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.

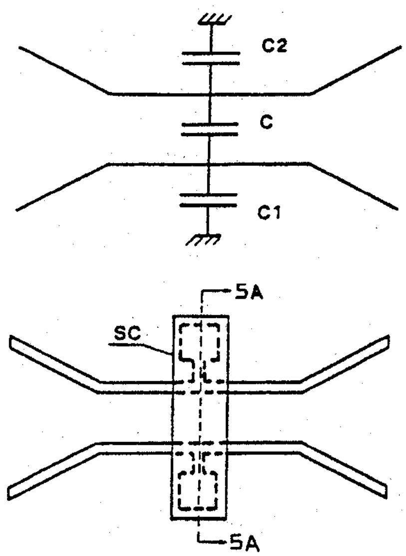
5,243,305 Sept. 7, 1993

Method to Make Microwave Coupler With Maximal Directivity and Adaptation and Relevant Microstrip Coupler

Inventors: Enzo C. D'Oro, Lorenzo Miglioli, Massimo Rivolta.
Assignee: Forem S.P.A.
Filed: June 5, 1992.

Abstract—A method for increasing the directivity and adaptation of directive microwave couplers formed of two spaced apart lines, in which the length of each line is reduced to a value of less than one quarter of the operating wavelength. Capacitance is added to the coupler to counter the reduction of capacitance resulting from the shortened lines. The capacitance is added by: (1) increasing the surface area of the shortened lines by adding lateral pads; and (2) providing a dielectric bridge across the pads.

5 Claims, 2 Drawing Sheets



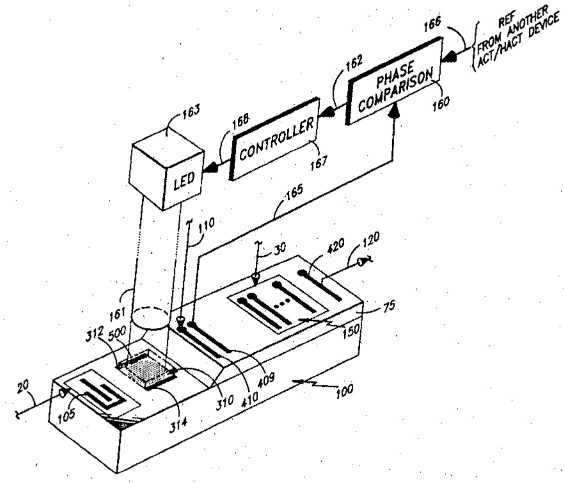
5,243,307 Sept. 7, 1993

ACT Device Having Optical Control of Saw Velocity

Inventor: Thomas W. Grudkowski.
Assignee: Untied Technologies Corporation.
Filed: Feb. 22, 1991.

Abstract—A high speed analog to digital converter system employs a set of ACT devices in parallel to buffer a high speed data sampling rate to the processing rate of the analog to digital converters employed. Vernier control of phase between individual devices is maintained by controlling the speed of propagation of the SAW wave by illumination of the substrate in response to a phase comparison between the SAW and a reference signal.

9 Claims, 2 Drawing Sheets



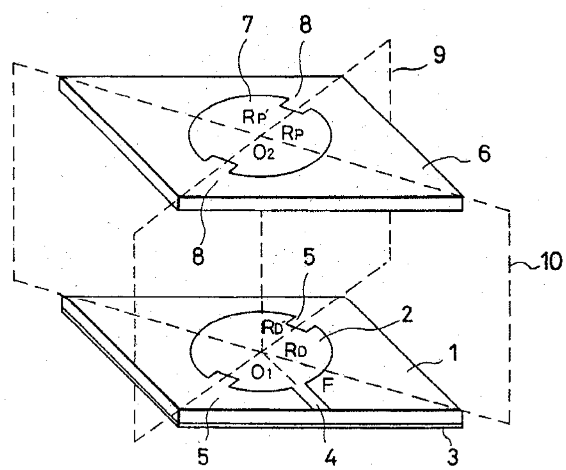
5,243,353 Sept. 7, 1993

Circularly Polarized Broadband Microstrip Antenna

Inventors: Shintaro Nakahara and Makoto Matsunaga.
Assignee: Mitsubishi Denki Kabushiki Kaisha.
Filed: Oct. 30, 1990.

Abstract—A circularly polarized microstrip antenna has a ground plane, a disk-shaped driven element, and a disk-shaped parasitic element. The driven element is located between the ground plane and the parasitic element and is parallel to both of them. The driven element and parasitic element both have diametrically opposed notches, or diametrically opposed projections, or diametrically opposed notches and diametrically opposed projections. The driven element is coupled to a conducting strip that parallels the ground plane to form a microstrip transmission line.

13 Claims, 12 Drawing Sheets



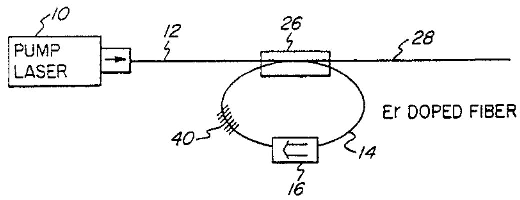
5,243,609 Sept. 7, 1993

Laser With Longitudinal Mode Selection

Inventor: David R. Huber.
Assignee: General Instrument Corporation.
Filed: May 22, 1992.

Abstract—A laser is fabricated from an optical transmission medium having a laser cavity with a rare earth (e.g. Erbium) doped portion. At least one longitudinal mode is suppressed using a plurality of series coupled Fabry-Perot cavities, an optical grating, or a combination thereof. Ring lasers, Sagnac cavity lasers, Fox-Smith cavity lasers, and linear structures are disclosed.

15 Claims, 5 Drawing Sheets



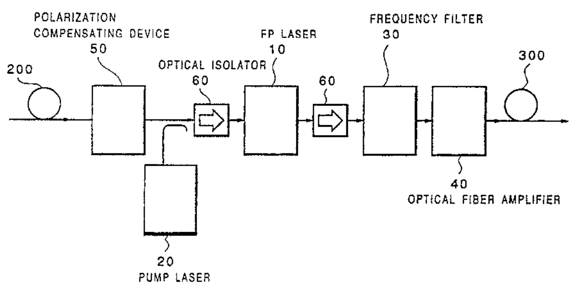
5,243,610 Sept. 7, 1993

Optical Fiber Dispersion-Compensating Device

Inventor: Shigeru Murata.
Assignee: NEC Corporation.
Filed: Feb. 18, 1992.

Abstract—A stable optical fiber dispersion-compensating device reduces electrical power consumption and compensates for wave deterioration due to dispersion of high speed signals having a frequency of several Gb/s or above. The devices includes a non-linear optical medium, a pump laser for generating pump light, means for injecting input signal light and the pump light into the non-linear optical medium, means for taking out output signal light which is frequency converted and is generated from the non-linear optical medium by non-degenerate four-wave mixing. The non-linear optical medium is a Fabry-Perot semiconductor laser, and the frequencies of the pump light and input signal light respectively substantially coincide with one of different resonant modes of the Fabry-Perot semiconductor laser.

7 Claims, 6 Drawing Sheets



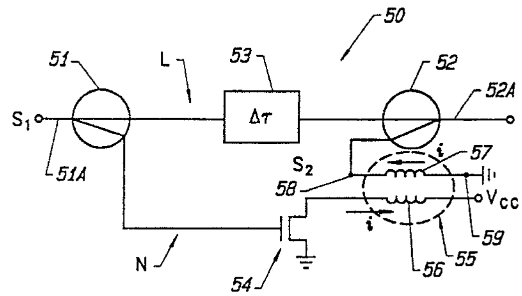
5,243,613 Sept. 7, 1993

Method and Apparatus to Compensate for Distortion in Optical Transmission Systems

Inventors: Hermann Gysel and Mani Ramachandran.
Assignee: Synchronous Communications, Inc.
Filed: Nov. 5, 1991.

Abstract—An electrical compensation circuit and an optical compensation circuit are provided for compensating for expansion-type and compression-type gain distortion due to the interaction of a laser and an optical amplifier. In the electrical compensation circuit there is provided a linear signal path and a nonlinear signal path. A delay circuit in the linear signal path compensates for a signal delay in the nonlinear signal path. In the nonlinear signal path there is provided an FET and a transformer. A modulation signal applied to the linear signal path and the nonlinear signal path is processed in the nonlinear signal path and combined with the signal in the linear signal path so as to provide a predistorted modulation signal which is substantially equal in amplitude and opposite in phase to the gain distortion in the optical signal at the output of the optical amplifier. In the optical compensation circuit there is provided a predetermined length of erbium-doped fiber which is inserted between a laser and an erbium-doped fiber amplifier (EDFA) so as to provide an absorption of the output of the laser which is equal in magnitude and opposite in phase to the gain distortion in the output signal of an uncompensated EDFA.

18 Claims, 9 Drawing Sheets



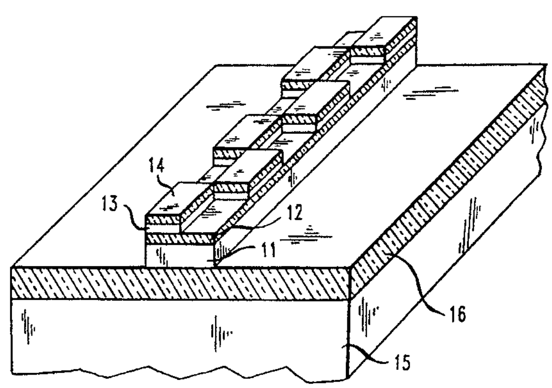
5,243,669 Sept. 7, 1993

Asymmetric, Periodically Loaded Waveguide for Polarization Rotation

Inventors: Rodney C. Alferness, Thomas L. Koch, Yosi Shani.
Assignee: AT&T Bell Laboratories.
Filed: Apr. 7, 1992.

Abstract—Polarization rotation is achieved in an exemplary embodiment in an optical waveguide by augmenting the waveguide structure with a plurality of spaced-apart sections for loading the refractive index of the waveguide to cause a lateral asymmetry in the refractive index profile of the waveguide viewed in the plane transverse to the waveguide longitudinal axis. Each spaced-apart section induces non-zero coupling between the principal orthogonal polarization modes. Phase matched coupling between the principal orthogonal polarization modes is achieved by spacing the sections periodically by a distance Λ equal to $\lambda/\Delta N$ where λ is the propagation wavelength in the waveguide and ΔN is the difference between the effective refractive indices for the principal orthogonal polarization modes. Realizations of the waveguide structure are shown using Group III-V semiconductor rib waveguide structures.

12 Claims, 7 Drawing Sheets



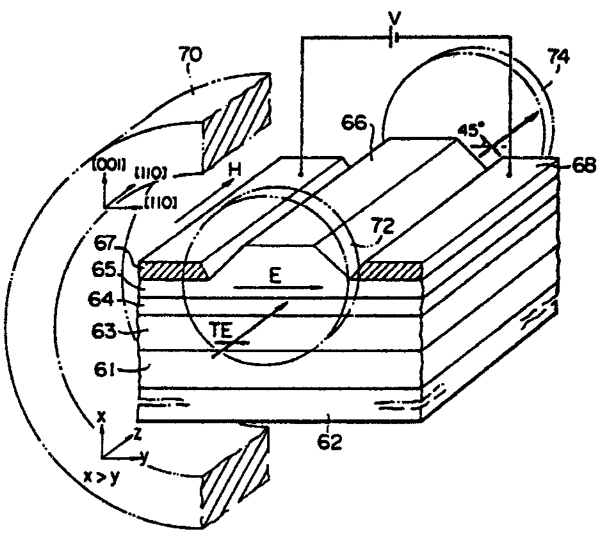
5,245,465 Sept. 14, 1993

Optical Polarization-State Converting Apparatus for Use as Isolator, Modulator and the Like

Inventors: Yasuo Tomita, Hitoshi Oda, Masahiro Okuda.
Assignee: Canon Kabushiki Kaisha.
Filed: Sept. 4, 1992.

Abstract—In polarization-state converting apparatus for use as an optical isolator, an optical modulator and the like, there are provided a waveguide including a magnetic semiconductor, a device for applying a magnetic field to the waveguide in a first predetermined direction, a device for applying an electric field to the waveguide in a second predetermined direction, and a mode conversion is caused via electrooptic and magnetooptic effects due to the electric and magnetic fields to change the polarization state of light propagating through the waveguide. When used as an optical isolator, the optical isolation is performed to compensate for degradation of the mode conversion rate due to a phase mismatch between light incident upon the waveguide and light emerging from the waveguide. When used as an optical modulator, the optical modulation of light emerging from the waveguide is performed by varying the electric field and an optical isolation function is effected while compensating for degradation of the mode conversion rate due to a phase mismatch between light incident upon the waveguide and light emerging from the waveguide.

21 Claims, 10 Drawing Sheets



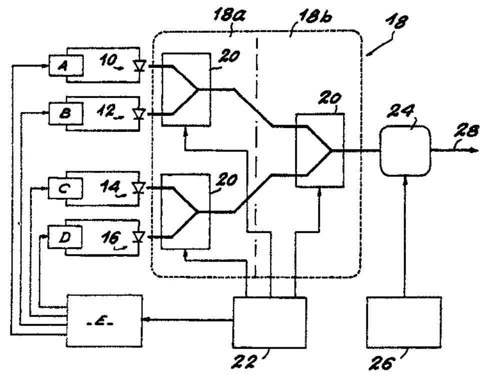
5,245,681 Sept. 14, 1993

Rapidly Reconfigurable Wavelength Multiplexing Device

Inventors: Philippe Guignard, Yvon Sorel, Jean-Francois Kerdiles.
Assignee: France Telecom Etablissement Autonome de Droit Public.
Filed: Mar. 25, 1992.

Abstract—A wavelength multiplexing device comprising a switching matrix (18) of the N to 1 type, which has several successive stages (18a, 18b) of controllable optical couplers (20) interconnected to form a tree structure and modulating means (24) connected to the output of the switching matrix (18). The device further has N sources (10, 12, 14, 16) each emitting a continuous light beam having a particular wavelength to an input of the matrix, and a control circuit (22) connected to the couplers and controlling the latter so as to select P wavelengths from among the N available wavelengths. The device allows efficient transmission of data through an optical network.

6 Claims, 1 Drawing Sheet



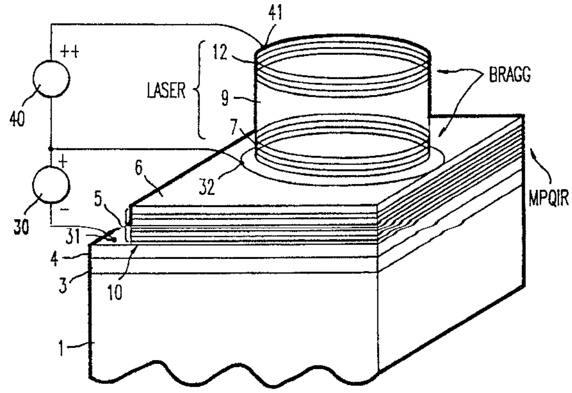
5,247,168 Sept. 21, 1993

Light Frequency Converter Having Laser Device Connected in Series With Photodetector

Inventors: Jean-Paul Pocholle and Michel Papuchon.
Assignee: Thomson-CSF.
Filed: Sept. 23, 1991.

Abstract—A structure providing a monolithic integration of an optical detector with an optical transmitter working in the region of the visible or the near IR spectrum. This source type makes it possible to transpose a perceived image belonging to a wavelength region to another wavelength region with a good output (photons/electrons coupling). Such a device may find particular application in imagery and signal processing systems.

9 Claims, 2 Drawing Sheets



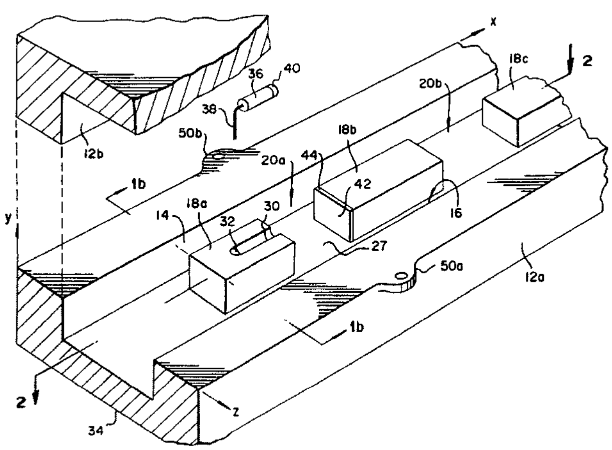
5,247,268 Sept. 21, 1993

Adjustable Waveguide Branch, and Directional Coupler

Inventor: William H. Meise.
Assignee: General Electric Company.
Filed: Jan. 6, 1992.

Abstract—A rectangular waveguide series junction has a layer of photoconductive material in one branch near the junction. The photoconductive material, wh en dark, is essentially a dielectric, which effectively increases the dimension of the waveguide branch over what it would be if not modified, thereby increasing its impedance at the series junction and causing power division preferentially into the branch. When illuminated, as by a laser or LED, the photoconductive layer becomes a conductor instead of a dielectric, and the dielectric "increase" in the dimension is eliminated. Instead, the conductive material actually decreases the cross-section, to thereby reduce the actual impedance of the branch at the junction point. This reduces the amount of coupling below that for an unmodified waveguide branch. Thus, the amount of coupling into the branch at the junction is increased by the dielectric constant when the photoconductor is dark, and decreased by the conductivity when illuminated. A waveguide directional coupler includes one or more such controllable branches. Redundant light emitting diodes are located in slots adjacent the central seam of the directional coupler housing, for fine control of the coupling factor. Control may be applied to move nulls in the coupler isolation to reduce interference in antenna arrays, to adjust coupling to achieve improved channel-to-channel isolation, or to compensate for aging, or other changes of amplifiers or other circuit components.

9 Claims, 6 Drawing Sheets



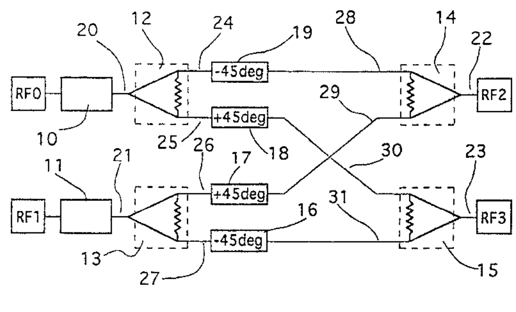
5,247,269 Sept. 21, 1993

Two-Way Duplexer for Polarized Microwaves

Inventors: André Boulouard, Marie-Laure Chares, Michel Le Rouzic.
Assignee: France Telecom.
Filed: July 30, 1991.

Abstract—Disclosed is a novel two-way duplexer structure for the simultaneous transmission and reception of circularly polarized microwaves. This two-way duplexer of the type designed to connect a first set of two inputs/outputs to a second opposite set of two inputs/outputs, each input/output of said duplexer being connected to the combination channel of a combiner/divider, the two division channels of each combiner/divider each providing for the connection with one of the division channels of one of the combiners/dividers connected to a distinct input/output of the opposite set of inputs/outputs, through distinct phase-shifting means.

25 Claims, 5 Drawing Sheets



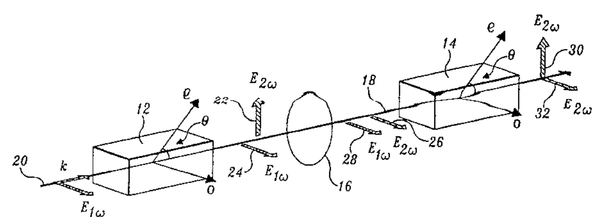
5,247,389 Sept. 21, 1993

Nonlinear Optical Frequency Converter

Inventor: Raymond G. Beausoleil.
Assignee: Cygnus Laser Corporation.
Filed: June 15, 1992.

Abstract—A general method which extends quadrature techniques to Type I nonlinear optical parametric interactions. In one embodiment, a pair of either uniaxial or biaxial birefringent nonlinear optical crystal elements are serially arranged and oriented so that each crystallographic axis in one conversion means is parallel to the corresponding axis in the second conversion means. Two colinear input fundamental laser fields with parallel polarizations propagate through both crystals, generating a sum-frequency output field. Between the two crystals, a harmonic waveplate is inserted that rotates only the polarization of the sum-frequency field generated in the first conversion means by 90° about its propagation axis. The net polarization rotation of each of the two residual fundamental waves which remain after the interaction in the first conversion means is zero. Therefore, the fundamental waves remain correctly polarized for efficient nonlinear optical conversion in the second conversion means, while the sum-frequency wave is no longer correctly phase-matched for back-conversion. Precise phase-matching may be accomplished either by tilting the assembly about its angularly sensitive axis ("critical" phase-matching) or by adjusting the temperature of the crystals ("non critical" phase-matching). In general, the polarization of the sum-frequency output field will be elliptical, but it can be linearized by tilting the assembly about its angularly insensitive axis.

14 Claims, 8 Drawing Sheets



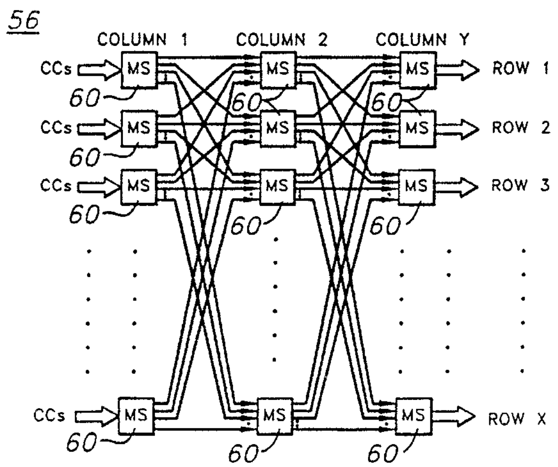
5,247,593 Sept. 21, 1993

Programmable Optical Crossbar Switch

Inventors: Tsen-Hwang Lin and Falvey Malarcher.
Assignee: Texas Instruments Incorporated.
Filed: Dec. 18, 1991.

Abstract—This is a crossbar switch which comprises: X rows by Y columns of modular optical switches each comprising X or more channel inputs and X or more channel outputs where X is greater than one; and each of columns 1 to Y-1 of the modular optical switches having 1/Xth of the channel outputs optically connected to 1/Xth of the channel inputs of each of the modular optical switches in a next column. Other methods and devices are disclosed.

9 Claims, 4 Drawing Sheets



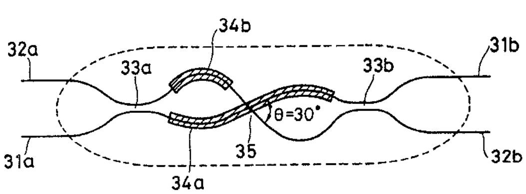
5,247,594 Sept. 21, 1993

Waveguide-Type Optical Matrix Switch

Inventors: Masayuki Okuno, Kuniharu Kato, Katsumi Katoh, Masao Kawachi.
Assignee: Nippon Telegraph and Telephone Corporation.
Filed: Mar. 20, 1992.

Abstract—A waveguide-type optical matrix switch including as its switching element a Mach-Zehnder interferometer which includes two directional couplers and an optical phase shifter. The two directional couplers are arranged by placing two optical waveguides in close proximity at two positions on a substrate, and have an identical coupling ratio. The optical phase shifter is disposed over at least one of the two optical waveguides between the directional couplers. The two optical waveguides have an effective optical path length difference of half a wavelength of a light signal between the two directional couplers, and are intersected in the optical switch element. The waveguide-type optical matrix switch is little affected by fabrication errors in the coupling ratio of the directional couplers, and superior in the extinction ratio.

29 Claims, 20 Drawing Sheets



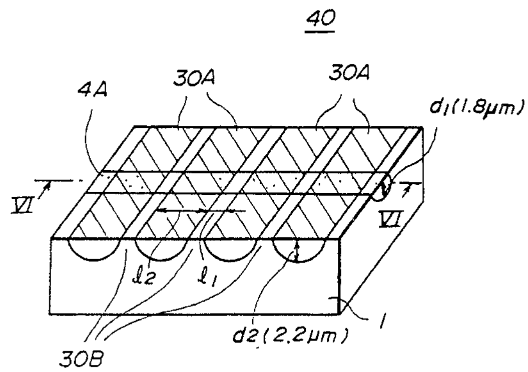
5,249,191 Sept. 28, 1993

Waveguide Type Second-Harmonic Generation Element and Method of Producing the Same

Inventors: Ippei Sawaki, Sunao Kurimura, Michio Miura.
Assignee: Fujitsu Limited.
Filed: Nov. 4, 1991.

Abstract—A waveguide type second-harmonic generation element includes a substrate made of $LiTaO_3$, approximately parallel domain inversion regions formed on the substrate and extending in a first direction, where the domain inversion regions have a first depth into the substrate, approximately parallel domain non-inversion regions formed on the substrate and extending in the first direction, where the domain inversion region and the domain non-inversion regions alternately occur on the substrate, and an optical waveguide formed on the substrate and traversing the domain inversion regions and the domain non-inversion regions, where the optical waveguide has a second depth and extends in a second direction which is approximately perpendicular to the first direction.

16 Claims, 13 Drawing Sheets



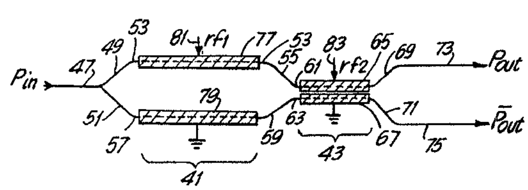
5,249,243 Sept. 28, 1993

Apparatus and Method for Cascade Coupled Integrated Optical Phase Modulator for Linearization of Signal Transfer

Inventor: Halvor Skeie.
Assignee: Siemens Components, Inc.
Filed: May 21, 1992.

Abstract—An integrated cascaded optical phase modulator for providing linearized complementary modulated light output signals consists of the successive cascade of a first phase modulator stage, first fixed optical coupler, second phase modulator stage, and second fixed optical coupler. Rf modulating signals applied to each phase modulator stage are adjusted in amplitude, for compensating for errors in the coupling angles of the first and second optical couplers. The levels of DC bias voltages applied to each phase modulator stage are adjusted for compensating for asymmetric phase modulation.

20 Claims, 8 Drawing Sheets



5,249,244 Sept. 28, 1993

Optical Device With an Optical Coupler for Effecting Light Branching/Combining and a Method for Producing the Same

Inventor: Mamoru Uchida.
Assignee: Canon Kabushiki Kaisha.
Filed: Mar. 12, 1992.

Abstract—Disclosed are an optical device having an optical coupler and a method for fabricating the optical device. The optical device includes a semiconductor crystal and a waveguide formed on the semiconductor crystal. The waveguide includes an etched portion having a predetermined pattern and a predetermined depth. A re-grown portion is formed in the etched portion of the waveguide. A coupler portion containing a recess is formed in the re-grown portion. The coupler portion effects at least one of a branching and a combining of the light propagated through the waveguide. In a method for fabricating the device, the etched portion is formed typically by ion beam etching, and the recess is formed typically by focused ion beam etching. in the method, the etching and the re-growth are performed using the same mask material.

13 Claims, 5 Drawing Sheets