Patent Abstracts

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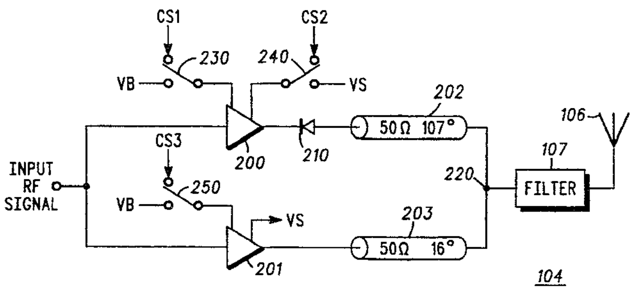
5,438,684 Aug. 1, 1995

Radio Frequency Signal Power Amplifier Combining Network

Inventors: Dale G. Schwent, Rashid M. Osmani, and Robert N. Weisshappel.
Assignee: Motorola, Inc.
Filed: Mar. 10, 1994.

Abstract—A dual-mode RF signal power amplifier combining network is comprised of two branches, each having a power amplifier (**200** and **201**). The first branch contains a nonlinear mode power amplifier (**200**) while the second branch contains a linear mode power amplifier (**201**). The nonlinear mode branch also has an RF switch (**210**). Both branches are coupled to a common output node (**220**). The common node (**220**) is coupled to a filter (**107**) before going to an antenna (**106**). The nonlinear mode power amplifier (**200**) operates when an FM signal is to be amplified, while the linear amplifier (**201**) is biased in an off state. The linear mode power amplifier (**201**) operates when a digital signal is to be amplified, while the nonlinear amplifier (**200**) is biased in an off state. The RF switch (**210**) removes the nonlinear amplifier (**200**) from the circuit to prevent loading the on state linear amplifier (**201**).

9 Claims, 3 Drawing Sheets



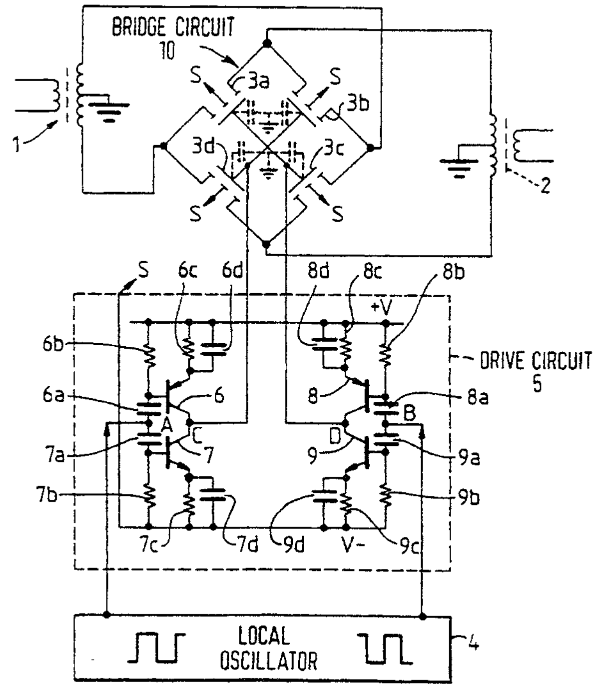
5,438,693 Aug. 1, 1995

RF Mixer

Inventor: Ian F. Cox.
Assignee: GEC-Marconi Limited.
Filed: Nov. 8, 1994.

Abstract—A mixer of the commutating type using field-effect transistors (FET's) to switch between the primary of a transformer for an RF input and the secondary of a transformer 2 for an IF output. The mixer has high linearity and low power consumption of the local oscillator drive because the gate electrodes of the FET's are switched using pulse waveforms from driving transistors.

8 Claims, 2 Drawing Sheets



5,440,415 Aug. 8, 1995

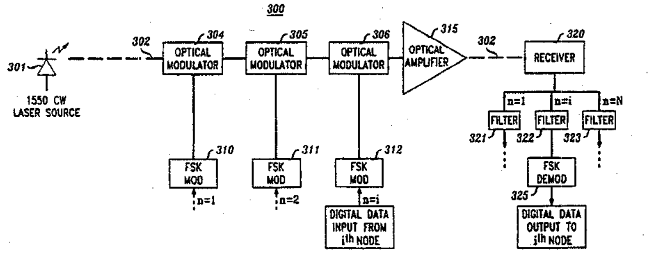
Optical Successive Modulation-Multiplexing for Fiber Optical Network

Inventors: Mohamed M. Mekawi and Yan-Chi Shi.
Assignee: AT&T Corp.
Filed: Aug. 4, 1993.

Abstract—A multiple-access network communication system employs a single continuous-wave optical carrier that is successively modulated and multiplexed at a plurality of data access nodes. The data access nodes are cascaded along an optical propagation path, and at each such node the optical carrier is impressed with a modulated electrical signal that corresponds to an electrical subcarrier having a subcarrier frequency uniquely responsive to its associated data access node. Local data at each such node is modulated electrically in accordance with a known modulation scheme, such as FSK modulation, the resulting modulated subcarrier being conducted to a respective optical modulator, which impresses same upon the optical carrier. The optical carrier is periodically, with respect to the data access nodes, amplified by an optical amplifier and ultimately conducted to a receiver where the optical carrier is detected and converted to a corresponding electrical signal. The electrical signal is then demultiplexed, illustratively by filters tuned to the subcarrier frequencies, each of which is then demodulated, whereby the original data signal is recovered. The invention can be implemented in bidirectional embodiments, which permit modulated optical carrier to be propagated in opposite directions. In addition, a bidirectional embodiment can be provided with both optical carriers from a single laser source.

Publisher Item Identifier S 1051-8207(96)07041-9.

22 Claims, 5 Drawing Sheets



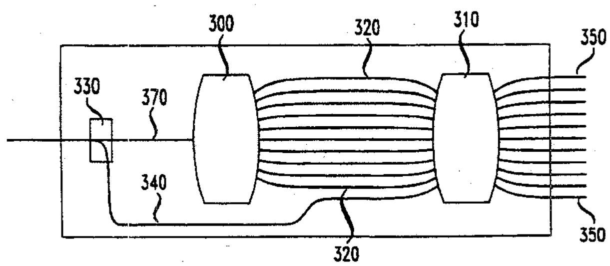
5,440,416 Aug. 8, 1995

Optical Network Comprising a Compact Wavelength-Dividing Component

Inventors: Leonard G. Cohen, Charles H. Henry, Rudolf F. Kazarinov, and Henry H. Yaffe.
Assignee: AT&T Corp.
Filed: Feb. 24, 1993.

Abstract—An optical communication network includes a novel, passive optical component. This component combines the function of a splitter with the function of a wavelength-division multiplexer. These functions are performed in distinct wavelength bands. In one embodiment, the inventive component is made using silicon optical bench technology.

6 Claims, 3 Drawing Sheets



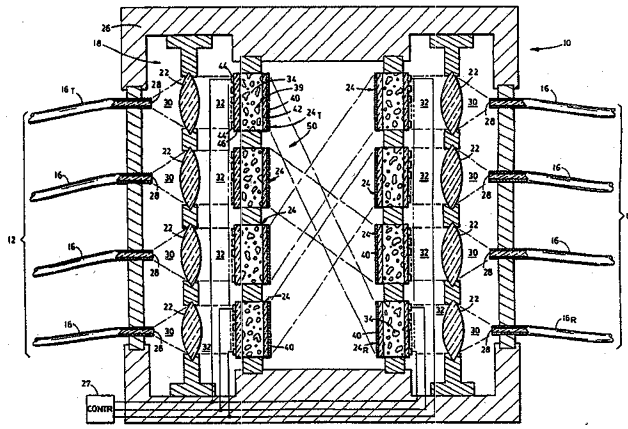
5,440,654 Aug. 8, 1995

Fiber-Optic Switching System

Inventor: L. Q. Lambert, Jr.
Assignee: Raytheon Company.
Filed: Dec. 30, 1993.

Abstract—A data communication system comprising a plurality of fiber-optic cables and a fiber-optic switching system comprising 1) a support structure for securing light-emitting/light-receiving ends of the plurality of fiber-optic cables in predetermined position and 2) means for redirecting light emitted from the light emitting/light receiving end of one of the fiber-optic cables to the light-emitting/light-receiving end to the light-emitting/light-receiving end of another one of the plurality of fiber-optic cables. The redirecting means includes means for collimating and directing the light emitted from the end of one of the cables as a beam propagating along a predetermined direction and for redirecting the beam toward the end of another one of the cables selectively, in accordance with an electrical signal. More particularly, the redirecting means includes electrooptical phase-shifting medium, preferably liquid crystal molecules.

12 Claims, 5 Drawing Sheets



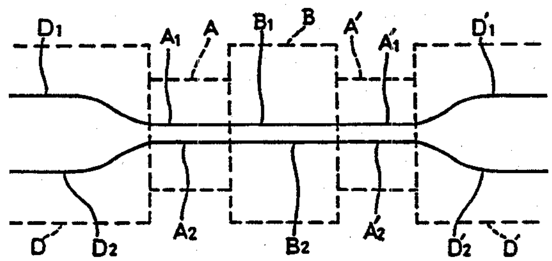
5,440,656 Aug. 8, 1995

Waveguide-Type Optical Component Having Optical Coupling Sections with Different Coupling Efficiencies

Inventors: Ken Ueki, Takeo Shimizu, and Hisaharu Yanagawa.
Assignee: The Furukawa Electric Co., Ltd.
Filed: Mar. 17, 1993.

Abstract—A waveguide type optical component as an optical coupler/splitter is provided that is capable of reducing the dependence of the efficiency of optical coupling between optical waveguides on wavelength and of permitting reduction in size. The optical component has a first optical coupling section (A) including optical waveguides (A1, A2) sharing the same propagation constant, a second optical coupling section (B) including optical waveguides (B1, B2) having different propagation constants, and a third optical coupling section (A′) including optical waveguides (A′1, A′2) sharing the same propagation constant. Associated ones of the optical waveguides (A1, B1, A′1; A2, B2, A′2) are connected in series with each other.

9 Claims, 1 Drawing Sheet



5,440,664 Aug. 8, 1995

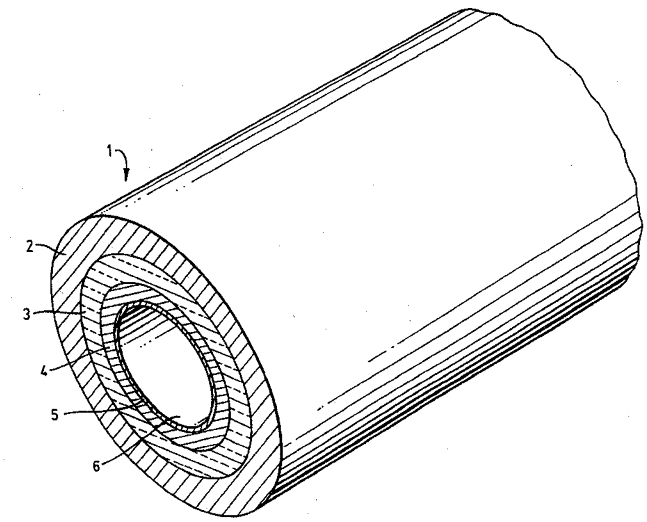
Coherent, Flexible, Coated-Bore Hollow-Fiber Waveguide

Inventors: James A. Harrington, Todd C. Abel, and Jeffrey Hirsch.
Assignee: Rutgers, The State University of New Jersey.
Filed: Jan. 13, 1994.

Abstract—A rugged, flexible hollow-fiber waveguide that permits preservation of good transverse spatial coherence of input infrared laser radiation and that transmits substantial power of such radiation, with low attenuation. The present invention preferably comprises a small-diameter, thin-wall silica-glass tube; a protective coating on the outer surface of the tube; a sufficient

reflective layer on the inner surface of the tube; and a thickness, optimal for the wavelength(s) of interest, of dielectric on the exposed surface of the reflective layer.

8 Claims, 8 Drawing Sheets



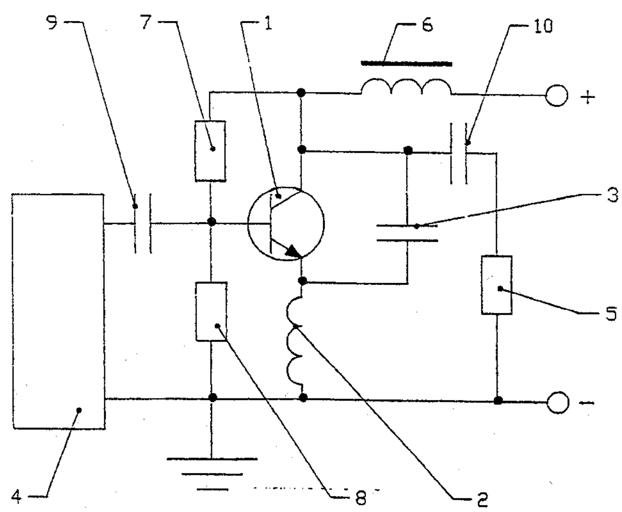
5,442,323 Aug. 15, 1995

Broad-Band Power Amplifier

Inventor: Sergey G. Tikhomirov.
Filed: May 6, 1994.

Abstract—A broad-band power amplifier circuit having a transistor with a base terminal, an emitter terminal, and a collector terminal connected between a positive power source terminal and a negative power source terminal. A bias circuit is connected to the base terminal of the transistor, a capacitor is connected between the collector and emitter terminals of the transistor, and an inductor is connected between the emitter terminal of the transistor and the negative power source terminal. A decoupling choke is connected between the collector terminal of the transistor and the positive power source terminal, a first decoupling capacitor is connected to the collector terminal of the transistor, and a second decoupling capacitor is connected to the base terminal of the transistor.

11 Claims, 3 Drawing Sheets



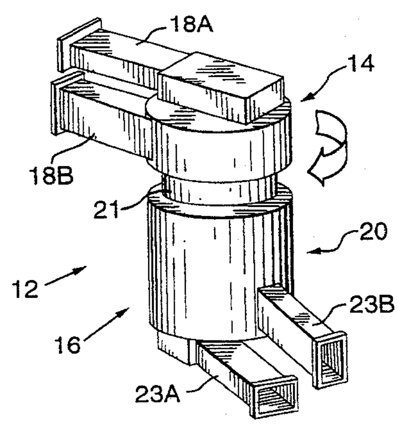
5,442,329 Aug. 15, 1995

Waveguide Rotary Joint and Mode Transducer Structure Therefor

Inventors: Subir Ghosh and Luiz C. Da Silva.
Assignee: SG Microwaves, Inc.
Filed: Dec. 9, 1993.

Abstract—The rotor of the joint includes two rectangular waveguide ports, carrying two separate signals. The stator has two corresponding rectangular waveguide ports. The ports are coupled with a circular waveguide, which comprises two relatively rotatable stub-cylinders, disposed coaxially in-line on the axis of rotation. Signal A is transmitted through the circular waveguide, across the joint, in the TM01 propagation mode, while signal B is transmitted across the joint in the TE01 mode. These circular–symmetrical modes, with mutually orthogonal field distribution, are able to cut crosstalk interference, since the mode transducers of these modes maintain good mutual isolation even through the signals are present together in the circular waveguide and at the same or similar frequency. The TM01 mode (signal A) is excited and received by means of slots formed in the end wall of the circular waveguide stubs. The port for signal A communicates with the circular waveguide through the two slots. The TE01 mode (signal B) is excited and received by means of four axial slots formed in the cylindrical wall of the circular waveguide. The transducer for signal B is disposed in a wrap-around relationship with the circular waveguide and is in communication with the circular waveguide through the four slots. An E-plane junctional continuation communicates the port for signal B, via two slots, with the transducer for signal B.

17 Claims, 4 Drawing Sheets



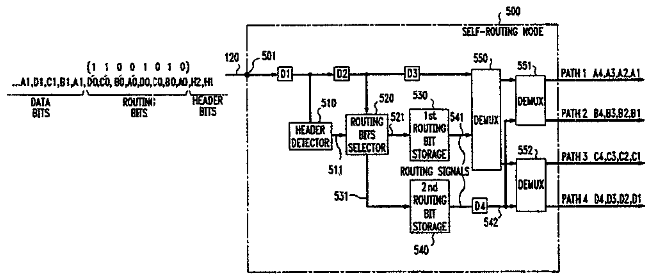
5,442,474 Aug. 15, 1995

Self-Routing Optical Communication Node Using Sagnac Gates

Inventors: Alan Huang and Norman A. Whitaker, Jr.
Assignee: AT&T Corp.
Filed: Aug. 29, 1994.

Abstract—A Sagnac gate-based self-routing optical signal switching node demultiplexes each channel of data bits of an N channel multiplexed optical data signal to one of a plurality of output terminals in accordance with the routing bit(s) of each data channel received in the N channel multiplexed optical data signal. In one embodiment, each data channel includes multiple routing bits, enabling greater demultiplexer selectivity.

14 Claims, 4 Drawing Sheets



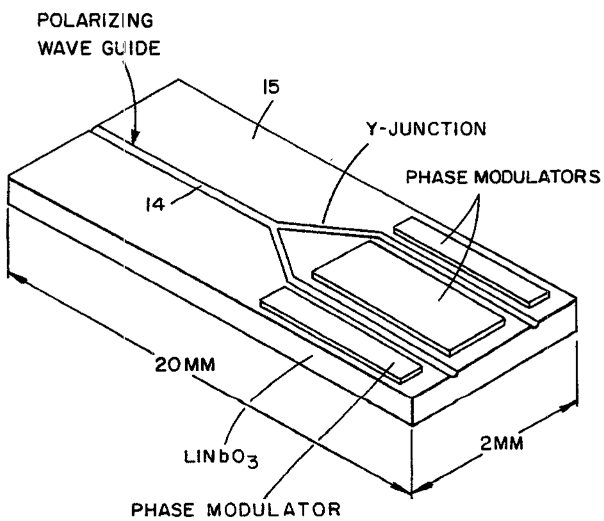
5,442,719 Aug. 15, 1995

Electrooptic Waveguides and Phase Modulators and Methods for Making Them

Inventors: Chin L. Chang, Albert Choi, and Sheri L. Douglas.
Assignee: Litton Systems, Inc.
Filed: July 21, 1993.

Abstract—Lithium niobate waveguides for light and lithium niobate channel waveguide electrooptic phase modulators for light include sufficient lithium ions such that, when an electrical signal of known value is applied to such waveguides and modulators, the phase of light passing through the waveguide or the modulator changes to a desired value within a time period that is substantially instantaneous.

14 Claims, 3 Drawing Sheets



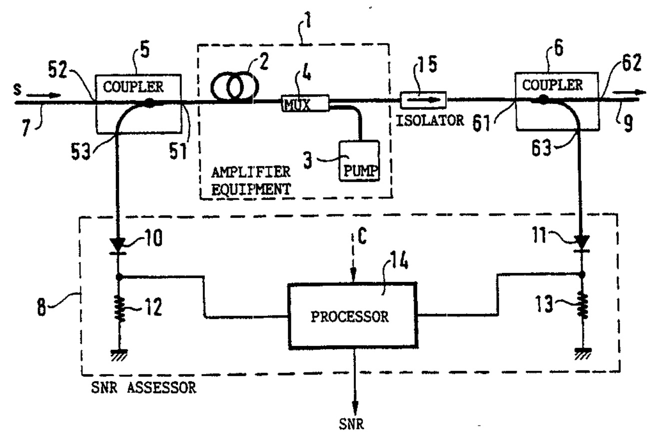
5,444,238 Aug. 22, 1995

Device for Assessing the Transmission Quality of an Optical Amplifier Equipment

Inventors: Bernard Gherardi, Gérard Bourret, and Jean-Bernard Leroy.
Assignee: Alcatel CIT.
Filed: Mar. 24, 1994.

Abstract—A device for assessing the transmission quality of an optical amplifier includes a coupler for sampling on the upstream side of the amplifier equipment relative to the direction of propagation of the optical signal to be amplified by the amplifier equipment part of the power of an optical signal propagating in the direction opposite to the propagation direction and corresponding to that part of the noise generated by the amplifier equipment transmitted in the direction opposite to the propagation direction. It also includes a coupler for sampling on the downstream side of the amplifier equipment relative to the propagation direction part of the power of an optical signal propagating in the propagation direction and corresponding to the optical signal after amplification by the amplifier equipment superimposed on that part of the noise generated by the amplifier equipment and transmitted in the propagation direction. It assesses the signal-to-noise ratio of the amplifier equipment from the optical powers sampled as above.

4 Claims, 1 Drawing Sheet



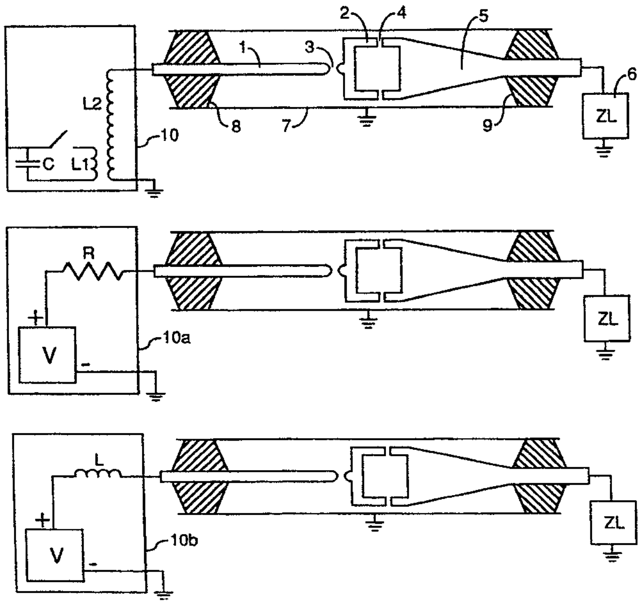
5,444,308 Aug. 22, 1995

Nanosecond Transmission Line Charging Apparatus

Inventor: James P. O'Loughlin.
Assignee: The United States of America as represented by the Secretary of the Air Force.
Filed: June 4, 1993.

Abstract—A device for charging pulse forming lines (PFL's) on a time scale of a few ns. The device includes a source transmission line (STL) connected through a switch to a pulse-forming transmission line. The source line is initially charged while the PFL is uncharged, and the switch is open. The impedance of the STL is larger than the impedance of the PFL. In operation, when the switch is closed, energy flows from the source line to the PFL. As the energy and voltage build on the PFL, an output switch closes and delivers the energy of the PFL to the output transmission line section. The impedance of the output transmission line section is matched to the PFL impedance so that all of the energy in the PFL flows into the output section in the form of a pulse.

20 Claims, 5 Drawing Sheets



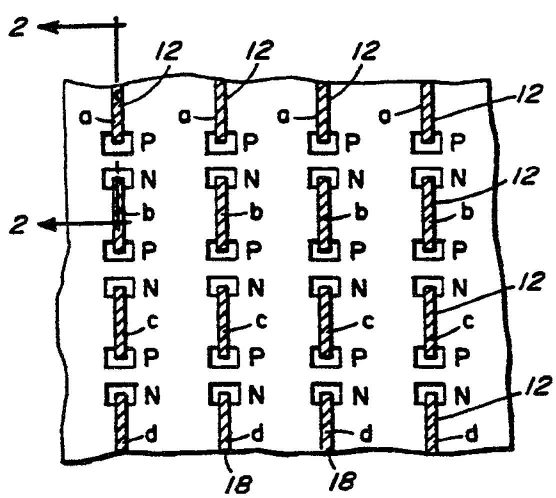
5,444,454 Aug. 22, 1995

Monolithic Millimeter-Wave Phased Array

Inventor: Joseph F. White.
Assignee: M/A-COM, Inc.
Filed: June 3, 1986.

Abstract—Microwave apparatus for altering the phase-front of microwave energy propagating in a predetermined path and in which there is provided a panel having a plurality of electrically conductive leads extending substantially parallel to the electric vector of the wave, each of which is lengthwise divided into sections. A semiconductor junction is formed in the semiconductor material at each end of each section of lead. Each pair of confronting junctions together with the semiconductor material therebetween provide a surface-oriented semiconductor diode switch. A switching voltage is applied to each of the leads so as to render at least some of the diodes in each of the leads simultaneously either conductive or nonconductive, thereby allowing each of the leads to be electrically divided either into said sections or continuous throughout at least a portion of its length.

14 Claims, 1 Drawing Sheet



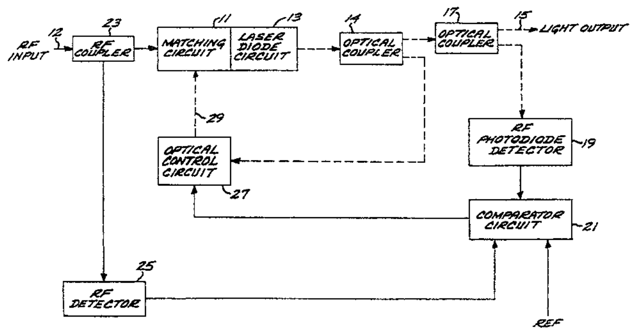
5,444,564 Aug. 22, 1995

Optoelectronic-Controlled RF Matching Circuit

Inventor: Irwin L. Newberg.
Assignee: Hughes Aircraft Company.
Filed: Feb. 9, 1994.

Abstract—A photonic RF impedance matching system that includes an RF photonically controlled impedance matching circuit having adjustable impedance and power transfer characteristics and feedback control circuitry for optically controlling the impedance matching circuit.

6 Claims, 5 Drawing Sheets



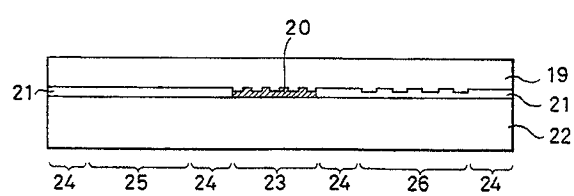
5,444,802 Aug. 22, 1995

Optical Switch

Inventors: Yasuo Shibata and Masahiro Ikeda.
Assignee: Nippon Telegraph & Telephone Corporation.
Filed: Nov. 16, 1994.

Abstract—A grating optical switch has at least one switch region for ON-OFF switch control of a signal light transmission and a signal light reflection, at least one input/output optical waveguide region for guiding the signal light to the switch, at least one coupler region for coupling the control light colinearly to the signal light and for guiding the control light to the switch region together with the signal light, and at least one separator region for separating the signal light and the control light. The switch region transmits the signal light when the control light is coupled while reflecting the signal light when the control light is not coupled.

12 Claims, 13 Drawing Sheets



5,446,425 Aug. 29, 1995

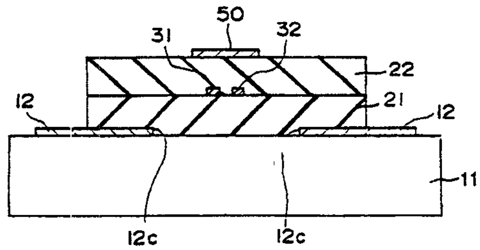
Floating Potential Conductor Coupled Quarter-Wavelength Coupled Line Type Directional Coupler Comprising Cut Portion Formed in Ground Plane Conductor

Inventor: Seiichi Banba.
Assignee: ATR Optical and Radio Communications Research Laboratories.
Filed: June 7, 1994.

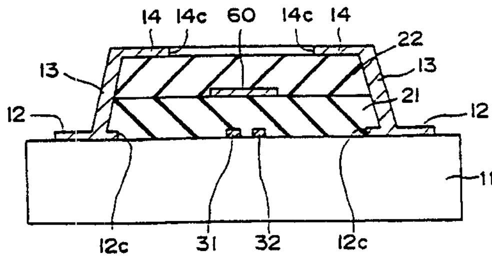
Abstract—In a quarter-wavelength coupled line-type directional coupler including a first dielectric layer having first and second surfaces parallel to each other, a ground plane conductor is formed on the first surface of the first dielectric layer and two coupled microstrip conductors each having a quarter wavelength are formed on the second surface of the first dielectric layer, arranging close to each other so as to be electromagnetically coupled with each other. Further, a second dielectric layer is formed on the second surface of the first dielectric layer, on which the coupled microstrip conductors are formed, and a floating potential conductor is formed on the second dielectric layer, arranging close to the microstrip conductors so as to be electromagnetically coupled with the coupled microstrip conductors. Then, a cut portion is formed in the ground plane conductor so that the ground plane conductor is separated apart from the coupled microstrip conductors by a predetermined distance.

9 Claims, 12 Drawing Sheets

Cross-section on line A-A'



Cross-section on line C-C'



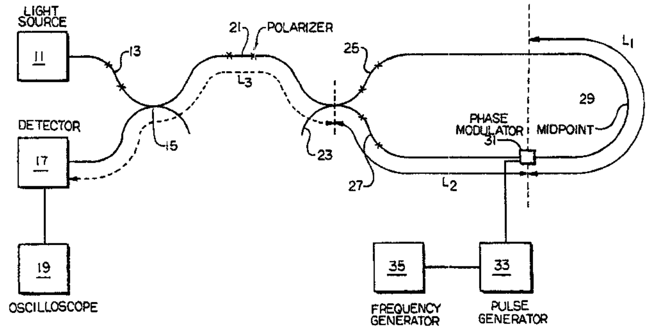
5,446,533 Aug. 29, 1995

Fiber-Optic Measuring Apparatus and Method

Inventors: Eric Udd and John P. Theriault.
Assignee: McDonnell Douglas Corporation.
Filed: Apr. 8, 1988.

Abstract—A method and apparatus for a fiber-optic measuring system is disclosed that works on the speed of propagation principle. The device can be utilized to determine the position of a disturbance or electronic source along the length of an optical path.

24 Claims, 5 Drawing Sheets



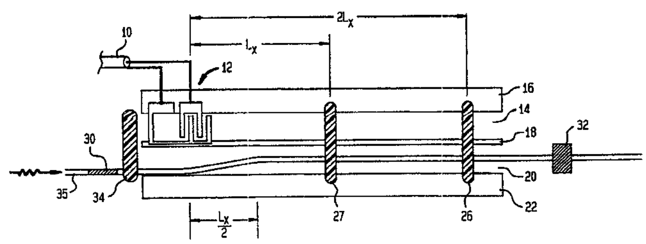
5,446,807 Aug. 29, 1995

Passband-Flattened Acoustooptic Polarization Converter

Inventors: Jane E. Baran, Antonio d'Alessandro, and Janet L. Jackel.
Assignee: Bell Communications Research, Inc.
Filed: June 23, 1994.

Abstract—A passband-flattened acoustooptic polarization converter (**100**) in which two acoustic waveguides (**14, 20**) are formed in a substrate and a separated by a small gap (**18**), such that the two acoustic waveguides act as a directional coupler in which acoustic power is transferred back and forth. An interdigitated transducer (**12**) launches a surface acoustic wave in the first acoustic waveguide, and an optical waveguide is formed in the middle of the second waveguide. A partial acoustic absorber (**27**) is formed over both acoustic waveguides at a crossover length at a distance from the transducer equal to the point at which the acoustic wave has transferred from the first to the second waveguides and back again. The partial absorber absorbs most of the acoustic amplitude with the attenuated acoustic amplitude being coupled back again to the second acoustic waveguide, but at an opposite sign. A complete absorber (**26**) is formed over both acoustic waveguides at a distance from the transducer equal to approximately twice the crossover length such that the attenuated acoustic wave following the partial absorber and transferred to the second acoustic waveguide again transfers back to the first acoustic waveguide. The optical signal is exposed to an acoustic signal that increases to a maximum, decreases, and then increases and decreases again with a smaller magnitude and reversed sign. The resultant frequency response has a significantly flattened shape for improved performance of the converter for use as an optical switch or filter.

13 Claims, 5 Drawing Sheets



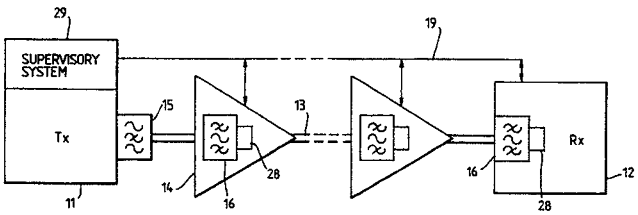
5,446,812 Aug. 29, 1995

Improving Signal to Noise Ratio in an Optical Transmission System

Inventor: Ian J. Hirst.
Assignee: Northern Telecom Limited.
Filed: Nov. 12, 1993.

Abstract—An optical transmission system comprises a concatenated chain of amplifiers disposed along a fiber transmission path. The signal to noise ratio is measured at each amplifier by selectively notch filtering a transmitted signal and measuring the power of the filtered and unfiltered signal within the notch bandwidth. A supervisory system controls the gain of each system amplifier whereby to maximize the aggregate signal-to-noise ratio of the system.

2 Claims, 3 Drawing Sheets



5,446,813 Aug. 29, 1995

Optical Isolator

Inventors: K. Roger Lee, Song-Fure Lin, and Yuh-Lin Cheng.
Assignee: Industrial Technology Research Institute.
Filed: Aug. 8, 1994.

Abstract—An optical isolator is placed in the path of an input optical fiber and an output optical fiber. The optical isolator comprises: a first GRIN lens for receiving rays emitted from the input optical fiber and converging into parallel rays; a first birefringent crystal wedge for splitting the parallel rays into a first ray polarized along the birefringent crystal's optical axis and a second ray polarized perpendicularly to the optical axis; a second birefringent crystal wedge for recombining the first ray and the second ray wherein at least one of the first birefringent crystal wedge and the second birefringent crystal wedge comprises a birefringent crystal of YVO_4; and a second GRIN lens for focusing the recombined rays into the output optical fiber through the second birefringent crystal wedge. A Faraday rotator is mounted between the first birefringent crystal wedge and the second birefringent crystal wedge so that the rays emitted from the input optical fiber can be recombined and focused into the output optical fiber and the rays reflected from the output optical fiber will be diverged and cannot be refocused into the input optical fiber.

7 Claims, 3 Drawing Sheets