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

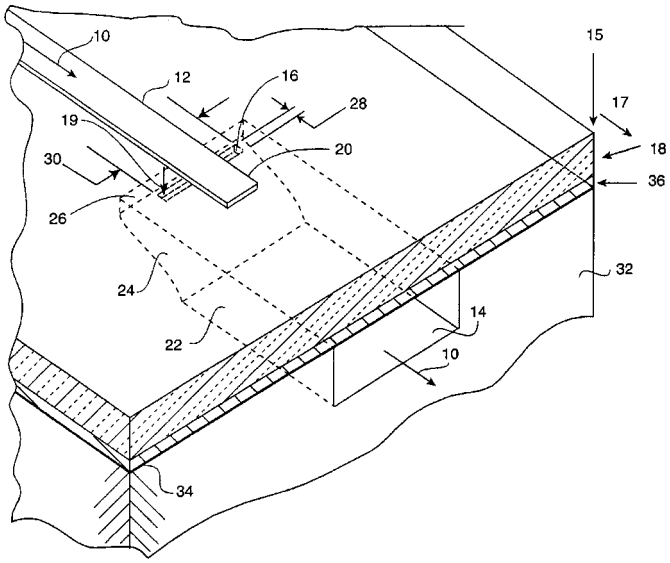
6,127,901 Oct. 3, 2000

Method and Apparatus for Coupling a Microstrip Transmission Line to a Waveguide Transmission Line for Microwave or Millimeter-Wave Frequency Range Transmission

Inventor: Jonathan J. Lynch.
Assignee: HRL Laboratories, LLC.
Filed: May 27, 1999.

***Abstract*—**A microstrip transmission line to waveguide transmission line transition. A microstrip transmission line is separated from a ground plane by a dielectric therebetween. The microstrip transmission line terminates at a microstrip transmission line open circuit end. A waveguide channel having narrow dimension waveguide walls and a broad dimension base waveguide wall connected therebetween is provided. The waveguide channel has a waveguide short circuit wall located along the channel. The narrow dimension waveguide walls are coupled with the ground plane to provide a broad dimension top waveguide wall for the waveguide transmission line. An aperture is located transverse to the microstrip transmission line and passes through an aperture ground plane opening in the ground plane. The aperture is located proximate to the microstrip transmission line open circuit end to provide a microstrip transmission line open circuit stub and proximate to the waveguide short circuit wall to provide a waveguide transmission line short circuit stub.

14 Claims, 5 Drawing Sheets



Publisher Item Identifier S 1531-1309(01)03810-7.

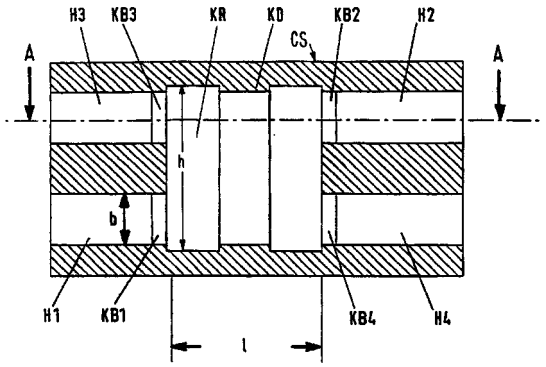
6,127,902 Oct. 3, 2000

Waveguide Directional Coupler Capable of Propagating Higher Order Modes

Inventors: Werner Speldrich and Uwe Rosenberg.
Assignee: Robert Bosch GmbH.
Filed: Apr. 8, 1998.

***Abstract*—**A simply made and very broad band directional coupler includes a hollow middle section (CS) provided with an empty interaction space having two ends, one pair of hollow guides (H1, H3) coupled to one end of the interaction space, another pair of hollow guides coupled to another end of the interaction space and a coupler diaphragm (KB1, KB2, KB3, KB4) provided between the interaction space (KR) and each individual hollow guide coupled to it. Higher wave types (are consisting of TE11 and TM11 modes) propagated in the interaction space (KR) as well as a fundamental wave type (TE 10). Furthermore a height (h) of the interaction space is at least 2.5 times the smallest height (b) of a coupling diaphragm (KB1, KB2, KB3, KB4) so that a comparatively broad band directional coupler results.

1 Claim, 1 Drawing Sheet



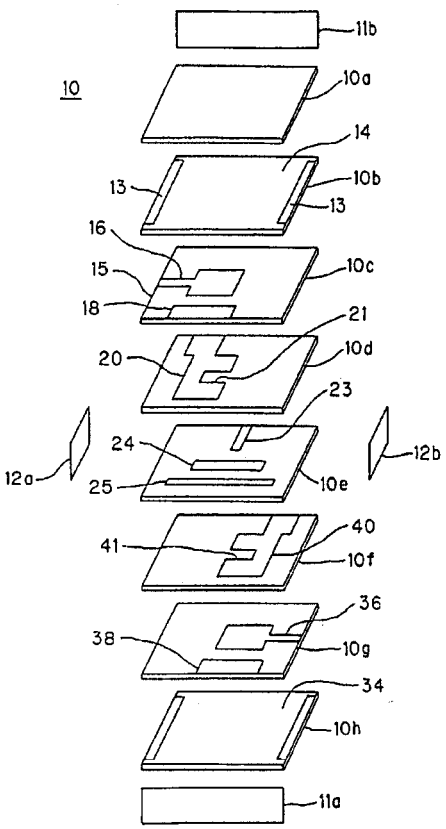
6,127,905 Oct. 3, 2000

Dielectric Filter and Method for Adjusting Bandpass Characteristics of Same

Inventor: Kenichi Horie.
Assignee: U.S. Philips Corporation.
Filed: Oct. 30, 1998.

***Abstract*—**A dielectric filter (10) comprises two stripline resonators (20, 40) which are arranged on parallel planes, respectively, with dielectric layers (10d, 10e) being sandwiched therebetween and are electromagnetically coupled to each other. Each of the two stripline resonators (20, 40) comprises a first stripline portion grounded at a proximal end thereof and a second stripline portion extending from a distal end of the first stripline portion in the same direction as the first stripline portion extends. The width of the first stripline portion is slightly less than that of the second stripline portion. Side edges of the second stripline portion is shifted relative to respective side edges of the first stripline portion in the same direction which is perpendicular to the direction in which the first and second stripline portions extend. A generally rectangular notch extends in the second stripline portion from one side edge thereof.

9 Claims, 5 Drawing Sheets



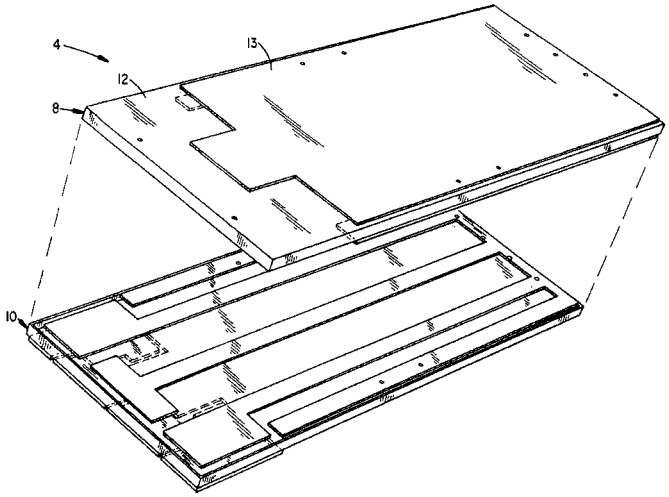
6,127,906 Oct. 3, 2000

Modular Thin Film Distributed Filter

Inventors: Mark Brooks and Mark Hamilton Broman.
Assignee: Thin Film Technology Corp.
Filed: Feb. 25, 1999.

***Abstract*—**A modular thin film, distributed, lumped element band-pass filter. 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 800 MHz and 1.9 GHz band-pass filter circuits are disclosed. Bordering ground conductors and covering ground planes shield lumped impedance resonator and overlapping capacitor elements. The layers are configured to accommodate a range of frequencies and permit pre-fabrication with subsequent laser trimming, assembly and packaging.

7 Claims, 9 Drawing Sheets



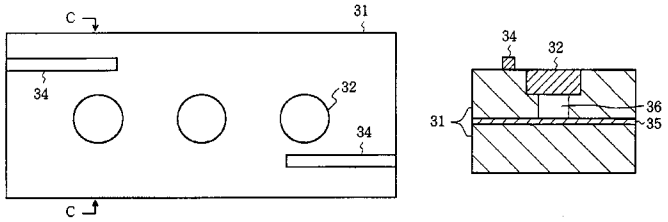
6,127,907 Oct. 3, 2000

High Frequency Filter and Frequency Characteristics Regulation Method Therefor

Inventors: Mitsuru Furuya, Osamu Myohga, and Yoshitsugu Okada.
Assignee: NEC Corporation.
Filed: Nov. 6, 1998.

***Abstract*—**Dielectric parts **12** which become resonators are fitted in holes formed in a dielectric substrate **11** and magnetic parts **13** for setting resonance frequencies of the dielectric parts **12** are also fitted in holes formed in the dielectric substrate **11**. With such construction in which the dielectric parts are fitted in the holes of the dielectric substrate, the physical preciseness of a high frequency filter is improved. Further, by fitting not only the dielectric parts **12** but also the magnetic parts **13** in the holes of the dielectric substrate **11**, it is possible to form the high frequency filter operating in a frequency band of several tens GHz as a micro wave integrated circuit to thereby improve the uniformality and mass-producibility of the high frequency filter.

15 Claims, 7 Drawing Sheets



6,130,189 Oct. 10, 2000

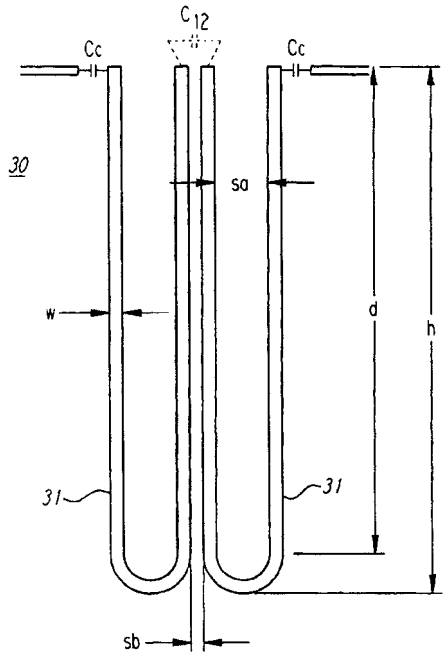
Microwave Hairpin-Comb Filters for Narrow-Band Applications

Inventor: George L. Matthaei.
Assignee: Superconductor Technologies, Inc.
Filed: Sep. 23, 1998.

***Abstract*—**Microwave hairpin-comb filters utilize a plurality of hairpin (i.e., folded) half-wavelength microstrip or stripline resonators arranged side-by-side and all with the same orientation. The coupling regions between resonators extend parallel to the sides of the resonators for substantially 1/8 to 1/4 wavelength at the frequency of resonance of the resonators. This length of coupling region

between resonators, along with all resonators being oriented in the same direction, result in resonance effects in the coupling regions between the resonators. These effects greatly reduce the couplings between the resonators so that the resonators can be very closely spaced so as to produce a compact filter structure yet still have a narrow passband. The structure can also be made to produce poles of attenuation adjacent to the passband in order to enhance the filter cutoff characteristic. The filter structure can be conveniently tuned using asymmetric dielectric pieces which rotate above an interdigital conductor pattern placed between the open ends of each resonator, the axis of rotation being normal to the substrate. This manner of tuning is particularly attractive for narrow-band, very low loss, high temperature superconductor (HTS) filters since these tuners can be made to give smooth tuning with no normal metal parts in the circuit and with no ground connections required. Such normal metal parts or ground connections would introduce considerable loss and degrade the HTS filter performance.

15 Claims, 12 Drawing Sheets



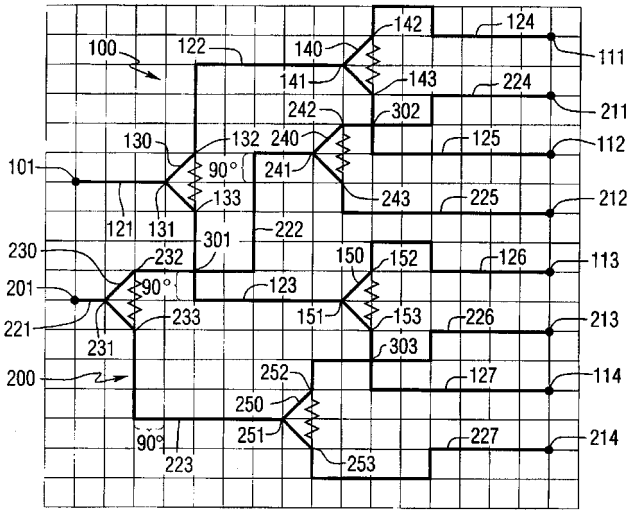
6,130,585 Oct. 10, 2000

Cross-Over Distribution Scheme for Canceling Mutually Coupled Signals between Adjacent Stripline Signal Distribution Networks

Inventors: Walter M. Whybrew, Jeffery C. May, and Douglas E. Heckaman.
Assignee: Harris Corporation.
Filed: Jan. 22, 1998.

***Abstract*—**A stripline cross-over architecture includes a first stripline layer extending on a first side of a dielectric layer between a first signal input port and a plurality of first signal output ports. A second stripline layer extends on a second side of the dielectric layer between a second signal input port and a plurality of second signal output ports, crossing over the first stripline layer at a plurality of cross-overs of mutual overlap therebetween. The electrical lengths of the stripline layers are defined and the cross-overs are located such that electrical distances between the cross-overs and signal combination locations cause cross-coupled signals to cancel one another, when non cross-coupled signals are combined in phase.

11 Claims, 4 Drawing Sheets



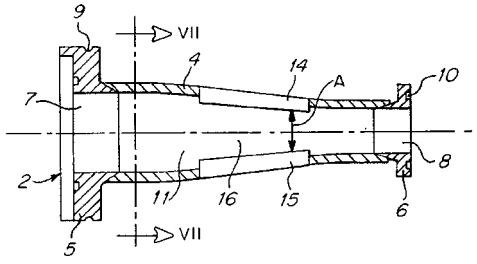
6,130,586 Oct. 10, 2000

Mode Filter for Connecting Two Electromagnetic Waveguides

Inventor: Dietmar Schulz.
Assignee: Alcatel.
Filed: Aug. 21, 1998.

***Abstract*—**A mode filter for connecting two electromagnetic waveguides with different cross-sections includes a tubular section (4) with openings at both ends. The cross-sections of the openings match the cross-sections of the two different waveguides, while the interior space (11) of the tubular section (4) transitions from one cross-sectional shape into the other cross-sectional shape. Undesirable modes of the electromagnetic waves which are to be transmitted, are minimized by flat elements (14, 15) protruding radially inwardly into the transition region and extending axially along the tubular section (4). The flat elements (14, 15) are made of a material with a high electrical conductivity. The elements (14, 15) are arranged diametrically opposed from each other and aligned in the same plane and separated by a gap (16). The axial length of the flat elements is short in relation to the length of the tubular section (4). The length of the flat elements in the axial direction and the spacing (A) between them is dimensioned so as to minimize the ripple in the group velocity and the amplitude of the wave to be transmitted. The ripple is caused by the superposition of the excited modes.

6 Claims, 2 Drawing Sheets



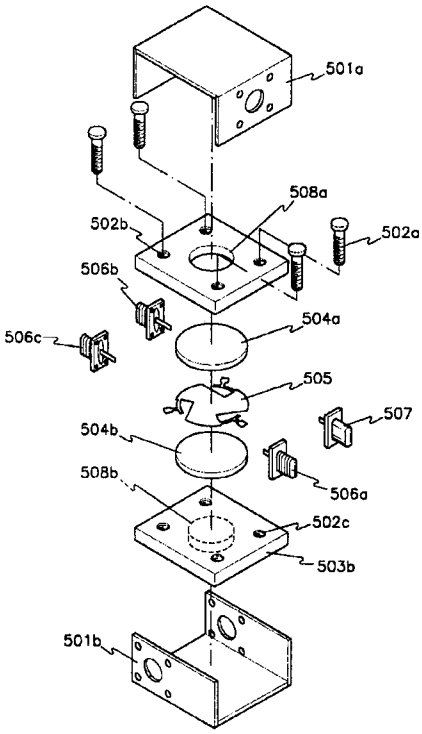
6,130,587 Oct. 10, 2000

Microstripline/Stripline Isolator/Circulator Having a Propeller Resonator

Inventors: Dong Suk Jun, Meyung Soo Kim, Bon Hee Koo, Chang Hwa Lee, Sang Seok Lee, and Tae Goo Choy.
Assignee: Electronics and Telecommunications Research Institute.
Filed: Aug. 10, 1998.

***Abstract*—**An isolator/circulator can keep a size of a 3-way asymmetric propeller resonator and intensity of magnetism, control the preferred frequency, and improve the insertion loss and isolation characteristic due to reducing the ferrite usage region on the maximum, extend the wide band without the external wide band extension, finally to miniaturize, reduce the fabricating cost by means of a simple fabrication. A microstrip/stripline isolator/circulator having a propeller resonator can be used for the device protection and impedance matching of a system and terminal in a transfer communication, personal communication, CT and satellite communication.

9 Claims, 8 Drawing Sheets



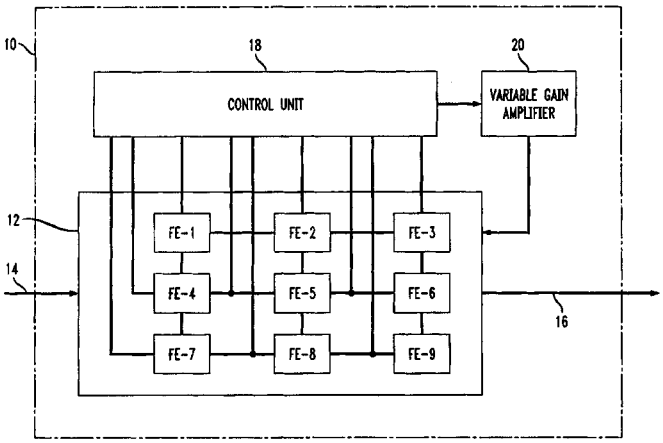
6,130,590 Oct. 10, 2000

Programmable Filter Bank Having Notch Filter and Bandpass Filter Frequency Responses

Inventor: Arild Kolsrud.
Assignee: Lucent Technologies Inc.
Filed: Aug. 14, 1998.

***Abstract*—**An inexpensive to produce and small profile programmable filter bank with a high quality factor that applies an adjustable frequency response to an input signal to produce a filtered output signal. In a preferred embodiment, the programmable filter bank includes an input for receiving the input signal, an output for transmitting the filtered output signal and a set of interconnected individually selectable filter elements, where each filter element provides a predefined fixed frequency response. A control unit, such as a digital state machine or a microprocessor is connected to the filter elements and enables a user to select one or more filter elements in order to generate a desired overall frequency response, for application to the input signal, that is formed of the combination of the frequency responses of the selected filter element(s).

11 Claims, 4 Drawing Sheets



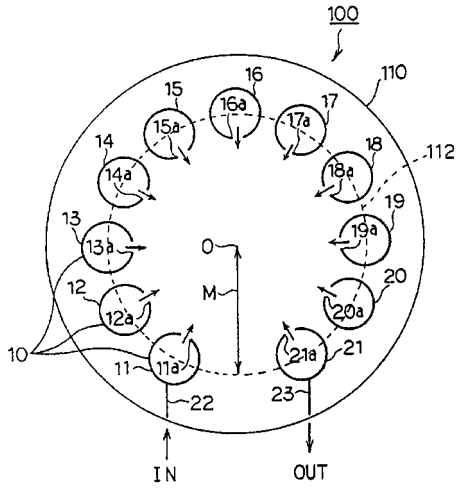
6,130,591 Oct. 10, 2000

Band-Pass Filter Comprising Series Coupled Split Gap Resonators Arranged Along a Circular Position Line

Inventor: Genichi Tsuzuki.
Assignee: Advanced Mobile Telecommunication Technology Inc.
Filed: May 27, 1998.

***Abstract*—**Herein disclosed is a band-pass filter for a radio wave having a wavelength range of a high frequency, such as a microwave and a milliwave. The band-pass filter comprises: a dielectric substrate; input and output terminals; and a plurality of conductive strip line resonators being capable of resonating with a predetermined wavelength. Each of the strip line resonators has two ends and bent line extending from one end to the other end with a predetermined length corresponding to the wavelength. The one end and the other end are placed face to face with each other to provide a gap therebetween. In the band-pass filter, the plurality as arranged on the dielectric substrate in series and spaced apart from each other at predetermined intervals along a predetermined position line and coupled with each other through the inductive and capacitive coupling to transfer the signal between the resonators one after another. Each of the adjoining resonators has a predetermined intensity of the coupling between them in accordance with a relationship between the positions of the gaps of the adjoining resonators. As a result, the band-pass filter can be miniaturized as regulating a desired intensity of coupling between resonators.

7 Claims, 14 Drawing Sheets



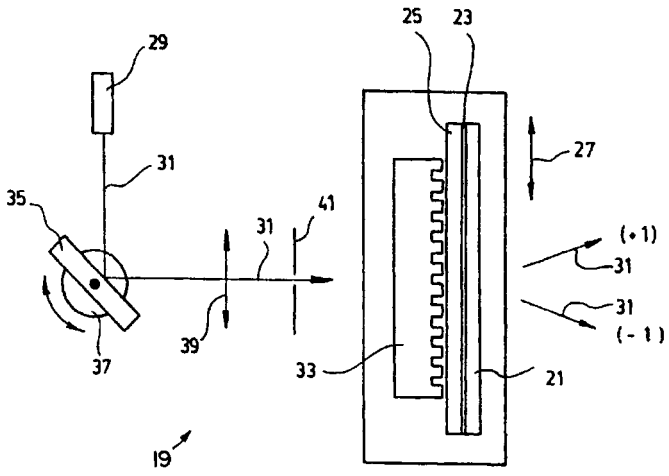
6,130,973 Oct. 10, 2000

Method and Apparatus for Spectrally Designing All-Fiber Filters

Inventors: Jocelyn Lauzon, Martin Guy, Yves Painchaud, and Martin Pelletier.
Assignee: Institut National D'Optique.
Filed: Mar. 26, 1998.

***Abstract*—**A method and an apparatus to photoinduce a grating or other type of modulated refractive index change in a photosensitive optical medium such as optical fiber. The resulting grating has a variable and controllable intensity profile and average value of the index change. The modulated refractive index change is photoimprinted in the medium in a series of writing steps, each comprising exposing a segment of the medium to a writing beam for a predetermined exposure time. To change the modulation intensity from step to step, the angle of incidence of the writing beam is dithered for an appropriate fraction of the exposure time at each step. This allows to control the amount of incident light on the medium for each step. If the exposure time is the same for each writing step, the average value of the index change may be kept constant avoiding undesired structure in the grating frequency response.

11 Claims, 6 Drawing Sheets



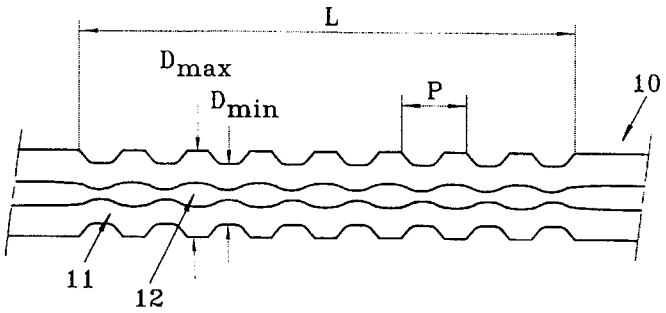
6,130,974 Oct. 10, 2000

Long-Interval Grating in an Optical Fiber and Manufacturing Method

Inventor: Loïc Rivoallan.
Assignee: France Telecom.
Filed: Jul. 22, 1998.

***Abstract*—**A long-interval grating in an optical fiber is designed to enable the making of a mode-coupling filter. In particular, it has periodic variations of the diameter of the optical fiber and a symmetry of revolution.

11 Claims, 8 Drawing Sheets



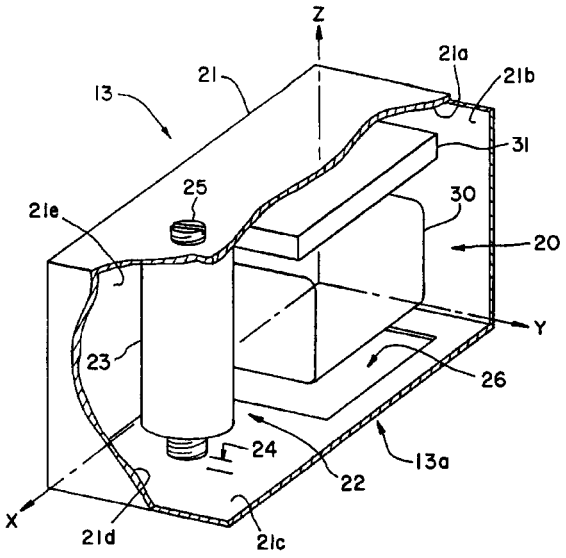
6,133,800 Oct. 17, 2000

Subminiature Microwave Cavity

Inventor: Jinquan Deng.
Assignee: Datum Inc.
Filed: Aug. 2, 1999.

***Abstract*—**An extremely small and inexpensively manufactured physics package for an atomic frequency standard can be provided with a microwave cavity having noncritical dimensions that is driven in a substantially TEM mode by a lumped LC means, the cavity resonant frequency being primarily determined by the lumped LC means. The lumped LC means can be any structure or combination of elements providing, at a selected microwave reference frequency, a resonant inductance and capacitance. Examples of such lumped LC means include, preferably, a rod or wire conductively attached to a wall of the microwave cavity as a lumped inductance and extending into the cavity to form, at its other end, a gap with an opposing cavity wall as a lumped capacitance; or a pair of rods or wires conductively attached to opposing walls and extending therefrom as a lumped inductance to form a gap therebetween as a lumped capacitance.

29 Claims, 4 Drawing Sheets



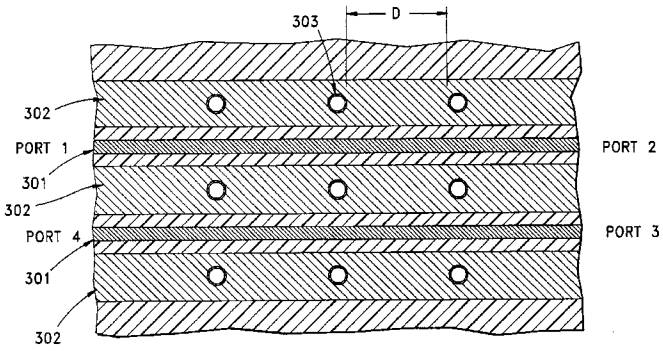
6,133,805 Oct. 17, 2000

Isolation in Multi-Layer Structures

Inventors: Nitin Jain, John Stephen Atherton, Paul John Schwab, and Graham J. H. Wells.
Assignee: The Whitaker Corporation.
Filed: May 1, 1998.

***Abstract*—**An apparatus for propagating high frequency energy hag a wavelength of λ in a dielectric medium has first and second signal lines, substantially coplanar with each other, and carrying high frequency energy, A ground trace separates the signal lines and has a plurality of vias, each spaced a distance greater than one quarter λ and less than one half λ apart from another one of the vias.

8 Claims, 8 Drawing Sheets



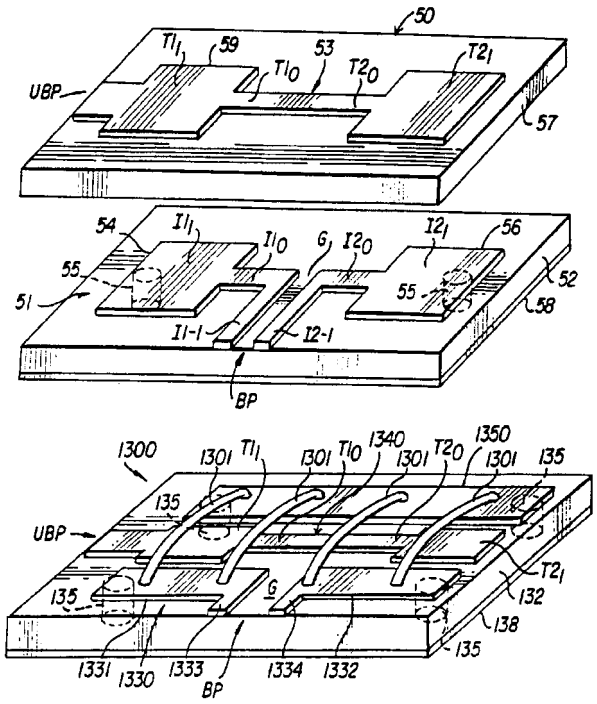
6,133,806 Oct. 17, 2000

Miniaturized Balun Transformer

Inventor: Jyh-Wen Sheen.
Assignee: Industrial Technology Research Institute.
Filed: Mar. 25, 1999.

***Abstract*—**A balun circuit includes a dielectric substrate having planar opposing surfaces: a groundplane conductor layer disposed on a first opposing surface; an interlayer conductor layer disposed on a second opposing surface and including first and second electrically isolated conducting strips, with a balance point gap between first ends thereof, and second ends thereof being short-circuited; an interlayer dielectric layer having substantially planar opposing surfaces, with a first opposing surface thereof being disposed over the interlayer conductor layer; and a top conductor layer disposed over a second opposing surface of the interlayer dielectric layer and including a third conducting strip overlying the first and second conducting strips, one end of the third conducting strip providing an unbalanced port terminal and another end of the third conducting strip being open-circuited. The third conducting strip includes a first and a second set of series-connected line sections each having diverse impedances which are a mirror opposite of each other relative to a center plane of the balun circuit. The first and second conducting strip have impedances which are a mirror opposite of each other relative to the center plane of the balun circuit. The impedances of the first and second conducting strips can be diverse impedances. Phase and amplitude balance at the balance point gap is achieved by the mirror opposite relationship of the impedances of the first and second set of line sections and the mirror opposite relationship of the impedances of the first and second conducting strips.

16 Claims, 9 Drawing Sheets



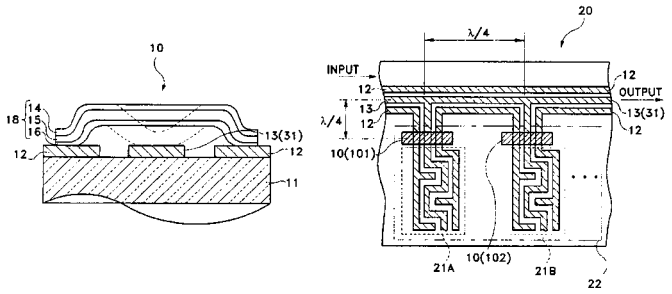
6,133,807 Oct. 17, 2000

High-Frequency Switch and Integrated High-Frequency Switch Array

Inventors: Shoichi Akiyama, Kazuhiko Adachi, and Yutaka Maita.
Assignee: Ricoh Company, Ltd.
Filed: Mar. 17, 1999.

***Abstract*—**A high-frequency switch includes a substrate, external conductors provided on the substrate, and a central conductor provided on the substrate, the external conductors and the central conductor constituting a coplanar high-frequency wave line on the substrate. A deflectable air-bridge is held on the external conductors via an air gap and extends out over the central conductor, the air-bridge being deflectable by an electrostatic field created by an actuation voltage applied between the wave line and the air-bridge. A control-signal conductor generates the actuation voltage between the wave line and the air-bridge. The central conductor acts as the control-signal conductor which generates the actuation voltage between the wave line and the air-bridge. The air-bridge contains a plurality of laminated thin films, the laminated thin films having variable internal stresses that are adjustable to match a particular actuation voltage selected for the switch.

6 Claims, 3 Drawing Sheets



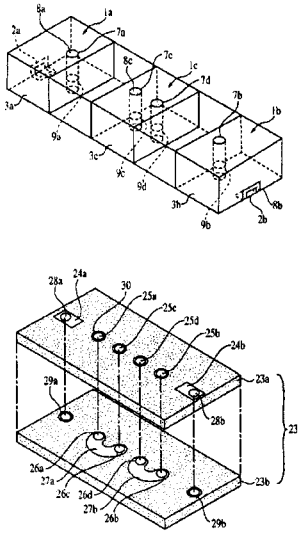
6,133,808 Oct. 17, 2000

Dielectric Filter having Input/Output Electrodes Connected to Electrodes on a Substrate, and Dielectric Duplexer Incorporating the Dielectric Filter

Inventor: Shigeji Arakawa.
Assignee: Murata Manufacturing Co., Ltd.
Filed: Feb. 13, 1998.

***Abstract*—**The invention provides a dielectric filter and a dielectric duplexer each having a high degree of freedom in terms of the direction and position of a lead electrode and having a high mutual bonding strength among resonators against bending stress. At both ends of an insulating substrate, lead electrodes are formed. TE-mode dielectric resonators are connected in series with electrically conductive adhesive such as solder and are secured to the substrate again with electrically conductive adhesive. A respective input and output electrode of each of the resonators is connected to a corresponding lead electrode on the substrate with electrically conductive adhesive. The lead electrodes can be routed in any way on the surface of the substrate, and thereby the lead directions and the lead positions can freely be changed.

11 Claims, 13 Drawing Sheets



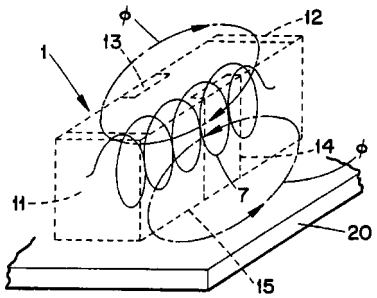
6,133,809 Oct. 17, 2000

LC Filter with a Parallel Ground Electrode

Inventors: Takashi Tomohiro, Takahiro Azuma, Hidetoshi Yamamoto, Toshimi Kaneko, and Yasuhiro Nakata.
Assignee: Murata Manufacturing Co., Ltd.
Filed: Apr. 21, 1997.

***Abstract*—**An LC filter is disclosed which exhibits excellent attenuation characteristics in a high-frequency range and substantially preserves its self-inductance and Q-factor. The LC filter is constructed of a laminated block formed by laminating insulating sheets each provided with a coil conductor. The coil conductors are connected in series to each other through via-holes to form a coil. Input/output external electrodes and ground external electrodes are disposed on the surfaces of the laminated block. The insulating sheets are laminated in a direction perpendicular to the input/output external electrodes and parallel to the mounting surface. The coil is axially placed perpendicular to the input/output external electrodes and parallel to the ground external electrodes and the mounting surface. A distributed capacitance is generated between the coil and each of the ground external electrodes to form a capacitor.

20 Claims, 18 Drawing Sheets



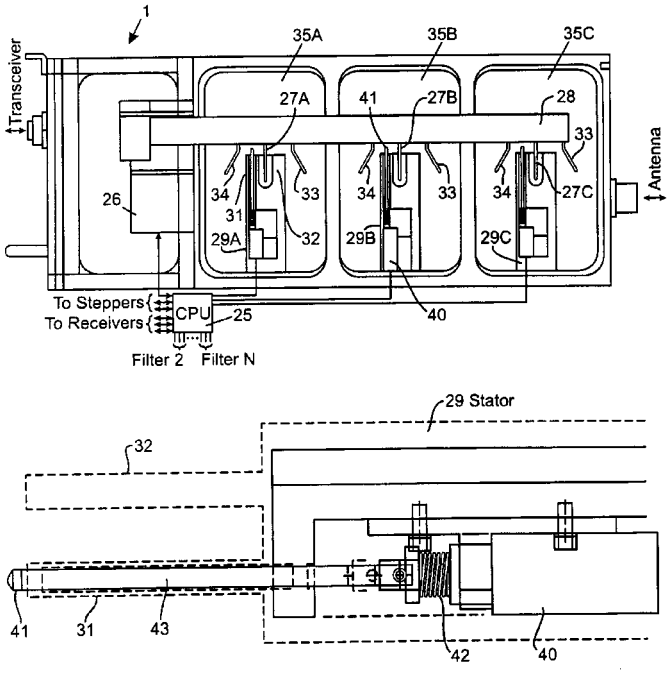
6,133,810 Oct. 17, 2000

Enhanced Coaxial Cavity Filter Configured to be Tunable while Shorted

Inventor: Paul R. Shockley.
Assignee: K & L Microwave, Inc.
Filed: Jan. 15, 1998.

***Abstract*—**An enhanced tunable coaxial cavity filter that may be tuned while it is shorted. The coaxial cavity filter may have one or more cavities. One or more of the cavities may include a switch for shorting the cavity. When a plurality of cavities are implemented, the cavities may be coupled in series such that shorting one of the cavities effectively shorts the entire filter. The switch for shorting the cavity may include a solenoid switch. The solenoid switch may be disposed within a stator that is stationary with respect to a rotatable rod for tuning the filter. Such a design has shown to be extremely robust for wear, vibration, and other considerations, even in high stress environments.

41 Claims, 4 Drawing Sheets



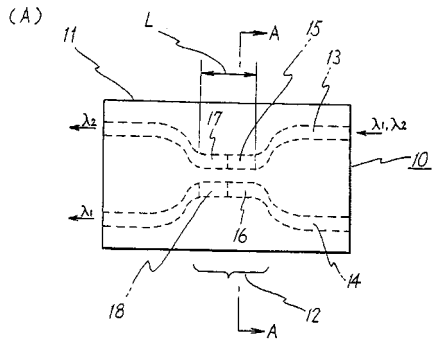
6,134,361 Oct. 17, 2000

Optical Multiplexer/Demultiplexer

Inventor: Yutaka Urino.
Assignee: NEC Corporation.
Filed: Jun. 17, 1998.

***Abstract*—**The present invention is related to an optical multiplexer/demultiplexer that has a wide wavelength passing band. This optical multiplexer/demultiplexer includes a substrate formed from a material with a uniform refractive index, a first and a second waveguide which are mounted to the substrate and are formed from a material with a refractive index higher than the substrate, and a directional coupler that is formed by placing each portions the first and second waveguides in close proximity to each other at a preselected length. Each of the portions of the first and second waveguides which are in close proximity are bisected into an upper region and a lower region in the one direction the light waves propagate. The propagation constant of the upper region of the first waveguide is set to be higher than the other portion and the propagation constant of the lower region of the second waveguide is set to be higher than the other portion. This allows expansion of the wavelength passing band.

24 Claims, 8 Drawing Sheets



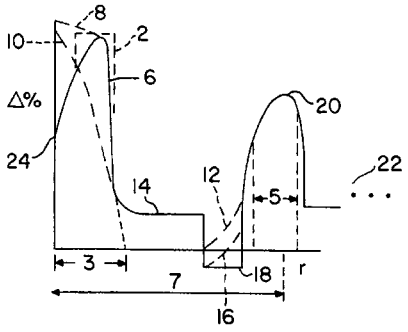
6,134,367 Oct. 17, 2000

Low Attenuation Optical Waveguide

Inventors: Peter C. Jones, Daiping Ma, and David K. Smith.
Assignee: Corning Incorporated.
Filed: Sep. 2, 1998.

***Abstract*—**Disclosed is a single mode optical waveguide fiber having a core refractive index profile in which the profile parameters are selected to provide an attenuation minimum. A set of profiles having the same general shape and dimensions is shown to have a group of profiles contained in a sub-set which exhibit a minimum of attenuation as compared to the remaining members of the set. The members of the sub-set have been found to have the lowest effective group index, n_{geff} and the lowest change in β^2 under waveguide fiber bending.

7 Claims, 2 Drawing Sheets



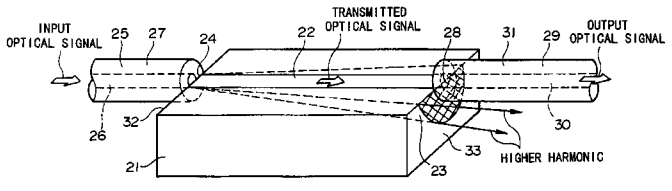
6,134,372 Oct. 17, 2000

Light Intensity Attenuator and Attenuating Method

Inventors: Junichiro Ichikawa, Hirotoshi Nagata, Kaoru Higuma, Junichiro Minowa, Takaaki Ogata, and Yasuhisa Taneda.
Assignees: Sumitomo Osaka Cement Co., Ltd. and NEC Corporation.
Filed: Sep. 20, 1998.

***Abstract*—**A light intensity attenuator and attenuating method is provided, by which a pulse-shaped optical surge can be attenuated and an optical signal component using desired light intensity can be output by using a simpler structural arrangement, and without using many optical components and circuits. In this method, an optical signal including a pulse-shaped optical surge component is received, and the optical signal is again output after the light intensity of the surge component is attenuated by a desired amount. Typically, (i) at least one of a substrate and an optical waveguide formed on the substrate is made of a material producing a nonlinear optical effect, and the refractive index of the optical waveguide with respect to the optical signal is smaller than the refractive index of the substrate with respect to a higher harmonic of the optical signal, thereby wavelength-converting a part of the input optical signal by the nonlinear optical effect into a light portion having a wavelength shorter than that of the optical signal, and scattering this converted portion, and (ii) a part of the optical signal is scattered by using a polar-molecule liquid including polar molecules.

14 Claims, 11 Drawing Sheets



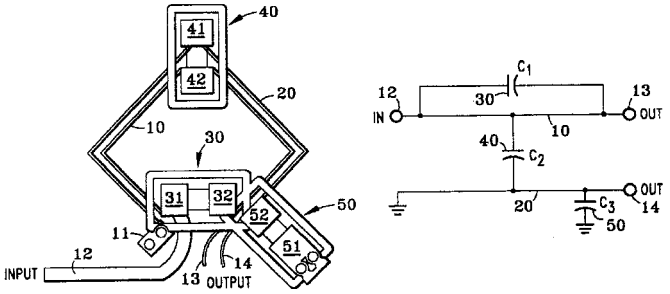
6,137,376 Oct. 24, 2000

Printed BALUN Circuits

Inventors: James Imbornone and Jean-Marc Mourant.
Assignee: International Business Machines Corporation.
Filed: Jul. 14, 1999.

***Abstract*—**A planar BALUN circuit comprises two separate parallel branches with three capacitive elements. The values of the capacitive elements are selected to provide impedances which first of all enhance balanced current flow and which also impede and reduce unbalanced current flow. The circuit is provided so as to lie substantially in a single plane as a pattern disposed on a printed circuit board together with either certain discrete capacitive elements or with capacitive structures which are also printed on the board. The BALUN circuits of the present invention are particularly useful for circuits operating in the gigahertz range and are particularly useful in light weight devices such as cellular telephones and cellular telephone systems.

6 Claims, 3 Drawing Sheets



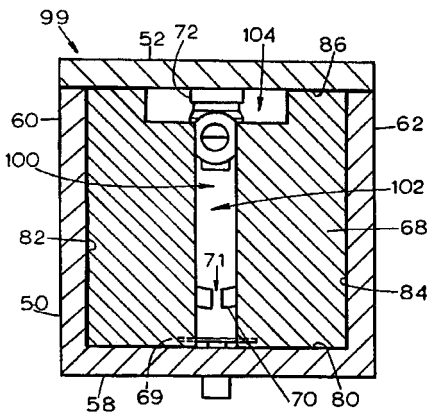
6,137,381 Oct. 24, 2000

Aperture Having First and Second Slots for Coupling Split-Ring Resonators

Inventors: Stephen K. Remillard, Amr Abdelmonem, and Mostafa A. Beik.
Assignee: Illinois Superconductor Corporation.
Filed: Apr. 22, 1999.

***Abstract*—**An electromagnetic filter includes a filter housing containing a first resonant cavity and a second resonant cavity. Resonators are disposed within each of the cavities. The electromagnetic filter also includes a cavity wall separating the first resonant cavity and the second resonant cavity. The cavity wall includes a T-shaped aperture to achieve magnetic coupling between the first resonant cavity and the second resonant cavity.

7 Claims, 5 Drawing Sheets



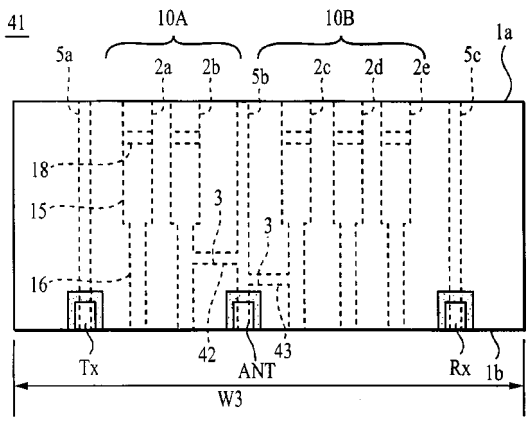
6,137,382 Oct. 24, 2000

Dielectric Duplexer and a Communication Device Including Such Dielectric Duplexer

Inventors: Jun Toda and Hideyuki Kato.
Assignee: Murata Manufacturing Co., Ltd.
Filed: Feb. 19, 1999.

***Abstract*—**Antenna side through-holes pass through to the internal surfaces of neighboring resonator holes from an antenna side electrode. The antenna side through-holes (transverse holes) have their axes in a direction substantially at a right angle to the axial direction of the resonator holes and on the internal surface of the antenna side through-holes an inner conductor is formed. The transmission side filter and the antenna side electrode of a duplexer are electrically connected through an antenna side through-hole. The reception side filter and the antenna side electrode are also electrically connected through an antenna side through-hole.

14 Claims, 8 Drawing Sheets



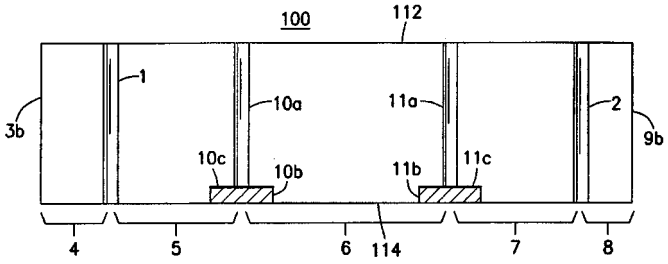
6,137,383 Oct. 24, 2000

Multilayer Dielectric Evanescent Mode Waveguide Filter Utilizing via Holes

Inventor: Rocco A. De Lillo.
Assignee: Merrimac Industries, Inc.
Filed: Jun. 11, 1999.

***Abstract*—**A multilayer dielectric evanescent mode waveguide bandpass filter with resonators utilizing via hole technology is capable of achieving very narrow bandwidths with minimal insertion loss and high selectivity at microwave frequencies is provided. The resonators may also be used as feed posts. A typical implementation of this filter is fabricated with soft substrate multilayer dielectrics with high dielectric constant ceramics. This filter typically takes up less space than other filters presently available. A typical implementation operates at a center frequency of 1 GHz, although other center frequencies, such as approximately 0.5 GHz to approximately 60 GHz, are achievable. The perimeter of the filter may be defined by via holes or plated slots.

20 Claims, 17 Drawing Sheets



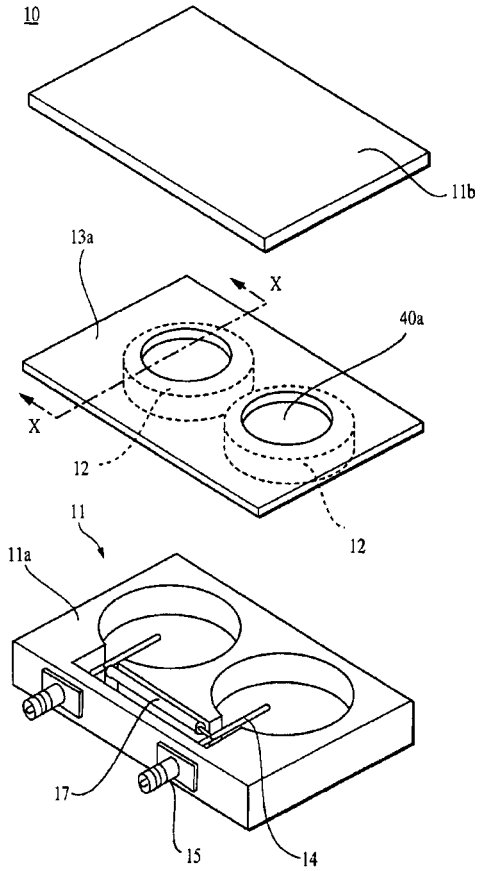
6,137,384 Oct. 24, 2000

Dielectric Resonator Dielectric Filter Dielectric Duplexer and Communication Device

Inventors: Kazuhiko Kubota and Tomoyuki Ise.
Assignee: Murata Manufacturing Co., Ltd.
Filed: Feb. 19, 1999.

***Abstract*—**A dielectric filter has an electroconductive case, dielectric resonators each having electrodes formed on the opposite sides thereof disposed inside of the case, a ground plate disposed inside of the case, and external connectors. At least one of the electrodes is a thin film multilayered electrode connected to the ground plate. The ground plate is provided with protuberant portions, and each of the protuberant portions is connected, at the lower surface portion of the protuberant portion, to the respective thin film multilayered electrode on a corresponding dielectric resonator. The lower surface of the protuberant portion is smaller than the size of the corresponding dielectric resonator defined by the side edges thereof.

14 Claims, 9 Drawing Sheets



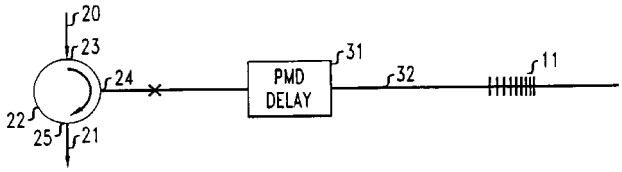
6,137,924 Oct. 24, 2000

Article Comprising a Dispersion Compensating Grating with Low Polarization Mode Dispersion

Inventors: Thomas Andrew Strasser and Jefferson Lynn Wagener.
Assignee: Lucent Technologies Inc.
Filed: Sep. 2, 1998.

***Abstract*—**A dispersion compensating chirped optical fiber Bragg grating according to our invention is formed in polarization maintaining (PM) fiber having birefringence of at least 10^{-6}, preferably 10^{-5} or more. Use of the PM fiber makes possible substantial cancellation of the polarization mode dispersion that typically is unavoidably present in chirped Bragg gratings for dispersion compensation.

13 Claims, 2 Drawing Sheets



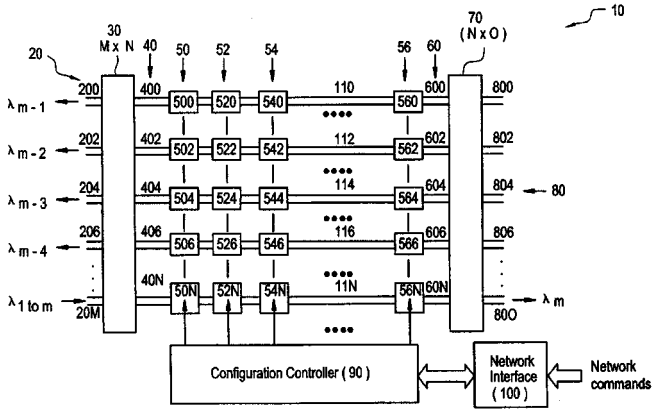
6,137,927 Oct. 24, 2000

N-Port Reconfigurable DWDM Multiplexer and Demultiplexer

Inventors: Donald B. Keck and Daniel A. Nolan.
Assignee: Corning Incorporated.
Filed: Dec. 18, 1998.

***Abstract*—**An N-port optical wavelength division multiplexer and demultiplexer includes two evanescent wave couplers connected by N optical paths. Each of the optical paths includes wavelength-selecting elements that are used to select specific wavelengths of light. Light signals composed of N wavelengths of light introduced to an exterior port in one of the couplers are split substantially equally among all the optical paths within the coupler, so that each optical path exiting the coupler includes light of all the wavelengths initially introduced to the coupler. The wavelength selecting elements disposed on each optical path are situated to direct the light in a manner such that light of only the selected wavelengths interferes constructively at a given exterior coupler port and other wavelengths interfere destructively. Consequently, optical signals composed of N wavelengths may be demultiplexed such that N optical paths carry light having one wavelength. Conversely, N optical paths carrying light signals having only one wavelength can be multiplexed into a signal having wavelengths $\lambda_1, \lambda_2, \ldots, \lambda_N$. The multiplexed signal is then coupled into up to M+O exterior ports.

35 Claims, 7 Drawing Sheets



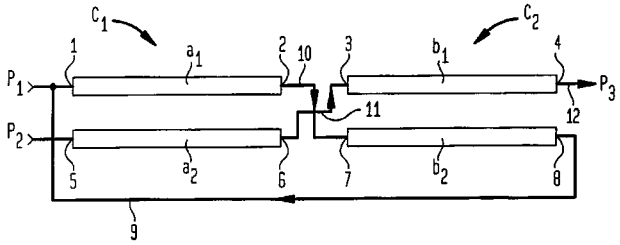
6,140,886 Oct. 31, 2000

Wideband BALUN for Wireless and RF Application

Inventors: Roger Anthony Fratti, John Wayne Bowen, and Melvin West.
Assignee: Lucent Technologies, Inc.
Filed: Feb. 25, 1999.

***Abstract*—**A transmission line balun transformer for providing a single ended output signal from a pair of differential input signals includes two transmission line signal couplers. The couplers are individually designed to be relatively loosely coupled devices, i.e., having a coupling factor greater than 3 dB, but are coupled together with proper phase relationships so as to achieve a relatively tighter composite coupling characteristic in the order of 3 dB, thereby resulting in an increase in bandwidth.

25 Claims, 5 Drawing Sheets



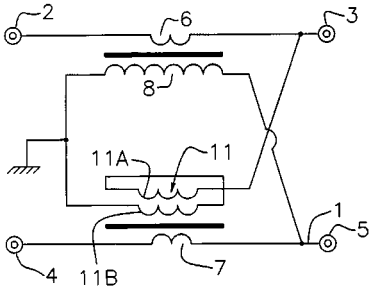
6,140,887 Oct. 31, 2000

Wide Band Directional Coupler

Inventor: Wei Ping Zheng.
Assignee: Scientific Components.
Filed: Jan. 22, 1999.

***Abstract*—**A wide band directional coupler of the type using ferrite cores and discrete winding in which a special winding method and its position on the core improves coupling flatness, directivity, as well as input and output VSWR.

3 Claims, 5 Drawing Sheets



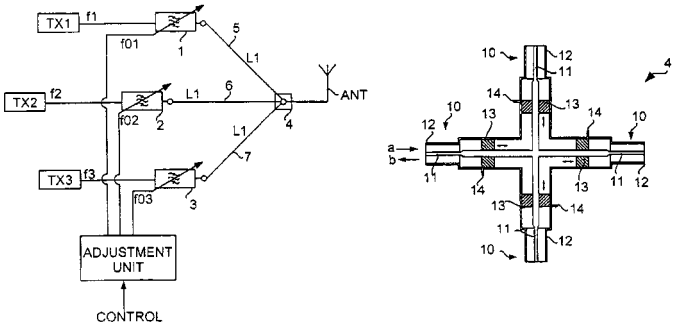
6,140,888 Oct. 31, 2000

Method and Structure for Tuning the Summing Network of a Base Station

Inventors: Veli-Matti Särkkä and Timo Ahonpää.
Assignee: Nokia Telecommunications Oy.
Filed: Oct. 20, 1998.

***Abstract*—**The invention relates to a summing member comprising in-connectors for receiving and combining different RF signals and an out-connector for supplying the combined signals further, at least one of the connectors being coaxial and comprising an elongated rod-like inner conductor, and an outer conductor surrounding the rod-like inner conductor. To provide an adjustable summing point, said at least one connector comprises a movable part of low-loss dielectric material or ferrimagnetic material, the part surrounding at least the inner conductor and being movable lengthwise of the inner conductor so as to adjust the phase angle of a wave reflecting from the connector.

3 Claims, 1 Drawing Sheet



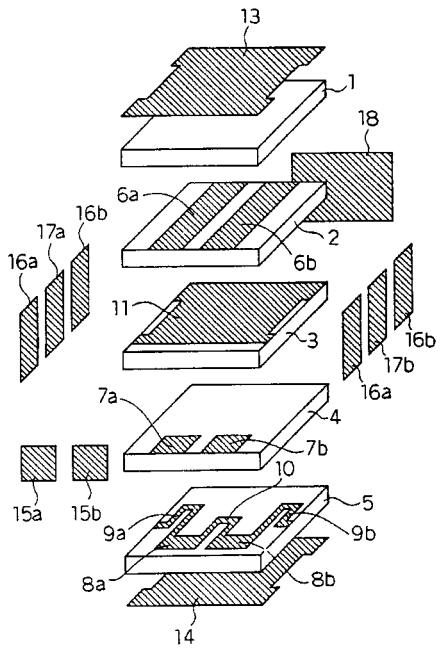
6,140,891 Oct. 31, 2000

Dielectric Laminated Filter

Inventors: Hideaki Nakakubo, Toshio Ishizaki, Toru Yamada, Shoichi Kitazawa, and Hiroshi Kushitani.
Assignee: Matsushita Electric Industrial Co., Ltd.
Filed: Oct. 20, 1997.

***Abstract*—**A dielectric laminated filter has a first dielectric laminated block including a first strip line electrode and a second dielectric laminated block including a second strip line electrode and a coupling element, wherein the first and the second dielectric laminated blocks are laminated via a first shield electrode and wherein the first and the second strip lines are connected via a third strip line. This configuration allows the unwanted electromagnetic coupling between a resonator and the coupling element to be neglected, and uses the third strip line electrode to form the first and the second strip line electrodes so that they extend across different layers, thereby enabling the size of the resonator to be reduced. In addition, since the third strip line electrode serves to adjust the filter characteristics, a small high-performance dielectric laminated filter that can be designed easily can be provided.

18 Claims, 21 Drawing Sheets



6,141,571 Oct. 31, 2000

Magnetically Tunable Ferrite Microwave Devices

Inventor: Gerald F. Dionne.
Assignee: Massachusetts Institute of Technology.
Filed: Feb. 20, 1998.

***Abstract*—**In a ferrite switchable microwave device, a magnetic structure is formed in a nearly continuous closed-loop configuration of a single crystal material, or of a material exhibiting the magnetic properties of single crystal materials (quasisingle crystal materials). A magnetization M is induced in the structure. The toroidal shape of the structure in combination with the properties of the magnetic material results in a device which exhibits virtually no hysteresis. The device is operable either in a fully magnetized state or in a partially magnetized state. In a fully magnetized state, the device operates in the region of magnetic saturation. The absence of hysteresis in the device enables switching between the positive and negative magnetic saturation points with very little energy. In a partially magnetized state, the device provides a variable magnetization M between the two saturation points. The magnetization curve is made linear and therefore controllable by introducing a gap or other demagnetizing feature in the magnetic structure. This device is particularly operable as a variable phase shifter or tunable filter where the magnetization controls the velocity of electromagnetic energy propagating in the magnetic device.

42 Claims, 9 Drawing Sheets