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, DC 20231.

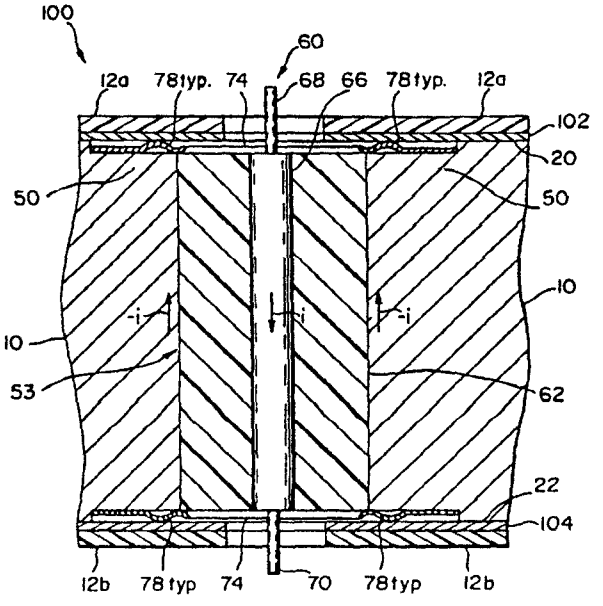
5,302,923 Apr. 12, 1994

Interconnection Plate Having High Frequency Transmission Line Through Paths

Inventors: Roy L. Mason, Paul A. Richer, James K. Pietsch.
Assignee: Hewlett-Packard Company.
Filed: July 16, 1992.

Abstract—An interconnection plate apparatus provides high frequency signal paths for communication among multiple pc boards and/or high frequency system components. The apparatus includes an interconnection plate which is a conductor having cross-sectional channels at which transmission line structures are formed. The transmission line structure includes a through-plate conductor concentrically surrounded by a through-plate insulator concentrically surrounded by the channel walls. An RF ground ring is positioned between the interconnection plate and a pc board at the transmission line structure. The interconnection plate provides a common ground reference and a common ground path for each board mounted to the interconnection plate. The ground ring structures assure a stable ground connection between the interconnection plate and the pc board ground planes. Different transmission line structures implement different signal transformation functions. The transmission line structure may simply pass the signal. In one embodiment, however, the transmission line structure serves as a low-pass filter.

17 Claims, 4 Drawing Sheets



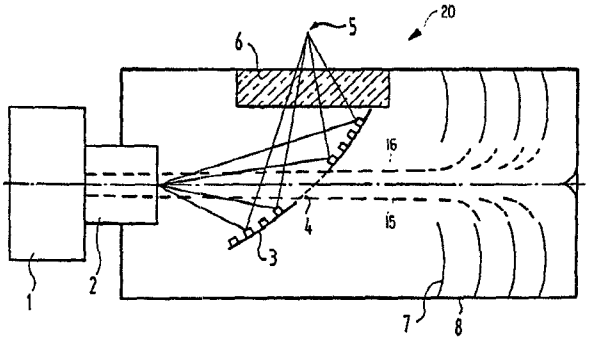
5,302,962 Apr. 12, 1994

Antenna System Producing a Millimeter Wave Beam Having a Gaussian-like Distribution

Inventors: Luigi Rebuffi and Manfred Thumm.
Assignee: European Atomic Energy Community (Euratom).
Filed: Dec. 5, 1989.

Abstract—An antenna system for producing a millimeter wave beam having a Gaussian distribution uses a high power source and a partial mode converter operatively coupled to the source and reviving from the source a $T_{m,n}$ mode wave which might either be $TE_{m,n}$ or $TM_{m,n'}$. The converter delivers a mixture of modes including the mode $T_{m,n}$ at a relative power rate of 70 to 85% and at a relative phase 0, and at least one of the following additional modes, namely $T_{m,n-1}$ at a relative power rate of 10 to 20% and at relative phase π and $TE_{m,n+1}$ at a relative power rate of 10 to 20% and at a relative phase π.. The mixture of modes is applied to a collimation reflector (3, 10), having a concentration point (5) constituting the antenna system outlet. The antenna system can convert any $T_{m,n}$ mode into a linearly polarized narrow beam of very high power (about 1 MW) and of high frequencies above 100 GHz.

6 Claims, 2 Drawing Sheets



5,303,079 Apr. 12, 1994

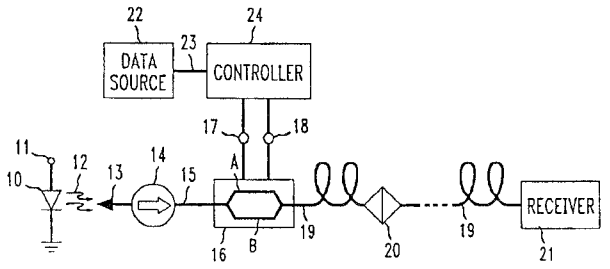
Tunable Chirp, Lightwave Modulator for Dispersion Compensation

Inventors: Alan H. Gnauck, Steven K. Korotky, Jane E. Zucker.
Assignee: AT&T Bell Laboratories.
Filed: Apr. 9, 1992.

Abstract—External modulation is accomplished in a dual waveguide device wherein substantially identical input optical beams are supplied to the waveguides and wherein each waveguide through its electrode is subject to individual, mutually exclusive control. Modulation signals are applied to each waveguide via its separate electrode. Control signals are applied to each waveguide for adjusting the modulation chirp parameter to a desired fixed, nonzero value. Typically, the desired value of the chirp parameter is one which provides the lowest fiber dispersion penalty for the system. Modulated lightwave signals emerging from the waveguides are combined to form a single output signal suitable for transmission, over an optical fiber. In one embodiment, Mach-Zehnder interferometer having separately controllable waveguides has its input coupled to a CW laser. Both III-V semiconductor

and Ti:$LiNbO_3$ Mach-Zehnder interferometers have been utilized as eternal modulators in accordance with the principles of the present invention.

10 Claims, 5 Drawing Sheets



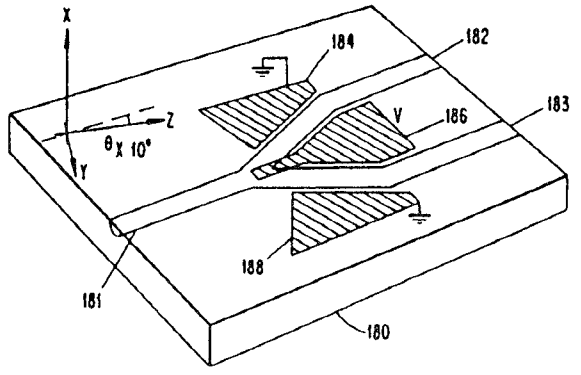
5,303,315 Apr. 12, 1994

Near Z Digital Switch

Inventor: Per O. Granestrand.
Assignee: Telefonasktiebolaget L M Ericsson.
Filed: Sept. 1, 1992.

Abstract—An X-cut or near Y-cut monocrystalline wafer of electro-optical material forms a substrate of digital optical switch. Waveguides of $LiNbO_3$ are diffused into the wafer to form ribbon waveguides such that light propagates in a direction near the Z axis of the wafer. These waveguides form a Y-shape, refractive indices of which are controlled by electrodes formed closely adjacent thereto.

52 Claims, 5 Drawing Sheets



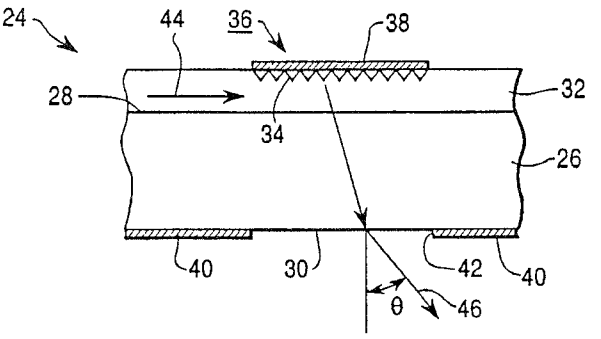
5,303,316 Apr. 12, 1994

Optical Beam Scanner

Inventor: Jacob M. Hammer.
Assignee: David Sarnoff Research Center, Inc.
Filed: Dec. 22, 1989.

Abstract—An optical device having a substrate with a waveguide layer on a surface thereof and grating in the waveguide. The grating has a period such as to deflect light passing along the waveguide out of the optical device. The angle at which the light is emitted from the waveguide can be varied by varying the index of refraction of the material of the waveguide under the grating. This can be achieved by applying a voltage across the waveguide.

7 Claims, 1 Drawing Sheet



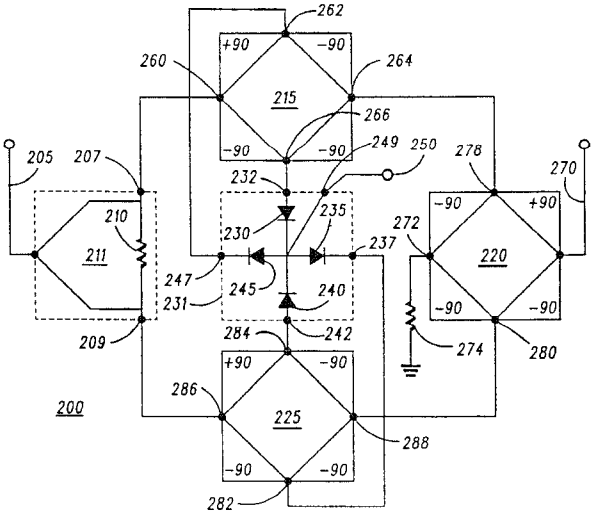
5,303,418 Apr. 12, 1994

High Isolation Mixer

Inventors: Joseph Staudinger and William B. Beckwith.
Assignee: Motorola, Inc.
Filed: June 21, 1991.

Abstract—A method and apparatus for improved isolation of IF, LO, and RF frequency signals from the non-associated mixer ports (e.g., avoiding introducing RF frequency signals at the IF and LO ports, and similarly vis-a-vis other signals and ports), is provided by coupling a RF (or LO) signal to first ports of four-port first and second phase shift means, each having two signal output ports having 180° phase difference for signals input from the first port, coupling the LO (or RF) signal to the first port of a third phase shift means, with two output signal ports having a phase difference of 180°, supplying the third phase shift means output signals to fourth ports of the first and second phase shift means, supplying the output signals of the first and second phase shift means to distinct ports of a five port mixer, and coupling an IF signal from the five port mixer to an IF port.

23 Claims, 3 Drawing Sheets



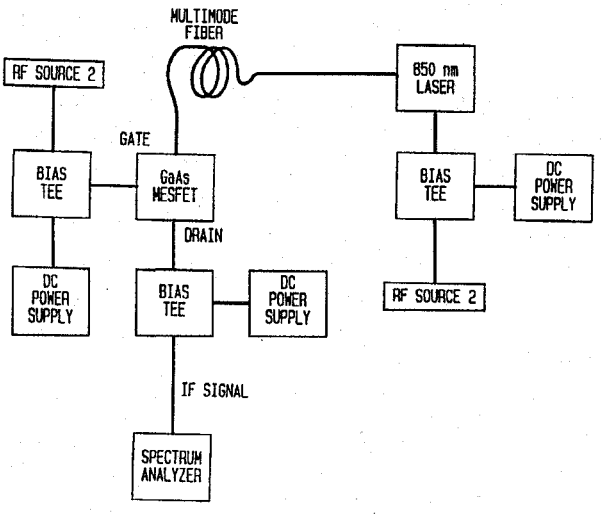
5,304,794 Apr. 19, 1994

Method for Mixing Optical and Microwave Signals Using a GaAs MESFET

Inventors: Steven A. Malone and Arthur C. Paolella.
Assignee: The United States of America as represented by the Secretary of the Army.
Filed: May 25, 1993.

Abstract—The present invention utilizes the internal photovoltaic effect of a GaAs MESFET to mix an RF modulated optical signal with a microwave signal. As those skilled in the art will readily recognize, a GaAs MESFET generically comprises an n layer of GaAs (channel) deposited on semi-insulating GaAs (substrate). Source, gate and drain electrodes are then formed on the channel with the gate acting as a Schottky barrier. In this standard MESFET, the difference in doping between the channel and substrate produces a potential barrier. It has been found that when the device is illuminated, the potential barrier is reduced in the region between the source and the gate and drain and the gate. This reduced potential barrier allows more drain current to flow from the device. It has been found that this drain current photoresponse is highly non-linear with respect the gate voltage applied to the device and therefore, it may be used to mix RF modulated optical signals with microwave signals. Accordingly, the present invention uses this effect to mix an optical signal directly or indirectly delivered to the MESFET with an RF signal so as to produce an IF signal.

8 Claims, 3 Drawing Sheets



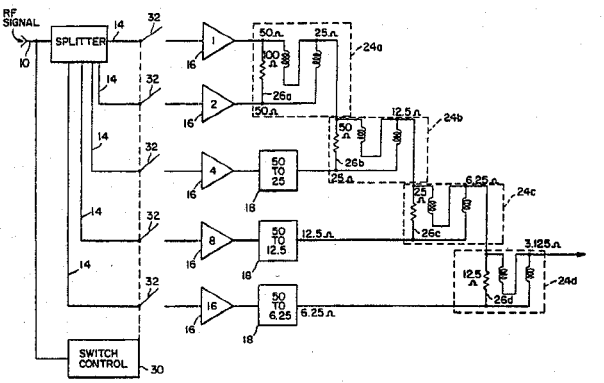
5,304,943 Apr. 19, 1994

In-Phase Combiner and RF Recovery System

Inventor: Floyd A. Koontz.
Assignee: Harris Corporation.
Filed: Nov. 16, 1992.

Abstract—A system and method for combining RF signals by a series of in-phase combiners. The system uses a series of switched, high efficiency amplifiers which may be selectively operated to obtain a desired output signal, such as an Amplitude Modulated (AM) signal. The output signals of the amplifiers are combined by a series of in-phase combiners. In a high linearity system a feedback loop is used to correct for combiner losses. The RF power normally lost in the combiners is recovered and available to increase the overall combiner efficiency.

11 Claims, 4 Drawing Sheets



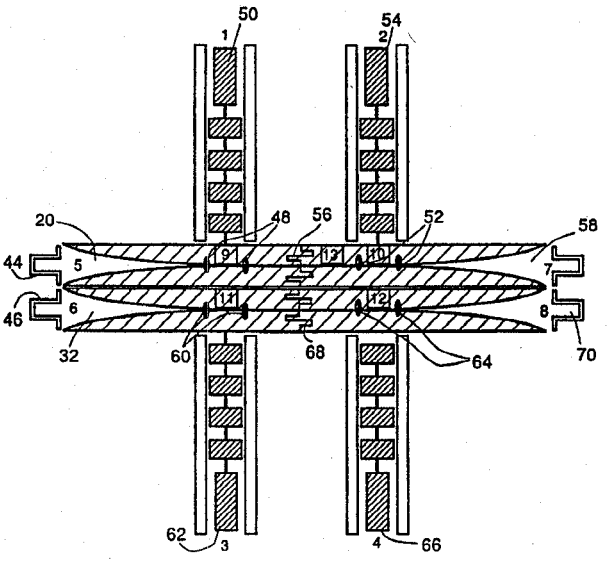
5,304,944 Apr. 19, 1994

High Frequency Linearizer

Inventors: Wilbert Copeland and Russ Reisner.
Assignee: Hughes Aircraft Company.
Filed: Oct. 9, 1992.

Abstract—A linearizer particularly valuable for millimeter wave satellite communications is disclosed. A satellite (12) divides signal into linear (20) and nonlinear (32) paths which are converted to finline. A pair of beamlead PIN diodes (48) and a pair of varactor diodes (52) extend across the finline linear path to constitute an attenuator and phase shifter. A pair of anti-parallel Schottky diodes (60) and a pair of PIN diodes (64) extend across the nonlinear path to constitute a limiter and an attenuator. A combiner (30) combines the linear and nonlinear signals for input to an amplifier.

24 Claims, 3 Drawing Sheets



5,304,945 Apr. 19, 1994

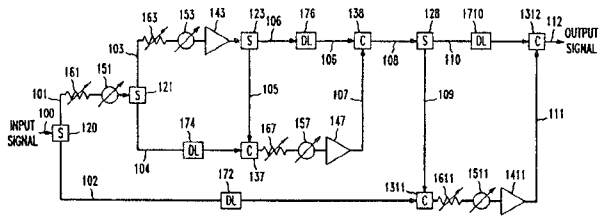
Low-Distortion Feed-Forward Amplifier

Inventor: Robert E. Myer.
Assignee: AT&T Bell Laboratories.
Filed: Apr. 19, 1993.

Abstract—A low-distortion, high-power, feed-forward amplifier is disclosed which is particularly well-suited for cellular radio applications. An

illustrative embodiment comprises a main amplifier and a pair of correction amplifiers, which each are used to eliminate different distortion products introduced by the main amplifier into the amplified signal.

8 Claims, 3 Drawing Sheets



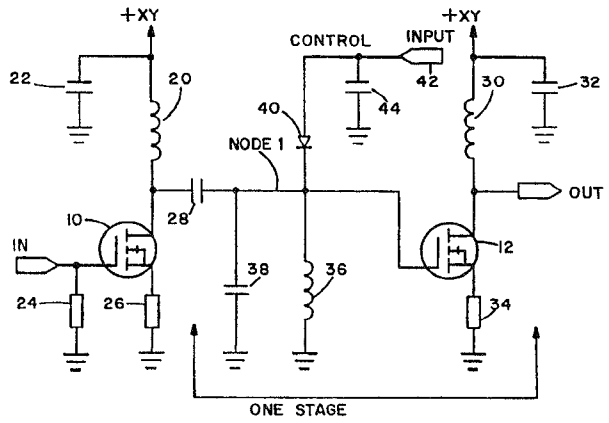
5,304,948 Apr. 19, 1994

RF Amplifier with Linear Gain Control

Inventor: Lars H. Mucke.
Assignee: Nokia Mobile Phones Ltd.
Filed: Dec. 11, 1992.

Abstract—A circuit amplifies an input RF band of signals and exhibits a signal gain in decibels that is a linear function of the logarithm of a control signal input. The circuit comprises a first amplifier stage having an output node that exhibits a first RF complex admittance within the RF band of signals. A second amplifier stage has an input node coupled to the output node of the first amplifier stage and exhibits a second RF complex admittance within the RF band of signals. A PIN diode, used as a gain control element, is shunt connected between the control signal input and the output node. An RF reactance circuit is also shunt connected between the output node and a common potential. The RF reactance circuit has a third admittance that is chosen to negate the imaginary portions of the first and second complex admittances, whereby the total admittance is substantially real and enables the PIN diode to see a minimal resistive load.

8 Claims, 2 Drawing Sheets



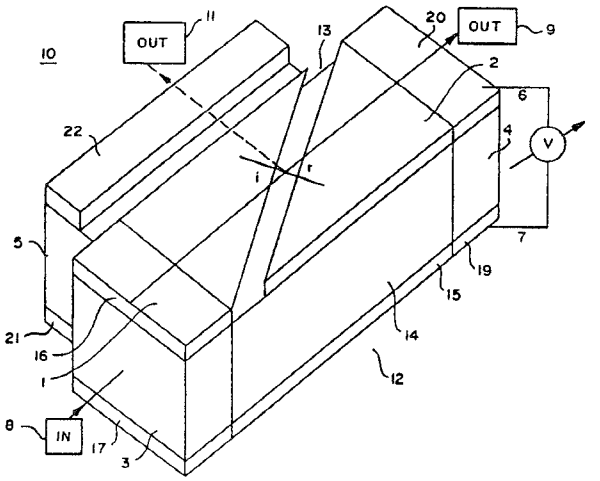
5,304,960 Apr. 19, 1994

Ferroelectric Total Internal Reflection RF Switch

Inventor: Satyendranath Das.
Filed: Apr. 1, 1993.

Abstract—An electronically controlled ferroelectric RF switch is an active medium formed from a ferroelectric material the permittivity, and as such the refractive index, of which may be varied by varying the strength of an electric field in which it is immersed The ferroelectric RF switch includes the ferroelectric material having electrodes or conductors mounted thereon that are connected to an adjustable d.c. or a.c. voltage source. The switch may be placed in an RF transmission line that includes appropriate input and output impedance matching devices such as quarterwave transformers. The active medium of the RF switch is constructed of two prismatic structures of a ferroelectric material. When the two prisms are at the same zero bias voltage, then the RF energy passing through the switch is not deflected and the switch is in the OFF condition. Application of a bias voltage reduces the permittivity and the refractive index of the outer prismatic structure. The RF energy is refracted away from the normal at the interface between the prismatic surfaces When the magnitude of the bias voltage is sufficiently high and the permittivity and the refractive index of the outer prismatic structure are sufficiently reduced, total internal reflection of the RF energy takes place at the boundary of the two prismatic surfaces and the switch is switched ON, and the RF energy appears on another port. The ferroelectric RF switch may be embedded as part of a microwave integrated circuit. The ferroelectric RF switch may be constructed of thin ferroelectric film. The copper losses may be reduced by using a high Tc superconductor material as the conducting surface The ferroelectric material is operated in the paraelectric phase slightly above its Curie temperature. The switch is reciprocal between the conductive ports.

10 Claims, 2 Drawing Sheets



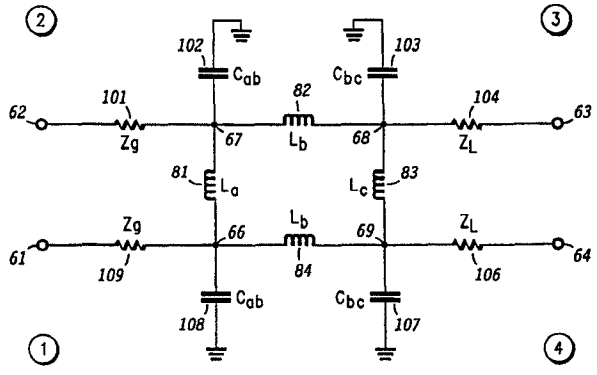
5,304,961 Apr. 19, 1994

Impedance Transforming Directional Coupler

Inventor: Michael Dydyk.
Assignee: Motorola, Inc.
Filed: Mar. 30, 1992.

Abstract—A lumped impedance transforming directional coupler including a first reactive element, a second reactive element coupled to the first reactive element at a first port, a third reactive element coupled to the second reactive element at a second port, a fourth reactive element coupled to the first reactive element at a third port and to the first reactive element at a fourth port, and the first, the second, the third, and the fourth ports each coupled through a first, a second, a third, and a fourth capacitor, respectively, to electrical ground, the reactive elements and the capacitors providing impedance transformation Alternate embodiments include a lumped element directional coupler arising from a distributed impedance transforming directional couplers with a pair of transmission lines one-fourth of a wavelength of a center operating frequency in length, and a second pair of transmission lines three-fourth of that wavelength in length

19 Claims, 6 Drawing Sheets



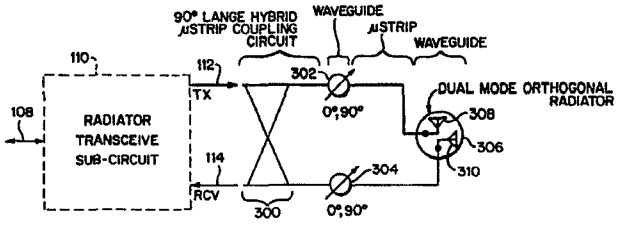
5,304,999 Apr. 19, 1994

Polarization Agility in an RF Radiator Module for Use in a Phased Array

Inventors: Roger G. Roberts and Thomas E. Sharon.
Assignee: Electromagnetic Sciences, Inc.
Filed: Nov. 20, 1991.

Abstract—A 90° coupling circuit cascaded with a pair of hybrid mode latchable phase shifters provides polarization agility for an RF radiator module of the type typically used in a phased array. For example, such radiator modules typically may utilize an active microwave integrated circuit (MIC), a monolithic microwave integrated circuit (MMIC) or a passive reciprocal hybrid mode element (RHYME) circuit. These circuits are arranged to provide duplex RF transmit/receive functions with controllable phase shifts at each radiator site in a phased array. By appropriately setting the two controllable phase shifters to different combinations of phase shifts (e.g., 0° and/or 90°) to a dual orthogonal mode radiator, different spatial polarizations for RF radiator transmit/receive functions can be defined. The radiator itself may include a square or circular waveguide including, in some cases, a reciprocal dielectric quarter-wave plate and a non-reciprocal ferrite quarter-wave plate. If a square waveguide is utilized, then 0°, 90° hybrid mode latchable phase shifters may be arranged on either side of a common ground plane with direct waveguide coupling into a septum polarizer waveguide section of the radiator element. A 90° Lange hybrid coupler also may be used by itself in conjunction with an electrically rotatable ferrite quarter-wave plate radiating element to achieve a certain degree of polarization agility.

25 Claims, 20 Drawing Sheets



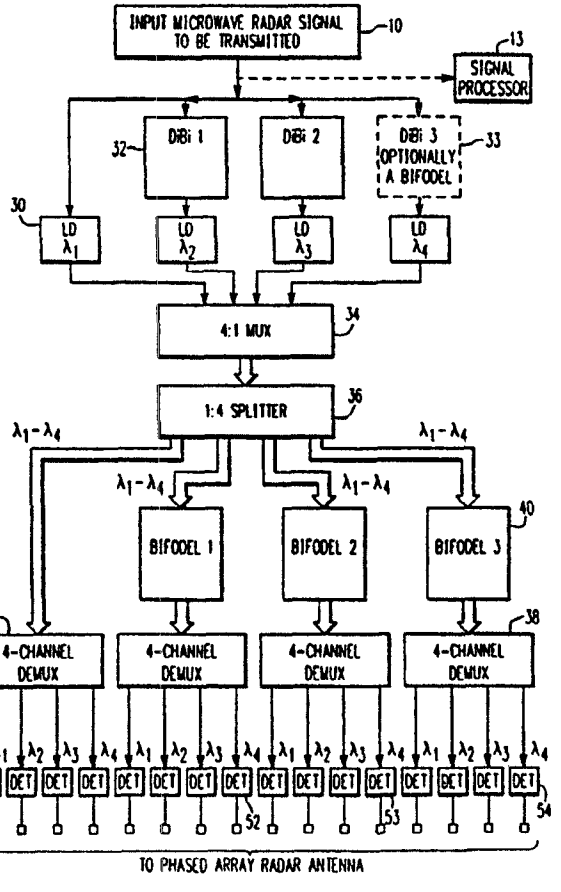
5,305,009 Apr. 19, 1994

Hybrid Electronic-Fiberoptic System for Phased Array Antennas

Inventors: Anastasios P. Goutzoulis, David K. Davies, Casey J. Coppock, John M. Zomp.
Assignee: Westinghouse Electric Corp.
Filed: Dec. 10, 1992.

Abstract—An improved phase array radar system has a plurality of bias binary fiber optic delay lines each connected between the transmit/receive cells and at least one of signal input means and signal processing means. A plurality of electronic binary delay lines are connected to at least one of the signal input means and the signal processing means and each bias binary fiber optic delay line.

6 Claims, 4 Drawing Sheets



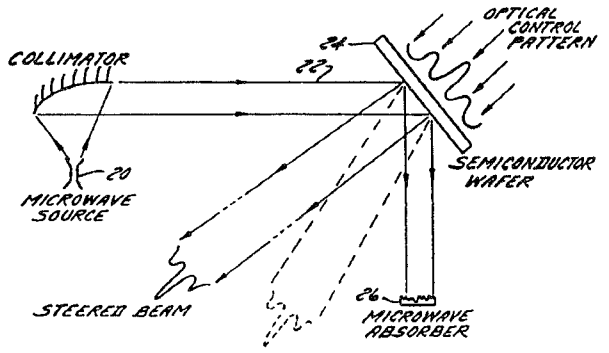
5,305,123 Apr. 19, 1994

Light Controlled Spatial and Angular Electromagnetic Wave Modulator

Inventors: Lev S. Sadovnik, Tomasz P. Jannson, Vladimir Manasson.
Assignee: Physical Optics Corporation.
Filed: Jan. 9, 1992.

Abstract—A 2D/3D optically controlled spatial and angular electromagnetic wave modulator is disclosed. The modulator of the present invention modulates the amplitude and direction of an electromagnetic wave such as millimeter microwaves or infrared waves by diffracting or scattering the electromagnetic wave from a semiconductor material upon which is incident a controlling lightwave. The lightwave incident upon the semiconductor is of varying intensity, and may be time varying, and changes the complex refractive permittivity of the semiconductor material. The electromagnetic wave is thus modulated in accordance with the controlling lightwave.

14 Claims, 3 Drawing Sheets



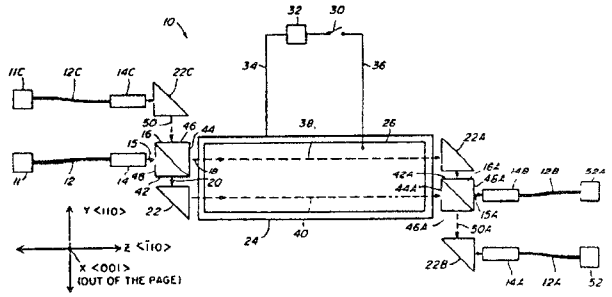
5,305,136 Apr. 19, 1994

Optically Bidirectional Fast Optical Switch Having Reduced Light Loss

Inventor: Malcolm C. Smith.
Assignee: Geo-Centers, Inc.
Filed: Mar. 31, 1992.

Abstract—An optically bidirectional electrically controlled optical switch having reduced light loss includes an electro-optic crystal having one set of fast and slow optical axes and having at least two light paths for receiving light beams through the crystal, the crystal exhibiting electric field induced birefringence such that a light beam passing through the crystal along a light path and having a plane of polarization oriented in a first direction may have its plane of polarization switched from the first direction to a plane of polarization oriented in a second direction Beam splitting polarizers are disposed at each end of the electro-optic crystal and optically aligned with the two light paths. The beam splitting polarizers split the optical beam into two light beams having planes of polarization oriented in the first and second directions when transmitting light to the two light paths and combine the two light beams into a single light beam when receiving light beams from the two light paths. Substantially 100% of the unpolarized light input to the optical switch is transferred to the output due to the use of the beam splitting polarizers. In a preferred embodiment of the invention, the electrooptic crystal is a cubic crystal chosen from crystal classes 43 m, 42 m, or 23.

11 Claims, 7 Drawing Sheets



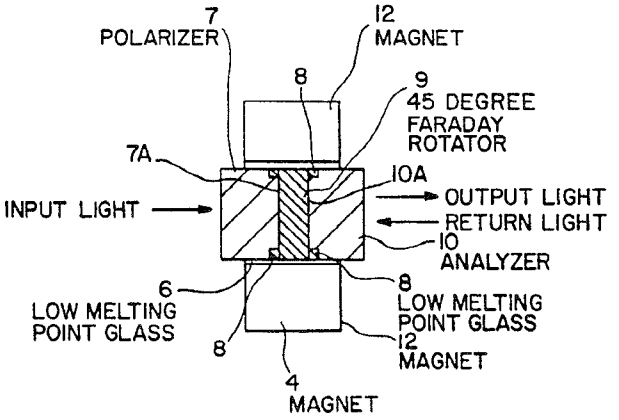
5,305,137 Apr. 19, 1994

Optical Isolator and Method for Fabricating the Same

Inventor: Kazuhide Ohkawara.
Assignee: Nec Corporation.
Filed: May 11, 1992.

Abstract—A polarizer, a Faraday rotator and an analyzer are fixed by fused gas applied on an outer periphery of the polarizer to be contacted with the Faraday rotator and on an outer periphery of the analyzer to be contacted with the Faraday rotator No adhesive exists between contact planes of the polarizer and the Faraday rotator and those of the Faraday rotator and the analyzer.

2 Claims, 4 Drawing Sheets



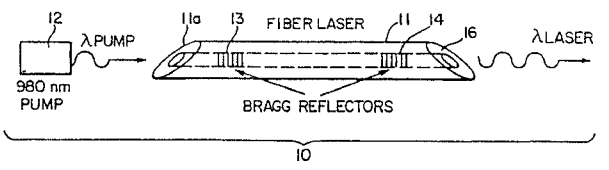
5,305,335 Apr. 19, 1994

Single Longitudinal Mode Pumped Optical Waveguide Laser Arrangement

Inventors: Gary A. Ball and William H. Glenn.
Assignee: United Technologies Corporation.
Filed: Feb. 12, 1993.

Abstract—An optical waveguide laser arrangement includes a solid optical waveguide having a waveguiding portion that extends along an axis between two spaced regions of the optical waveguide and is of a material capable of emitting stimulated light upon excitation by pumping light that is launched into the optical waveguide for axial propagation through the axially spaced regions of the optical waveguide Two reflectors are provided, each being disposed at one of the axially spaced regions of the optical waveguide to delimit a laser resonator At least one of the reflectors is constituted by a Bragg grating consisting of a multitude of axially consecutive periodic perturbations in the refractive index of the respective one of the axially spaced regions that cumulatively reflect the stimulated light at a reflectivity that decreases for adjacent longitudinal modes of the stimulated light with increasing deviation from a central wavelength. The axial length of the laser resonator, the reflectivity of the Bragg grating and the gain of the excitable material are so coordinated with one another as to sustain lasing in only a single longitudinal mode.

2 Claims, 4 Drawing Sheets



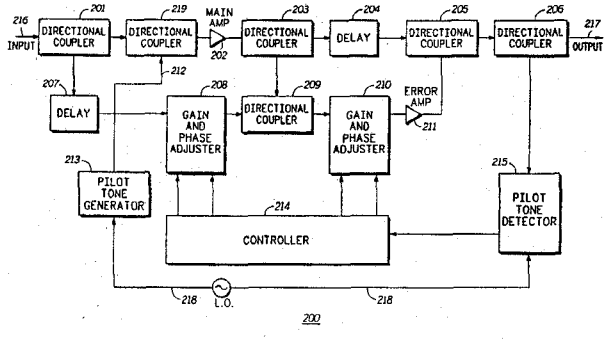
5,307,022 Apr. 26, 1994

High Dynamic Range Modulation Independent Feed Forward Amplifier Network

Inventors: Derek L. Tattersall, Jr., and James F. Long.
Assignee: Motorola, Inc.
Filed: Mar. 20, 1992.

Abstract—Briefly described the present invention is a feed forward amplifier network (200) employing a frequency swept pilot tone signal (212) in order to reduce the distortion generated by the network's power amplifier (202). Initially a composite input signal (216) comprising either wide (520) and/or narrow (510) bandwidth modulation formats is input into the network (200). In addition, the frequency swept pilot tone (212), generated for example by a variable frequency oscillator (213), is injected into the input path of the power amplifier (202). Thereafter, distortion cancellation is employed to generate an amplified output signal (217) having output components (510, 520) which replicate those within the input signal (216). Thereafter pilot tone power is detected (by 215) within the amplifier passband where the output components (510, 520) are absent, in order to ascertain the average pilot tone power remaining within the amplified output signal (217). In response to this detection, various amplifier network characteristics are adjusted (by 214, 208 and 209) in order to reduce the amount of pilot tone at the amplifier network output (217).

20 Claims, 5 Drawing Sheets



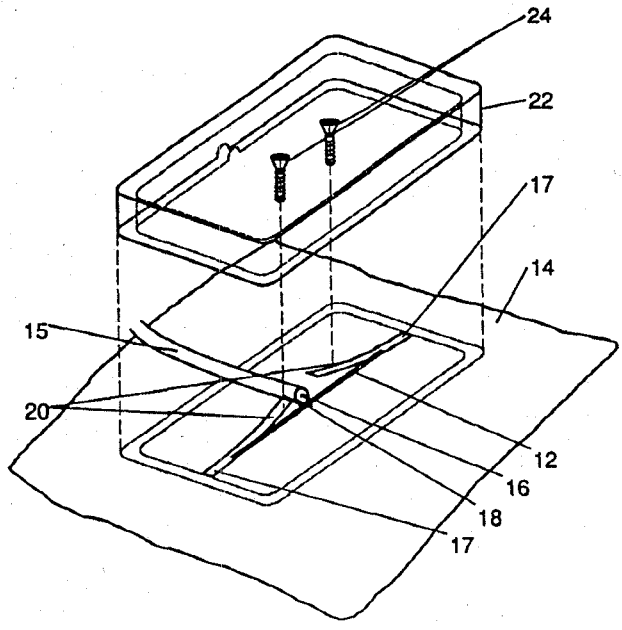
5,307,030 Apr. 26, 1994

Coupling Adjustment of Microwave Slots

Inventors: Ray J. King and Michael J. Werner.
Assignee: KDC Technology Corp.
Filed: Sept. 14, 1992.

Abstract—The invention is method and apparatus for *in situ* mechanical adjustment of electromagnetic power coupled through an aperture or slot. In its preferred form this adjustment of coupling is achieved by electrically connecting two thin, curved conductive leaf springs (20) to ground plane (14) at the ends of the coupling aperture or slot (12). The springs (20) are curved so as to bend away from the center of the aperture or slot opening (12). The aperture or slot is usually enclosed by a metal backing cavity (22) to prevent radiation from the rear of the aperture or slot and to provide a method for mechanically adjusting the position of springs (20) over the aperture or slot (12), e.g., by adjustment of screws (24). By advancing or retracting screws (24), leaf springs (20) are caused to progressively cover or uncover aperture or slot (12), thereby adjusting the electric field across the aperture or slot (12) and the coupled electromagnetic power through the aperture or slot (12). With this method and apparatus, a wide range of impedance matching to the slot feed line (15) can be adjusted as desired.

17 Claims, 3 Drawing Sheets



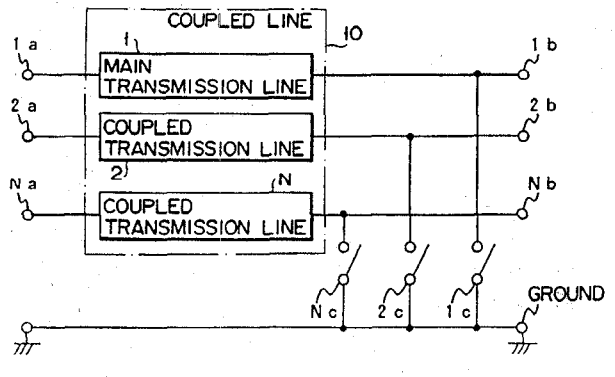
5,307,032 Apr. 26, 1994

Wideband Frequency Distributed Signal Selector Using Electromagnetic Coupling

Inventor: Tsuyomasa Uno.
Assignee: Anritsu Corporation.
Filed: Mar. 23, 1992.

Abstract—According to the present invention, there is provided a signal selector using a distributed coupled line with a small signal distortion in a range from a low-frequency wave to a high-frequency wave. One end of a main transmission line is a common terminal, and the other end is a signal selecting terminal. A coupled transmission line has at least one signal selecting terminal, and the coupled transmission line comprises one or a plurality of coupled transmission lines coupled to the main transmission line by an electric field, a magnetic field, or both the electric and magnetic fields. Switches are respectively arranged between the signal selecting terminal and ground or between ground and the signal selecting terminal and between the ground and the other end of the main transmission line so as to be selectively ON/OFF-operated.

9 Claims, 14 Drawing Sheets



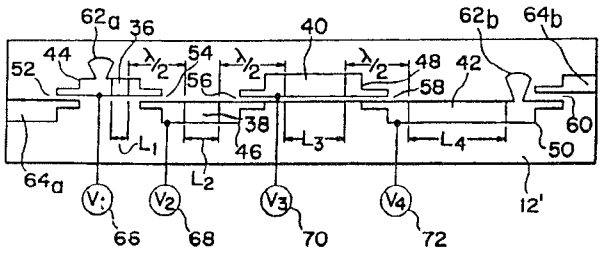
5,307,033 Apr. 26, 1994

Planar Digital Ferroelectric Phase Shifter

Inventors: Thomas E. Koscica, Richard W. Babbitt, William C. Drach.
Assignee: The United States of America as represented by the Secretary of the Army.
Filed: Jan. 19, 1993.

Abstract—A planar stripline type of ferroelectric phase shifter which includes a set of series coupled phase shifter sections, each having mutually different and binary weighted lengths of ferroelectric phase shifting material. Fixed amplitude control voltages are respectively applied to one or more lengths of ferroelectric material the permittivity and effective electric length of which change to provide a desired composite phase shift. The phase shifter, moreover, employs half wavelength spacings between elements or matching networks therebetween so that the microwave signal propagating through the phase shift will be minimally impeded between the input end and an output end.

12 Claims, 1 Drawing Sheet



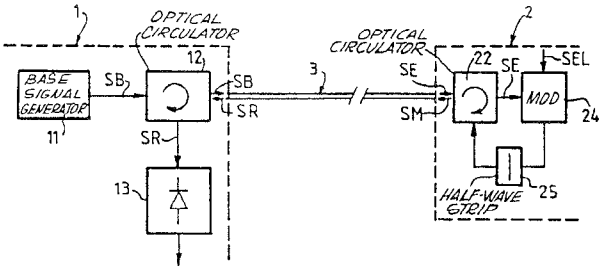
5,307,195 Apr. 26, 1994

Method and Means for the Transmission of an Electromagnetic Signal in an Optical Fiber

Inventor: Pierre Nicole.
Assignee: Dassault Electronique.
Filed: June 1, 1992.

Abstract—In a method of transmitting an electromagnetic signal in an optical fiber a polarized optical base signal is generated and input at a first and of an optical fiber, an optical signal emerging from the fiber after the base signal has passed through it is recovered at a second end of the fiber, this emergent signal is processed by electro-optical modulation with the electromagnetic signal which is to be transmitted and polarization conversion is effected, and the optical signal modified in this way is reinput to the said second end of the fiber; an optical return signal emerging from the fiber after the modified optical signal has passed through it is recovered at the first end of the optical fiber and this is analyzed in order to determine the characteristics of the electromagnetic signal.

14 Claims, 1 Drawing Sheet



5,307,196 Apr. 26, 1994

Optical Receiver

Inventor: Osamu Kinoshita.
Assignee: Kabushiki Kaisha Toshiba.
Filed: May 26, 1992.

Abstract—According to an optical receiver of the present invention, an optical input signal is converted to an electric signal by a photoelectric element, and amplified by an amplifier. Thereafter a band frequency is restricted by a low pass filter, and a peak value of a bottom level of the band-restricted pulse signal is detected Then, an offset voltage is added to the detected value, thereby a compare reference value is generated. The output of the amplifier is compared with the compare reference voltage by a comparator, thereby data is discriminated

6 Claims, 7 Drawing Sheets