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.

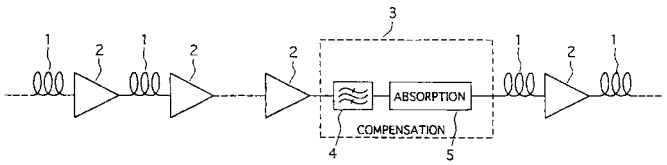
5,532,861 July 2, 1996

Optical Fiber Transmission System with Compensation for Line Distortions

Inventors: Francis Pirio and Jean-Baptiste Thomine.
Assignee: France Telecom.
Filed: June 30, 1994.

***Abstract*—**A system for transmission of a digital signal on a transmission line with an optical on-line amplification. The transmission line is formed by a plurality of optical fiber sections and a plurality of optical amplifiers. Each of the optical amplifier is interposed between two adjacent optical fiber sections. The system includes at least one device for on-line compensation of the distortions induced in the digital signal, notably by the noise and the propagation on the transmission line. The on-line compensation device includes at least one bandpass optical filter having a passband whose value is substantially lower than that of the passband of the digital signal before transmission, and at least one saturable absorbent element that is a nonlinear passive optical element having an absorption that depends decreasingly on the optical power.

15 Claims, 4 Drawing Sheets



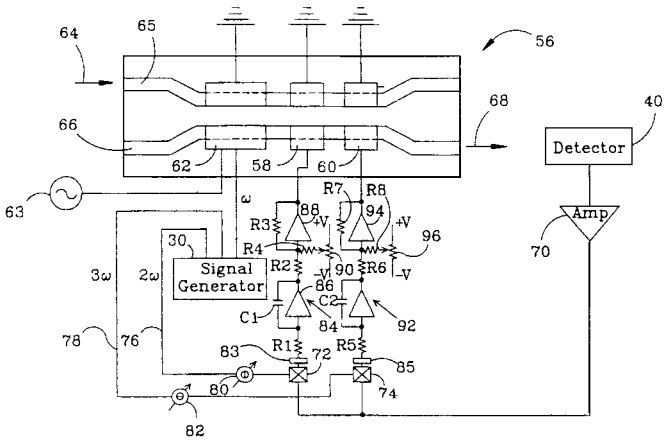
5,532,867 July 2, 1996

Bias Stabilization Circuit and Method for a Linearized Directional Coupler Modulator

Inventors: Robert R. Hayes and William B. Bridges.
Assignee: Hughes Aircraft Company.
Filed: June 6, 1995.

***Abstract*—**A circuit and method for actively stabilizing the dc bias voltages applied to passive sections of a linearized directional coupler modulator. A reference electrical signal is applied to the active section of a linearized directional coupler modulator, thereby modulating an input optical beam. An optical detector is used at the output end of the modulator to monitor the modulated optical beam. The output of the detector is sent to one or more synchronous detectors that select the one or more harmonic frequency components that one wants to suppress. The synchronous detector output is sent to a filter that converts the harmonic frequency component to a dc bias voltage, which is integrated and used to bias the passive section of the modulator. The resulting negative-feedback loop minimizes the magnitude of the particular harmonic that is selected by the filter. In a preferred embodiment, the present stabilization circuit is used to stabilize the bias voltages in a three-section linearized directional coupler modulator, resulting in a stable modulator with low second harmonic distortion and low third-order intermodulation distortion.

17 Claims, 4 Drawing Sheets



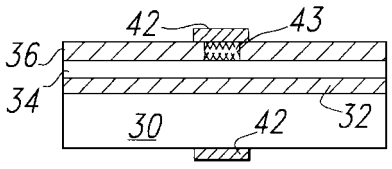
5,533,151 July 2, 1996

Active Cladding Optical Modulator Using an Electrooptic Polymer on an Inorganic Waveguide

Inventor: Jerry Leonard.
Assignee: Texas Instruments Incorporated.
Filed: Apr. 28, 1995.

***Abstract*—**Generally, the present invention is an optical waveguide circuit comprising a substrate **30**, a nonorganic waveguide channel **34** disposed within one or more cladding layers **32**, **36** upon the substrate and an active cladding region comprising electrooptic **40**, **43** or optically nonlinear polymer material **46** adjacent to the waveguide channel wherein the phase of an optical signal within the waveguide channel may be modulated by controlling the index of refraction of the active cladding region. An embodiment of the present invention uses an inorganic optical waveguide **34** with a region of active organic cladding to provide a phase modulator for a Mach-Zender interferometer which can be used to implement high-speed low-loss switching of optical signals.

15 Claims, 1 Drawing Sheet



Publisher Item Identifier S 1051-8207(97)06191-6.

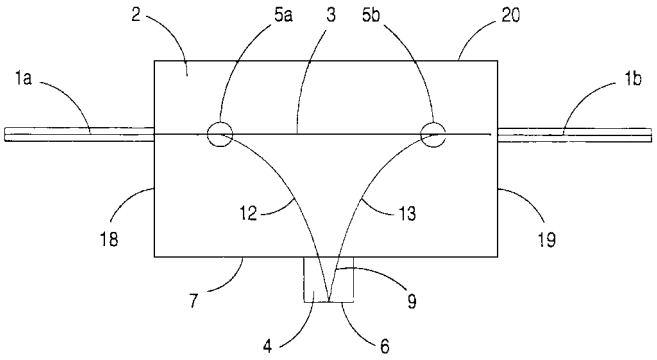
5,533,153 July 2, 1996

Optical Relay Amplifier with a Bypass Waveguide

Inventor: Takeshi Ota.
Assignee: Fuji Xerox Co., Ltd.
Filed: Apr. 19, 1995.

***Abstract*—**In an optical relay amplifier of the present invention, an inputted signal optical is divided into a plurality of lights by the first optical coupler. One of the divided inputted signal lights is amplified by an optical amplifier, and the other inputted signal light is made to pass through a bypass optical waveguide path provided. The amplified light from the optical amplifier is coupled with the light that has passed through the bypass optical waveguide path by a second optical coupler, and the optical amplifier is a semiconductor laser amplifier including a V-shaped optical waveguide path and two end portions connected with the optical waveguide paths of the first and second optical couplers. A reflecting surface is formed in a returning end portion of the V-shaped optical waveguide path.

19 Claims, 7 Drawing Sheets



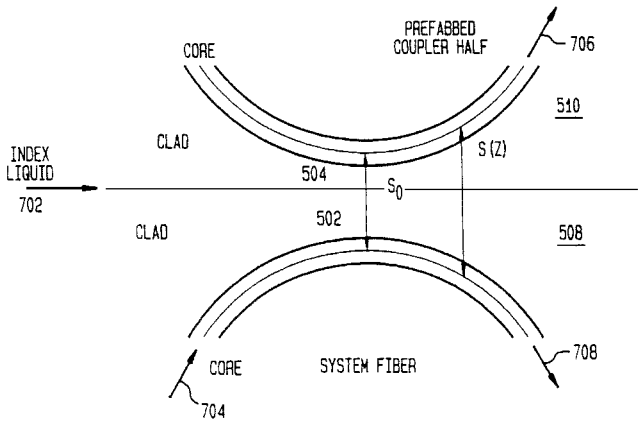
5,533,155 July 2, 1996

Evanescent Field Coupler

Inventors: Yvonne L. Barberio, Jon W. Engelberth, and Arthur E. Neeves.
Assignee: AT&T Corp.
Filed: Dec. 30, 1994.

***Abstract*—**An evanescent field coupler comprising a coupler holder, a first optical fiber mounted in a first substrate block, and a second optical fiber mounted in a second substrate block. The first substrate block is compliantly mounted to the holder. Means are included for positioning the substrate blocks with respect to the other for switching and adjustment of the coupling ratio. The compliant mount elastically deforms during switching and/or alignment to facilitate accurate, repeatable switching, while maintaining the desired coupling ratio between the optical fibers.

20 Claims, 12 Drawing Sheets



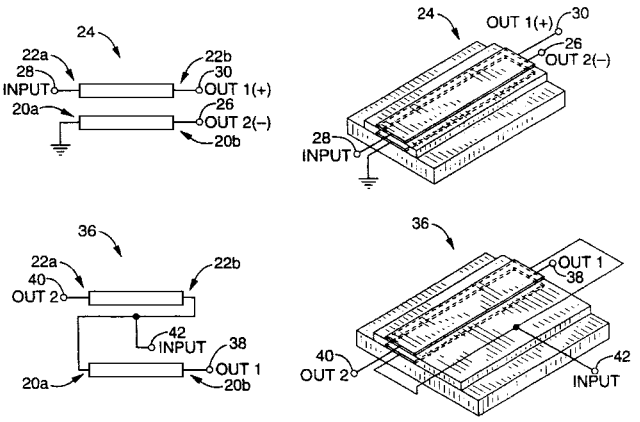
5,534,830 July 9, 1996

Thick-Film Balanced-Line Structure, and Microwave Baluns, Resonators, Mixers, Splitters, and Filters Constructed Therefrom

Inventor: Loren E. Ralph.
Assignee: R F Prime Corporation.
Filed: Jan. 3, 1995.

***Abstract*—**A thick-film balanced-line multilayered structure having a substrate base of nominal 0.025 or 0.030-in-thick ceramic material, a first metal layer deposited on the substrate base, a nominal 0.003-in-thick dielectric layer deposited over and around the first metal layer, and a second metal layer deposited on top of the dielectric layer in alignment with, and parallel to, the first metal layer. The structure defines a standard circuit cell suitable for use as a balun, a capacitor, or an autotransformer for use in microwave mixers, power splitters, filters, resonators, and other microwave devices. The impedance of the cell is controlled by the width of the metal layers and ranges from 5 to 125 Ω, and the frequency of the cell is controlled by the length of the metal layers.

11 Claims, 5 Drawing Sheets



5,534,831 July 9, 1996

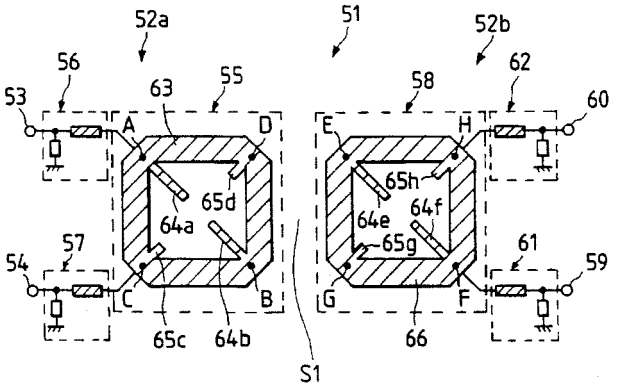
Plane-Type Strip-Line Filter in which Strip Line Is Shortened and Dual Mode Resonator in which Two Types Microwaves Are Independently Resonated

Inventors: Hiroyuki Yabuki, Michiaki Matsuo, Morikazu Sagawa, and Mitsuo Makimoto.
Assignee: Matsushita Industrial Electric Co., Ltd.
Filed: Oct. 4, 1994.

***Abstract*—**A strip-line filter is provided with upper- and lower-stage resonators having the same electromagnetic characteristics. Each of the resonantors has a one-wavelength square-shaped strip line and four open-end transmission lines connected to four coupling points A, C, B, and D (or E, G, F, and H) of each resonator which are spaced 90 degrees in electric length in that order. The square-shaped strip lines have a pair of parallel coupling lines closely placed in parallel to each other to electromagnetically couple the resonators. Therefore, the filter can be manufactured in a small size. A first microwave resonated in each resonator is electromagnetically influenced by two open-end transmission lines connected to two coupling points A and B (or E and F), and a second microwave resonated in each resonator is electromagnetically influenced by two open-end transmission lines connected to two coupling points C and D (or G and H). Therefore, resonance wavelengths of the microwaves can be longer than a line length of each square-shaped strip line. Also, the resonance wavelengths can be adjusted by

trimming the transmission lines. Also, because all constitutional elements are made of strip lines, the filter can be made plane.

14 Claims, 22 Drawing Sheets



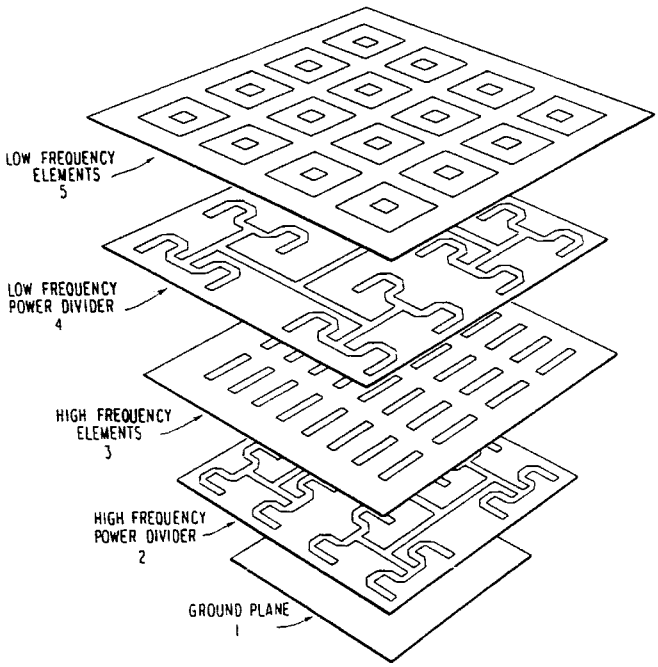
5,534,877 July 9, 1996

Orthogonally Polarized Dual-Band Printed Circuit Antenna Employing Radiating Elements Capacitively Coupled to Feedlines

Inventors: Robert M. Sorbello and Amir I. Zaghloul.
Assignee: Comsat.
Filed: Sept. 24, 1993.

***Abstract*—**A dual-polarized printed circuit antenna operating in dual-frequency bands. A first array of radiating elements radiates at a first frequency, and a second array of radiating elements radiates at a second, different frequency. Separate power divider arrays are provided for each array of radiating elements, and the overall structure is provided in a stacked configuration.

4 Claims, 8 Drawing Sheets



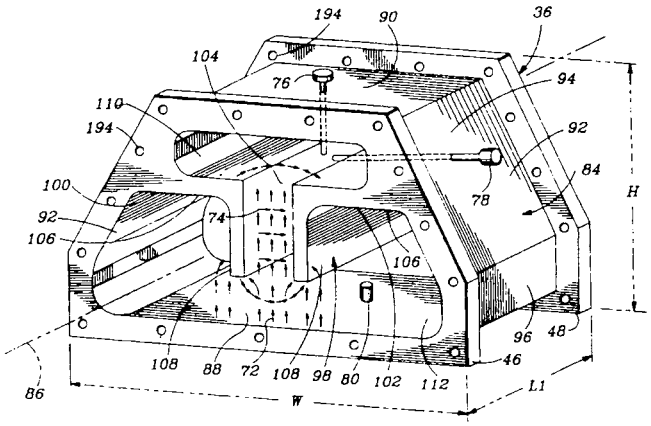
5,534,881 July 9, 1996

Microwave Filter Assembly Having a Nonsymmetrical Waveguide and an Antenna

Inventors: Frederick A. Young, Louis W. Hendrick, and Keith N. Loi.
Assignee: Hughes Aircraft Company.
Filed: Aug. 31, 1994.

***Abstract*—**A microwave cavity filter (30, 30A) is formed of a section of waveguide (36, 114) terminated by end walls (38, 40, 44, 166, 168, 176) to form cavities (32, 34, 32A, 34A) wherein ridges (100, 102, 118, 120) are disposed longitudinally within a cavity and extend from the cavity wall partway to a central region (104, 124) of the cavity. In a preferred embodiment of the invention, the ridges are disposed symmetrically about a central plane (144), each ridge having a first component (106, 122) perpendicular to the central plane and a second component (108, 126) parallel to the central plane, A cross-sectional shape of a filter cavity may approximate a semicircle wherein one wall section (88, 130) of the filter cavity is disposed within a diametric plane (216) of the cavity. The end walls of the cavities may be constructed as iris plates with apertures (82, 182, 184, 186, 190) for coupling energy of selected modes of electromagnetic resonance within the respective cavities. Each cavity supports two orthogonal modes wherein, within the region, between the parallel second components of the two ridges, the electromagnetic fields of a first mode are parallel to the central plane and the electromagnetic fields of the second mode are perpendicular to the central plane. Mode coupling screws (80, 156) may be provided for coupling of energy between the modes within a cavity. The ridging of the waveguide section of the cavity reduces the low frequency cutoff, thereby enabling the cavities to be constructed with smaller dimensions to facilitate their emplacement within satellite communication systems.

11 Claims, 11 Drawing Sheets



5,534,993 July 9, 1996

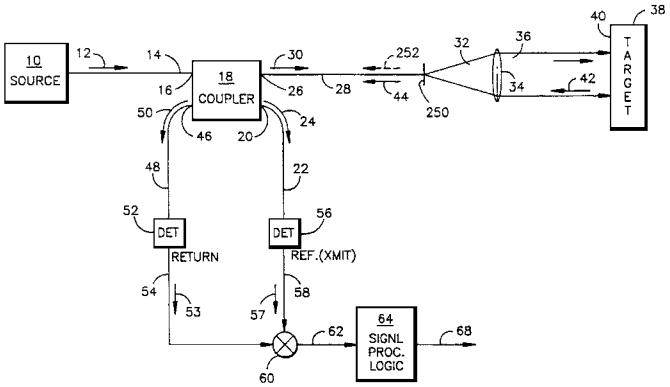
Dual-Wavelength Frequency-Chirped Microwave AMCW Ladar System

Inventors: Gary A. Ball and Leon A. Newman.
Assignee: United Technologies Corporation.
Filed: June 15, 1994.

***Abstract*—**An amplitude modulated continuous wave (AMCW) laser radar (ladar) system is provided with a dual-wavelength source 10 which provides a dual wavelength signal 12 (one fixed and one chirped) which is launched

down a fiber 28 to a target 38 and reflected back along the fiber 28 and the return detected by a detector 52. The transmitted signal is detected by a detector 56. The detectors 52, 56 provide an electrical return beat signal and reference beat signal, respectively, indicative of the difference between the wavelengths incident thereon. The signals are fed to a frequency mixer 60 which subtracts the two beat frequencies and signal processing logic 64 computes the distance to the target 38. Using dual wavelengths and beat frequencies provides a much broader chirp bandwidth than conventional lader techniques, and allows for higher power sources, thereby reducing range error.

4 Claims, 3 Drawing Sheets



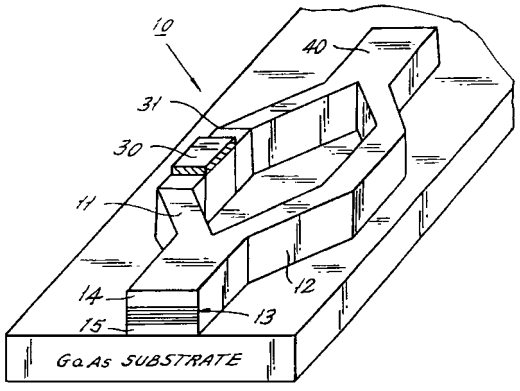
5,535,045 July 9, 1996

Modulation Doped Quantum-Well Waveguide Modulator

Inventors: Mitra Dutta and Weimin Zhou.
Assignee: The United States of America as represented by the Secretary of the Army.
Filed: Mar. 17, 1994.

***Abstract*—**The dielectric constant and the optical properties of a semiconductor device are changed by tuning the electron density in modulation-doped quantum-wells. The quantum wells are formed in an "i" region of a p-i-n structure having, in sequence, a 150-Å-wide GaAs quantum-well, a wider $Al_xGa_{1-x}As$ barrier with a central silicon doped section, and an undoped AlGaAs barrier with a slightly higher barrier height to prevent transfer of carriers to the next well. When a reverse bias is applied, more D centers are tuned below the Fermi level so that they can trap electrons from the wells, thereby reducing electron density and changing the optical properties of the material.

17 Claims, 2 Drawing Sheets



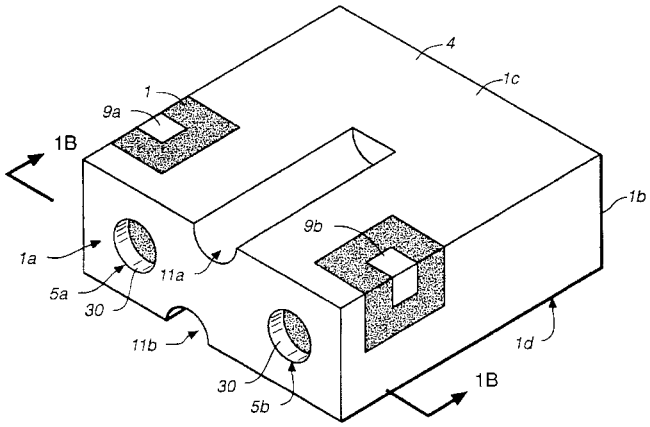
5,537,082 July 16, 1996

Dielectric Resonator Apparatus Including Means for Adjusting the Degree of Coupling

Inventors: Hitoshi Tada, Hideyuki Kato, Tatsuya Tsujiguchi, Yukihiro Kitaichi, Tadahiro Yorita, Hisashi Mori, and Haruo Matsumoto.
Assignee: Murata Manufacturing Co., Ltd.
Filed: Feb. 18, 1994.

***Abstract*—**A compact dielectric resonator apparatus is comprised of a dielectric block having a plurality of mutually parallel throughholes formed therethrough with inner surfaces covered with a conductive film so as to provide coaxial resonators. The degree of coupling between a mutually adjacent pair of such dielectric resonators can be adjusted by forming grooves, a bottomed hole or a slit or burying a conductive plate therebetween in the dielectric block, and varying physical characteristics of such grooves, bottomed hole, slit and/or conductive plate, without changing the separations between the throughholes or the external dimensions of the dielectric block.

15 Claims, 17 Drawing Sheets



5,539,361 July 23, 1996

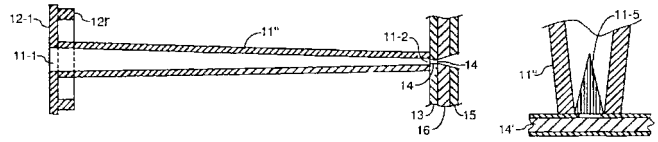
Electromagnetic Wave Transfer

Inventor: Marat Davidoviitz.
Assignee: The United States of America as represented by the Secretary of the Air Force.
Filed: May 31, 1995.

***Abstract*—**Method and apparatus for transiting from one form of electromagnetic wave guidance to another by increasingly or reducingly guiding an electromagnetic wave to or from a conductor serving as a ground plane and coupled to the other form of wave guidance at the ground plane through an aperture, where wave guidance can be by a waveguide, planar line, or coaxial

cable and to or from a planar line that is transversely disposed in relation to wave guidance thereto or therefrom.

3 Claims, 7 Drawing Sheets



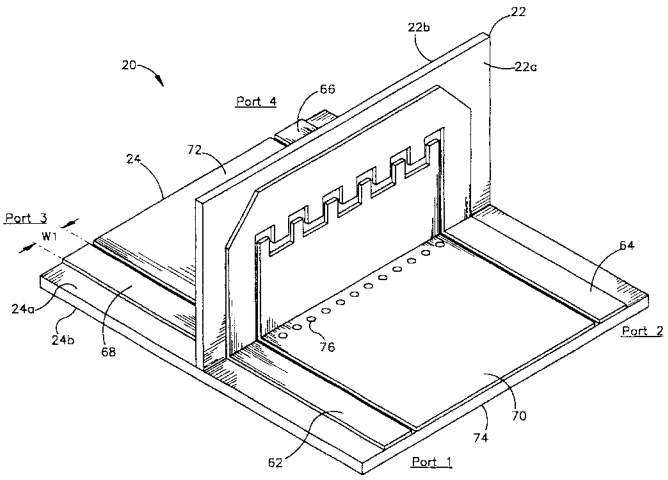
5,539,362 July 23, 1996

Surface-Mounted Directional Coupler

Inventor: Michael J. Culling.
Assignee: Harris Corporation.
Filed: June 30, 1995.

***Abstract*—**A microwave directional coupler comprises a coupler dielectric board which is mounted substantially perpendicular to the surface of a parent circuit board. Upper interdigital elements are disposed on opposing surfaces of the coupler dielectric board. The coupling between the upper interdigital elements determines the odd mode impedance Z_{oo} of the microwave directional coupler. Lower interdigital elements are also disposed on opposing surfaces of the coupler dielectric board. The lower interdigital elements are connected to ground and are arranged so that coupling between the lower interdigital elements and the upper interdigital elements determines the even mode impedance Z_{oe} of the microwave directional coupler.

14 Claims, 4 Drawing Sheets



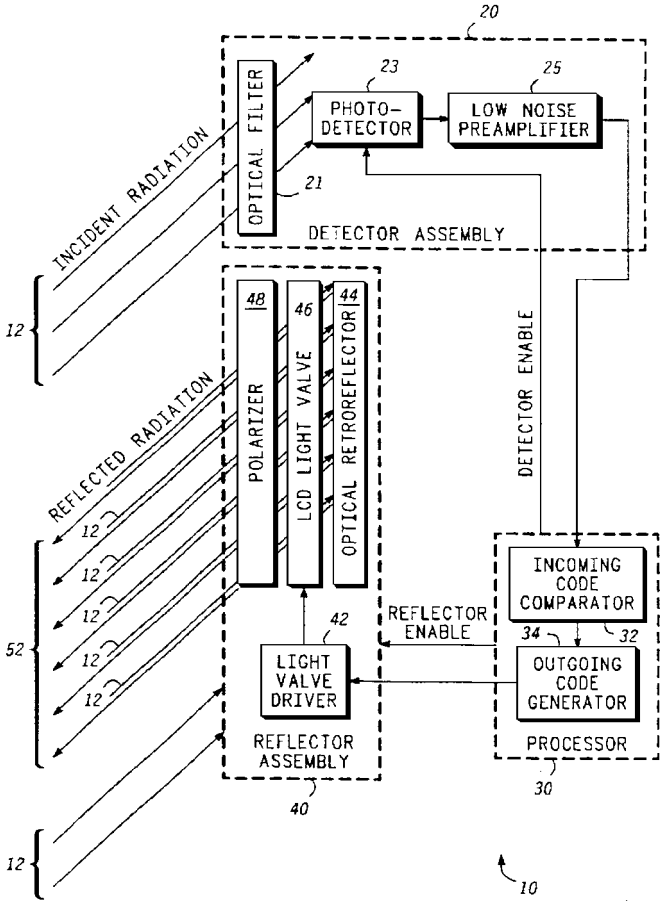
5,539,565 July 23, 1996

Method and Apparatus for a Selective Optical Retroreflector

Inventors: Ray O. Waddoups and John S. Scavarda.
Assignee: Motorola, Inc.
Filed: Sept. 27, 1995.

***Abstract*—**An optical retroreflector apparatus and method detects (**20**) incident light radiation (**12**). A processor (**30**) periodically enables the detector (**20**, **60**–**64**) to receive a signal included in the incident light radiation (**12**). A reflector (**40**) is triggered by receipt of a particular signal included in the incident light radiation to reflect a coded signal toward the source of the incident light radiation.

18 Claims, 2 Drawing Sheets



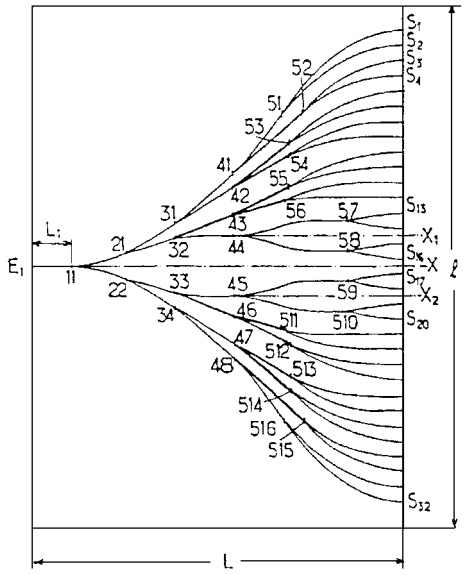
5,539,847 July 23, 1996

Integrated Optical Coupler with One Input Port and 2^N Output Ports

Inventors: Christian Lerminiaux and Denis M. Trouchet.
Assignee: Corning Incorporated.
Filed: Feb. 17, 1995.

***Abstract*—**The present invention relates to a coupler having one input port and 2^n output ports which includes a plurality of essentially coplanar waveguides connecting the input port to one of the 2^n output ports. The plurality of waveguides are arranged in two symmetrical groups in relation to the axis of the coupler and have points of inflection. Each of the waveguides includes branches connected in a tree-like manner by n levels of Y-junctions where the waveguides connecting at least two of the output ports that are located furthest from the axis of the coupler to the input port have no singularities and between the first level and the nth level of the Y-junction have points of inflection located outside the junctions. Further, the junctions located along these waveguides have axes of symmetry which are not parallel to the axis of the coupler. The waveguides connecting at least two of the output ports that are located closest to the axis of the coupler have junctions in the $(n-1)$th level having axis of symmetry parallel to the axis of the coupler, with the axis of each of these junctions defining an axis symmetry for two junctions in the nth level and which are likewise parallel to the axis of the coupler, and also for the four output points that they feed.

4 Claims, 1 Drawing Sheet



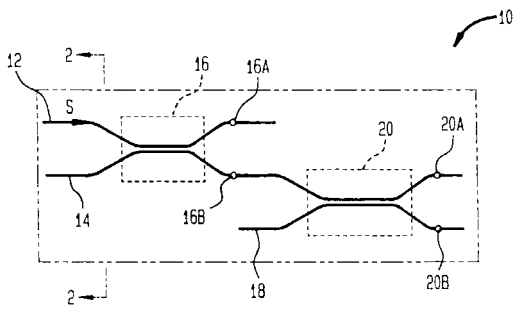
5,539,850 July 23, 1996

Polarization- and Wavelength-Independent Optical Waveguide Tap

Inventors: Charles H. Henry and Ronald E. Scotti.
Assignee: AT&T Corp.
Filed: Dec. 30, 1994.

***Abstract*—**An integrated optical device for tapping signal power provides a tap which is substantially independent of wavelength and polarization. The optical device includes a first tap consisting of a first optical waveguide carrying an input signal S disposed in coupling relation with a second optical waveguide for providing an output cross-state transmission T_1. The cross-state transmission T_1 is polarization and wavelength dependent. The optical device further includes a second tap consisting of a third optical waveguide disposed in coupling relation with and in series with the second optical waveguide carrying the output cross-state transmission T_1 for providing an output bar-state transmission T_2. The bar-state transmission T_2 has an opposite dependency on waveguide coupling than that of the cross-state transmission T_1 and, thus, compensates for wavelength and polarization dependencies of the cross-state transmission signal T_1, thereby providing an overall tap transmission T, which is equal to $\mathrm{T}_1\ \mathrm{T}_2$ and is substantially independent of polarization and wavelength.

13 Claims, 3 Drawing Sheets



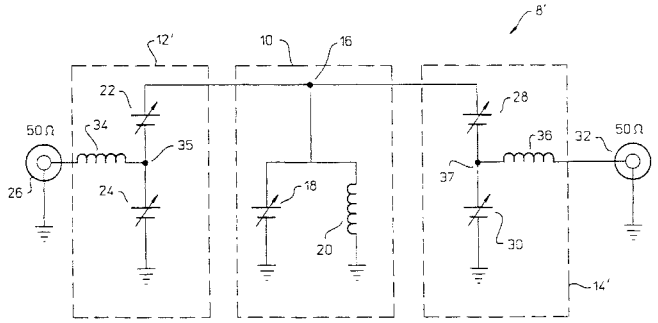
5,541,558 July 30, 1996

Capacitively Tapped, Variable, Wideband Bandpass Filter

Inventors: Leonard Weber, Bruce A. Erickson, and Edward M. Barich.
Assignee: Hewlett-Packard Company.
Filed: Nov. 1, 1994.

***Abstract*—**A wideband bandpass filter has a tank circuit connected between an input and output tapping circuit. The tank circuit contains a variable capacitor and an inductor in parallel. The tank circuit determines a center frequency for the bandpass filter. The input tapping circuit has an input variable impedance, and the output tapping circuit has an output variable impedance. The input and output variable impedances determine the continuously variable bandwidth of the filter.

8 Claims, 8 Drawing Sheets



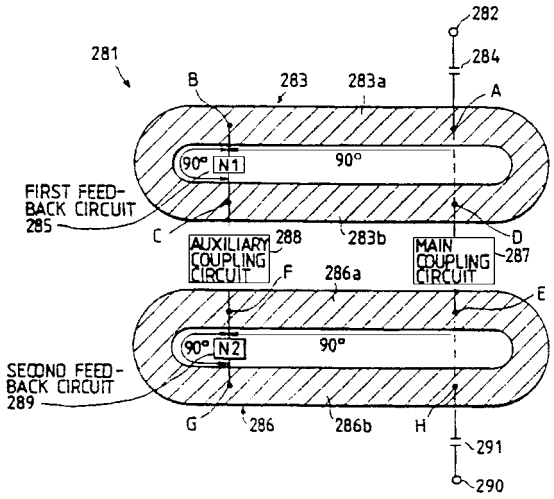
5,541,559 July 30, 1996

Loop-Shaded Strip-Line Dual-Mode Multistage Filter in which the Strip-Line Dual-Mode Filters Are Arranged in Series

Inventors: Kazuaki Takahashi, Munenori Fujimura, Hiroyuki Yabuki, and Mitsuo Makimoto.
Assignee: Matsushita Electric Industrial Co., Ltd.
Filed: Sept. 27, 1995.

***Abstract*—**A strip dual-mode filter consists of a strip-line ring resonator having an electric length equivalent to a resonance wavelength λ_o for resonating microwaves at the resonance wavelength λ_o according to a characteristic impedance thereof, an input coupling capacitor for transmitting the microwaves from an input terminal to a coupling point A of the ring resonator, an output coupling capacitor for outputting the microwaves resonated in the ring resonator from a coupling point B of the ring resonator to an output terminal, and a phase-shifting circuit connected to a coupling point C, and a coupling point D of the ring resonator for changing the characteristic impedance of the ring resonator by shifting a phase of the microwave by a multiple of a half wavelength of the microwaves. The coupling point B is spaced a quarter wavelength of the microwaves apart from the coupling point A, the coupling point C is spaced the half wavelength of the microwaves apart from the coupling point A, and the coupling point D is spaced the half wavelength of the microwaves apart from the coupling point B.

8 Claims, 15 Drawing Sheets



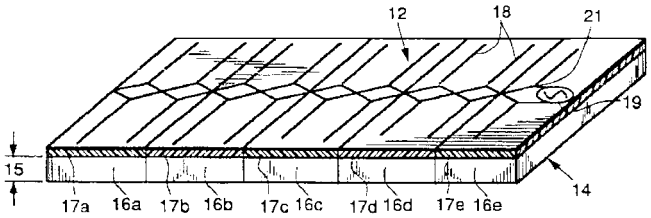
5,541,613 July 30, 1996

Efficient Broadband Antenna System Using Photonic Bandgap Crystals

Inventor: Juan F. Lam, Ronald I. Wolfson, and Jerome Glaser.
Assignees: Hughes Aircraft Company, Hughes Electronics.
Filed: Nov. 3, 1994.

***Abstract*—**A broadband antenna system utilizes multiple photonic bandgap crystals to achieve nearly 100 percent power efficiency over a larger range of frequencies than prior antenna systems. Multiple custom-tailored photonic bandgap crystals form a substrate for the antenna system. Each of the crystals is designed to cover a specific range of frequencies. The multiple crystals are attached together to form a photonic bandgap substrate whose bandwidth varies as a function of location on the substrate. A broadband antenna that can cover a wide frequency range, and whose active region shifts to different portions of the antenna as a function of frequency, is formed on the substrate such that the active region of the antenna is always on a crystal that has a corresponding operating bandwidth. The photonic bandgap crystals provide a nearly 100 percent efficient reflector for radiation emitted into the substrate that would otherwise be trapped or dissipated therein.

10 Claims, 2 Drawing Sheets



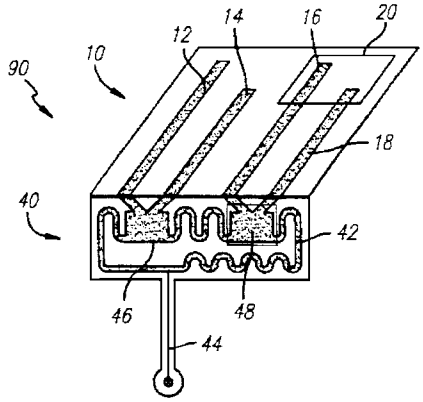
5,541,617 July 30, 1996

Monolithic Quadrifilar Helix Antenna

Inventor: Peter J. Connolly, Steren G. Ow, and Robert D. McCarthy.
Filed: July 7, 1994.

***Abstract*—**A quadrifilar helix antenna containing a hybrid junction power divider feed circuit and a plurality of radiating elements. The radiating elements are connected on one end to the hybrid junction power divider feed circuit and are free to radiate on the other end. In a particular embodiment, the antenna includes a microstrip hybrid junction power divider feed circuit deposited on the lower rectangular section of a dielectric substrate. The hybrid junction power divider feed circuit provides both a 0 to 180-degree phase shift and impedance matching. The antenna also includes four radiating microstrip elements deposited on the upper section of the dielectric substrate at a predetermined angle to form a helical pattern upon turning the planar antenna into a cylinder. The radiating elements are connected to the microstrip hybrid junction power divider feed circuit in pairs. The first pair is connected to the hybrid junction power divider feed circuit at the location of the 0-degree phase shift whereas the other pair is located at the 180-degree phase shift location. The second element of each pair is shorter than the first element by a predetermined distance to provide a phase quadrature between them. Therefore, through this method, the required phase relationships for a circularly polarized beam pattern are achieved.

9 Claims, 1 Drawing Sheet



5,541,755 July 30, 1996

Method for Readjusting a Phase or Frequency Modulation Shift of an Optical Transmission Signal

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***Abstract*—**Apparatus and methods are disclosed for readjusting a modulation shift of a transmission light modulated optical signal. In these systems and methods, a first modulated portion of the modulated transmission light is removed to obtain a first modulated signal which is divided into first and second light beams. The first light beam is delayed by a specific delay time and the first and second light beams are coherently superimposed to obtain an optical superposition signal which is detected to produce a detector signal that is proportional to a power of the superposition signal. An error signal is subsequently generated from the detector signal which is representative of a modulation shift from a desired shift value which is used for substantially correcting a modulation of the transmission light.

30 Claims, 4 Drawing Sheets