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, D.C. 20231.

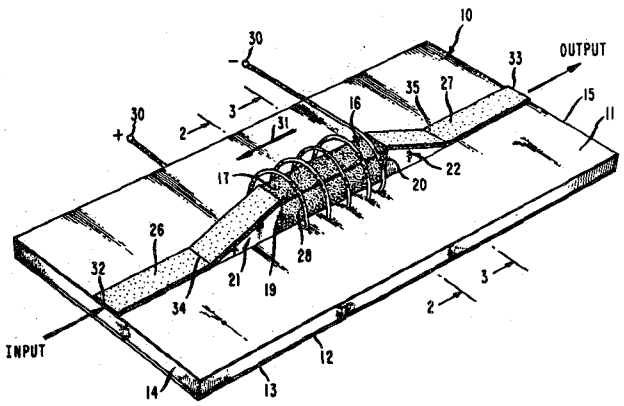
4,845,449 July 4, 1989

Millimeter-Wave Microstrip Modulator/Switch

Inventors: Richard A. Stern and Richard W. Babbitt.
Assignee: The United States of America as represented by the Secretary of the Army.
Filed: Nov. 3, 1988.

Abstract—A microstrip switch is provided comprising a rectangular ferrite rod having a pair of ramp-shaped dielectric waveguide members at the ends thereof. The ramp members are made of dielectric waveguide material having a dielectric constant which is substantially the same as the dielectric constant of the ferrite. The rod and ramp members are mounted on one surface of a microstrip dielectric substrate having a dielectric constant substantially less than the dielectric constant of the ramp members and a ground plane on the other surface thereof. Input and output sections of microstrip conductor are mounted on the surface of the substrate and the sloping surfaces of the ramp members in axial alignment with the rod and ramp members. A helical coil surrounding the rod and passing through the substrate and ground plane is selectively energized to produce a unidirectional magnetic field along the longitudinal axis of the rod which causes Faraday rotation of RF wave energy passing through the rod from the input microstrip section and subsequent misalignment of the RF wave energy exiting from the rod to the output microstrip conductor section.

5 Claims, 1 Drawing Sheet



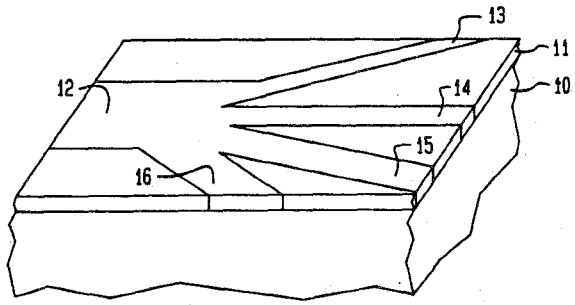
4,846,540 July 11, 1989

Optical Waveguide Junction

Inventor: Elyahou Kapon.
Assignee: Bell Communications Research, Inc.
Filed: Jan. 25, 1988.

Abstract—An optical waveguide junction including a multimode input waveguide and a plurality of n spaced apart output waveguides, disposed on a substrate. Each of the output waveguides has a different propagation constant, (e.g., by having different widths or indices of refraction), so that the input modes of optical radiation are sorted in a predetermined way into n groups of output modes corresponding to the n output waveguides. If the input waveguide is excited with optical radiation of different wavelengths, the output waveguides may be tailored with specific widths and indices of refraction to sort the input radiation into the n output waveguides as a function of wavelength, thereby demultiplexing the input optical signal. More generally, the junction may also be utilized with m input waveguides and n output waveguides to implement routing, switching, modulation, and wavelength multiplexing/demultiplexing.

16 Claims, 3 Drawing Sheets



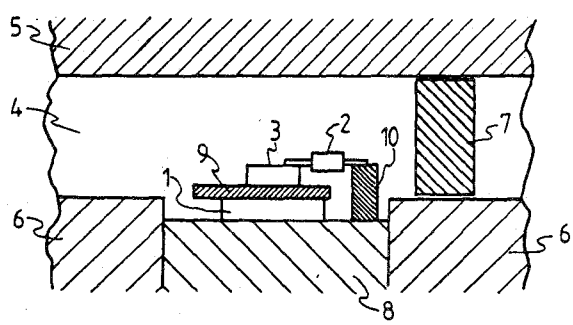
4,847,571 July 11, 1989

Microwave Oscillator Integrated in a Waveguide

Inventors: Jean Stevance, Edmond Klein, and Georges Lleti.
Assignee: Thomson Hybrides et Microondes.
Filed: Mar. 17, 1988.

Abstract—A negative-resistance diode oscillator tuned by a varactor as applicable to frequency-modulated transmitters or to receiver oscillators operating within the 56–100 GHz frequency band is integrated in a waveguide. The diode is encapsulated in a capped package and mounted on a ground-connected base. A coupling capacitor is fixed on the metallic cap of the package. A varactor having beam-lead connections is mounted as a bridge between the capacitor and a ground-connected metallic stud. The bias voltages are brought in the plane of the waveguide by means of two wires and two capacitors housed within orifices formed through the waveguide walls.

6 Claims, 2 Drawing Sheets



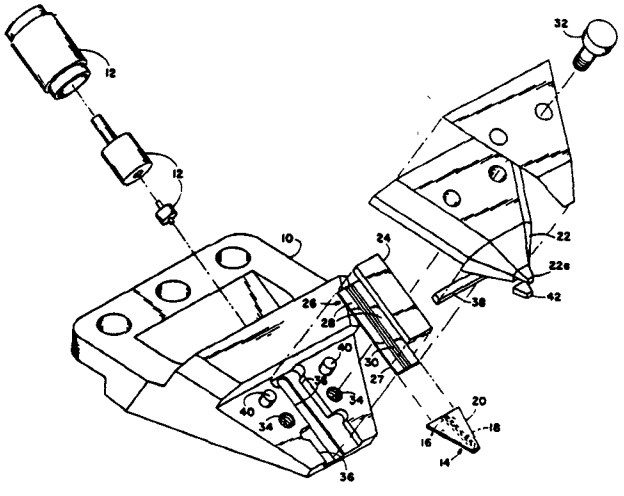
4,849,689 July 18, 1989

Microwave Wafer Probe Having Replaceable Probe Tip

Inventors: K. Reed Gleason, Keith E. Jones, and Eric W. Strid.
Assignee: Cascade Microtech, Inc.
Filed: Nov. 4, 1988.

Abstract—A microwave wafer probe having a replaceable planar transmission line probe tip which detachably connects to a planar transmission line circuit board within the probe head. The circuit board may include passive and/or active electrical circuit components interconnecting its conductors which, due to the detachable interconnection with the probe tip, do not have to be replaced if the probe tip should be damaged. The detachable interconnection between the probe tip and the circuit board is tolerant to misalignment of the two elements because the interconnected end portions of the respective conductors are shaped so as to maintain the impedance between the two elements substantially constant despite misalignment. Preferably, both the circuit board and the detachable tip include coplanar transmission lines interconnected by compressing the overlapping end portions of their conductors together.

12 Claims, 3 Drawing Sheets



4,849,716 July 18, 1989

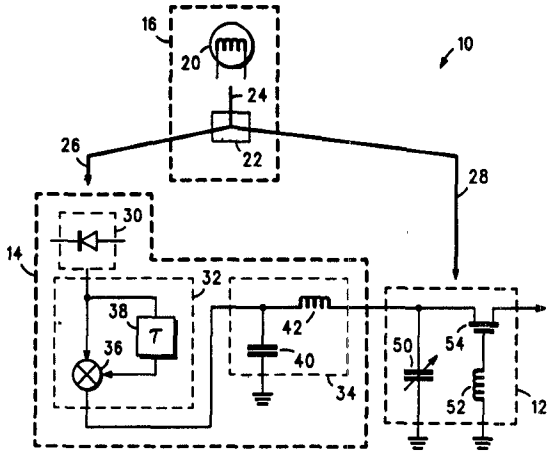
Direct Optical Injection Locking Circuitry Utilizing Optical Oscillator Tuning

Inventors: John M. Golio and David A. Warren.
Assignee: Motorola, Inc.
Filed: Aug. 15, 1988.

Abstract—An optical injection locking oscillator is contemplated having a tuning device. The tuning device generates a dc voltage proportional to the resonant frequency of a modulated light used to injection lock the free running oscillator. The dc voltage is applied to a varactor capacitor within the oscillator to bring the frequency of oscillation within a close proximity to the modulating frequency of the light. This facilitates injection locking, whereas frequencies of oscillation outside a certain locking range will not facilitate injection locking. The modulated light then locks the oscillator into a desired resonant frequency. A second embodiment contemplates using a YIG oscillator regulated by a dc current generated within the tuning device.

19 Claims, 1 Drawing Sheet

4,849,720 July 18, 1989

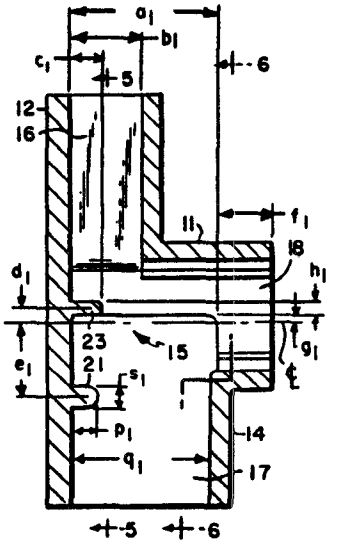


Orthogonal Mode Tee

Inventor: William F. Call.
Assignee: Nelco Microwave Company.
Filed: May 22, 1986.

Abstract—An orthogonal mode tee to use at microwave frequencies and having a junction for three ports, two of the ports, two of the ports propagating the TE_{10} mode and the common port propagating the TE_{11} mode.

5 Claims, 5 Drawing Sheets



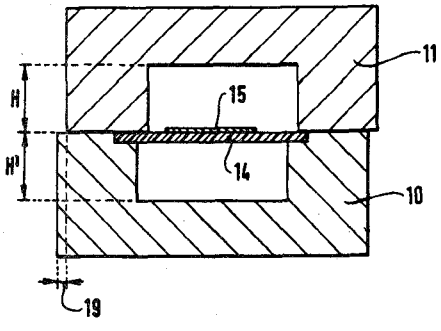
4,849,722 9July 18, 1989

Adjustable Band Suspended Substrate Filter

Inventors: Jean-Claude Cruchon and Jean-Denis Schubert.
Assignee: Alcatel Thomson Faisceaux Hertziens.
Filed: Sept. 25, 1987.

Abstract—An adjustable band filter comprising a conductive screening body (10, 11) made of two parts (10 and 11) joined to each other on either side of a separation plane (13), a cavity (12) inside said body, said cavity containing a half wavelength resonant line (15) carried on a first face (16) of a suspended substrate (14), the substrate being end-coupled and received in grooves (17) made in the walls of the first portion (10). The first face (16) of the substrate (14) divides the cavity (12) into two asymmetrical volumes in such a manner as to enable the passband of said filter to be modified.

10 Claims, 4 Drawing Sheets



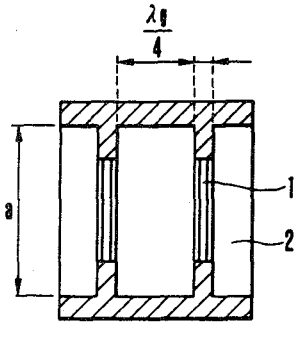
4,849,724 July 18, 1989

Waveguide Band-Pass Filter

Inventor: Shuichi Koreeda.
Assignee: NEC Corporation.
Filed: Dec. 8, 1988.

Abstract—A waveguide band-pass filter has at least two resonators each consisting of a high-impedance section and a low-impedance section. The resonators are cascade-connected at intervals of $\lambda_g/4$ in a waveguide.

2 Claims, 4 Drawing Sheets



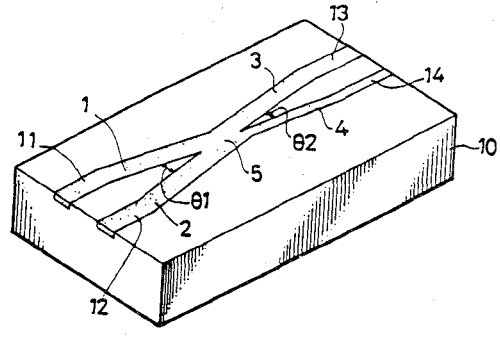
4,850,666 July 25, 1989

Slab-Type Optical Device

Inventors: Masayuki Izutsu, Tadasi Sueta, and Masaharu Matano.
Assignee: Omron Tateisi Electronics Co.
Filed: Jan. 6, 1987.

Abstract—A slab-type optical device comprising a pair of single-mode waveguides equal in phase constant and intersecting each other each at its one end and a pair of single-mode waveguides different in phase constant and intersecting each other each at its one end. The pairs of waveguides are joined to each other at their intersections. The angle of intersection of the two waveguides in each pair is set to such a small value that when light propagates along the waveguide a very small distance, the variation in the spacing between the waveguides is negligible relative to the distance of propagation.

16 Claims, 8 Drawing Sheets



4,851,794 July 25, 1989

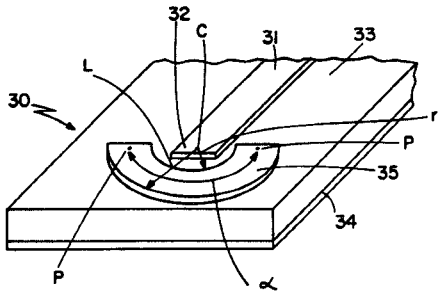
Microstrip to Coplanar Waveguide Transitional Device

Inventors: Dylan F. Williams and Tommy H. Miers.
Assignee: Ball Corporation.
Filed: Oct. 9, 1987.

Abstract—A novel transition device is disclosed capable of being used in an integrated circuit comprising a substrate having a first planar surface upon which at least one circuit element is formed and a second planar surface upon which a ground metallization is formed, said first planar surface being spaced from and parallel to the second planar surface, said at least one circuit element being connected to a metal strip and having an open end terminating on said first planar surface, a coplanar grounding station disposed on the first planar surface and situated adjacent to and spaced from said open end, said coplanar grounding station being free of any electrically conducting path between said metal strip and said coplanar grounding station and between said ground metallization and said coplanar grounding station. The expression *grounding station* as used herein may be defined as a planar structure comprising of at least one metallized patch situated to and spced from a strip transmission line, said patch lying parallel to and separated from

a ground plane of said line, said patch not being electrically connected to said transmission line.

33 Claims, 2 Drawing Sheets



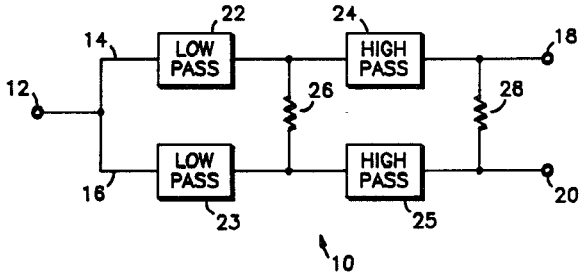
4,851,795 July 25, 1989

Miniature Wide-Band Microwave Power Divider

Inventor: William B. Beckwith.
Assignee: Motorola, Inc.
Filed: Mar. 4, 1988.

Abstract—A minature wide-band microwave power divider comprising a common terminal connected to a plurality of parallel signal paths with each signal path comprising a low pass and a high pass filter made up of discrete components. Use of discrete components allows the entire power divider to be incorporated on a single chip. Isolation is achieved between the signal paths by isolation means comprising resistors.

15 Claims, 2 Drawing Sheets



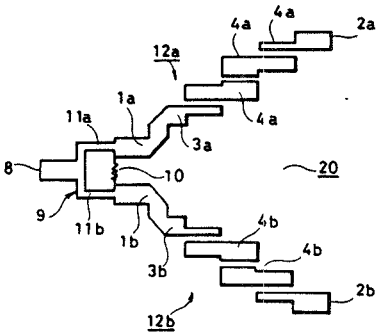
4,851,797 July 25, 1989

One-Half-Wavelength Side Coupled Filter

Inventor: Makio Nakamura.
Assignee: Sharp Kabushiki Kaisha.
Filed: July 28, 1988.

Abstract—In a $\frac{1}{2}$-wavelength side coupling filter, a plurality of resonance lines (4) are arranged on a board (20) in parallel to each other in a staggered manner so that respective ends thereof have step portions. An input coupling line (3) is arranged in parallel to the plurality of resonance lines, with an input end (5) formed opposed to an intermediate position of the adjacent resonance line and one end portion (6) formed aligned with one end portion of the adjacent resonance line. An adjusting line (7) is formed extending from one end portion (6) on the input coupling line, and the filtering characteristics adjusted by the adjusting line.

4 Claims, 3 Drawing Sheets



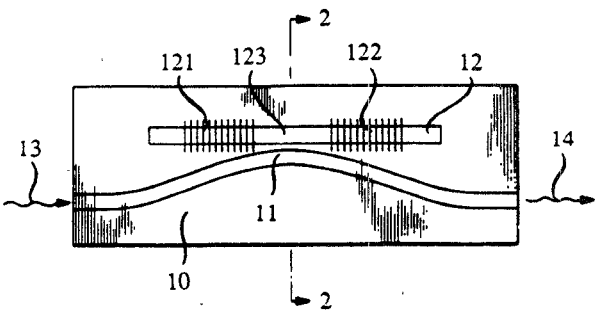
4,852,960 Aug. 1, 1989

Narrow-Line-Width Resonant Optical Device, Transmitter, System, and Method

Inventors: Rodney C. Alferness, Charles H Henry, Rudolf F. Kazarinov, Nils A. Olsson, and Kenneth J. Orlowsky.
Assignee: American Telephone and Telegraph Company, AT&T Bell Laboratories.
Filed: Sept. 23, 1988.

Abstract—Highly frequency-selective reflectivity is realized in an optical device including a waveguide and an evanescent-field coupled grating resonator cavity. The device may include a light source and serve as a low-chirp, narrow-line-width communications laser for use, e.g., for transmission over a fiber having nonnegligible dispersion and also in wavelength-multiplexed coherent systems.

23 Claims, 5 Drawing Sheets



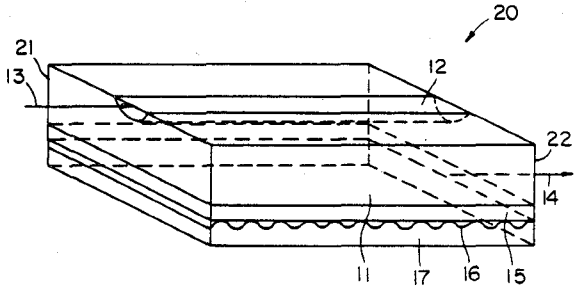
4,852,961 Aug. 1, 1989

Nonlinear Optical Waveguide Device Including Grating for Changing of the Wavelength of Light

Inventors: Osamu Yamamoto and Toshihiko Yoshida.
Assignee: Sharp Kabushiki Kaisha.
Filed: Sept. 30, 1988.

Abstract—A device for the changing of the wavelength of light comprising a nonlinear optical crystal, first and second optical waveguides that are formed in the nonlinear optical crystal, and an introducing means that is positioned adjacent to the second optical waveguide, the light being incident upon the first optical waveguide and propagated within the first optical waveguide, resulting in harmonic light that satisfies the phase-matching conditions, and the harmonic light being introduced, by the introducing means, into the second optical waveguide from which the harmonic light is output.

7 Claims, 3 Drawing Sheets



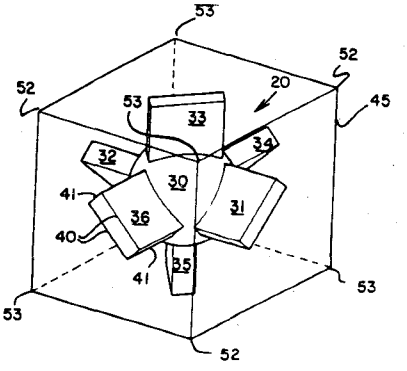
4,853,650 Aug. 1, 1989

Symmetric Waveguide Junction Combiner

Inventors: Donald R. Bowling and Charles F. Smith.
Assignee: The United States of America as represented by The Secretary of the Navy.
Filed: Oct. 4, 1988.

Abstract—A microwave power combiner having a spherical region from which six rectangular waveguides extend oppositely along mutually orthogonal diameters. The long dimension of each waveguide cross section extends along a diagonal of a cube circumscribing the region and extends orthogonally to this long dimension of the opposite waveguide. One waveguide is an input for an injection locking signal, and four waveguides are inputs for power to be combined in the region from oscillators controlled by the signal. No circulator is required, and the combined power may be output through the remaining waveguide or through the injection locking input waveguide. A number of the combiners may be connected with the output of one combiner serving as an injection locking input or as one power input to another of the combiners.

20 Claims, 7 Drawing Sheets



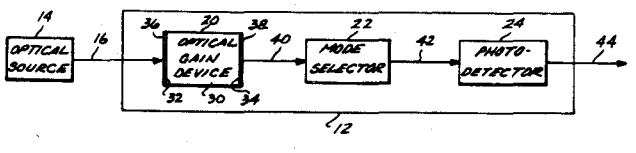
4,859,015 Aug. 22, 1989

Optical Receiver Having Optical Gain Medium and Mode Selector

Inventors: Jeffrey A. Krinsky and Robert A. Falk.
Assignee: The Boeing Company.
Filed: Aug. 17, 1988.

Abstract—An optical receiver particularly suited for use in a noisy environment, the receiver includes an optical gain device for amplifying an input signal to produce an amplified input signal, a photodetector, and a mode selector. The optical gain device includes an optical gain medium, an optical input port through which the input signal may be received into the optical gain medium, and an optical output port through which an optical output signal may leave the optical gain medium. The output signal includes the amplified input signal, plus any noise generated within the optical gain device. The input and output ports include antireflection means. In a preferred embodiment, the mode selector comprises a single mode fiber-optic cable that transmits a single spatial mode of the output signal to the photodetector.

5 Claims, 1 Drawing Sheet



4,853,656 Aug. 1, 1989

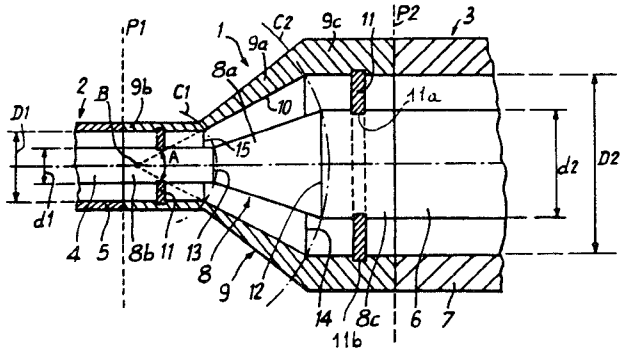
Device for Connecting Together Two Ultra-High Frequency Structures Which Are Coaxial and of Different Diameters

Inventors: Bernard P. Y. Guillou and Pierre V. A. Lahitte.
Assignee: Aerospatiale Societe Nationale Industrielle.
Filed: July 29, 1988.

Abstract—A device is provided for connecting together two coaxial ultra-high frequency structures of different diameters. This device is remarkable in that it has itself a rigid coaxial structure comprising a central core in the form of a truncated cone, as well as a peripheral sheath whose internal wall is a truncated cone shaped surface, the small bases of the truncated cones of said central core and of said peripheral sheath of said connection are two parallels of the same sphere centered on the apex of the truncated cone shaped surface of said internal wall and the large bases of the truncated cones of

said central core and said peripheral sheath of said connection are two parallels of a second sphere concentric to the first one.

11 Claims, 1 Drawing Sheet



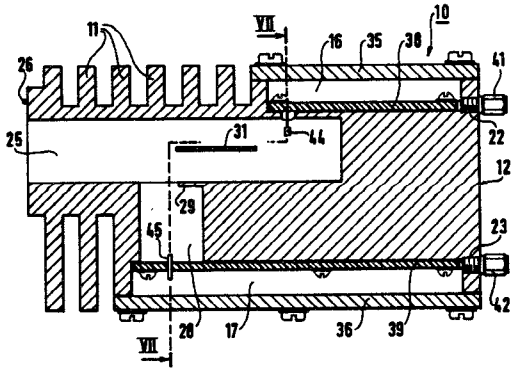
4,853,657

Orthogonaol Polarization Duplex Send-Receive Microwave Head

Inventors: Jean-Claude Cruchon, Franck Fontaine, and Michel Brugidou.
Assignee: Societe anonyme dite: Alcatel Thomson Faisceaux Hertziens.
Filed: June 16, 1988.

Abstract—An orthogonal polarization duplex send-receive microwave head comprising an elongate housing (10) provided at one end (26) with a longitudinal bore (25) forming a first waveguide and with a transverse bore (28) forming a second waveguide opening out into the first waveguide, and an antenna (44) which extends into the first waveguide, said microwave head being characterized in that said antenna (44) is a receive antenna which extends into said first waveguide at a location situated between the inside end of said first waveguide (25) and the location at which said second waveguide (28) opens out therein, and in that a transmit antenna (45) extends into the second waveguide at its free end, with said antennas being connected to respective coaxial accesses (41, 42) and with a metal plate (31) being disposed longitudinally in the first waveguide between two transverse planes containing the two antennas (44, 45).

8 Claims, 2 Drawing Sheets



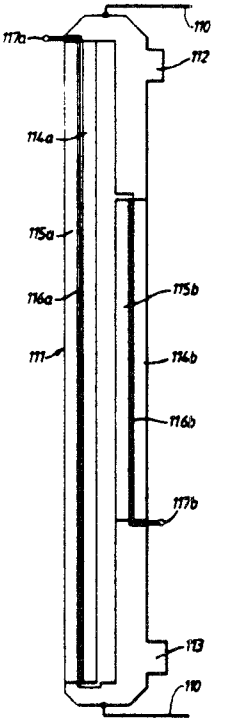
4,853,658 Aug. 1, 1989

Microwave Phase Shifters

Inventor: Anthony A. Lane.
Assignee: Plessey Overseas Limited.
Filed: June 27, 1988.

Abstract—The invention provides a phase-shifting device for inclusion into a microwave transmission line to effect a predetermined, constant, broadband shift in phase of transmitted signals. The device comprises, in its preferred form, two gallium arsenide field effect transistors, connected in parallel, serially included in the line, and means for switching the transitors between alternate states to effect the phase shift.

5 Claims, 3 Drawing Sheets



4,853,660 Aug. 1, 1989

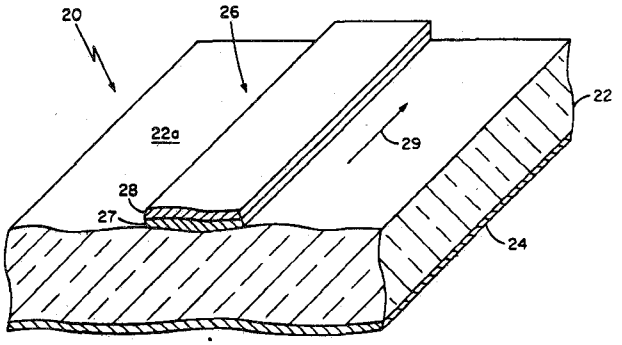
Integratable Microwave Devices Based on Ferromagnetic Films Disposed on Dielectric Substrates

Inventor: Ernst F. R. A. Schloemann.
Assignee: Raytheon Company.
Filed: June 30, 1988.

Abstract—Integratable microwave devices such as a tuneable band reject filter or an RF switch are provided on a gallium arsenide substrate having a (100) orientation. Each of the devices includes a layer of a ferromagnetic material having a pair of easy axes which lie in the plane of said (100) orientated substrate and a layer of a conductive, nonmagnetic material disposed thereover. The ferromagnetic material has a ferromagnetic resonant frequency related to the applied dc magnetic field, the anisotropy field, the

saturation magnetization, and gyromagnetic ratio. Such devices are provided by utilizing the ferromagnetic resonant properties of the ferromagnetic material disposed on the (100) substrate.

22 Claims, 8 Drawing Sheets



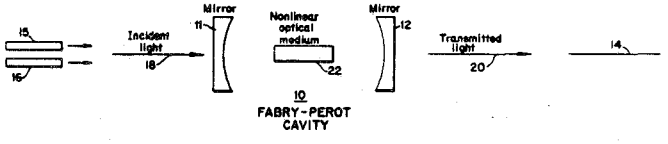
4,854,676 Aug. 8, 1989

Bistable Optical Devices

Inventors: Palaiyur S. Kalyanaraman and Anthony F. Garito.
Assignee: Hoechst Celanese Corp.
Filed: Apr. 19, 1988.

Abstract—In one embodiment this invention provides a bistable optical device comprising a Fabry–Perot etalon which has an optical cavity containing a naphthalocyanine dye medium as a nonlinear optical component.

22 Claims, 1 Drawing Sheet



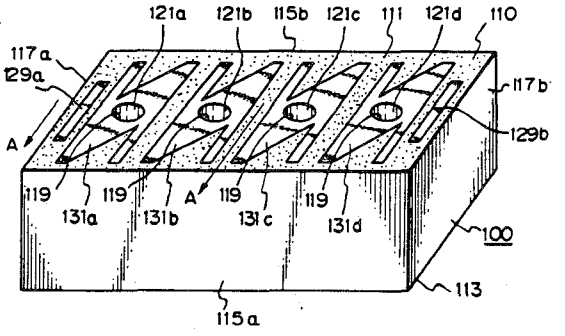
4,855,693 Aug. 8, 1989

Dielectric Filter and a Method of Manufacture Thereof

Inventors: Hisao Matsukura, Osamu Yamato, and Hiroyuki Horii.
Assignee: Oki Electric Industry Co., Ltd.
Filed: Aug. 3, 1988.

Abstract—A dielectric filter and a method of manufacture. The filter includes a block of ceramic material having one or more holes extending from a top surface to a bottom surface, each of which is interiorly covered with conductive material so as to form an inner conductive layer. The bottom surface and side surfaces of the block are also covered with bottom and side conductive layers electrically connected to the inner conductive layers at the bottom surface. The inner conductive layer is further connected to spaced apart top conductive layer portions provided on the top surface of the block surrounding each hole. The top layer portions are spaced from each other and have an oblique edge portion which is capacitively coupled with, and obliguely faces an upper edge portion of the side conductive layers, the oblique edge facilitating adjustment of the resonant frequency by removal of a predetermined amount of conductive matrial therefrom. In accordance with the method of manufacture of this filter, the filter is initially constructed to have a resonant frequency which is greater than that ultimately desired, and after measuring the resonant frequency initially obtained, a predetermined amount of conductive material is removed from the top conductive layer at a location along the oblique edge portion according to the required reduction in resonant frequency in order to reduce the resonant frequency to a desired value.

21 Claims, 5 Drawing Sheets



4,855,694 Aug. 8, 1989

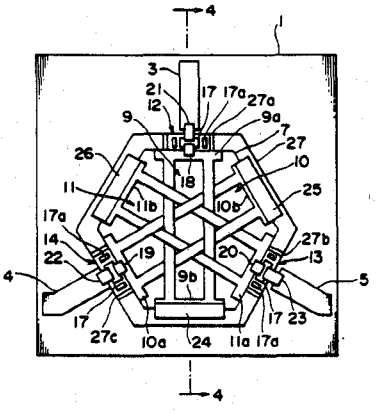
Lumped Element Circulator Having a Conductive Pedestal Frame Structure

Inventor: Hiroshi Ogawa.
Assignee: Nec Corporation.
Filed: May 31, 1988.

Abstract—A lumped element circulator comprises a dielectric substrate having a conductive layer on an upper center portion of its upper surface and a lower conductive layer entirely on its lower surface. A conductive pedestal frame structure is soldered to the upper conductive layer of the dielectric substrate on the outer periphery of a ferromagnetic substrate secured to the upper conductive layer of the dielectric substrate. Capacitors are mounted in recesses formed on the pedestal frame structure. A plurality of overcrossing parallel conductive strip lines extend in pairs across the ferromagnetic substrate with 120° angular separation at their centers. One end of each strip line pair is short-circuited by a terminating conductor located substantially on the same horizontal plane as the upper electrodes of the capacitors and connected thereto, allowing them to be interconnected by short connecting leads and further to input/output ports. The other end of each strip line pair

is short-circuited by a second terminating conductor which is connected by a short connecting lead to the upper surface of the pedestal frame structure.

3 Claims, 3 Drawing Sheets



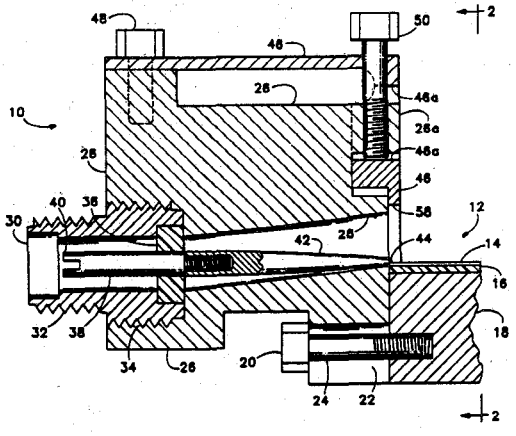
4,855,697 Aug. 8, 1989

Coaxial Transmission Line to Microstrip Transmission Line Launcher

Inventors: Keith E. Jones and Warren K. Harwood.
Assignee: Cascade Microtech, Inc.
Filed: June 27, 1988.

Abstract—A launcher having an outer conductor and a tapered central contact pin within a bore of the outer conductor connects coaxial transmission lines with microstrip transmission lines. The launcher, when used with a microstrip transmission line having a specific dielectric substrate thickness, provides matching of both the characteristic impedance and the electromagnetic field configuration. The launcher also may be used effectively with microstrip transmission lines having different substrate thickness. An adjustable stop transversely positions the upper surface of the microstrip transmission line relative to the launcher's outer conductor to counteract capacitive discontinuities caused by different substrate thickness. Although such adjustments flex the central contact pin transversely, thus changing the launcher's characteristic impedance, the launcher provides better overall matching between the two types of transmission lines. The contact tip of the pin has a cylindrical contact surface coaxial with the pin, thus forming a repeatable line contact with the upper conductor of the microstrip transmission line enabling consistent results. The bore of the outer conductor is at an angle with respect to the coaxial transmission line jack, allowing the tapered pin to extend coaxially with the jack so that the pin can be drilled and tapped on its center axis, simplifying its mass production.

8 Claims, 1 Drawing Sheet



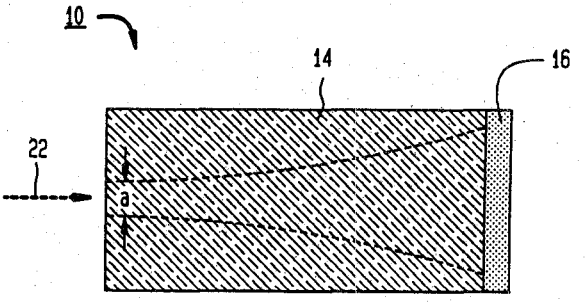
4,856,860 Aug. 15, 1989

Integrated All-Optical Switching Devices

Inventors: Yaron Silberberg and Peter W. Smith.
Assignee: Bell Communications Research, Inc.
Filed: May 26, 1988.

Abstract—Two-dimensional all-optical devices include a planar single-mode waveguide formed on or in a major surface of a supporting substrate. The waveguide comprises a nonlinear medium having an intensity-dependent index of refraction. For input optical signals above a critical intensity, self-focusing occurs in the waveguide. Microminiature high-speed bistable and switching devices based on this phenomenon and compatible with integrated-optics technology are thereby provided.

3 Claims, 3 Drawing Sheets



4,857,869 Aug. 15, 1989

High-Frequency Push–Pull Transformer

Inventors: Takashige Terakawa, Noriyuki Akaba, and Sadayoshi Hattori.
Assignee: Tokyo Keiki Co., Ltd.
Filed: Mar. 17, 1988.

Abstract—This invention relates to a push–pull transformer for use in a high frequency push–pull amplifier. This push–pull transformer has a coaxial line whose one end is connected to an input terminal, while the other end thereof is provided with an internal conductor and an outer conductor, the internal and outer conductors being grounded through stubs. A capacitor having a proper capacity is connected between the internal conductor and the outer conductor whereby the push–pull transformer can be properly actuated in a low frequency range other than the frequency used without any necessity to enlarge the size of the stubs.

12 Claims, 2 Drawing Sheets