

# Patent Abstracts

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5,387,884

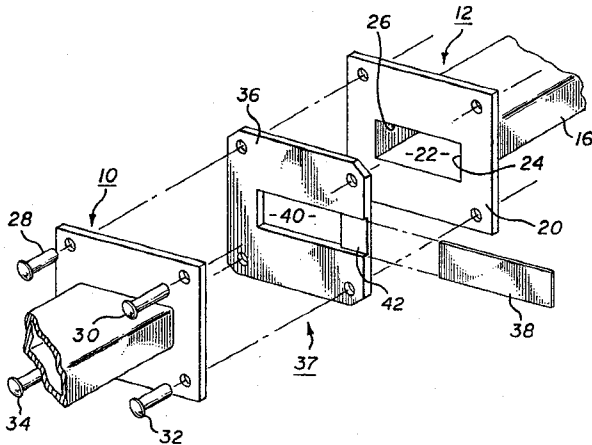
Feb. 7, 1995

## Impedance Matching Flange for a Rectangular Waveguide

Inventor: John C. Porcello.  
Assignee: Litton Systems, Inc.  
Filed: July 13, 1993.

**Abstract**—A method and apparatus for adjusting the impedance of an electromagnetic energy-actuated device. An auxiliary test flange includes a substantially planar metallic member. An internal aperture matches the dimensions of the waveguide cavity formed at the mating ports of adjacent electromagnetic energy-actuated devices. The member includes an access groove for a metallic stub, permitting the stub to be inserted from an edge of the member into the aperture. Measurements of energy transfer are made as the stub is inserted to thereby adjust either the capacitive or inductive impedance to energy transfer. After a predetermined degree of energy transfer is observed, one or the other of the devices may be modified by the addition of a permanent auxiliary flange or directly modified in accordance with the optimized aperture reduction.

7 Claims, 2 Drawing Sheets



5,387,972

Feb. 7, 1995

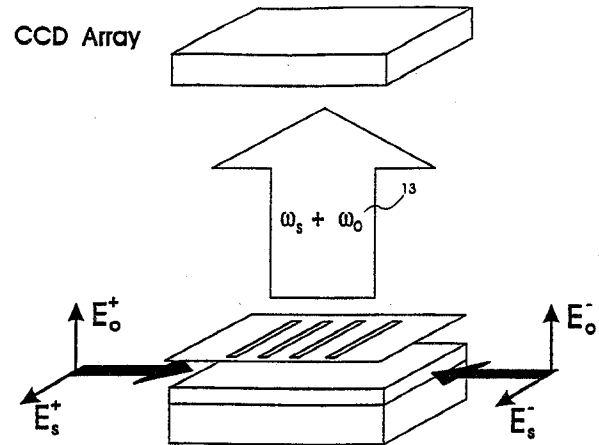
## Coherent Phase and Frequency Detection Using Sum-Frequency Mixing in Nonlinear Waveguides

Inventors: Siegfried Janz, Edward Frlan, Hongxing Dai, Francoise Chatenoud, and Richard Normandin.  
Assignee: National Research Council of Canada.  
Filed: Mar. 15, 1993.

**Abstract**—A plurality of signals are mixed in a nonlinear waveguide for generating a near field sum-frequency output pattern. The near field output pattern is monitored for changes that correspond to changes in the phase relationship between the plurality of signals. A grating provides a mask through which the near field pattern may propagate. Detectors positioned above the grating at predetermined locations measure the intensity of the near

field pattern and a change in the phase relationship between the input signals is determined from a change in the intensity of the near field output pattern.

14 Claims, 6 Drawing Sheets



5,387,997

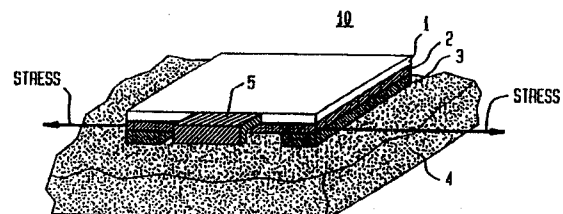
Feb. 7, 1995

## Optical Modulator Based on Piezoelectrically Driven Anisotropic Optical Absorption

Inventors: Gerald J. Iafrate, Mitra Dutta, Hongen Shen, Michael A. Strosio, and Arthur Ballato.  
Assignee: The United States of America as represented by the Secretary of the Army.  
Filed: Nov. 29, 1993.

**Abstract**—An optic modulator having a transparent piezoelectric substrate, an active multiple quantum-well (MQW) epilayer with bottom electrical contacts bonded to the substrate, wherein the substrate is cut such that its thermal expansion coefficient is matched or roughly matched to that of the MQW epilayer in the direction parallel to the long axes of the bottom contacts and so that the piezoelectrically active direction of the substrate is normal to the long axes of the bottom contacts. In order to control the bias of the MQW epilayer, a transparent contact is disposed over the MQW epilayer. In operation, the piezoelectric substrate, when activated, will displace an anisotropic strain on the MQW epilayer, which will break the rotational symmetry in the plane of the MQW. This will result in anisotropic mixing of the heavy and light holes in the MQW epilayer and, thus, will result in an anisotropic excitonic absorption of light normal to the MQW epilayer.

6 Claims, 2 Drawing Sheets



5,388,001

Feb. 7, 1995

15 Claims, 3 Drawing Sheets

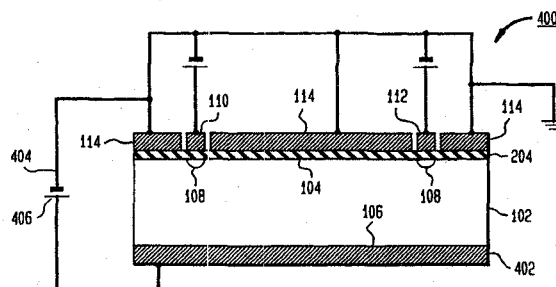
### Polarization-Independent Optical Wavelength Filter with Simplified Structure

Inventors: Hideaki Okayama, Issei Asabayashi, and Masao Kobayashi.

Assignee: Oki Electric Industry Co., Ltd.

Filed: Sept. 29, 1993.

**Abstract**—A polarization-independent optical wavelength filter uses a polarization splitter to divide an optical input signal into first and second signals with mutually perpendicular planes of polarization. The first signal propagates via a first optical path to a first end of an optical device, such as a TE-TM mode converter or a polarization-dependent filter, which acts selectively on the desired wavelength, then returns via a second optical path from a second end of the optical device to the polarization splitter. The second signal propagates via the second optical path to the second end of the same optical device and returns from the first end via the first optical path to the polarization splitter. The polarization splitter recombines the returning signals into an optical output signal consisting only of the desired wavelength.



5,389,890

Feb. 14, 1995

### Combiners for R.F. Power Amplifiers

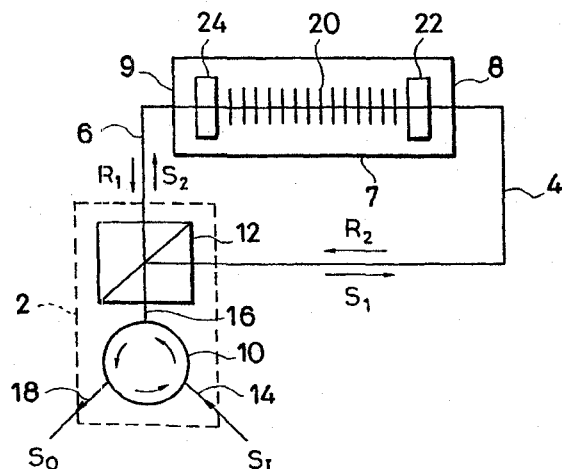
Inventor: Clement P. Burrage.

Assignee: GEC-Marconi Limited.

Filed: July 29, 1993.

**Abstract**—Directional couplers  $7^1-7^{20}$  are used to couple power from rf power amplifier modules  $5^1-5^{20}$  to a transmission line 6 or other type of resonator, from which it is withdrawn by directional coupler 8. The power withdrawn from the continuous transmission line, which is an integral number of wavelengths at the operating frequency of the modules in length, is less than the power circulating around the transmission line 6. The balance load may be removed to enable the output load to be combined with the output of another rf power amplifier operating a different frequency so that, e.g., sound and vision signals can be combined at an aerial and, in the latter case, means may be provided for improving the resonance of the main loop 6.

34 Claims, 7 Drawing Sheets



5,388,170

Feb. 7, 1995

### Electrooptic Device Structure and Method for Reducing Thermal Effects in Optical Waveguide Modulators

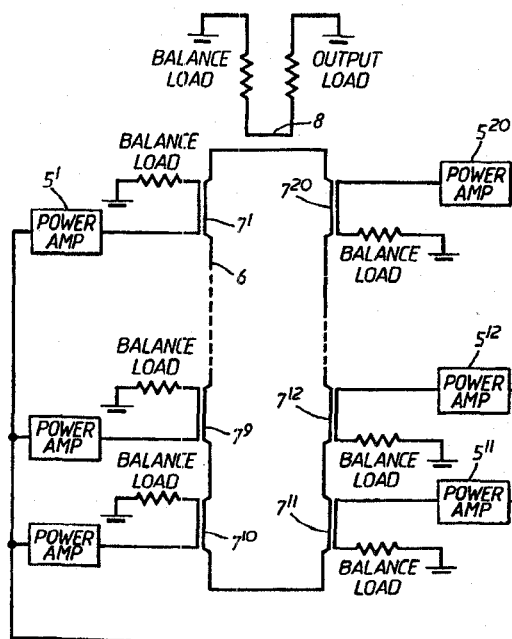
Inventors: Fred L. Heismann, Steven K. Korotky, and John J. Veselka.

Assignee: AT&T Corp.

Filed: Nov. 22, 1993.

**Abstract**—An interferometric modulator comprising a substrate of titanium-doped lithium niobate ( $\text{Ti:LiNbO}_3$ ) having top and bottom surfaces and a waveguide formed in the top surface is disclosed. A conductive layer is formed on the bottom surface of the substrate and electrically coupled to a top-surface ground plane or simply to ground potential. The bottom surface conductive layer functions to thermally stabilize the modulator during operation.

15 Claims, 3 Drawing Sheets



5,389,901

Feb. 14, 1995

### Microwave Amplitude Equalizer Circuit

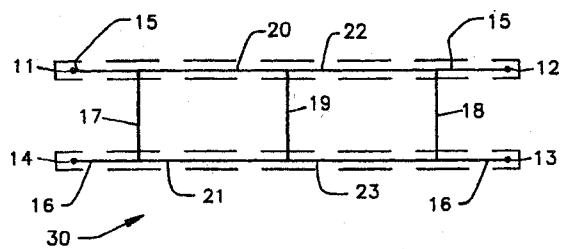
Inventors: William G. Sterns and Ching F. Cho.

Assignee: ITT Corporation.

Filed: Mar. 23, 1993.

**Abstract**—A modified branch line coupler amplitude equalizer circuit employing cross arms and branch lines of varying lengths and impedances to minimize the return loss of the circuit.

17 Claims, 13 Drawing Sheets



TRACE	$Z/Z_0$	LENGTH AT $F/F_0 = 1.00$ (DEGREES)
15,16	1.000	NA
20,21,22,23	1.192	98.6
17,18	0.968	107.4
19	1.592	65.4

5,389,937

Feb. 14, 1995

### Wedge Feed System for Wideband Operation of Microstrip Antennas

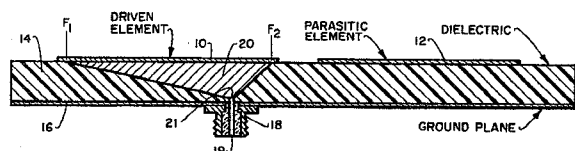
Inventor: Cyril M. Kaloi.

Assignee: The United States of America as represented by the Secretary of the Navy.

Filed: May 1, 1984.

**Abstract**—The microstrip antenna system uses a special wedge-shaped feed connected from the antenna radiation element to the center pin of the coaxial to microstrip adapter to obtain wide bandwidth operation. The special wedge feed connects the center pin to an indefinite series of feedpoints along the length of radiating element. The angle of the taper of the wedge feed along with the distance between the bottom of the wedge and the ground plane provides impedance matching for the antenna.

11 Claims, 3 Drawing Sheets



5,389,944

Feb. 14, 1995

### Phase Correcting Reflection Zone Plate for Focusing Microwave

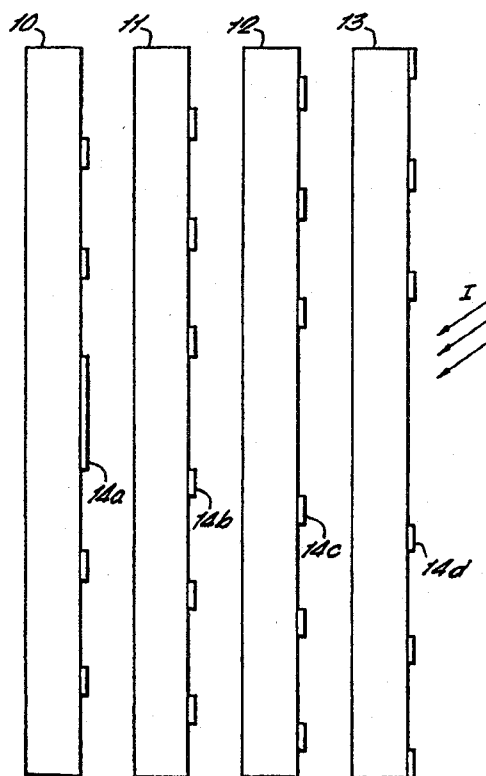
Inventors: Gary Collinge and Thomas M. B. Wright.

Assignee: Mawzones Developments Limited.

Filed: July 10, 1991.

**Abstract**—A zone plate for focusing microwave energy is provided comprising a plurality of reflective portions corresponding to zones of the zone plate, each reflective portion reflecting energy  $\lambda/P$  out of phase with respect to adjacent reflective portions, where  $\lambda$  is the wavelength of the energy. The reflective portions are positioned in  $P$  parallel planes mounted on low dielectric loss sheets and separated by a distance of  $\lambda/2P$  such that energy reflected from the reflective portions constructively interfere at a focus of the zone plate.

18 Claims, 11 Drawing Sheets



5,392,010

Feb. 21, 1995

### 90-Degree Phase Shifter

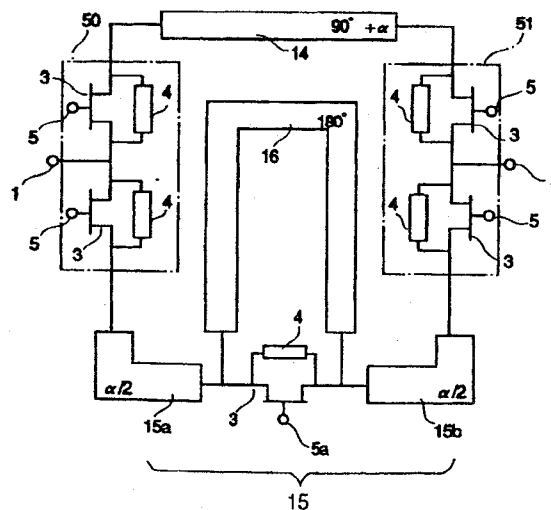
Inventor: Kazuhiko Nakahara.

Assignee: Mitsubishi Denki Kabushiki Kaisha.

Filed: Dec. 1, 1993.

**Abstract**—A switched-line-type 90° phase shifter includes two single-pole double throw switches, a reference transmission line having an electrical length of  $\alpha$  connected between output terminals of the first and the second single pole double throw switches, a phase difference producing transmission line having an electrical length of  $(90^\circ + \alpha)$  at a usage frequency connected between other output terminals of the first and the second single pole double throw switches, and a phase inverting circuit switchably connected for serial connection to and between two parts of the reference transmission line, which two parts produce the entirety of the reference transmission line, the one terminal of the first single pole double throw switch is an input terminal of the entire terminal, and one terminal of the second single-pole double throw switch is an output terminal.

5 Claims, 11 Drawing Sheets



5,392,152

Feb. 21, 1995

15 Claims, 2 Drawing Sheets

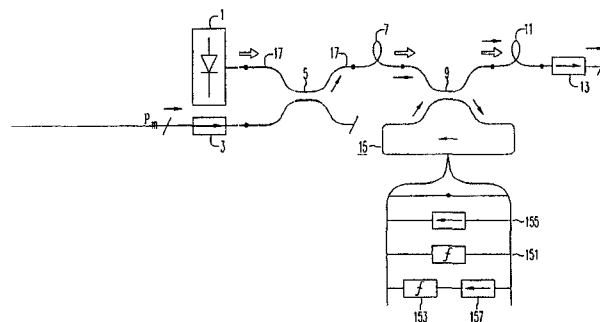
**Quasi-Optic Amplifier with Slot and Patch Antennas**

Inventors: J. Aiden Higgins and Emilio A. Sovero.

Assignee: Rockwell International Corporation.

Filed: Oct. 13, 1993.

**Abstract**—A monolithic quasi-optic amplifier is provided for colinear beam propagation in the millimeter-wave frequency range (30–300 GHz). The amplifier comprises a multiplicity of unit cells that act as nearly independent amplifiers. Each unit cell includes a GaAs transistor, a slot antenna, a patch antenna, a microstrip line, and a dc bias provided by a ground plane that routes nonradiating transmission lines without interference. The slot antennas on GaAs provide preferential directionality in receiving the input waves. A vertically polarized input wave couples energy into each unit cell through the slots in the ground plane, through the microstrip lines, and to the base of each transistor. After amplification by the transistors, the signal is fed to the patch antennas, which generate a horizontally polarized output wave. The size of each patch antenna, which is determined by the operating frequency, is approximately 1 mm by 1 mm in GaAs at 44 GHz.



5,394,122

Feb. 28, 1995

**RF Digital-to-Analog Converter**

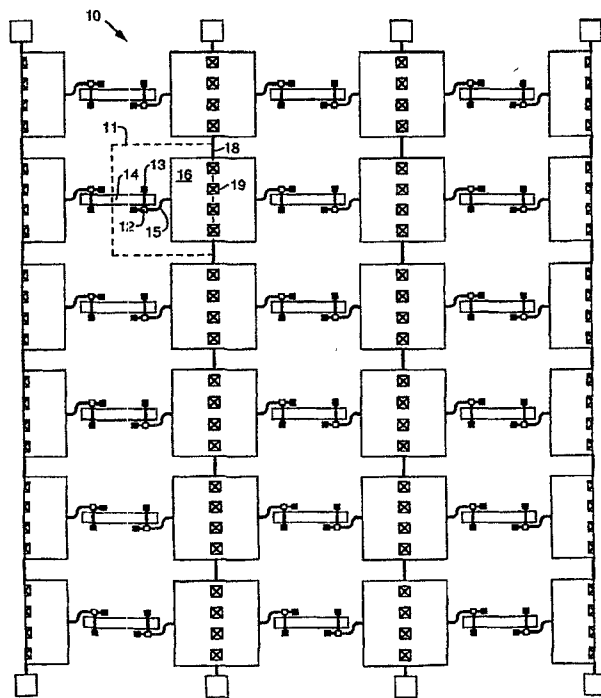
Inventors: Patrick H. Conway and David U. L. Yu.

Assignee: Duly Research Incorporated.

Filed: Sept. 28, 1992.

**Abstract**—A digital-to-analogue converter for producing an rf output signal proportional to a digital input word of  $N$  bits from an rf reference input,  $N$  being an integer greater or equal to 2. The converter comprises a plurality of power splitters, power combiners, and a plurality of mixers or rf switches connected in a predetermined configuration.

5 Claims, 6 Drawing Sheets



5,392,153

Feb. 21, 1995

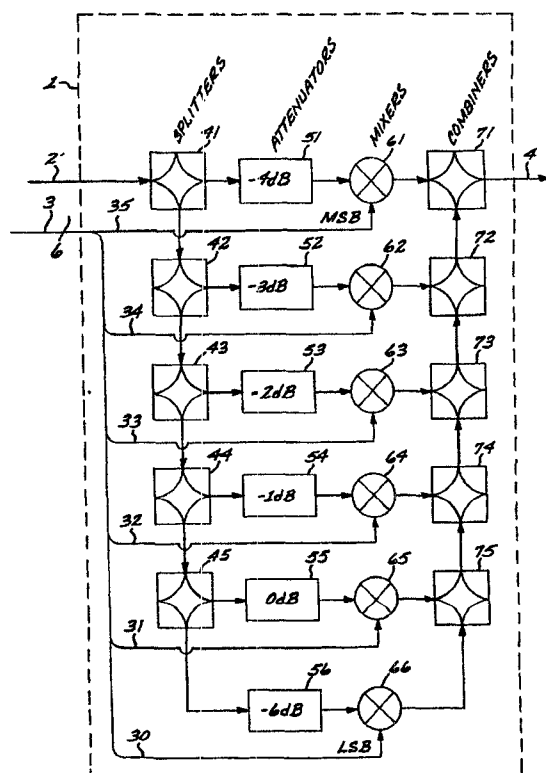
**Optical Amplifier**

Inventor: Jean-Marc P. Delavaux.

Assignee: AT&amp;T Corp.

Filed: Aug. 31, 1993.

**Abstract**—An amplifier is described that has a two-stage arrangement in which the second stage is pumped with the pump signal not used in the first stage.



5,394,415

Feb. 28, 1995 5,394,491

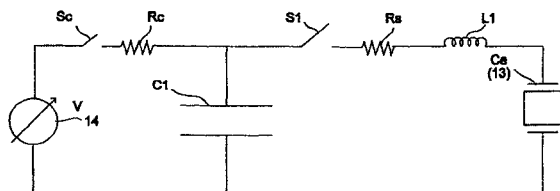
Feb. 28, 1995

### Method and Apparatus for Modulating Optical Energy Using Light-Activated Semiconductor Switches

Inventors: Oved S. F. Zucker, Iain A. McIntyre, Paul J. Solone, and David Giorgi.  
 Assignee: Energy Compression Research Corporation.  
 Filed: Jan. 21, 1994.

**Abstract**—The optical modulator of the invention comprises an electrooptic material (EOD) that modulates optical energy in accordance with an applied voltage. The applied voltage is controlled by a light-activated switch, or switches, which vary the magnitude of the voltage applied by switching a charge transfer circuit (or other dc source) of which the EOD forms a capacitive element. The charge transfer circuit preferably includes a plurality of capacitive elements, each charged to a separate voltage, so that when switched by said light activated switches, the voltage applied to the EOD is controlled. When used in a laser cavity, the optical modulator can control the output of the laser in response to optical input signals. The optical modulator may be used for Q-switching the laser cavity, mode-locking the laser, cavity dumping the laser or modulating the output of the laser, or a combination of the above. The optical input control signal may comprise light from within the laser cavity, from the output of the laser cavity or from a source external to the laser cavity. The optical modulator may modulate a plurality of beams of optical energy based upon a single applied voltage or it may modulate the plurality of beams in accordance with a respective plurality of applied voltage levels.

163 Claims, 23 Drawing Sheets



### Semiconductor Optical Switch and Array of the Same

Inventors: Hiroaki Inoue, Kazuhisa Uomi, and Koji Ishida.  
 Assignee: Hitachi, Ltd.  
 Filed: Apr. 25, 1994.

**Abstract**—A semiconductor optical switch and an optical switch array for use in an optical logic circuit, photonic switching, OEIC, etc., wherein a light amplifying means is provided on a bypass waveguide that connects a plurality of optical waveguides, thereby enabling improvement of the light crosstalk and the light propagation loss. In particular, according to the arrangement of the present invention that a light amplifying means is provided in addition to the deflecting portion, no noise component is amplified and therefore the SN ratio is markedly increased.

8 Claims, 6 Drawing Sheets

