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.

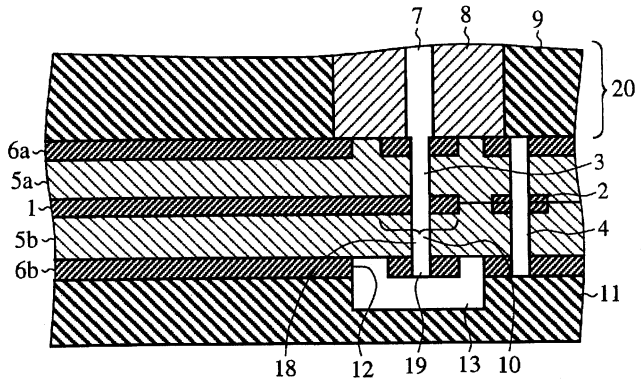
6,400,234 June 4, 2002

STRIP LINE FEEDING APPARATUS

Inventors: Hideyuki Ohhashi, Yukihiro Tahara, and Moriyasu Miyazaki.
Assignee: Mitsubishi Denki Kabushiki Kaisha.
Filed: February 9, 2000.

***Abstract*—**A reflection characteristic in a high frequency region at a feeding point into a strip line is improved and the assembly of a strip line feeding apparatus facilitated by the method and apparatus herein. The strip line includes a strip line pattern on a surface of a first dielectric substrate having a ground conductor pattern disposed on the opposite surface thereof, and a second ground conductor pattern disposed on a surface of a second dielectric substrate. A serial high impedance portion is disposed at an area near the tip portion of the strip line pattern. The high impedance portion includes a portion of the strip line pattern having narrowed width or a hole disposed under a through-hole for an inner conductor, which electrically connects the strip line pattern and an inner conductor. Dimensions of the high impedance portion are controlled to cancel out parasitic susceptance due to the discontinuous structure. A matching through-hole is further disposed in the second dielectric substrate in an area separated from the tip portion of the strip line pattern by a distance of around 25% of the typical wave length. The matching through-hole is elongated to a land pattern in a hole disposed in the second ground conductor pattern so as to electrically connect the conductor strip pattern and the land pattern.

18 Claims, 17 Drawing Sheets



6,400,235 June 4, 2002

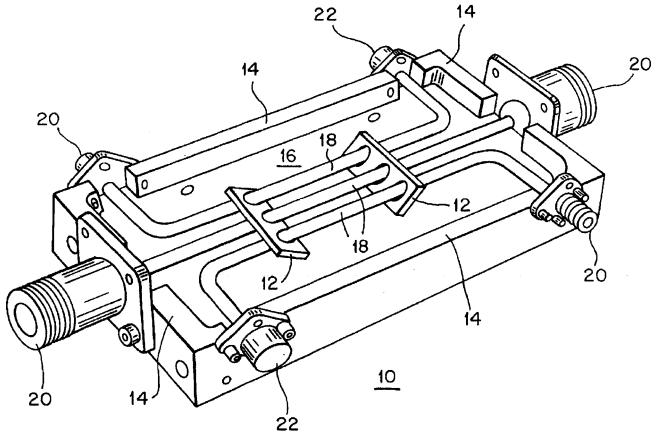
RADIO FREQUENCY, MILLIMETER-WAVE OR MICROWAVE DEVICE AND METHOD OF MAKING SAME

Digital Object Identifier 10.1109/LMWC.2002.807014

Inventor: Henry Perez.
Assignee: L3 Communications Corporation.
Filed: August 20, 1999.

***Abstract*—**A coupler includes one or more conductors and a support structure for the conductors within the coupler. The conductors are inserted through oblong holes in the support structure while the support structure is in an assembling position. When the support structure is tilted from the assembling position to a securing position, which is in a direction away from normal to a longitudinal axis of the conductors, the external surfaces of the conductors are engaged by the support structure at the oblong holes. Typically, a removable cover of the coupler exerts a downward force, which deflects opposite outer edges of the support structure to maintain the support structure in the securing position. The spacing between the conductors is maintained substantially constant over time, temperature, and handling while the support structure is in the securing position.

8 Claims, 4 Drawing Sheets



6,400,238 June 4, 2002

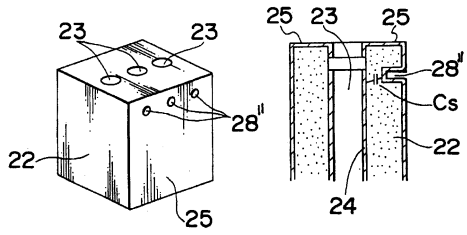
DIELECTRIC FILTER HAVING SIDE SURFACE INDENTATION

Inventors: Haruo Matsumoto, Yasuo Yamada, Yukihiro Kitaichi, Tadahiro Yorita, Hideyuki Kato, Tatsuya Tsujiguchi, Hisashi Mori, and Hitoshi Tada.
Assignee: Murata Manufacturing Co., Ltd.
Filed: June 8, 2000.

***Abstract*—**A dielectric filter, having a dielectric block with an outer surface including first and second end surfaces and a side surface extending between the first and second end surfaces; an external conductor disposed on the outer surface of the dielectric block, the external conductor substantially completely covering the outer surface; at least one hole extending through the dielectric body between the first and second end surfaces, the at least one hole having an inner surface; the at least one hole having a respective pair of internal conductors disposed on the corresponding inner surface thereof and conductively connected to the external conductor respectively at the first and second end surfaces, a respective nonconductive portion at the corresponding inner surface being spaced from both of the end surfaces and thereby separating the corresponding pair of internal conductors and defining a respective capacitance between the corresponding pair of internal conductors; a predetermined portion of the side surface of the dielectric block having a shape such that a first portion of the external conductor at the predetermined portion is closer to at least one of the internal

conductors of the at least one hole, as compared with a second portion of the external conductor at a portion of the dielectric block other than the predetermined portion.

20 Claims, 21 Drawing Sheets



6,400,239 June 4, 2002

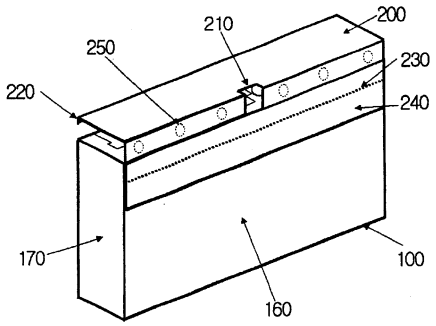
MICROWAVE FILTER WITH A MOVABLE SHIELD HAVING ALIGNMENT WINDOWS

Inventors: Oh Gon Chun, Chang Hwa Lee, Bon Hee Koo, Dong Suk Jun, and Sang Seok Lee.
Assignee: Electronics and Telecommunications Research Institute.
Filed: February 4, 2000.

***Abstract*—**The object of the present invention is to provide a microwave filter having a shield for electromagnetic interference shielding, wherein the filter is adapted for use in a radio frequency circuitry located in a stage next to an antenna for a radio communication system, such as a mobile communication system, a portable communication system, satellite communication system, and IMT-2000, for passing signals having desired frequencies while removing signals having frequencies having undesired frequencies.

According to the present invention, there is provided a microwave filter for electromagnetic interference shielding, comprising a block of dielectric material plated with a metal with the exception of one surface, a plurality of resonators contained within the dielectric block, and a shield fixed on the surface which is not plated, wherein the shield has at least an alignment window for securing the easy alignment between the dielectric block and the shield through a visual observation.

8 Claims, 3 Drawing Sheets



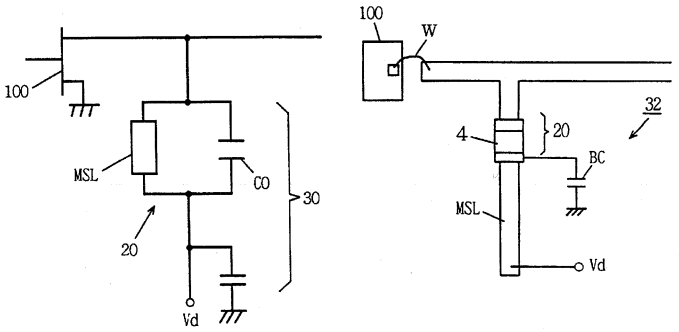
6,400,240 June 4, 2002

INTEGRATED RESONANCE CIRCUIT CONSISTING OF A PARALLEL CONNECTION OF A MICROSTRIP LINE AND A CAPACITOR

Inventors: Masao Nishida and Tetsuro Sawai.
Assignee: Sanyo Electric Co., Ltd.
Filed: December 18, 2000.

***Abstract*—**A chip capacitor is arranged on a microstrip conductor forming a microstrip line. The chip capacitor has a dielectric material and electrodes provided on both ends thereof. The electrodes of the chip capacitor are connected to the microstrip conductor. A resonance frequency is decided by the length of the microstrip conductor between the electrodes of the chip capacitor, the dielectric constant and the thickness of the dielectric substrate and the capacitance value of the chip capacitor.

4 Claims, 16 Drawing Sheets



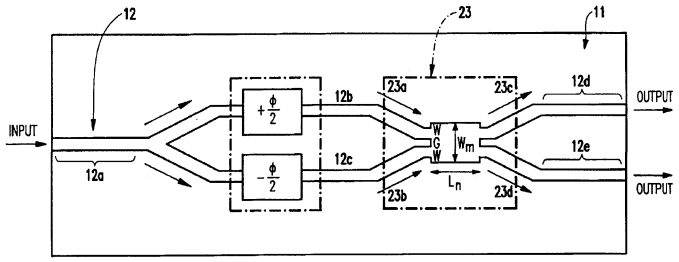
6,400,490 June 4, 2002

MACH–ZEHNDER OPTICAL MODULATOR

Inventor: Toru Hosoi.
Assignee: NEC Corporation.
Filed: November 22, 2000.

***Abstract*—**An optical modulator is provided that not only can realize a suitable initial operating point without using dc voltage for control, but that has little optical loss and can obtain an excellent extinction ratio. The optical modulator comprises: a substrate having an electro-optical effect, first and second branch optical waveguides formed in a first major surface of the substrate; an optical branching structure for splitting input optical signal and supplying the split signals to the branch optical waveguides; and a 3-dB directional coupler that couples the outputs of the first and second branch optical waveguides. The ratio of nonuniformity, which is represented by the difference in propagation constants of the two optical waveguides in 3-dB directional coupler, to the coupling coefficient of the 3-dB directional coupler is 1 to at least 5, preferably 1 to at least 15, and still more preferably, 1 to at least 20.

24 Claims, 14 Drawing Sheets



6,400,494 June 4, 2002

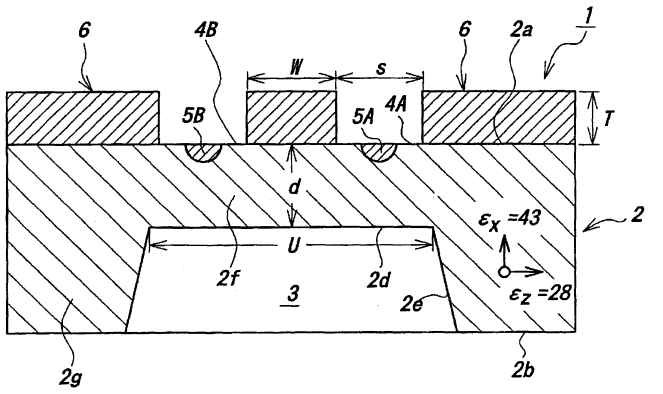
TRAVELING WAVE OPTICAL MODULATOR

Inventors: Jungo Kondo, Atsuo Kondo, and Kenji Aoki.
Assignee: NGK Insulators, Ltd.
Filed: August 10, 2000.

***Abstract*—**A traveling wave optical modulator comprising a substrate made of a ferrodielectric electro-optic single crystal and having a pair of opposing main planes, an optical waveguide formed on a side of one of the main planes of

the substrate, and a pair of electrode films which apply a voltage for modulating a light transmitting through the optical waveguide and between which the optical waveguide is located, wherein the thickness of each of the electrode films is not less than 20 μm and a width of a gap between a pair of the electrode films is not less than 25 μm.

5 Claims, 10 Drawing Sheets



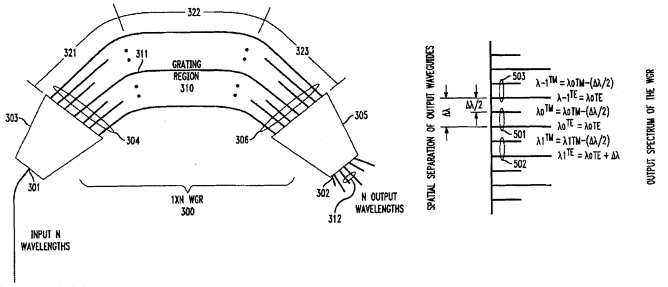
6,400,860 June 4, 2002

WAVELENGTH SELECTIVE POLARIZATION BEAM SPLITTER/COMBINER

Inventors: Sethumadhavan Chandrasekhar and Jiten Sarathy.
Assignee: Lucent Technologies, Inc.
Filed: March 21, 2000.

***Abstract*—**A wavelength selective polarization beam device uses waveguide grating routers (WGR's) having birefringent grating waveguides. When the device is used as a splitter it separates different wavelength channels of a wavelength division multiplexed (WDM) signal as well as the orthogonal polarization components of each wavelength channel. Since the WGR device is reciprocal, it can also be used as a combiner to combine the orthogonal polarization components of each wavelength channel into a WDM signal.

14 Claims, 6 Drawing Sheets



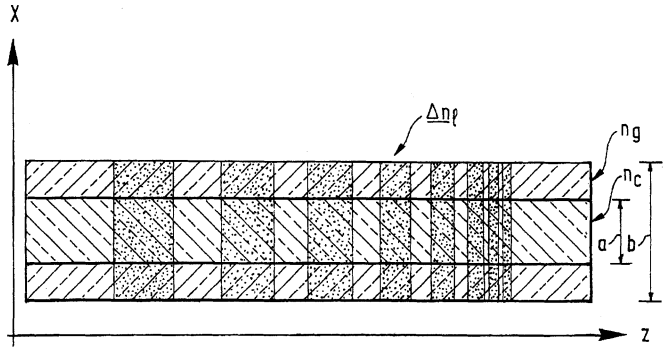
6,400,868 June 4, 2002

PHOTOSENSITIVE OPTICAL FIBER FOR A BRAGG GRATING FILTER, A METHOD OF FABRICATING SAID FIBER, AND A CHROMATIC DISPERSION AND CHROMATIC DISPERSION SLOPE COMPENSATOR INCLUDING A FIBER OF THIS KIND

Inventors: Isabelle Riant and Pierre Sansonetti.
Assignee: Alcatel.
Filed: January 24, 2000.

***Abstract*—**The invention proposes a photosensitive optical fiber for inscribing a Bragg grating by UV illumination, in which the photosensitivity is very high either to reduce the exposure time or to increase the contrast of the optically induced refraction index variations, whilst retaining a reasonable exposure time. Thanks to this high contrast, the fiber of the invention, imprinted with a linear chirp, in addition to correcting chromatic dispersion, is also effective in correcting the chromatic dispersion slope of a fiber of ordinary contrast, imprinted with a quadratic chirp. In a preferred embodiment, the fiber of the invention is photosensitive in the cladding. In a particularly advantageous embodiment, a nonphotosensitive dopant is added to the core of said fiber to reduce the refractive index in the core, reducing the birefringence of the fiber.

11 Claims, 3 Drawing Sheets



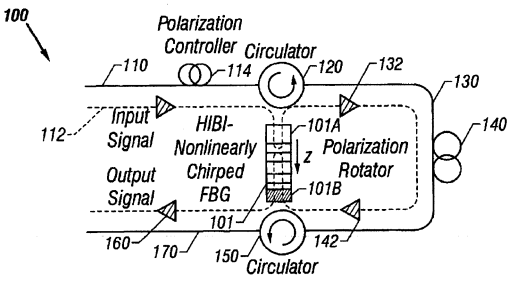
6,400,869 June 4, 2002

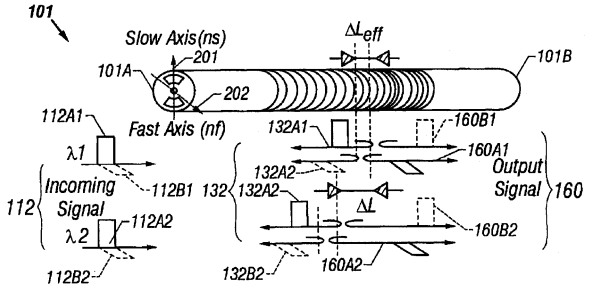
TUNABLE COMPENSATION FOR POLARIZATION-MODE DISPERSION USING A BIREFRINGENT NONLINEARLY-CHIRPED BRAGG GRATING IN A DUAL-PASS CONFIGURATION

Inventors: Zhongqi Pan, Yong Xie, Sanggeon Lee, and Alan E. Willner.
Assignee: University of Southern California.
Filed: December 1, 2000.

***Abstract*—**Techniques and devices for compensating polarization-mode dispersion in an optical signal by using a nonlinearly-chirped Bragg grating in a dual-pass configuration.

24 Claims, 4 Drawing Sheets





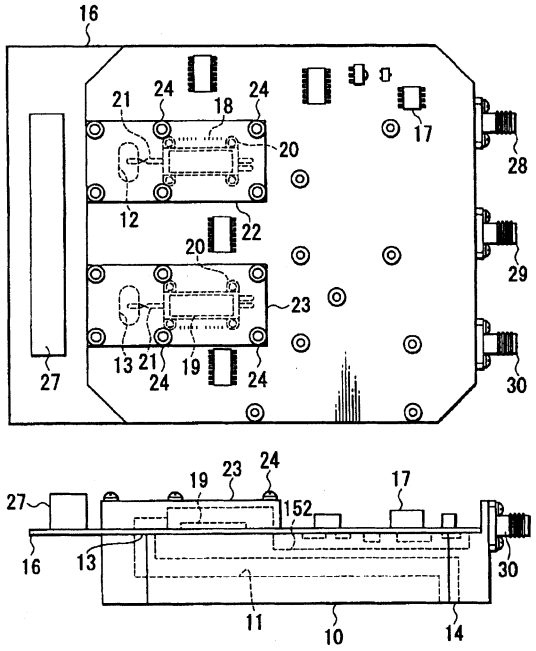
6,404,300 June 11, 2002

MICROWAVE MODULE FOR SEPARATING HIGH FREQUENCY TRANSMISSION SIGNALS AND HIGH FREQUENCY RECEPTION SIGNALS ON THE BASIS OF THEIR FREQUENCIES

Inventor: Masaaki Ishida.
Assignee: Kabushiki Kaisha Toshiba.
Filed: March 13, 2001.

***Abstract*—**A waveguide for separating a high-frequency transmission signal and a high-frequency reception signal on the basis of their frequencies is formed in a diplexer. Further, a transmission-side connection port, a reception-side connection port and an antenna connection port are formed in peripheral portions of the diplexer such that the ports communicate with the waveguide. A circuit section including a high-frequency transmission circuit, a high-frequency reception circuit, and direct-current circuits are mounted on one side of the diplexer. The high-frequency transmission circuit is connected to the transmission-side connection port of the diplexer, and the high-frequency reception circuit is connected to the reception-side connection port of the diplexer.

16 Claims, 4 Drawing Sheets



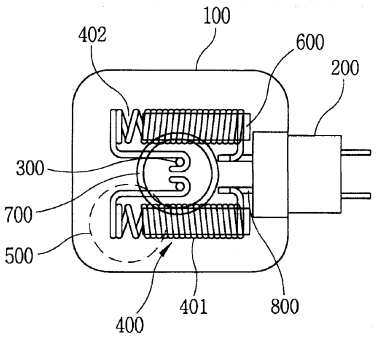
6,404,301 June 11, 2002

METHOD OF FORMING NOISE FILTER FOR A MAGNETRON

Inventors: Byeong Wook Park, Kyung Ahn Kwon, and Joong Geon Rhee.
Assignee: LG Electronics, Inc.
Filed: May 5, 2000.

***Abstract*—**The present invention relates to a noise removing filter of a magnetron and a noise removing method. In the conventional art, the noise is removed by forming a low band pass filter formed of a choke coil and a through type capacitor. In this case, it is impossible to effectively remove the noises which are outputted at a band width below 100 MHz and at a band width of 500 MHz and 700–800 MHz. In order to overcome the above-described problem, a magnetron noise filter in accordance with the present invention which includes a shield box fixed to one side of the magnetron, a through type capacitor installed at one side of the shield box and a combined choke coil connected to a cathode terminal of the magnetron and a terminal of the capacitor, wherein the combined choke coil comprising a tightly wound portion around a bar having a certain diameter and a loosely wound portion connected with the tightly wound portion. Therefore, it is possible to remove noises which occur at a band width below 100 MHz and a high frequency band width above a few hundreds MHz.

2 Claims, 3 Drawing Sheets



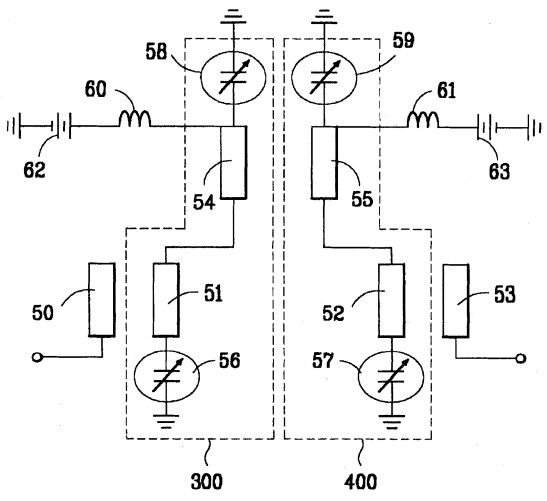
6,404,304 June 11, 2002

MICROWAVE TUNABLE FILTER USING MICROELECTROMECHANICAL (MEMS) SYSTEM

Inventors: Young Woo Kwon, Yong Kweon Kim, Hong Teuk Kim, and Jae Hyoung Park.
Assignee: LG Electronics, Inc.
Filed: March 8, 2000.

***Abstract*—**A microwave tunable filter having some advantages as follows: a) the integration of MEMS tunable filter and MMIC; b) the very low signal transmission loss and low dispersion; and c) the drastic variation and linear characteristic of frequency by means of MEMS capacitor and an external control signal. The microwave tunable MEMS filter includes a plurality of unit resonant cells, each unit resonant cell being formed by various serial and parallel combination of an inductor, a capacitor, a transmission line, and a variable MEMS capacitor, whereby capacitance variation of the variable MEMS capacitor in the unit resonant cell converts a resonant frequency of the unit resonant cell to thereby convert a center frequency of the filter.

15 Claims, 6 Drawing Sheets



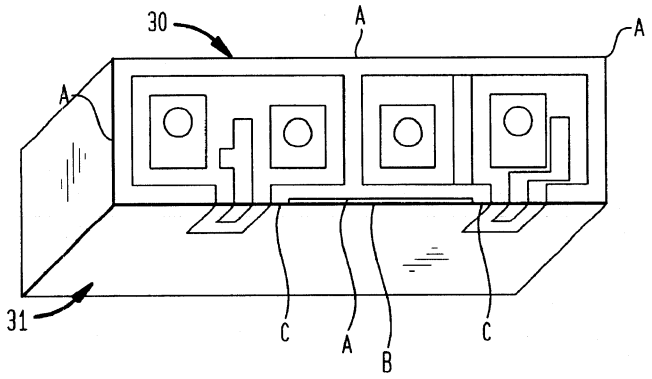
6,404,305 June 11, 2002

3 Claims, 4 Drawing Sheets

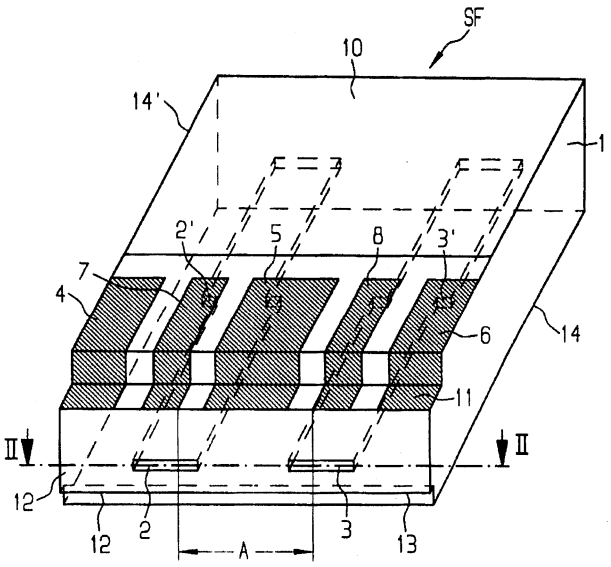
STRIP TRANSMISSION FILTER

Inventor: Christian Block.
Assignee: Epcos Aktiengesellschaft.
Filed: September 24, 1998.

***Abstract*—**A strip transmission filter having resonators with impedance skips in which the resonators are provided in a ceramic substrate. The strip transmission filter also includes capacitive couplings. The ceramic substrate has a metallic coating on all sides except for a face side. The coupling structures are at the face side of the substrate. The ceramic substrate is constructed in a stepped formation in a region of the coupling structures and at least one ground terminal. Thus, the adhesion of metallic coating is increased which, in turn, facilitates soldering.



2 Claims, 2 Drawing Sheets



6,404,306 June 11, 2002

DIELECTRIC CERAMIC FILTER WITH IMPROVED ELECTRICAL CHARACTERISTICS IN HIGH SIDE OF FILTER PASSBAND

Inventors: Masahiko Kitajima, Hiroshi Nakamura, and Kosuke Nishimura.
Assignee: Ube Electronics, Ltd.
Filed: March 17, 2000.

***Abstract*—**A ceramic block filter is designed with a shunt transmission line to attenuate third harmonics. A metallized belt is printed on the top surface of the filter along its edges so that it is connected to the metallized ground of the side surfaces. Along one edge an unmetallized line is left along one edge of the filter, whose ends are grounded. The unmetallized line is designed with a length greater than one-half of the length of the metallized belt, but smaller than the length of the metallized belt. The length and width of the unmetallized line are design choices for the specific frequencies sought to be attenuated.

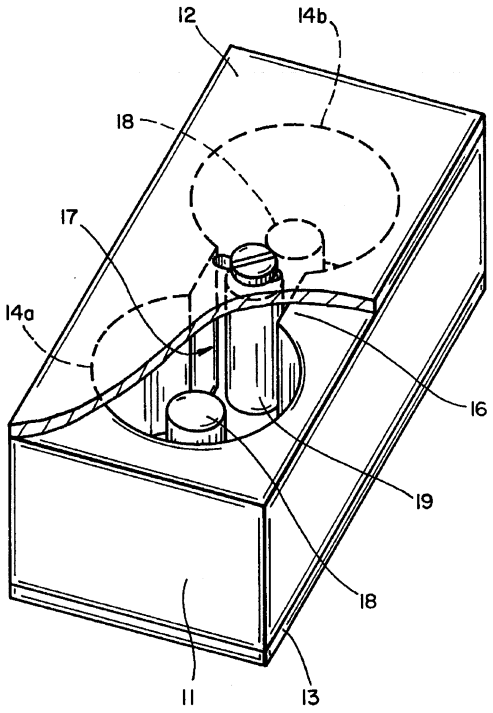
6,404,307 June 11, 2002

RESONANT CAVITY COUPLING MECHANISM

Inventor: Torsten R. Wulff.
Assignee: Kathrein, Inc., Scala Division.
Filed: November 28, 2000.

***Abstract*—**A coupling mechanism for coupling adjacent cavities which includes a window having side walls joining two cavities and a coupling member extending into said window between said side walls. The coupling member is movable between said side walls to adjust the coupling.

4 Claims, 2 Drawing Sheets



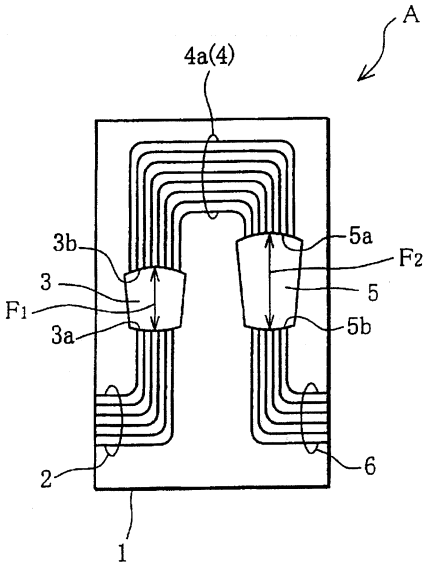
6,404,946 June 11, 2002

ARRAYED WAVEGUIDE GRATING TYPE OPTICAL MULTIPLEXER/DEMULTIPLEXER

Inventors: Takeshi Nakajima, Kanji Tanaka, Toshihiko Ohta, and Shiro Nakamura.
Assignee: The Furukawa Electric Co., Ltd.
Filed: August 9, 2000.

***Abstract*—**An arrayed waveguide grating type optical multiplexer/demultiplexer including an arrayed waveguide grating having a plurality of channel waveguides. Concave end faces of input-side and output-side slab waveguides are connected to opposite ends of the diffraction grating. At least one input waveguide and at least one output waveguide are connected to the other concave end faces of the input-side and output-side slab waveguides, respectively. The focal length of the output-side slab waveguide end face is longer than the focal length of the input-side slab waveguide end face. The optical multiplexer/demultiplexer has a sufficiently flat wavelength-dependent spectrum response in passing channel spacings, and helps construct an optical wavelength multiple communication system having a good signal-to-noise ratio.

17 Claims, 5 Drawing Sheets



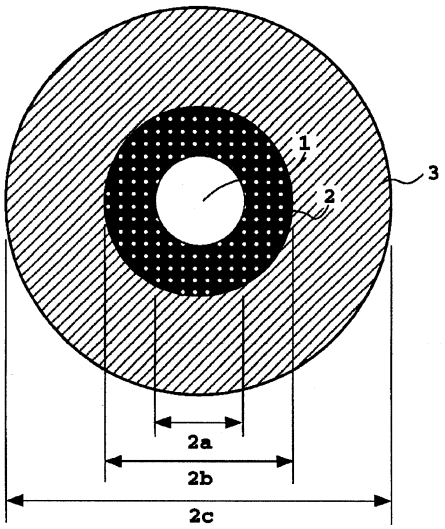
6,404,966 June 11, 2002

OPTICAL FIBER

Inventors: Satoki Kawanishi and Katsunari Okamoto.
Assignee: Nippon Telegraph and Telephone Corporation.
Filed: May 6, 1999.

***Abstract*—**An optical fiber including a core having an area of about several times an optical wavelength and composed of a hollow hole, and a cladding having a diffraction grating which is arranged at least in a peripheral area adjacent to the core and has a grating period equal to 1/2 the optical wavelength.

32 Claims, 9 Drawing Sheets



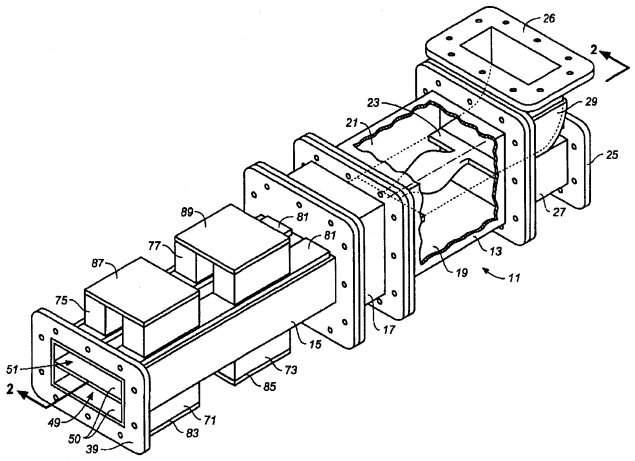
6,407,646 June 18, 2002

DISTRIBUTED THREE PORT STACKED WAVEGUIDE CIRCULATOR

Inventor: Ray M. Johnson.
Filed: March 23, 2000.

***Abstract*—**A three port distributed waveguide circulator has a hybrid coupler section connected to a waveguide section which is bifurcated by a central web plate to produce reduced height stacked waveguides and which is loaded with a distributed nonreciprocal ferromagnetic material for producing relative phase shifting of the microwave power traveling through the reduced height guides. In one embodiment, the coupler output is stepped down to the reduced height waveguides by a stepped transformer between the output of the hybrid coupler and the bifurcated input end of the bifurcated waveguide section. Alternatively, a tapered transformer is provided. A static magnetic circuit is provided for producing transverse static magnetic fields in the reduced height waveguides necessary for the distributed ferromagnetic material to exhibit nonreciprocal properties. The ferromagnetic material in the reduced height waveguides of the bifurcated waveguide is preferably in the form of ferromagnetic strips which are secured to the outer broadwalls of the bifurcated guides and which are cooled by cooling tubes running along the outside of the broadwalls.

35 Claims, 5 Drawing Sheets



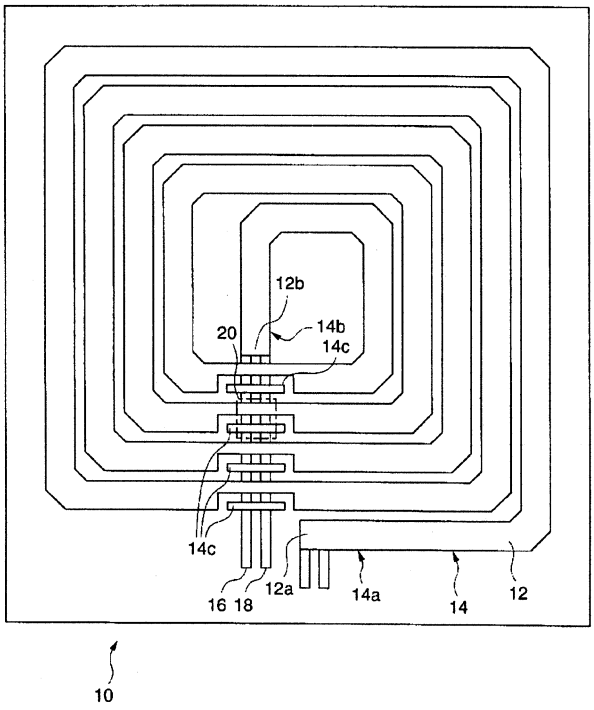
6,407,647 June 18, 2002

INTEGRATED BROADSIDE COUPLED TRANSMISSION LINE ELEMENT

Inventors: Thomas R. Apel and Richard L. Campbell.
Assignee: TriQuint Semiconductor, Inc.
Filed: January 23, 2001.

***Abstract*—**A novel broadside-coupled transmission line element is disclosed. The element includes a first metallization layer that has a first spiral-shaped transmission line and at least one bridge segment formed therein. The element also includes a second metallization layer that has a second spiral-shaped transmission line and connector segments formed therein. The connector segments provide respective electrical conduction paths between the inner area of the first and second transmission lines and the outer area of the first and second transmission lines. A first one of the connector segments is electrically connected to the inner terminus of the second transmission line. The second transmission line has a gap at each intersection with the connector segments. A dielectric layer lies between the first and second metallization layers. The dielectric layer has a plurality of apertures formed therein for providing electrical connections between the second transmission line and the bridge segment(s) of the first metallization layer, and for providing an electrical connection between the inner terminus of the first transmission line and a second one of the connector segments. The element is realized in an integrated circuit environment, and may be used to create various circuit elements such as baluns, balanced and unbalanced transformers and current and voltage inverters for operation at high frequencies.

14 Claims, 7 Drawing Sheets



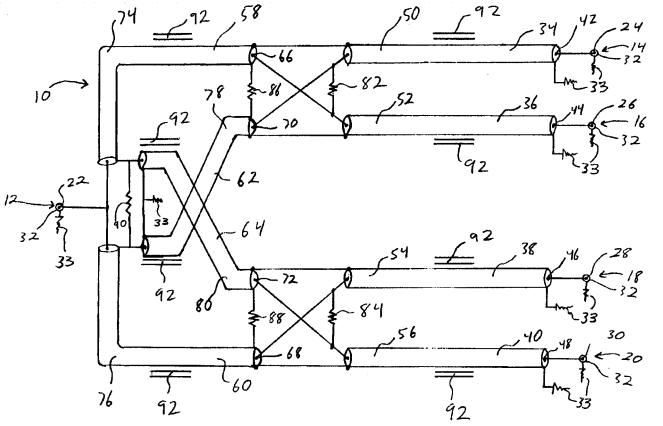
6,407,648 June 18, 2002

FOUR-WAY NON-DIRECTIONAL POWER COMBINER

Inventor: Joseph M. Johnson.
Assignee: Werlatone, Inc.
Filed: November 15, 1999.

***Abstract*—**A four-way nondirectional power combiner employing cascaded 2 : 1 impedance step-up and step-down hybrid two-way combiners such that the use of additional impedance matching transformers is not required is disclosed. Unlike prior art combiners, the combiner disclosed employs a simple design which requires as few as eight transmission lines and four even mode impedance inhibitors, which may comprise ferrite cores. The nondirectional signal combiner utilizes the inherent impedance transformation characteristics of a hybrid circuit in a four-way combiner, thereby eliminating the need for impedance matching transformers, and wherein the step-up and step-down hybrid circuits are interconnected in a balanced arrangement, thereby eliminating transmission line sections resulting in a shorter signal path with reduced losses from input to output.

24 Claims, 3 Drawing Sheets



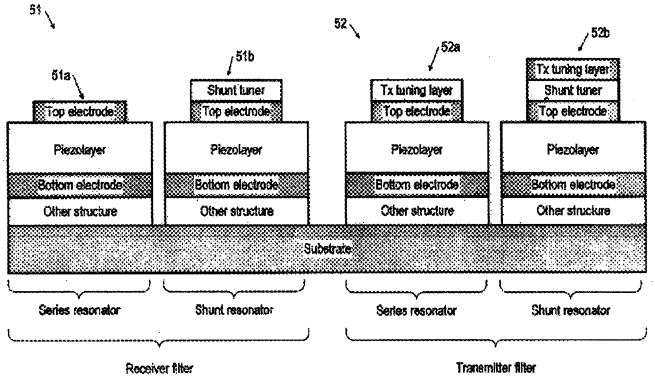
6,407,649 June 18, 2002

MONOLITHIC FBAR DUPLEXER AND METHOD OF MAKING THE SAME

Inventors: Pasi Tikka, Juha Ellä, and Jyrki Kaitila.
Assignee: Nokia Corporation.
Filed: January 5, 2001.

***Abstract*—**A monolithic bulk acoustic wave (BAW) duplexer, and a method for fabricating same, the duplexer having a, transmitter section as a first component filter and a receiver section as a second component filter, both component filters fabricated on a single substrate and both including at least one shunt BAW resonator and one series BAW resonator, each BAW resonator including a resonator section atop an isolation structure provided so as to separate the resonator section from the substrate, including: a patterned bottom electrode material for use as the bottom electrode of each of the resonators of the duplexer; a patterned piezoelectric material for use as the piezolayer of each of the resonators of the duplexer; a patterned top electrode material for use as the top electrode of each of the resonators of the duplexer; a tuning layer for the shunt resonator of each of the two component duplexer filters; and a tuning layer for both the series and shunt resonators of one of the two component duplexer filters. In some applications, each isolation structure is an acoustic mirror. Also in some applications, the duplexer further includes at least one planar spiral inductor provided in the course of depositing one or another layer of material in building up the duplexer, the planar spiral inductor having coils spiraling outward substantially in a plane from an innermost coil to an outermost coil.

10 Claims, 10 Drawing Sheets



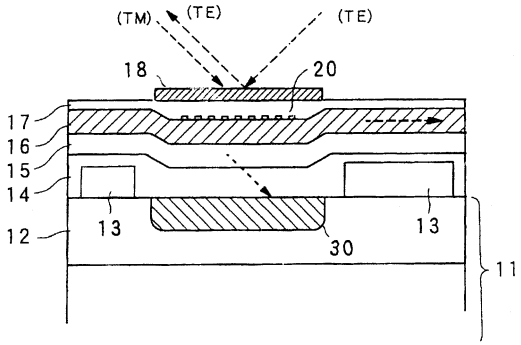
6,408,116 June 18, 2002

LIGHT GUIDE PATH ELEMENT AND OPTICAL PICKUP

Inventor: Masataka Izawa.
Assignee: Pioneer Corporation.
Filed: February 14, 2000.

***Abstract*—**The light beam emitted by the light source is irradiated on the information storage medium via the optical system. The reflected light beam is irradiated by the light guide path element. Then by the grating, a part of the light beam is input-coupled with the waveguide layer while the remaining part is transmitted and received by the light receiving portion below. An adjustment is made such that the coupling efficiency to the waveguide layer by the first grating pattern is maximized when the relative distance between the information storage medium and the optical system increases, and the coupling efficiency to the waveguide layer by the second grating pattern is maximized when the relative distance between the information storage medium and the optical system decreases. In the light receiving portion, divided according to the respective grating patterns, the received light quantity becomes minimum when the respective coupling efficiencies are maximum.

8 Claims, 9 Drawing Sheets



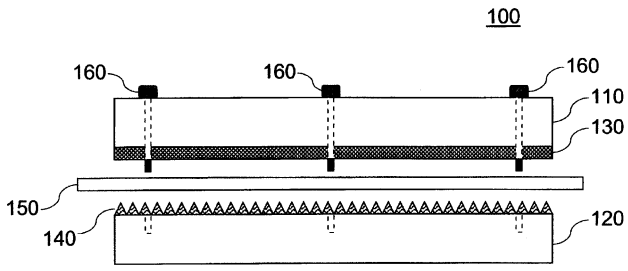
6,408,117 June 18, 2002

MECHANICALLY INDUCED LONG PERIOD OPTICAL FIBER GRATINGS

Inventor: Linn Frederick Mollenauer.
Assignee: Lucent Technologies, Inc.
Filed: April 5, 2000.

***Abstract*—**By urging an ordinary single-mode (usually dispersion-shifted) fiber into an external, long period mechanical grating, a highly wavelength-selective coupling between the fiber's guiding mode and a cladding mode is induced. A sequence of such induced gratings, all on the same fiber, can be used to create a many tens of nm wide loss band of arbitrary shape, with resolution of 3 nm or better, whose strength at any wavelength can be continuously adjusted from zero to −17 dB or more. With its simplicity, nearly zero background loss, and especially, with its potential for continual readjustment, the device is ideal for dynamic gain equalization of optical amplifiers.

12 Claims, 12 Drawing Sheets



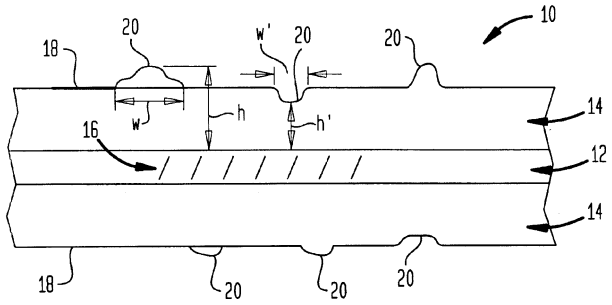
6,408,118 June 18, 2002

OPTICAL WAVEGUIDE GRATINGS HAVING ROUGHENED CLADDING FOR REDUCED SHORT WAVELENGTH CLADDING MODE LOSS

Inventors: Ashish Ahuja, Benjamin John Eggleton, Jon W. Engelberth, Arturo Hale, Glen Robert Kowach, Sharad Ramanathan, Steven Herbert Simon, and Paul Stephen Westbrook.
Assignee: Agere Systems Guardian Corp.
Filed: August 25, 2000.

***Abstract*—**In accordance with the invention, an optical waveguide comprising a longitudinally extending core housing an optical grating and a cladding layer peripherally surrounding the core, is provided with an outer surface of the cladding layer having one or more perturbations. Each perturbation has a height with respect to the core that varies by at least 0.1 times a Bragg wavelength of the grating over the surface of the perturbation and covers an extent of the outer surface whose linear dimensions are less than 1 cm. The perturbations suppress cladding mode spectra and reduce short wavelength cladding mode loss.

21 Claims, 11 Drawing Sheets



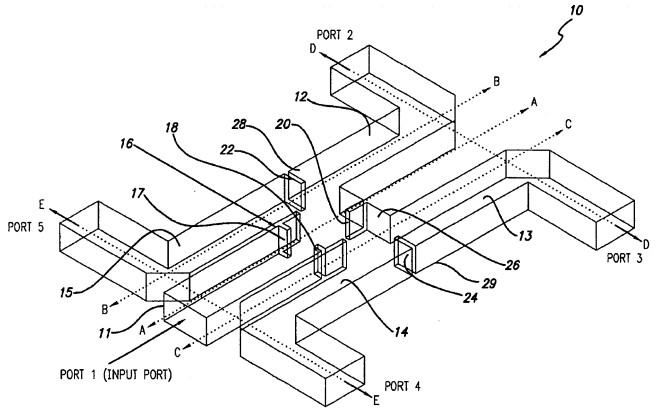
6,411,174 June 25, 2002

COMPACT FOUR-WAY WAVEGUIDE POWER DIVIDER

Inventors: David D. Crouch, Vincent Giancola, and Kenneth W. Brown.
Assignee: Raytheon Company.
Filed: June 14, 2000.

***Abstract*—**A compact four-way waveguide power divider (**10**). The inventive power divider (**10**) includes an input waveguide (**11**) that terminates at a junction with two adjacent waveguides on opposite sides of the input waveguide. On the opposite side of the junction is a conducting wall into which is built an inductive septum (**20**). The inductive septum (**20**) serves to partially match the input impedance of the structure. Second and third inductive septums (**22** and **24**) are also built into the output arms of the power divider (**10**). The purpose of the second and third septums (**22** and **24**) is twofold. In addition to partially matching the power divider's input impedance, the positions of the second and third septums (**22** and **24**) can be adjusted to equalize the power division between the output arms. Hence, the waves exiting the four output arms of the power divider have highly equalized amplitudes and phases. Further, the phases at the output ports are equalized by adjusting the lengths of the output arms. The use of offset inductive septums (**22** and **24**) in the output arms to achieve equalized power division allows the input and output waveguides to be placed in very close proximity, resulting in an extremely compact structure.

27 Claims, 5 Drawing Sheets



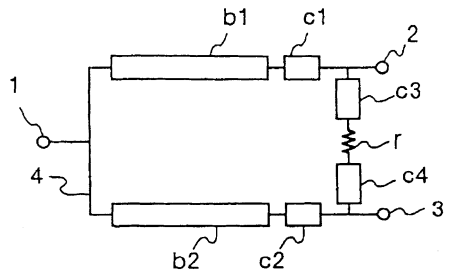
6,411,175 June 25, 2002

POWER DISTRIBUTION/SYNTHESIS APPARATUS

Inventors: Satoru Sugawara and Koji Mizuno.
Assignee: Ricoh Company, Ltd.
Filed: December 3, 1999.

***Abstract*—**In a power divider/combiner, two quarter wavelength lines are connected to a first I/O terminal. A first transmission line is connected between the other end of one of the quarter wavelength lines and one of the second I/O terminals, a second transmission line is connected between the other end of the remaining quarter wavelength line and the remaining second I/O terminal, a third transmission line is connected between an absorption resistor and the one of the second I/O terminals, and a forth transmission line is connected between the absorption resistor and the remaining second I/O terminal. Assuming that the characteristic impedance at the I/O terminals is $Z0$, the characteristic impedance of each of the four transmission lines is set to $\sqrt{2} \cdot Z0$.

6 Claims, 8 Drawing Sheets



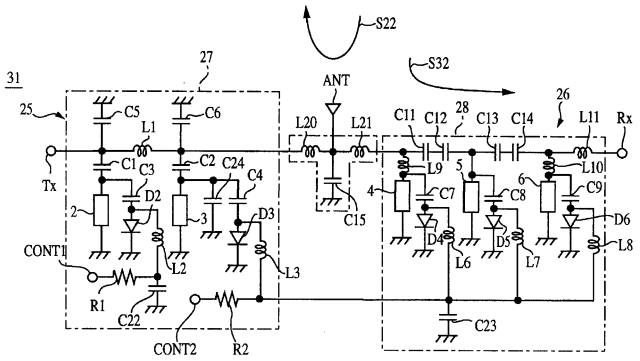
6,411,176 June 25, 2002

VOLTAGE-CONTROLLED DUPLEXER AND COMMUNICATION APPARATUS

Inventors: Masayuki Atokawa and Kikuo Tsunoda.
Assignee: Murata Manufacturing Co., Ltd.
Filed: June 5, 2000.

***Abstract*—**There is disclosed a duplexer comprising: a first external terminal; a second external terminal; an antenna terminal; a first frequency variable filter electrically connected between the first external terminal and the antenna terminal, and composed of at least one resonator and a reactance element electrically connected to the resonator and capable of being voltage-controlled; a second frequency variable filter electrically connected between the second external terminal and the antenna terminal, and composed of at least one resonator and a reactance element electrically connected to the resonator and capable of being voltage-controlled; the predetermined reactance element of the first frequency variable filter being in the on state when the reactance element of the second frequency variable filter is in the on state.

8 Claims, 9 Drawing Sheets



6,411,177 June 25, 2002

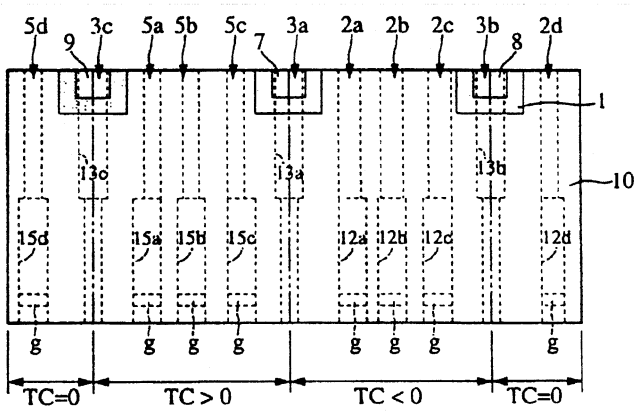
DIELECTRIC FILTER, DIELECTRIC DUPLEXER, AND COMMUNICATION APPARATUS

Inventors: Hitoshi Tada, Hideyuki Kato, and Motoharu Hiroshima.
Assignee: Murata Manufacturing Co., Ltd.
Filed: January 28, 2000.

***Abstract*—**There is disclosed a dielectric filter comprising: an attenuation band in proximity to a pass band; a threshold-frequency position of a determined maximum insertion loss being arranged close to a shoulder portion of a waveform exhibiting pass characteristics in which insertion losses increase in a region from the pass band to the attenuation band; temperature characteristics of a dielectric material being determined in such a manner that the shoulder portion moves toward the attenuation-band direction according to an increase and decrease in temperature.

In the above dielectric filter, the deterioration of insertion-loss characteristics with respect to temperature changes is improved so that good characteristics are exhibited over a wide range of temperatures.

9 Claims, 10 Drawing Sheets



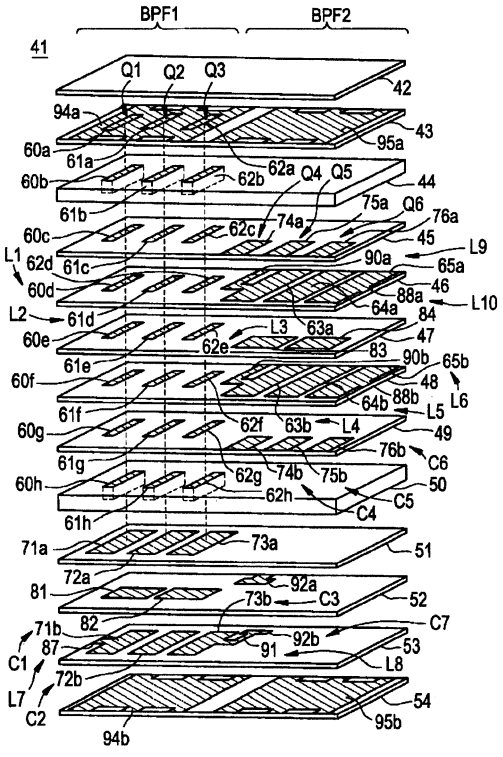
6,411,178 June 25, 2002

MULTI-LAYER COMPOSITE ELECTRONIC COMPONENT

Inventors: Sadayuki Matsumura, Noboru Kato, and Hiroko Nomura.
Assignee: Murata Manufacturing Co., Ltd.
Filed: August 23, 2000.

***Abstract*—**A compact multi-layer composite electronic component is such that electric couplings occurring between a plurality of high-frequency circuits are reduced. In this compact multi-layer composite electronic component, the axes of the inductors of LC resonators defining a first band pass filter circuit (BPF **1**) are disposed substantially perpendicularly to the axes of the inductors of LC resonators defining a second band pass filter circuit (BPF **2**). The inductors of the LC resonators defining the BPF **1** are constituted by joining via-holes disposed on insulating sheets. The inductors of the LC resonators defining the BPF **2** are constituted of inductor patterns provided on the surfaces of specific ones of the insulating sheets.

22 Claims, 6 Drawing Sheets



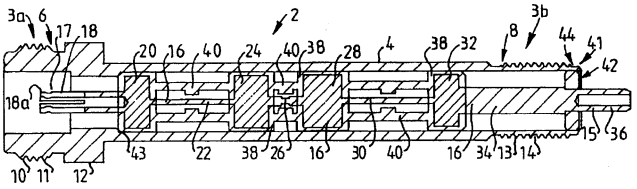
6,411,180 June 25, 2002

FILTER

Inventors: Uno Henningsson, Patrik Lindell, and Patrik Lustig.
Assignee: Telefonaktiebolaget LM Ericsson (publ.).
Filed: April 14, 2000.

***Abstract*—**A filter includes a first end, a second end, a conducting casing, at least one central conductor, and connecting devices at each of the ends, the casing extending along an imaginary axis and intended to accommodate the conductor along this imaginary axis. The conductor is provided with capacitance generating portions and inductance generating portions. The connecting device at the first end of the filter includes a first connecting member connected to the casing and a second connecting member connected to the conductor, and the connecting device at the second end of the filter includes a third connecting member connected to the casing and a fourth connecting member connected to the conductor. Both the second and the fourth connecting members are provided integrally with the conductor.

16 Claims, 2 Drawing Sheets



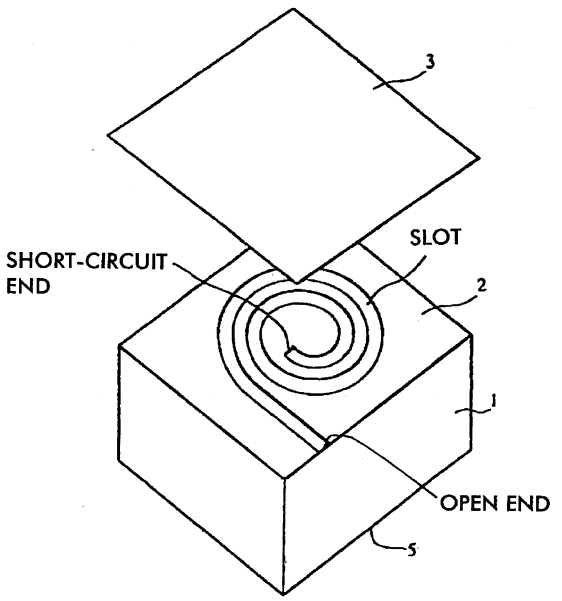
6,411,181 June 25, 2002

DIELECTRIC RESONATOR, INDUCTOR, CAPACITOR, DIELECTRIC FILTER, OSCILLATOR, AND COMMUNICATION DEVICE

Inventors: Yohei Ishikawa, Kenichi Iio, Hiroaki Tanaka, and Yutaka Ida.
Assignee: Murata Manufacturing Co., Ltd.
Filed: February 23, 2000.

***Abstract*—**A dielectric resonator includes a slot line constructed by providing a slot electrode having a spiral slot at either an external face of a dielectric layer or inside the dielectric layer and a shielding conductor provided at a predetermined distance from the slot electrode. The slot line is employed as a resonant line so as to provide a dielectric resonator, an inductor, a capacitor, a dielectric filter, an oscillator, and/or a communication device.

12 Claims, 13 Drawing Sheets



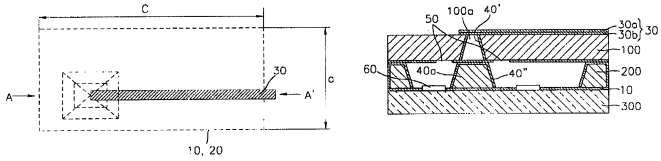
6,411,182 June 25, 2002

CAVITY RESONATOR FOR REDUCING PHASE NOISE OF VOLTAGE CONTROLLED OSCILLATOR AND METHOD FOR FABRICATING THE SAME

Inventors: Cimoo Song, Chungwoo Kim, Seokjin Kang, Insang Song, Yongwoo Kwon, and Changyul Cheon.
Assignee: Samsung Electronics Co., Ltd.
Filed: March 31, 2000.

***Abstract*—**A cavity resonator for reducing the phase noise of microwaves or millimeter waves output from a monolithic microwave integrated circuit (MMIC) voltage controlled oscillator (VCO) by using silicon (Si) or a compound semiconductor and a micro electro mechanical system (MEMS), and a method for fabricating the cavity resonator are provided. In the cavity resonator, instead of a conventional metal cavity, a cavity, obtained by finely processing silicon or a compound semiconductor, is coupled to a microstrip line to allow the cavity resonator to be adopted in a reflection type voltage controlled oscillator. A pole is provided to connect the edge of the microstrip line to a predetermined location of a cavity lower thin film. A coupling slot is formed by removing a predetermined width of a cavity upper thin film adjacent to the pole which comes in contact with the cavity upper thin film. A resistive thin film for impedance matching is formed around the cavity lower thin film which comes in contact with the pole. Consequently, the cavity resonator reduces the phase noise of microwaves or millimeter waves which are output from a voltage controlled oscillator.

11 Claims, 5 Drawing Sheets



6,411,748 June 25, 2002

WIDE TUNING RANGE ACOUSTO-OPTICAL FIBER BRAGG GRATING FILTER (FBGF)

Inventor: Lawrence E. Foltzer.
Assignee: Alcatel USA Sourcing, L.P.
Filed: July 17, 2000.

***Abstract*—**An acousto-optical filter having a wide tuning range and a method of making the same. An acoustic transducer is provided for generating an acoustic pressure wave of a selected frequency that is propagated longitudinally along an optical fiber member. The pressure wave generates a plurality of alternating localized compressions and rarefactions in the optical fiber such that a grating (i.e., periodic changes in the fiber's refractive index) is created therein. The grating reflects optical signals of a particular wavelength depending upon its period or pitch (i.e., Bragg resonance wavelength). The acoustic pressure wave's frequency is modulated by controlling the acoustic transducer such that a variable grating pitch is obtained, thereby causing a corresponding change in the Bragg resonance wavelength of the grating. In response, a reflected optical signal selected from incoming multiplexed optical signals tunes to a different wavelength. A closed-loop controller is provided for controlling input signals to the acoustic transducer/actuator so as to modulate the tuning of the reflected optical signals.

22 Claims, 4 Drawing Sheets