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.

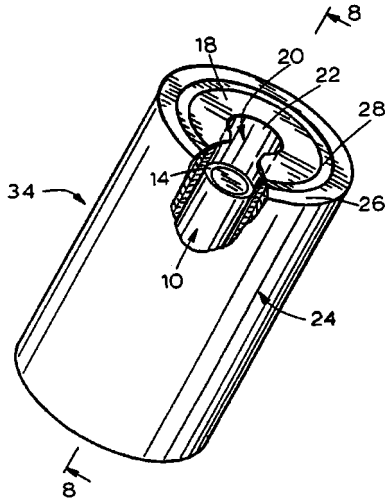
6,083,883 Jul. 4, 2000

Method of Forming a Dielectric and Superconductor Resonant Structure

Inventor: Robert D. Lithgow.
Assignee: Illinois Superconductor Corporation.
Filed: Apr. 26, 1996.

***Abstract*—**A resonant structure has a center conductor, a dielectric element, and an outer conductor. The center conductor is a substrate with a coating of a superconductor on its outer surface, and the outer conductor is a substrate with a coating of a superconductor on its inner surface. The dielectric element has a passageway which is sized for receiving the inner conductor so that there is substantially complete contact between the layers of superconductor coating and the dielectric. Similarly, the outer surface of the dielectric element is sized to match the inner superconductor coated surface of the outer conductor.

8 Claims, 2 Drawing Sheets



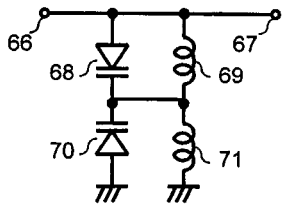
6,084,486 Jul. 4, 2000

Controllable Filter and High Frequency Apparatus Using the Same

Inventors: Masanori Suzuki, Hideya Kitamura, and Hirokazu Kitamura.
Assignee: Matsushita Electric Industrial Co., Ltd.
Filed: Oct. 15, 1998.

***Abstract*—**A filter comprises an inductor, a first variable capacitance diode, a second variable capacitance diode having nearly identical characteristic as the first variable capacitance diode, a control terminal for applying voltage to the first and the second variable capacitance diodes, an input terminal, an output terminal and a signal line between the input terminal and the output terminal. A cutoff frequency is controllable with the voltage applied to the control terminal. The variable frequency filter which can receive a large signal has reduced size due to a structure in which the first and the second variable capacitance diodes having nearly identical characteristics are connected either in series or in parallel with their polarities reversed against each other.

11 Claims, 7 Drawing Sheets



6,084,487 Jul. 4, 2000

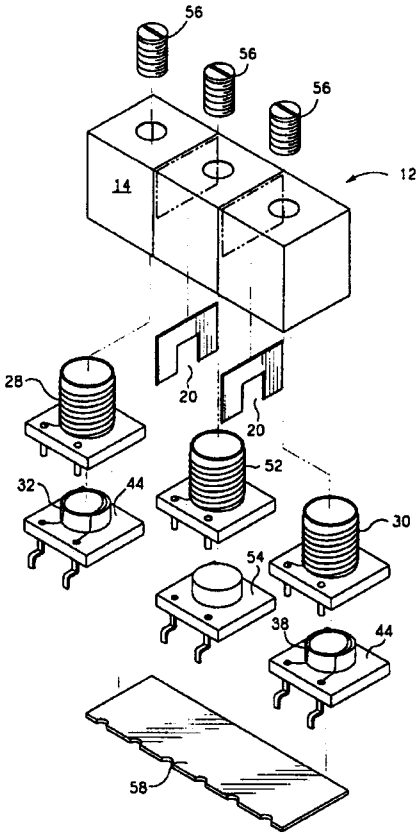
Helical Filter with a Removable Tap Housing

Inventor: Mark Allan Hoffman.
Filed: Nov. 27, 1998.

***Abstract*—**A high frequency filter kit in which resonating first and second electrical circuits are enclosed between proximal and distal ends of a filter case. Partitioning the inside of the enclosed resonant circuits may be performed by a user to form at least a first cavity and a second cavity. The first resonating circuit is then disposed inside the first cavity of the filter case extending from the proximal end toward the distal end, and the second resonating circuit is disposed inside the second cavity also extending from the proximal end toward the distal end. Electrical signals are coupled into the resonating circuits by an encased signal coupler which is removably mounted by a coupling housing for supporting the signal coupler at the proximal end of the filter case for positioning in the vicinity of the resonating circuits. The kit thus facilitates enhanced turnout time and communication of design specifications for manufacture by specifying the basic components required to build the specific high frequency filter, allowing the user to build prototype filters that may be used for manufacturing a RF/microwave system or be provided as a sample to the filter manufacturers.

Publisher Item Identifier S 1531-1309(01)02833-1.

24 Claims, 4 Drawing Sheets



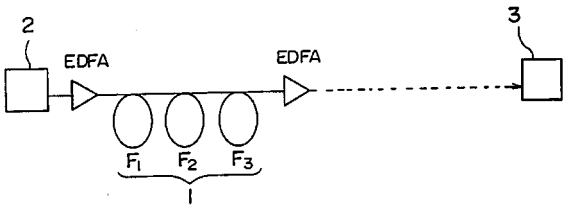
6,084,993 Jul. 4, 2000

Optical Transmission Link for Division Multiplex Transmission, and Optical Fiber Constituting the Link

Inventor: Kazunori Mukasa.
Assignee: The Furukawa Electric Co., Ltd.
Filed: Sep. 9, 1998.

***Abstract*—**The invention is to provide an optical transmission link suitable for a high speed and high bit rate wavelength division multiplex transmission. An optical transmission link **1** is composed of a nonlinearity diminishing optical fiber F_1, a dispersion adjusted transmission optical fiber F_2, and an optical fiber F_3 for diminishing and adjusting a dispersion slope. The mode field diameter of the nonlinearity diminishing optical fiber F_1 is made into 12 m or more. The dispersion slope is made small to be nearly zero with the mode field diameter of the dispersion adjusted transmission optical fiber F_2 set to 10 m or more, and the dispersion produced at the nonlinearity diminishing optical fiber F_3 is adjusted to be small. At the optical fiber F_3 for diminishing and adjusting a dispersion slope, the dispersion slope of the entire optical transmission link **1** is adjusted to nearly zero. The refractive index profile of the fibers F**1** and F**2** is made into a segment type, and the refractive index profile of the optical fiber F**3** for diminishing and adjusting a dispersion slope is made W-shaped. The absolute value of dispersion at any point position in the lengthwise direction of the optical transmission link **1** is made greater than 0.5 ps/nm/km, thereby suppressing the generation of four-wavelength mixture.

7 Claims, 2 Drawing Sheets



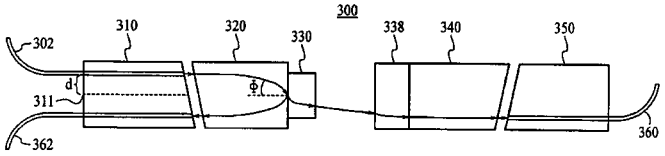
6,084,994 Jul. 4, 2000

Tunable, Low Back-Reflection Wavelength Division Multiplexer

Inventors: Wei-Zhong Li, Feng Liu, and Haiguang Lu.
Assignee: Oplink Communications, Inc.
Filed: Apr. 2, 1998.

***Abstract*—**The tunable wavelength division multiplexer is disclosed. The wavelength division multiplexer includes a fiber, a holder, a filter, and an isolator. The fiber carries an optical signal that includes a plurality of channels. The holder has an end and an axis. The holder receives the first fiber in an aperture such that the first fiber is separated from the axis by a distance. The distance is selected to tune the first angle of incidence so that the filter transmits a portion of the optical signal centered around at least one particular wavelength. The optical signal from the fiber impacts the filter at a first angle of incidence. The filter transmits a portion of the optical signal centered around at least one particular wavelength. The isolator is optically coupled with the filter and prevents a first portion of the portion of optical signal transmitted by the filter from returning to the first fiber. Thus, not only is the filter tunable, but because of the presence of the isolator, back reflections to the first fiber are also reduced.

17 Claims, 5 Drawing Sheets



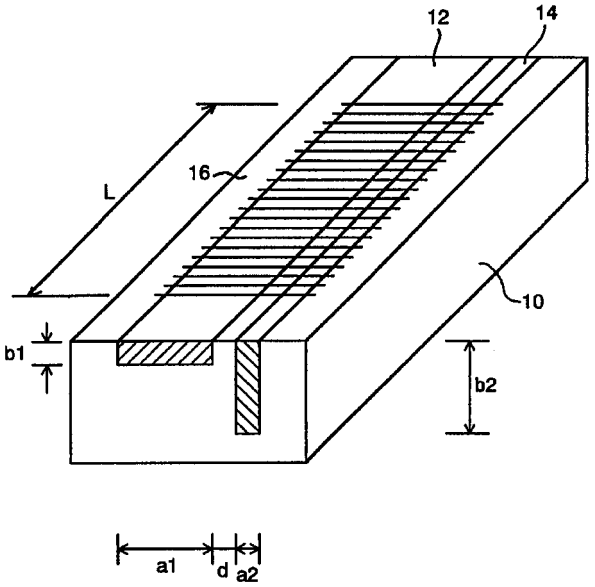
6,084,997 Jul. 4, 2000

Coupled Waveguide Structure

Inventors: Katsuyuki Utaka, Shinsuke Tanaka, Masayoshi Horita, and Yuichi Matsushima.
Assignee: Kokusai Denshin Denwa Kabushiki Kaisha.
Filed: Jun. 22, 1998.

***Abstract*—**The coupled waveguide structure comprises first and second rectangular waveguides, disposed closely. The aspect ratio of the first waveguide is substantially inverse in number to that of the second waveguide.

6 Claims, 5 Drawing Sheets



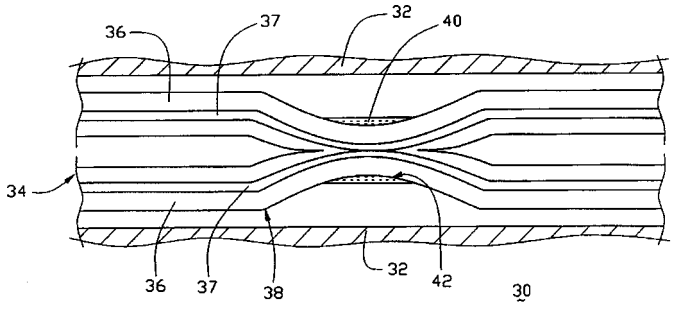
6,084,999 Jul. 4, 2000

Optical Coupler Assembly and Method Making the Same

Inventors: Paisheng Shen, Zhong Ming Mao, and Peter C. Chang.
Assignee: Alliance Fiber Optics Products, Inc.
Filed: Nov. 12, 1997.

***Abstract*—**A coupler (30) includes an enclosure (32) sealing therein a fiber assembly (34) consisting essentially of a pair of fibers (36). The fiber assembly (34) includes a hourglass-like configuration (38) on the middle portion wherein a reinforcement structure (40) is applied to the neck portion (42) of said fiber assembly so as to enhance the strength thereof, so that the whole coupler (30) can own a better mechanical character for convenient and reliable usage.

3 Claims, 2 Drawing Sheets



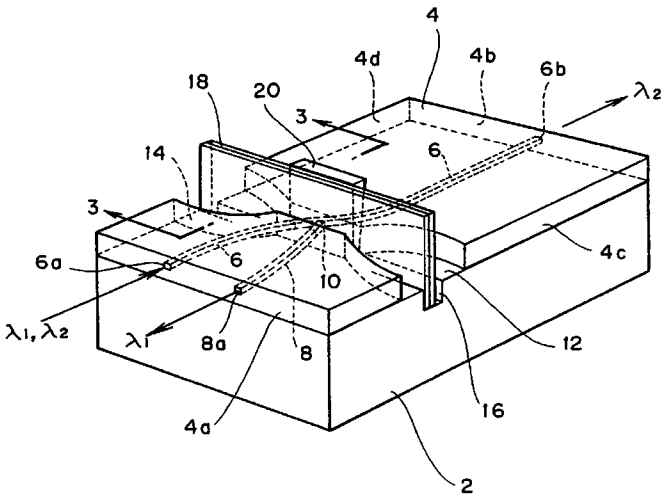
6,085,000 Jul. 4, 2000

Wavelength Division Multiplexing Optical Device and Manufacturing Method Therefor

Inventors: Kazuhiro Tanaka, Goji Nakagawa, Youske Yamazaki, and Haruhiko Tabuchi.
Assignee: Fujitsu Limited.
Filed: Mar. 13, 1998.

***Abstract*—**A wavelength division multiplexing optical device includes a cladding layer formed on a waveguide substrate, a first optical waveguide embedded in the cladding layer, a second optical waveguide embedded in the cladding layer and connected at one end thereof to an intermediate portion of the first optical waveguide, and an insertion groove formed in the waveguide substrate and the cladding layer so as to extend across a connected portion of the first and second optical waveguides. The wavelength division multiplexing optical device further includes first and second wide grooves formed in the cladding layer so as to cover opposite end portions of the insertion groove and open to the opposite side surfaces of the cladding layer, and a wavelength selecting filter inserted in the insertion groove.

5 Claims, 10 Drawing Sheets



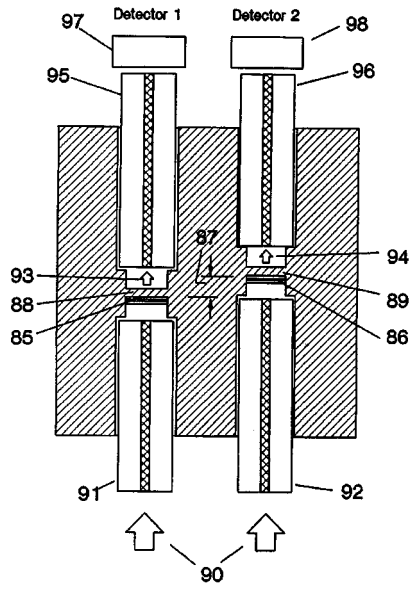
6,085,002 Jul. 4, 2000

Methods to Fabricate Dense Wavelength Division Multiplexers

Inventors: Cindy Xing Qiu, Yi-Chi Shih, and Lap Sum Yip.
Filed: Mar. 16, 1998.

***Abstract*—**Methods for the fabrication of dense wavelength division multiplexors (DWDM) are disclosed. In one embodiment, an array of micro membranes and an array of cavities for optical fibers are etched in a substrate. The distance between major surface of adjacent micro membranes is controlled during the etching step. Multilayer narrow band pass filters are then deposited on all micro membranes simultaneously by vacuum deposition methods. Due to the controlled separation between adjacent micro membranes, the central wavelength of transmission either increases or decreases from one membrane to another. In another embodiment, a micro machined structure containing a plurality of cavities and a slot for variable narrow band pass filter is fabricated. The variable narrow band pass filter is aligned with respect to the optical fibers to obtain a WDM.

16 Claims, 22 Drawing Sheets



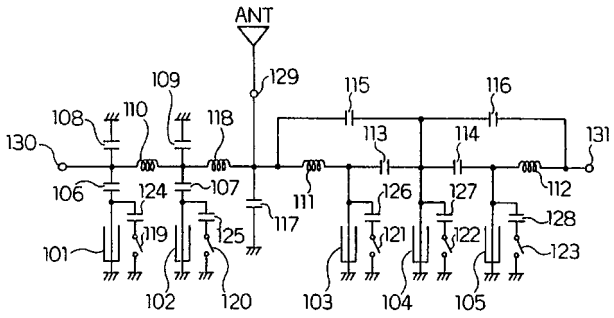
6,085,071 Jul. 4, 2000

Antenna Duplexer

Inventors: Toru Yamada, Yukihiro Takeda, Masaki Kita, Hideyuki Miyake, Toshio Ishizaki, Makoto Fujikawa, and Hideki Hayama.
Assignee: Matsushita Electric Industrial Co., Ltd.
Filed: Mar. 12, 1998.

***Abstract*—**An antenna duplexer has a transmission input terminal, a receiving output terminal, an antenna terminal in which a transmission output terminal and a receiving input terminal are used in common, a transmission filter having at least one resonance element set between the transmission input terminal and the transmission output terminal and coupled by a coupling element, a receiving filter having at least one resonance element set between the receiving output terminal and said receiving input terminal and coupled by a coupling element, and an impedance variable element connected to the resonance element of the transmission filter and the resonance element of said receiving filter respectively in parallel, wherein the frequency transfer characteristic of the transmission filter and the frequency transfer characteristic of the receiving filter are controlled by applying control signals and thereby changing the impedances of the impedance variable element.

23 Claims, 12 Drawing Sheets



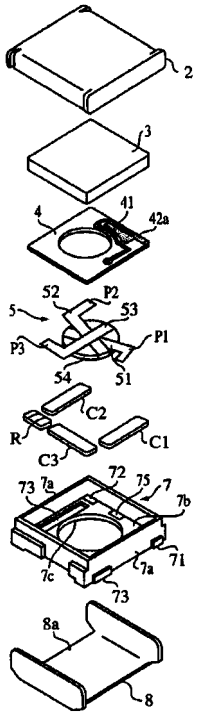
6,087,905 Jul. 11, 2000

Nonreciprocal Circuit Device Having a Low-Pass Filter Formed on a Spacer

Inventors: Toshihiro Makino, Takashi Kawanami, and Takashi Hasegawa.
Assignee: Murata Manufacturing Co., Ltd.
Filed: Mar. 3, 1999.

***Abstract*—**A nonreciprocal circuit device which can achieve miniaturization and cost reduction by increasing attenuation outside a passband and greatly decreasing the occurrence of extraneous radiation emissions. The nonreciprocal circuit device comprises: a magnetic circuit comprising a permanent magnet disposed in a yoke; a magnetic member; a magnetic assembly disposed in the magnetic circuit and having a plurality of central conductors disposed on the magnetic member so as to mutually intersect; a plurality of matching capacitors connected respectively between a port of each of the central conductors and a ground terminal; a resin case containing the magnetic assembly and the matching capacitors and having an input/output terminal and said ground terminal; and a spacer for stably supporting at least the magnetic assembly and the matching capacitors in the case; wherein the spacer includes a filter inductor and a filter capacitor; the filter inductor is connected between said port of one of the central conductors and an input/output terminal corresponding to the port; the filter capacitor is connected between said input/output terminal and said ground; whereby a low-pass filter is formed by the filter inductor, the filter capacitor, and the matching capacitor.

13 Claims, 8 Drawing Sheets



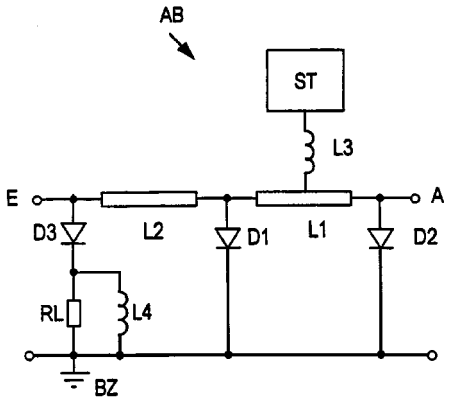
6,087,906 Jul. 11, 2000

Absorbent Amplitude Filter

Inventor: Peter Lampel.
Assignee: Siemens Aktiengesellschaft.
Filed: Jun. 17, 1998.

***Abstract*—**An absorbent amplitude filter for HF signals employs a reflective filter and an absorption circuit comprising a load resistor. The absorption circuit inventively comprises another $\lambda/4$ line upstream of the filter, which comprises, at the input side, a series connection consisting of another diode and the load resistor. This series connection is connected with the reference potential, whereby an HF block is connected in parallel to the load resistor.

2 Claims, 1 Drawing Sheet



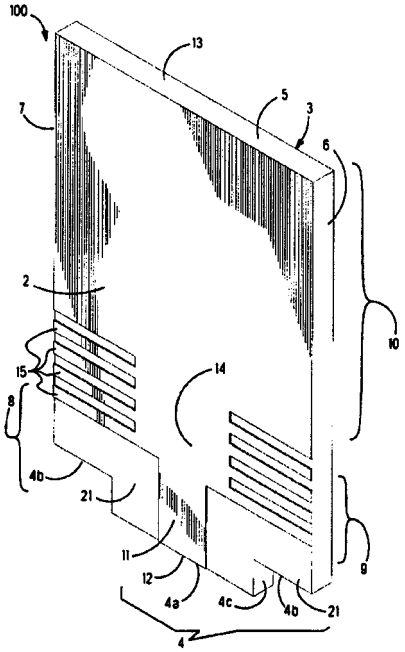
6,087,907 Jul. 11, 2000

Transverse Electric or Quasi-Transverse Electric Mode to Waveguide Mode Transformer

Inventor: Nitin Jain.
Assignee: The Whitaker Corporation.
Filed: Aug. 31, 1998.

***Abstract*—**A transverse electric or quasi-transverse electric mode to rectangular waveguide mode transformer converts an electrical signal propagating in a transmission line from the TE or quasi-TEM transmission mode to a rectangular waveguide transmission mode for propagating in a waveguide. The transformer comprises a trace printed on a substrate, the substrate having first and second major surfaces and first, second, third, and fourth minor surfaces. The transformer is logically divided into a quasi-TEM mode portion, a conversion portion, and a waveguide mode portion. The quasi-TEM mode comprises a length of microstrip. The microstrip widens to a conversion trace in the conversion portion where there is one or more converting fins oriented perpendicularly to the direction of signal propagation. The conversion portion is adjacent the waveguide mode portion comprising metalized first and second major surfaces and third and fourth minor surfaces. The fins direct the quasi-TEM energy into waveguide mode energy in the substrate for propagation through the substrate.

38 Claims, 9 Drawing Sheets



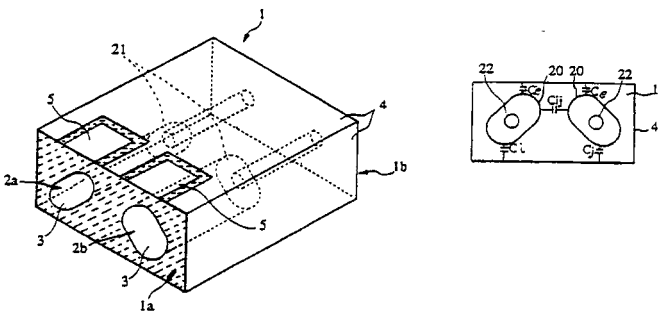
6,087,909 Jul. 11, 2000

Dielectric Filter Having at Least One Stepped Resonator Hole with an Elongated Cross-Section

Inventors: Jun Toda and Haruo Matsumoto.
Assignee: Murata Manufacturing Co., Ltd.
Filed: Mar. 3, 1998.

***Abstract*—**A dielectric filter and a dielectric duplexer having a dielectric block with resonator holes formed therein, each having a large-sectional-area portion and a small-sectional-area portion so that the resonator hole has different respective inner diameters at an open-circuited end and a short-circuited end. Each large-sectional-area portion is formed with the cross-sectional shape of an elongated circle, an ellipse, or a rectangle, for example, the cross-sectional shape defining a longitudinal axis which is disposed at an angle against with respect to a plane in which the resonator holes are arranged. The invention increases the degree of freedom in providing a desired resonant frequency and a desired degree of coupling between resonators, in order to be able to easily provide desired filter characteristics, even in a case in which the external dimensions of the required dielectric block are restricted. Also disclosed is a method of manufacturing the dielectric filter and dielectric duplexer, as well as a radio transceiver utilizing the dielectric duplexer.

12 Claims, 8 Drawing Sheets



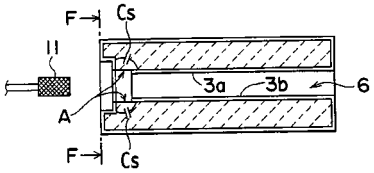
6,087,910 Jul. 11, 2000

Dielectric Filter Having Stepped Resonators with Non-Conductive Gap

Inventors: Haruo Matsumoto, Yasuo Yamada, Yukihiro Kitaichi, Tadahiro Yorita, Hideyuki Kato, and Hisashi Mori.
Assignee: Murata Manufacturing Co., Ltd.
Filed: Apr. 14, 1997.

***Abstract*—**Dielectric resonator wherein an internal conductor nonformed portion is provided near one open face of the internal conductor formed holes, and signal input, output electrodes are provided on one portion of the external conductor, whereby electromagnetic field leakage is restrained, because the open face is not formed, and individual parts such as signal input, output pins and so on are not required.

27 Claims, 20 Drawing Sheets



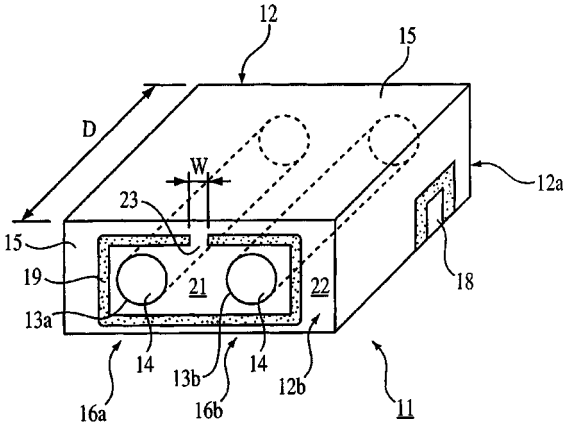
6,087,911 Jul. 11, 2000

Dielectric Filter, Duplexer, and Communication System

Inventors: Hitoshi Tada and Hideyuki Kato.
Assignee: Murata Manufacturing Co., Ltd.
Filed: Aug. 28, 1998.

***Abstract*—**The invention provides a dielectric filter, comprising: a dielectric block having a first end surface and a second end surface opposite to said first end surface; a plurality of resonator holes passing through from said first end surface to said second end surface of said dielectric block; an inner conductor provided on an inner surface of said resonator holes; and an outer conductor provided on an outside surface of said dielectric block; wherein said first end surface of said dielectric block constitutes a short-circuit end surface; said short-circuit end surface includes an inside portion including ends of said resonator holes adjacent to each other and an outside portion provided around said inside portion; said inside portion is electrically separated from said outside portion by a nonconducting portion substantially encircling said inside portion; and said inside portion is connected to said outside portion by a microinductance generating means. According to this dielectric filter, it is possible to easily adjust the coupling between adjacent dielectric resonators without altering the configuration and dimensions of a dielectric block.

10 Claims, 12 Drawing Sheets



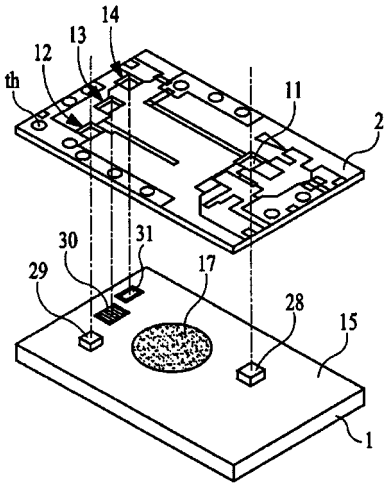
6,087,912 Jul. 11, 2000

High Frequency Multi-Layer Module Comprising a Dielectric Resonator

Inventors: Koichi Sakamoto, Kenichi Iio, Sadao Yamashita, and Yohei Ishikawa.
Assignee: Murata Manufacturing Co., Ltd.
Filed: Apr. 14, 1998.

***Abstract*—**An electronic module, comprising: a dielectric base plate having first and second opposing surfaces on which respective electrodes are disposed such that respective areas at the first and second surfaces are free of electrode material and aligned relative to one another to form a dielectric resonator; a first electronic component coupled to the base plate; and a first circuit sheet having first and second opposing surfaces, at least one aperture between the surfaces, and a conductor pattern disposed on the first surface, the first circuit sheet being disposed on the base plate such that: i) the first electronic component is at least partially received within the aperture; and ii) at least part of the conductor pattern is coupled to the dielectric resonator.

8 Claims, 7 Drawing Sheets



6,088,495 Jul. 11, 2000

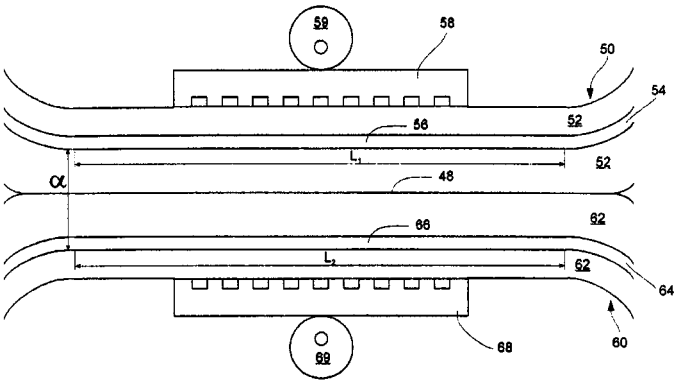
10 Claims, 2 Drawing Sheets

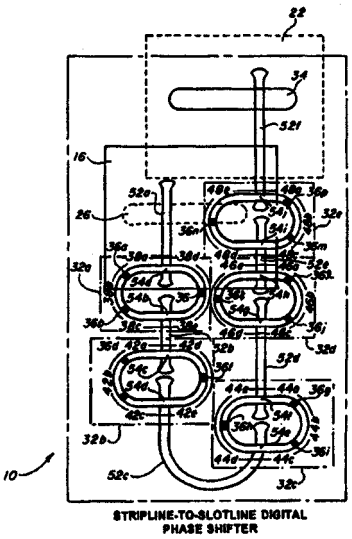
Intermediate-State-Assisted Optical Coupler

Inventors: Ilya Vorobeichik, Nimrod Moiseyev, and Meir Orenstein.
Assignee: Technion Research & Development Foundation Ltd.
Filed: Apr. 21, 1998.

***Abstract*—**An optical coupler, for coupling two waveguides, and an optical switch based on the optical coupler. The indices of refraction of parallel sections of the two waveguides are reversibly perturbed periodically in space to couple low order modes in the two waveguides via a high order mode common to the two waveguides. The waveguides are thus couples with a beat length that may be five or more orders of magnitude shorter than it would be without the periodic perturbations.

18 Claims, 4 Drawing Sheets





6,091,312 Jul. 18, 2000

Semi-Lumped Bandstop Filter

Inventor: Jyh-Wen Sheen.
Assignee: Industrial Technology Research Institute.
Filed: Jun. 26, 1998.

***Abstract*—**The inventive bandstop filter is suitable for use in a multi-layer ceramic (MLC) structure. Specifically, the filter is a semi-lumped type, formed by lumped capacitors and distributed transmission lines. Preferably, transmission lines are used as equivalent inductors, instead of as **J**, **K** inverters or resonators. The bandstop filter preferably has attenuation poles very close to lower passband edge, which results in a very sharp rejection near the stopband. The inventive filter may be utilized as a transmitter-end filter in, e.g., duplexer applications or for miniaturized applications, such as portable communications.

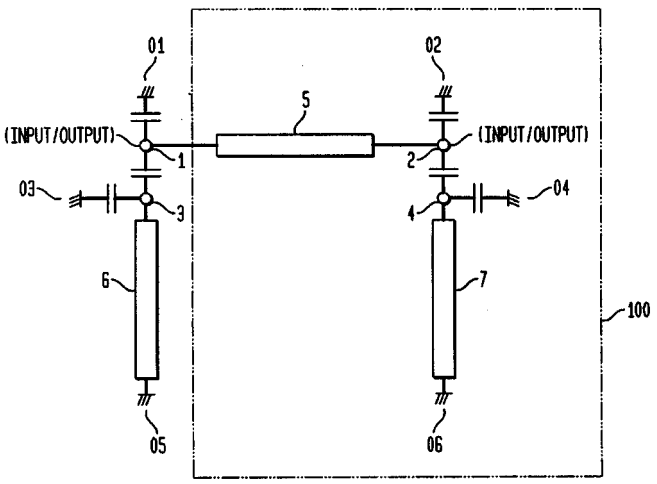
5 Claims, 6 Drawing Sheets

6,091,311 Jul. 18, 2000

Selectable Path Stripline/Slotline Digital Phase Shifter

Inventor: William M. Waters.
Assignee: The United States of America as represented by the Secretary of the Navy.
Filed: Aug. 21, 1997.

***Abstract*—**The stripline–slotline digital phase shifter is located between a ground plane associated with a patch antenna and another ground plane associated with the other patch antenna, or other output circuits. It is comprised of a section of stripline adjacent to a slot in ground plane associated with the receiving patch antenna which transitions an input electromagnetic signal to a plurality of oval slotlines, called bit circuits, of varying lengths which form a delay circuit by shifting the phase of the input electromagnetic signal. The varying lengths of slotline are switched into and out of the circuit to provide a predetermined amount of delay and the phase adjusted electromagnetic signal is transitioned to portion of stripline adjacent to a slot associated with the transmission patch antenna or other output circuits.



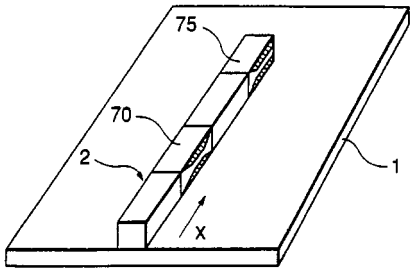
6,094,106 Jul. 25, 2000 **10 Claims, 3 Drawing Sheets**

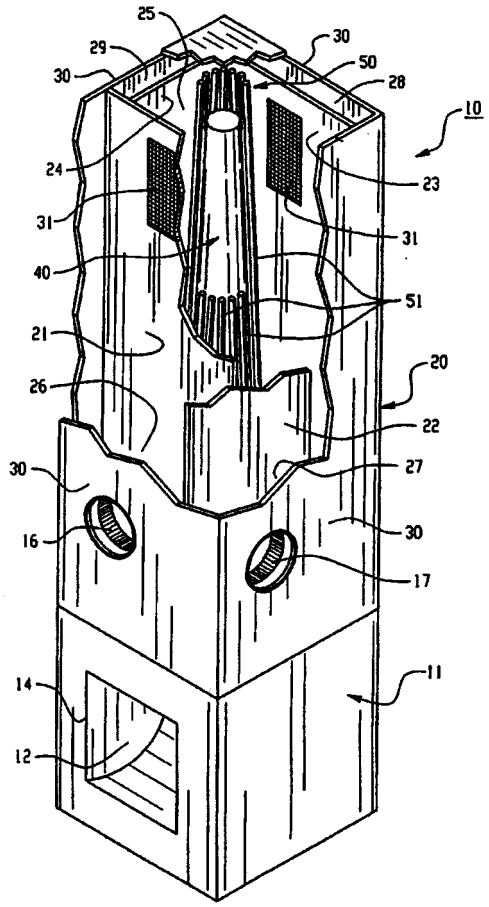
Non-Radiative Dielectric Waveguide Module

Inventors: Tetsuya Kishino and Takeshi Okamura.
Assignee: Kyocera Corporation.
Filed: Jun. 24, 1998.

***Abstract*—**A module equipped with a nonradiative dielectric waveguide in accordance with this invention comprises a pair of parallel flat conductors arranged at a space of 1/2 or below of a high frequency signal wavelength λ and a dielectric strip extending between these parallel flat conductors. This dielectric strip is formed from a cordierite ceramic having a dielectric constant of 4.5 to 8, especially 4.5 to 6. Conversion of an electromagnetic wave of LSM mode to an electromagnetic wave of LSE is minimal. When the module has a dielectric strip having a steep curved portion having a small radius of curvature, the transmission is possible with a low loss, and the band width of a high frequency signal is broad.

23 Claims, 16 Drawing Sheets





6,094,107 Jul. 25, 2000

Air Cooled Termination for Transmission Lines

Inventor: Jefferson D. Lexa
Filed: Sep. 29, 1998.

***Abstract*—**A termination for a coaxial transmission line wherein an elongated central conductor is located in an enclosure or housing and is surrounded by a plurality of elongated resistor tubes. The central conductor is connected to the inner conductor of the transmission line and the resistor elements are connected to the outer conductor. The housing defines an inner flow chamber and a plurality of outer flow passages surrounding the inner flow chamber with the upper ends thereof communicating with the upper end of the inner flow chamber. A centrifugal blower is located at the bottom of each of the outer flow passages to generate an air flow upwardly and then through lateral ports into the upper end of the inner flow chamber, whereupon a flow proceeds downwardly in a turbulent vortex through the inner flow chamber to cool the resistor elements.

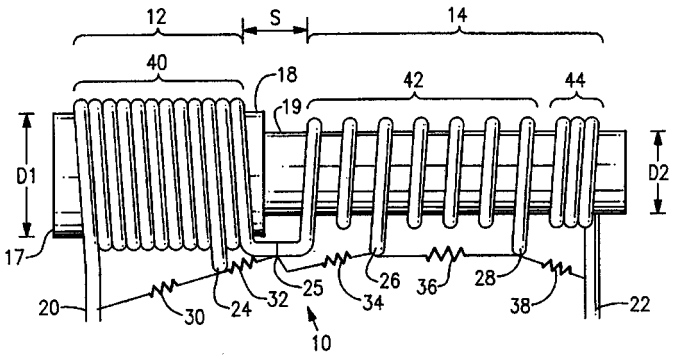
6,094,110 Jul. 25, 2000

RF Choke with Windings Located at Two Different Core Diameters

Inventor: Prabhakara Reddy.
Assignee: National Electronic Devices, Inc.
Filed: Nov. 18, 1998.

***Abstract*—**This invention relates to a radio frequency ("RF) choke having improved insertion loss and reduced hum modulation. The RF choke includes three conductors wound in series around an elongated core. The first conductor forms a first group of windings where each turn abuts the next turn. The second conductor forms a second group windings where each turn is spaced from the next. The third conductor forms a third group of windings where each turn abuts the next turn. The second and third groups of windings are wound in an opposite direction around the core than the first group of windings. The elongated core can include two separate diameters. A plurality of resistors are electrically connected to said conductors to provide an impedence that effectively blocks an RF signal at between 5 MHz and 1000 MHz. This type of choke can be employed in numerous circuits, including line splitters and couplers, trunk amplifiers, bridge amplifiers and line extender amplifiers.

19 Claims, 2 Drawing Sheets



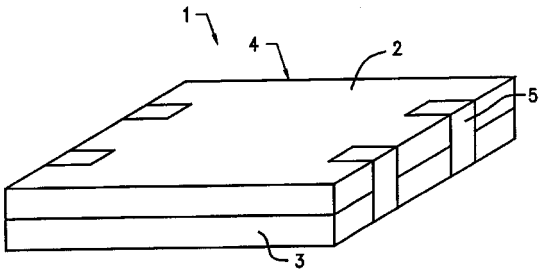
6,094,111 Jul. 25, 2000

Inductance–Capacitance Composite Component with a Glass Having a Low Temperature Softening Point

Inventor: Hirofumi Sunahara.
Assignee: Murata Manufacturing Co., Ltd.
Filed: Nov. 17, 1997.

***Abstract*—**An inductance–capacitance (LC) composite component comprising a body obtained by monolithically sintering a capacitor portion having a layered structure consisting of a dielectric ceramic layer and an electrode layer with an inductor portion having a layered structure consisting of a magnetic ceramic layer and an electrode layer, wherein at least one of said dielectric ceramic layer and said magnetic layer contains a glass having a softening point of 800°C. or lower, and said dielectric ceramic layer and said magnetic layer are monolithically sintered at a temperature of 1000°C. or lower. The LC composite component is free from generation of cracks and degradation in characteristics, and is thereby highly reliable.

11 Claims, 1 Drawing Sheet



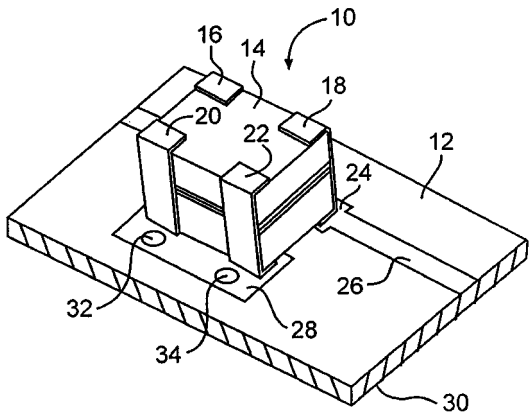
6,094,112 Jul. 25, 2000

Surface Mount Filter Device

Inventors: Haim Goldberger, Isaac Refaely, and Ehud Elron.
Assignee: AVX Corporation.
Filed: Oct. 9, 1998.

***Abstract*—**A surface mount filter device is provided having a device body with a plurality of terminations located thereon. Capacitors and inductors are located on the same chip to create a variety of LC filters, such as LPF, HPF, BPF and BRF, or combinations of these options, as well as LC resonator structures. The chip is preferably built by thin film technology, which allows a considerable reduction in component or circuit size. The device body is constructed having a rigid insulative substrate to which a first conductive pattern having one or more first capacitor plates is applied. A dielectric is located over the first conductive pattern, and itself supports a second conductive pattern defining the opposed capacitor plates. One or more layers of insulative polymer are located above the dielectric layer, and have conductor channels in which conductive material is located. The conductive material in the conductive channels forms the coil of the on-chip inductor. A sealing cover, such as glass or a planar polymeric sheet, is located above the polymeric insulative layers.

14 Claims, 12 Drawing Sheets



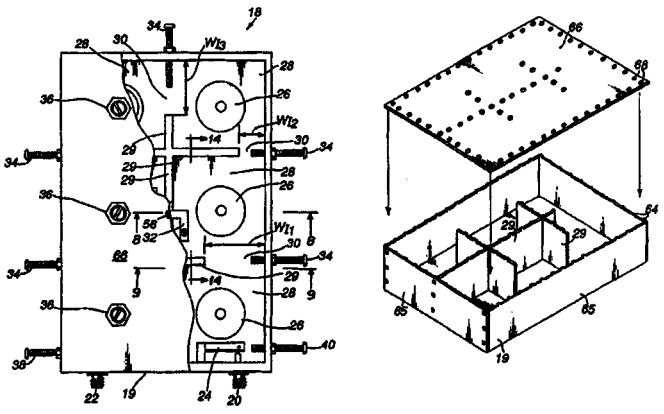
6,094,113 Jul. 25, 2000

Dielectric Resonator Filter Having Cross-Coupled Resonators

Inventors: Robert J. Wenzel, William G. Erlinger, Paul Bartley, and Lucy Bartley.
Assignee: Bartley Machines & Manufacturing.
Filed: Mar. 10, 1998.

***Abstract*—**A dielectric resonator filter operating in a magnetic dipole mode includes a plurality of dielectric resonators disposed in a plurality of dielectric resonator cavities. A plurality of coupling mechanism provide an in-line coupling factor between respective resonators of electrically adjacent dielectric resonator cavities. At least one cross-coupling device provides cross-coupling between respective resonators of nonadjacent dielectric resonator cavities. A magnitude and sign of the in-line coupling factors and the cross-coupling factor, provide a dielectric resonator filter, for which a desired amplitude and phase response can be provided.

21 Claims, 14 Drawing Sheets



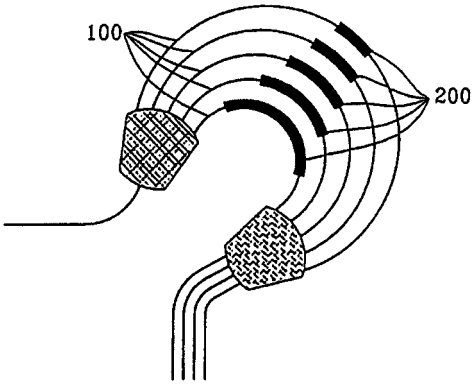
6,094,513 Jul. 25, 2000

Demultiplexer with a Square Spectral Response

Inventors: Arnaud Rigny and Adrien Bruno.
Assignee: France Telecom.
Filed: Nov. 12, 1998.

***Abstract*—**The present invention relates to a multiplexer and/or demultiplexer optical component of the waveguide array spectrograph type, wherein the waveguides are numbered in order of increasing optical path length, the optical path lengths of the waveguides describing a function of waveguide number which varies about a mean linear function, a difference measured between said waveguide number function and said mean linear function describing a difference function not limited to a set of two linear functions, said difference function being suitable for giving the optical component a spectral response that is square in shape.

10 Claims, 6 Drawing Sheets



6,094,588 Jul. 25, 2000

Rapidly Tunable, High-Temperature Superconductor, Microwave Filter Apparatus and Method and Radar Receiver Employing Such Filter in a Simplified Configuration with Full Dynamic Range

Inventor: John D. Adam.
Assignee: Northrop Grumman Corporation.
Filed: May 23, 1997.

***Abstract*—**A narrow bandwidth (1 to >100 MHz) HTS microwave filter (**30** or **50**) is described which is tunable over a moderate frequency range (100 to >1000 MHz at X-band). The low loss (<1 dB) and GHz/microsecond tuning rates enable the filter to operate as a radar preselector filter. The filter consists of a multi-pole microstrip or stripline HTS coupled one-half resonator pattern deposited onto a ferrite substrate (**32** or **52**, **54**). The ferrite substrate is operated in a latching mode like that in the operation of digital phase shifters. The filter tunability arises from the variation of the effective permeability with the remanent magnetization.

5 Claims, 6 Drawing Sheets