# 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.

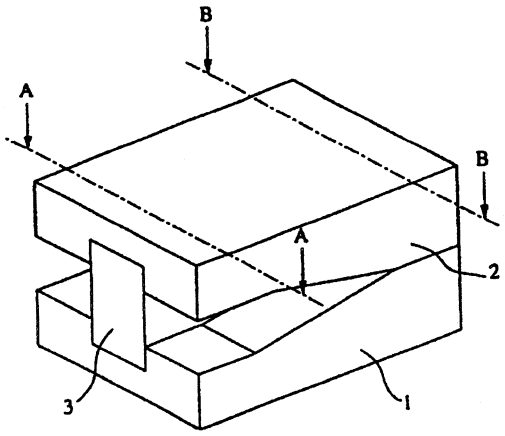
**6,384,694** May 7, 2002

## DIELECTRIC LINE CONVERTER, DIELECTRIC LINE UNIT, DIRECTIONAL COUPLER, HIGH-FREQUENCY CIRCUIT MOBILE, AND TRANSMITTER-RECEIVER

Inventors: Toru Tanizaki, Ikuo Takakuwa, and Atsushi Saitoh.
Assignee: Murata Manufacturing Co., Ltd.
Filed: October 21, 1999.

***Abstract*—**A dielectric line converter which includes a dielectric stripline; an upper conductor surface and a lower conductor surface sandwiching the dielectric stripline; the upper and lower conductor surfaces having a first spacing in a first region along the dielectric stripline so as to form a first-kind dielectric line, a second spacing which is substantially zero in a second region so as to form a second-kind dielectric line, and a third spacing which is less than the first spacing in a line conversion region between the first and second regions. Grooves may be formed in the opposing surfaces of the upper and lower conductor surfaces, and the dielectric stripline may be arranged in the grooves. Impedance matching between the first-kind and second-kind dielectric lines is arranged n the line conversion region. The length of the line conversion portion may be set to be an odd multiple of $\lambda/4$.

**16 Claims, 20 Drawing Sheets**



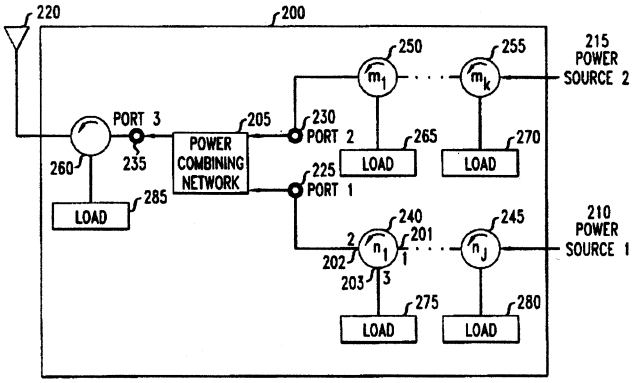

**6,384,695** May 7, 2002

## HIGH POWER COMBINER APPARATUS

Inventors: Elias Bonaventure Kpodzo and Greg Alan Nease.
Assignee: Lucent Technologies, Inc.
Filed: March 8, 1999.

***Abstract*—**A high power combiner arrangement with improved isolation between input ports for high power applications. In particular, in accordance with high power combiner arrangement, power combining logic is combined with a series of isolators such that at least one isolator is inserted between each power source, i.e., a signal source, and a corresponding input port to the power combining logic. The number of isolators inserted is determined as a function of the isolation requirements of the overall application. Advantageously, the degree of isolation achieved by the high power combiner is directly proportional to the number of inserted isolators placed between each power source. Furthermore, the insertion of a number of high power circulators between each power source and the power combing logic facilitates the achievement of higher isolation between the power sources with minimal degradation in signal characteristics.

**33 Claims, 2 Drawing Sheets**




**6,384,699** May 7, 2002

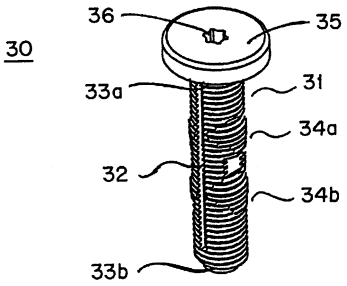
## TUNING ARRANGEMENT FOR A CAVITY FILTER

Inventors: Bo Uno Egon Henningsson, Torbjörn Ahl, and Sven Patrik Lindell.
Assignee: Telefonaktiebolaget LM Ericsson (publ).
Filed: April 13, 2000.

***Abstract*—**The present invention relates to an arrangement in a cavity filter for tuning the frequency relationship of the filter or its coupling coefficient factor. The arrangement includes a self-locking screw that can be fitted in the filter cavity, for instance in the center conductor, in the filter lid, or in some suitable place in the filter chassis. Tuning is effected by adjusting the position of the screw in relation to the center conductor or lid of the cavity filter. The screw can be made of metallic segments embedded in plastic, or made completely of metal, and provided with a radially through-penetrating slot. At least one part of the screw has a cross-sectional area whose extension perpendicular to the through-penetrating slot is slightly greater than in a direction along said slot.

Digital Object Identifier 10.1109/LMWC.2002.806001

**11 Claims, 7 Drawing Sheets**



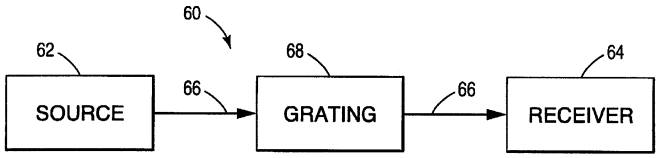

**6,385,368** May 7, 2002

## METHOD AND APPARATUS FOR MODULATING SIGNAL STRENGTH WITHIN OPTICAL SYSTEMS

Inventors: Karl R. Amundson, Todd Christian Haber, Jefferson Lynn Wagener, and Robert Scott Windeler.
Assignee: Lucent Technologies, Inc.
Filed: February 19, 1999.

***Abstract*—**Embodiments of the invention include an optical system apparatus and method for modulating the strength of a grating such as a long period grating (LPG) within optical systems and devices by varying the light transmission and loss characteristics of the cladding mode, rather than varying the effective refractive index of the fiber layers. According to embodiments of the invention, the use of a light-scattering or light absorptive material in the cladding of the optical fiber or other optical energy transmission medium causes the cladding to switch between a first state that effectively allows coherent coupling of cladding modes and a second state that effectively prevents coherent coupling of cladding modes. The light-scattering materials include electro-optic materials that cause the cladding to switch between the first and second states based on the presence (or absence) of an electric field, magneto-optic materials that cause the cladding to switch between the first and second states based on the presence (or absence) of a magnetic field, and materials capable of phase transitions that cause the cladding to switch between the first and second states based on temperature. The light-absorptive materials include dopants that cause the cladding to switch between the first and second states based on the wavelength of the optical energy. Embodiments of the invention differ from conventional optical media in that, according to embodiments of the invention, the cladding mode loss (attenuation) is varied rather than conventional changes in the index of refraction. The magnitude of the loss according to embodiments of the invention depends on the specification arrangements employed, but such loss typically is defined in dB per unit length in the given cladding mode.

**24 Claims, 3 Drawing Sheets**



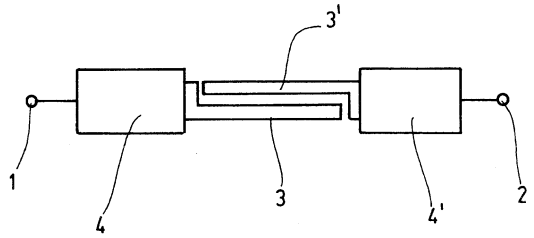

**6,388,538** May 14, 2002

## MICROWAVE COUPLING ELEMENT

Inventor: Thomas Meier.
Assignee: Robert Bosch GmbH.
Filed: November 12, 1999.

***Abstract*—**A microwave coupling element for coupling an input conductor with an output conductor exhibiting a predetermined wave propagation resistance includes a coupling portion interposed between the input and output conductors and including two parallel strip conductors that are galvanically uncoupled from one another. The strip conductors are spaced from each other by a predetermined distance and each has a predetermined width, at least one of the predetermined width and the predetermined distance being up to twice as large as that which would correspond to a minimum mismatch with the input and output connectors. The resulting mismatch is compensated for by at least one transformation connector exhibiting a wave propagation resistance smaller than the predetermined wave propagation resistance.

**11 Claims, 3 Drawing Sheets**



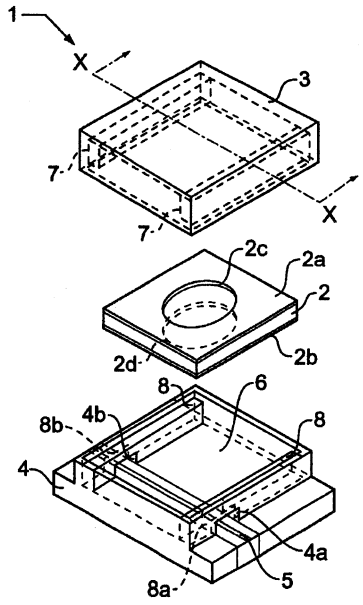

**6,388,541** May 14, 2002

## DIELECTRIC RESONATOR HAVING AN ELECTROMAGNETIC WAVE ABSORBING MEMBER AND APPARATUS INCORPORATING THE DIELECTRIC RESONATOR

Inventors: Toshiro Hiratsuka, Tomiya Sonoda, and Kenichi Iio.
Assignee: Murata Manufacturing Co., Ltd.
Filed: March 25, 1998.

***Abstract*—**There is provided a dielectric resonator which can suppress a spurious output acting as unnecessary resonance and can prevent the out-of-band characteristics of a filter from being degraded. Electrodes having circular openings are formed on a dielectric substrate, and the dielectric substrate is arranged between upper and lower conductive cases. A resonance region is used as a portion between the openings of the dielectric substrate, and columnar members consisting of a wave absorber are arranged between the upper and lower conductive cases.

**10 Claims, 9 Drawing Sheets**



**6,388,542** May 14, 2002

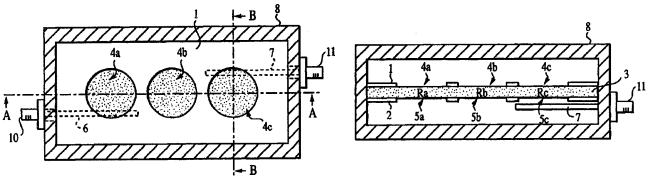
**17 Claims, 10 Drawing Sheets**

## DIELECTRIC FILTER, TRANSMISSION-RECEPTION SHARING UNIT, AND COMMUNICATION DEVICE

Inventors: Toshiro Hiratsuka, Tomiya Sonoda, and Kenichi Iio.
Assignee: Murata Manufacturing Co., Ltd.
Filed: December 29, 2000.

***Abstract*—**A dielectric filter, a transmission-reception shared unit, and a transceiver, which incorporate the filter, are disclosed; in which spurious modes such as HE110 mode, HE210 mode, HE310 mode, etc., can be suppressed so as to improve blocking-band attenuation characteristics. The dielectric filter comprises a dielectric plate; electrodes having electrodeless parts, which are formed on both main surfaces of the dielectric plate so as to form dielectric resonators; and probes disposed parallel to the line along which the dielectric resonators are aligned.

**12 Claims, 13 Drawing Sheets**

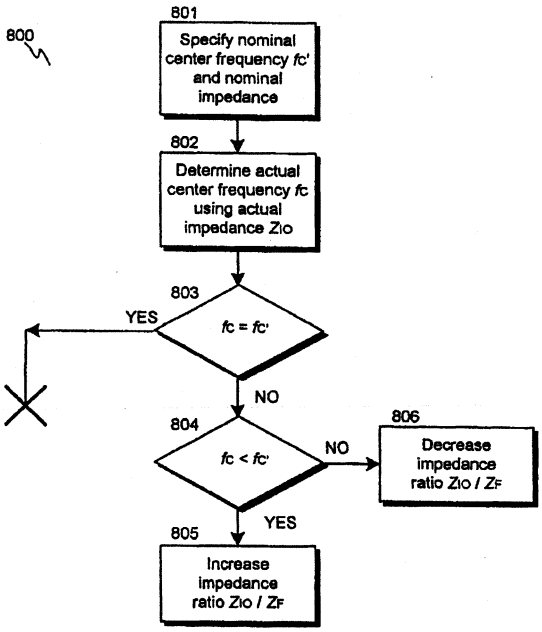



**6,388,544** May 14, 2002

## METHOD FOR ADJUSTING THE CENTER FREQUENCY OF A BALANCED FILTER AND A PLURALITY OF BALANCED FILTERS

Inventor: Juha Ellä.
Assignee: Nokia Mobile Phones Ltd.
Filed: November 22, 2000.

***Abstract*—**Method (**800**) for adjusting the center frequency of a balanced filter comprising at least four resonators, comprises the following steps: specifying (**801**) a nominal center frequency for the balanced filter when connected to a circuitry having a certain nominal impedance; determining (**802**) the actual center frequency of the balanced filter when connected to a circuitry having a certain actual impedance, comparing (**803**, **804**) the actual center frequency of the filter to the nominal one, and adjusting (**805**, **806**) the impedance ratio between the circuitry and the balanced filter within certain limits based on the comparison. A plurality of balanced filters (**1610**, **1620**, **1630**) on a substrate (**1600**) is characterized in that the total area of bulk acoustic wave resonators in the balanced resonators depends on the position of the balanced filter on the substrate. Further, the balanced filters have substantially the same actual center frequency.



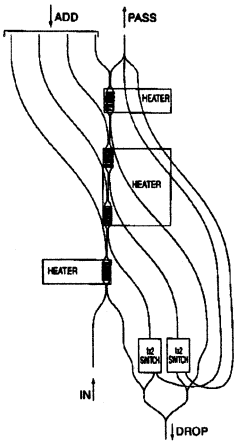

**6,389,199** May 14, 2002

## TUNABLE OPTICAL ADD/DROP MULTIPLEXER

Inventors: Louay Eldada and Robert A. Norwood.
Assignee: Corning Incorporated.
Filed: February 19, 1999.

***Abstract*—**Optical signal devices, wavelength division multiplexer/demultiplexer optical devices, and methods of employing the same in which the core layer includes a grating and is comprised of a material whose refractive index is tuned so that the grating reflects a preselected wavelength of light. A single optical signal device can therefore be used to select a variety of wavelengths for segregation.

**35 Claims, 11 Drawing Sheets**



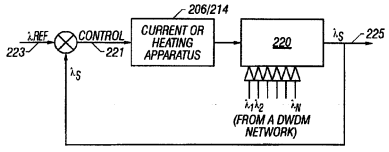
**6,389,200** May 14, 2002

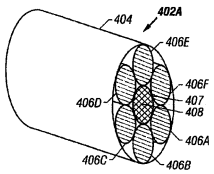
## WIDE TUNING RANGE FIBER BRAGG GRATING FILTER (FBGF) USING MUSCLE WIRE

Inventor: Lawrence E. Foltzer.
Assignee: Alcatel USA Sourcing, L.P.
Filed: December 28, 1999.

***Abstract*—**An optical filter having a wide tuning range and a method of making the same. A fiber Bragg grating member having a selected grating pitch is coupled to a plurality of actuating members such as Shape Memory Alloys. A current source or thermal source is included for providing a controlled amount of current or heat so as to cause a change in the length of the actuating members. The length of the fiber Bragg grating member is accordingly changed also. The grating pitch is correspondingly altered, thereby causing a 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 energy inputs to the actuating members to modulate the tuning of the reflected optical signals.

**25 Claims, 7 Drawing Sheets**



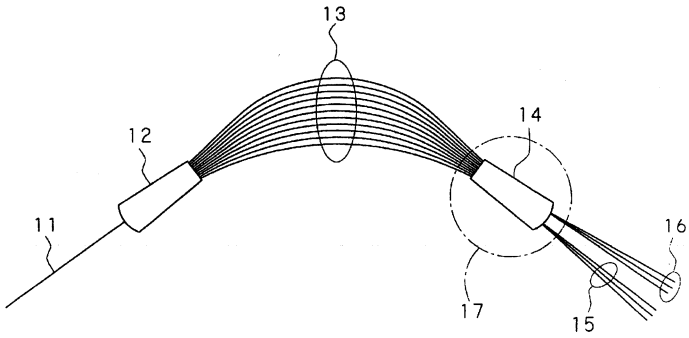

**6,389,201** May 14, 2002

## ARRAYED WAVEGUIDE GRATING HAVING ARRAYED WAVEGUIDE EMPLOYING TAPER STRUCTURE

Inventor: Yutaka Urino.
Assignee: NEC Corporation.
Filed: October 11, 2000.

***Abstract*—**An arrayed waveguide grating for easily changing the ratio of distribution of an optical signal into the main optical signal and the monitored optical signal is disclosed. In the device, an optical signal incident on an input waveguide is input into an arrayed waveguide via an input-side slab waveguide and is divided into main optical signals having different wavelengths in the arrayed waveguide with respect to a diffraction order $\mathrm{m}$ (natural number), and the divided optical signals are transmitted through an output-side slab waveguide and converged on output waveguides. The device has monitoring waveguides for monitoring optical signals having corresponding wavelengths of the main optical signals, where the monitored optical signals are diffracted in the arrayed waveguide with respect to a diffraction order $\mathrm{m}+\mathrm{i}$ or $\mathrm{m}-\mathrm{i}$ ($\mathrm{i}$ is a natural number), and the arrayed waveguide has a taper structure in the vicinity of the joint of the arrayed waveguide and the output-side slab waveguide, in which the width of each waveguide gradually changes along the direction of light transmission so as to adjust the ratio of distribution into the main optical signal and the monitored optical signal.

**6 Claims, 9 Drawing Sheets**



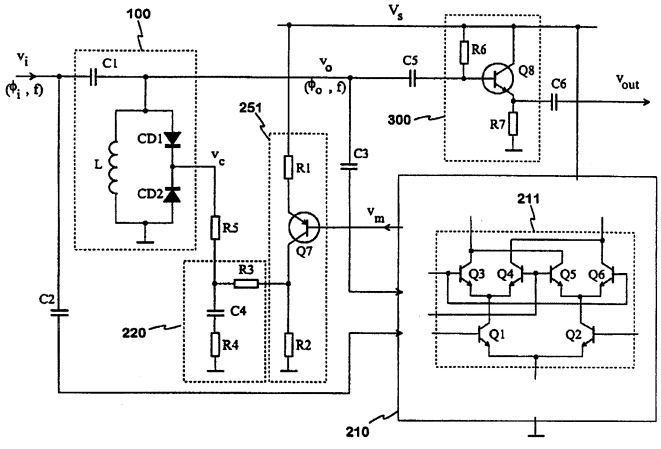

**6,392,501** May 21, 2002

## METHOD AND ARRANGEMENT FOR TUNING A RESONATOR

Inventor: Simo Murtojärvi.
Assignee: Nokia Mobile Phones Ltd.
Filed: April 18, 2000.

***Abstract*—**The invention relates to a bandpass filter that follows the frequency of an input signal especially for reducing the noise on the receive band of mobile communications devices. More specifically the invention relates to a method and arrangement for tuning a resonator (100), where an input signal feeds the resonator in such a manner that the resonator oscillates at, the frequency of the input signal, and where the center frequency of the pass band of the resonator is set substantially to the frequency of the input, signal. In accordance with the invention, there is generated (200) a difference signal ($\mathrm{V}_c$, $\mathrm{V}_e$) proportional to the phase difference ($\Delta\phi$) between the input signal voltage ($\mathrm{V}_i$) and resonator voltage ($\mathrm{V}_o$) and the resonance frequency of the resonator is changed using the difference signal in such a manner that said phase difference becomes smaller. Using the invention, the resonance frequency of the resonator can be set relatively accurately to the input signal frequency because the phase characteristic of the resonator is at its steepest at the resonance frequency, whereby the phase difference detector reacts strongly on even the slightest changes in frequency.

**10 Claims, 3 Drawing Sheets**



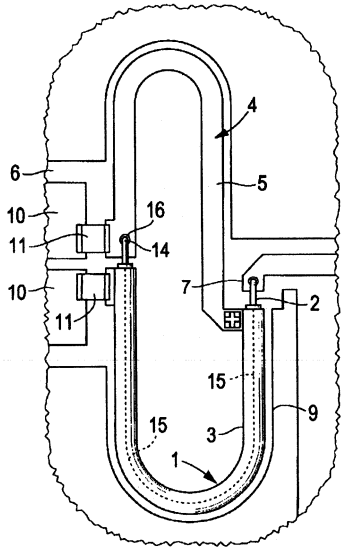
**6,392,502** May 21, 2002

## BALUN ASSEMBLY WITH RELIABLE COAXIAL CONNECTION

Inventors: Richard Emil Sweeney and Glen Brian Rochford.
Assignee: The Whitaker Corporation.
Filed: December 17, 1998.

***Abstract*—**A Balun assembly has a signal conductor (**2**) on the balanced side of a Balun, the signal conductor (**2**) being joined to a microstrip RF launch area 7 on a circuit board 6, the signal conductor (**2**) having a bend of axial orientation for lower cost, reliability, avoiding contact with a ground circuit path (**9**), being more suited for higher volume manufacturing, that distributes thermal expansion and contraction thereof substantially throughout to lessen stress at a junction of the signal conductor (**2**) and the RF launch area (**7**), and the signal conductor (**2**) being of minimum length and of smooth and even curvature to lessen impedance mismatch at the junction.

**5 Claims, 4 Drawing Sheets**



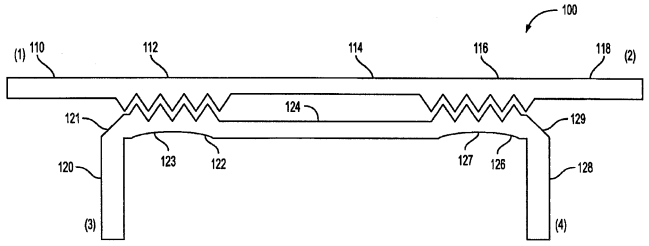

**6,392,503** May 21, 2002

## HALF-SAWTOOTH MICROSTRIP DIRECTIONAL COUPLER

Inventor: William Thornton.
Assignee: Nokia Networks Oy.
Filed: May 9, 2000.

***Abstract*—**A directional coupler includes a main arm and a branch arm. The main arm includes a first main sawtooth section, a second main sawtooth section and a main straight section coupled between the first and second main sawtooth sections. The branch arm includes a first branch sawtooth section and a second branch sawtooth section. The first branch sawtooth section includes a first side and a second side. The first side of the first branch sawtooth section is shaped to include a zig-zag edge and the second side of the first branch sawtooth section is shaped to include a nonstraight edge. The second branch sawtooth section includes a first side and a second side, and the first side of the second branch sawtooth section is shaped to include a zig-zag edge. The zig-zag edge of the first side of the first branch sawtooth section is coupled to the first main sawtooth section, and the zig-zag edge of the first side of the second branch sawtooth section is coupled to the second main sawtooth section. In an alternative embodiment, a method to make a coupler includes steps of fabricating a coupler based on a first pattern, modifying the coupler, measuring a performance parameter of the coupler, and revising the first pattern to make a second pattern for use in making more couplers. The fabricated coupler includes a main arm and a branch arm. The main arm includes a first main sawtooth section, a second main sawtooth section and a main straight section coupled therebetween. The branch arm includes a first branch sawtooth section and a second branch sawtooth section. The first branch sawtooth section includes a first side and a second side wherein the first side of the first branch sawtooth section is shaped to include a zig-zag edge. The second branch sawtooth section includes a first side and a second side wherein the first side of the second branch sawtooth section is shaped to include a zig-zag edge. The zig-zag edge of the first side of the first branch sawtooth section is coupled to the first main sawtooth section, and the zig-zag edge of the first side of the second branch sawtooth section is coupled to the second main sawtooth section.

**7 Claims, 5 Drawing Sheets**



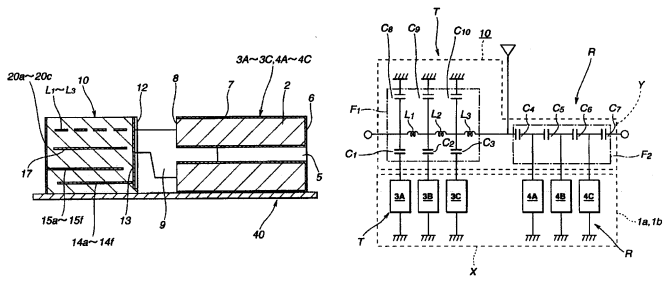

**6,392,505** May 21, 2002

## DIELECTRIC DEVICE

Inventor: Kenji Ito.
Assignee: NGK Spark Plug Co., Ltd.
Filed: September 23, 1999.

***Abstract*—**A dielectric device is provided which comprises a dielectric resonator element having a plurality of resonators arranged in parallel with each other, a multilayer circuit element having conductive patterns constituting a coupling circuit, the conductive patterns being laminated vertically while alternating with dielectric layers, the circuit element being rectangular and having a pair of opposite vertical side surfaces, the coupling circuit having first connecting ends disposed at the first vertical side surface and second connecting ends disposed at the second vertical side surface, a plurality of vertical conduction grooves disposed at the first vertical side surface, the conduction groove having open upper ends and electrically connected to the first connecting ends of the coupling circuit, a plurality of metallic terminal members fitted in respective through holes of the resonators and thereby electrically connected to inner conductors of the resonators while being fitted in the conduction grooves and thereby electrically connected to the first connecting ends of the coupling circuit, and a printed board mounting thereon the resonator element and the circuit element and having external connecting terminals electrically connected to the second connecting ends of the coupling circuit.

**12 Claims, 7 Drawing Sheets**



**6,392,506** May 21, 2002

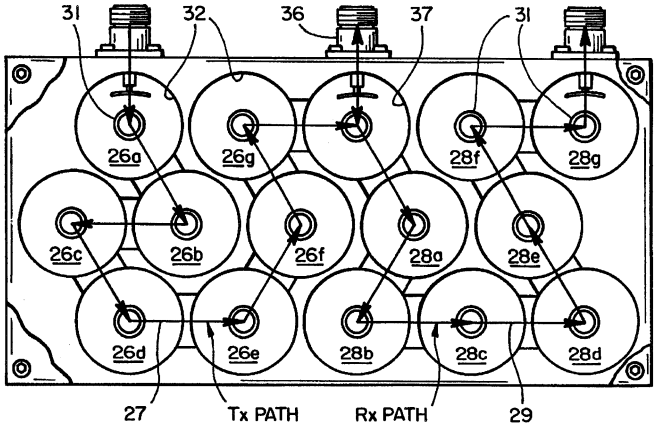
**21 Claims, 15 Drawing Sheets**

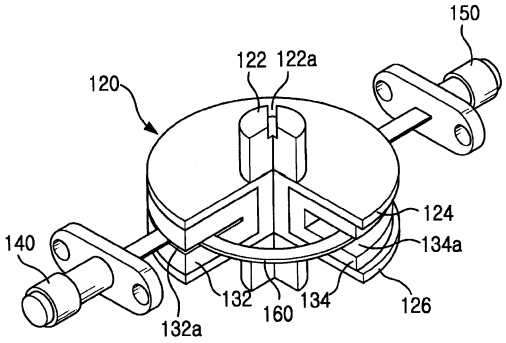
## RECEIVE/TRANSMIT MULTIPLE CAVITY FILTER HAVING SINGLE INPUT/OUTPUT CAVITY

Inventor: Torsten R. Wulff.
Assignee: Kathrein, Inc.
Filed: December 5, 2000.

***Abstract*—**A receive/transmit multi-cavity filter having input and output filter sections coupled to an antenna by a single cavity.

**4 Claims, 2 Drawing Sheets**




**6,392,508** May 21, 2002

## TUNEABLE WAVEGUIDE FILTER AND METHOD OF DESIGN THEREOF

Inventors: Simon Jacques Damphousse and Steve A. Beaudin.
Assignee: Nortel Networks Limited.
Filed: March 28, 2000.

***Abstract*—**A tuneable E-plane waveguide filter is presented. Tuning is achieved using sliders inserted into the cavities of the insert of the waveguide filter. The sliders are inserted through gaps or notches in the insert, or through notches in the waveguide housing. The positions of the sliders is adjusted to fine-tune the frequency response of the waveguide filter, overcoming limits on narrow relative bandpasses imposed by manufacturing tolerances. When a desired frequency response is achieved, the sliders are fixed in position. Assembly and tuning is less expensive and less complex than tuneable H-plane waveguide filters.

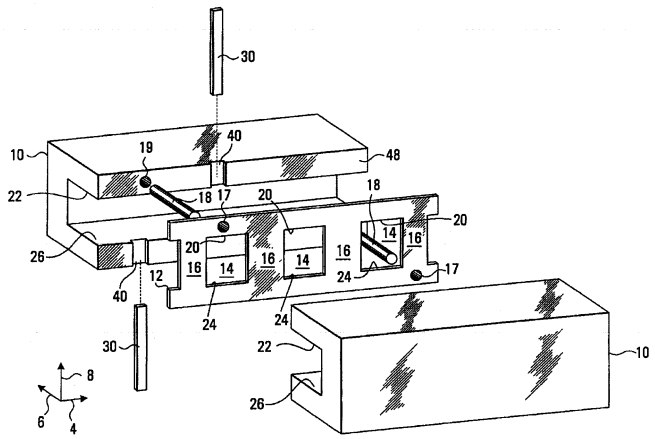
**33 Claims, 4 Drawing Sheets**

**6,392,507** May 21, 2002

## SIGNAL-PROCESSING APPARATUS FOR SHIFTING PHASE OF A SIGNAL INPUTTED THERETO AND ATTENUATING THE SIGNAL

Inventor: Duk-Yong Kim.
Assignee: KMW Co., Ltd.
Filed: May 18, 2000.

***Abstract*—**A signal-processing apparatus is capable of stably operating without regard to outside circumstances and miniaturizing. The signal-processing apparatus for shifting phase of a signal inputted thereto and attenuating the signal includes an input connector for inputting a signal; an output connector for outputting the signal; a rotation body to be rotated by the rotational force provided from the rotational force supplying means; a plurality of rotatable members respectively having a groove in peripheral portion, the rotatable members being coupled to peripheral portion of the rotation body so that the grooves communicate with each other; and a signal transmitting member for transmitting the inputted signal to the output connector, the signal transmitting member being located in the grooves and its both ends being respectively connected to the input and output connectors.



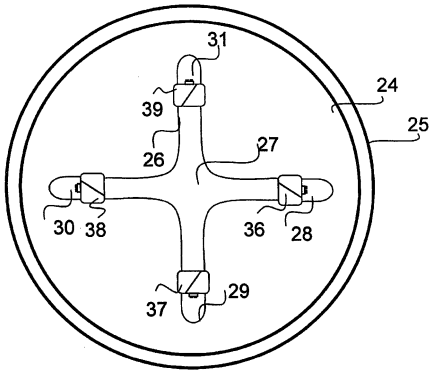
**6,392,509** May 21, 2002

## ADJUSTABLE COUPLING ARRANGEMENT FOR APERTURE COUPLED CAVITY FILTERS

Inventors: Graham Broad and Steven Bowey.
Assignee: Alcatel.
Filed: December 4, 2000.

***Abstract*—**An adjustable coupling arrangement for aperture coupled cavity filters. According to the invention, in an electric wall (**24**) separating two cavities to be coupled in a bandpass filter, provide a cruciform iris (**26**) comprising a central aperture (**27**) having four slits (**28**, **29**, **30**, **31**) extending outwardly therefrom. In each slit there is arranged a captive movable rectangular metal slug (**36**, **37**, **38**, **39**) whose position along the slit's length can be manipulated by a tool that engages the slug when the tool is introduced into a radial passageway (**32**, **33**, **34**, **35**) that connects the slit with an access hole in the filter's housing. When desired coupling parameters are achieved by manipulating each of the slugs to effectively change the electrical length of the slits, each slug is locked in position by a respective associated locking means actuated by the tool. Because a significant part of the tool is within a passageway during manipulation, the filter's characteristics are not disturbed by its presence.

**7 Claims, 3 Drawing Sheets**



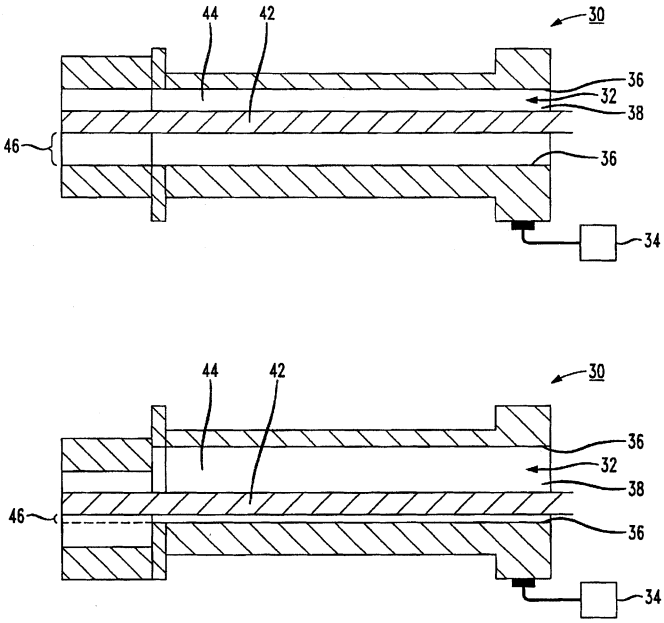

**6,392,511** May 21, 2002

## RF IMPEDANCE SELECTOR AND/OR RF SHORT SWITCH

Inventor: Meng-Kun Ke.
Assignee: Lucent Technologies, Inc.
Filed: October 15, 1999.

***Abstract*—**An impedance selector includes an input port receiving input signals. An outer conductor electrically communicates with the input port. A dielectric material is encircled by the outer conductor. An inner conductive core is encircled by the outer conductor and electrically communicates with the input port. An output port electrically communicates with the input port via the outer conductor and the inner core. A characteristic impedance of the outer conductor and the inner core is selectively set as a function of a minimum distance between the inner core and the outer conductor.

**18 Claims, 7 Drawing Sheets**



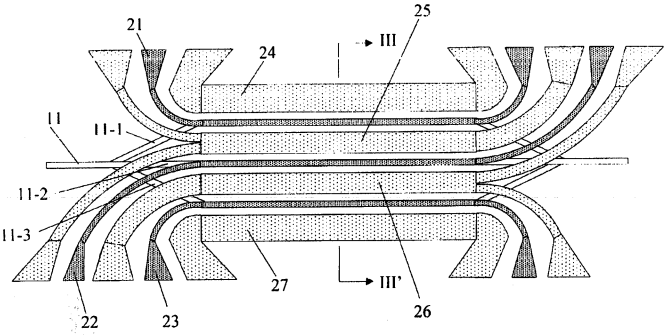

**6,393,166** May 21, 2002

## VARIABLE CHIRP MODULATOR HAVING THREE ARM INTERFEROMETER

Inventor: William K. Burns.
Assignee: Codeon Corporation.
Filed: March 27, 2000.

***Abstract*—**An electrically tunable optical modulator includes a substrate having an electrooptical effect, an optical waveguide having first, second, and third cascading portions in the substrate, and transmitting an optical field, a first coplanar waveguide electrode having a first part over the first cascading portion and second and third parts extending beyond the first cascading portion, a second coplanar waveguide electrode having a fourth part over the second cascading portion and fifth and sixth parts extending beyond the second cascading portion, a third coplanar waveguide electrode having a seventh part over the third cascading portion and eighth and ninth parts extending beyond the third cascading portion, a fourth coplanar waveguide electrode, a fifth coplanar waveguide electrode formed between the first and second coplanar waveguide electrodes, respectively, a sixth coplanar waveguide electrode formed between the second and third coplanar waveguide electrodes, and a seventh coplanar waveguide electrode.

**16 Claims, 4 Drawing Sheets**



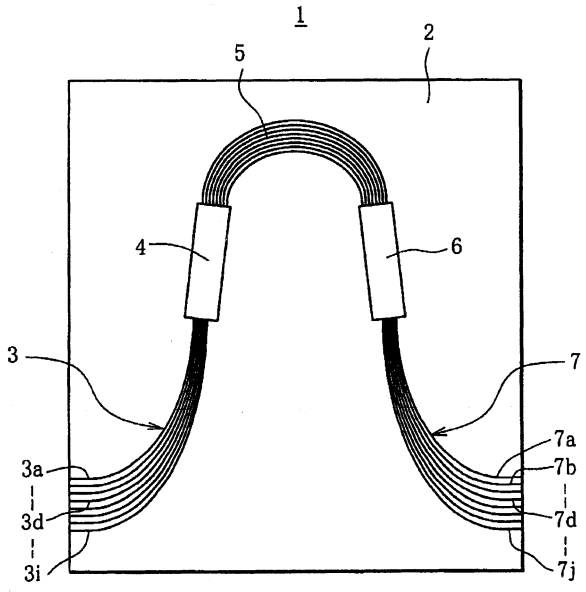
**6,393,170** May 21, 2002

## OPTICAL MULTIPLEXER/DEMULTIPLEXER

Inventors: Takeshi Nakajima, Naoki Hashizume, and Kanji Tanaka.
Assignee: The Furukawa Electric Co., Ltd.
Filed: October 19, 1999.

***Abstract*—**An optical multiplexer/demultiplexer **1** having a plurality of first waveguides **3**, a first slab waveguide **4**, an arrayed waveguide grating **5** having a plurality of waveguides, a second slab waveguide **6** and a plurality of second waveguides **7**, the individual waveguides being connected in the above order. The ratio of a distance between the plurality of first waveguides **3** at a connecting portion with the first slab waveguide **4** to a distance between the plurality of second waveguides **7** at a connecting portion with the second slab waveguide **6** differs from a ratio of a focal length of the first slab waveguide **4** to a focal length of the second slab waveguide **6**.

**3 Claims, 3 Drawing Sheets**



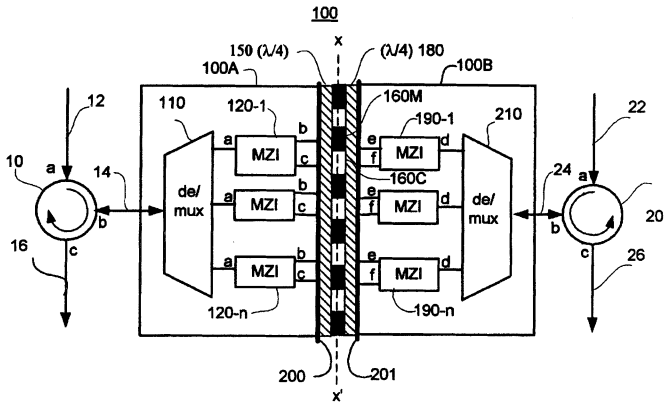

**6,393,173** May 21, 2002

## 2×2 INTEGRATED OPTICAL CROSS-CONNECT

Inventors: Christopher Richard Doerr and Pierre Schiffer.
Assignee: Lucent Technologies, Inc.
Filed: March 28, 2000.

***Abstract*—**An optical circulator is connected to each end of an integrated circuit chip containing a pair of multiplexer/demuliplexers driving respective arrays of 2×2 MZIs separated by a striped mirror interface and a plate having a thickness of 1/4 the central wavelength on each side of the mirror. Light passes through the device twice making it polarization insensitive in power and in wavelength. Phase errors due to inserting these plates will not cause power disturbances because no interference exists. Because the same router is used for multiplexing/demultiplexing, there are no loss/crosstalk penalties for through-channels due to mismatch in wavelength response. Back reflections for the switch-conditions are suppressed by aligning the waveguide, which passes the striped mirror, under a slight angle so that reflected light at the interface will penetrate the substrate. Lateral offset applied between the ends of two waveguides at the mirror interface ensures that crosstalk performance is not limited.

**11 Claims, 1 Drawing Sheet**



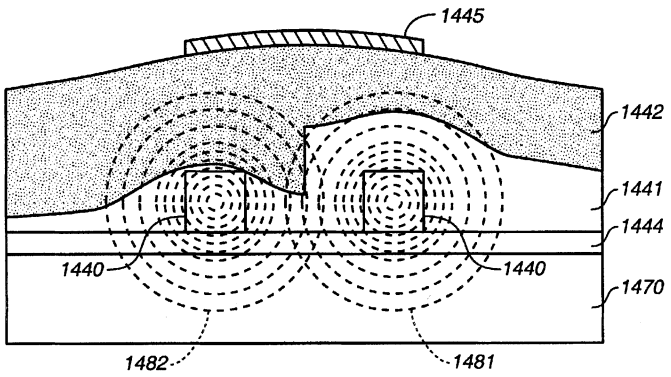

**6,393,185** May 21, 2002

## DIFFERENTIAL WAVEGUIDE PAIR

Inventor: David A. G. Deacon.
Assignee: Sparkolor Corporation.
Filed: November 3, 1999.

***Abstract*—**An asymmetric waveguide pair (**1440**) with a differential thermal response has an optical coupling frequency that may be thermo-optically tuned. Tuning may also be accomplished by applying an electric field (**1445**) across a liquid crystal portion (**1442**) of the waveguide structure. The waveguide pair may include a grating and be used as a frequency selective coupler for an optical resonator. The differential waveguide pair may also be used as a temperature or electric field sensor, or it may be used in a waveguide array to adjust a phase relationship, e.g., in an arrayed waveguide grating.

**73 Claims, 14 Drawing Sheets**



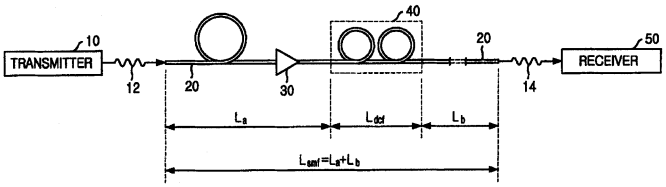
**6,393,188** May 21, 2002

## DISPERSION COMPENSATION DEVICE AND OPTICAL TRANSMISSION SYSTEM WITH THE SAME

Inventors: Ki-Tae Jeong, Young-Tark Lee, Ho-Jin Jeong, Han-Kyo Seo, Jeong-U Jeon, Tae-Sang Park, Seok-Bong Ko, Yun-Hee Cho, Seong-Il Choi, and Sang-Woork Park.
Assignees: Korea Telecom and Daewoo Telecom, Ltd.
Filed: September 2, 1999.

***Abstract*—**A dispersion compensation device and an optical transmission system are capable of simultaneously compensating a dispersion value and dispersion slope in a single-mode optical fiber in a high-speed long-distance optical transmission system and a wavelength division optical transmission system. The dispersion compensation device includes N number of component optical fibers arranged in a serial fashion, N being a positive integer more than one, wherein each of the component optical fiber has a different dispersion value per a unit length, a dispersion slope per a unit length, and a different length.

**8 Claims, 2 Drawing Sheets**



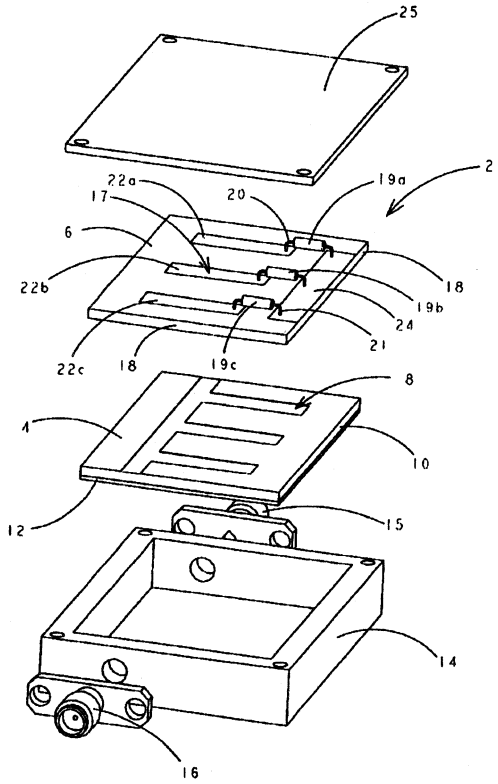

**6,393,309** May 21, 2002

## MICROWAVE SWITCH AND METHOD OF OPERATION THEREOF

Inventor: Raafat R. Mansour.
Assignee: Com Dev, Ltd.
Filed: November 12, 1998.

***Abstract*—**An HTS microwave circuit has two layers formed with metallic film on a substrate. One layer has a first circuit and another layer has a second circuit, the two circuits being coupled to one another. The second circuit has elements that are incompatible with HTS material such as MEMS technology and flip-chip technology. A microwave switch has a first layer that can carry an RF signal and a second layer that has switch elements that are controlled by a DC. signal. The RF signal and DC signal are isolated from one another. The switch elements include various technologies including a narrow HTS strip. A single layer HTS microwave switch can also be utilized where the switch element is a narrow HTS line. A method of combing HTS technology with incompatible technologies into one device is provided.

**29 Claims, 10 Drawing Sheets**



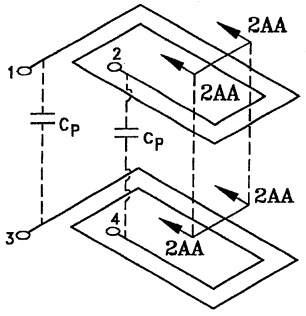

**6,396,362** May 28, 2002

## COMPACT MULTILAYER BALUN FOR RF INTEGRATED CIRCUITS

Inventors: Jean-Marc Mourant and James Imbornone.
Assignee: International Business Machines Corporation.
Filed: January 10, 2000.

***Abstract*—**A compact BALUN transformer comprises a primary and a secondary conductor loop. Each of these loops are disposed in a substantially flat spiral configuration. However, one of these loops, either the primary or the secondary, is preferably disposed in a multi-layer (stacked) configuration. The stacking of at least one of the primary or secondary layers in a multi-layer arrangement provides an increase of impedance in one of the loops. This increased impedance for impedance matching purposes comes with the advantage that parasitic capacitance between primary and secondary layers as would normally be introduced in a multi-layer configuration is absent. In another embodiment of the present invention, both conductor loops are disposed in a multi-layer configuration. Such configurations are particularly useful for 1 to 1 impedance matching conditions and for somewhat lower frequency BALUN circuits.

**3 Claims, 5 Drawing Sheets**



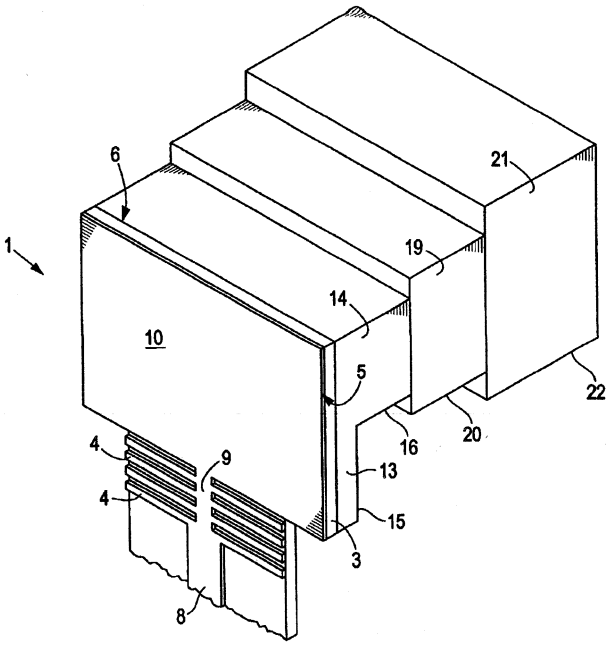
**6,396,363** May 28, 2002

## PLANAR TRANSMISSION LINE TO WAVEGUIDE TRANSITION FOR A MICROWAVE SIGNAL

Inventors: Angelos Alexanian, Nitin Jain, and Thomas Budka.
Assignee: Tyco Electronics Corporation.
Filed: December 17, 1999.

***Abstract*—**A transition from a planar transmission line to a waveguide has a planar transmission line patterned onto a glass substrate. A mode transformer **1** on the substrate **3** is electrically connected to a transmission line **2** and converts a transverse electric or quasitransverse electric mode signal carried by the transmission line to a waveguide mode signal. A combination of a first extension of the substrate **3** and a dielectric portion having some depth makes up a first impedance matching element **13**. A second impedance matching element **14** is a combination of a second extension of the substrate **3** and a dielectric portion having another depth greater than the first depth. The aperture created by the second impedance matching element launches an RF signal into the air for use as a wireless communication signal. Also disclosed is a method for optimizing a transition according to the teachings of the present invention for alternative dimensions and dielectrics.

**12 Claims, 3 Drawing Sheets**



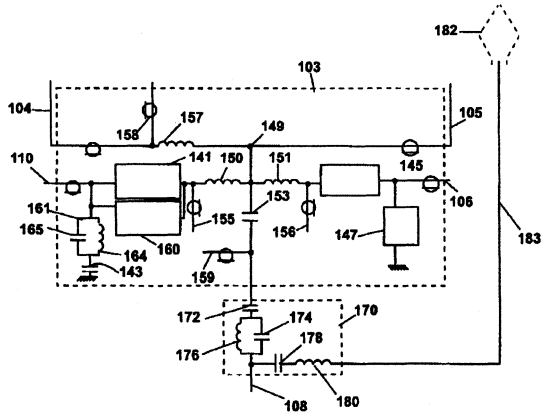

**6,396,365** May 28, 2002

## MULTIPLEXER FOR CELLULAR TELEPHONE

Inventors: Paul E. Miller, Glen J. Seward, and Paul A. Bogdans.
Assignee: R.A. Miller Industries, Inc.
Filed: March 20, 2000.

***Abstract*—**A multiplexer circuit adapted to receive standard cellular telephone signals and PCS signals without user intervention comprises two filter circuits. The first filter circuit presents a high impedance to signals outside the standard cellular frequency range from one antenna and the second circuit presents a high impedance to signals outside the higher PCS frequency range from a second antenna. A cell phone adapted to receive both frequency ranges will automatically detect the appropriate signal.

**12 Claims, 4 Drawing Sheets**



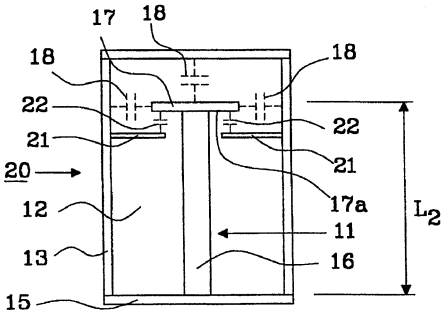

**6,396,366** May 28, 2002

## COAXIAL CAVITY RESONATOR

Inventors: Tuomo Räty and Antti Kanervo.
Assignee: Allgon AB.
Filed: August 12, 1999.

***Abstract*—**The construction is a coaxial cavity resonator (**20**, **30**, **40**, **50**) comprising at least one conductive body (**11**, **31**), which body is open at one end and shortened from a quarter-wave resonator. The conductive body includes a main rod (**16**), which is in one end attached to the cavity wall (**15**), and a main disc (**17**) attached to the free end of the main rod (**16**). The cavity (**12**) further comprises one or more conductive plates (**21**, **41**, **51**) located between the main disc (**17**) and the side walls (**13**), at the first side (**17***a*) of, and out of galvanic contact with, the main disc (**17**). The shortening is carried out by creating air-insulated extra capacitance between the resonator cavity walls via the conductive plates and a mechanical structure at the open end of the conductive body.

**13 Claims, 2 Drawing Sheets**



**6,396,367** May 28, 2002

## COAXIAL CONNECTOR

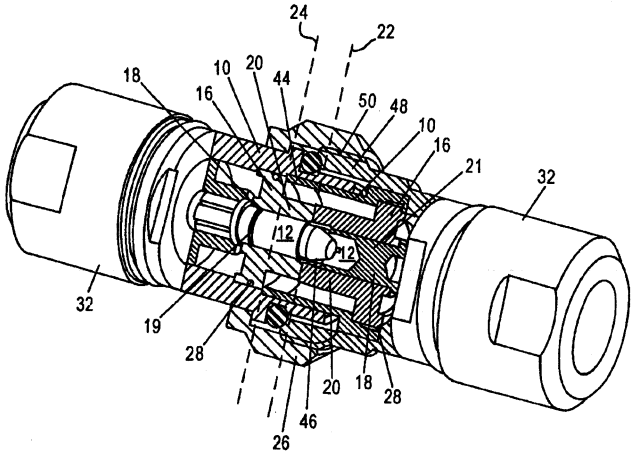
Inventor: Bernhard Rosenberger.
Assignee: Rosenberger Hochfrequenztechnik GmbH & Co.
Filed: April 21, 2000.

***Abstract*—**A coaxial connector comprises an outer conductor having an inner diameter D, an inner conductor coaxial with the outer conductor and having an outer diameter d, and an insulating structure having pluralradii between the conductors. The diameters are selected in such a manner that the connector has a predetermined characteristic impedance

$$Z_0 = \frac{60}{\sqrt{\epsilon_r}} \ln\left[\frac{D}{d}\right].$$

The connector has a first cable side for connection to a coaxial cable and a second connection side for connection to a corresponding coaxial connector. The insulating structure is one piece, including a disk and tube, together having a bore with a diameter less than d. The inner conductor is inserted into the bore of the tube that is mounted in proximity to the second end. The disk periphery is fixedly mounted against the inner wall of the outer conductor. The portion of the inner conductor in the bore and the bore have a smaller diameter than d to compensate for the dielectric properties of the insulating structure in such manner that the connector has the predetermined characteristic impedance $Z_0$ where the insulating structure is located. The structure radii are selected as a function of the structure dielectric constant $\epsilon$ in such manner that the predetermined characteristic impedance $Z_0$ wave equation is attained.

**23 Claims, 5 Drawing Sheets**



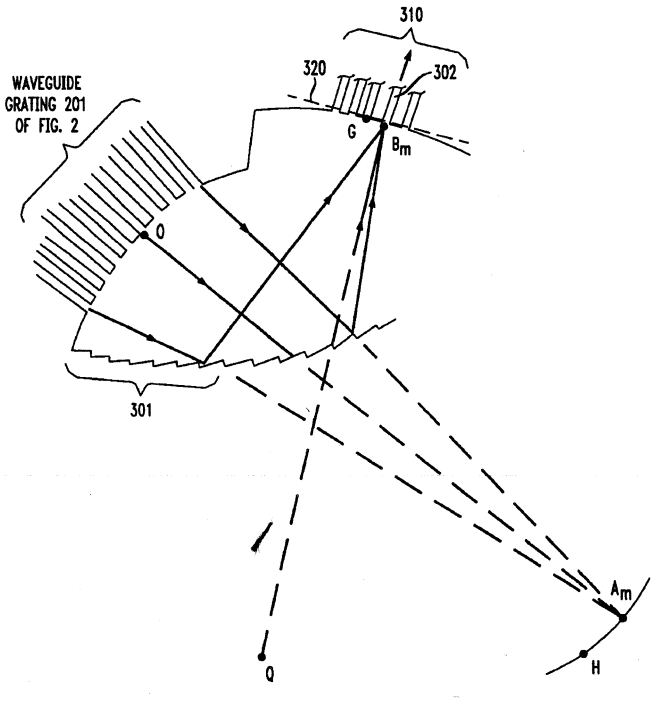

**6,396,977** May 28, 2002

## WAVELENGTH ROUTER WITH A WIDE PASSBAND REALIZED USING TWO GRATINGS OF OPPOSITE ANGULAR DISPERSIONS

Inventor: Corrado Pietro Dragone.
Assignee: Lucent Technologies, Inc.
Filed: June 30, 1999.

***Abstract*—**The passband of an optical wavelength router is widened by using a combination of two grating apparatuses with opposite angular dispersions. The passband width approaches the channel spacing, with minimal loss penalty. This technique is particularly attractive for applications requiring a large number of ports with maximum passband width and relatively small loss. The optical wavelength router may be formed using either reflective or transmissive elements formed using grating apparatuses that are free space optical elements or waveguide gratings.

**20 Claims, 16 Drawing Sheets**




**6,396,994** May 28, 2002

## APPARATUS FOR VARYING THE OPTICAL CHARACTERISTICS OF AN OPTICAL FIBER BY STRETCHING THE FIBER

Inventors: Joshua Philipson, Feliks Lapinski, and Mohiuddin Mala.
Assignee: JDS Uniphase, Inc.
Filed: March 10, 2000.

***Abstract*—**Apparatus for modifying the optical characteristics of an optical fiber by controlled stretching of a length of the fiber, comprising a first fiber holder fixedly carried by a base and capable of firmly holding a first portion of the optical fiber, a lever part attached to the base at a fulcrum, and second fiber holder movably connected to the lever part and capable of firmly holding a second portion of the fiber, so that an intermediate length of fiber may be held taut between said first and second holding means. An electromagnetic circuit moves the lever part between first and second predetermined positions, so that the intermediate length of fiber is stretched as the lever part moves between first and second positions. Preferably, the intermediate length of fiber includes a Bragg grating.

**10 Claims, 3 Drawing Sheets**