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.

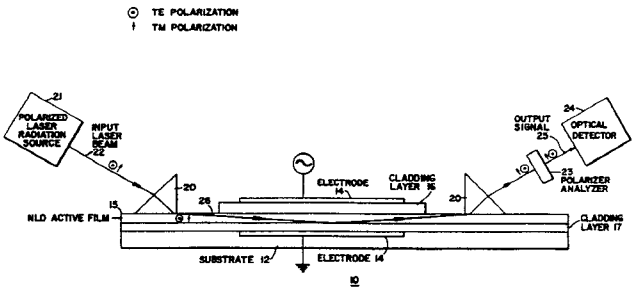
4,877,298 Oct. 31, 1989

Thin-Film Waveguide Electro-optic Modulator

Inventors: Chia-Chi Teng and Dagobert E. Stuetz.
Assignee: Hoechst Celanese Corporation.
Filed: July 5, 1988.

Abstract—This invention provides a thin-film waveguide electro-optic intensity modulation device. The thin-film waveguide is an isotropic organic medium which exhibits nonlinear optical response. The device is adapted to modulate waveguided radiation by refractive index change commensurate with change in an applied electric field

3 Claims, 1 Drawing Sheet



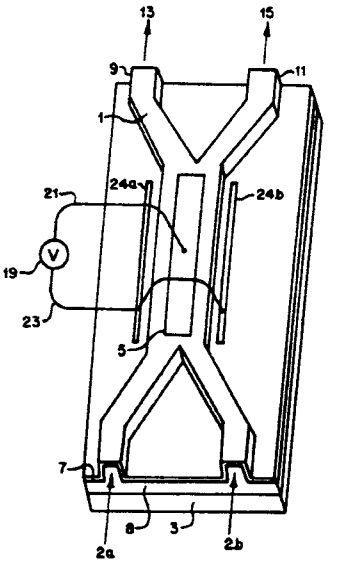
4,877,299 Oct. 31, 1989

Metal-Insulator-Semiconductor Control of Guided Optical Waves in Semiconductor Waveguides

Inventors: Joseph P. Lorenzo and Richard A. Soref.
Assignee: United States of America as represented by the Secretary of the Air Force.
Filed: Mar. 15, 1989.

Abstract—This invention describes an infrared lightwave modulation and switching apparatus for very rapidly changing the refractive index of a light-transmitting, doped, semiconductor waveguide. Electrical control is exerted by a MIS diode or MISFET. The apparatus includes a transparent crystalline silicon waveguide, an electrically insulating dielectric layer overlaying a portion of that waveguide, and an elongated, conductive gate electrode in contact with the insulator. A gate voltage applied between the semiconductor and gate serves to deplete free charge carriers from the region of the waveguide under the gate. Elongated source and drain electrodes may be added to enhance electro-optic control.

37 Claims, 3 Drawing Sheets



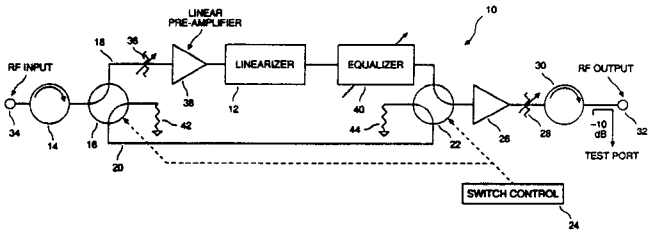
4,878,030 Oct. 31, 1989

Linearizer for Microwave Amplifier

Inventor: Arpad D. Vincze.
Assignee: Ford Aerospace & Communications Corporation.
Filed: Oct. 23, 1987.

Abstract—A microwave signal linearizer for a travelling wave tube amplifier (TWTA) provides for simple and flexible adjustment of a predistortion network suitable for independently compensating for a wide range of travelling wave tube amplifier-induced distortions. The linearizer or predistortion network is formed by three divided parallel passive microwave signal channels, the first channel having a coaxial microwave limiter diode network, the second channel having a variable attenuator for adjusting amplitude modulation (AM/AM) nonlinearity, and a third channel for adjusting amplitude modulation to phase modulation (AM/PM) nonlinearity. Signals directed to the first and second channels are combined in a 180° hybrid network to produce a difference signal which is directed through a difference channel to a 90° hybrid network. The signals through the third channel are directed to the 90° hybrid network where the difference channel and the third channel are combined and directed to an output channel for providing drive signal to a power amplifier, i.e., a travelling wave tube

6 Claims, 3 Drawing Sheets



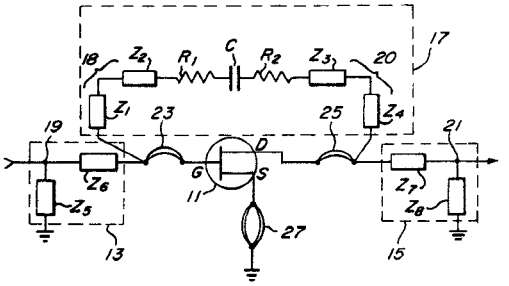
4,878,033 Oct. 31, 1989

Low-Noise Microwave Amplifier Having Optimal Stability, Gain, and Noise Control

Inventor: Joseph S. Wong.
Assignee: Hughes Aircraft Company.
Filed: Aug. 16, 1988.

Abstract—A gallium arsenide MESFET amplifier circuit employing a parallel feedback network having first and second transmission line section filtering networks connected on either side of a series $R-C-R$ circuit. In one optimized embodiment, the transmission line sections each include low and high impedances unequal in length to one-quarter wavelength. The use of two discrete resistors, together with the filtering networks to eliminate thermal noise generated by the resistors, provides optimum gain, low noise, and stable operation over a wide range of microwave frequencies.

15 Claims, 3 Drawing Sheets



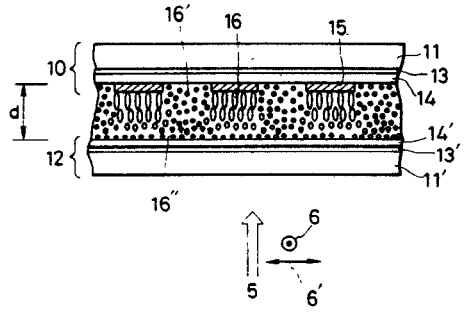
4,878,742 Nov. 7, 1989

Liquid Crystal Optical Modulator

Inventors: Yukitoshi Ohkubo, Yasuyuki Watanabe, Chiori Mochizuki, Takayuki Ishii, Masato Yamanobe, and Kazuya Ishiwata.
Assignee: Canon Kabushiki Kaisha.
Filed: Aug. 3, 1987.

Abstract—A liquid crystal optical modulator having a liquid crystal held between two substrates each having a light-transmissive electrode on the surface, in which at least one substrate has minute alignment-treated region having two or more kinds of liquid crystal aligning abilities different from each other formed and arranged on the same substrate.

11 Claims, 3 Drawing Sheets



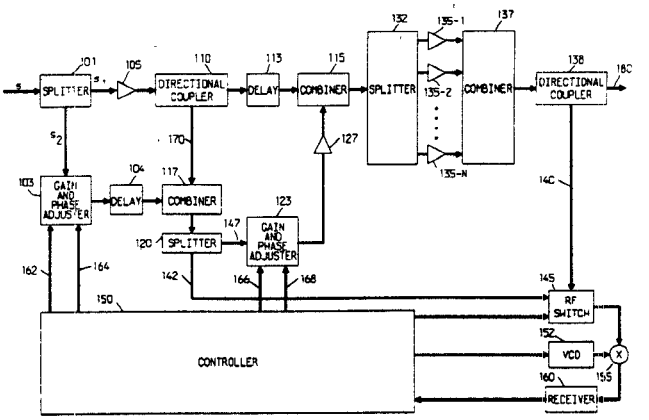
4,879,519 Nov. 7, 1989

Predistortion Compensated Linear Amplifier

Inventor: Robert E. Myer.
Assignee: American Telephone and Telegraph Company, AT&T Bell Labs.
Filed: Oct. 31, 1988.

Abstract—A distortion compensation circuit for power amplifier producing a prescribed distortion component receives an input signal having at least one carrier therein in a prescribed frequency range. The input signal is applied to a first circuit path having an amplifier that produces an amplified signal with the prescribed distortion component and to a second circuit path that delays the input signal without distortion. The output signals of the first and second circuit paths are combined in a first combiner to form a signal representative of the prescribed distortion component. A second combiner forms a signal having an amplified input signal component and inverted phase prescribed distortion component responsive to the output of the first combiner and the output the first circuit path. To eliminate signals other than the distortion component from the first combiner, the prescribed frequency range is scanned to detect a carrier signal and the amplitude and phase of the signal in the second circuit path is modified to remove the detected carrier from the output of the first combiner. Remaining distortion in the power amplifier output is removed by scanning the prescribed frequency range to detect an intermodulation product signal and modifying the amplitude and phase of the first combiner output to minimize the detected intermodulation product signal.

25 Claims, 8 Drawing Sheets



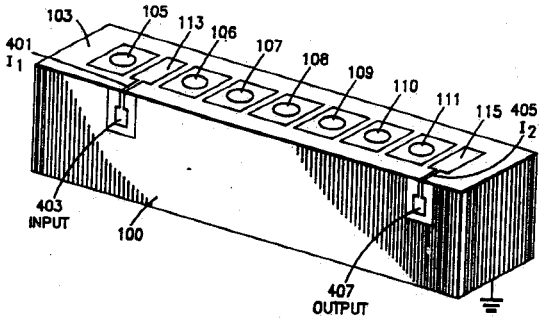
4,879,533 Nov. 7, 1989

Surface Mount Filter with Integral Transmission Line Connection

Inventors: David M. de Muro, John G. Stillmank, and Duane C. Rabe.
Assignee: Motorola, Inc.
Filed: Apr. 1, 1988.

Abstract—A surface mount dielectric block filter with an integral transmission line connection to external circuitry is disclosed. In order to connect an input/output capacitor metallized on the surface of the dielectric block to a substrate upon which the dielectric block is directly mounted, a transmission line of appropriate characteristic impedance disposed on the surface of the dielectric block is connected between one plate of the metallized capacitor and an input/output terminal. Two such dielectric block filters may be coupled together to form a radio transceiver duplexer.

45 Claims, 5 Drawing Sheets



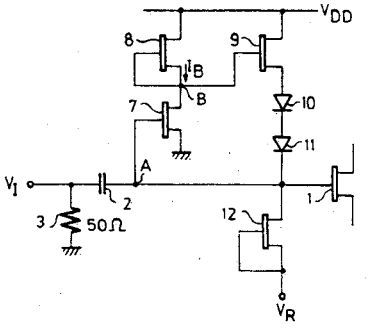
4,881,046 Nov. 14, 1989

Microwave Linear Amplifier with Very Wide Passband

Inventor: Pham N. Tung.
Assignee: Thompson Hybrides et Microondes.
Filed: Nov. 23, 1988.

Abstract—A microwave linear amplifier is described. Its passband is equal to that of the transistors which constitute it, without being limited by the usual biasing circuits which comprise chokes and capacitors with a narrow passband. In this amplifier, which has at least one input transistor, the gate bias at neutral point is provided by a BFL type circuit, generally used in logic circuits, the output of which is looped to the input. The input signal is applied both to the inverter transistor of the BFL circuit and to the input transistor. The same BFL circuit used in the amplification stage provides for the self-matching of the stages which can be cascaded.

8 Claims, 2 Drawing Sheets



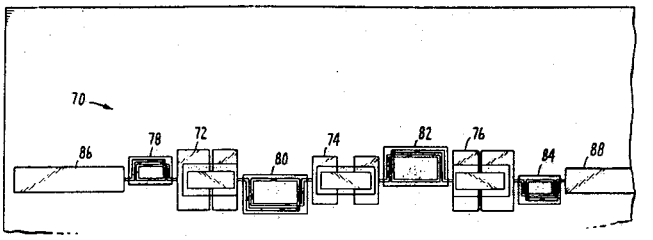
4,881,050 Nov. 14, 1989

Thin-Film Microwave Filter

Inventor: Daniel G. Swanson, Jr.
Assignee: Avantek, Inc.
Filed: Aug. 4, 1988.

Abstract—A thin-film, lumped element filter utilizing spiral inductors and capacitive pi networks is disclosed. The filter is fabricated from a planar dielectric substrate having a ground plane on one side thereof and two thin-film metal layers and an insulation layer disposed therebetween on the opposite side of the dielectric substrate. The metal and insulation layers are configured to form one or more capacitive pi networks and spiral inductors, which are electrically interconnected to form the filter.

8 Claims, 3 Drawing Sheets



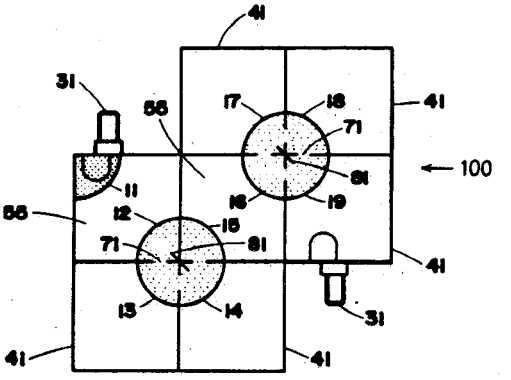
4,881,051 Nov. 14, 1989

Dielectric Image-Resonator Multiplexer

Inventors: Wai-Cheung Tang, Richard J. Cameron, and David M. T. Bryant.
Assignee: Com Dev Ltd.
Filed: Aug. 3, 1988.

Abstract—A two, three or four channel multiplexer can be operated in the $TE_{01\delta}$ or $HE_{11\delta}$ modes, each channel of the multiplexer has one bandpass filter, with each filter usually having a plurality of cavities. One cavity of each filter is a common cavity with all of the other filters of the multiplexer. The common cavity contains one independent dielectric quarter-cut or half-cut image resonator for each filter representing a channel of the multiplexer. Each resonator is mounted on a suitable support the common cavity provides a common junction and contains a loop coupling to couple electromagnetic energy between the various channels. The multiplexer has at least one input and at least one output. Previous microwave multiplexers have a plurality of bandpass filters arranged on a coaxial manifold. With the multiplexer of the present invention, the manifold can be eliminated. Further, at the *S*-band or *L*-band, substantial weight and volume savings can be achieved using the multiplexer of the present invention without sacrificing performance. This can be very important for space applications.

26 Claims, 7 Drawing Sheets



4,881,052 Nov. 14, 1989

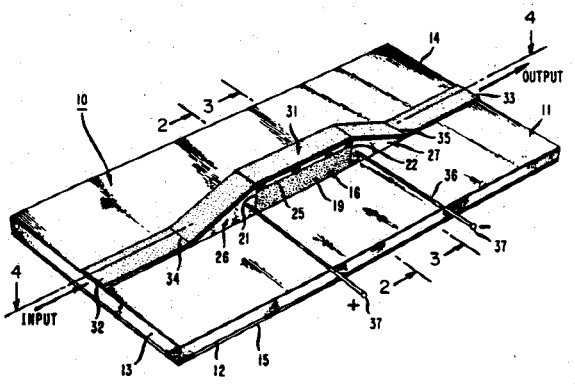
Millimeter-Wave Microstrip Nonreciprocal Phase Shifter

Inventors: Richard A. Stern and Richard W. Babbitt.
Assignee: The United States of America as represented by the Secretary of the Army.
Filed: Dec. 5, 1988.

Abstract—A microstrip nonreciprocal latching phase shifter has a ferrite rod with ramp-shaped dielectric waveguide members at the ends thereof mounted on one surface of a microstrip dielectric substrate having a ground plane on the opposite surface thereof. The dielectric constants of the ramp

members and the rod are substantially the same and the substrate dielectric constant is substantially less than the dielectric constant of the ramp members. A dielectric plate is on top of the rod. A microstrip conductor mounted on the substrate, the ramp members and the plate in axial alignment with the rod extends between the ends of the substrate. The rod has a rectangular longitudinally-extending passageway therein filled by a dielectric core insert having a dielectric constant greater than the dielectric constant of the rod. A single control wire is disposed in and aligned with the core insert. By selectively pulsing the control wire with reversible polarity current pulses, circular magnetic fields of reversible directions are created in the toroidal-shaped flux path formed in the rod around the wire, so that the rod acts as a twin slab type of phase shifter with respect to millimeter-wave energy passing from one end of the microstrip conductor to the other end thereof.

7 Claims, 2 Drawing Sheets



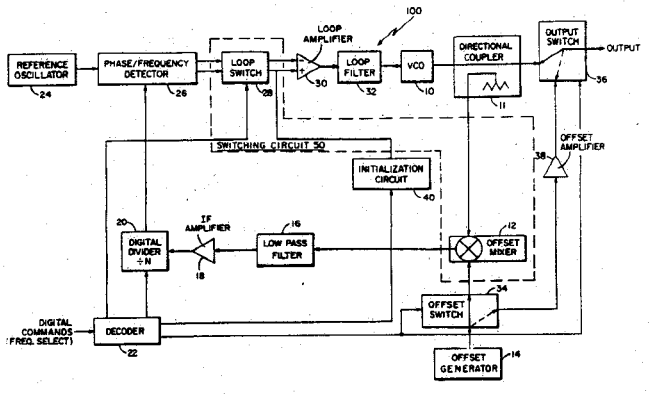
4,882,549 Nov. 21, 1989

Center Offset Microwave Frequency Synthesizer

Inventors: Zvi Galani, Malcolm E. Skinner and John A. Chiesa.
Filed: Nov. 16, 1988.

Abstract—An improved microwave frequency signal source using a single frequency offset technique which increases the frequency range of an indirect frequency synthesizer to twice the highest operating frequency of the programmable digital frequency divider in the loop includes a voltage-controlled oscillator (VCO) operating within a predetermined microwave frequency band and phase-locked to a reference oscillator operating at a reference frequency below microwave frequencies. The offset loop signal is developed by heterodyning the voltage-controlled oscillator (VCO) output signal with a microwave signal whose frequency is located at the center of the predetermined microwave frequency band of the VCO to form a signal at an intermediate frequency (I.F.) within the frequency range of a programmable digital frequency divider.

4 Claims, 2 Drawing Sheets



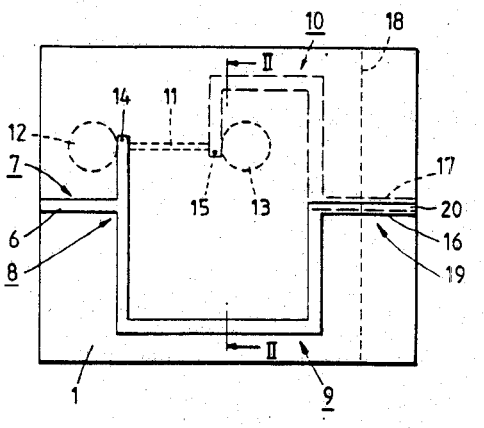
4,882,553 Nov. 21, 1989

Microwave Balun

Inventors: Robert Davies, Percy W. Hoare, and Peter J. Gibson.
Assignee: U.S. Philips Corp.
Filed: Sept. 21, 1988.

Abstract—A broad-band balun, suitable for feeding a spiral antenna, has a balanced port (20) comprising two adjacent strip conductors (16, 17; 36, 37) which are coupled to the unbalanced port (6) by respective paths of the same effective electrical lengths. The paths comprise respective strip transmission lines (9, 10) having a common ground conductor (3; 44) which terminates in a transition to the balanced line (19), and further comprise slot line means (11; 21) and strip transmission line-to-slot line coupling means (14, 15) so arranged as in operation to provide in the two strip conductors (16, 17; 36, 37) from an RF signal at the unbalanced port (6) signals of mutually opposite phases with respect to the common ground conductor (3; 44). The two strip conductors (16, 17) may be disposed on the outer surfaces of two substrates (1, 2) with a ground plane (3) between the substrates, or may be coplanar (36, 37) with a transition to an unbalanced line comprising strip conductors (45, 46) on opposite sides of a central ground conductor (44) in the same plane.

19 Claims, 3 Drawing Sheets



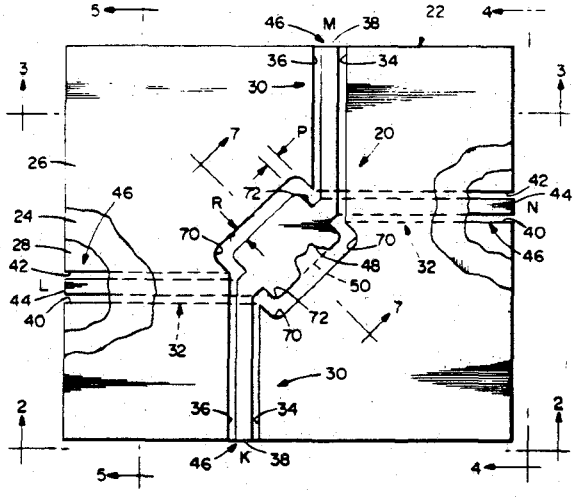
4,882,555 Nov. 21, 1989

Plural-Plane Waveguide Coupler

Inventor: Mon N. Wong.
Assignee: Hughes Aircraft Company.
Filed: Aug. 12, 1988.

Abstract—A quadrature hybrid coupler for coupling electromagnetic power between a first coplanar waveguide disposed on a first side of a circuit board and a second coplanar waveguide disposed on a second side of the circuit board is formed by means of a first pad and a second pad disposed in respective ones of the waveguides. The pads are formed as a widening of a central strip conductor of each of the waveguides. The pads are in registration with each other. Circumferential slots defining the pads are widened in proportion to a widening of the strip conductor to retain a characteristic impedance of the waveguides from ports of the coupler through the pads.

9 Claims, 2 Drawing Sheets



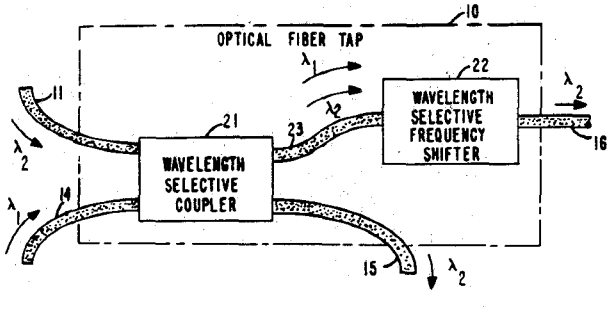
4,883,335 Nov. 28, 1989

Single-Mode Optical Fiber Tap

Inventors: Rodney C. Alferness and Thomas H. Wood.
Assignees: American Telephone and Telegraph Company, AT&T Bell Laboratories.
Filed: Jan. 20, 1988.

Abstract—An optical power tap is disclosed which allows effectively nonreciprocal injection and removal of power at each node of a single-mode optical fiber local area network. The power tap uses a wavelength-selective directional coupler to inject and remove power from the bus, and a nonlinear converter in the bus to convert light from one wavelength to another. In the specific embodiment disclosed a neodymium-doped silica fiber is used as a nonlinear material to convert light from one wavelength to another.

8 Claims, 3 Drawing Sheets



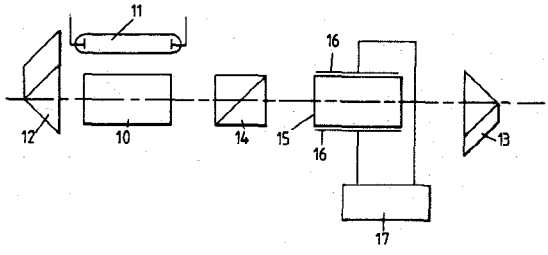
4,884,044 Nov. 28, 1989

Optical Modulators

Inventors: Peter J. Heywood and Richard A. Eggleston.
Assignee: Ferranti International Signal plc.
Filed: Aug. 23, 1988.

Abstract—An optical modulator comprises a crystal (15) of material exhibiting the pyroelectric effect, and charge-dissipating means for dissipating any charge built up on the optical faces of the prism. The charge-dissipating means may comprise point electrodes (30) positioned adjacent to the optical faces (21) of the crystal and connected to an alternating-current high-voltage power supply (31). The electrodes produce charged ions which neutralize any charge on the optical faces of the crystal. The crystal may be used as the Q-switch in a laser.

9 Claims, 3 Drawing Sheets



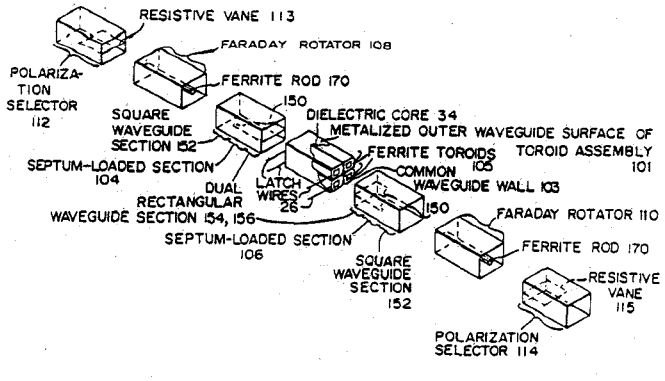
4,884,045 Nov. 28, 1989

Fast Switching Reciprocal Ferrite Phase Shifter

Inventors: William K. Alverson and James A. Ruller.
Assignee: Electromagnetic Sciences, Inc.
Filed: Jan. 19, 1988.

Abstract—A fast switching ferrite phase shifter is disclosed featuring both reciprocal operation and fast switching speeds. Reciprocal operation in transmit and receive modes is achieved by employing two latching, toroidal nonreciprocal phase shifters; one for transmitting and one for receiving. The exemplary embodiment utilizes input and output circulating devices which include a Faraday rotator and septum polarizer for appropriately routing signals through one or the other of the phase shifters depending upon the direction of input signal propagation. The phase shifter achieves fast switching since the latching, toroidal, nonreciprocal phase shifters are transversely magnetized devices and are disposed entirely within a waveguide so that the generated magnetic field is confined entirely within the waveguide. The phase shifters do not intersect the waveguide walls and, thus, during a switching operation, the magnetic field is not switched through conductive waveguide walls. Accordingly, eddy currents are not induced during a switching operation thereby allowing for fast phase changes to be accomplished (which are not limited due to eddy current delays). An embodiment is disclosed wherein forward and reverse propagating signals may be shifted in phase by individually controllable amounts which may be the same or different.

35 Claims, 18 Drawing Sheets



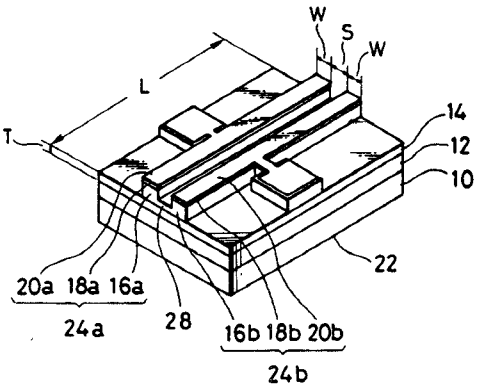
4,884,858 Dec. 5, 1989

Distributed Coupler Switch

Inventors: Takashi Ushikubo, Hideaki Okayama, Masato Kawahara, and Issei Asabayashi.
Assignee: Oki Electric Industry Co., Ltd.
Filed: Nov. 18, 1988.

Abstract—In an electro-optic distributed coupler switch having a parallel rib geometry, a coupling enhancement region formed of the same material as the upper cladding layers but of lower step height is located between the ribs. By increasing the electric field strength, the coupling enhancement region enables the coupling length L_c to be reduced.

13 Claims, 7 Drawing Sheets



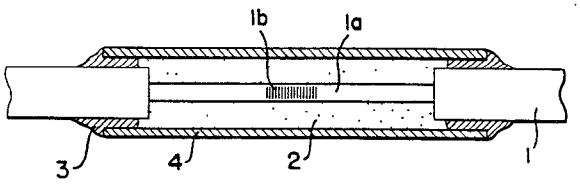
4,884,859 Dec. 5, 1989

Optical Attenuator and Manufacturing Method for Making Same

Inventors: Hiroyoshi Yamamoto, Toshiharu Takesue, and Naoki Kawawada.
Assignee: Seiko Instruments Inc.
Filed: Aug. 15, 1988.

Abstract—A simple method of manufacturing optical attenuators comprises heating a part of an optical fiber composed of a core and a cladding to a temperature around the softening point of the materials of the optical fiber and applying a tension and/or a twist to the optical fiber at a predetermined speed to form an optical attenuation area having fine cracks in the heated part of the optical fiber.

14 Claims, 2 Drawing Sheets



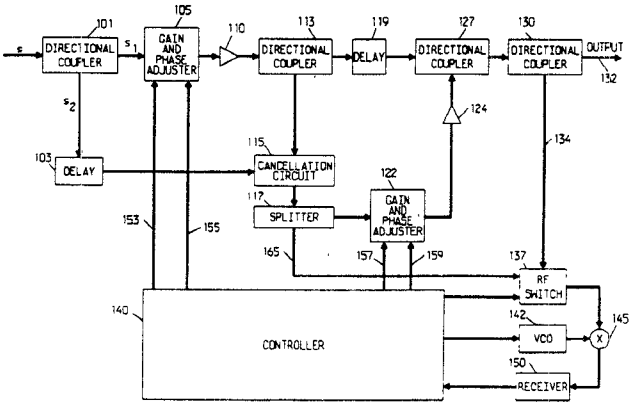
4,885,551 Dec. 5, 1989

Feed-Forward Linear Amplifier

Inventor: Robert E. Myer.
Assignee: American Telephone and Telegraph Company, AT&T Bell Laboratories.
Filed: Oct. 31, 1988.

Abstract—A feed-forward circuit receives an input signal having at least one carrier therein in a prescribed frequency range. The input signal is applied to a first circuit path having a power amplifier that produces an output signal with a distortion component and to a second circuit path that delays the input signal without distortion. The output signal of the first circuit path is combined with the output signal of the second circuit path to form a signal representative of the distortion component of the first circuit path output signal and the distortion component representative signal is subtracted from the output signal of the first circuit path to cancel the distortion component therein. The prescribed frequency range of the first circuit path output is scanned to detect a carrier signal, and the amplitude and phase of the signal in the first circuit path are modified to minimize the magnitude of the detected carrier in the distortion representative signal.

20 Claims, 11 Drawing Sheets



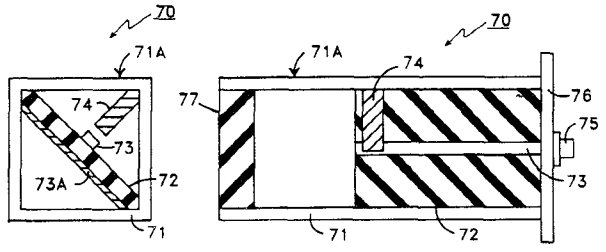
4,885,556 Dec. 5, 1989

Circularly Polarized Evanescent-Mode Radiator

Inventors: Bernard J. Lamberty and Steven J. Peters.
Assignee: The Boeing Company.
Filed: Nov. 1, 1988.

Abstract—A nearly square waveguide below cutoff has a microstrip substrate disposed diagonally therein. A first shunt capacitance is provided by either a conductor formed on the microstrip substrate or a conductor disposed in the waveguide perpendicular to the microstrip substrate. A dielectric window is disposed in the end to provide a shunt capacitance at the opposite end of the waveguide.

15 Claims, 5 Drawing Sheets



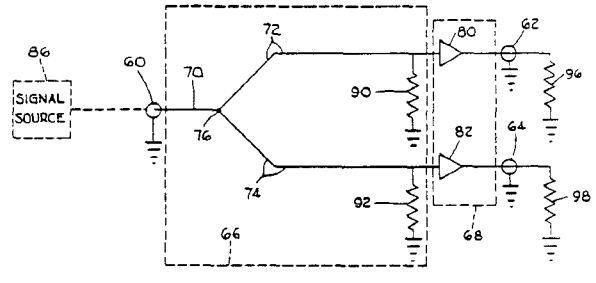
4,885,557 Dec. 5, 1989

Broad-Band Constant-Voltage Multicoupler

Inventor: Daniel A. Barczys.
Filed: Aug. 8, 1988.

Abstract—A broad-band, constant-voltage multicoupler including an input port and a plurality of output ports wherein the impedance rises in the same proportion as the power falls in the internal branches so that the voltage is substantially constant therein. The multicoupler comprises a signal splitter transmission line network having an electrical characteristic which maintains the same voltage throughout and a plurality of active devices associated therewith. In particular, the signal splitting network comprises a first transmission line connected at one end to the input and terminating at the opposite end, and a plurality of additional transmission lines having an impedance equal to n times the impedance of the first transmission line where n equals the number of the outputs. The active devices are in the form of buffer amplifiers, one for each of the outputs, each of the active devices having an input connected to one of the additional transmission lines and each of the active devices properly terminating the corresponding transmission line and providing a desirable output impedance value. As a result, the voltage level at the terminations of the additional transmission lines is substantially the same as the voltage at the input resulting in substantially no degradation of signal to noise ratio. This, in turn, allows the multicoupler to be connected directly to a signal source without need for a preamplifier. In addition, the transmission lines are properly terminated so as to be length-independent and frequency independent thereby advantageously resulting in broadband operation.

14 Claims, 3 Drawing Sheets



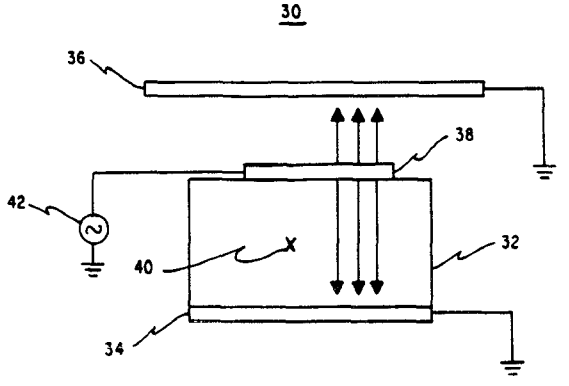
4,886,345 Dec. 12, 1989

Electro-Optical Phase Modulator

Inventor: Marc H. Popek.
Assignee: Harris Corporation.
Filed: Aug. 5, 1988.

Abstract—An electro-optical phase modulator. The electro-optical modulator incorporates a stripline configuration with a bottom ground plane attached to the bottom surface of the crystal and a signal conductor that is affixed to the top surface of the crystal. The signal conductor is separated from a top ground plane by a dielectric, usually air. The top ground plane also overhangs the sides of the crystal to lower the effective dielectric constant of the modulating signal that is applied to the signal conductor. In this way, the electric field established in the crystal by the modulating signal has a speed more nearly equal to the speed of the optical beam that passes through the crystal and is modulated by the electrical signal.

5 Claims, 5 Drawing Sheets



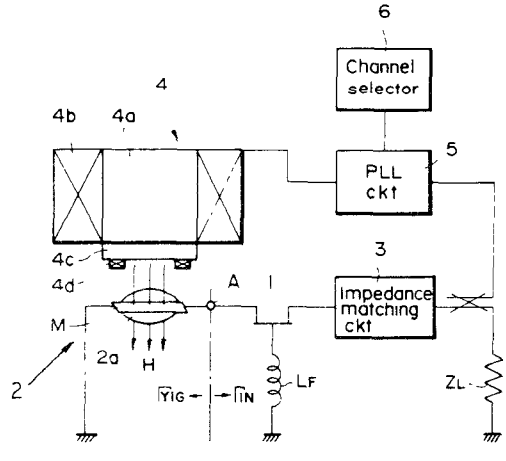
4,887,052 Dec. 12, 1989

Tuned Oscillator Utilizing Thin-Film Ferromagnetic Resonator

Inventors: Yoshikazu Murakami, Yasuyuki Mizunuma, Takahiro Ohgihara, Hiroyuki Nakano, Kanako Niikura, and Tsutomu Okamoto.
Assignee: Sony Corporation.
Filed: Nov. 25, 1988.

Abstract—A tuned oscillator utilizing a thin film ferromagnetic resonator is disclosed. The oscillator comprises an active element for oscillator and a YIG thin film resonator connected to the active element as a part of feedback circuit for the active element. The YIG thin film resonator is applied with a bias magnetic field perpendicular to a surface of a YIG disk which is generated by a permanent magnet for a fixed component and a coil for a variable component for the resonance frequency. The resonance frequency is stabilized by use of a PLL circuit connected to an output of the oscillator and feeding back to the coil. Since the YIG thin film tuned oscillator has a high Q value, high quality communication signal processing can be achieved. The YIG tuned oscillator is used as local oscillator for a transceiver.

4 Claims, 9 Drawing Sheets



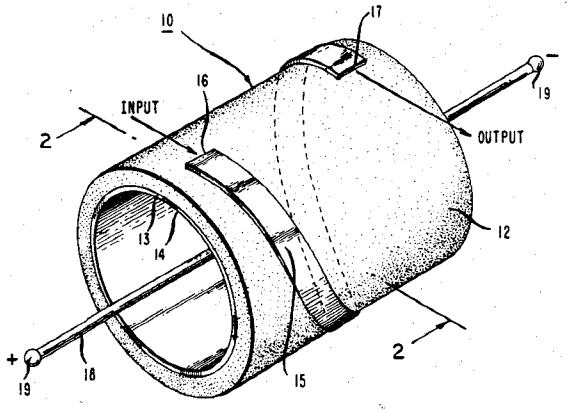
4,887,054 Dec. 12, 1989

Compact Microstrip Latching Reciprocal 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: Dec. 23, 1988.

Abstract—A latching type of microstrip reciprocal phase shifter is provided having a toroidal-shaped ferrite core with a length of microstrip conductor wound about the outer cylindrical surface of the core and a ground plane mounted on the inner cylindrical surface of the core surrounding the aperture in the core. A single control wire is passed through the aperture in the core and creates a circular magnetic field in the core surrounding the aperture when the core is pulsed with a unidirectional current pulse. By successively pulsing the control wire with current pulses of opposite polarity, the core may be switched back and forth between a first saturated magnetic state in which it exhibits a first insertion phase with respect to millimeter-wave energy traveling between the ends of the microstrip conductor dispoased on the outer cylindrical surface of the core and a second non-saturated magnetic state in which it exhibits a different insertion phase with respect to such millimeter wave energy traveling along the microstrip conductor on the outer surface of the core.

4 Claims, 2 Drawing Sheets



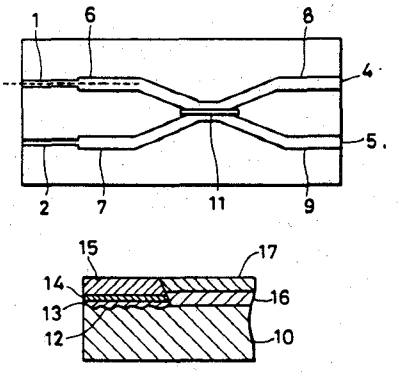
4,887,877 Dec. 19, 1989

Optical Devices and Optical Integrated Circuits

Inventors: Hiroaki Inoue, Shinji Sakano, Hitoshi Nakamura, Toshio Katsuyama, and Hiroyoshi Matsumura.
Assignee: Hitachi, Ltd.
Filed: Dec. 15, 1988.

Abstract—An optical device and an optical integrated circuit which incorporate an optical switch and have a novel function. Light sources are respectively coupled to two input ends of an X-type 2×2 optical switch, and light receivers are respectively coupled to two output ends of the optical switch, thereby obtaining an optical device which is capable of performing both AND and OR logics. A light source is coupled to one input end of an optical switch, and a light receiver is provided at one output end from which the light emitted from the light source emerges when no electric power is supplied to the optical switch, whereby it is possible to construct a system in which, even when one terminal has a power failure, there is no hindrance to other terminals. If an optical switch is arranged such as to use driving electric power as a modulating signal, the optical switch can serve as a modulator in which the output from one output end can be employed to monitor a modulated optical signal. In addition, if the optical switch is formed into, e.g., a carrier injection type optical switch using a semiconductor, the above-described devices can be fabricated as integrated circuit.

29 Claims, 4 Drawing Sheets



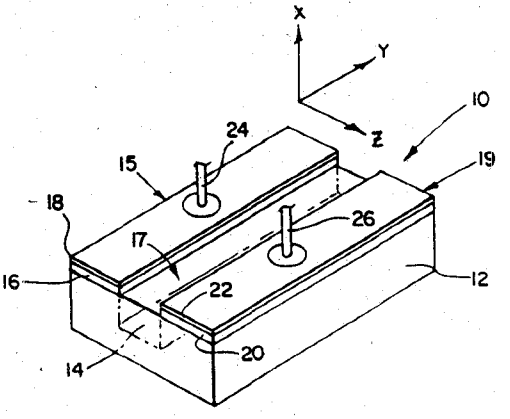
4,887,878 Dec. 19, 1989

Optical Modulation Device

Inventors: William C. Robinson and Norman A. Sanford.
Assignee: Polaroid Corporation.
Filed: Sept. 22, 1988.

Abstract—An external light modulator which relies on efficient changes in electro-optic coupling of light between copolarized guided modes in a single waveguide channel formed in a lithium niobate or lithium tantalate substrate by proton exchange with benzoic acid.

12 Claims, 3 Drawing Sheets



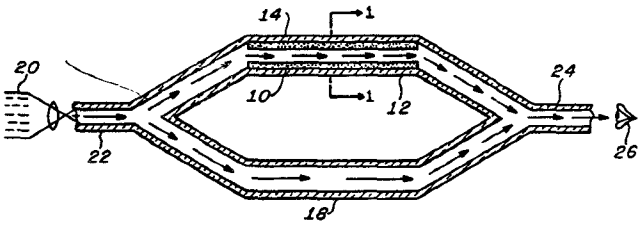
4,887,884 Dec. 19, 1989

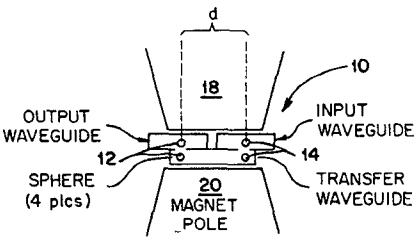
Capillary Nonlinear Optical Waveguide Device

Inventor: L. M. Hayden.
Assignee: Unisys Corporation.
Filed: Feb. 23, 1989.

Abstract—An optical waveguide for transmitting light energy is defined by a glass capillary with a core of noncentrosymmetric nonlinear optical polymer which has been poled to induce a stable axial alignment of molecules therein. Changes in refractive index of the polymer are induced by an applied electric field. In a preferred embodiment, the waveguide is used as an electric field sensor and may form an arm of a Mach–Zender interferometer. The device is adapted to modulate waveguided electromagnetic energy by a change in refractive index proportional to the applied electric field. In a further embodiment, the birefringent properties of the polymer are used to cause polarized light energy transmitted by the waveguide to undergo a change in polarization, which, when intercepted by a polarization sensitive analyzer, provides an amplitude modulation of the transmitted light energy.

9 Claims, 1 Drawing Sheet





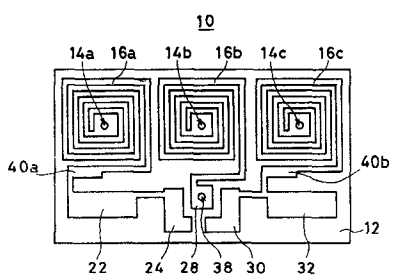
4,888,568 Dec. 19, 1989

LC Filter

Inventor: Masahiko Kawaguchi.
Assignee: Murata Manufacturing Co., Ltd.
Filed: Mar. 11, 1988.

Abstract—An *LC* filter includes a dielectric base plate having throughholes, and pluralities of first and second inductance conductors are formed on the both main surfaces of the dielectric base plate, respectively. The respective first and second inductance conductors are paired by being electrically connected through the throughholes and, thereby a plurality of inductors are formed. A capacitor is formed by first and second capacitance electrodes which are formed on both main surfaces of the dielectric base plate at positions opposing each other. The plurality of inductors and the capacitor are suitably connected. First and second additional electrodes are formed on both main surfaces of dielectric base plate at positions opposing each other so that a capacitor for trimming is formed by the additional electrodes. The capacitor of trimming is connected in parallel with at least one of the plurality of inductors. By trimming the first and/or the second additional electrodes, a capacitance value of the capacitor for trimming is changed, whereby a resonant frequency, determined by the inductor to which the capacitor for trimming is connected, can be adjusted.

4 Claims, 9 Drawing Sheets



4,888,569 Dec. 19, 1989

Magnetically Tuneable Millimeter-Wave Bandpass Filter Having High Off-Resonance Isolation

Inventors: Dean B. Nicholson and Robert J. Matreci.
Assignee: Hewlett-Packard Company.
Filed: May 23, 1988.

Abstract—By combining four hexagonal ferrite spheres under the same electromagnet structure, a magnetically tuneable bandpass filter can be built in waveguide yielding high off-resonance isolation, while keeping insertion loss to a reasonable value. Implementations of this filter in *A*, *Q*, *U*, and *V* bands have typical off-resonance isolation greater than 70 dB and insertion loss less than 13 dB for full-band tuning. The filter can be utilized as a preselector for swept-frequency signal analyzers, for example.

24 Claims, 16 Drawing Sheets

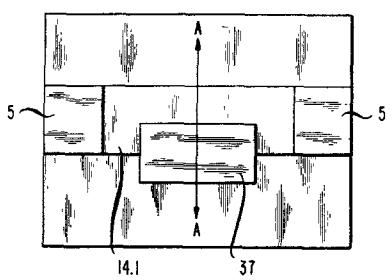
4,889,402 Dec. 26, 1989

Electro-Optic Polarization Modulation in Multielectrode Waveguides

Inventor: Franz K. Reinhart.
Assignee: American Telephone and Telegraph Company, AT&T Bell Laboratories.
Filed: Apr. 21, 1989.

Abstract—A rib waveguide polarization modulator is described that permits easy application to monolithic optical circuits. The device comprises a rib waveguide having two polarization modulation sections with a phasing section between the two modulation section. The phasing section adjusts the phase of the optical radiation in the waveguide before it enters the second modulation section.

6 Claims, 3 Drawing Sheets



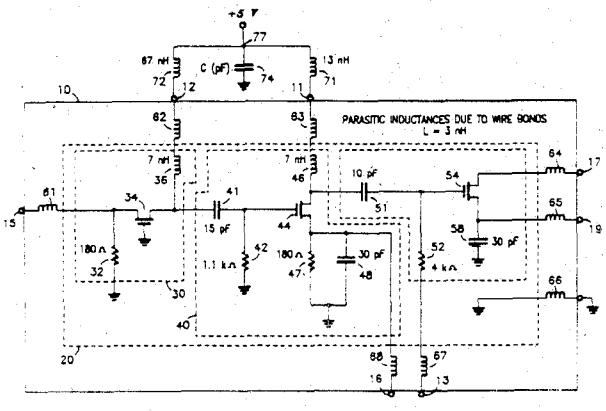
4,890,069 Dec. 26, 1989

Gallium Arsenide Power Monolithic Microwave Integrated Circuit

Inventors: Joseph M. Duffalo and Steven C. Lazar, Jr.
Assignee: Motorola Inc.
Filed: Feb. 29, 1988.

Abstract—A gallium arsenide monolithic microwave integrated circuit amplifier comprising a first stage having a common-gate field effect transistor to provide matching of the input impedance, a second stage having a common-source field effect transistor to provide class A gain, and a third stage having a common-source open drain field effect transistor to provide class B gain for the amplifier. This monolithic integrated circuit amplifier provides a gain of greater than 25 decibels over a frequency band of 400 mHz–1.5 GHz.

4 Claims, 2 Drawing Sheets



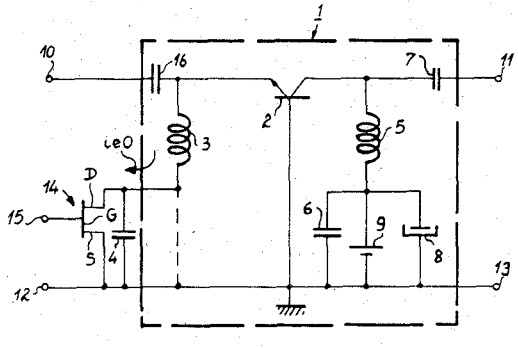
4,890,070 Dec. 26, 1989

Device to Control the Output Power of a Class Amplifier

Inventors: Guy Benahim, Jean-Michel Dutaut, and Jean-Claude Giraudon.
Assignee: Thomson-CSF.
Filed: Aug. 30, 1988.

Abstract—Disclosed is a device to control the output power of an amplifier working in class C mode and comprising at least one bipolar transistor. The bias resistance of the bipolar transistor is made variable through the presence of a field effect transistor, to the gate of which is applied a voltage V_{gs}, chosen from a set of values that are determined experimentally as a function of the output power to be obtained, the power and frequency of the input signal and the temperature of the bipolar transistor.

8 Claims, 3 Drawing Sheets



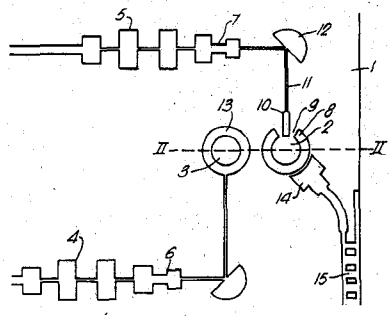
4,890,074 Dec. 26, 1989

Quartz Microstrip Gunn Oscillator

Inventor: John Ondria.
Assignee: Marconoi Electronic Devices Limited.
Filed: Feb. 9, 1989.

Abstract—A microwave microstrip oscillator includes a thin dielectric substrate, a Gunn diode mounted within the thickness of the substrate, an annular conductive resonator lying on the surface of the substrate and at least partially surrounding the Gunn diode, and a varactor diode associated with the Gunn diode for controlling the frequency of oscillation of the Gunn diode. A microstrip circuit coupled to the Gunn diode extracts an output power signal at a desired microwave frequency.

6 Claims, 3 Drawing Sheets



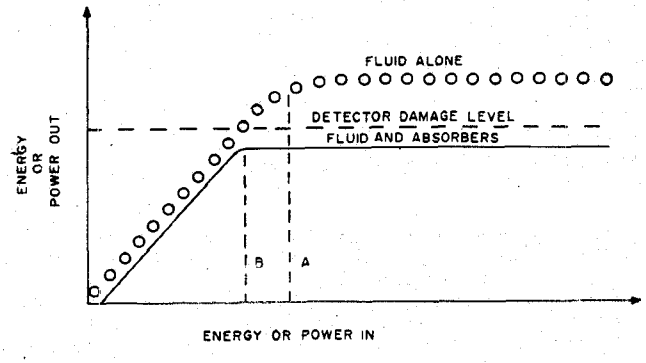
4,890,075 Dec. 26, 1989

Optical Radiation Limiter

Inventors: Juergen L. W. Pohlmann, Richard C. Honey, and John L. Guagliardo.
Assignee: The United States of America as represented by the Secretary of the Army.
Filed: July 31, 1986.

Abstract—A nonlinear optical fluid with radiation-absorbing small particles uniformly suspended in the fluid. For radiation below a threshold value, radiation passes through with slight attenuation. Above the threshold, only a limited level of radiation is passed, the limit being below the damage level of a sensitive optical detector.

3 Claims, 1 Drawing Sheet



4,890,077 Dec. 26, 1989

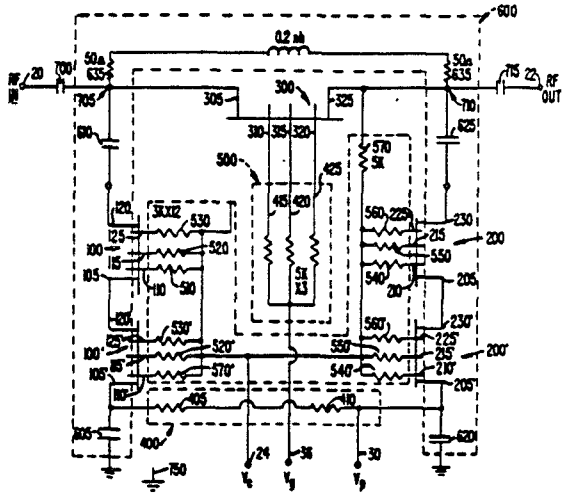
FET Monolithic Microwave Integrated Circuit Variable Attenuator

Inventor: Horng-Jye Sun.
Assignee: Teledyne MEC.
Filed: Mar. 28, 1989.

Abstract—A MMIC variable attenuator uses depletion mode Schottky gate FET's as variable conductance devices in a "π" configuration to vary attenuation as a function of a dc control voltage. Attenuation is flat within ± 1 dB,

VSWR is $\leq 2:1$ throughout the operating frequency and control voltage range, and about 12 dB variable attenuation is provided. The "π" is formed by FET's is shunt to ground between attenuator input and output, and by a FET in series between input and output. Resistors and an inductor connected in parallel with the series FET extend attenuator bandwidth to 20 GHz and improve attenuation linearity versus control voltage. A resistor in series with each shunt FET also improves linearity. The typically 0 to $+3$ V_{dc} control voltage is applied to the FET gates and drain/source leads permitting attenuation control with a single control voltage. FR power capability is increased without degrading RF performance by using multigate FET's wherein the ratio of gate width to number of gates is maintained substantially constant compared to a single-gate FET. Series-connected FET's further increase attenuator RF power capability. Operating from 2–20 GHz, embodiments using a single control voltage handle about 30 mW RF input power and use single-gate and dual-gate FET's, and handle about 250 mW RF input power and use triple-gate FET's. A third embodiment, operating from dc–20 GHz and handling about 500 mW RF input power, employs dual-gate FET's throughout and requires two complementary control voltages.

38 Claims, 13 Drawing Sheets



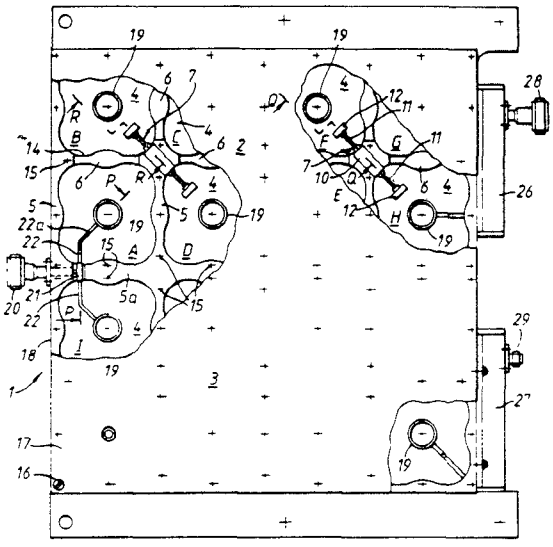
4,890,078 Dec. 26, 1989

Diplexer

Inventor: Christopher J. Radcliffe.
Assignee: Phase Devices Limited.
Filed: Apr. 12, 1988.

Abstract—A diplexer having receive and transmit sections connected to a common port comprises square-cross section cavities arranged in rows and columns. At least three adjacent cavities form a triangular group in which the nonadjacent cavities are cross-coupled. The cross coupling means comprises an inductive loop or a capacitive probe. Adjacent cavities in each section are also coupled, on folded paths, by irises. Cavity wall thickness is reduced where possible. The antenna port is diplexed to both sections by a T-branch connector having wire sections which are tapped into central resonators at a predetermined distance above electrical ground. Low-pass filters with nonoverlapping peak responses provide further isolation between the sections.

8 Claims, 5 Drawing Sheets



4,890,079 Dec. 26, 1989

Dielectric Band-pass Filter

Inventor: Kanemi Sasaki.
Assignee: Kokusai Denki Kabushiki Kaisha.
Filed: Sept. 19, 1988.

Abstract—This invention relates to a dielectric band-pass filter using a dielectric resonator for selecting a desired wave and removing an undesired wave. The dielectric resonator has one central conductive hole (10) for resonance and more than one nonmetallized coupling bores (2, 2) which are provided at the open faces of plurality of resonators (1, 1, $\cdots$ 1) which are disposed so as to contact the respective earth faces of each other. Neighboring coupling bores (2, 2) are connected by coupling metal pieces (4), with output and input matching pins (3) inserted into either coupling bores or central holes. In this invention, it is possible to dispose the resonators freely as constructed in a band-pass filter using the space effectively so that a compact installation can be realized.

17 Claims, 9 Drawing Sheets