# 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.

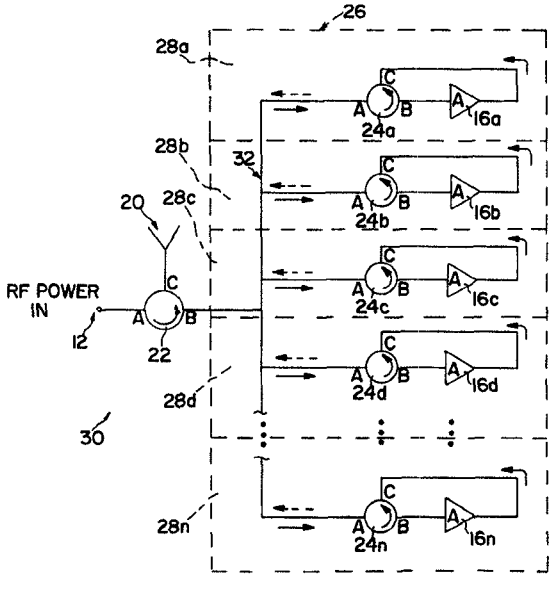
**5,191,299** Mar. 2, 1993

## Radial Power Combining of Field-Effect Transistor-Based Amplifiers

Inventor: Gerald H. Nesbit.
Assignee: TRW Inc.
Filed: July 15, 1991.

***Abstract***—A radial power combining scheme is provided for combining a plurality of field-effect transistor-based amplifiers to form an amplifier circuit. The amplifier circuit includes input terminals for receiving high frequency power signals. A radial line power combiner/divider is provided for dividing the input signal amongst a plurality of amplifiers. The radial line power combiner/divider is further adapted to receive and combine the amplified signals which are then provided to an output. The circuit advantageously utilizes a plurality of three-port circulators for transmitting the signals within the circuit.

**16 Claims, 2 Drawing Sheets**



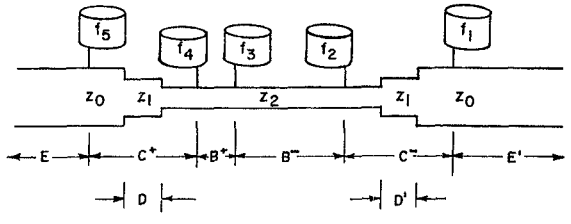

**5,191,304** Mar. 2, 1994

## Bandstop Filter Having Symmetrically Altered or Compensated Quarter Wavelength Transmission Line Sections

Inventor: Douglas R. Jachowski.
Assignee: Orion Industries, Inc.
Filed: Feb. 27, 1991.

***Abstract***—A multi-resonator notch filter incorporates a variable impedance transmission line with impedance values going from a relatively low value and increasing upward to a relatively high value then back down to a relatively low value again. A plurality of resonant cavities is coupled to the relatively high central impedance line section of the filter at odd multiples of quarter wavelength intervals. Other resonators can be coupled to lower impedance sections of the transmission line. The locations of selected resonators on the quarter wavelength intervals can be altered thereby increasing and decreasing the nominal quarter wavelength intervals of selected internal pairs by a predetermined amount thereby providing acceptable levels of performance with fewer resonators.

**44 Claims, 14 Drawing Sheets**



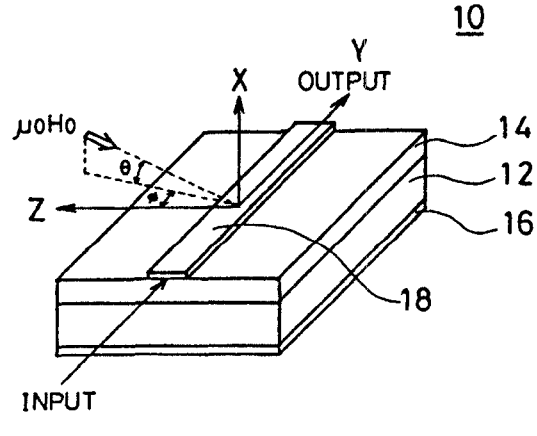

**5,191,308** Mar. 2, 1993

## Magnetostrictive Wave Device Having a Higher Maximum Cut-Off Band Elimination Filter

Inventors: Makoto Tsutsumi and Toshio Nishikawa.
Assignee: Murata Manufacturing Co., Ltd.
Filed: Jan. 14, 1991.

***Abstract***—This magnetostatic wave device includes a ferrimagnetic substrate like, for example, a YIG thin film. On this ferrimagnetic substrate a strip line is formed. One end of the strip line is connected to an input terminal and the other end is connected to an output terminal. A magnetic field is applied to the ferrimagnetic substrate by a magnet. In this case, the ferrimagnetic substrate is so disposed that a direction parallel to its principal plane and a direction perpendicular to its principal plane are not parallel to the direction of a line of magnetic force of the magnet.

**9 Claims, 3 Drawing Sheets**



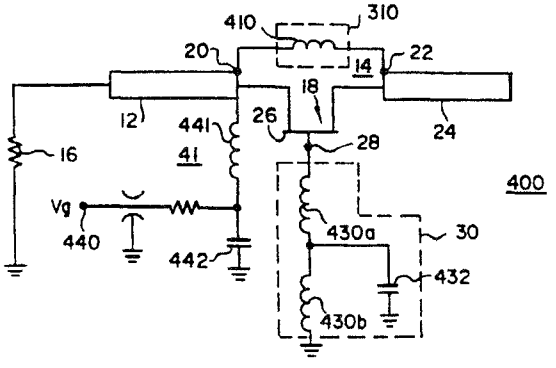
**5,191,338** Mar. 2, 1993

## Wideband Transmission-Mode FET Linearizer

Inventors: Allen Katz and Shabbir S. Moochalla.
Assignee: General Electric Company.
Filed: Nov. 29, 1991.

*Abstract*—A FET is operated without source-to-drain bias, with the source-to-drain conductive path coupled in series with a transmission line. A gate-to-ground impedance is selected in conjunction with a gate voltage near pinch-off to impress nonlinear distortion or gain and/or phase of signals traversing the source-to-drain conductive path. The nonlinear distortion can compensate for the amplitude distortion of a following amplifier, but the phase distortion may not be suitable for correcting that of the following amplifier. An inductor is bridged from source to drain, and corrects the phase without excessive effect on the amplitude. The magnitude of the inductor may be adjusted to minimize nonlinear amplitude change without affecting the phase change, where-upon the phase change may be made independent of amplitude change. A resistor in series with the bridging inductor can be selected to render amplitude change independent of phase change. Two such independent amplitude and phase correctors may be cascaded.

**16 Claims, 10 Drawing Sheets**



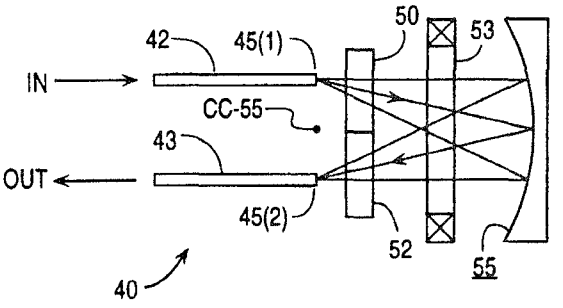

**5,191,467** Mar. 2, 1993

## Fiber Optic Isolator and Amplifier

Inventors: Narinder S. Kapany, Fred C. Unterleitner, and Shin-Lo Chia.
Assignee: Kaptron, Inc.
Filed: Apr. 2, 1992.

*Abstract*—A fiber optic isolator uses only one-half the amount of costly rotator material as the prior art and an isolated laser amplifier uses only one-quarter the amount of costly rotator material. An embodiment of a fiber optic isolator includes a concave reflector and a fiber holder defining first and second fiber ports that register the respective ends of first and second fibers. A polarizer is located between the first port and the reflector, an analyzer is located between the second port and the reflector, and a Faraday rotator is disposed between the polarizer and analyzer on one side and the reflector on the other side. The polarizer and analyzer have their polarization axes at a relative angle of 45° while the rotator is configured to provide a 22.5° rotation. The port locations, the reflector, the polarizer, and the analyzer are configured so that light diverging from the end of the first fiber and entering the first port passes through the system and is imaged at the end of the second fiber, at least for one polarization component. At the same time, light that enters the second port is prevented from leaving the first port, regardless of the polarization mode.

**25 Claims, 4 Drawing Sheets**



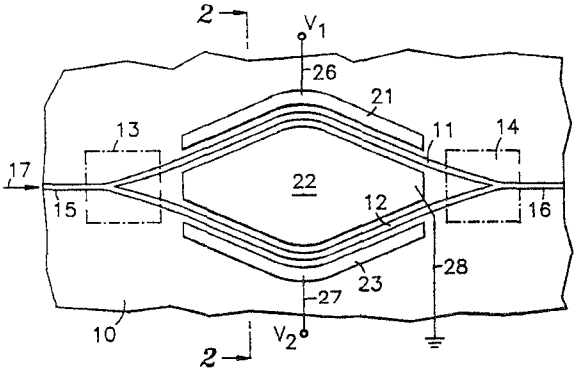

**5,193,128** Mar. 9, 1993

## Integrated Optic Modulator with Smooth Electro-optic Bandpass Characteristics

Inventors: James D. Farina and Paul G. Suchoski.
Assignee: United Technologies Corporation.
Filed: Mar. 9, 1993.

*Abstract*—An optic intensity modulator includes a substrate of an optic material that is conductive to light and acoustic waves and has both electro-optic and piezoelectric properties. A pair of associated elongated light waveguides is formed in the substrate, with the waveguides extending substantially coextensively with one another, and being separated from one another by a transverse distance that gradually varies along the courses of the waveguides. Each of two portions of light of substantially identical properties is launched into one of the waveguides for propagation longitudinally thereof, and different phase shifts are induced in the light portions as they propagate in the waveguides by imposing different variable electric fields onto each of the waveguides. The light portions are combined with one another subsequently to their emergence from the waveguides with attendant amplitude modulation of the combined output light due to interference between such phase-shifted light portions.

**7 Claims, 3 Drawing Sheets**



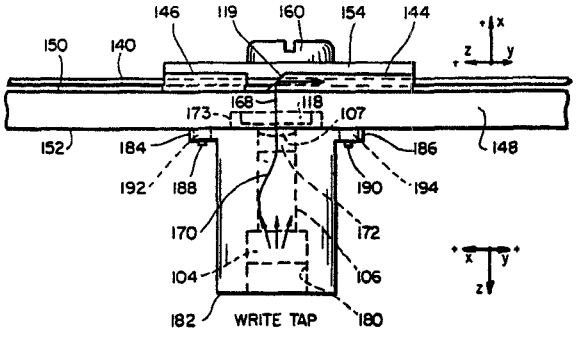

**5,193,132** Mar. 9, 1993

## Method of Coupling Light via a Coupler on a Fiber Optic Light Guide using Phase Space Matching

Inventors: William D. Uken and William T. Link.
Assignee: Raynet Corporation.
Filed: May 2, 1990.

***Abstract*—A coupler for a fiber optic light waveguide has phase space matching optics to increase coupling efficiency. The acceptance phase space of the fiber optic waveguide has two components for light in two orthogonal planes. One of the phase space plots has a straight spine and the other has a bent spine. The phase space matching optics include a graded index lens optically coupled to the phase of a light emitting diode, in the case of a write coupler, which alters the emitted light phase space at a reference plane of the emitted light to match, at the reference plane, the acceptance phase space component having the straight spine. Another lens takes the output light from the graded index lens and alters the phase space further to match the phase space component having the bent spine. Also disclosed is a method for measuring phase space and a system using write and read couplers and a pair of buses for bidirectional communication of information between a plurality of users and a central facility such a telephone central switching office.**

**27 Claims, 27 Drawing Sheets**



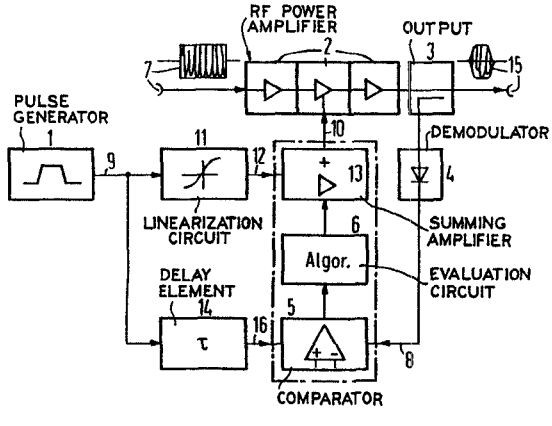

**5,194,823** Mar. 16, 1993

## Modulation Means for an RF Power Amplifier

Inventors: Peter Wendt and Gerold Friedrich.
Assignee: Siemens Aktiengesellschaft.
Filed: Dec. 3, 1991.

***Abstract*—Modulation device for an RF power amplifier. A correction of the modulation pulse is defined from the nonlinear control characteristic of the RF power amplifier (2) such that the influence on the desired output pulse shape caused by the nonlinear control characteristic is first compensated for without involvement of a controller. When, due to disturbances acting on the amplifier, changes of the control characteristics or of the RF gain and, consequently deviations in the pulse shape and power occur, then the controller corrects these deviations during the pulse transmission. The modulation device is used in RF transistor power amplifiers having a pulse modulation input.**

**10 Claims, 2 Drawing Sheets**



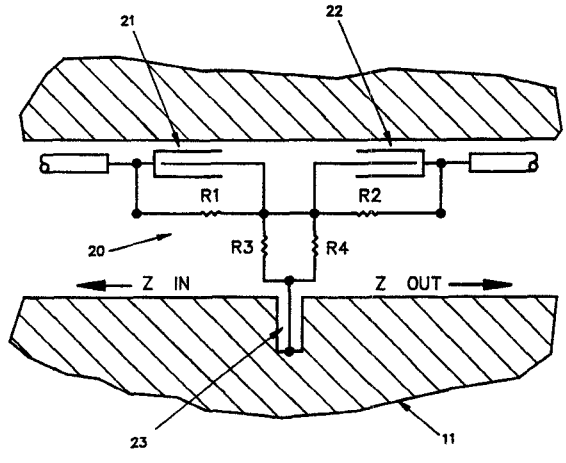

**5,194,834** Mar. 16, 1993

## Apparatus for a Matched and Adjustable Microwave Frequency Selective Attenuator Unit

Inventors: Helmut bacher, Clyfton W. Bourne, Jr., and Bradley Knott.
Assignee: Semflex, Inc.
Filed: June 13, 1991.

***Abstract*—Apparatus and a method are disclosed for providing a microwave attenuator system using distributed (transmission line) reactive elements to achieve a reduction in the transmitted electrical signal amplitude. The attenuator system includes a fixed attenuator unit and an adjustable attenuator unit. The fixed attenuator unit contains a "T" resistive attenuator component. Transmission line resonator components are added to the attenuator component to provide frequency selectively. The transmission line resonator components are coupled to the resistive attenuator component in such a way as not to compromise the impedance match of the transmission line. The step adjustable loss component includes shunt transmission lines coupled to the center conductor of the transmission line by means of a spring contacting mechanism. The shunt transmission lines include preselected resistive elements. The preselected resistive elements provide incremental known attenuation characteristics for manual fine response step adjustments.**

**18 Claims, 6 Drawing Sheets**



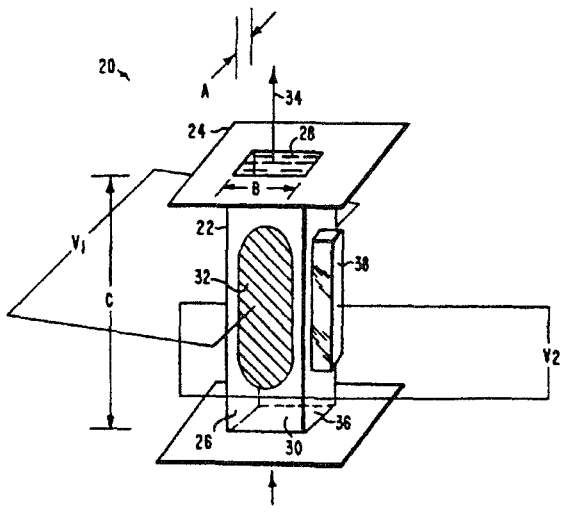

**5,194,972** Mar. 16, 1993

## Microwave Phase Modulations with Liquid Crystals

Inventors: Khoon C. Lim, J. David Margerum, Anna M. Lackner, and Leroy J. Miller.
Assignee: Hughes Aircraft Company.
Filed: Feb. 18, 1192.

***Abstract*—A liquid crystal is used as the phase modulating medium in a microwave phase modulating cell (20). Applied electric and/or magnetic fields transverse to the direction of wave propagation create a birefringence that changes the velocity of wave propagation and the index of refraction of the medium. The phase modulating cell (20) is used singly or in arrays to direct microwave beams.**

**25 Claims, 6 Drawing Sheets**



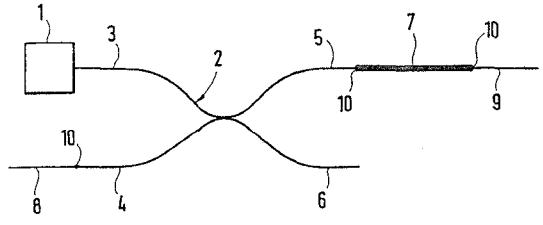

**5,195,149** Mar. 16, 1993

## Fiber Optic Amplifier

Inventors: Thomas Pfeiffer, Rolf Rossberg, and Henning Bülow.
Assignee: Alcatel N.V.
Filed: Feb. 13, 1992.

***Abstract***—To increase the pump efficiency in a fiber-optic amplifier, the pump coupler (2) is fabricated from a fiber whose mode field diameter for the pump light is adapted to the mode field diameter of the active length of fiber (7). In an alternative solution, the arm of the pump coupler (2) coupled to the pump source (1) on the one hand and connected to the active length of fiber (7) on the other hand consists of a fiber adapted to the mode field diameter of the active length of fiber (7), and the arm of the pump coupler (2) serving as a connection to the incoming transmission line (8) consists of a fiber corresponding to the optical waveguide of the transmission line (8).

**9 Claims, 1 Drawing Sheet**



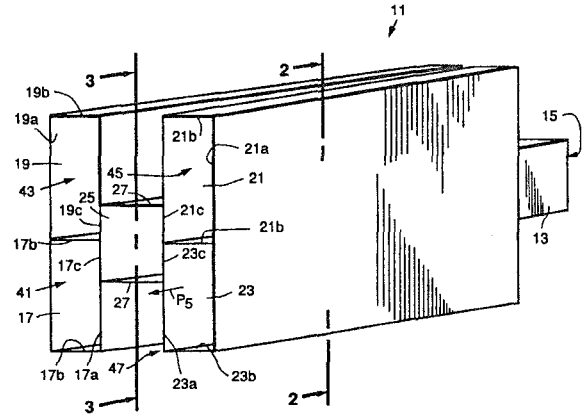

**5,196,812** Mar. 23, 1993

## Compact $N$-Way Waveguide Power Divider

Inventors: Steven W. Drost and William W. Milroy.
Assignee: Hughes Aircraft Company.
Filed: June 27, 1991.

***Abstract***—An $n$-way waveguide power divider wherein microwave power entering a first waveguide section is directionally coupled simultaneously into a plurality of parallel waveguide sections that share a longitudinal portion of their broad walls with a different longitudinal portion of the broad walls of the first waveguide section. The power is coupled through an individual pair of elongated axially-aligned coupling members in each of the shared broad wall longitudinal portions. The coupling members may have a variety of shapes including square, rectangular, circular, cross, or dog bone shapes.

**11 Claims, 6 Drawing Sheets**



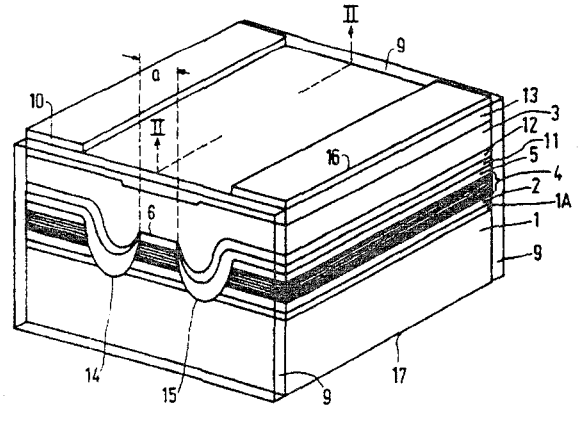

**5,196,958** Mar. 23, 1993

## Optical Amplifier Having Gain at Two Separated Wavelengths

Inventors: Bastiaan H. Verbeek, Wilma van Es-Spiekman, and Leonardus J. M. Hendrix.
Assignee: U.S. Philips Corporation.
Filed: Oct. 23, 1990.

***Abstract***—An optical amplifier with a semiconductor body comprising a layer structure grown on a substrate 1 with an active layer 4 situated between two cladding layers (2, 3) with a strip-shaped amplification region bounded by two end surfaces (7, 8) which form the input and output surfaces of the radiation to be amplified. The active layer comprises a number of quantum well (QW) layers 4A with direct band transition, which are separated by barrier layers 4B of a different semiconductor material. The material, the number, and the thickness of the QW layers 4A and the barrier layers 4B in combination with the length 1 of the amplification region are chosen in such a way that two optical transitions can take place in the active layer 4, maximum amplification occurring at a certain currently density through the PN junction for the radiation wavelengths corresponding to these optical transitions, while the end surfaces (7, 8) are provided with an anti-reflection layer 9 which has a reflection coefficient $R$ of at most 0.5% for these two wavelengths. An anti-reflection layer made up of four layers of alternately titanium oxide and aluminum oxide is advantageously used.

**8 Claims, 2 Drawing Sheets**



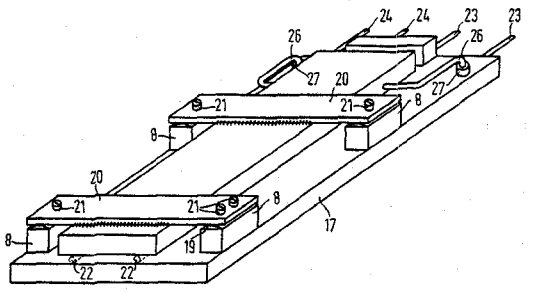
**5,197,079** Mar. 23, 1993

## High-Power Stripline Laser

Inventors: Hans Krueger and Walter Kirschner.
Assignee: Siemens Aktiengesellschaft.
Filed: Aug. 26, 1991.

***Abstract*—High-power stripline laser. In a high-power stripline laser, a high beam quality and mode purity is achieved in that the mutual spacing of two electrodes that form waveguide surfaces for the laser emission and limit a discharge space are adjustable in a longitudinal direction and in a transverse direction of the discharge space and the metal spring is set to a desired value. The invention is suitable for high-power stripline lasers having high beam quality.**

**13 Claims, 2 Drawing Sheets**



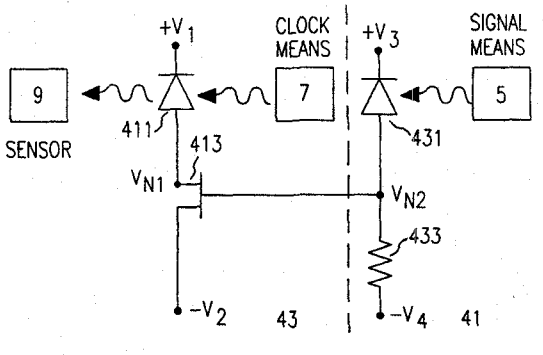
**5,198,656** Mar. 30, 1993

## Dynamic Optical Logic Using Voltage Pull Up

Inventor: Leo M. F. Chirovsky.
Assignee: AT&T Bell Laboratories.
Filed: June 6, 1991.

***Abstract*—An optical switch in which states are defined by dynamic charge storage, rather than contention resolution, and which switches using pulsed radiation having a wavelength somewhat longer than the exciton wavelength in a SEED diode. The switch does not exhibit or need bistability but switches at a relatively low energy as compared to S-SEEDS switched at the exciton wavelength.**

**25 Claims, 3 Drawing Sheets**



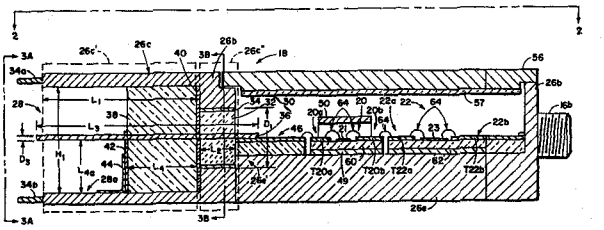

**5,198,786** Mar. 30, 1993

## Waveguide Transition Circuit

Inventors: Mark E. Russell and Dominic V. Restagno.
Assignee: Raytheon Company.
Filed: Dec. 4, 1991.

***Abstract*—A transition circuit includes a conductive pin; a first dielectric member disposed about a first portion of the conductive pin; and a second dielectric member disposed about a second, different portion of the conductive pin and having a first surface disposed adjacent to a first surface of the first dielectric member. A conductive wall is disposed about and contiguous to a second surface of the first dielectric member and a second surface of the second dielectric member. A strip conductor is disposed on a third surface of said second dielectric member and coupled between said conductive pin and said conductive wall.**

**11 Claims, 5 Drawing Sheets**



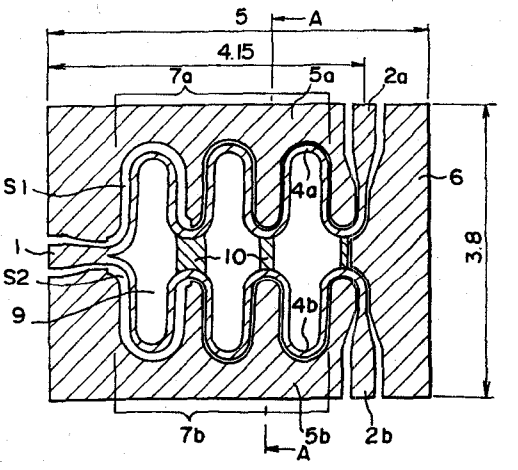
**5,198,787** Mar. 30, 1993

## Waveguide for Dividing and Combining Microwaves

Inventors: Eiichi Sano, Masahito Asa, and Masayuki Nakajima.
Assignee: Tokimec, Inc.
Filed: Sept. 12, 1991.

***Abstract*—A waveguide having a pair of quarter-wavelength impedance transformers and adapted to divide and combine microwaves. The pair of quarter-wavelength impedance transformers includes two strip transmission lines connected together at one end, two ground conductors each located adjacent to and spaced from a respective one of said strip transmission lines, each said ground conductor serving as a ground potential at least mutually to the adjacent strip transmission line, and a dielectric substrate supporting thereon said strip transmission lines and said ground conductors. The two strip transmission lines may be connected to each other at numerous positions by resistors.**

**18 Claims, 6 Drawing Sheets**



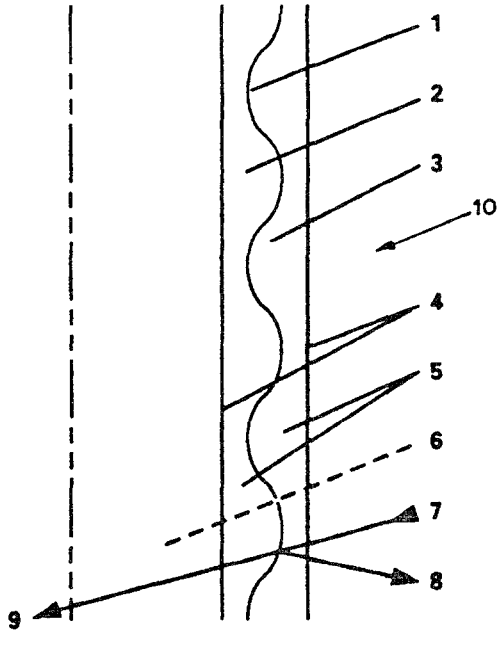
**5,198,922** Mar. 30, 1993

## Specularly Transmitting and Diffuse Reflecting Optical Shutter

Inventor: Day Chahroudi.
Filed: Mar. 19, 1991.

***Abstract*—A diffuse reflecting and specularly transmitting optical shutter structure comprises an optically rough layer of an optically thin optical shutter, and two additional layers disposed on either side of the optical shutter. These two additional layers have refractive indices which approximately match. The surfaces of these two additional layers adjacent to the optical shutter conform to the optically rough surfaces of the optical shutter and the non-adjacent surfaces to the optical shutter of these two additional layers are optically smooth.**

**13 Claims, 2 Drawing Sheets**



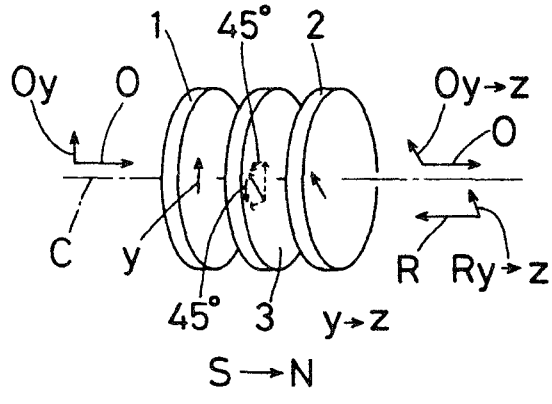

**5,198,923** Mar. 30, 1993

## Optical Isolator

Inventors: Toshiaki Watanabe and Toshihiko Ryuo.
Assignee: Shin-Estu Chemical Co. Ltd.
Filed: Jan. 16, 1992.

***Abstract*—The optical isolator of the present invention comprises a polarizer, a Farady rotator and an analyzer arranged in this order, wherein the Farady rotator has a garnet crystalline structure represented by the formula $(Tb_{1-(a+b)}Ln_aBi_b)_3(Fe_{1-c}M_c)_5O_{12}$ wherein Ln represents at least one element selected from the group consisting of rare earth elements other than Tb; $0 < a \leq 0.6$; $0 < b \leq 0.2$; M represents at least one element selected from the group consisting of Al and Ga; and $0 \leq c < 0.1$; or the formula $(Tb_{1-(d+e+b)}\ Ln_dEu_eBi_b)_3\ (Fe_{1-c}M_c)_5O_{12}$ wherein Ln represents at least one element selected from the group consisting of rare earth elements other than Tb and Eu; $0 < d < 0.6$, $0 < e \leq 0.2$; $0 < d + e \leq 0.6$; $0 < b \leq 0.2$; M represents at least one element selected from the group consisting of Al and Ga; and $O \leq C < 0.1$; or the formula $(Y_{1-(a+b)}Ln_aBi_b)_3\ (Fe_{1-(c+d)}M_cTi_d)_5O_{12}$ wherein Ln represents at least one element selected from the group consisting of Er, Tm, Yb, and Lu; $0 < a \leq 0.4$;$0 < b \leq 0.1$; M represents at least one element selected from the group consisting of Al and Ga; $0 \leq c \leq 0.1$;$0 \leq d \leq 0.01$.**

**6 Claims, 2 Drawing Sheets**




**5,199,086** Mar. 30, 1993

## Electro-Optic System

Inventors: Leonard M. Johnson, Warren K. Hutchinson, and Alexander Sonnenschein.
Assignee: Massachusetts Institute of Technology.
Filed: Jan. 17, 1991.

***Abstract*—An electro-optic system for mixing and/or transmitting electrical signals using an optical carrier is described in which the electrical signals are applied to an electro-optic intensity modulator with a nonlinear transfer function, preferably of the Mach–Zehnder interferometric type biased at the transmission null point. The modulator output optical signal is transmitted to a receiver where it is detected and voltage products of the applied electrical signals are recovered.**

**41 Claims, 2 Drawing Sheets**