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 USA.

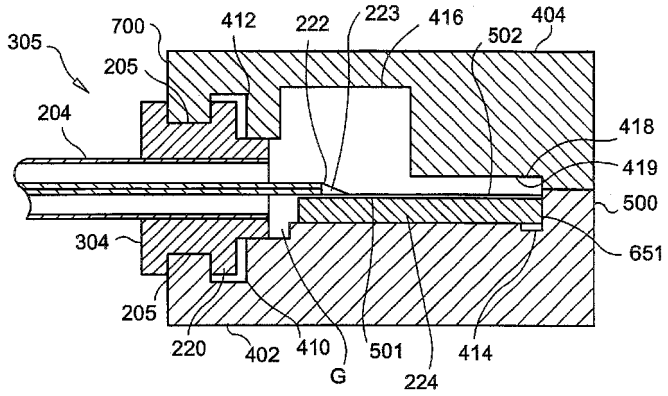
6,326,862 Dec. 4, 2001

TUNED REACTANCE CAVITY ELECTRICAL TERMINATION

Inventors: Donald A. Ferguson and Martin Gottschalk.
Assignee: Florida RF Labs, Inc.
Filed: Sep. 13, 1999.

***Abstract*—**An electrical termination system includes an electrical contact electrically connected to an RF resistor (**224**). A housing (**102**) at least partially encloses the RF resistor (**224**). In one alternative, the housing (**102**) includes an electrically conductive surface located at a first distance relative to the RF resistor (**224**) to provide a reactance at the RF resistor (**224**) to reduce reflected energy at the electrical contact for a wide band RF signal present at the electrical contact. In a second alternative, a surface of a dielectric substrate (**602**) is located substantially adjacent to the RF resistor (**224**) to provide a reactance at the RF resistor (**224**) to reduce reflected energy at the electrical contact.

8 Claims, 2 Drawing Sheets



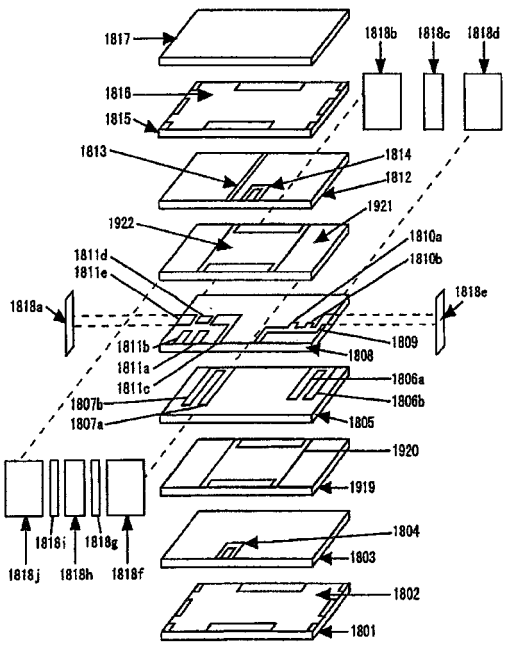
6,326,863 Dec. 4, 2001

MATCHING CIRCUIT CHIP, FILTER WITH MATCHING CIRCUIT, DUPLEXER AND CELLULAR PHONE

Inventors: Hiroshi Kushitani, Toru Yamada, Naoki Yuda, Toshio Ishizaki, Hideaki Nakakubo, and Makoto Fujikawa.
Assignee: Matsushita Electric Industrial Co., Ltd.
Filed: Dec. 18, 1998.

***Abstract*—**The present matching circuit chip has an integrated shape comprising a first transmission line, a second transmission line and a third transmission line, wherein one end of the first transmission line, one end of the second transmission line and one end of the third transmission line are connected to one another, a first filter connection terminal is connected to the other end of the first transmission line, an antenna terminal is connected to the other end of the second transmission line, and a second filter connection terminal is connected to the other end of the third transmission line, whereby the second transmission line converts the characteristic impedances of the first and third transmission lines so that the impedance matching between the antenna terminal and the first filter connection terminal can be attained, and so that the impedance matching between the antenna terminal and the second filter connection terminal can be attained.

5 Claims, 21 Drawing Sheets



Publisher Item Identifier S 1531-1309(02)06271-2.

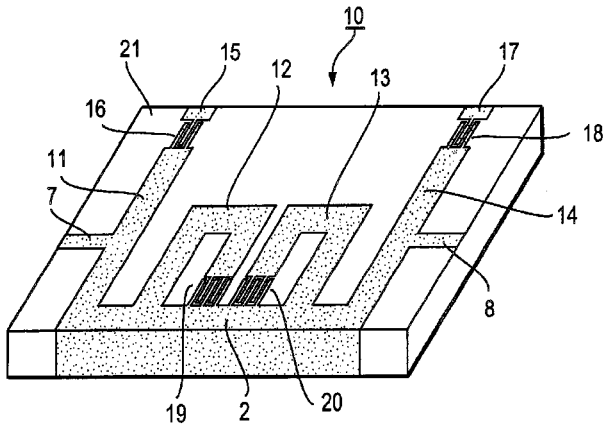
1531-1309/02$17.00 © 2002 IEEE

6,326,865 Dec. 4, 2001 **23 Claims, 7 Drawing Sheets**

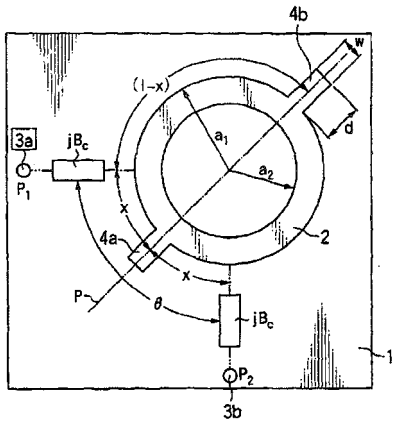
DUAL-MODE FILTER AND DESIGN METHOD THEREFOR

Inventors: Arun Chandra Kundu and Ikuo Awal.
Assignee: TDK Corporation; IKUO Awai
Filed: Mar. 22, 2000.

***Abstract*—**In a dual-mode filter, this invention is capable of optionally setting an attenuation pole frequency with maintaining a passbandwidth of the filter by selecting a combination of an angle between input/output ports and a size of a stub perturbation. The dual-mode filter includes a circular resonator formed on a dielectric substrate, a pair of input/output ports connected to the circular resonator through a capacitance formed on the substrate at a symmetrical position with respect to a symmetry plane passing through a center of the circular shape of the circular resonator, and stub poles are formed on the substrate radially extending along the symmetry plane from opposite positions of the circular resonator in the diametrical direction with each other. The pair of input/output ports are formed with defining an angle different from a right angle therebetween. When the angle between the pair of input/output ports is smaller or greater than 90°, an attenuation pole frequency can optionally be set by this angle and the size of the stub perturbation.



9 Claims, 10 Drawing Sheets



6,326,866 Dec. 4, 2001

BANDPASS FILTER, DUPLEXER, HIGH-FREQUENCY MODULE AND COMMUNICATIONS DEVICE

Inventors: Yutaka Sasaki and Hiroaki Tanaka.
Assignee: Murata Manufacturing Co., Ltd.
Filed: Feb. 23, 1999.

***Abstract*—**A bandpass filter is capable of forming attenuation extremes on both sides of a passband. Multiple microstrip line resonators, one end of each being an open terminal and the other end connecting to a ground electrode, are provided in a row, and the inner microstrip line resonators are bent in a C-shape so that the open terminals of the outer microstrip line resonators project further than the inner microstrip line resonators. The line of sight between the open terminals of the microstrip line resonators is improved and capacitance is formed there, so that attenuation extremes can be formed on both sides of the passband, and the amount of attenuation can be increased.

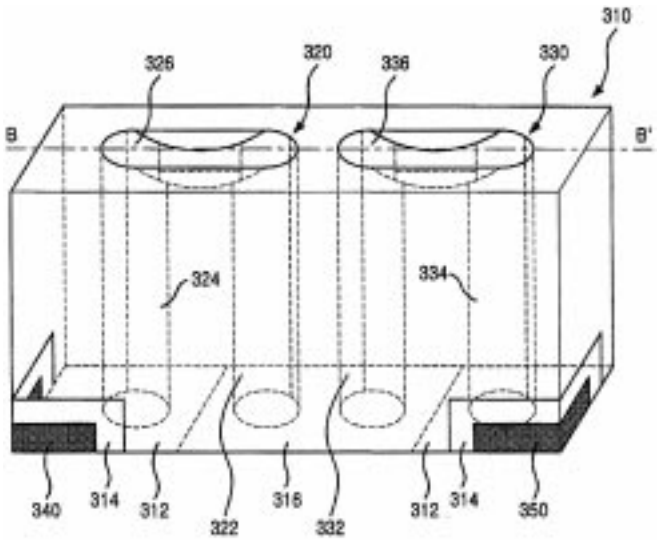
6,326,867 Dec. 4, 2001

DIELECTRIC FILTER HAVING RESONATORS ARRANGED IN SERIES

Inventors: Chang Hwa Lee, Bon Hee Koo, O. Gon Chun, Dong Seok Jeon, and Sang Seok Lee.
Assignee: Electronics and Telecommunications Research Institute
Filed: Dec. 30, 1999.

***Abstract*—**The present invention provides a dielectric filter having a dielectric block, and a plurality of resonators formed within the dielectric block, each of the resonators having a first and second through holes formed vertically through the dielectric block and arranged in series along longitudinal axis of the dielectric block and a coupling portion electrically connecting an end of the first through hole to an end of the second through hole.

18 Claims, 10 Drawing Sheets



6,327,404 Dec. 4, 2001

18 Claims, 8 Drawing Sheets

WAVELENGTH FILTER

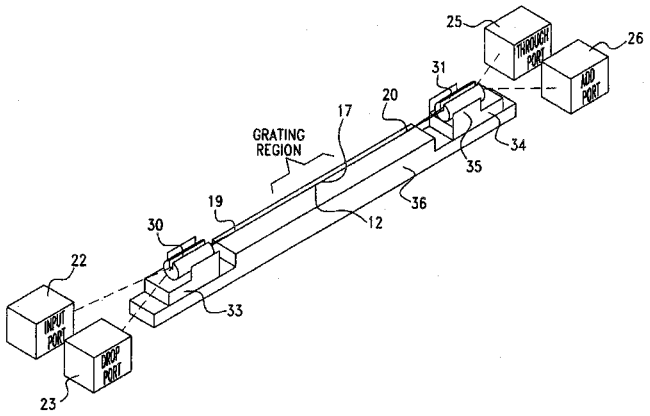
Inventors: Masayoshi Horita, Shinsuke Tanaka, and Yulchi Matsushima.
Assignee: KDD Corporation; Submarine Cable Systems, Inc.
Filed: Jul. 26, 1999.

***Abstract*—**A diffraction grating is disposed adjacent to a ridge waveguide formed on a substrate (cladding). Assumed that a light propagation direction at the waveguide is z, a direction of width of the waveguide is x, and ends of the diffraction grating of this embodiment is x=g_{min} when z=0 and x=g_{max} when z=L/2, the ends of the diffraction grating can be expressed as the following functions f(z). Namely,

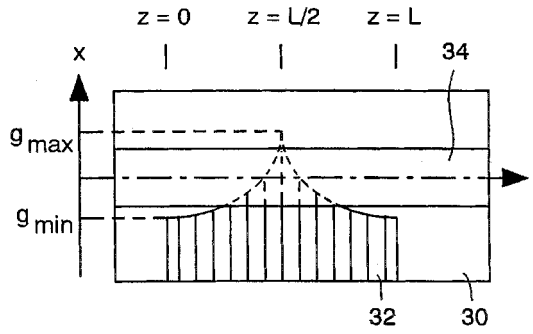
$$f(Z)=g_{min}+(g_{max}-g_{min})\times(2z/L)^n \quad \text{when } 0 \leqq z \leqq L/2,$$

and

$$f(Z)=g_{min}+(g_{max}-g_{min})\times(2-2z/L)^n \quad \text{when } L/2 \leqq z \leqq L, \quad \text{where } n>1.$$



10 Claims, 11 Drawing Sheets



6,327,405 Dec. 4, 2001

DEVICES AND METHODS FOR TEMPERATURE STABILIZATION OF BRAGG GRATING STRUCTURES

Inventors: Victor Leyva, Xian-Li Yeh, and Huey Lu.
Assignee: Arroyo Optics Inc.
Filed: Mar. 3, 2000.

***Abstract*—**Precisely tensioned optical fiber devices are held in a temperature compensated package, with a small diameter span of a fiber containing a Bragg grating of a needed periodicity being supported under tension at opposite ends between spaced apart end members whose thermal expansion characteristics differ from that of an underlying base. The direct points of attachment of the ends of the tensioned span are rotationally as well as axially movable, enabling fine tuning of periodicity and twisting to minimize polarization and dispersion effects. This configuration is also useful for unique methods of assembly of the components, and for use during writing the Bragg grating in the small diameter span.

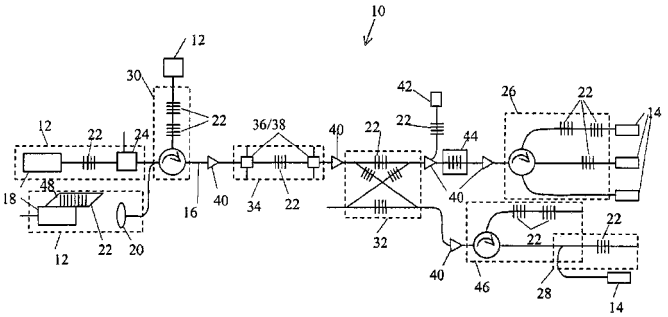
6,327,406 Dec. 4, 2001

OPTICAL TRANSMISSION SYSTEMS AND APPARATUSES INCLUDING BRAGG GRATINGS AND METHODS OF MAKING

Inventors: Thomas J. Cullen, Timothy E. Hammon, and John M. Stockhausen.
Assignee: ACME Grating Ventures LLC
Filed: Apr. 7, 2000.

***Abstract*—**Apparatuses, systems, and methods are disclosed for providing optical communications. Bragg grating used in the optical components and systems of the present invention are produced by selectively hydrogenating one or more selected sections of an optical waveguide in general, and particularly optical fiber. Selective hydrogenation can be performed by selectively establishing local conditions in a first environment conducive to introducing greater quantities of hydrogen into selected sections than into nonselected sections, which are maintained in a second environment. The extent of selective hydrogenation and the hydrogen concentration difference between selected and nonselected section of the waveguide is a function of the temperature, pressure, and time of exposure established in the first and second environments.

20 Claims, 2 Drawing Sheets



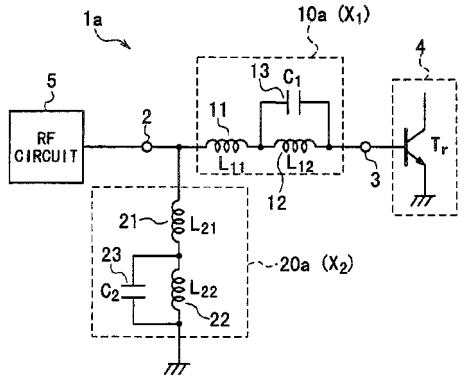
6,329,886 Dec. 11, 2001

IMPEDANCE-MATCHING METHOD AND CIRCUIT AT DIFFERENT FREQUENCES

Inventor: Kazuo Ogoro
Assignee: NEC Corporation
Filed: May 11, 1999.

***Abstract*—**An impedance-matching method for matching impedances of first and second circuits at two or more frequencies by using an impedance-matching circuit including reactance elements is provided, which makes it possible to set the impedance of two circuits to be connected at an optimum value or values at the frequencies. In the first step, reactance circuits equivalent to the individual reactance elements of the impedance-matching circuit are configured. Each of the reactance circuits comprises reactance elements and has a frequency characteristic giving desired reactance values at the two or more frequencies. In the second step, reactance values of the reactance elements forming each of the reactance circuits configured in the first step are calculated. In the third step, impedance values of the impedance-matching circuit at the two or more frequencies are determined by using the reactance circuits having the calculated reactance values in the second step, thereby equalizing the impedances of the first and second circuits to their optimum value or value. Each of the reactance circuits comprises a parallel or series resonant circuit having a resonant frequency located between two adjacent ones of the frequencies.

33 Claims, 31 Drawing Sheets



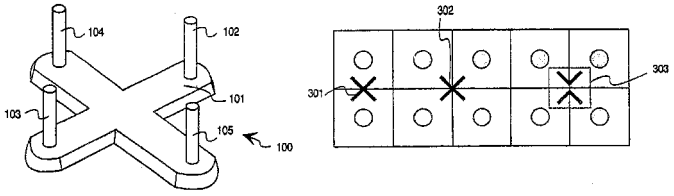
6,329,889 Dec. 11, 2001

COUPLING ELEMENT AND HIGH-FREQUENCY FILTER

Inventor: Jukka Puoskari
Assignee: Filtronic LK Oy
Filed: Jun. 8, 1999.

***Abstract*—**To realize electromagnetic couplings in a high-frequency filter a coupling element (**100**) comprises a first conductor (**201**), which has a first end (**102**) and a second end (**103**), and an insulating part (**101**). A portion of the first conductor, located between the first end and second end of the first conductor, is wholly surrounded by the insulating part. On both sides of said portion the first conductor comprises a portion which is outside the insulating part. The insulating part is arranged so as to become attached inside the high-frequency filter.

10 Claims, 3 Drawing Sheets



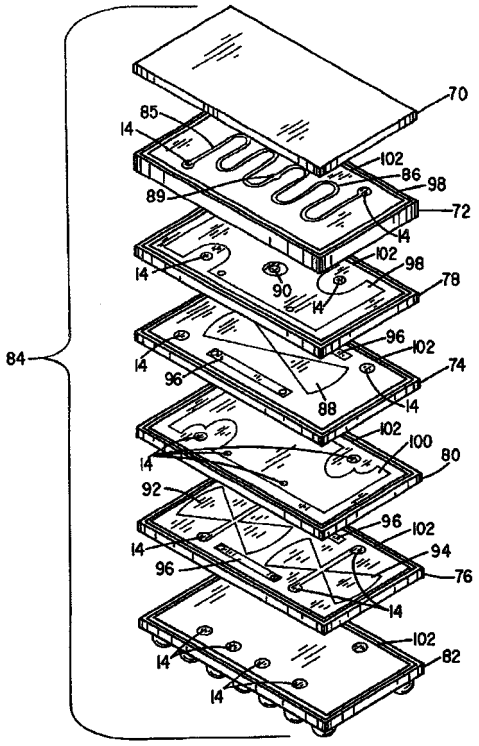
6,329,890 Dec. 11, 2001

MODULAR THIN FILM DISTRIBUTED FILTER

Inventors: Mark Brooks and Mark Hamilton Broman.
Assignee: Thin Film Technology Corp.
Filed: Sep. 29, 2000.

***Abstract*—**Modular thin film, distributed, lumped element band-pass filters. The filter circuitry is configured on a number of ceramic substrates. The component defining depositions are arranged to overlap and couple to one another with connecting vias. Alternative band-pass filter and delay line circuits are disclosed that provide desirable delay characteristics. Bordering ground conductors and covering ground planes shield lumped impedance resonator and overlapping capacitor elements and/or provide a hermetic seal between the layers. The assemblies are configured to accommodate a range of frequencies and permit pre-fabrication with subsequent laser trimming, assembly and packaging.

6 Claims, 13 Drawing Sheets



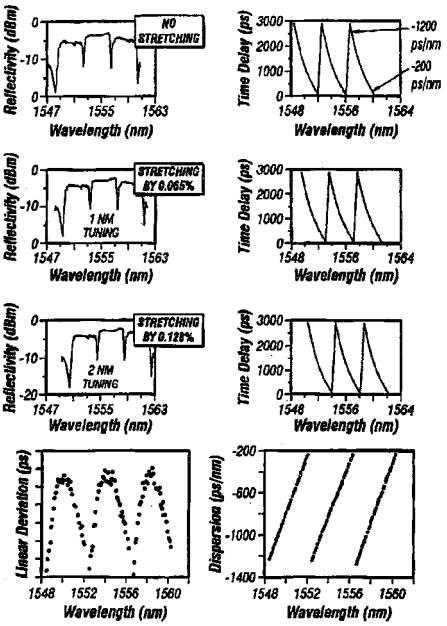
6,330,098 Dec. 11, 2001 **80 Claims, 24 Drawing Sheets**

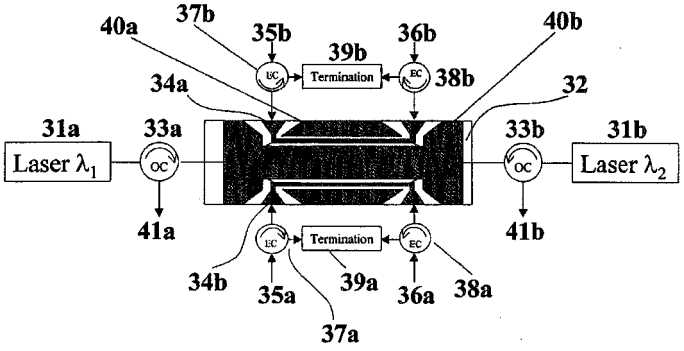
APPARATUS FOR EXTERNALLY MODULATING TWO OPTICAL CHANNELS AT THE SAME TIME

Inventor: Ganesh K. Gopalakrishnan
Assignee: Codeon Corporation
Filed: Oct. 6, 1999.

***Abstract*—**A Mach-Zehnder interferometer-type modulator for externally modulating two independent optical signals with first and second electrical signals, the modulator includes a first electrode receiving the first electrical signal, a second electrode receiving the second electrical signal, a first optical signal path co-propagating the first optical signal with the first electrical signal and counter-propagating the first optical signal with the second electrical signal, to generate a first modulated optical signal corresponding to the first optical signal modulated with the first electrical signal, and a second optical signal path co-propagating the second optical signal with the second electrical signal and counter-propagating the second optical signal with the second electrical signal, to generate a second modulated optical signal corresponding to the second optical signal modulated with the second electrical signal.

43 Claims, 3 Drawing Sheets





6,330,383 Dec. 11, 2001

DISPERSON COMPENSATION BY USING TUNABLE NONLINEARLY-CHIRPED GRATINGS

Inventors: Jin-Xing Cai, Kai-Ming Feng, Alan E. Willner, Jiangde Peng, Sanggeon Lee, and Reza Khosravani.
Assignee: University of Southern California
Filed: Feb. 19, 1999.

***Abstract*—**A nonlinearly chirped fiber grating for achieving tunable dispersion compensation, dispersion slope compensation, polarization mode dispersion, chirp reduction in directly modulated diode lasers, and optical pulse manipulation. A dynamical dispersion compensation mechanism can be implemented in a fiber communication system based on such a nonlinearly chirped fiber grating.

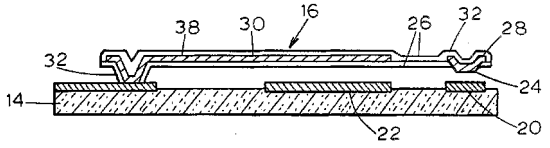
6,331,257 Dec. 18, 2001

FABRICATION OF BROADBAND SURFACE-MICROMACHINED MICRO-ELECTROMECHANICAL SWITCHES FOR MICROWAVE AND MILLIMETER-WAVE APPLICATIONS

Inventors: Robert Y. Loo, Adele Schmitz, Julia Brown, James Foschaar, Daniel J. Hyman, and Tsung-Yuan Hsu.
Assignee: Hughes Electronics Corporation
Filed: Nov. 30, 1999.

***Abstract*—**Methods for the design and fabrication of micro-electromechanical switches are disclosed. Two different switch designs with three different switch fabrication techniques are presented for a total of six switch structures. Each switch has a multiple-layer armature with a suspended biasing electrode and a conducting transmission line affixed to the structural layer of the armature. A conducting dimple is connected to the conducting line to provide a reliable region of contact for the switch. The switch is fabricated using silicon nitride as the armature structural layer and silicon dioxide as the sacrificial layer supporting the armature during fabrication. Hydrofluoric acid is used to remove the silicon dioxide layer with post-processing in a critical point dryer to increase yield.

30 Claims, 5 Drawing Sheets



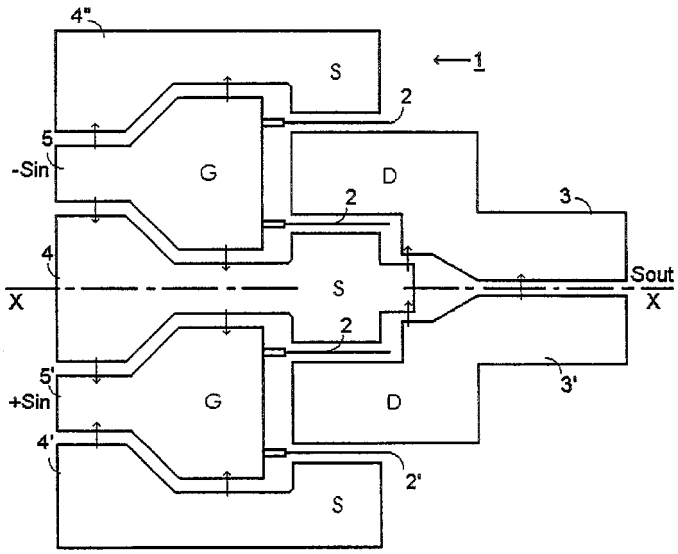
6,331,807 Dec. 18, 2001

MICROWAVE COUPLER FOR A MONOLITHIC INTEGRATED CIRCUIT

Inventors: Didier Prieto, Eric Rogeaux, Jean-Francois Villemazet, and Thierry Parra.
Assignee: Alcatel
Filed: Oct. 4, 1999.

***Abstract*—**A balanced and active coplanar microwave coupler for an MMIC, comprising FET's provided with metal grid, source, and drain electrodes integrated with coplanar plane metal elements combined to constitute the inlet and outlet access of the coupler. All of the access are constituted by an association comprising one or more CPSes and one or more CPW's.

9 Claims, 4 Drawing Sheets



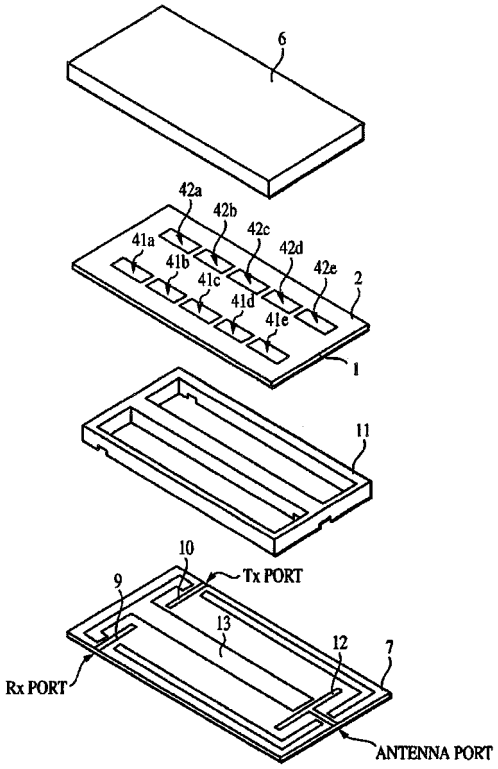
6,331,808 Dec. 18, 2001

DIELECTRIC RESONATOR DEVICE

Inventors: Shigeyuki Mikami, Toshiro Hiratsuka, and Tomiya Sonoda.
Assignee: Murata Manufacturing Co.
Filed: Dec. 13, 2000.

***Abstract*—**A dielectric resonator device having characteristics of a plane circuit type dielectric resonator device applicable to miniaturization is included. Non-loading Q0 of a resonator is increased so as to decrease insertion loss in the case of forming a band sass filter, or the like. Changes in filter characteristics with respect to changes in structural dimensions of the length of the resonator, the gap between the resonators, or the like, are reduced. There is an increase in the freedom in adjustment of resonant frequency to enhance production efficiency. In this arrangement, on each main surface of a dielectric plate is disposed an electrode having mutually opposing openings, which serve as a rectangular-slot mode dielectric resonator; in which the length of the resonator is longer than a half-wave length at the resonant frequency being used so as to resonate in a higher mode.

40 Claims, 13 Drawing Sheets



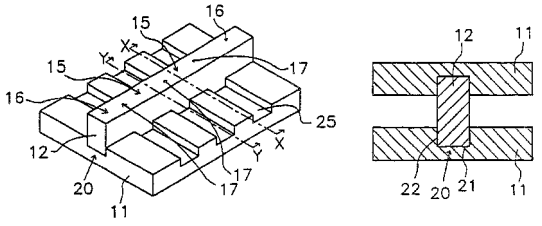
6,331,809 Dec. 18, 2001

NONRADIATIVE DIELECTRIC WAVEGUIDE RESONATOR, NONRADIATIVE DIELECTRIC WAVEGUIDE FILTER, DUPLEXER AND TRANSCEIVER INCORPORATING THE SAME

Inventors: Ikuo Takakuwa, Toru Tanizaki, and Toshiro Hiratsuka.
Assignee: Murata Manufacturing Co., Ltd.
Filed: Jun. 10, 1999.

***Abstract*—**A nonradiative dielectric waveguide filter of the present invention permits the manufacturing process including the production of a dielectric strip to be simpler. The filter can be formed by a pillar dielectric strip. The nonradiative dielectric waveguide filter includes resonators, input-output connection units, and cut-off regions, in which the upper and lower conductor plates and a dielectric strip disposed therebetween form the filter. In one example, the main signal-transmitting mode is the LSM mode; a groove having a bottom and conductor walls is disposed in a position in which the conductor plates are opposing; the resonator is formed by fitting the dielectric strip into the groove; and the cut-off regions are formed by second grooves formed in the conductor plates adjacent to the dielectric strip.

11 Claims, 12 Drawing Sheets



6,332,048 Dec. 18, 2001

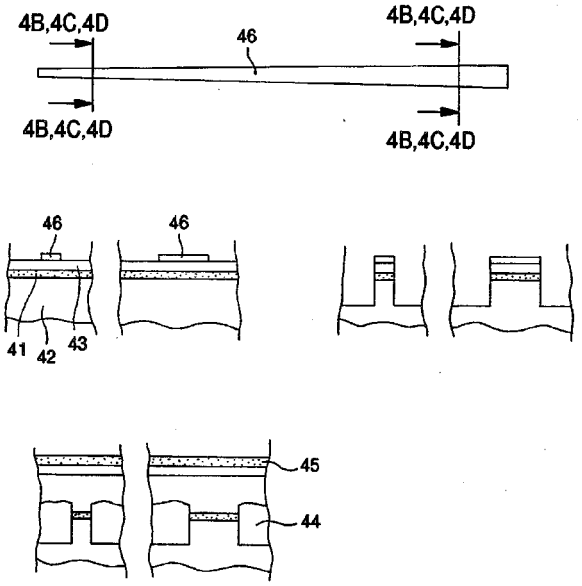
8 Claims, 1 Drawing Sheet

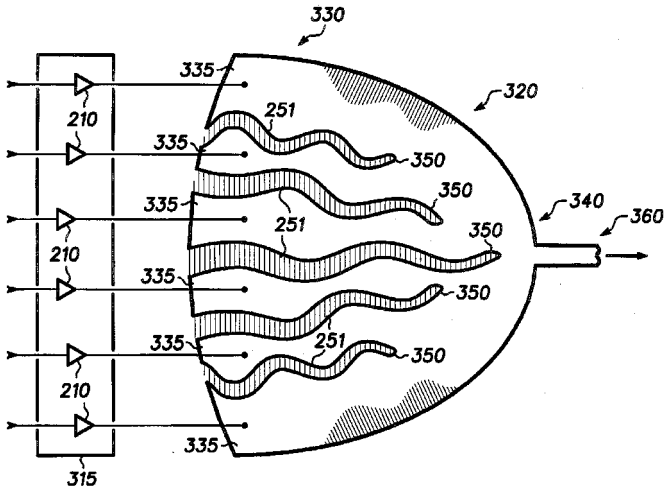
MODULATOR AND METHOD FOR MANUFACTURING OF SUCH A MODULATOR

Inventor: Lennart Lundqvist
Assignee: Telefonaktiebolaget LM Ericsson (publ)
Filed: Oct. 14, 1999.

***Abstract*—**Electro-absorption modulator (EAM), of the kind that includes a waveguide, for modulation of light, comprising a waveguide core, a waveguide cladding (**42**, **43**, **52, 53**), and an electrode (**45**, **55**), the modulator being arranged to modulate light launched into the modulator as a response to a voltage being applied on the electrode. According to the invention, the width and/or the thickness of the waveguide core (**41**, **51**) are/is varying along the length of the modulator. The width/thickness is smaller in the portion of the modulator where the light is intended to be input, for the purpose of reducing the absorption of the modulator there. A method in manufacturing of the modulator may utilize a tapered photolithography mask (**46**).

16 Claims, 3 Drawing Sheets





6,333,682 Dec. 25, 2001

HIGH FREQUENCY LOW LOSS POWER AMPLIFIER COMBINER

Inventors: Warren Leroy Seely and Jay Chae Pyon.
Assignee: Motorola, Inc.
Filed: Jan. 13, 2000.

***Abstract*—**A conductive element (FIG. **1, 220**) incorporates a wide end portion (**230**) which is subdivided into a set of low impedance coupling paths (**235**) separated by one of the planar grooves (**250**). Each of the low impedance coupling paths (**235**) is suitable for coupling to a corresponding solid-state amplifier device (**210**). Power from each solid-state amplifier device (**210**) is combined at a narrow end portion (**240**) and conveyed to a transmission line (**260**). The high frequency low loss power combiner requires minimal integrated circuit chip area and can be designed and fabricated using existing microstrip analysis and design tools. Additionally, the substantially fully metallic structure provides additional excess heat dissipation through increased surface area over that of the Wilkenson power combiner. Further, due the broad conductive path formed by the conductive element, resistive losses are also minimized, thus increasing overall device efficiency.

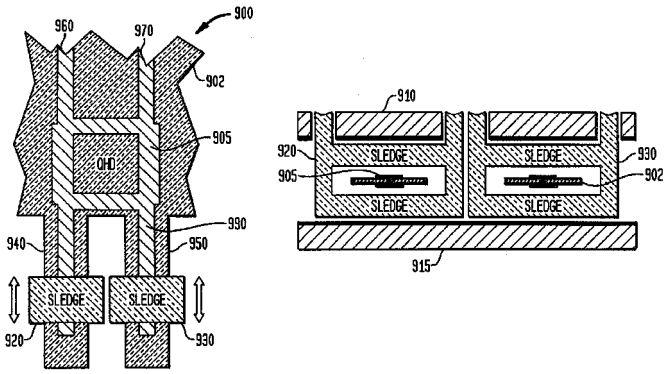
6,333,683 Dec. 25, 2001

REFLECTION MODE PHASE SHIFTER

Inventor: Karl Georg Hampel
Assignee: Agere System Optoelectronics Guardian Corp.
Filed: Sep. 4, 1998.

***Abstract*—**The invention is a mechanically or electro-mechanically driven phase shifter for radio frequencies. It is a device for phase shifting a signal propagating through a transmission line by moving a conductive construct between an active line and a ground plane of the transmission line. The conductive construct capacitively couples with either the active line and/or the ground plane, forming a capacitive shunt that reflects a significant part of the signal. The remaining portion of the signal is reflected at a terminated end of the transmission line, resulting in substantially no signal loss. The reflectance of the conductive constructs is determined by its capacitance to active line and ground, by its length, and by the step in the field-distribution at the interface between air-suspended and sledge-suspended sections. Design alterations are possible that enhance one or several of these effects, such as capacitance enhancement by dielectric coating of the sledge, any length variation, multiple sledge structures, modifications of the sledge cross-section etc. Further, a restriction to usage of only one sledge is also possible. A common driving mechanism is used when using multiple conductive constructs. The phase shifter is used in conjunction with signal separation circuits that separate incoming and reflected outgoing signals.

39 Claims, 17 Drawing Sheets



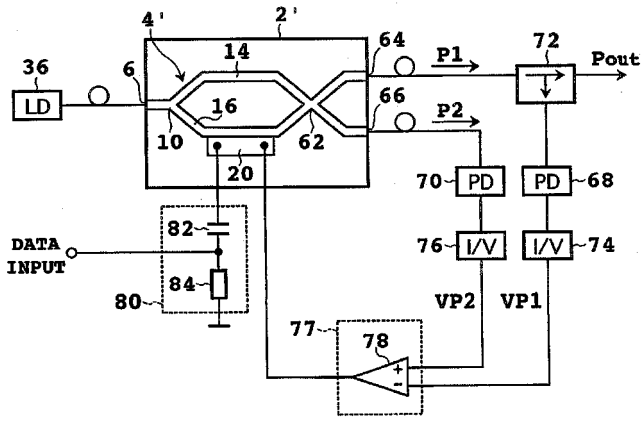
6,334,004 Dec. 25, 2001

OPTICAL MODULATOR, BIAS CONTROL CIRCUIT THEREFOR, AND OPTICAL TRANSMITTER INCLUDING THE OPTICAL MODULATOR

Inventors: Yoshinori Ohkuma and Motoyoshi Sekiya.
Assignee: Fujitsu Limited
Filed: Dec. 13, 1999.

***Abstract*—**Disclosed herein is an optical modulator including an optical waveguide structure for converting an input beam into first and second output beams, an electrode for applying an electric field to the optical waveguide structure, so as to switch between a first mode where the input beam is converted into the first output beam and a second mode where the input beam is converted into the second output beam, first and second photodetectors for detecting the powers of the first and second output beams, respectively, and a bias circuit for applying a bias to the electrode so that the ratio in output level between the first and second photodetectors becomes constant. With this configuration, an operation point can be stabilized without the need for superimposition of a low-frequency signal, thereby suppressing intersymbol interference.

16 Claims, 11 Drawing Sheets



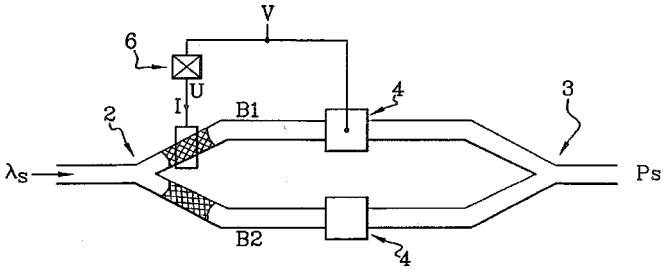
6,334,005 Dec. 25, 2001

MODULATOR OF THE MACH-ZEHNDER TYPE HAVING A VERY HIGH EXTINCTION RATIO

Inventors: Jean-René Burie and Hakon Helmers.
Assignee: Alcatel
Filed: Dec. 16, 1999.

***Abstract*—**The invention relates to modulator of the Mach-Zehnder type in which an optical wave source is coupled to an optical waveguide separating through a coupler (**2**) into two branches (**B1, B2**) which recombine, the branches being respectively provided with electro-optical modulators (**4**). According to the invention, the coupler (**2**) has an adjustable coupling ratio, regulation means being provided for adjusting the said coupling ratio following the application of at least one signal (**V**) to at least one of the electro-optical modulators (**4**) so that the output optical powers of the branches (**B1, B2**) are respectively equal for destructive interference conditions and for constructive interference conditions. These regulation means comprise at least one regulation electrode (**5**). The invention applies principally to optical signal transmission systems.

13 Claims, 3 Drawing Sheets



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OPTICAL FIBRE GRATINGS

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***Abstract*—**An optical fiber, a section of length (L_{gr}) which is modulated in refractive index so as to form a grating with a plurality of characteristics reflection wavelength channels, has a refractive index modulation comprising an amplitude modulation having an underlaying higher frequency component defining the shape of the reflection profile of each of the wavelength channels and, superposed thereon, a lower frequency component of period P imposing repeated envelopes over the higher frequency component and defining the separation of the wavelength channels. In one embodiment, the lower frequency component has the shape of a sinc-function with varying refractive index (δn) and with discrete π-phase shifts ($\delta\phi$) each envelope, to form a sinc-sampled grating. Chirped multi-channel optical fiber gratings may thus be provided for dispersion compensation in long-haul transmission links.

8 Claims, 10 Drawing Sheets