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.

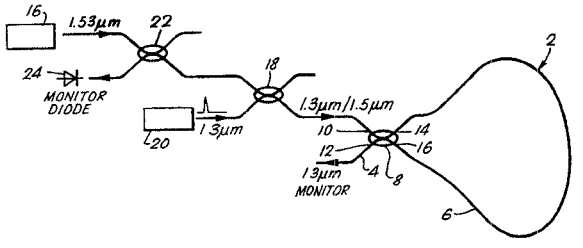
5,208,455 May 4, 1993

Square Optical Pulse Generator

Inventors: Brian P. Nelson, Keith J. Blow, Nicholas J. Doran.
Assignee: British Telecommunications plc.
Filed: Sept. 14, 1990.

Abstract—An all-optical fibre Sagnac antiresonant interferometer (2) is formed from an optical fibre having a non-linear refractive index. The coupler (8) is a dichroic coupler coupling equal portions of a cw optical signal at 1.53 μm from laser (16) to ports (14 and 16) and all of a pulsed optical signal from laser (20) to port (14). The intensity of the pulsed optical signal is sufficient to provide a relative phase shift in the counter propagating 1.53 μm signals. The loop (6) is longer than the inverse of the absolute difference in group delays of the cw and pulsed optical so causing a square optical pulse at 1.53 μm to be switched to port (12) of the coupler.

6 Claims, 3 Drawing Sheets



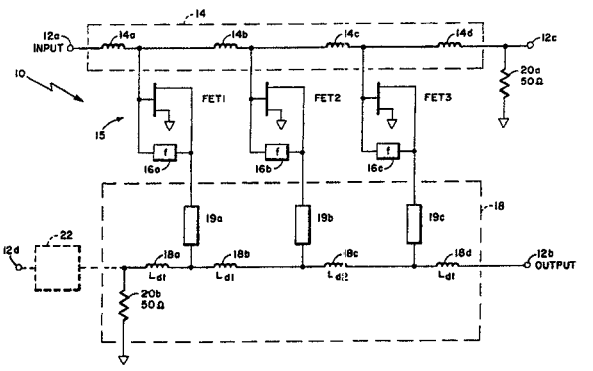
5,208,547 May 4, 1993

Distributed Amplifier Having Negative Feedback

Inventor: Manfred J. Schindler.
Assignee: Raytheon Company.
Filed: June 6, 1991.

Abstract—A radio frequency amplifier including a plurality of field effect transistors having input electrodes successively coupled by an input propagation network and output electrode successively coupled by an output propagation network is described. The radio frequency circuit includes a feedback circuit, preferably a plurality of feedback circuits, each one being disposed about a corresponding one of the plurality of transistors to provide a negative feedback path about each one of said transistors.

11 Claims, 7 Drawing Sheets



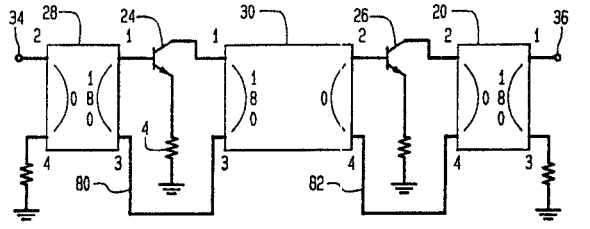
5,208,553 May 4, 1993

Multi-Stage Amplifier With Shared Directional Coupler Feedback

Inventor: Christopher W. Rice.
Assignee: Q-Bit Corporation.
Filed: Apr. 5, 1991.

Abstract—An n-stage amplifier circuit includes $n + 1$ directional couplers connected in series between the circuit input, the amplifier stages, and the circuit output. Each coupler includes first and third ports forming an inverting interface, and second and fourth ports forming a non-inverting interface, the ports being coupled through suitable windings. Feedback lines are connected between adjacent successive couplers. The interfaces of the couplers are connected such that feedback loops covering one or more contiguous successive amplifier stages provide negative feedback for the amplifier circuit.

10 Claims, 3 Drawing Sheets



5,208,554 May 4, 1993

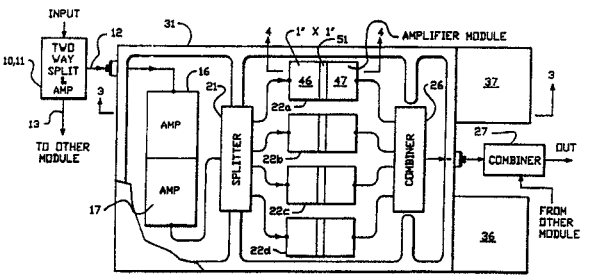
High Power Compact Microwave Amplifier

Inventors: Harvey Endler and Hadi Mojaradi.
Assignee: Systron Donnor Corporation.
Filed: Jan. 24, 1992.

Abstract—A class A high power amplifier having an operating frequency in the range of less than substantially 2 GHz and suitable for aircraft use, is all solid state in that gallium arsenide field effect transistors are utilized. These are mounted in a large copper heat sink which is air cooled to provide for overall cooling by conduction and convection. By the use of microstrip

matching circuits, the relatively low impedance of the gallium arsenide FET units is matched to the required higher system impedance. At the same time a 40% band-width is provided due to the superior matching.

6 Claims, 4 Drawing Sheets



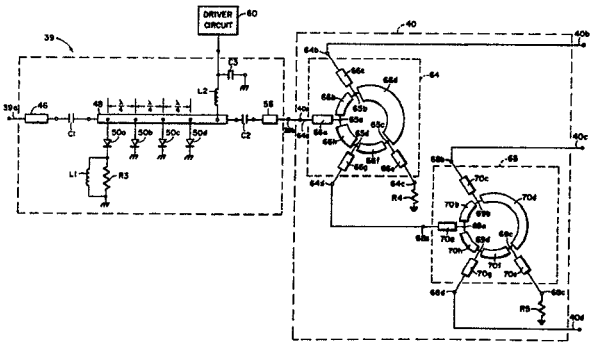
5,208,563 May 4, 1993

Radio Frequency Circuit

Inventors: Mark E. Russell, David C. Miller, Anthony M. Donisi.
Assignee: Raytheon Company.
Filed: Dec. 19, 1991.

Abstract—An RF circuit includes an RF power divider circuit having an input port and a plurality of output ports the RF power divider circuit providing in response to a signal fed to the input port an output signal at each output port each output signal having known amplitude and known phase. The RF circuit further includes means for selectively coupling at least a portion of a signal fed to an input port of the RF circuit to the input port of the RF power divider circuit and a like plurality of directional coupler circuits each of the coupler circuits having an input port and a coupled port with each input port coupled to a corresponding one of the plurality of output ports of the power divider circuit and each coupled port corresponding to an output port of the RF circuit.

7 Claims, 3 Drawing Sheets



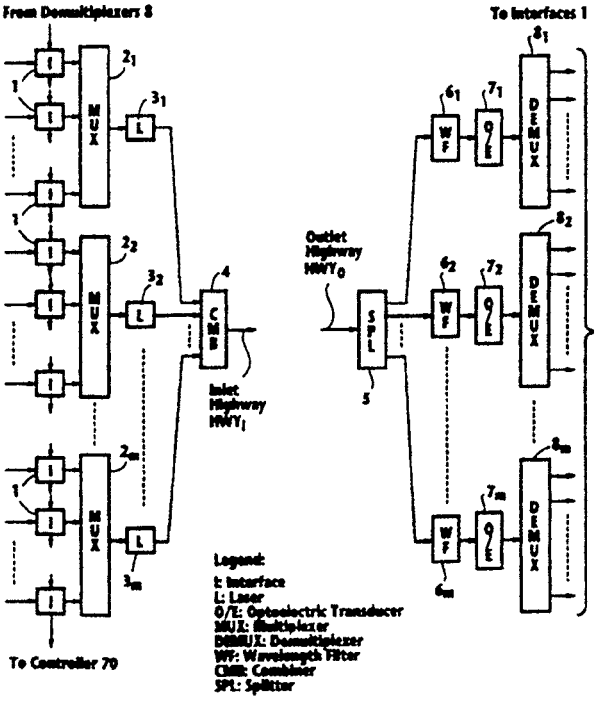
5,208,691 May 4, 1993

Wavelength-Time-Space Division Switching System

Inventor: Makoto Nishio.
Assignee: NEC Corporation.
Filed: June 28, 1991.

Abstract—An optical switching network comprises a plurality of optical splitters coupled respectively to inlet highways for receiving wavelength-time division multiplex (WTDM) signals through the respective inlet highways, each of the multiplex signals comprising a series of WTDM signals each being identified by a unique wavelength and a unique time slot. A like plurality of sets of tunable wavelength filters are provided. The filters of each set are coupled to respective outputs of the splitters for selecting one of the WTDM signals. A like plurality of time-space switches are associated respectively with the sets of the tunable wavelength filters. Each of the time-space switches has input ports and output ports, the input ports of the time-space switch being coupled respectively to outputs of the filters of the associated set for interchanging the time slot of the selected WTDM signal with another time slot and establishing a path for the selected wavelength between the input ports and the output ports. A like plurality of sets of wavelength tunable lasers are provided, the wavelength tunable lasers of each set being coupled to the output ports of an associated one of the time-space switches for generating an optical output according to the WTDM signal from the established path, the optical output having a wavelength different from the wavelength of the selected WTDM signal. A like plurality of optical combiners are provided for coupling the output of the wavelength tunable lasers of different sets to a respective one of outlet highways.

10 Claims, 4 Drawing Sheets



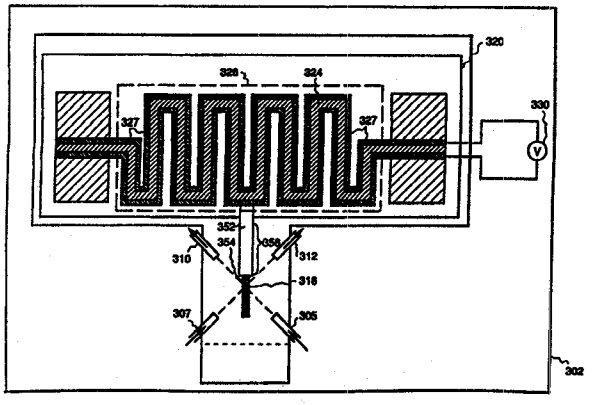
5,208,880 May 4, 1993

Microdynamical Fiber-Optic Switch and Method of Switching Using Same

Inventors: Nabeel A. Riza and Dennis L. Polla.
Assignee: General Electric Company.
Filed: Apr. 30, 1992.

Abstract—A microdynamical optical switch includes a piezoelectric actuator disposed on a substrate, a mirror securely mechanically coupled to the actuator, an input connection port, and a plurality of output connection ports. The actuator displaces the mirror along a mirror displacement path such that the mirror, which is oriented at a 45° angle to the path of the incident light, deflects light passing from the input connection port into an output connection port. The actuator includes a plurality of piezoelectric bars mechanically coupled together in series in a meander line geometry such that the cumulative deflection of the piezoelectric bars is used to displace the mirror. The amount of displacement of the actuator is governed by a controllable voltage source, which applies a voltage across each of the piezoelectric bars. In one embodiment the microdynamical switch has a $1 \times n$ arrangement, in which light entering through one input connection port is selectively directed to one of n output connection ports. In an alternative embodiment, the switch has a 2×2 arrangement in which light beams entering through two ports are individually selectively directed to one of two respective outlet ports.

20 Claims, 3 Drawing Sheets



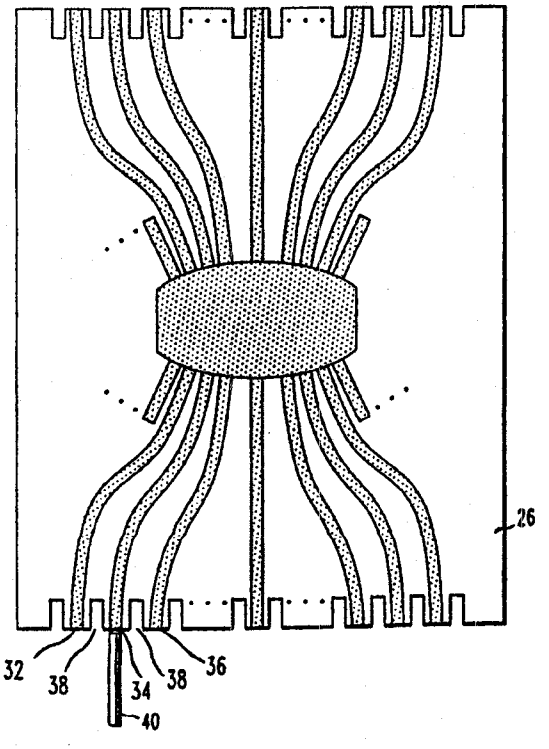
5,208,885 May 4, 1993

Optical Fiber to Strip Waveguide Interconnect

Inventors: Corrado Dragone and Herman M. Presby.
Assignee: AT&T Bell Laboratories.
Filed: Feb. 27, 1992.

Abstract—This invention is directed toward joining, with glass, a waveguide supported by a substrate to an optical fiber. In a preferred embodiment, a glass material which melts at a temperature that is lower than the temperature to which the waveguide can be safely heated is applied to either the optical fiber and/or the waveguide. The glass material is then heated to cause it to connect the optical fiber to the waveguide. A feature of the invention is the presence of heat breaks in the substrate upon which the waveguide resides to thermally isolate the end of each waveguide and the underlying substrate from adjacent waveguides and the portions of the substrate which underlie said adjacent waveguides. The heat breaks restrict heat from being conducted along the end of the substrate from one waveguide region to adjacent waveguide regions when heat is being applied to make a connection.

14 Claims, 4 Drawing Sheets



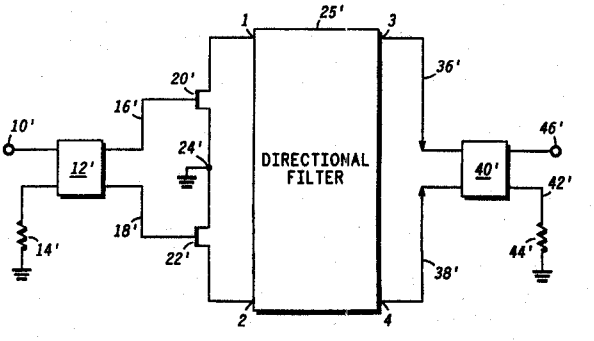
5,210,507 May 11, 1993

Method and Apparatus for Harmonic Reaction Amplifier Via Directional Filter

Inventor: Michael Dydyk.
Assignee: Motorola, Inc.
Filed: Jan. 3, 1992.

Abstract—A harmonic reaction amplifier (HRA) apparatus and method using a directional filter, including an HRA input for receiving an input signal, a divider coupled to the HRA input, the divider for splitting the input signal into a first divider signal and a second divider signal, an amplifier coupled to the divider, the amplifier for amplifying the first divider signal and the second divider signal, a directional filter coupled to the amplifier, the directional filter to filter the first and second divider signals to produce a filtered first divider signal and a filtered second divider signal, a combiner for combining the filtered first divider signal and the filtered second divider signal to produce an output signal, the combiner coupled to the directional filter, and an HRA output coupled to the combiner, the HRA output to receive the output signal from the combiner. The HRA can be used in a microwave radio.

16 Claims, 3 Drawing Sheets



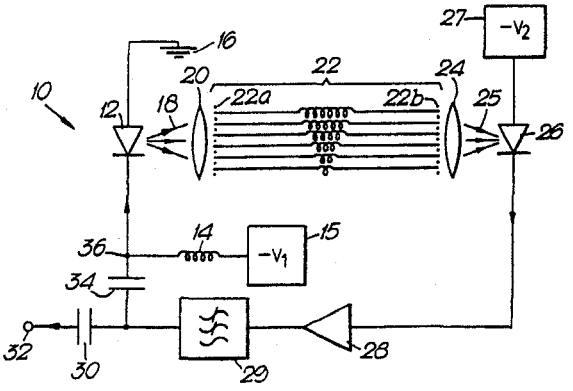
5,210,763 May 11, 1993

Oscillator

Inventors: Meirion F. Lewis and David R. Wight.
Assignees: State for Defense in Her Britannic Majesty's Government of the United Kingdom of Great Britain and Northern Ireland, The A Corp. of Britain, London.
Filed: May 6, 1992.

Abstract—A single frequency oscillator (10) comprises a laser diode (12), a fibre optic bundle (22) acting as a delay line filter, a photodiode (26) and a feedback loop to the laser diode (12) containing an amplifier (28) and additional low Q filtering (29, 34). The laser diode output (18) bears a modulation signal which is filtered to a series of "resonant" or synchronous frequencies by the bundle (22), converted back to an electrical signal by the diode (26) amplified, and reduced to a single resonant frequency by the low Q filtering (29, 34). It is then applied to the laser diode (12) as positive feedback to modulate the diode output (18). The output of the oscillator (10) can be taken as a microwave signal or on an optical carrier. The invention provides an oscillator incorporating feedback on an optical carrier.

7 Claims, 3 Drawing Sheets



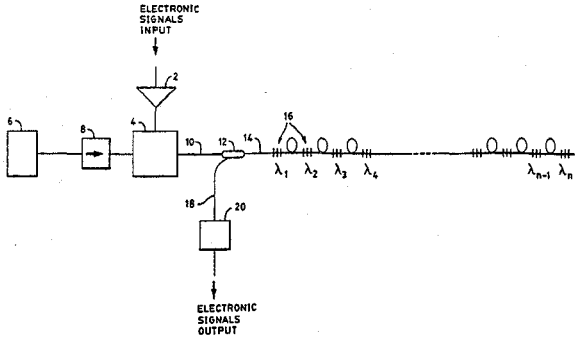
5,210,807 May 11, 1993

Variable Wide Band Fiber Optic Delay Line

Inventor: Gregory H. Ames.
Assignee: The United States of America as represented by the Secretary of the Navy.
Filed: June 29, 1992.

Abstract—Apparatus and method for a variable wide band fiber optic delay line. The apparatus comprises components that allow a user to select a delay time of a signal by the use of a wavelength tunable laser. The user selected wavelength determines the length that a light intensity signal corresponding to an electronic signal travels, thereby determining the time of delay.

4 Claims, 1 Drawing Sheet



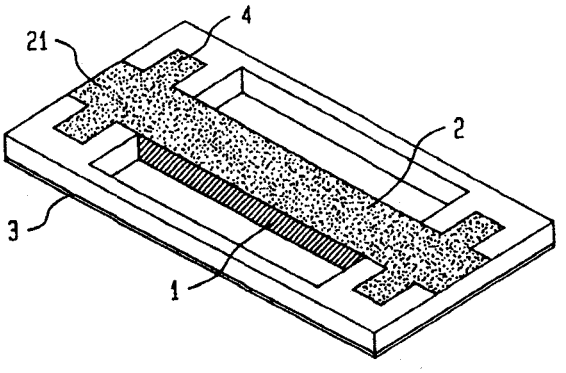
5,212,463 May 18, 1993

Planar Ferro-Electric Phase Shifter

Inventors: Richard W. Babbitt, William C. Drach, Thomas E. Koscica.
Assignee: The United States of America as represented by the Secretary of the Army.
Filed: July 22, 1992.

Abstract—A planar ferro-electric phase shifter which is compatible with commonly-used microwave transmission media to include microstrip, inverted microstrip, and slot line. The ferro-electric material, $Ba_xSr_{1-x}TiO_3$, which has a high dielectric-constant, is the phase shifting element. In the microstrip embodiment, the microstrip circuit consists of a ferro-electric element interposed between a conductor line and a ground plane. A DC voltage is applied between the conductor line and the ground plane, thereby controlling the dielectric constant of the ferro-electric material. The dielectric constant of the ferro-electric element in turn controls the speed of the microwave signal, which causes a phase shift. Microwave energy is prevented from entering the DC supply by either a high-impedance, low pass filter, or by an inductive coil. DC voltage is blocked from traveling through the microstrip circuit by a capacitive high-voltage DC bias blocking circuit in the ground plane.

10 Claims, 5 Drawing Sheets



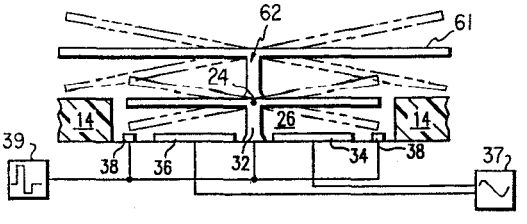
5,212,582 May 18, 1993

Electrostatically Controlled Beam Stearing Device and Method

Inventor: William E. Nelson.
Assignee: Texas Instruments Incorporated.
Filed: Mar. 4, 1992.

Abstract—A device for steering light and its method of manufacture are disclosed. The device in the preferred embodiment consists of a multi-layer structure on a substrate. The substrate contains at least one electrode (36) for addressing a deflectable element (16) causing it to deflect towards the activated electrode (36). Upon the deflectable element (16) is at least one support post (62) which is positioned approximately along the axis of rotation (24) of the deflectable element (16). A reflecting element (61) is supported by the post (62) and deflects as the first element (16) deflects. The second element (62) is of far greater extent than the first element (16). Additionally, the method of manufacture of such a device is disclosed.

10 Claims, 6 Drawing Sheets



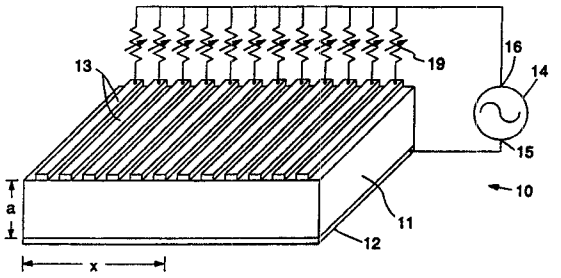
5,212,583 May 18, 1993

Adaptive Optics Using the Electrooptic Effect

Inventors: Victor Vali, David B. Chang, I-Fu Shih, Bruce R. Youmans.
Assignee: Hughes Aircraft Company.
Filed: Jan. 8, 1992.

Abstract—An adaptive electrooptical lens system for use in optical data storage systems, optical phased arrays, laser or other optical projectors, and raster scanning devices, and the like. The invention provides an electrooptical means for scanning an optical beam or moving an optical storage or retrieval point. Beam movement is achieved electrooptically, by changing the index of refraction of an electrooptical material by controlling electric fields applied thereto. A plurality of electrodes are disposed on one surface of the electrooptical material and a ground electrode is disposed on the other. The electrodes are adapted to apply electric fields derived from a voltage source to the electrooptic material that selectively change its index of refraction and provides for a predetermined index of refraction profile along at least one dimension thereof, thus forming a lens. By appropriately forming the electrode pattern and properly controlling the voltages applied thereto, differing lens shapes may be formed. Since the response times of the electrooptic materials employed in the present invention are on the order of nanoseconds (10^{-9} sec) or less, the intrinsic response frequency of the lens system is 10^9 Hz or more. The present invention thus increases the data storage and retrieval capacity of optical systems in which it is employed.

17 Claims, 1 Drawing Sheet



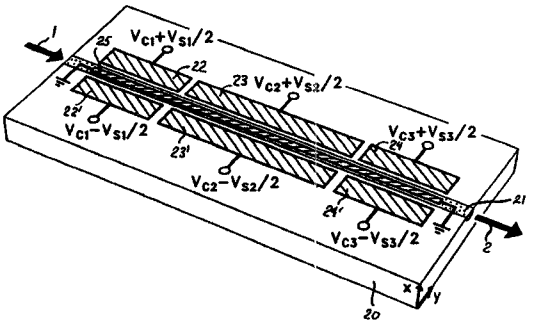
5,212,743 May 18, 1993

Automatic Polarization Controller Having Broadband, Reset-Free Operation

Inventor: Fred L. Heismann.
Assignee: AT&T Bell Laboratories.
Filed: Feb. 12, 1992.

Abstract—Wide optical bandwidth and broad wavelength tuning range are achieved in a reset-free, optical, automatic polarization controller by combining three controllable fractional wave elements in cascade and further by controlling the orientations of both outermost fractional wave elements to differ by a prescribed angular amount which is maintained substantially constant. The prescribed angular amount is defined to be between 0 and 2π, inclusively. Synchronous control of both outermost fractional wave elements maintains the prescribed angular difference to be maintained constant during operation of the polarization controller. The three fractional wave elements are described as an endlessly rotatable half-wave element and two synchronously rotatable quarter-wave elements wherein the half-wave element is placed between the quarter-wave elements. Each fractional wave element varies the orientation of linear birefringence along its optical wavepath and introduces a specified phase retardation. Embodiments of the polarization controller are realized using either distributed bulk optic devices or integrated electrooptic waveguide devices. Rotation of the elements is afforded by a feedback control circuit which monitors the output optical polarization and derives appropriate electrical drive signals to achieve the proper rotation of the elements.

32 Claims, 4 Drawing Sheets



32 Claims, 4 Drawing Sheets

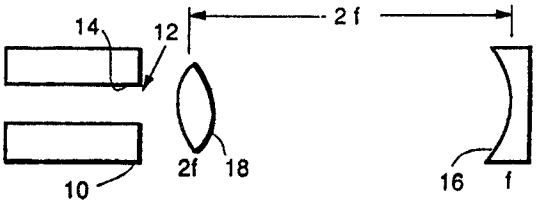
5,212,747 May 18, 1993

Zero Loss Waveguide Coupler

Inventor: David Fink.
Assignee: Hughes Aircraft Company.
Filed: Apr. 21, 1992.

Abstract—A waveguide coupler comprises a curved end reflector mirror that images a waveguide exit back into the waveguide with an essentially exact reproduction of the waveguide output intensity distribution. The coupler also comprises a lens disposed near the waveguide exit at a point between the exit and the mirror, the lens providing a phase compensation to the beam passing there through such that the phase of the beam returned to the waveguide matches that of the exiting beam. Thus, coupling losses due to clipping of the returned beam at the exit/entrance to the waveguide bore and coupling losses due to a mismatch of the returning field phase to that of the waveguide mode are made essentially zero. Other embodiments of the coupler are presented wherein the phase compensating lens is positioned at locations other than adjacent to the waveguide exit, or wherein no inversion of the imaged field distribution occurs, or wherein the beam is not caused to be focused at the center of a lens, or wherein one waveguide is coupled to another waveguide having a similar sized or a dissimilar sized bore.

29 Claims, 3 Drawing Sheets



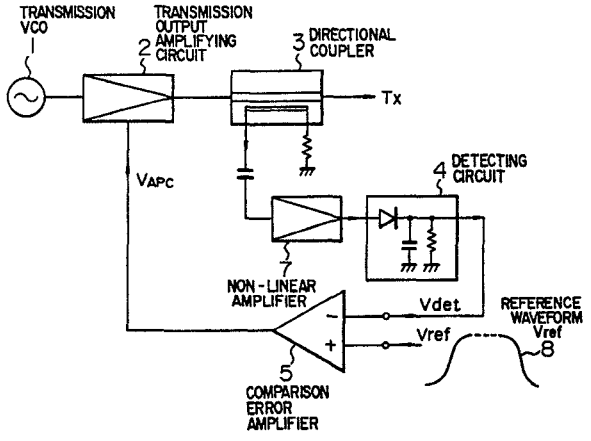
5,214,393 May 25, 1993

Transmission Output Control Circuit

Inventor: Yukichi Aihara.
Assignee: Matsushita Electric Industrial Co., Ltd.
Filed: Aug. 6, 1991.

Abstract—In a radio transmitter, a part of an output of a transmission output amplifying circuit is supplied to a variable attenuating circuit and an output of the variable attenuating circuit is supplied to a detecting circuit. An output of the detecting circuit and a reference voltage are compared and a control voltage is given to the transmission power amplifying circuit in accordance with the result of the comparison, thereby controlling the transmission output. By controlling the attenuation amount of the variable attenuating circuit, the transmission output can be controlled over a wide dynamic range with a high reproducing fidelity.

12 Claims, 4 Drawing Sheets



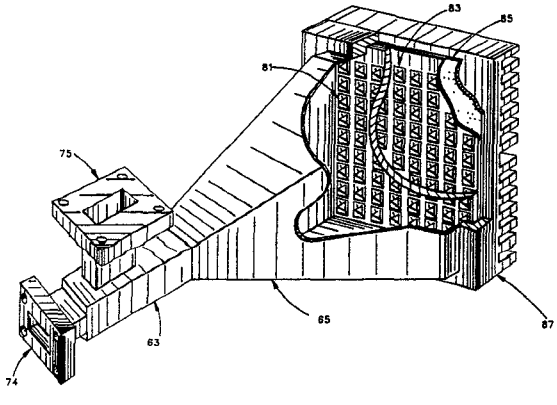
5,214,394 May 25, 1993

High Efficiency Bi-Directional Spatial Power Combined Amplifier

Inventor: Sam H. Wong.
Assignee: Rockwell International Corporation.
Filed: Apr. 15, 1991.

***Abstract*—The present invention is a high efficiency bi-directional spatial power combiner for extremely high frequency signals. In one embodiment, orthogonally polarized electro-magnetic waves are used to isolate signals going into and out of a planar array of amplifiers. A dual mode horn transmits vertically polarized fields to a MMIC planar array of amplifiers. Vertically polarized array elements receive the signals, amplify them, and retransmit back to the horn using horizontally polarized array elements. An ortho-mode transducer on the horn provides isolation for the two polarized signals. The backside of the array can be used for a heat sink, and to provide access for DC biasing of the array elements. In a second embodiment, monolithic grid oscillators are used in lieu of power amplifiers with orthogonal polarization array elements. The input signal and the output signal are of the same polarization. A circulator is used in lieu of an ortho-mode transducer to isolate the input signal from the output signal.**

19 Claims, 19 Drawing Sheets



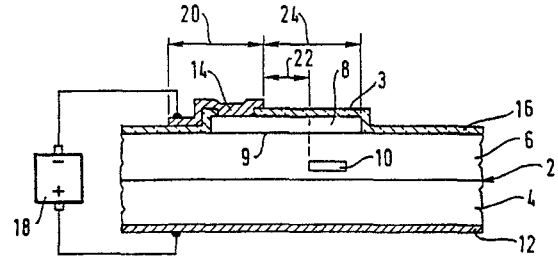
5,214,723 May 25, 1993

Electro-optic Device Including a Waveguide

Inventor: Frédéric Zamkotsian.
Assignee: Alcatel N.V.
Filed: Jan. 30, 1992.

***Abstract*—An electro-optic device incorporating a waveguide includes a locating electrode formed on a plate for locating an electrical phenomenon in a waveguide carried by the plate. The electrode comprises two juxtaposed flat surfaces, namely a locating surface relatively close to the waveguide and which has a relatively high electrical resistivity and a connection surface relatively far from the waveguide and which has a relatively low electrical resistivity. This juxtaposition makes it possible to eliminate at least partially deformation and/or attenuation of the guided waves. Applications of the invention include the implementation of a polarization modulator.**

9 Claims, 3 Drawing Sheets



5,214,725 May 25, 1993

Optical Coupler/Splitter With a Filter

Inventors: Hisaharu Yanagawa, Takeo Shimizu, Shiro Nakamura, Isao Ohyama.
Assignee: The Furukawa Electric Co., Ltd.
Filed: May 29, 1992.

***Abstract*—An optical coupler/splitter having an optical waveguide on the side of light incidence, two optical waveguides on the branched side, branched from the former optical waveguide and each having straight and curved sections, and a dielectric multi-layer film filter provided in a manner crossing the latter waveguides and common to them. The filter is so formed as to intersect with a straight section of one waveguide and with a curved section of the other, so that respective crossing angles between the filter and the branched optical waveguides differ from each other, thereby providing different reflection or transmission characteristics with respect to the branched optical waveguides. An optical signal having a variable wavelength and issued from a measuring apparatus based on the backscattering method is distinguished by the common filter of the coupler/splitter, making it possible to perform measurement of the losses of the branched optical waveguides independently without being affected by interference light. There is no need to provide a plurality of filters having different characteristics, and thus the coupler/splitter has a simplified structure and excellent productivity.**

3 Claims, 2 Drawing Sheets