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.

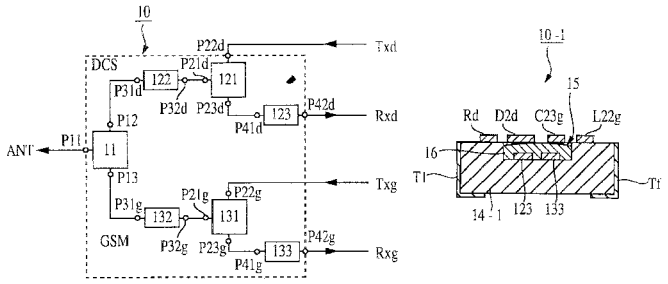
6,445,262 Sep. 3, 2002

COMPOSITE HIGH FREQUENCY COMPONENT AND MOBILE COMMUNICATION APPARATUS INCORPORATING THE SAME

Inventors: Koji Tanaka, Koji Furutani, Takahiro Watanabe, Hideki Muto, Takanori Uejima, and Norio Nakajima.
Assignee: Murata Manufacturing Co., Ltd.
Filed: Sep. 28, 2000.

***Abstract*—**A composite high frequency component and a mobile communication apparatus incorporating the same which needs no matching circuits and can easily be miniaturized. The composite high frequency component is constituted of a diplexer, high frequency switches, high frequency filters, and surface acoustic wave filters. The diplexer is formed by first inductors and first capacitors. The high frequency switches are formed by diodes, second inductors, and second capacitors. The high frequency filters are formed by third inductors and third capacitors.

7 Claims, 7 Drawing Sheets



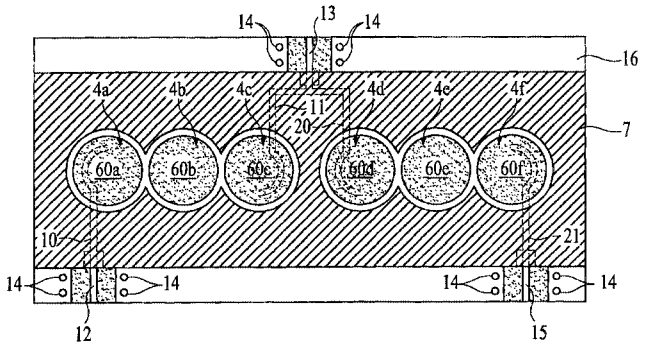
6,445,263 Sep. 3,2002

DIELECTRIC RESONATOR, DIELECTRIC FILTER. DUPLEXER, AND COMMUNICATION DEVICE

Inventors: Tomiya Sonoda, Toshiro Hiratsuka, Yutaka Ida, Shigeyuki Mikami, and Kiyoshi Kanagawa.
Assignee: Murata Manufacturing Co., Ltd.
Filed: May 8, 2000.

***Abstract*—**The invention provides, a dielectric resonator for example in the TE010 mode characterized in that electrodes are formed on both principal surfaces of a dielectric plate in such a manner that influence of spurious waves propagating in a space between the electrodes and a conductive plate is prevented thus preventing the reduction in Qo and degradation in the attenuation characteristic in the frequency ranges outside the passband. The inner diameter of the cavity is selected such that when the cavity is regarded as a waveguide the cutoff frequency of the waveguide becomes higher than the resonant frequency of a resonance region and such that the inner diameter of the cavity is greater than a nonelectrode part.

8 Claims, 12 Drawing Sheets



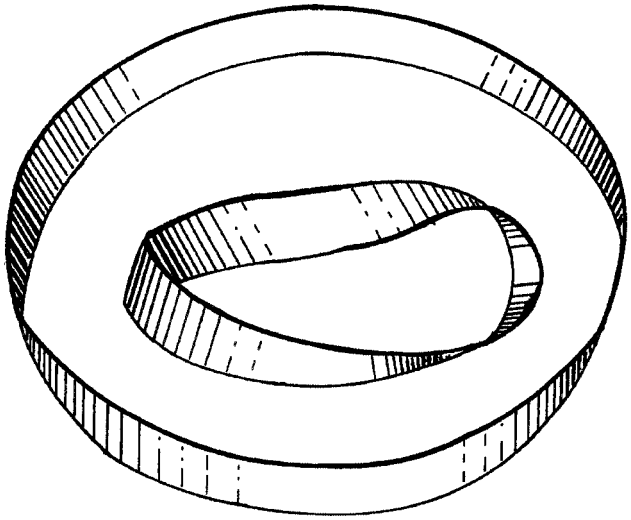
6,445,264 Sep. 3, 2002

MOBIUS RESONATOR AND FILTER

Inventor: Jeffrey M. Pond
Assignee: The United States of America as represented by the Secretary of the Navy
Filed: Jun. 9, 2000.

***Abstract*—**An electromagnetic resonator and a frequency filter. The resonator is composed of an electromagnetic waveguiding structure which is twisted along its axis while being bent back and the two ends connected smoothly to provide a smooth path to the electromagnetic wave, the twist providing additional phase shift to facilitate a resonant condition in a smaller volume. The filter includes one or more coupled resonators which are coupled in a controlled fashion to an external circuit to realize a desired frequency selectivity.

13 Claims, 4 Drawing Sheets



Digital Object Identifier 10.1109/LMWC.2003.810557

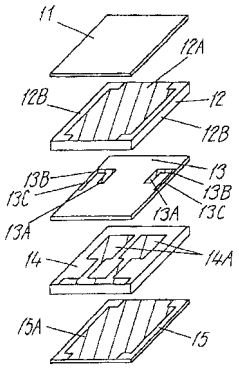
6,445,266 Sep. 3, 2002

MULTILAYER FILTER HAVING VARIED DIELECTRIC CONSTANT REGIONS

Inventors: Yoshitaka Nagatomi, Naoki Yuda, Toshio Ishizaki, Shoichi Kitazawa, and Toru Yamada.
Assignee: Matsushita Electric Industrial Co., Ltd.
Filed: Oct. 25, 2001.

***Abstract*—**A small multilayer filter, in which a phase shifter may be constituted without increasing overall size of the filter. The overall size may be reduced without deteriorating the characteristics. Above the open end of a plurality of strip lines **4**A provided on a dielectric layer **4**, a coupling sector **3**A of input/output pattern is placed to face it with a dielectric layer **3** interposed. An inductance L**1**, L**2** is formed by connecting a side electrode **7**A, **7**B with a continuity sector **3**B of input/output pattern; and said side electrode **7**A, **7**B with an input electrode **8**A, output electrode **8**B, respectively, by means of an electrode pattern **5**A.

3 Claims, 12 Drawing Sheets



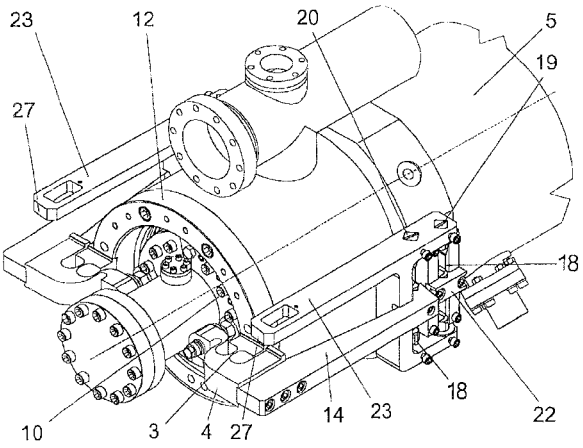
6,445,267 Sep. 3, 2002

TUNER FOR CAVITY RESONATOR

Inventor: Juergen Stephan
Assignee: Forschungszentrum Rossendorf e.V.
Filed: Jun. 8, 2000.

***Abstract*—**It is an object of the invention to propose a mechanical gearing for a tuner for cavity resonators, which can be realized and operated in a less expensive version and with long service life and little backlash even at very low temperatures. At the same time, there is no piezoelectnc or magnetostrictive driving mechanisms or their combinations with coarse driving mechanisms. The tuner includes a multistage lever mechanism, for which the fulcrum and the movable connecting site are integral and are connected over a narrow cross member. The connecting sites between the stages of the multi-stage lever mechanism are constructed as a bolt-shaped part, the ends of which are firmly connected with one stage and the middle part of which is connected with the other stage.

18 Claims, 5 Drawing Sheets



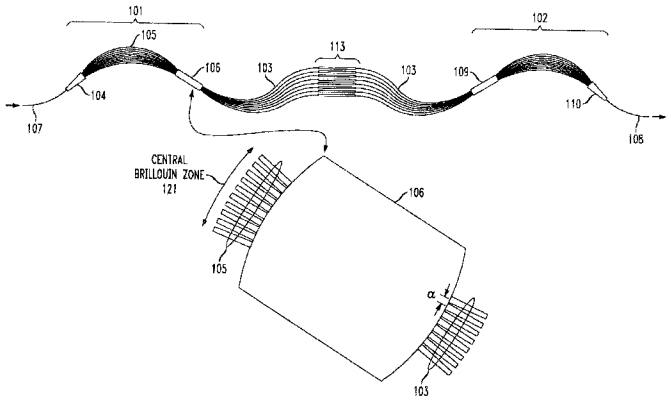
6,445,847 Sep. 3, 2002

APPARATUS AND METHOD FOR ACHIEVING A SMOOTH SPECTRAL RESPONSE OPTICAL FILTER

Inventor: Christopher Richard Doerr
Assignee: Lucent Technologies Inc.
Filed: Oct. 28, 1999.

***Abstract*—**A design technique minimizes the loss and ripple in the spectral response of an optical filter formed using a pair of gratings connected by an array of optical elements. This filter can be, for example, two waveguide grating routers (WGRs) connected by an array of waveguides. Each WGR includes two star couplers connected by waveguide grating arms. The smoothest spectral response is achieved for a given set of connecting waveguides, by choosing the number of grating arms less than or equal to filling the star coupler central Brillouin zone made by the set of connecting waveguides resulting in the connecting waveguides neither substantially over- or under-sampling the optical spectrum from the waveguide gratings. Exactly filling the Brillouin zone with the grating arms minimizes the loss, and so is the preferred choice.

16 Claims, 5 Drawing Sheets



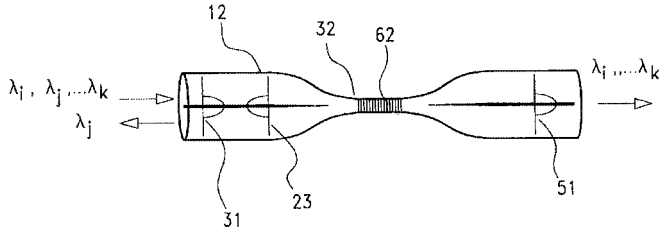
6,445,851 Sep. 3, 2002

TAPERED FIBER GRATINGS AND APPLICATIONS

Inventors: George A. Rakuijic and Anthony S. Kewitsch.
Assignee: Arroyo Optics Inc.
Filed: Dec. 15, 1999.

***Abstract*—**Optical filter devices in accordance with the invention are based on tapered optical fibers having transversely distributed refractive index variations in a small diameter waist region where waves are propagated in combined cladding air-guided modes. The grating has a periodicity selected for reflection of a selected center wavelength and the waist diameter and grating pattern split the wavelengths of the lossy cladding modes from the backreflected signals by more than 10 nm. Such wavelength selective optical fiber devices have a variety of applications. In one application, a tapered fiber grating with optical circulators is used to add or drop optical signals for communication via a common transmission path. In another application, the tapered fiber grating is used with grating assisted mode couplers and circulators to form an add/drop multiplexer. In another application, these components are used with optical switches to produce programmable add/drop filters and crossconnects.

8 Claims, 7 Drawing Sheets



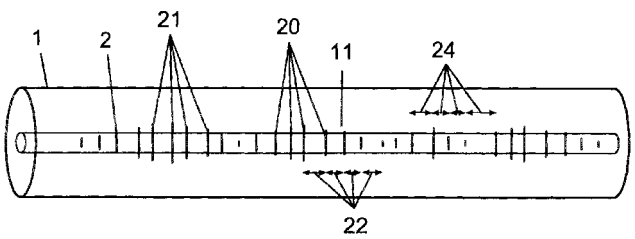
6,445,852 Sep. 3, 2002

OPTICAL FIBER GRATING

Inventors: Ricardo Feced, Michael Nickolaos Zervas, and Michael Kevan Durkin.
Assignee: University of Southampton
Filed: Aug. 1, 2000.

***Abstract*—**Methods and apparatus for creating a Bragg grating in an optical waveguide having an optical fiber on which the Bragg grating is defined, the Bragg grating having an actual response which closely approximates a desired response. The Bragg grating comprises a plurality of lines, each line being defined by a respective strength, and each line having a relative displacement from adjacent lines. The Bragg grating is designed using a serial iterative response. The serial iterative process can be used to calculate the strength and the line spacing of at least some of the lines. The serial iterative process can further be a function of a coupling function, which is a function of the strength and line spacing of the lines of the grating. A moving window can be used to limit the number of reflections in the impulse response which is used to calculate the next serial line spacing. The serial iterative process can further be a function of the group velocity of light in the optical fiber, the reflectivity of the grating, and the dispersion response of the grating.

23 Claims, 22 Drawing Sheets



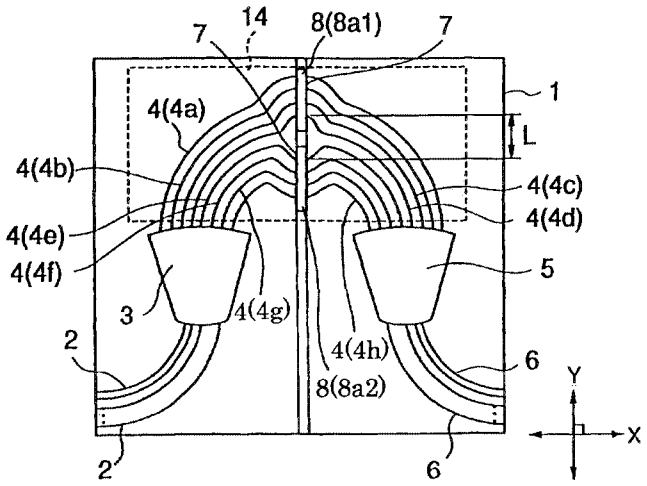
6,445,853 Sep. 3, 2002

ARRAYED WAVEGUTDE GRATING

Inventors: Kazuhisa Kashihara, Takeshi Nakajima, and Tsunetoshi Saito.
Assignee: The Furukawa Electric Co., Ltd.
Filed: Sep. 13, 2000.

***Abstract*—**An arrayed waveguide grating comprise at least two half-wavelength plates **8*a*1** and **8*a*2** crossing the center in the length direction of the plurality of arrayed waveguides **4** disposed in series in the vertical direction of the arrayed waveguides **4**. By these half-wavelength plates **8*a*1** and **8*a*2**, a polarization mode conversion part to convert the TE mode and TM mode of signal beams to be transmitted through the arrayed waveguides **4** is formed. The arrayed waveguides **4** are divided into a group of arrayed waveguides **4** crossed by the half-wavelength plate **8*a*1** and a group of arrayed waveguides **4** crossed by the half-wavelength plate **8*a*2**.

4 Claims, 3 Drawing Sheets



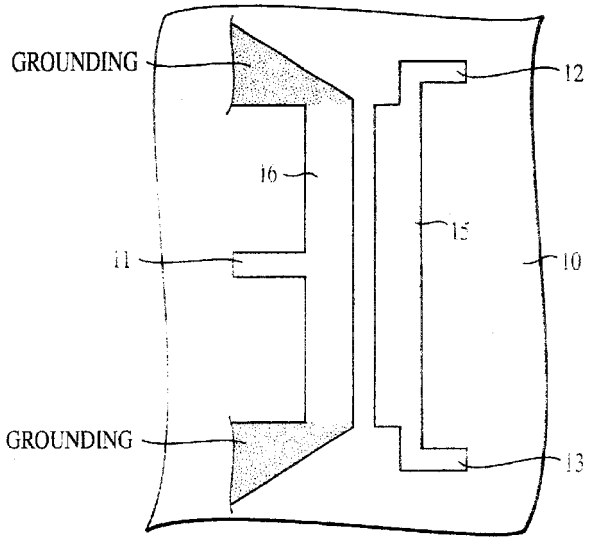
6,448,864 Sep, 10, 2002

BALANCED-UNBALANCED CONVERTING CIRCUIT, BALANCED-UNBALANCED CONVERTER, AND COMMUNICATION DEVICE INCLUDING THE SAME

Inventors: Motoharu Hiroshima, Shohachi Nishijima, and Hideyuki Kato.
Assignee: Murata Manufacturing Co., Ltd.
Filed: Nov. 16, 2000.

***Abstract*—**Inner conductor formation holes having inner conductors formed on the inner walls thereof are formed in a dielectric block. Both of the ends of one of the inner conductors are open and led out as terminal electrodes which function as balanced ports. Both of the ends of another inner conductor are connected to an outer conductor to be grounded, and the center portion of the inner conductor between the ends is led out as a terminal electrode which functions as an unbalanced port. The circuit can also be realized with striplines or microstriplines on a dielectric substrate. Thus, a balanced-unbalanced converter having these terminal electrodes as balanced and unbalanced ports is formed.

9 Claims, 7 Drawing Sheets



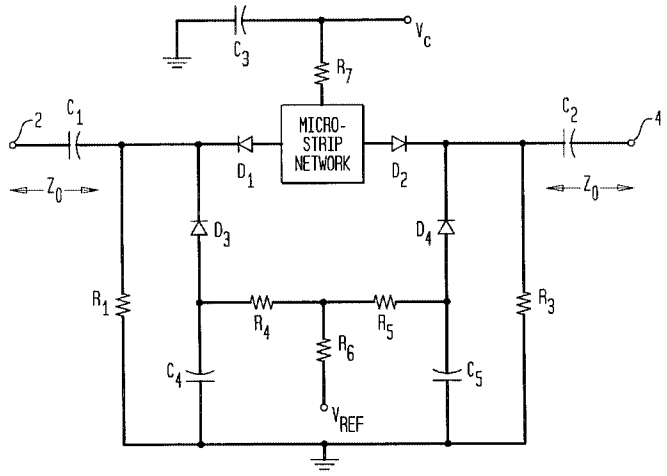
6,448,867 Sep. 10, 2002

HIGH FREQUENCY VOLTAGE VARIABLE ATTENUATOR

Inventor: Michael Gordon Kossor
Assignee: Lucent Technologies Inc.
Filed: Jul. 25, 2000.

***Abstract*—**The attenuator has a microstrip network connected between an input and an output of the attenuator, and the microstrip network has a different impedance than a remainder of the attenuator.

13 Claims, 3 Drawing Sheets



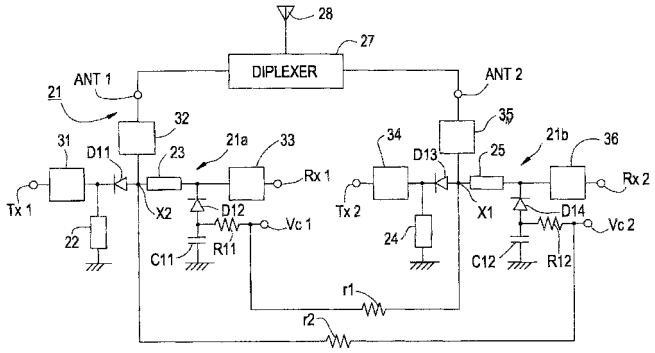
6,448,868 Sep. 10, 2002

HIGH-FREQUENCY SWITCH

Inventors: Mitsuhide Kato and Hideki Muto.
Assignee: Murata Manufacturing Co., Ltd.
Filed: Jan. 17, 2001.

***Abstract*—**A high-ftequency switch having a greatly reduced occurrence of high harmonic signals includes first and second switches, and each of these two switches includes two diodes and two transmission lines. Besides, one of the two voltage control terminals is connected, via a resistor, to the intermediate connection point between the anode of one of the two diodes of the first switch and one of the two transmission lines of the first switch. The other of the voltage control terminals is connected, via another resistor, to the intermediate connection point between the anode of one of the two diodes of the second switch and one of the two transmission lines of the second switch.

17 Claims, 14 Drawing Sheets



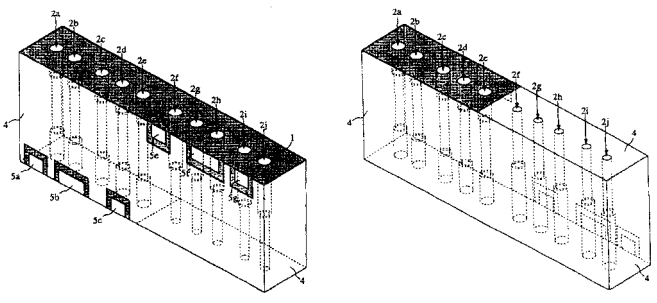
6,448,870 Sep. 10, 2002

DIELECTRIC FILTER, DIELECTRIC DUPLEXER, AND COMMUNICATION APPARATUS USING THE SAME FOREIGN PATENT DOCUMENTS

Inventors: Motoharu Hiroshima, Shohachi Nishijima, Hideyuki Kato, and Kikuo Tsunoda.
Assignee: Murata Manufacturing Co., Ltd.
Filed: May 26, 2000.

***Abstract*—**A dielectric filter and a dielectric duplexer adapted to two frequency bands formed by using a single component are disclose, in addition to a communication apparatus using the same. In this case, since a dielectric block used as the single component can be easily molded and grasped, production efficiency can be enhanced. The dielectric duplexer adaptable to two frequency bands is formed by disposing inner-conductor-formed holes acting as $\lambda/2$ resonators and $\lambda/4$ resonators in the single dielectric block.

15 Claims, 8 Drawing Sheets



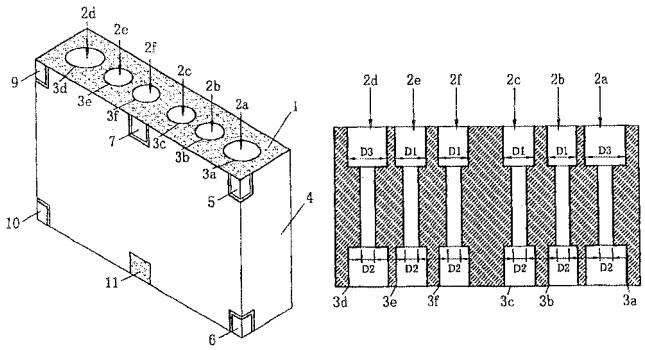
6,448,871 Sep. 10, 2002

DIELECTRIC FILTER, DIELECTRIC DUPLEXER, AND COMMUNICATION APPARATUS

Inventors: Motoharu Hiroshima and Hideyuki Kato.
Assignee: Murata Manufacturing Co., Ltd.
Filed: Aug. 14, 2001.

***Abstract*—**A dielectric filter which corrects the mismatch of the resonance frequencies of resonators formed by internal conductors between a balanced terminal side and an unbalanced terminal side of the filter, and which is capable of easily obtaining a predetermined external coupling capacitance. Also, a dielectric duplexer, and a communication apparatus having the filter are obtained. Inside a dielectric block, a plurality of internal-conductor holes have different cross-sectional sizes, in which both ends thereof are open and internal conductors are formed on the inner surfaces. Also, the outer surface of the dielectric block is formed with an external conductor over four surfaces, but not on the opening surfaces of both ends of the internal-conductor holes. A pair of balanced terminals are coupled to the ends of one of the internal conductors, and an unbalanced terminal is coupled to one of the end portions of another internal conductor. An external-conductor-removed section may also be formed in a portion in the vicinity of the end portion of the other internal conductor. In this manner, the dielectric filter is formed.

10 Claims, 7 Drawing Sheets



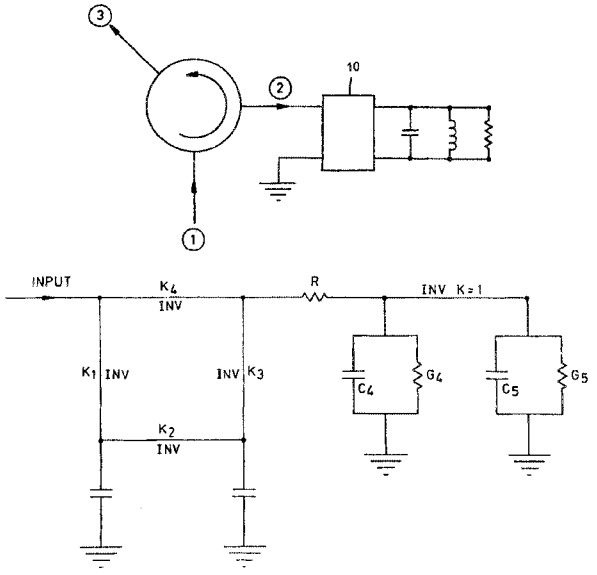
6,448,872 Sep. 10, 2002

REFLECTION-MODE FILTER AND METHOD WITH A CONSTANT LOSS OFFSET

Inventors: John Rhodes and Ian Hunter.
Assignee: Filtronic PLC
Filed: Feb. 28, 2001.

***Abstract*—**A method of producing filters using lower unloaded Q factor components than filters with the same performance characteristics but requiring higher unloaded Q factor components is disclosed. The method includes the steps of defining a desired filter characteristic and applying an algorithm which provides a filter having infinite Q factor elements and having a theoretical characteristic corresponding to the desired characteristic transformed to a compensate for the difference between finite Q factor and infinite Q factor elements.

15 ClaIms, 8 Drawing Sheets



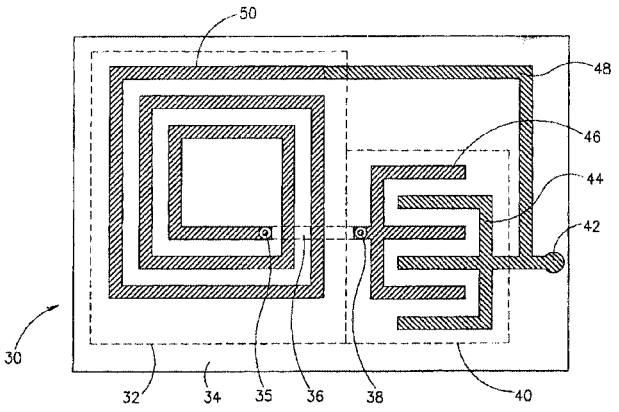
6,448,873 Sep. 10, 2002

LC FILTER WITH SUSPENDED PRINTED INDUCTOR AND COMPENSATING INTERDIGITAL CAPACITOR

Inventor: Alexander Mostov
Assignee: Texas Instruments Incorporated
Filed: Apr. 4, 2000.

***Abstract*—**A suspended printed inductor (SPI) connected in parallel to a suspended interdigital capacitor (SIC) so as to form a parallel resonant circuit that is nearly independent of variations in PCB etching tolerances. This combination of SPI and SIC functions to resonate at a center frequency and with similar parallel resonant circuits can be used to form RF filters having any desired order. Using the parallel resonant combination of SPI and SIC, a RF filter can be constructed whose electrical properties are nearly insensitive to variations in PCB parameters and etch processing. The sensitivity of the spiral suspended printed inductor in combination with the suspended printed interdigital capacitor to PCB parameters such as dielectric constant and PCB height is greatly reduced. Further, the parallel combination of suspended printed spiral inductor and suspended interdigital capacitor is nearly insensitive to PCB etching tolerances. SPI's and SIC's are characterized by the absence of a ground plane. Low cost RF filters can be formed over any suitable substrate material, such as a dielectric substrate, with greatly reduced effects on filter performance due to the variations in PCB height, trace width and PCB material.

31 Claims, 6 Drawing Sheets



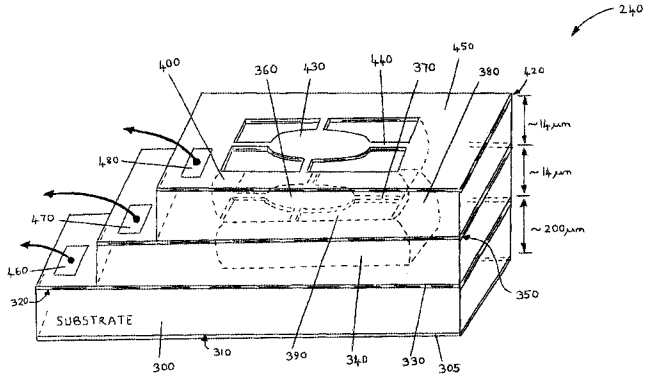
6,449,403 Sep. 10, 2002

WAVELENGTH SELECTIVE OPTICAL FILTER

Inventors: Rosemary Cush, William J Stewart, and Ruth Hibberson.
Assignee: Marconi Communications Limited
Filed: Dec. 11, 2000.

***Abstract*—**The present invention provides a wavelength selective optical filter device **(240)** for receiving input radiation and outputting corresponding filtered output radiation, characterized in that the filter device **(240)** includes a plurality of at least partially mutually coupled Fabry-Perot optical resonators **(330, 340, 360; 360, 400, 430)** for filtering the input radiation to generate the output radiation, the filter device **(240)** being tunable from a first radiation wavelength to a second radiation wavelength by mutually detuning the resonators in a period where the resonators are being returned from the first wavelength (λ_1) to the second wavelength (λ_2) so that the filter device **(240)** is substantially in a non-responsive state during the period. The resonators incorporate freely suspended mirrors **(360, 430)** which are electrostatically actuated to affect tuning of the resonators **(330, 340, 360; 360, 400, 430)**. The filter device **(240)** is thereby capable of tuning between different wavelengths without tuning through wavelengths there between. The filter device **(240)** can be included into an add-drop filter **(10)** for providing channel add and drop functions when the filter **(10)** is incorporated in a multichannel **WDM** communication system **(100)**.

31 Claims, 9 Drawing Sheets



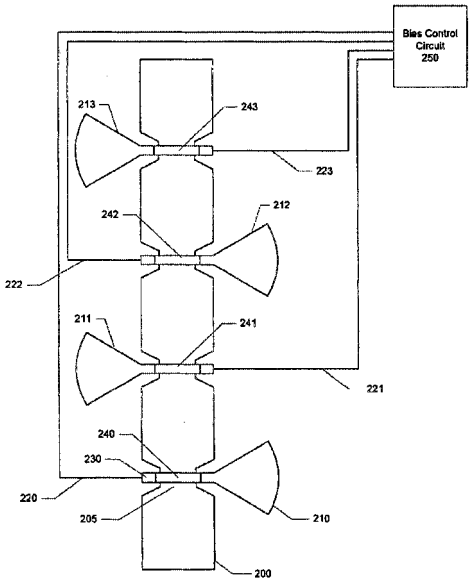
6,452,465 Sep. 17, 2002

HIGH QUALITY-FACTOR TUNABLE RESONATOR

Inventors: Andrew Brown and Gabriel Rebeiz.
Assignee: M-Squared Filters, LLC,
Filed: Jun. 27, 2000.

***Abstract*—**A high quality-factor, tunable radio frequency or microwave resonator is disclosed. The resonator includes one or more microelectromechanical switches positioned along its length. The switches are comprised of metal membrane bridges spanning the microstrip resonator. The bridges are connected to radial stubs that comprise reactive loads. An electrostatic potential differential between the bridge and microstrip resonator causes the bridge to collapse, thereby coupling a radial stub to the microstrip. The imposition of the reactive loads on the resonator causes the resonant frequency to change. Multiple resonators employed in a filter configuration can be variably coupled using microelectromechanical bridges that engage or disengage capacitive air gaps between two microstrip lines, to control filter bandwidth over wide tuning ranges.

14 Claims, 6 Drawing Sheets



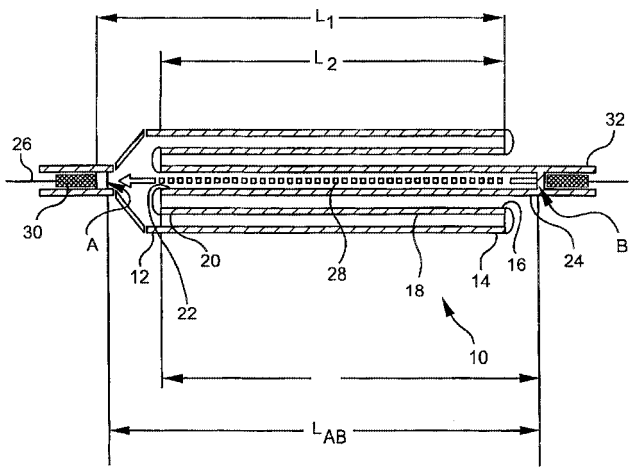
6,453,092 Sep. 17, 2002

TEMPERATURE COMPENSATED OPTICAL DEVICE

Inventor: Jackson P. Trentelman
Assignee: Corning Incorporated
Filed: Dec. 22, 2000.

***Abstract*—**A package for temperature compensating a Bragg grating region of an optical waveguide fiber. The package includes a first tubular member having a low coefficient of thermal expansion attached to the optical fiber. A second tubular member, having a coefficient of thermal expansion greater than that of the first tubular member, is attached to the first tubular member. A third tubular member, having the same coefficient of thermal expansion as the first tubular member has one end attached to the optical waveguide fiber and the other end is attached to the second tubular member. The three tubular members are coaxial with one another and the Bragg grating region is encapsulated by the package.

14 Claims, 8 Drawing Sheets



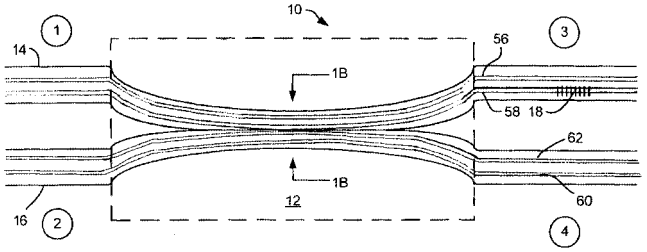
6,453,094 Sep. 17, 2002

ALL FIBER DWDM MULTIPLEXER AND DEMULTIPLEXER

Inventor: Chaoyu Yue
Assignee: Keystone Fiberoptics Inc.
Filed: Feb. 1, 2001.

***Abstract*—**A dense wavelength division multiplexing (DWDM) filter includes an optical fiber coupling device, having at least one multiple core optical fiber fusion coupled to a second optical fiber, and a dual core fiber grating. According to an especially preferred embodiment of the invention, two multiple core fibers are used with each multiple core fiber having a first core with a first effective index of refraction and a first propagation constant and a second core with a second effective index of refraction and a second propagation constant. Such an arrangement ensures a close match in effective index and propagation constant between the respective second cores. The first and second multiple core fibers are aligned and fused together such that the second core of the first multiple core fiber is in sufficient proximity to the second core of the second multiple core fiber as to obtain overlapping mode fields and efficient coupling of propagating optical signals there between, while the first core of the first multiple core fiber is sufficiently separated from the first core of the second multiple core fiber as to obtain weak or substantially no coupling of propagating optical signals there between. Accordingly, any signals propagating along the first core of the first fiber experience only very low loss, on the order of 0.2 dB. The dual core fiber grating provides wavelength selectivity to accommodate either wavelength addition or wavelength subtraction, depending upon whether a multiplexing or demultiplexing functionality is desired.

20 Claims, 5 Drawing Sheets



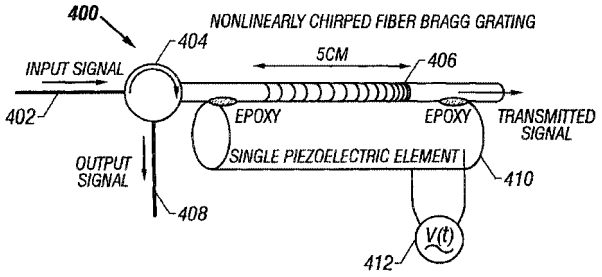
6,453,095 Sep. 17, 2002

TUNING OF OPTICAL DISPERSION BY USING A TUNABLE FIBER BRAGG GRATING

Inventors: Kai-Ming Feng, Jin-Xing Cai, Alan E. Whiner, Victor Grubsky, Dmitry Starodubov, and Jack Feinberg.
Assignee: University of Southern California
Filed: Apr. 6, 2001.

***Abstract*—**Techniques and devices based on a wave-guiding element which has a spatial grating pattern that is an oscillatory variation along its optic axis. The wave-guiding element is configured to receive an input optical signal and to produce an output optical signal by reflection within a Bragg reflection band produced by the spatial grating pattern so as to produce time delays of different reflected spectral components as a nonlinear function of spatial positions along said optic axis at which the different reflected spectral components are respectively reflected. Such a wave-guiding element may be a nonlinearly chirped fiber grating A control unit may be engaged to the wave-guiding element and is operable to change a property of the spatial grating pattern along the optic axis to tune at least relative time delays of the different reflected spectral components nonlinearly with respect to wavelength.

74 Claims, 24 Drawing Sheets



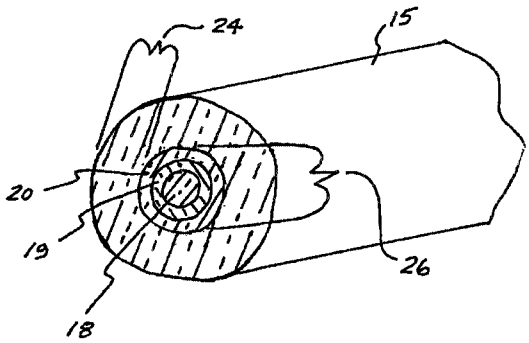
6,453,102 Sep. 17, 2002

DISPERSION COMPENSATING MODULE AND MODE CONVERTER, COUPLER AND DISPERSION COMPENSATING OPTICAL WAVEGUIDE THEREN

Inventors: Liang Dong, Gang Qi, and David L. Weidman.
Assignee: Corning Incorporated
Filed: Jul. 20, 2000.

***Abstract*—**A dispersion compensating module, mode converter, coupler and dispersion compensated optical fiber therein. The dispersion compensating fiber has a plurality of core segments, the refractive index profile being selected to exhibit properties such that an LP_{02} mode at 1550 nm may be propagated a distance (generally 0.5–3.0 km), upon conversion to LP_{02}, to compensate for dispersion of a length of transmission waveguide preferably greater than 25 km propagating in an LP_{01} mode. In another embodiment, the dispersion compensating module has a mode converter having a reflective fiber grating for converting a first to a second mode interconnected to a dispersion compensated fiber propagating in the second mode. The mode converter has a coupler adapted to operatively couple light propagating in a first mode from a first fiber into a second, and a reflective fiber grating operatively coupled to the second fiber; the grating being capable of converting light from the first into the second mode. According to another embodiment, an optical fiber coupler is provided having a first fiber with a first propagation constant in a first mode, and a second fiber within the coupler having a second propagation constant, the second fiber including a necked-down portion which is formed prior to fusion of the fibers, the necked-down portion being formed such that the local propagation constant of the second fiber substantially matches the first propagation constant thereby enhancing first mode coupling.

37 Claims, 8 Drawing Sheets



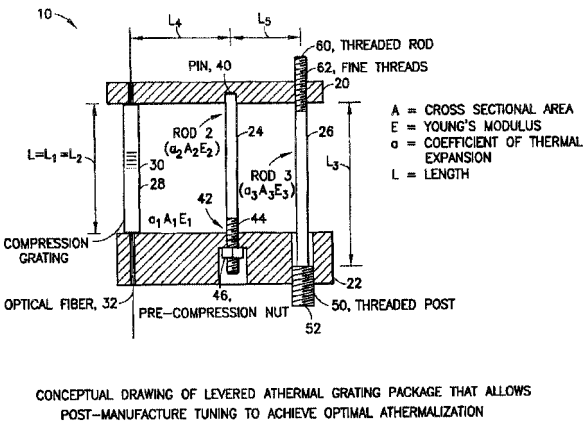
6,453,108 Sep. 17, 2002

ATHERMAL BRAGG GRATING PACKAGE WITH COURSE AND FINE MECHANICAL TUNING

Inventor: James S. Sirkis
Assignee: CIDRA Corporation
Filed: Sep. 30, 2000.

***Abstract*—**An athermal grating design has a Bragg grating unit and a lever arrangement. In operation, the Bragg grating unit responds to an optical signal, a change of temperature and a lever force for offsetting thermally-induced changes in the Bragg grating unit, for providing a grating signal that does not change in relation to change of temperature. The lever arrangement responds to a change of temperature, for providing the level force to the grating to compensate for the change in the temperature. The Bragg grating unit includes a large diameter waveguide cane structure. The lever arrangement may include a top plate, a bottom plate, a lever arm pivotally coupled between the top plate and the bottom plate, and a rod coupled between the top plate and the bottom plate on one side of the lever arm. The Bragg grating unit is arranged between the top plate and the bottom plate on another side of the lever arm. The level arm and the rod have different coefficients of expansion.

13 Claims, 4 Drawing Sheets



CONCEPTUAL DRAWING OF LEVERED ATHERMAL GRATING PACKAGE THAT ALLOWS POST-MANUFACTURE TUNING TO ACHIEVE OPTIMAL ATHERMALIZATION

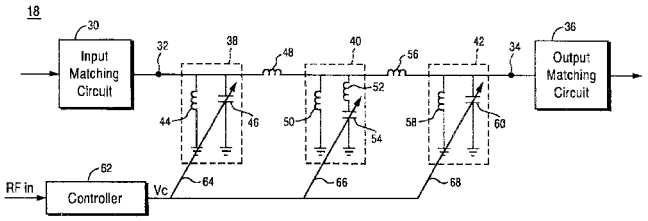
6,453,157 Sep. 17, 2002

RADIO FREQUENCY TRACKING FILTER

Inventor: Gerald E. Roberts
Assignee: Ericsson Inc.
Filed: Mar. 23, 2000.

***Abstract*—**A passive bandpass tracking filter tracks the frequency of an RF input signal received within a radio receiver's tracking range of RF frequencies. The bandpass filter includes parallel inductor and capacitor circuits connected in shunt between the input and output filter ports. A tracking control signal is selectively applied to change the capacitance of the LC circuits in order to shift the filter's frequency characteristics/profile as the filter tracks through the tracking band. The filter attenuates half-IF, receiver IF, and image spurious signals. In particular, the filter substantially attenuates the image spurious signal throughout the tracking frequency range by 50 dB or more below the filter output signal level. The filter also attenuates the half-IF spurious signal throughout the tracking frequency range by well over 10 dB or more below the filter output signal level. The receiver IF spurious signal is attenuated about 40 dB. The bandpass tracking filter has both a low insertion loss of about 5.0 dB or less and a substantially constant insertion loss variance at the RF receive frequency of about 1 dB or less over the entire tracking frequency range.

29 Claims, 5 Drawing Sheets



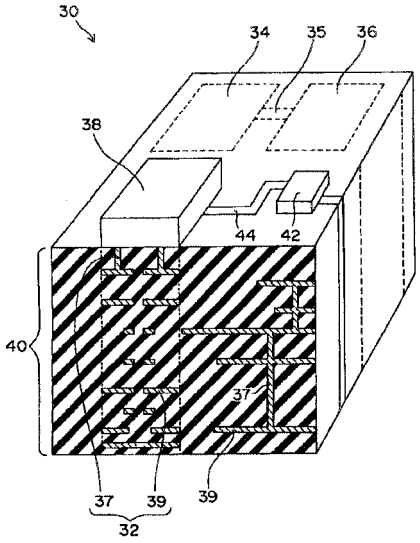
6,456,172 Sep. 24, 2002

MULTILAYERED CERAMIC RE DEVICE

Inventors: Toshio Ishizaki, Torts Yamada, Hiroshi Kagata, and Makoto Sekakura.
Assignee: Matsushita Electric Industrial Co., Ltd.
Filed: Oct. 20, 2000.

***Abstract*—**A multilayered ceramic RF device having at least one radio frequency filter includes a low temperature-cofired multi-layered ceramic body having a plurality of ceramic layers laminated one upon another and fired together. The low temperature-cofired multilayered ceramic body also has a first electrode pattern formed therein and a second electrode pattern formed thereon. The first and second electrode patterns are electrically connected to one another through a via hole. A bare semiconductor chip is mounted on the low temperature-cofired multilayered ceramic body with a face down bonding, and the bare semiconductor chip is coated with a sealing resin. The at least one radio frequency filter is a multilayered filter formed in the low temperature-cofired multilayered ceramic body, and the multilayered filter includes a part of the first and second electrode patterns.

23 Claims, 12 Drawing Sheets



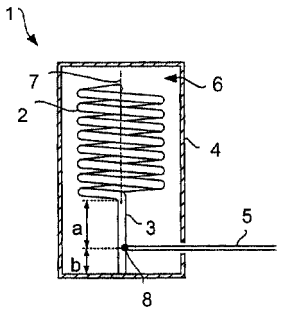
6,456,175 Sep. 24, 2002

HELICAL AND COAXIAL RESONATOR COMBINATION

Inventor: Marko Kivelä
Assignee: Nokia Networks Oy
Filed: Apr. 21, 1999.

***Abstract*—**The present invention relates to a resonator assembly **(1)** comprising a helix resonator **(2)** consisting of a conductor wound as a cylindrical coil, and a housing **(4)** at least partly made conductive material and enveloping the helix resonator. In order to provide a resonator assembly with a better Q factor without the resonator assembly consequently significantly increasing in size, the conductor forming the cylindrical coil **(2)** continues as a straight conductor part **(3)**, which extends from the cylindrical coil **(2)** substantially in the direction of the longitudinal axis **(7)** of the cylindrical coil, whereby said straight part constitutes a coaxial resonator. Further, a housing **(4)** envelopes the resonator formed by a combination of the helix resonator **(2)** and the coaxial resonator **(3)**.

4 Claims, 1 Drawing Sheet



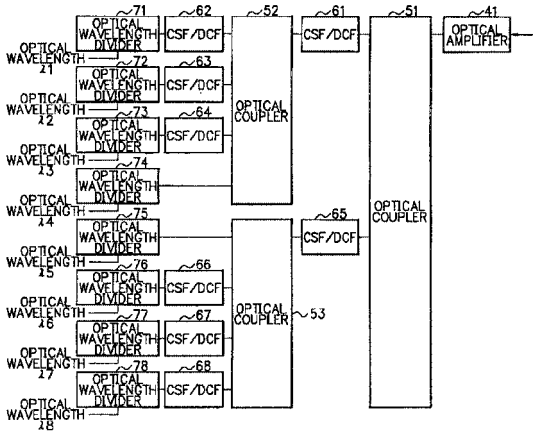
6,456,755 Sep. 24, 2002

OPTICAL WAVELENGTH DIVISION MULTIPLEX SYSTEM AND METHOD THEREOF

Inventor: Yukio Sonoda
Assignee: NEC Corporation
Filed: Feb. 17, 2000.

***Abstract*—**An optical wavelength division multiplex (WDM) system and an optical WDM method, in which a trouble in one optical wavelength divider does not influence the other optical wavelength multiplexed signals to be divided, are provided. An inputted optical wavelength multiplexed signal branches into "n" optical wavelength mutilplexed signals at a first optical coupler. After cutoff shifted or dispersion compensation operation is performed for the branching optical wavelength multiplexed signals, the performed optical wavelength multiplexed signals are inputted to second and third optical couplers respectively. The "n" optical wavelength multiplexed signals inputted to the second and third optical couplers are outputted to "n" optical coupler dividers via cutoff shifted or dispersion compensation fibers (CSF/DCFs) or directly from the second and third optical couplers. At each of the "n" optical wavelength dividers, a required optical wavelength signal is extracted and the extracted optical wavelength signal is outputted respectively. By connecting the optical coupler to the optical wavelength dividers, and making one optical wavelength multiplexed signal and one optical wavelength divider a pair respectively, the optical wavelength dividing processes between one optical wavelength signal outputted from one optical wavelength divider and the other optical wavelength signals outputted from the other optical wavelength dividers become independent with each other. As a result, even when a trouble occurs at one optical wavelength divider in which one optical wavelength is extracted, the one optical wavelength is suffered by the trouble and causes abnormal communication, and the deterioration of the communication quality for the other optical wavelength signals can be prevented.

8 Claims, 2 Drawing Sheets



6,456,763 Sep. 24, 2002

ARRAYED WAVEGUIDE GRATING TYPE OPTICAL MULTIPLEXER/DEMULTIPLEXER AND A METHOD OF MANUFACTURING THE SAME

Inventors: Kazuhisa Kashihara, Kazutaka Nara, and Yoshinobu Nekado.
Assignee: The Furukawa Electric Co., Ltd.
Filed: Dec. 22, 2000.

***Abstract*—**An arrayed waveguide grating type optical multiplexer/demultiplexer in which a light transmission central wavelength is independent of temperature. A substrate is formed on a waveguide forming region in which optical input waveguides, a first slab waveguide, an arrayed waveguide including a plurality of channel waveguides that are arranged side by side, a second slab waveguide, and a plurality of optical output waveguides arranged side by side are sequentially connected. Dividing lines are set to divide the first slab waveguide into two by intersecting dividing planes that intersect with a route of light traveling along the first slab waveguide. A position shifting member is fixed so as to be secured in a waveguide forming region at its one end and in a waveguide forming region on its other end. The position shifting member fixes to a base the waveguide forming region on the side of a divided slab waveguide and slides the waveguide forming region on the side of another divided slab waveguide. An arrayed waveguide grating is then divided at the dividing lines, separating the first and second waveguide forming regions from each other.

22 Claims, 13 Drawing Sheets