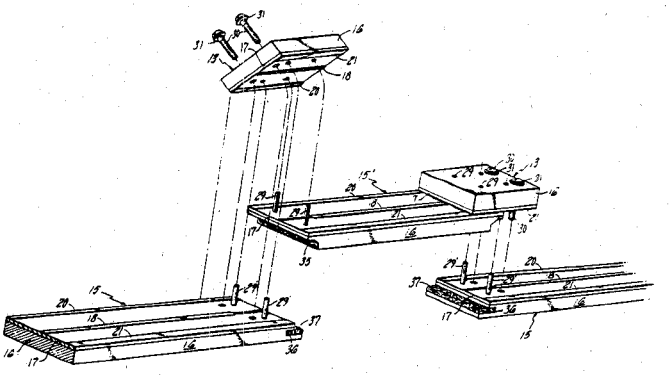
4,816,789 Mar. 28, 1989

Solderless, Push-Down Connectors for RF and dc

Inventor: Jeffrey R. Mars.
Assignee: United Technologies Corporation.
Filed: Feb. 25, 1988.

Abstract—A connector arrangement (13) for electrically connecting first and second microstrip structures (15,15') carrying for example RF and dc voltage values therebetween, the ground plates of the connector arrangement (13) and said microstrip structures (15,15') establishing an offset stripline arrangement, the dielectric layer of the connector arrangement (13) being substantially thicker and the dielectric constant thereof substantially lower in value than the corresponding values of the dielectric layers of said microstrip structures (15,15'), thereby enabling the metallization lines (18, 20 and 21) in the connector arrangement (13) to be relatively wide to enable effective alignment of microstrip structures (15,15') and connector arrangement (13).

14 Claims, 1 Drawing Sheet



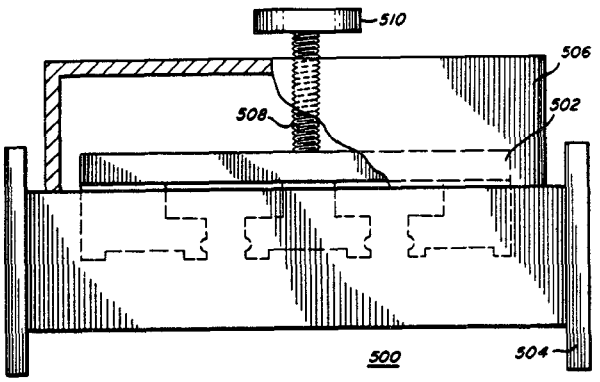
4,816,790 Mar. 28, 1989

Linear Microwave Attenuator

Inventor: Robert C. Kane.
Assignee: Motorola, Inc.
Filed: Aug. 13, 1987.

Abstract—A linear microwave attenuator has an absorbing element which is selectively shaped to provide reduced capacitive coupling and increased attenuation by segmenting the absorber into at least two members. The selective shaping reduces both the surface area and mass of the absorber while maximizing the attenuation of possible from the absorber. In this way, reduced size, linear performance, and increased attenuation over those of the prior art are provided by the present invention.

8 Claims, 3 Drawing Sheets



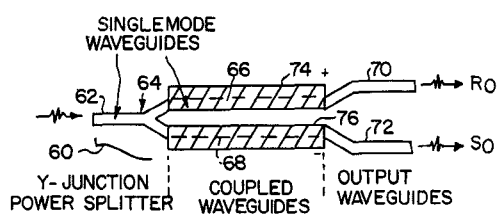
4,820,009 Apr. 11, 1989

Electro-Optical Switch and Modulator

Inventor: Suwat Thaniyavarn.
Assignee: TRW Inc.
Filed: Aug. 13, 1987.

Abstract—A directional coupler having two coupled waveguides that receive a single optical input through a Y-junction power splitter, and two outputs from the coupled waveguides. Electrodes positioned over the coupled waveguides apply opposite electric fields to the waveguides and, through the electro-optical effect, modulate the optical outputs. For a zero applied voltage and zero electric field, the outputs are both equal to approximately half of the maximum possible output intensity, and no bias voltage is needed for operation as a modulator. As the voltage is varied from zero, positively or negatively, the optical intensity from either of the outputs varies linearly over a useful range. Moreover, the voltage required to switch full power from one output to the other is less than that required for conventional electro-optical modulators or switches.

7 Claims, 1 Drawing Sheet



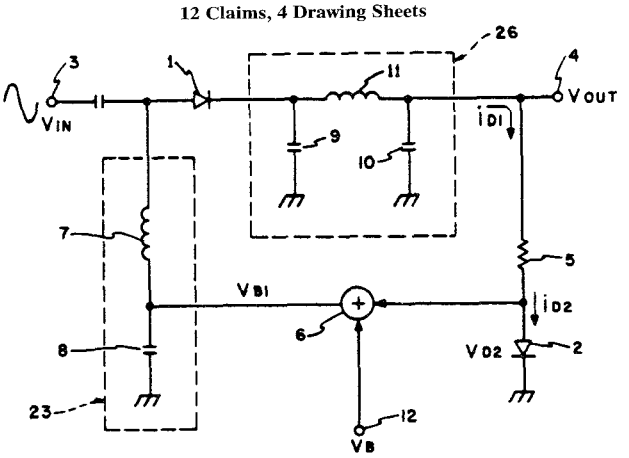
4,820,995 Apr. 11, 1989

Temperature-Stabilized RF Detector

Inventor: Yoshiharu Tamura.
Assignee: NEC Corporation.
Filed: May 13, 1988.

Abstract—A temperature-stabilized RF detector uses a series circuit including a detecting diode coupled in series with a similarly poled stabilizing diode so that a single current flows in a single direction through both diodes. The temperature related effects of the two diodes are mutually balancing so that temperature variations in the detecting diode do not adversely affect the detection of an RF signal.

12 Claims, 4 Drawing Sheets



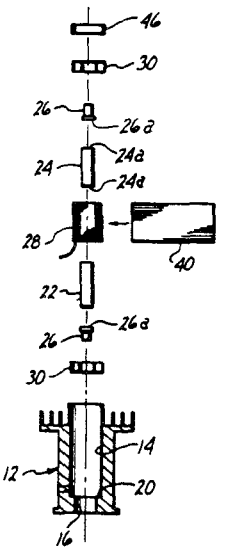
4,821,002 Apr. 11, 1989

Ku-Band Polarizer

Inventor: Robert A. Luly.
Filed: Apr. 7, 1988.

Abstract—Signal degradation is minimized in an electronic polarizer of the type having a circular input waveguide, rectangular output waveguide and an intermediate electromagnetic coil. A ferrite core is contained between impedance matching transformers within a small diameter intermediate waveguide section and air gaps are minimized by ferro-magnetic washers pressed onto the intermediate waveguide to hold the transformers in close contact with the ferrite core ends. The washers also support the electromagnetic coil coaxially within the cylindrical input waveguide, enhance the efficiency of the coil and define the transition walls between the small intermediate waveguide and the larger input and output waveguides.

13 Claims, 1 Drawing Sheet



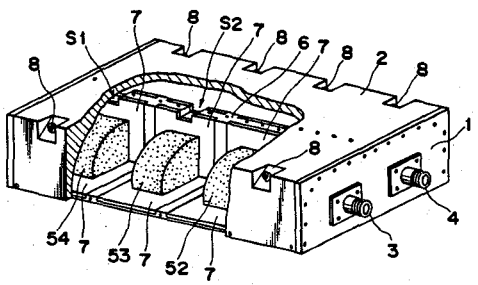
4,821,006 Apr. 11, 1989

Dielectric Resonator Apparatus

Inventors: Youhei Ishikawa, Kikuo Tsunoda, Toshiro Hiratsuka, and Hirotsugu Abe.
Assignee: Murata Manufacturing Co., Ltd.
Filed: Jan. 14, 1988.

Abstract—The dielectric resonator apparatus is characterized in that electric walls exist on one plane or two including the central axis of the electromagnetic field distribution in the using mode of a dielectric resonator, a dielectric resonator with either of dielectrics between the electric wall being removed in shape is provided by plurality, an equivalent axis is common to the central axis of each of the dielectric resonators, with the dielectric resonators being inductively coupled in the axial direction. A dielectric resonator which prevents the current from being concentrated on the central axis of the electromagnetic field distribution, is collectively smaller in the Joule loss and is higher in Q. The dielectric resonator of the present invention is characterized in that the dielectric close to the central axis is removed, wherein electric walls exist on one plane or two including the central axis of the electromagnetic field distribution in a dielectric resonator using, for instance, a $TE_{01\delta}$ mode, with either of dielectrics between the electric wall being removed in shape.

30 Claims, 14 Drawing Sheets



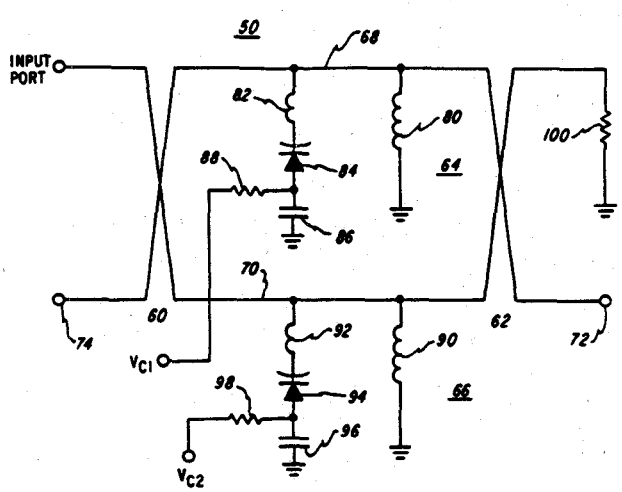
4,823,096 Apr. 18, 1989

Variable Ratio Power Divider/Combiner

Inventor: Ronald J. Hash.
Assignee: Harris Corporation.
Filed: Jan. 11, 1988.

Abstract—A variable ratio power divider/combiner includes first and second resonant circuits connected between the input port and the two output ports in the divider configuration. The signals appear at an output port of the divider as determined by the resonant condition of the resonant circuits. The resonance condition is controlled by a control signal that varies a capacitance in the resonant circuit.

17 Claims, 4 Drawing Sheets



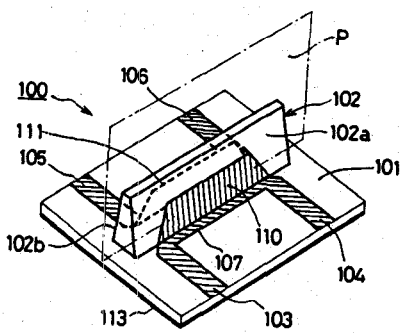
4,823,097 Apr. 18, 1989

Microwave Directional Coupler

Inventors: Yoshihiro Konishi and Haruaki Fujimoto.
Assignee: Uniden Corporation.
Filed: May 27, 1987.

Abstract—A microwave directional coupler which has a second dielectric board which stands erect on the surface of the first dielectric board; coupling elements are arranged with their planes facing each other on both sides of the second dielectric board, forming a coupling line part; and both end parts of the coupling line part are formed on the first dielectric board so that they can be connected by lead lines.

4 Claims, 8 Drawing Sheets



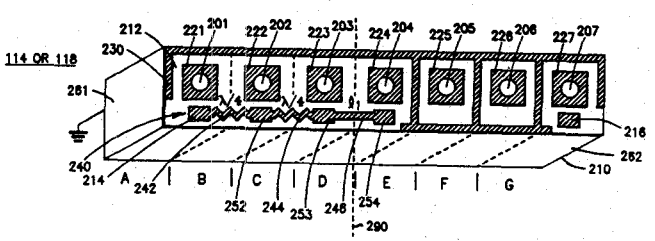
4,823,098 Apr. 18, 1989

Monolithic Ceramic Filter with Bandstop Function

Inventors: David M. DeMuro and Darioush Agahi-Kesheh.
Assignee: Motorola, Inc.
Filed: June 14, 1988.

Abstract—A ceramic filter includes a multiple zero bandstop filter function. The ceramic filter has a dielectric block with top and bottom surfaces and at least two holes, including a first hole and a second hole, extending from the top surface toward the bottom surface of the block. The block is selectively covered with a conductive material to provide a transmission line resonator for each of the two holes. The filter also includes an input electrode coupled to the dielectric means at a predetermined distance from the first holde, and an output electrode coupled to the dielectric means at a predetermined distance from the second hold. Finally, conductive plating, in the form of a transmission line, is continguously disposed on the dielectric means adjacent the two holes and coupled thereto to provide a bandstop filter function with a zero represented at each hole.

16 Claims, 2 Drawing Sheets



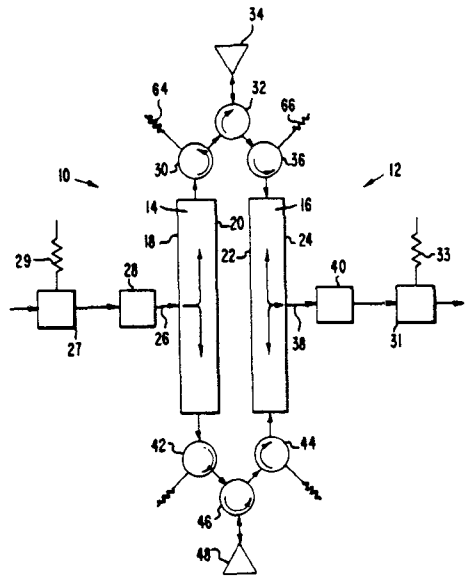
4,824,200 Apr. 25, 1989

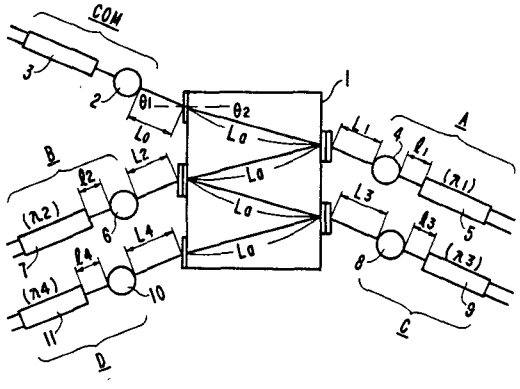
Optical Branching Filter

Inventors: Hideki Isono, Kazushi Asanuma, Takashi Yokota, and Kiyoshi Terai.
Assignee: Fujitsu Limited.
Filed: Feb. 6, 1987.

Abstract—An optical branching filter branches or mixes lights of n-kind of wavelengths. An input/output port for the light mixed n-kind of wavelengths is provided to one of two surfaces of the transparent block and second input/output parts for forming optical filters allowing only the lights having the predetermined wavelengths to pass therethrough, respectively among the lights in n-kind of wavelengths, but reflecting the lights having other wavelengths, respectively is provided to any one of two surfaces. A first input/output port and n second input/output ports, respectively is formed by an optical waveguide and a lens which optically connects the optical waveguide and first input/output part or a second input/output part. Positions of each second input/output port are selected so that the length of optical paths formed between the lenses of the first input/output port in the second input/output port are in the reverse proportion to the lengths of wavelengths corresponding to the second input/output portions.

8 Claims, 5 Drawing Sheets





4,825,175 Apr. 25, 1989

Broad-Band, High-Isolation Radial Line Power Divider/Combiner

Inventors: George I. Tsuda and James S. Ajioka.
Assignee: Hughes Aircraft Company.
Filed: Aug. 31, 1987.

Abstract—Disclosed is a power divider/combiner using two parallel-plate radial transmission lines having parallel plate spacing of less than $\lambda/2$ and which operates in a higher order mode, preferably the first higher order circumferential mode TE_{11}. High isolation between amplifiers coupled to the radial transmission lines at their circumferences is achieved by coupling an arrangement of circulators between the amplifiers and the radial transmission lines. This isolation arrangement reduces the effects of any spurious signals that are generated by means such as imperfections and imbalances in any active devices coupled to the radial line and permits de-energizing amplifiers as desired for lowering power output without degrading performance.

15 Claims, 4 Drawing Sheets

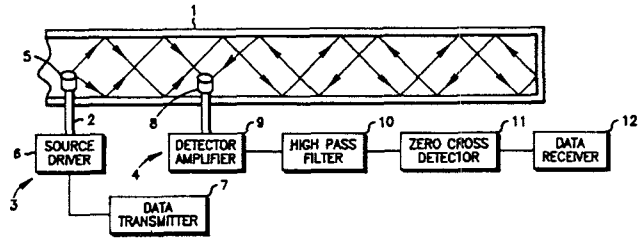
4,826,274 May 2, 1989

Optical Coupling Arrangements Including Emitter and Detector Placed Inside of a Hollow Closed End Reflective Waveguide

Inventors: Menachem Diamantstein, Paul Gran, Marian Berinzon Zvi Eckstien, Uri Gal, and Julie Greenberg.
Assignee: Motorola, Inc.
Filed: Dec. 21, 1987.

Abstract—An arrangement for optically coupling separate modules forming part of a multiprocessor system comprises an air-filled substantially cylindrical optical waveguide 1 having a reflective inner wall and apertures 2 therein via which a photoemitter 3 and a photodetector 4 associated with each module can optically communicate with other photoemitters and photodetectors associated with other modules.

13 Claims, 1 Drawing Sheet



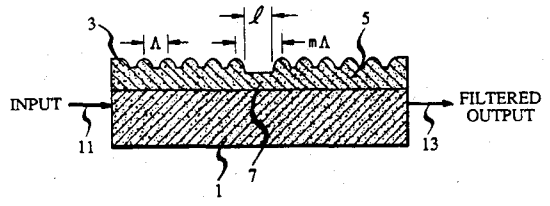
4,826,282 May 2, 1989

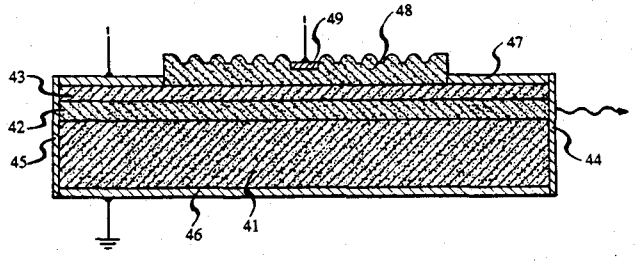
Optical Communications Laser Including a Resonator Filter

Inventor: Rodney C. Alferness.
Assignee: American Telephone and Telegraph Company, AT&T Bell Laboratories.
Filed: July 21, 1987.

Abstract—A structure of first and second grating sections separated by a phase-shift section serves as a narrow-band resonator filter. Such structure may be optically coupled to a semiconductor laser cavity, and the resulting assembly can serve as a tunable narrow-linewidth laser, e.g., in wavelength-multiplexed and coherent-lightwave communications systems.

10 Claims, 3 Drawing Sheets





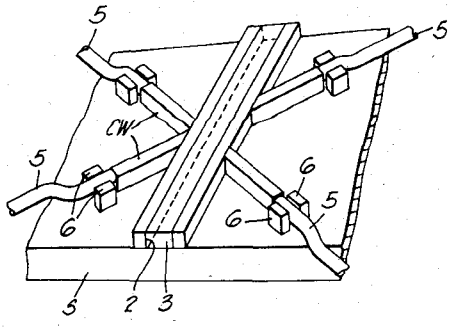
4,828,362 May 9, 1989

Optical Switch

Inventors: Jeffrey D. Skinner and John S. McCormack.
Assignee: The General Electric Company, p.lc.
Filed: June 25, 1986.

Abstract—An optical switching device comprises an optical waveguide formed from two light-transmitting materials having an interface between them, and in which the refractive index of one of the materials can be altered by an external influence; the other has a light path directed at the interface at an angle such that by varying the refractive index of the first material the light can either pass through the material or be reflected at the interface. By utilizing a plurality of such interfaces in sequence the light may be selectively switched along several different paths.

4 Claims, 2 Drawing Sheets



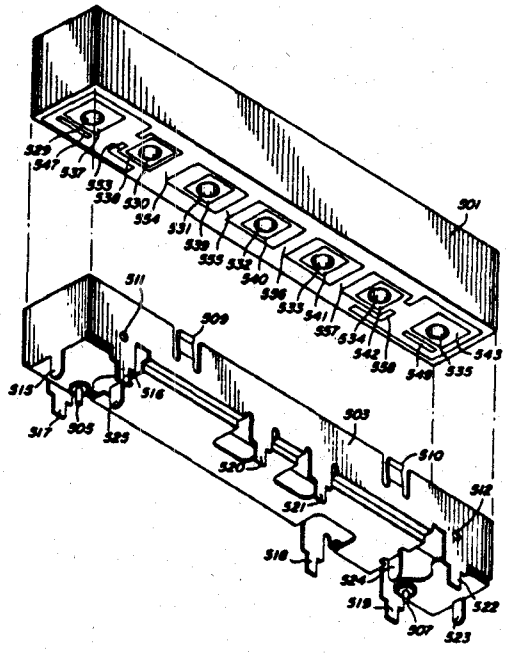
4,829,274 May 9, 1989

Multiple-Resonator Dielectric Filter

Inventors: Steven R. Green, David M. De Muro, and Raymond L. Sokola.
Assignee: Motorola, Inc.
Filed: Sept. 3, 1987.

Abstract—A multiresonator dielectric block filter is disclosed in which capacitive coupling between resonators disposed in the dielectric block is controlled by an electrode strip coupled to the conductive material covering the majority of the dielectric block surface. The electrode strip extends at least partially between two adjacent resonators to control the capacitive coupling between the resonators.

21 Claims, 6 Drawing Sheets



4,830,444 May 16, 1989

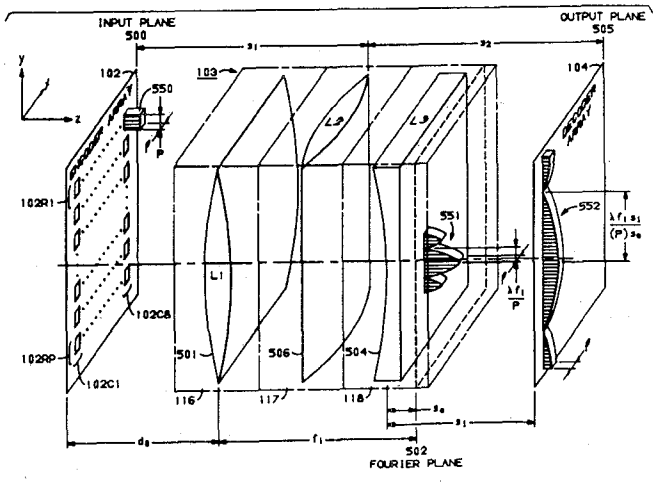
Optical Switch

Inventors: Thomas J. Cloonan, Harvard S. Hinton, and Frederick B. McCormick, Jr.
Assignee: American Telephone and Telegraph Company, AT&T Bell Laboratories.
Filed: Dec. 31, 1987.

Abstract—An optical switch (100) is disclosed for switching spatially separated complementary optical signals from a row of a two-dimensional input storage array (132) to a selected row of a two-dimensional output storage array (133). The switch includes an input system (101) for converting temporally-separated information represented by a serial bit stream of complementary optical signals into a spatially-separated format for storage in the input array. An output system 105 is also included for converting the switched, spatially-separated information in the output array into a temporally-separated format for serial transmission on plurality of optical output fiber pairs 160(1)–160(N). The input and output systems enable the switch to perform both time- and space-division switching with only a single stage of switching.

A distributor system (103), also included in the switch, spatially distributes the optical signal pairs from a row of the input array over the entire output array for selective storage of the information represented by the signals in one or more rows of the output array.

30 Claims, 15 Drawing Sheets



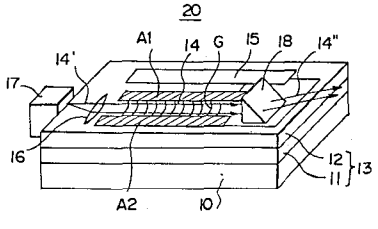
4,830,448 May 16, 1989

Light Modulator and Waveguide Device

Inventors: Yoji Okazaki, Hiroshi Sunagawa, and Kozi Kamiyama.
Assignee: Fuji Photo Film Co., Ltd.
Filed: Oct. 9, 1986.

Abstract—A light modulator comprises a stack of a waveguide layer and an adjacent layer normally exhibiting a refractive index smaller than that of the waveguide layer, at least one of these layers being formed of a material whose refractive index changes by application of energy. An energy applicator is provided at least in one of these layers, and a dielectric grating is positioned at the surface of the adjacent layer over a section where energy is applied by the energy applicator. A drive circuit is provided for energizing the energy applicator and causing a change in refractive index to arise in the waveguide layer and/or the adjacent layer so that a wave guided inside of the waveguide layer is radiated out of the stack by interaction with the dielectric grating. In a waveguide device, the waveguide layer is formed of a thermo-optic material in which the thermal coefficient of refractive index is zero or negative, and the adjacent layer is formed of a thermo-optic material exhibiting a positive thermal coefficient of refractive index.

9 Claims, 7 Drawing Sheets



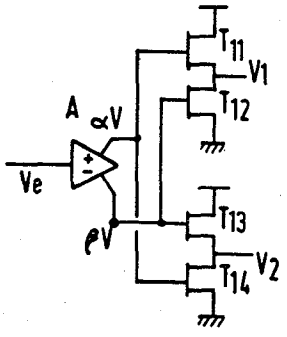
4,831,336 May 16, 1989

Zero to One Hundred and Eight-Degree Active Phase Shifter for Microwave Frequencies

Inventor: Pierre B. Dautriche.
Assignee: U.S. Philips Corporation.
Filed: Jan. 20, 1988.

Abstract—A zero to one hundred and eight-degree active phase shifter for microwave frequencies contains a differential input amplifier having an inverting output (βV) and a non-inverting output (αV) and a first (T_{11}, T_{12}) and a second (T_{13}, T_{14}) output stage of the push-pull type realized with MES-transistors and each comprising an inverting input and a noninverting input. The inverting output (βV) of the input amplifier controls the inverting input (T_{12}) of the first output stage and the noninverting input (T_{13}) of the second output stage. The noninverting output (αV) of the input amplifier controls the non-inverting input (T_{11}) of the first output stage and the inverting input (T_{14}) of the second output stage.

4 Claims, 2 Drawing Sheets



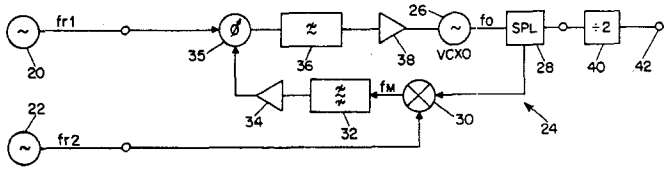
4,831,339 May 16, 1989

Oscillator Having Low Phase Noise

Inventor: Robert Nemeth.
Assignee: Nemeth-Bates Corp.
Filed: Aug. 21, 1987.

Abstract—Phase noise in a carrier signal is reduced by use of a phase locked loop which is responsive to the carrier signal and another signal of comparable noise level but having noncorrelated phase noise.

32 Claims, 2 Drawing Sheets



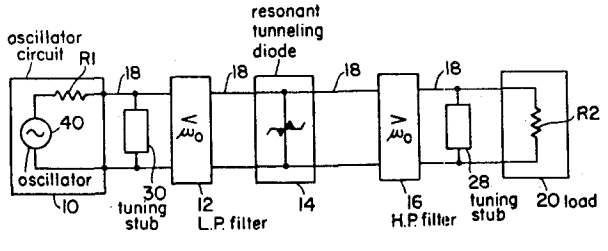
4,831,340 May 16, 1989

Harmonic Multiplier Using Resonant Tunneling Device

Inventor: T. C. L. Gerhard Sollner.
Assignee: Massachusetts Institute of Technology.
Filed: Jan. 11, 1988.

Abstract—An harmonic multiplier comprising a resonant-tunneling diode responsive to a fundamental frequency source oscillator for generating odd harmonics of said fundamental frequency. The resonant-tunneling diode has a current/voltage characteristics curve exhibiting antisymmetry about a zero-volt, zero-current origin and negative differential resistance with high current peaks and low current valleys.

12 Claims, 5 Drawing Sheets



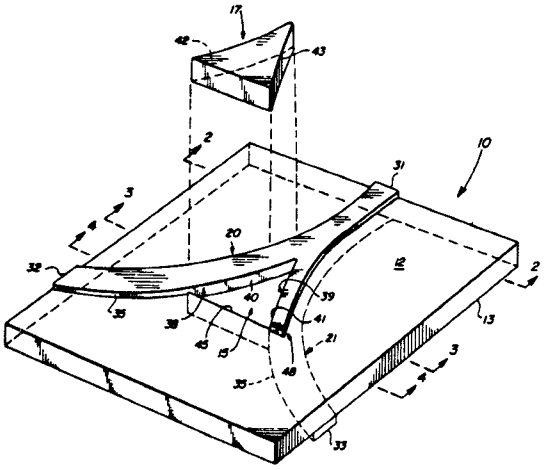
4,831,345 May 16, 1989

Stripline Power Divider

Inventor: Frank J. Schiavone.
Assignee: The United States of America as represented by the Secretary of the Navy.
Filed: June 17, 1988.

Abstract—In a stripline power divider having a pair of conductive stripes, which are on opposite sides of a dielectric board, overlap at an input port, and then diverge oppositely to a pair of output ports individual to the stripes, the improvement characterized by the divider having an opening extending through the board and between the strips in the region where they diverge, by conductive plating extending from each stripe along the adjacent edge of the opening, and by a plug of elastomeric, lossy material fitted in the opening to electrically connect the plated edges and suppress odd mode fields between the stripes.

6 Claims, 5 Drawing Sheets



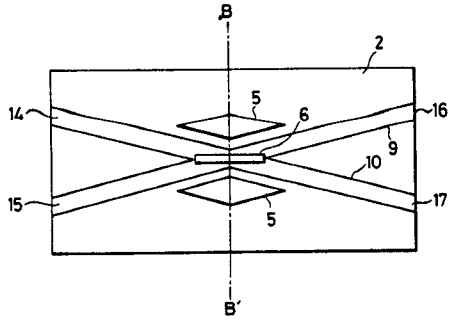
4,832,430 May 23, 1989

Optical Switch

Inventors: Kunio Tada, Yoshitaka Okada, Hiroaki Inoue, and Hiroyoshi Matsumura.
Assignee: Hitachi, Ltd.
Filed: Jan. 29, 1987.

Abstract—Electrodes are provided in the vicinity of the switching region of a carrier injection type optical switch, and carriers are removed rapidly through these electrodes when the switch is turned OFF. As the result, a switching speed is increased.

15 Claims, 4 Drawing Sheets



4,832,431 May 23, 1989

Apparatus for Continuous Polarization and Phase Control

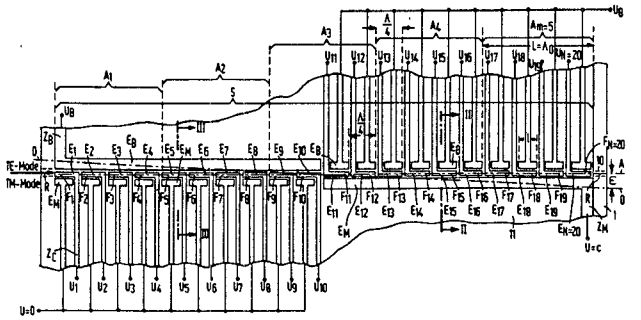
Inventors: Hans-Peter Nolting, Helmut Heidrich, and Detlef Hoffmann.
Assignee: Siemens Aktiengesellschaft.
Filed: Sept. 11, 1987.

Abstract—Apparatus for continuous reset-free polarization and phase control which includes an optical strip waveguide 10 in which two waves TE and TM mode are polarized orthogonally relative to each other and have mutually different propagation constants β_1 and β_2 and includes a plurality of $N = 4m$ equidistant electrodes (E_i, where $i = 1, 2 \cdots, N$) which are mounted successively along the strip waveguide 10 and where m is a whole number between 5 and 10 and wherein each electrode E_i receives a voltage

$$U_i = U_0 \sin\left(\eta + (i-1)\cdot\pi\cdot\Lambda_0/2\cdot\Lambda_1\right) \qquad \text{with } i = 1, 2, \cdots, N$$

wherein Λ_0 is the geometrical length fixed by four electrodes and Λ_1 is the length defined by the operating wavelength Λ_1 and η is a variable control quantity between and 0 and 2π and U_0 is a variable maximum voltage. A wavelength region spreading of one octave or more can be achieved with this arrangement and the arrangement can be utilized as a tunable filter having a very large tuning range or can be utilized as a wavelength/selective switch.

15 Claims, 1 Drawing Sheet



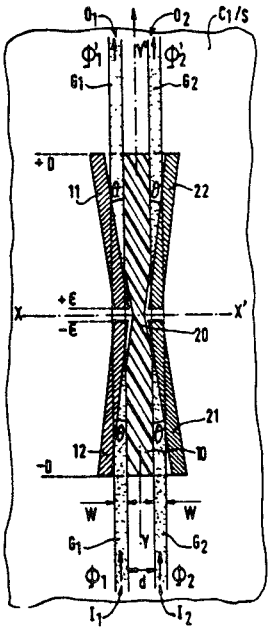
4,832,432 May 23, 1989

Optical Switching Element Between Two Optical Guides and Optical Switching Matrix Constituted by These Switching Elements

Inventor: Marko Erman.
Assignee: U.S. Philips Corp.
Filed: Dec. 22, 1987.

Abstract—An optical switching element including two parallel optical guides G_1 and G_2 each constituted by a strip of a semiconductor material having a refractive index n_1 formed on a semiconductor substrate having a lower refractive index n_0, the switching operation being obtained by the effect of voltages applied to electrodes arranged in the switching zone, characterized in that the latter is constituted by a strip of the same semiconductor material as the guides, which extends between the latter over a coupling length D between the abscissa $-D/2$ and $+D/2$ indicated on the orientated longitudinal axis of symmetry, and in that the electrodes are at least three in number, of which a first electrode permits of applying a reference voltage to the substrate, a second electrode extends substantially at the surface of the second guide from the abscissa $-D$ to the abscissa $-\epsilon$, ϵ being small with respect to D, and a third electrode extends substantially at the surface of the first guide from the abscissa $+\epsilon$ to the abscissa $+D$, the second and third electrodes forming strips whose longitudinal axes of symmetry enclose with the optical axes of the second and first guides, respectively, an angle $-\theta$ defined on first approximation by the relation: $\theta_2 \approx 2(n_1 - n_0)/n_1$.

13 Claims, 6 Drawing Sheets



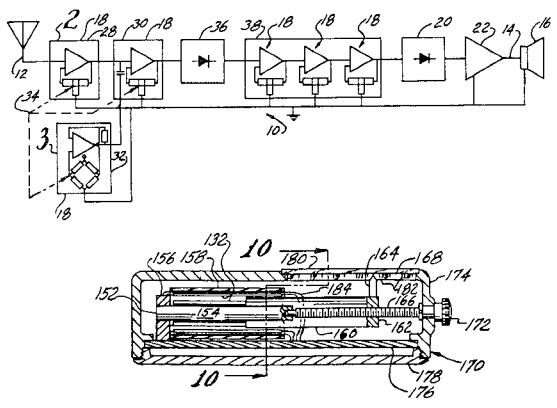
4,833,419 May 23, 1989

Noninductive Radio Apparatus

Inventor: Henry Chrystie.
Filed: Oct. 29, 1987.

Abstract—A radio circuit apparatus for broadcast frequencies promotes micro miniaturization and avoids the production of unwanted radiation by incorporating tunable $R-C$ circuits in place of inductive elements. The apparatus provides simultaneous tuning of RF, mixer, and local oscillator circuits by coupling variable radiation levels to a plurality of radiation-sensitive resistor elements in each circuit. In one configuration of the tuner portion, a rod having a radioactive coating is mounted coaxially within a cylindrical parallel array of resistor elements, the elements being connected in tunable Wien-bridge and/or twin-T circuits. An axially movable, cylindrical shutter is interposed between the rod and the resistor elements for variably blocking the radiation from the rod for tuning the circuits. In another configuration, a conductive plate is formed on the shutter for capacitive coupling to other plates placed in association with the resistor elements, the plates forming a pair of variable capacitors in a Wein-bridge circuit, the combination of variable resistors and capacitors compounding to extend the tuning range of the circuit. In another configuration, a variable voltage is coupled individually to an array of field-effect transistors that serve as the variable resistance elements. In a further configuration, a variably illuminated optical conduit is positioned adjacent to a plurality of photo-resistor elements, each element receiving a portion of light from the conduit. The apparatus can be configured as a transmitter as well as for reception.

19 Claims, 2 Drawing Sheets



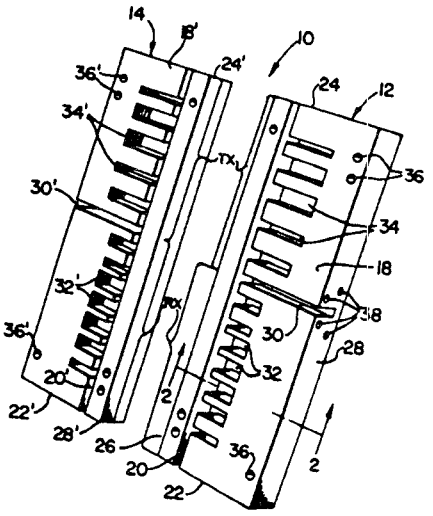
4,833,428 May 23, 1989

14/12 GHz Duplexer

Inventors: Chuck K. Mok and Alain Martin.
Filed: Nov. 30, 1987.

Abstract—A duplexer for use in a feed network for a satellite communications antenna is made in waveguide form and comprises two plate halves each with a pattern of channels on one surface, the pattern on one half being the mirror image of the pattern on the other. When the two halves are assembled with the patterned faces juxtaposed, a receive filter and a transmit filter with receive, transmit and common ports are obtained. Each filter has a main waveguide and several short-circuited half wavelength stubs in serial connection to the main waveguide. The joint between the two halves bisects the waveguide broadwall and is, therefore, of no electrical significance. The simplicity of the design lends itself to fabrication as part of a bigger integral assembly consisting of duplexers and other feed components. After manufacture, no further tuning is necessary.

13 Claims, 1 Drawing Sheet



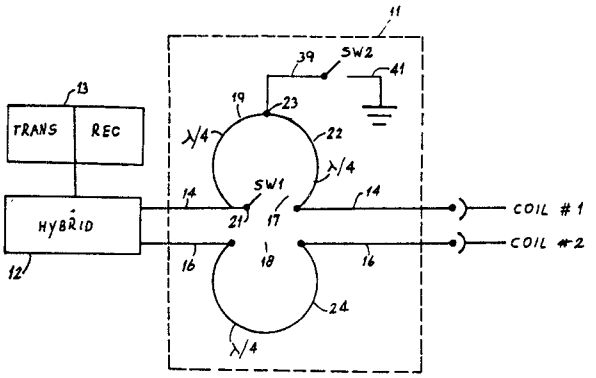
4,833,429 May 23, 1989

Quadrature Combiner

Inventors: Hanan Keren and Itzchak Linenberg.
Assignee: Elscint, Ltd.
Filed: May 17, 1988.

Abstract—A quadrature coil combiner for phase shifting the pulses and signals of a quadrature coil system used in magnetic resonance (MR) systems to selectively combine or cancel the pulses and signals transmitted and received. The combiner comprises a first and a second conductor for coupling a first and a second coil respectively of the quadrature coil system to a transmit-receive circuit of the MR system. The first conductor comprises an insertable $\pi/2$ radian delay. The second conductor includes a fixed $\pi/2$ radian delay. At least one of either the fixed delay or the insertable delay is a quarter wavelength cable whereby active elements are minimized.

6 Claims, 1 Drawing Sheet



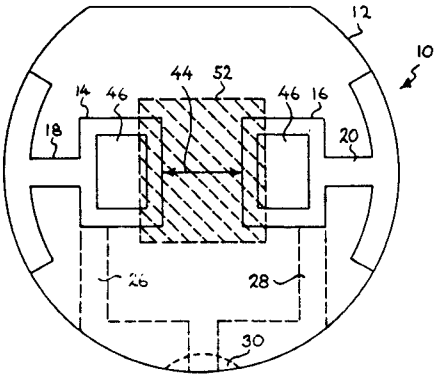
4,833,430 May 23, 1989

Coupled-Dual Resonator Crystal

Inventors: Gerald E. Roberts, Samuel Toliver, and Robert J. Crescenzi.
Assignee: General Electric Company.
Filed: Mar. 13, 1987.

Abstract—A dual-coupled resonator crystal is fine-tuned by frequency balancing the input and output resonators and thereafter plating a coupling adjust spot on the grounded side shadowing the unelectroded region of the front side of the crystal to produce a change in synchronous peak separation frequency. Thereafter, the front side electrodes are sequentially plated to bring plateback and synchronous peak separation frequency to their target values. Interim adjustments in synchronous peak separation frequency may be made during the tuning process to compensate for misalignment of the plating elements.

3 Claims, 10 Drawing Sheets



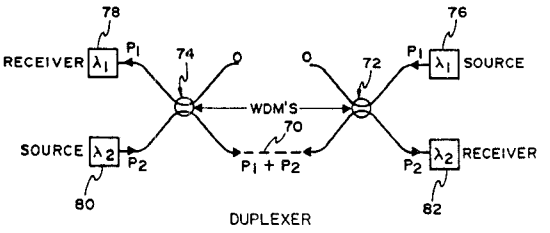
4,834,481 May 30, 1989

In-Line Single-Mode Fiber-Optic Multiplexer/Demultiplexer

Inventors: Christopher M. Lawson, Vincent J. Tekippe, and Paul Kopera.
Assignee: Gould Inc.
Filed: Nov. 12, 1985.

Abstract—A single-mode fiber-optic multiplexer/demultiplexer has first and second optical fibers, each having an input and an output end. The first and second optical fibers are single-mode fibers, each having a core of a predetermined diameter and a cladding about the core of a predetermined diameter. Along a predetermined length two fibers are placed in juxtaposition and the claddings are fused together to form a fiber optic coupler. Previous to being fused, the claddings are reduced by etching. The coupling of the fiber optic device is such that a first light having a first predetermined wavelength and a second light having a second predetermined wavelength enter together on an input of one of the fibers and are substantially split such that substantially only the first light will appear on an output of one of the fibers and substantially only a second light will appear on an output of the other fiber. When the first and second lights enter on the input end of the first and second fibers, the novel device combines the first and second lights onto one of the output ends of the fibers. In this configuration the device operates as a multiplexer. A method of fabricating the multiplexer/demultiplexer is disclosed.

12 Claims, 5 Drawing Sheets



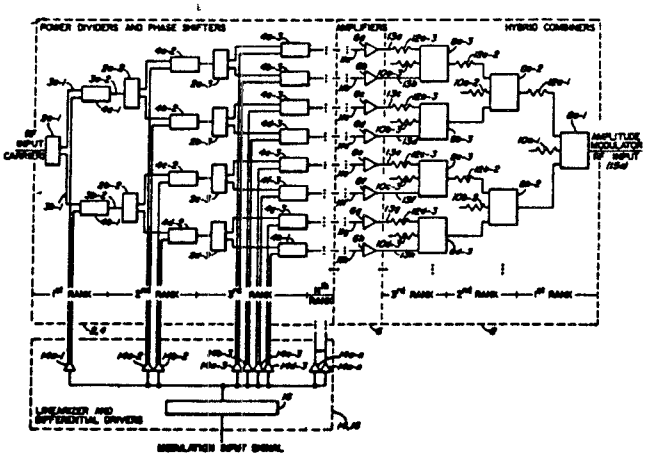
4,835,493 May 30, 1989

Very Wide Bandwidth Linear Amplitude Modulation of RF Signal By Vector Summation

Inventor: Kenneth A. Walsh, Jr.
Assignee: Hughes Aircraft Company.
Filed: Oct. 19, 1987.

Abstract—A radio frequency (RF) carrier wave is successively divided and the divided parts are non-linearly, phase modulated in response to a modulating signal. The modulating signal is linearized so that the output of the circuit is linear with the modulating signal and then drives differential drivers to control voltage controlled phase shifters in pairs to differentially phase shift the divided RF signals. These phase shifted signals may be efficiently amplified in non-linear, Class C, RF power amplifiers. After amplification the signals are differentially recombined in an inverse binary tree of hybrid combiners to produce a synthesis output signal. This synthesis output signal is equivalent to the amplitude modulation, and the amplification, of the RF input signal. By operation of the circuit apparatus in accordance with the invention, amplitude modulation at wide bandwidths including hundreds of megahertz may typically be accomplished on microwave RF signals of high power levels including several kilowatts.

23 Claims, 2 Drawing Sheets



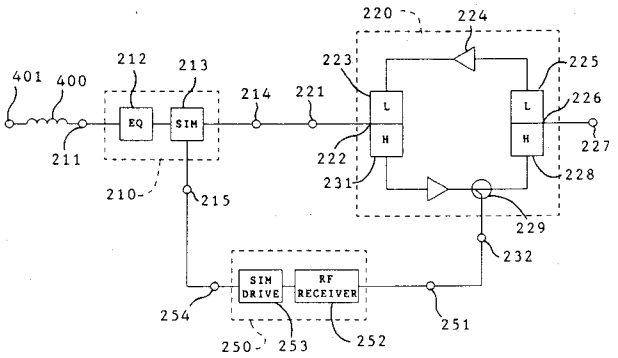
4,835,494 May 30, 1989

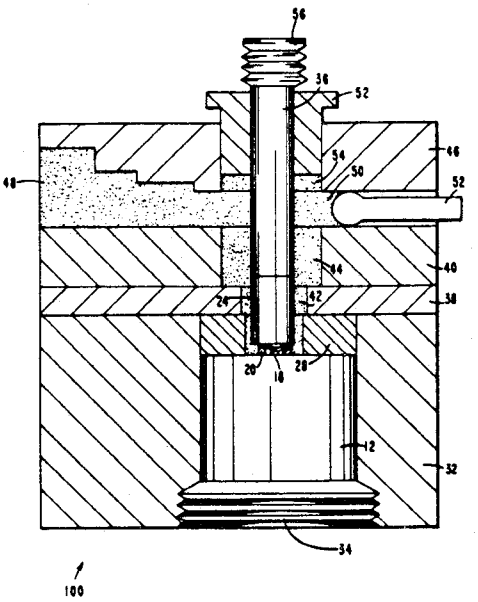
Automatic Level Control System for Broad-Band Cable Systems

Inventor: Joseph P. Preschutti.
Assignee: AMP Incorporated.
Filed: Apr. 20, 1988.

Abstract—A device including automatic gain control for balancing losses in a coaxial transmission path of a network is disclosed. The device includes a fixed gain bidirectional amplifier, an equalizer circuit for equalizing the loss of a fixed amount of cable a circuit for providing a variable amount of loss for simulating a variable amount of coaxial cable, and a closed loop system for monitoring the signal strength of an outbound pilot signal. The closed loop system provides for adjustment of the variable simulator circuit so that the sum of the losses provided by the coaxial transmission path, the equalizer circuit and the variable simulator circuit are equal in amplitude to the gain of the fixed gain amplifier across the entire inbound and outbound bandwidth of the network.

11 Claims, 5 Drawing Sheets





4,835,495 May 30, 1989

Diode Device Packaging Arrangement

Inventor: Mario D. Simonutti.
Assignee: Hughes Aircraft Company.
Filed: Apr. 11, 1988.

Abstract—An arrangement for packaging an active millimeter-wave device is provided having an active solid-state diode mounted on a cylindrical shaped heat sink pedestal. The cap for the diode is an elongated cylindrical conductor which also serves as a portion of the center coaxial conductor and dc bias pin. A conductive annular ring is also mounted on the pedestal encircling the diode and serves as the outer coaxial conductor for the coaxial transmission line structure. Advantageously the coaxial transmission line, namely the center and outer conductors, can be precisely assembled in relation to the diode for improved impedance characteristic and efficient energy coupling. Furthermore, the elongated cap moves the point of contact with the bias pin to a region of higher RF impedance, reducing RF losses.

7 Claims, 2 Drawing Sheets

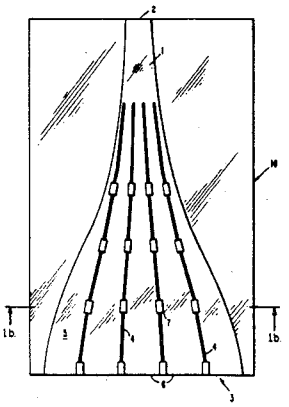
4,835,496 May 30, 1989

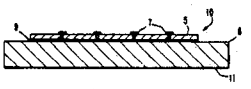
Power Divider/Combiner Circuit

Inventors: James M. Schellenberg and Wing Yau.
Assignee: Hughes Aircraft Company.
Filed: Aug. 1, 1988.

Abstract—Disclosed herein is an *N*-way, broad-band planar power divider/combiner circuit for dividing or combining RF signals which includes a tapered strip of electrically conductive material having a plurality of conductor fingers which define a plurality of ports at the wide end of the taper, and having a narrow end which defines single port. The tapered metal strip is mounted onto a dielectric slab, and isolation resistors connect adjacent fingers. A single RF signal can be fed into the single port which will be divided into a plurality of signals of equi-amplitude and equi-phase. Conversely, a plurality of RF signals can be fed into the ports at the wide end which will be combined into a single signal.

16 Claims, 2 Drawing Sheets





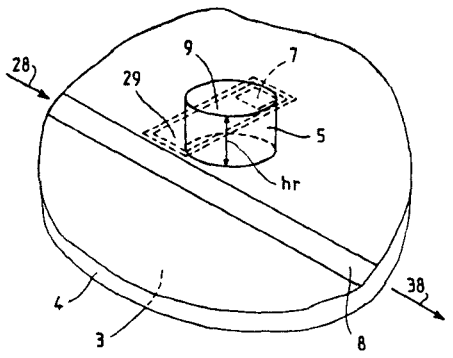
4,835,498 May 30, 1989

Tunable Microwave Filtering Device with Dielectric Resonator and Applications

Inventors: Jean-Michel Rouger, Gilles Denis, and Bernard Liabeuf.
Assignee: Thomson-CSF.
Filed: June 6, 1988.

Abstract—A tunable, microwave filtering device comprises a microstrip line, a dielectric resonator capable of being coupled to the microstrip line, a coplanar line capable of being coupled to the resonator, an active element, such as a varactor for example, mounted on the coplanar line, the variable impedance of which enables the frequency tuning of the device. The invention can be applied to the making of a tunable microwave frequency discriminator, the making of a microwave oscillator and the frequency stabilization of a tunable oscillator.

8 Claims, 5 Drawing Sheets



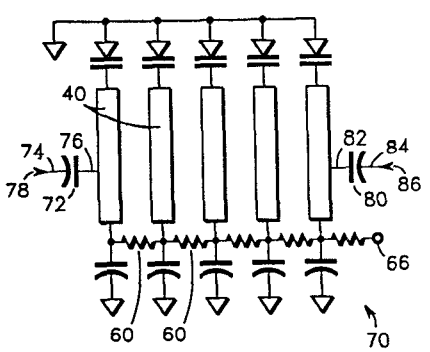
4,835,499 May 30, 1989

Voltage Tunable Band-Pass Filter

Inventor: Michael N. Pickett.
Assignee: Motorola, Inc.
Filed: Mar. 9, 1988.

Abstract—A voltage tunable band-pass filter consisting of a plurality of parallel resonators electromagnetically coupled and having tuning diodes coupled to a first end. The resonators are dc isolated at a second or RF grounded end of each resonator. A voltage source reverse biases the tuning diodes from the second or less critical end of the resonators.

14 Claims, 1 Drawing Sheet



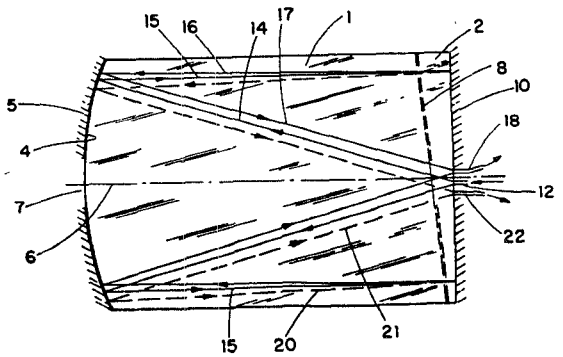
4,836,634 June 6, 1989

Wavelength Multiplexer/Demultiplexer Using Optical Fibers

Inventor: Jean-Pierre Laude.
Assignee: Instruments SA
Filed: Dec. 28, 1987.

Abstract—Selector for separating at least two wavelength bands from a complex light introduced into the apparatus through the end of an optical fiber (12) arranged in the immediate vicinity of the focal point of a concave mirror (5) producing a parallel beam directed towards a plane reflecting device, the return beam being focused towards an output optical fiber. It comprises at least one plane multidielectric layer (8) interposed between the concave mirror (5) and the plane reflecting device (10) and forming, with the vertex axis (6) of the concave mirror, an angle which is slightly different from that of the plane reflecting device, each multidielectric layer having a discontinuity in the vicinity of the vertex axis of the concave mirror.

5 Claims, 2 Drawing Sheets



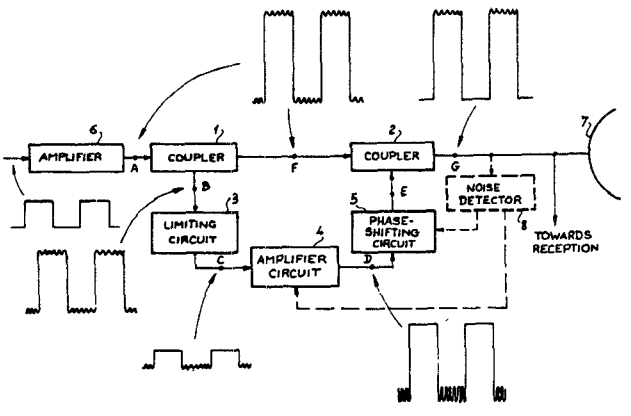
4,837,522 June 6, 1989

Noise Reducer for Microwave Amplifier

Inventors: Georges Fleury and Bernard Epsztein.
Assignee: Thomson CSF.
Filed: May 23, 1988.

Abstract—In a noise reducer for microwave amplifiers working by pulses, a small portion of the amplifier output signal is diverted through an ancillary channel. The amplitude of the pulses of this diverted signal is greatly reduced by a limiter. The noise between the pulses can then be processed in an amplifying circuit and in a phase-shifting circuit so that, by combining the main signal in a second coupler, the noise between the pulses is eliminated. This invention can be applied to transmission amplifiers forming part of a transmission/reception set where reception takes place between the transmission pulses.

2 Claims, 1 Drawing Sheet



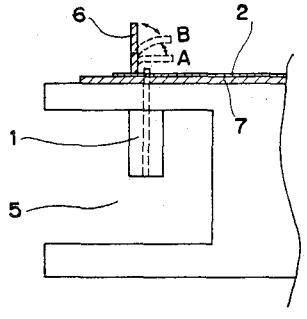
4,837,524 June 6, 1989

Lower-Noise Microwave Amplifying Circuit

Inventor: Makio Nakamura.
Assignee: Sharp Kabushiki Kaisha.
Filed: Feb. 11, 1988.

Abstract—A lower-noise microwave amplifying circuit for use in a lower-noise converter includes a metallic conductor for use in performance adjustment. The metallic conductor projects from the microstrip line and is provided near a bendable connecting portion between an input coaxial rod in a coaxial waveguide conversion portion and a microstrip line for constructing one portion of an amplifying circuit. Therefore, the lower-noise microwave amplification circuit is easily adjusted for improving the basic characteristics such as input VSWR or the like and is simpler in construction.

18 Claims, 3 Drawing Sheets



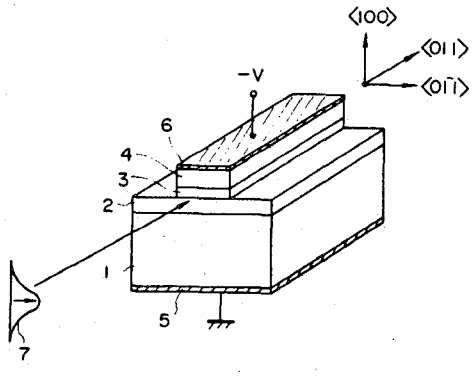
4,837,526 June 6, 1989

Semiconductor External Optical Modulator

Inventors: Masatoshi Suzuki, Yukio Noda, Yukitoshi Kushiro, and Shigeyuki Akiba.
Assignee: Kokusai Denshin Denwa Kabushiki Kaisha.
Filed: Apr. 24, 1987.

Abstract—A semiconductor external modulator is disclosed in which the mode of polarization of incident light, the crystal plane of the substrate (the direction of application of an electrical field), the energy gap of the optical waveguide layer, and the direction of travel of light are determined so that, of variations in the real and imaginary parts of the refractive index of the optical waveguide layer which are caused by the application of the electric field to the semiconductor external optical modulator, the variation in the real part of the refractive index may be reduced to substantially zero.

7 Claims, 1 Drawing Sheet



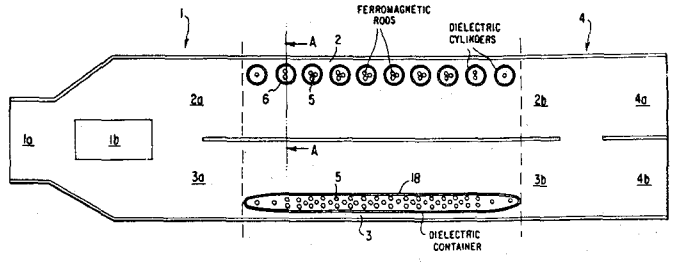
4,837,528 June 6, 1989

Microwave Phase Shifter

Inventors: Günter Mörz, Erich Pivit, and Sigmund Lenz.
Assignee: ANT Nachrichtentechnik GmbH.
Filed: Feb. 17, 1988.

Abstract—A phase shifter suitable for operation at very high high-frequency power is composed of a waveguide in which ferromagnetic material is distributed along at least one plane extending in the direction of wave propagation. The ferromagnetic material is exposed to a static magnetic field oriented parallel to the plane. The ferromagnetic material is shaped so that it forms a plurality of three-dimensional regions which extend in the direction of the applied static magnetic field from one waveguide wall to the opposite waveguide wall. These regions may be provided by a plurality of ferromagnetic rods, preferably housed in one or more dielectric containers to direct a flow of coolant fluid, or by a ferromagnetic body having a plurality of bores. Such bores also preferably direct a flow of coolant fluid.

12 Claims, 2 Drawing Sheets



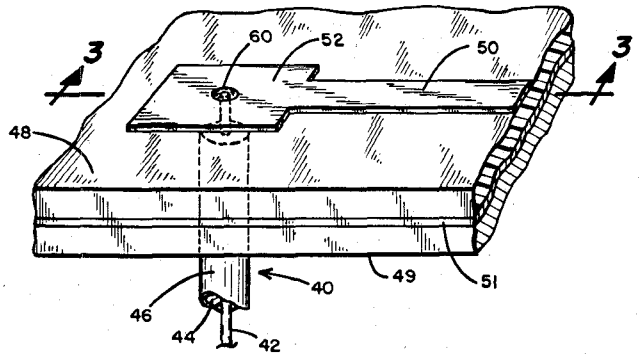
4,837,529 June 6, 1989

Millimeter-Wave Microstrip to Coaxial Line Side-Launch Transition

Inventors: Michael J. Gawronski, Steven L. Palmquist, John R. Lamberg, and Rebecca A. Hart.
Assignee: Honeywell, Inc.
Filed: Mar. 24, 1988.

Abstract—A side-launch transition for efficiently joining a coaxial transmission line or coaxial connector to a microstrip transmission line for operation at millimeter wave frequencies. The microstrip transmission line comprises a conductive microstrip pattern on one side of a dielectric substrate and a ground plane on the other. The conductive microstrip pattern includes a rectangular terminal pad area of a predetermined length designed to be approximately equal to the wavelength of the signal being transmitted. This pad area is integrally joined to the microstrip line. A circular iris or aperture, is formed through the ground plane and is in a centered alignment with the terminal pad on the opposite side of the substrate. A small hole extends through the center of the iris and penetrates the substrate as well as the conductive pad area. The outer shield conductor of the coaxial transmission line or the coaxial connector and the dielectric material insulating it from its center conductor are stripped back to expose a predetermined length of center conductor which is then fitted through the small hole from the ground plane side of the substrate and soldered to the conductive pad. The outer shield is likewise soldered or otherwise conductively bonded to the ground plane in the vicinity of the iris aperture.

9 Claims, 3 Drawing Sheets



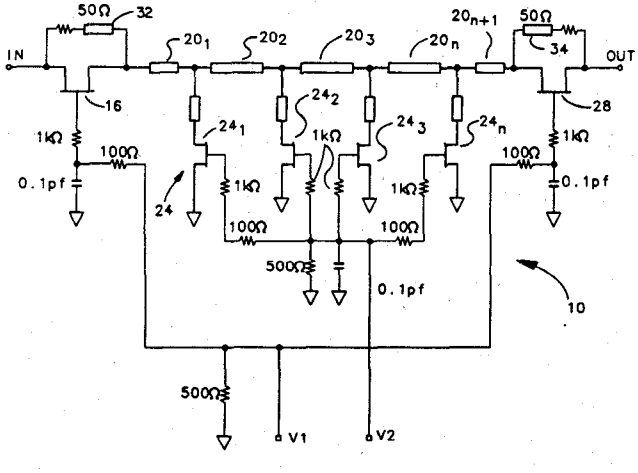
4,837,530 June 6, 1989

Wide-Band (dc–50 GHz) MMIC FET Variable Matched Attenuator

Inventor: Hiroshi Kondoh.
Assignee: Hewlett-Packard Company.
Filed: Dec. 11, 1987.

Abstract—A FET variable absorptive attenuator utilizes FET's as variable resistors controlled by voltages applied to their gate terminals, the FET's preferably being arranged in a T configuration with resistors connected in parallel with two series FET's, as well as a shunt FET in the form of a distributed shunt FET. One control voltage adjusts the resistances of the series FET's, and another controls the resistance of the distributed shunt FET. A proper combination of the two control voltages yields a desired level of attenuation with optimum input/output impedance matching. The resistors allow the series FET's to be biased well below their pinch-off voltages to minimize the parasitic capacitances of the series FET's at relatively high attenuation settings, improving the isolation for high attenuation settings at relatively high frequencies and also enabling the attenuator to function as a switch. They also improve the power-handling capability at high attenuation settings. The distributed shunt FET is split into several cells interconnected by inductive elements, providing a low insertion loss at maximum attenuation, as well as decreasing the parasitic capacitance of the shunt FET. The effects of this lower capacitance at relatively low attenuation settings can be more effectively counteracted by the inductive elements, extending the dynamic range of attenuation at relatively high frequencies. Also, the distributed shunt FET interconnected by the inductive elements compensates for the parasitic capacitances of the series FET's at relatively high attenuation settings, which yields increased attenuation with increasing frequency. Finally, the cutoff frequency of the attenuator at relatively low attenuation settings is increased.

21 Claims, 12 Drawing Sheets



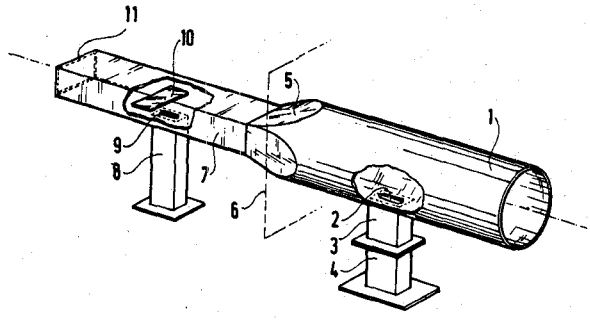
4,837,531 June 6, 1989

Three-Access Polarization and Frequency Duplexing Device

Inventors: Philippe Gourlain, Régis Lenormand, and Dominique Morin.
Assignee: Alcatel Espace.
Filed: Jan. 28, 1987.

Abstract—A three-access polarization and frequency duplexing device has in series a common circular waveguide for passing two polarizations of a wave within a low-frequency band and one polarizations of a wave within a high-frequency band, a first access waveguide which opens into the common waveguide and a transition, a secondary rectangular waveguide. The narrow sides of the secondary waveguide are parallel to one polarization of the low-frequency band and the broad sides are parallel to the polarization of the high-frequency band. A second access waveguide is connected to the secondary waveguide at right angles and coupled by a resonant slot. A short-circuit plate performs a short-circuiting function for the high-frequency portion of the wave of the high-frequency band aligned with the second access waveguide. The free end of the secondary waveguide being forms a third access waveguide. The first access waveguide has a filter for selecting a polarization of the wave from the low-frequency band. The second access waveguide is at right angles to the broad side of the secondary guide.

1 Claim, 1 Drawing Sheet



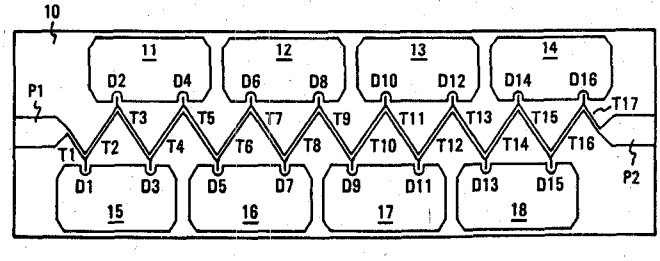
4,837,532 June 6, 1989

MMIC (Monolithic Microwave Integrated Circuit) Voltage-Controlled Analog Phase Shifter

Inventor: Richard J. Lang.
Assignee: General Electric Company.
Filed: Oct. 26, 1987.

Abstract—The invention relates to a voltage controlled analog phase shifter for operation at millimeter and microwave wavelengths using MMIC (monolithic microwave integrated circuit) fabrication techniques. The phase shifter is formed of an artificial transmission line consisting of multiple unit elements in which each unit element contains a serial transmission line-inductance and a shunt diode capacitance which is variable as a function of an applied potential. In the design, the interconnecting transmission lines may be a small fraction of a wavelength, substantially less than one-quarter wavelength, and of high impedance relative to the characteristic impedance of the phase shifter. In consequence of the lumped design, each unit element, and a phase shifter using a plurality of such unit elements may be very small. The design also exhibits a low to negligible power consumption.

6 Claims, 2 Drawing Sheets



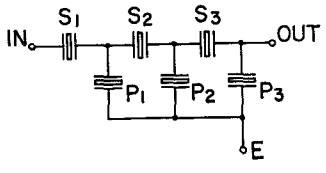
4,837,533 June 6, 1989

Ladder-Type Ceramic Filter

Inventor: Michitaka Oshikawa.
Assignee: Toko Kabushiki Kaisha.
Filed: July 19, 1988.

Abstract—A ladder-type ceramic filter formed of a plurality of series and parallel resonators arranged in series and in parallel between the input and output terminals. In this filter, resonators are arranged in a manner that a resonator (or resonators) in which each difference between resonant and antiresonant frequencies thereof is minimum is (or are) positioned in the center of the resonator arrangement, and that resonators in which respective differences between resonant and antiresonant frequencies thereof are a larger value or values are positioned on the sides of the input and output terminals, respectively.

4 Claims, 2 Drawing Sheets



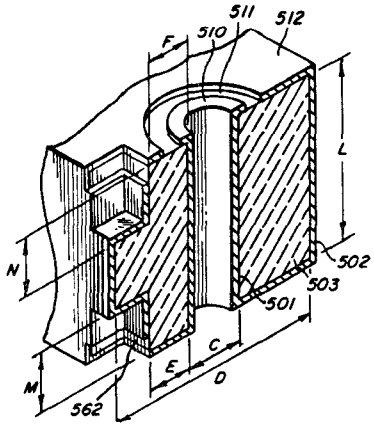
4,837,534 June 6, 1989

Ceramic Block Filter with Bidirectional Tuning

Inventor: Mark I. Van Horn.
Assignee: Motorola, Inc.
Filed: Jan. 29, 1988.

Abstract—Coupled transmission line resonators, such as those in a solid-dielectric ceramic block filter, are fabricated with tuning regions formed by notches in the outer conductor extending longitudinally parallel with the inner conductors from both the low-impedance ends and the high-impedance ends of the resonators. Removing conductive material from the notches in the vicinity of the low-impedance ends of the resonators decreases their resonant frequencies; removing conductive material from the notches in the vicinity of their high-impedance ends increases their resonant frequencies. Sensitivity of tuning depends on the depth of the notches. By situating all tuning regions along a common side of a filter, tuning both higher and lower in frequency may be accomplished without a need to re-orient the filter in a production-line fixture.

8 Claims, 2 Drawing Sheets



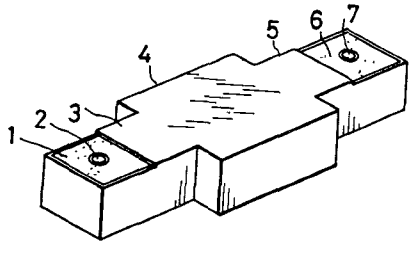
4,837,535 June 6, 1989

Resonant Wave Filter

Inventors: Yoshihiro Konishi, Kenichi Konno, and Ikuo Awai.
Assignee: Uniden Corporation.
Filed: Jan. 5, 1989.

Abstract—A compact resonant wave filter capable of selectively propagating an electromagnetic wave of a prescribed frequency with excellent band-pass wave filter characteristics comprises a TM mode resonator disposed perpendicularly to the direction of propagation of electromagnetic wave energy, a pair of TEM mode resonators disposed one on either side or said TM mode resonator in the direction of propagation of electromagnetic wave energy, and a pair of cutoff waveguides disposed one between said TEM mode resonator and each of said TM mode resonators to couple said TEM mode resonator with said TM mode resonators in evanescent mode.

8 Claims, 4 Drawing Sheets



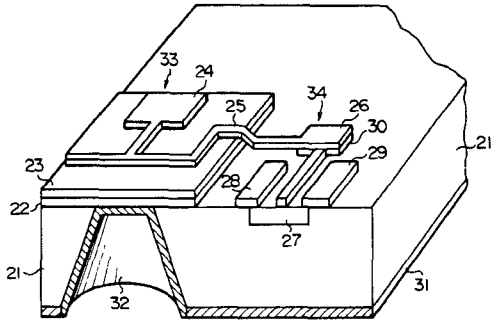
4,837,536 June 6, 1989

Monolithic Microwave Integrated Circuit Device Using High-Temperature Superconductive Material

Inventor: Kazuhiko Honjo.
Assignee: NEC Corporation.
Filed: July 25, 1988.

Abstract—For reduction in occupation area, there is disclosed a microwave device fabricated on a semi-insulating substrate and comprising a passive component area where a plurality of passive component elements are formed and an active component area where at least one active element is formed, the passive component area having a film overlain by a dielectric film and a strip conductor extending on the dielectric film, wherein the film and the strip conductor are formed by a superconductive material, so that the dielectric material is decreased in thickness by virtue of the strip conductor of the super-conductive material.

12 Claims, 3 Drawing Sheets



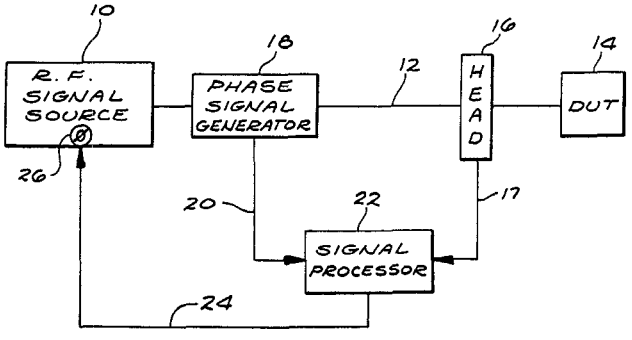
4,839,578 June 13, 1989

Method for Removing Phase Instabilities Caused by Flexure of Cables in Microwave Network Analyzer Measurements

Inventor: Mark D. Roos.
Assignee: EIP Microwave, Inc.
Filed: June 4, 1987.

Abstract—A method for removing phase errors from RF signals generated by movement of the cable interconnecting a network analyzer and a device under test. The method includes the steps of measuring the phase difference between incident and reflected signals during calibration to establish a reference, measuring the phase difference between incident and reflected signals during device testing, comparing this result to the reference to generate an error signal from phase correction.

5 Claims, 1 Drawing Sheet



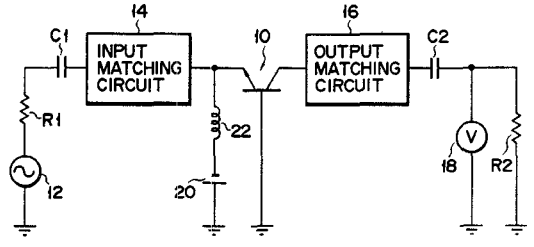
4,839,612 June 13, 1989

High-Frequency Power Amplifier Having Heterojunction Bipolar Transistor

Inventor: Junko Akagi.
Assignee: Kabushiki Kaisha Toshiba.
Filed: Mar. 11, 1988.

Abstract—A class C power amplifier has a heterojunction bipolar transistor as an element for amplifying an input signal. A dc bias voltage source, such as a dc battery, is connected to the transistor, such that a dc bias voltage lower than the turn-on voltage of the transistor is applied between the base and emitter of the bipolar transistor. An inductance coil is connected in series between the emitter of the transistor and the dc bias voltage source. Since the dc bias voltage is applied to the heterojunction bipolar transistor, the external drive voltage for activating the transistor is reduced to increase the high-frequency power gain of the amplifier.

5 Claims, 5 Drawing Sheets



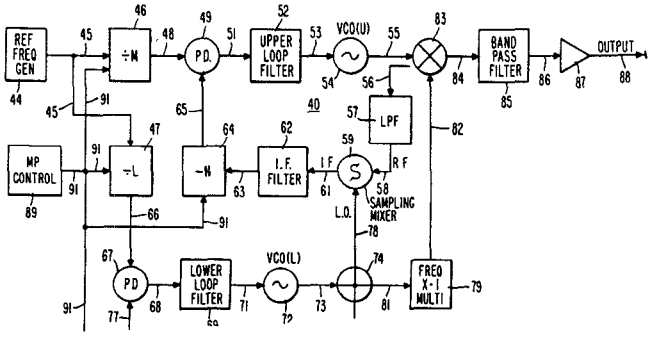
4,839,603 June 13, 1989

Multiple-Loop Microwave Frequency Synthesizer Using Two Phase Lock Loops

Inventors: Vaughn L. Mower, Evan A. Deneris, and John B. Cox.
Assignee: Unisys Corporation.
Filed: Sept. 24, 1987.

Abstract—A multiple-loop microwave frequency synthesizer is provided with an upper and a lower phased-lock loop. The phased-lock loops are mutually connected to a novel sampling mixer and their outputs are connected to an up-converter for providing microwave frequency generated signals. The phase-lock loops are provided with a plurality of programmable frequency dividers connected to a processor controller to provide a wide range of adjustable frequencies up to 20 GHz at the output of the frequency synthesizer.

12 Claims, 3 Drawing Sheets



4,839,616 June 13, 1989

Broad-Band Impedance Transformer

Inventor: Will Herzog.
Assignee: Harris Corporation.
Filed: July 18, 1983.

Abstract—A transformer for modifying the characteristics impedance of a transmission line. The transformer provides non-integer-squared impedance transformation ratios without the need for tapping one of the windings or the use of other nonbalanced techniques.

2 Claims, 3 Drawing Sheets