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.

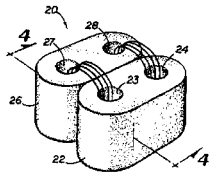
6,114,924 Sep. 5, 2000

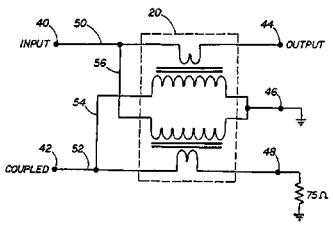
Dual Core RF Directional Coupler

Inventors: Steven L. Cain and Michael G. Ellis.
Assignee: Antec Corporation
Filed: Apr. 22, 1998.

***Abstract*—**An RF directional coupler includes dual binocular ferrite cores. The dual cores are positioned back-to-back, such that the adjacent surfaces of each core contact each other. Each core has two generally cylindrical holes that extend through the core. Each hole preferably extends longitudinally through each respective core and is parallel to each other hole. One core is called the "main core" and the other core is called the "return core." Wire windings enter the coupler from the printed circuit board from the bottom of the coupler. A winding enters one hole in the main core and exits the hole on the top of the coupler. The winding then enters the corresponding hole in the return core from the top of the coupler. The winding then proceeds downwardly and exits the hole in the return core at the bottom of the coupler. After exiting the return core, the winding may then again enter the hole in the main core or may connected to a connection port on the printed circuit board. In this manner, the windings are not required to exit the main core and then return to the main core by looping around the outside of the main core. Instead, the windings return to the main core through holes in the return core.

4 Claims, 2 Drawing Sheets





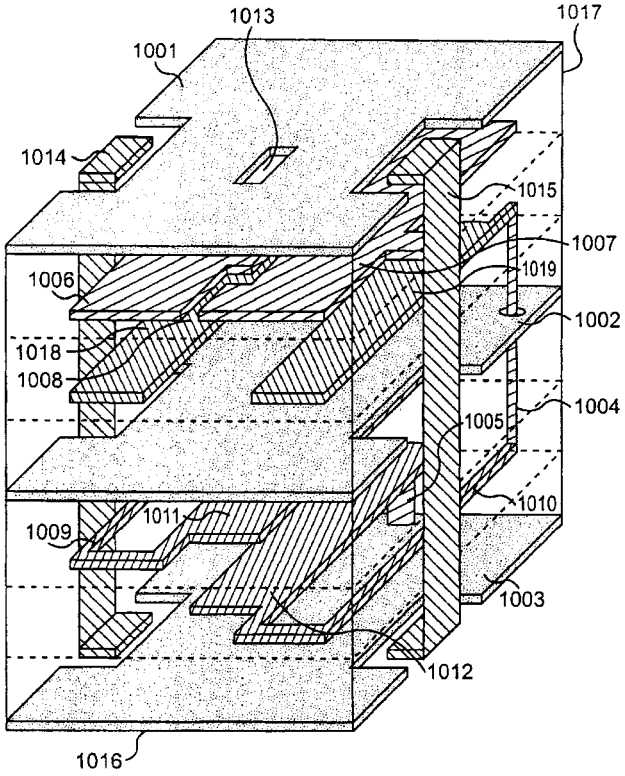
6,114,925 Sep. 5, 2000

Miniaturized Multilayer Ceramic Filter with High Impedance Lines Connected to Parallel Coupled Lines

Inventor: Wen-Teng Lo
Assignee: Industrial Technology Research Institute
Filed: Jun. 18, 1998.

***Abstract*—**A bandpass filter which is suitable to be implemented using a multilayered structure, including multilayer ceramic/low temperature co-fired ceramic (MLC/LTCC) technique, is presented. In structure, there is no need of using a substrate with high dielectric constant to reduce the filter size, and it is suitable to be buried into the substrate and thus easy to integrate with other sub-modules to form a single, miniaturized, multifunction module. Electrically, the proposed filter can be modified by adjusting the location of those poles to meet the system specification. These drastically reduce the amount or even the need for tuning, thereby lowering the filter cost.

10 Claims, 8 Drawing Sheets



6,114,928 Sep. 5, 2000

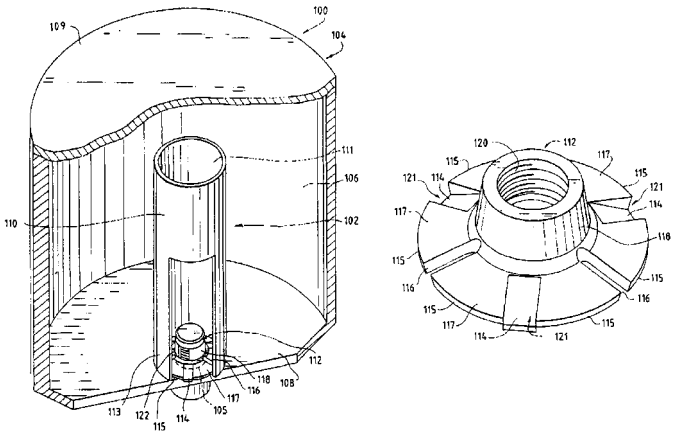
Mounting Assemblies for Tubular Members Used in RF Filters

Inventor: Patrick Smith
Filed: Nov. 10, 1997.

***Abstract*—**A tubular assembly for use in an RF filter having an internal cavity. The tubular assembly includes a hollow tube and a flare positioned inside the hollow tube for mounting the hollow tube onto the filter housing. The flare includes at least two engagement surface portions which engage the inner wall of the hollow tube. During assembly, the flare engagement surface portions expand thereby locking the hollow tube on the filter housing.

Publisher Item Identifier S 1531-1309(01)03809-0.

34 Claims, 5 Drawing Sheets



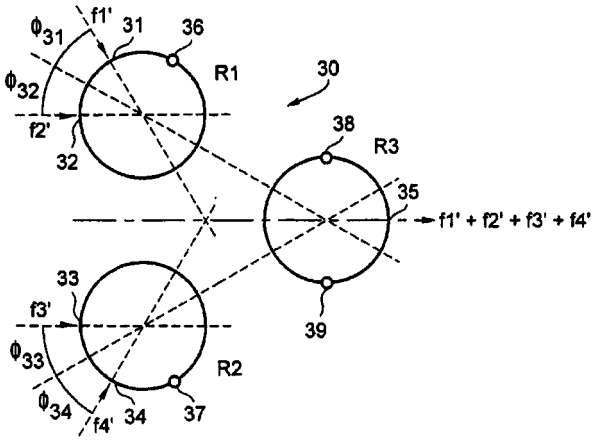
6,114,931 Sep. 5, 2000

Superconducting Arrangement with Non-Orthogonal Degenerate Resonator Modes

Inventors: Spartak Gevorgian and Erland Wikborg.
Assignee: Telefonaktiebolaget LM Ericsson
Filed: Jun. 18, 1998.

***Abstract*—**Superconducting multiplexing/demultiplexing arrangements include a number of signal input devices and a number of signal output devices. A number of resonators provides a number of filters. Each filter represents a channel. The resonator(s) operate(s) devices at lest in dual mode, and tuning devices are provided so that at least some of the resonators is/are tunable. A method is provided of multiplexing signals incoming to a multiplexing arrangement with a number of resonators, each of the resonators having a number of input ports which are so arranged that a number of multipole filters are created. Input signals having different frequencies are supplied to the different input ports of the resonators, each of which is operated in three modes. Coupling devices are arranged which at least comprise the angle between the input ports and a symmetry plane. The angles are nonperpendicularly azimuth. Tuning devices are further provided for tuning the resonant frequencies of the degenerate modes, and the coupling angles and tuning devices are controlled so that for a number of input signals, only input signal is transmitted to the output devices.

27 Claims, 7 Drawing Sheets



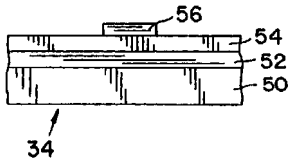
6,117,824 Sep. 12, 2000

Superconductor Microstrip Transmission Line

Inventors: Randy Wayne Simon, Christine Elizabeth Platt, Alfred Euinam Lee, and Gregory Steven Lee.
Assignee: TRW Inc.
Filed: Jan. 9, 1995.

***Abstract*—**A lanthanum aluminate ($LaAlO_3$) substrate on which thin films of layered perovskite copper oxide superconductors are formed. Lanthanum aluminate, with a pseudo-cubic perovskite crystal structure, has a crystal structure and lattice constant that closely match the crystal structures and lattice constants of the layered perovskite superconductors. Therefore, it promotes epitaxial film growth of the superconductors, with the crystals being oriented in the proper direction for good superconductive electrical properties, such as a high critical current density. In addition, $LaAlO_3$ has good high frequency properties, such as a low loss tangent and low dielectric constant at superconductive temperatures. Finally, lanthanum aluminate does not significantly interact with the superconductors. Lanthanum aluminate can also used to form thin insulating films between the superconductor layers, which allows for the fabrication of a wide variety of superconductor circuit elements.

1 Claim, 1 Drawing Sheet



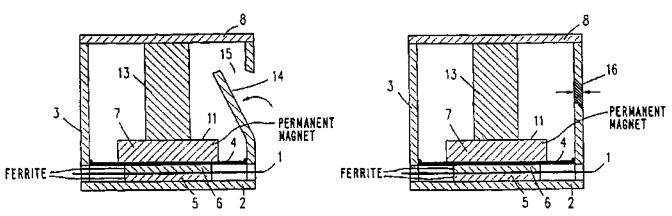
6,118,352 Sep. 12, 2000

Microwave Component Comprising Gyromagnetic Material Exposed to Adjustable Magnetic Field Strength

Inventor: Ralf Wendel
Assignee: U.S. Philips Corporation
Filed: Feb. 19, 1998.

***Abstract*—**A description is given of a microwave component which includes a microwave conductor arrangement for conducting electromagnetic waves and a gyromagnetic material which is provided in operative contact with the electromagnetic waves and can be subjected to a magnetic field of adjustable field strength in that the gyromagnetic material, at least one magnet for generating the magnetic field, and a magnetic tuning member, whose magnetic conductivity can be varied in order to adjust the magnetic field strength, are arranged in a magnetic circuit.

2 Claims, 1 Drawing Sheet



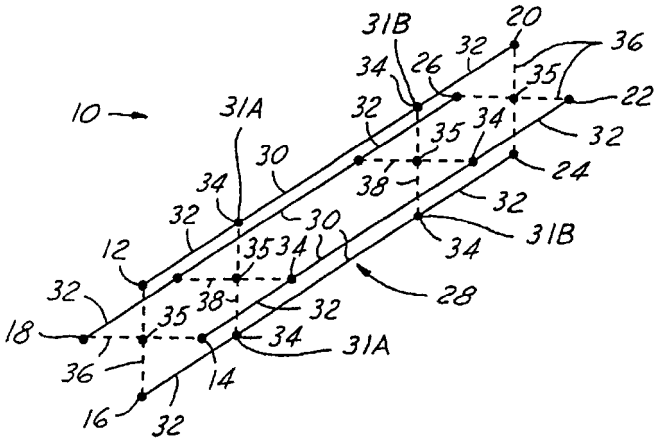
6,118,353 Sep. 12, 2000

Microwave Power Divider/Combiner Having Compact Structure and Flat Coupling

Inventor: James P. McKay
Assignee: Hughes Electronics Corporation
Filed: Feb. 17, 1999.

Abstract—A power divider/combiner for dividing received powers at 4 input ports, transmitting the divided powers to each of 4 output ports and combining the transmitted powers at each of the output ports. The power divider combiner has through transmission lines flanked on either side by secondary through transmission lines that interconnect corresponding input and output ports. The through transmission lines are likewise interconnected at a center node by a plurality of branch transmission lines. A method for making a power divider/combiner includes merging two 0 dB couplers by joining the center points of each of the branch transmission lines.

16 Claims, 6 Drawing Sheets



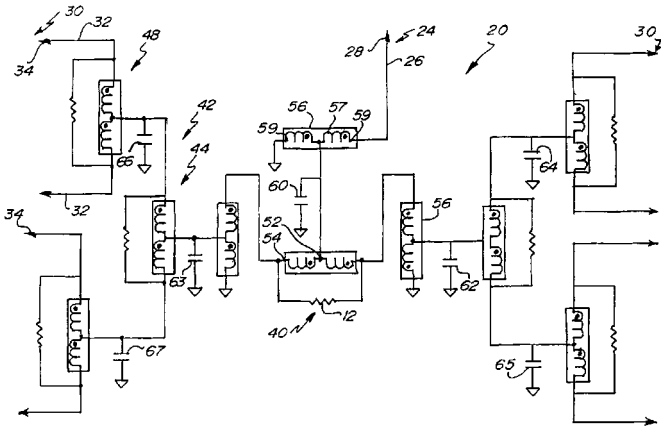
6,118,354 Sep. 12, 2000

High Frequency Splitter

Inventors: John E. Decramer and Franklin B. Gass.
Assignee: BH Electronics, Inc.
Filed: Nov. 16, 1998.

Abstract—A multi level splitter device suitable for CATV distribution systems utilizes transformers with bi-multiplefilar windings as well as impedance matching transformers selectively placed and port isolation techniques to provide excellent performance throughout a very broad frequency range. The device may utilize a standard JEDEC surface mount package, for example a 84 pin PLCC package which allows isolation of each of the output port terminals intermediate grounded terminals minimizing output line to output line crosstalk. Further, output line isolation is provided by use of resistors across adjacent "split" output lines.

16 Claims, 5 Drawing Sheets



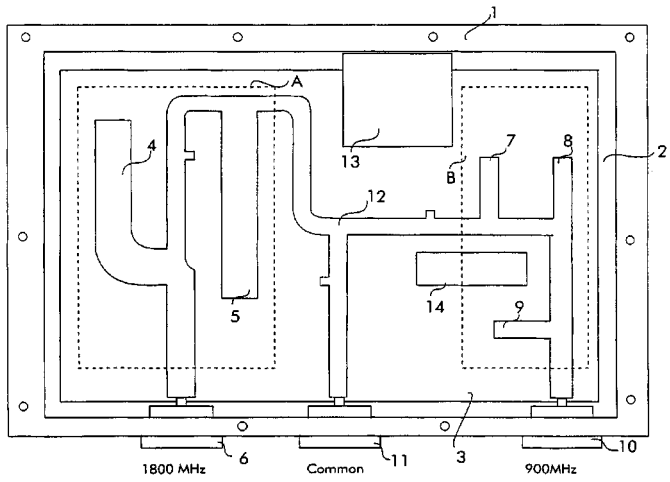
6,118,355 Sep. 12, 2000

Dual Band Combiner Arrangement

Inventors: Dieter Pelz and Noel McDonald.
Assignee: Alcatel
Filed: Jun. 8, 1999.

Abstract—A dual band combiner for combining two frequency bands having a 2:1 relationship, e.g., 900 MHz and 1800 MHz. The combiner comprises an upper frequency bandpass filter section and an upper frequency bandstop filter. The bandpass filter section comprises two open-end resonators whose lengths are 1/2 wavelength of the upper frequency band, and the bandstop filter comprises three open-end resonators whose lengths are 1/4 wavelength of the upper frequency band. Because of the 2:1 frequency relationship pronounced selectivity-enhancing transmission zeros are produced at the lower frequency band, thereby providing a combiner that has high isolation between ports while maintaining low insertion loss.

9 Claims, 2 Drawing Sheets



6,118,356 Sep. 12, 2000

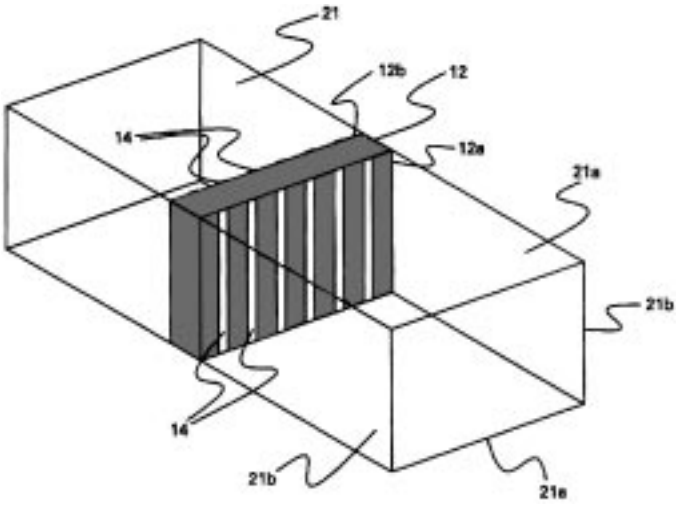
16 Claims, 4 Drawing Sheets

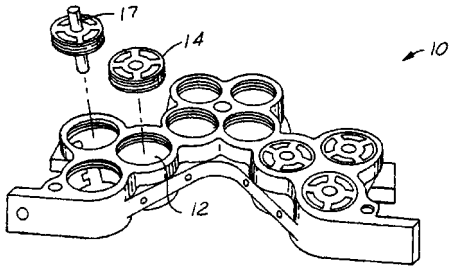
Microwave Cavity Having a Removable End Wall

Inventors: Keith N. Loi, Paul J. Tatomir, Franz D. Davis, Robert J. Ahulii, and James W. Schultz.
Assignee: Hughes Electronics Corporation
Filed: Sep. 16, 1998.

***Abstract*—**A plurality of end caps engagable with a microwave cavity each have an underside configured differently to cause the microwave cavity to have different electrical responses depending on which end cap engages the microwave cavity. A microwave device includes a cylindrical cavity and an end cap movable within the cavity to change its axial position within the cavity thereby varying the volume and the electrical response of the cavity.

19 Claims, 2 Drawing Sheets





6,118,909 Sep. 12, 2000

Athermal Optical Devices

Inventors: Jerry Chia-yung Chen, Corrado Dragone, and Yuan P. Li.
Assignee: Lucent Technologies, Inc.
Filed: Feb. 11, 1998.

***Abstract*—**Optical devices, such as wavelength routers, having a plurality of waveguides of differing lengths, with improved independence to temperature fluctuations. Improved temperature independence is achieved by varying the cross-section of the device waveguides. Cross-section variation can be implemented in one or more of following ways: selectively applying a temperature-compensating material (e.g., a polymer) over portions of the waveguides, and/or varying the dimensions and/or compositions of the materials used in the waveguides, either along each waveguide or between waveguides or both. By carefully designing the devices, the temperature effects resulting from the different lengths of the different waveguides can be compensated to produce a relatively temperature-independent device. The index of refraction of the temperature-compensating material changes with temperature in the same direction as the indices of refraction of the rest of the waveguide materials, and the effective length of the portion of a waveguide covered by the temperature-compensating material is inversely proportional to the effective length of the waveguide.

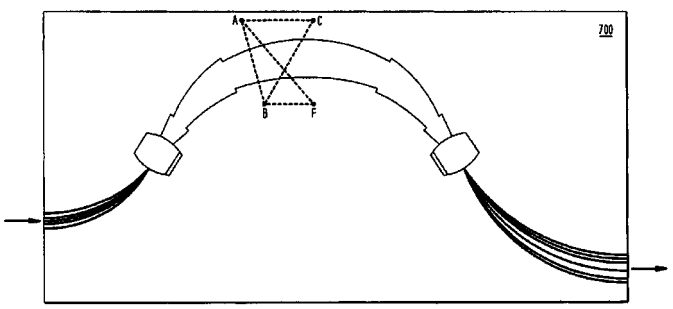
17 Claims, 6 Drawing Sheets

6,118,358 Sep. 12, 2000

High Average-Power Microwave Window with High Thermal Conductivity Dielectric Strips

Inventor: David D. Crouch
Filed: Jan. 18, 1999.

***Abstract*—**A high average-power microwave window is provided whose thermal conductivity has been enhanced to enable it to transmit higher average RF power levels than conventional windows of the same size. Such a window is suitable for use with high-average power RF sources such as klystrons and magnetrons. The window comprises a ceramic substrate, typically a low-loss ceramic such as alumina or quartz, to which narrow strips of a high thermal conductivity material have been bonded. One such high thermal conductivity material is synthetic polycrystalline diamond, which can be bonded to the surface of a dielectric substrate using a high-temperature cement or can be directly deposited on the surface by a process such as chemical vapor deposition (CVD). High-purity alumina, a commonly-used material for high-power RF windows, has a thermal conductivity of 26.4 W/m·°C, while synthetic diamond has a thermal conductivity of 1000 W/m·°C, 2.6 times that of copper and 38 times that of alumina. The novel feature is the use of high thermal conductivity strips to increase the effective thermal conductivity of a microwave window by providing low-resistance paths by which heat can be extracted from the window, resulting in a significant increase in the window's power-handling capacity.



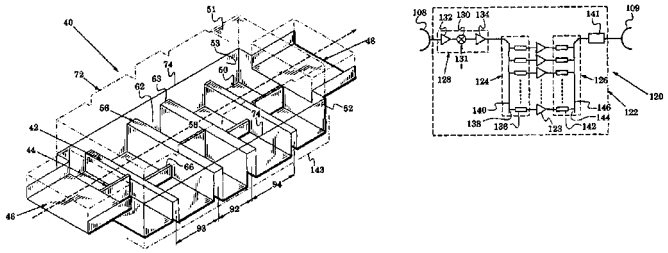
6,118,978 Sep. 12, 2000

Transverse-Electric Mode Filters and Methods

Inventor: Ralf R. Ihmels
Assignee: Hughes Electronics Corporation
Filed: Apr. 28, 1998.

***Abstract*—**A transverse-electric waveguide filter is provided for transmitting a fundamental transverse-electric mode in a first frequency band while attenuating an associated higher-order transverse-electric mode in a second frequency band. The filter includes transverse corrugations between input and output waveguide ports to attenuate the higher-order transverse-electric mode. The input and output waveguide ports have a characteristic impedance and the filter also includes a ridge system that is coupled between the first and second waveguide ports and is configured to provide a signal-path impedance that substantially matches the characteristic impedance to thereby support transmission of the fundamental transverse-electric mode from the input port to the output port.

18 Claims, 5 Drawing Sheets



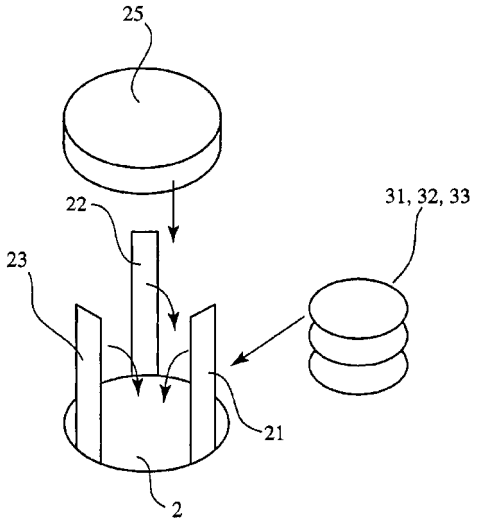
6,121,851 Sep. 19, 2000

Non-Reciprocal Circuit Element

Inventors: Shinji Takane and Ryouji Matsumoto.
Assignee: Hitachi Metals Ltd.
Filed: Oct. 14, 1998.

***Abstract*—**A nonreciprocal circuit element for transmitting a high-frequency signal of microwave band in one direction. The electrical characteristics of the nonreciprocal circuit element have been improved by using an insulating sheet having a thickness within a specific range thereby to regulate the distance between vertically adjacent strip electrodes within a specific range. Also, the product-to-product variation in the electrical characteristics of the nonreciprocal circuit element has been minimized by shaping the end portion of the strip electrode so as to extend in coplanar relationship to the top surface of the capacitor to be connected.

19 Claims, 4 Drawing Sheets



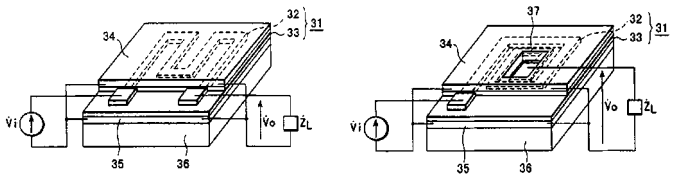
6,121,852 Sep. 19, 2000

Distributed Constant Element Using a Magnetic Thin Film

Inventors: Tetsuhiko Mizoguchi, Tetsuo Inoue, and Toshirou Sato.
Assignee: Kabushiki Kaisha Toshiba
Filed: Jul. 14, 1998.

***Abstract*—**The present invention is directed to a magnetic thin-film device whose operating frequency band ranges from several millihertz (MHz) to several gigahertz (GHz) and which is used as an inductor for a switching power supply, a noise filter, a reception circuit for receiving a quasimicrowave and a magnetic sensor. In this device, uniaxial magnetic anisotropy is guided to a magnetic layer, and the magnetic layer is sandwiched between dielectric layers to form a propagation path of electromagnetic wave. A microstrip line is provided on the top surface of the propagation path, while an insulative underlying substrate is formed on the bottom surface thereof with a lower grounded conductor interposed therebetween. Thus, the wavelength of the propagation path can be shortened to miniaturize the device. The device is rapidly improved in characteristics and miniaturized further, resulting in reduction in manufacturing costs.

10 Claims, 11 Drawing Sheets



6,121,853 Sep. 19, 2000

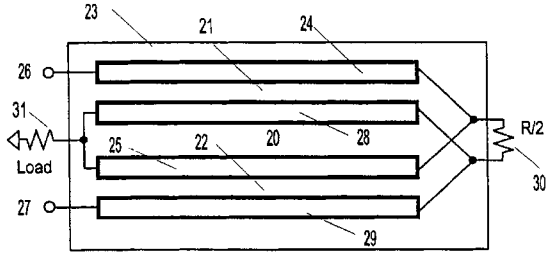
Broadband Coupled-Line Power Combiner/Divider

Inventor: Simon Y. London
Assignee: Apti, Inc.
Filed: Oct. 28, 1998.

***Abstract*—**A broadband coupled-line N-way power combiner is presented for combining N RF signals into a common load. This combiner includes $N \geqq 2$ input ports, a common output port, and N identical at least two-conductor coupled transmission lines, and N isolating resistors. Each of these two-conductor coupled transmission line has at one end one conductor connected to one of the input port of the power combiner, and another conductor connected to the

common output port. At another end two conductors of each two-conductor coupled transmission line are terminated to one of the N isolating resistors. The opposite ends of these resistors are connected to each other in a ring. This power combiner also can operate in reverse as N-way power divider.

6 Claims, 11 Drawing Sheets



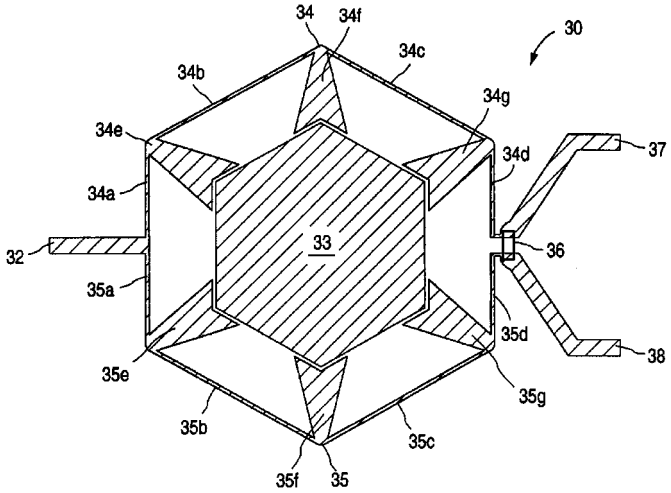
6,121,854 Sep. 19, 2000

Reduced Size 2-Way RF Power Divider Incorporating a Low Pass Filter Structure

Inventors: Robert K. Griffith and Roland Matian.
Assignee: Digital Microwave Corporation
Filed: Apr. 19, 1999.

***Abstract*—**A power divider includes an input port, a first output port, a second output port, a first transformer coupled between the input port and the first output port, and a second transformer coupled between the input port and the second output port. The first and second transformers each incorporates a low pass filter. The power divider further includes a ground plate disposed adjacent to the first and second transformers. The ground plate is capacitively coupled to the low pass filters of the first and second transformers for enhancing the low pass filtering characteristics of the power divider. The power divider provides low pass filtering capability while achieving a significant size reduction over conventional power dividers.

36 Claims, 5 Drawing Sheets



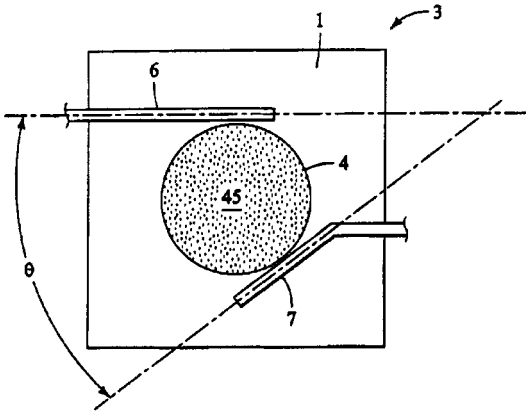
6,121,855 Sep. 19, 2000

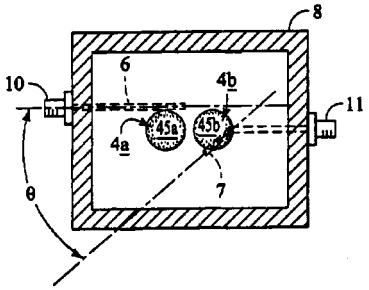
Dielectric Filter Comprising at Least One Coupling Member Coupled to Two Coupling Modes of a Resonator and a Communication Device Using the Same

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

***Abstract*—**A dielectric filter is formed by electrode nonformation parts (openings) disposed on opposite main surfaces of a dielectric plate so as to form a dielectric resonator, as well as two coupling members coupled to said dielectric resonator. A large amount of attenuation required for blocking a certain frequency is secured by generating an attenuation pole in the area of that frequency. The two coupling members may be constituted by probes or other structures. The two coupling members are nonparallel to each other, and one of the coupling members is coupled with at least two coupling modes of the resonator.

12 Claims, 13 Drawing Sheets





6,121,861 Sep. 19, 2000

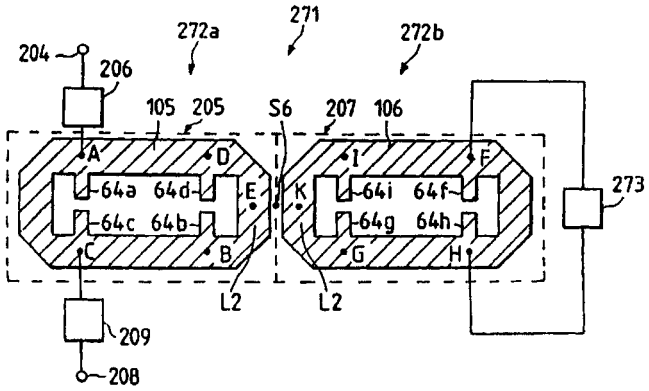
Plane Type Strip Line Filter in which Strip Line is Shortened and Dual Mode Resonator in which Two Types Microwaves are Independently Resonated

Inventors: Hiroyuki Yabuki, Morikazu Sagawa, and Mitsuo Makimoto.
Assignee: Matsushita Electric Industrial Co., Ltd.
Filed: Mar. 4, 1999.

***Abstract*—**A strip-line filter is provided with upper- and lower-stage resonators having the same electromagnetic characteristics. Each of the resonators has a one-wavelength square-shaped strip line and four open-end transmission lines connected to four coupling points A, C, B and D (or E, G, F and H) of

each resonator which are spaced 90 degrees in electric length in that order. The square-shaped strip lines having a pair of parallel coupling lines closely placed in parallel to each other to electromagnetically couple the resonators. Therefore, the filter can be manufactured in a small size. A first microwave resonated in each resonator is electromagnetically influenced by two open-end transmission lines connected to two coupling points A and B (or E and F), and a second microwave resonated in each resonator is electromagnetically influenced by two open-end transmission lines connected to two coupling points C and D (or G and H). Therefore, resonance wavelengths of the microwaves can be longer than a line length of each square-shaped strip line. Also, the resonance wavelengths can be adjusted by trimming the transmission lines. Also, because all constitutional elements are made of strip lines, the filter can be made plane.

8 Claims, 22 Drawing Sheets



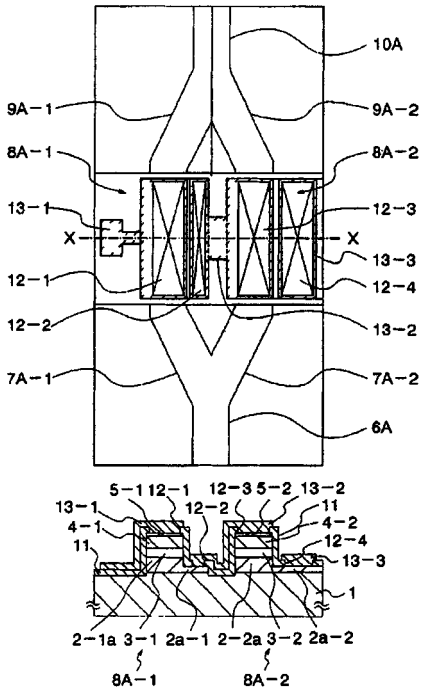
6,122,414 Sep. 19, 2000

Semiconductor Mach–Zehnder Modulator

Inventor: Junichi Shimizu
Assignee: NEC Corporation
Filed: May 28, 1998.

***Abstract*—**A semiconductor Mach–Zehnder modulator comprises a pair of phase modulator arm waveguides and a single driver for a push–pull modulation. A first electrode connected to p-type cladding layer of first modulator arm is maintained at a negative potential V_{π}, a second electrode connected to n-type cladding layer of first modulator arm and p-type cladding layer of second modulator arm is driven by a drive voltage, and a third electrode connected to n-type cladding layer of second modulator arm is maintained at a ground potential. The drive voltage changes between V_{π} and $V_{\pi/2}$ for push–pull modulation of both modulator arms.

19 Claims, 15 Drawing Sheets



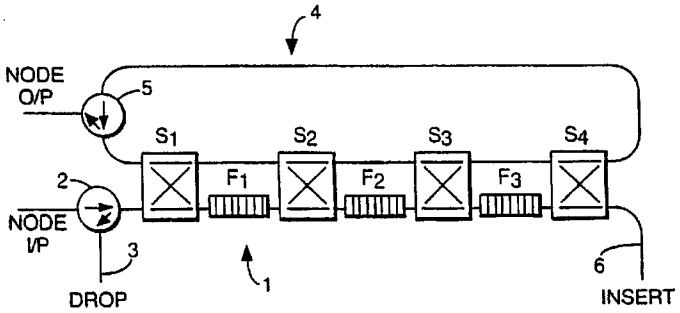
6,122,418 Sep. 19, 2000

Chromatic Dispersion Compensating Node

Inventor: Andrew D. Ellis
Assignee: British Telecommunications
Filed: Mar. 5, 1997.

***Abstract*—**Wavelength division multiplexed transmission line functions of chromatic dispersion compensation and channel drop are performed by a node having a concatenated series of wavelength selective dispersion compensating elements and switches. The switches are arranged to selector or bypass each wavelength selective dispersion compensating element. If a wavelength selective dispersion compensating element is appropriately selected, the corresponding channel is dispersion compensated and reflected to a drop port. Any remaining channels are circulated by the switches to the remaining channels are circulated by the switches to the remaining dispersion compensating elements where they are dispersion compensated and reflected to an optical output. In the preferred examples, the node includes an insert port to allow multiplexing of additional channels. This allows the node to perform both drop and insert functions in addition to dispersion compensation and so forms a dispersion compensating drop and insert node.

20 Claims, 7 Drawing Sheets



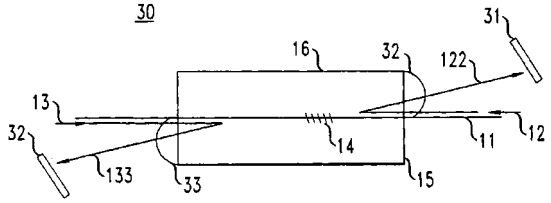
6,122,422 Sep. 19, 2000

Article Comprising a Dispersive Waveguide Tap

Inventors: Christopher Stephen Koeppen and Jefferson Lynn Wagener.
Assignee: Lucent Technologies Inc.
Filed: Jun. 8, 1998.

***Abstract*—**A bidirectional waveguide tap is disclosed. The tap comprises an appropriately blazed grating in the waveguide, with coupling means in optical cooperation with the waveguide causing transfer of light from a guided mode in the waveguide to a radiation mode. Radiation mode light of a given wavelength and propagation direction is brought to a focus on a predetermined region of utilization means, e.g., an array of protosensors.

11 Claims, 2 Drawing Sheets



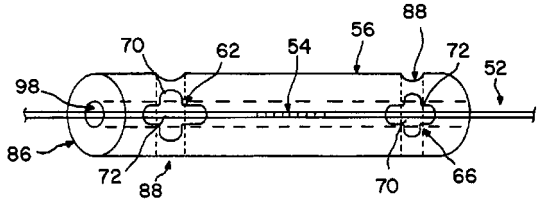
6,122,430 Sep. 19, 2000

Optical Device and Fusion Seal

Inventors: Dana Bookbinder, Joel Carberry, Steven Demartino, Gaylord Francis, Scott Glaeseman, Robert Morena, and Brent Wedding.
Assignee: Corning Incorporated
Filed: May 24, 1999.

***Abstract*—**An optical device, and a method of producing the device, are disclosed. The device comprises a substrate and an optical waveguide component affixed to the substrate with a glass frit fusion seal formed and locked within a recessed void in the substrate, the glass frit fusion seal being the fused product of a low melting glass frit. The recessed void in the substrate includes a region for receiving the optical waveguide component and an intersecting region that secures the placement of the glass frit fusion seal. The optical waveguide component is affixed to the substrate in order to control temperature varying optical properties of the component.

21 Claims, 4 Drawing Sheets



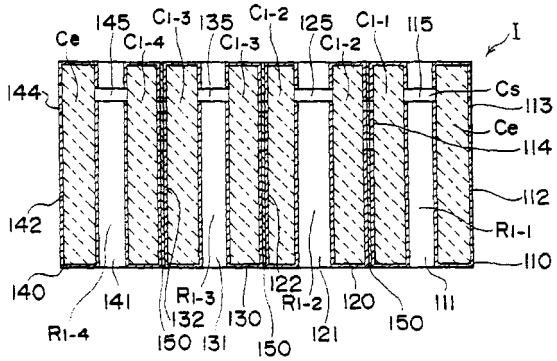
6,122,489 Sep. 19, 2000

Dielectric Filter Having Capacitive Coupling Windows Between Resonators, and Transceiver Using the Dielectric Filter

Inventor: Tadahiro Yorita
Assignee: Murata Manufacturing Co., Ltd.
Filed: Apr. 21, 1995.

***Abstract*—**A dielectric filter in which the resonant frequency of each resonator and the degree of coupling between resonators can be adjusted independently. The dielectric filter includes first and second dielectric blocks, each having a through bore. The dielectric blocks, including the bores,are covered with a conductive film to define respective dielectric resonators whose electric energy component varies in the direction of an axis of the through bore. A first isolated coupling electrode is formed on the first dielectric block for coupling an input signal to the first dielectric resonator. A second isolated coupling electrode is formed on the first dielectric block in a location with a relatively high electric energy component so that electric energy exits the first dielectric block via the second coupling electrode. The second dielectric block has a third isolated coupling electrode at a location corresponding to the second coupling electrode such that electric energy leaving enters the second dielectric block via the third coupling electrode and sets up an electromagnetic field in the second dielectric block whose electric energy component varies in the direction of the through bore of the second dielectric block. A fourth isolated coupling electrode is formed on the second dielectric block at a location with a relatively high resonant electric energy component such that electric energy leaves the dielectric block via the fourth coupling electrode.

58 Claims, 22 Drawing Sheets



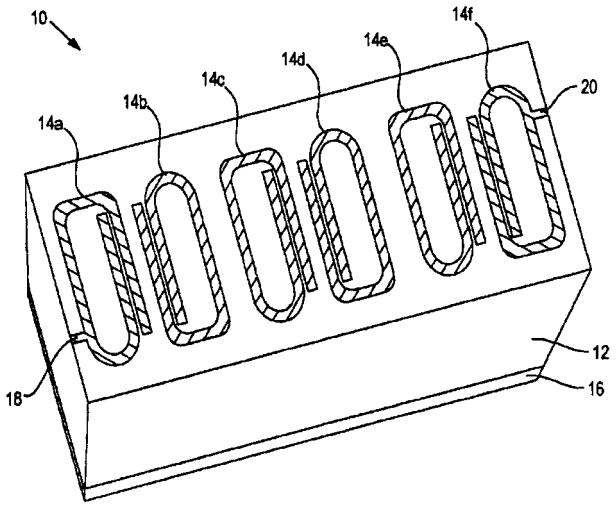
6,122,533 Sep. 19, 2000

Superconductive Planar Radio Frequency Filter Having Resonators with Folded Legs

Inventors: Zhihang Zhang, Attila Weiser, Jr., Jonathan Raymond Scupin, and Linda D'Evelyn.
Assignee: Spectral Solutions, Inc.
Filed: Jun. 27, 1997.

***Abstract*—**A planar filter for performing signal filtering at radio frequencies is provided. The planar filter can include asymmetrical resonators, wherein each resonator is asymmetrical about a longitudinal center axis through the resonator. In addition, the resonators can be grouped in coupled pairs such that the resonators in each coupled pair are asymmetrical about a longitudinal center axis between the paired resonators. In addition, a coupling structure is provided that includes both distributed coupling and tapped coupling to a resonator. Further, a bandstop filter device is provided that includes coupling between resonators in the filter.

36 Claims, 6 Drawing Sheets



6,124,768 Sep. 26, 2000

Microwave Testing High-Power Dummy Load Forming Method and Microwave Testing High-Power Dummy Load Apparatus

Inventor: Joji Makiyama
Assignee: NEC Corporation
Filed: Nov. 10, 1998.

***Abstract*—**In a method for forming microwave testing high-power dummy load, a first center conductor, to which microwave power is input, is connected to a power distributor formed from a second center conductor having an output-side distal end branching into a plurality of portions. This causes the microwave power input to the first center conductor to separate into a plurality of outputs in correspondence with the output-side distal end of the second center conductor. A plurality of termination resistors are connected between the output-side distal end of the second center conductor and a ground conductor to make the termination resistors consume the microwave power. The heat generated by the termination resistors upon consumption of the microwave power is radiated by the ground conductor. A microwave testing high-power dummy load apparatus made by the above described method is also disclosed.

10 Claims, 5 Drawing Sheets