

Patent Abstracts

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4,919,504

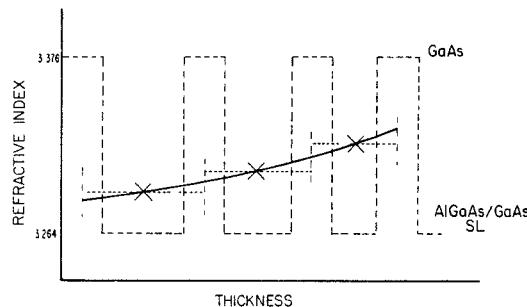
Apr. 24, 1990

Graded-Index Waveguides

Inventors: Etienne G. Colas and Alfredo Yi-Yan.
Assignee: Bell Communications Research, Inc.
Filed: May 17, 1989.

Abstract—A planar waveguide comprises a semiconductor substrate having one or more grooves along the surface of the substrate. A plurality of sequences of superlattice layers separated by a spacer layer over the grooved substrate is provided. The number of superlattice periods in each sequence changes from the base of the groove to the surface of the waveguide so as to provide a graded index of refraction in at least a portion of the region above the groove.

10 Claims, 5 Drawing Sheets



4,919,507

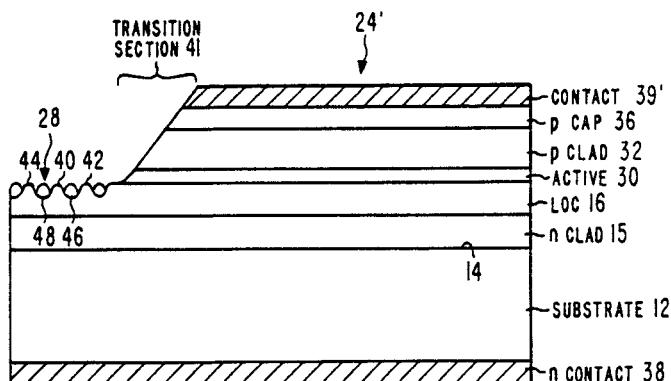
Apr. 24, 1990

Semiconductor Radiation Coupling System

Inventors: Gary A. Evans and Jay B. Kirk.
Assignee: General Electric Company.
Filed: May 10, 1989.

Abstract—A first array of laser diode devices are optically coupled by a diffraction grating comprising a plurality of spaced diffraction nodules in a grid array optically coupled to the devices. The light emitted from a device of the first array can pass through the grid array to a second device, reflect back to the emitting device in a distributed Bragg reflector (DBR) mode and deflect orthogonal to the emitted light optical axis to a third device in a distributed Bragg deflector (DBD) mode. The light from the second and third devices can be coupled to other laser diode devices by still further diffraction nodule arrays to produce phased-locked beams; beam steering of portions of the light and other effects.

26 Claims, 3 Drawing Sheets



4,919,511

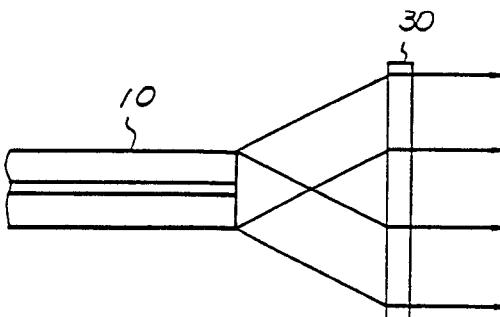
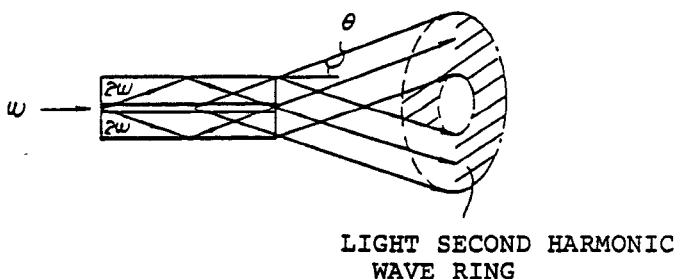
Apr. 24, 1990

Fibre-Type Light Conversion Device

Inventors: Seiichi Ohsawa.
Assignee: Pioneer Electronic Corporation.
Filed: Aug. 24, 1989.

Abstract—A fibre-type light conversion device for converting the wavelength of an incident light. According to the first feature of the invention the device has a structure in which a holographic element whose complex transparency varies periodically with respect to the distance from an optical axis is used as a means for transforming the light, to which the conversion of wavelength has been performed by a fibre-type SHG, into a parallel light. According to the second feature of the invention, the device is constructed so that the temperature of the light source or the holographic element can be controlled, thereby a parallel light having planar wave fronts is surely generated irrespectively of differences in the shape of the fibre-type SHG or variations in the refractive index.

8 Claims, 4 Drawing Sheets



4,920,323

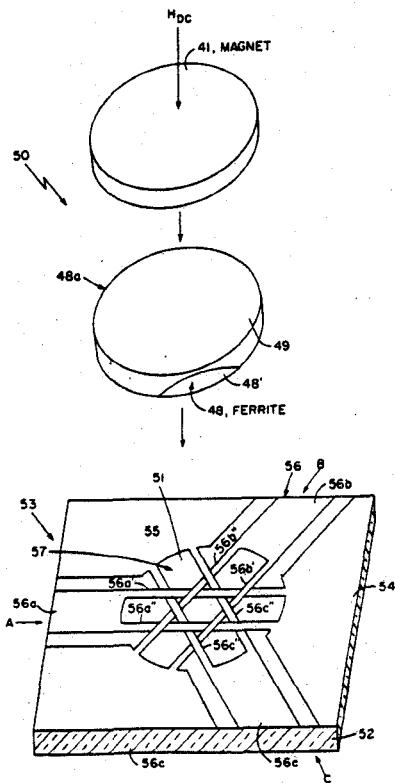
Apr. 24, 1990

Miniature Circulators for Monolithic Microwave Integrated Circuits

Inventors: Ernst F. R. A. Schloemann, Ronald E. Blight, and Robert L. Mozzi.
 Assignee: Raytheon Company.
 Filed: Dec. 27, 1988.

Abstract—A miniature circulator that is compatible with integrated circuits is described. The circulator includes a substrate that supports three coplanar waveguide transmission lines which are connected at a common junction. The common junction provides a coupling structure between the coplanar waveguide transmission lines. A ferrite disc having a conductive layer disposed thereover is provided over the intersection of the three coplanar waveguide transmission lines. A magnet is then disposed over the ferrite disc to direct a D.C. magnetic field through the disc. An alternative coupling structure having interwoven, balanced lines disposed on the substrate is also described. An alternative arrangement for the ferrite disc having a hexangular shape, which carries a beam-lead node metalization is also described.

20 Claims, 13 Drawing Sheets



4,920,351

Apr. 24, 1990

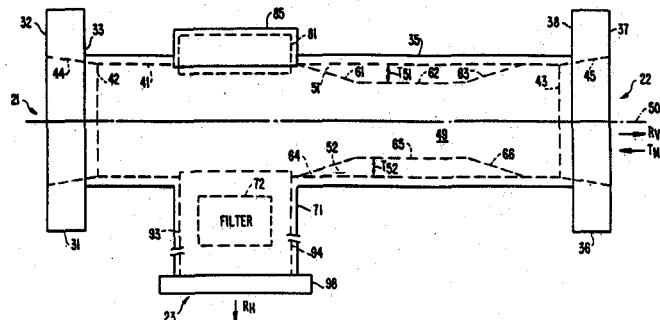
Diplexer for Orthogonally Polarized Transmit/Receive Signalling on Common Frequency

Inventors: Homer E. Bartlett and Kevin P. Gallagher.
 Assignee: Computer Science Innovations, Inc.
 Filed: Mar. 24, 1986.

Abstract—A microwave transmit/receive terminal having an antenna and associated feed for receiving vertically and horizontally polarized signals and for transmitting a horizontally polarized signal employs a diplexer to be inserted between the feed and an orthomode coupler. The diplexer is formed of a cylindrical waveguide main body, a first port of which is coupled to the

feed for receiving the orthogonally polarized receive signals and for coupling thereto the (horizontally polarized) transmit signal. A second port of the main body is coupled to the orthomode coupler for receiving the horizontally polarized signal to be transmitted and for coupling thereto the vertically polarized receive signals. A rectangular waveguide section is coupled to the cylindrical waveguide main body and forms a third port for coupling the horizontally polarized received signal away from said cylindrical waveguide main body. A first filter is disposed within the cylindrical waveguide main body between the first and second ports for preventing the coupling of horizontally polarized receive signals between the first and second ports. A second filter is coupled with the rectangular waveguide section for passing the horizontally polarized receive signal while preventing the coupling of the horizontally polarized transmit signal to the third port.

20 Claims, 4 Drawing Sheets



4,931,756

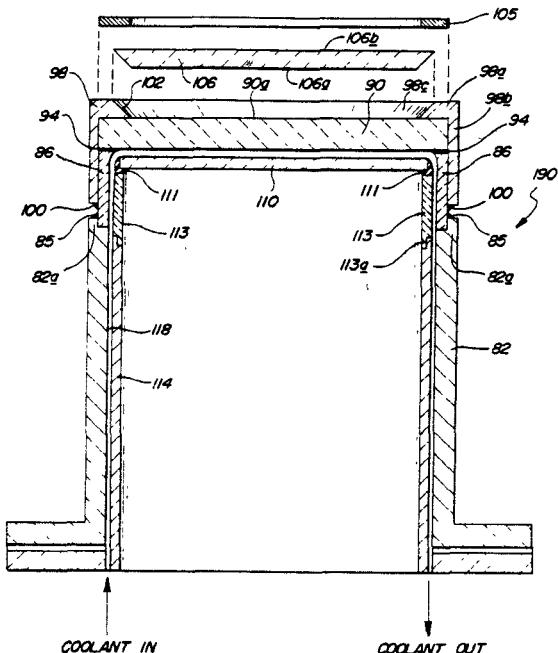
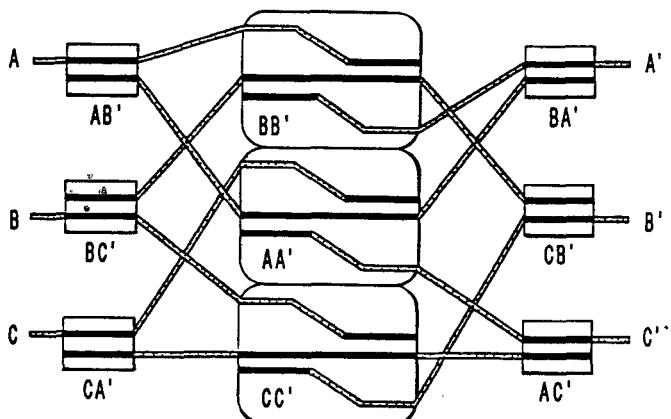
June 5, 1990

High-Power Microwave Transmissive Window Assembly

Inventors: Joachim Doehler, Buddie Dotter, II, Jeffrey M. Krisko, and Lester R. Peedin.
 Assignee: Energy Conversion Devices, Inc.
 Filed: Apr. 8, 1988.

Abstract—A window assembly for transmitting relatively high power microwave energy from a waveguide, held at substantially atmospheric pressure levels, into a microwave reaction chamber at sub-atmospheric pressure levels. The window assembly provides for the transmission of microwave energy to generate a glow discharge plasma without suffering from catastrophic failure as a result of excessive temperature and pressure conditions.

33 Claims, 3 Drawing Sheets



4,932,735

June 12, 1990

Integrated Optical Hybrid Matrix Switches with Very Low Crosstalk

Inventors: Kwang T. Koai.
 Assignee: GTE Laboratories Incorporated.
 Filed: Sept. 29, 1989.

Abstract—A hybrid design for rectangularly configured integrated optical matrix switches uses both 2×2 optical changeover switches and 2×2 optical shift switches to achieve significant reduction of crosstalk accumulation for a strictly nonblocking switch architecture. The 2×2 optical shift switches are novel two-stage switches which allow two connection paths to bypass each other with very little crosstalk in the crossover state. A crossbar matrix switch uses $2n$ 2×2 optical changeover switches in the outer stages and $n^2 - 2n$ optical shift switches in the intermediate stages.

11 Claims, 4 Drawing Sheets

4,932,736

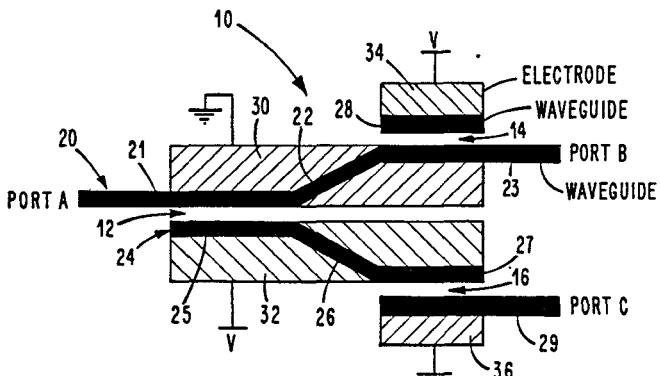
June 12, 1990

High-Extinction 1×2 Integrated Optical Switch

Inventors: Shing-Fong Su.
 Assignee: GTE Laboratories Incorporated.
 Filed: Sept. 29, 1989.

Abstract—A 1×2 integrated optical switch with a high extinction ratio is obtained from the monolithic integration of three integrated waveguide couplers. The waveguide couplers are designed such that the output of the first waveguide coupler is directly coupled to the input of the other two integrated waveguide couplers by an integrated waveguide. Thus, the switch has two cascaded integrated waveguide couplers along each path from the single input to each of the two outputs. Only two pairs of electrodes are required by this design. The extinction ratio of this switch is the sum of the extinction ratios along an input-output path. Since integrated waveguide couplers are bidirectional, this switch can be used as a 2×1 switch by reversing the input and outputs.

4 Claims, 1 Drawing Sheet



4,932,737

June 12, 1990

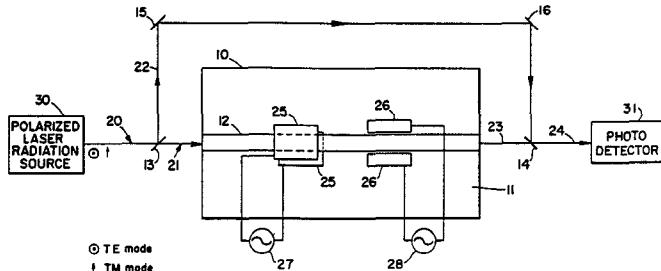
Polarization-Insensitive Linear Waveguide Electrooptic Phase Modulator

Inventors: Hyun-Nam Yoon and David R. Haas.
 Assignee: Hoechst Celanese Corp.
 Filed: June 13, 1989.

Abstract—In one embodiment this invention provides a polarization-insensitive linear waveguide electrooptic phase modulator device. In the linear waveguide structure, the optical path has two sets of electrodes, which apply

a horizontal electric field and a vertical electric field, respectively, to a nonlinear optically responsive polymeric medium in the optical path. The polymer medium section between each set of electrodes has a noncentrosymmetric molecular orientation parallel to the respective electric fields.

25 Claims, 1 Drawing Sheet



4,932,738

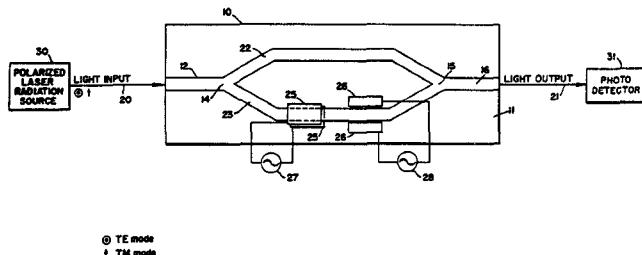
June 12, 1990

Polarization-Insensitive Interferometric Waveguide Electrooptic Modulator

Inventors: David R. Hass, Hyun-Nam Yoon, Chia C. Teng, Hong-Tai Man, and James B. Stamatoff.
 Assignee: Hoechst Celanese Corp.
 Filed: June 13, 1989.

Abstract—In one embodiment this invention provides a polarization-insensitive interferometric waveguide electrooptic modulator device. In a Mach-Zehnder type of waveguide geometry, one of the divergent optical paths has two sets of electrodes, which apply a horizontal electric field and a vertical electric field, respectively, to a nonlinear optically responsive polymeric medium in the optical path. The polymer medium section between each set of electrodes has a noncentrosymmetric molecular orientation parallel to the respective electric fields.

23 Claims, 1 Drawing Sheet



4,932,739

June 12, 1990

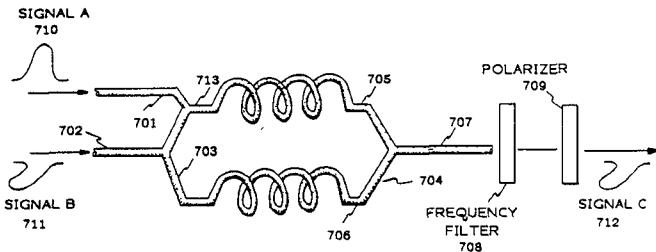
Ultra-Fast Optical Logic Devices

Inventors: Mohammed N. Islam.
 Assignee: AT&T Bell Laboratories.
 Filed: Sept. 25, 1989.

Abstract—Combinatorial (Boolean) logic functions are provided by ultra-fast optical logic devices that utilize soliton trapping between two optical signals propagating in a birefringent fiber. The logic devices are three terminal devices having orthogonally polarized soliton input signals and a single output signal. Optically filtering the output from the fiber permits the desired combinatorial logic operation to be performed on the input optical signals. Logic operations include AND, exclusive-OR, NOT, and NOR func-

tions. In operation, the devices exhibit phase insensitivity, low switching energy, high contrast ratio between output logic levels, and cascability. In one embodiment of the invention, a first optical signal and a second optical signal are optically coupled into the principal axes of a birefringent fiber. A Fabry Perot etalon centered at the center frequency of both the first and second signals is utilized to realize an exclusive-OR operation whereas centering the etalon on the frequency related to the spectral shift caused by soliton trapping realizes an AND operation.

19 Claims, 9 Drawing Sheets



4,933,651

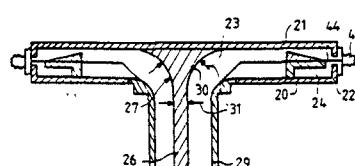
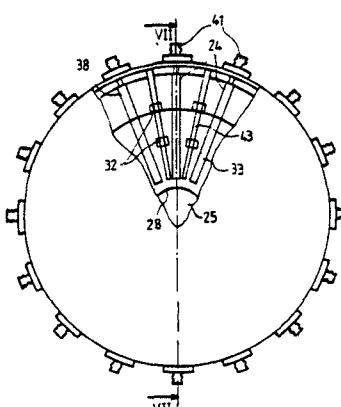
June 12, 1990

Multichannel Combiner/Divider

Inventors: Guy Benahim, Jean-Michel Dutaut, and Jean-Claude Giraudon.
 Assignee: Thomson-CSF.
 Filed: Mar. 14, 1989.

Abstract—Disclosed is a device to combine or divide the power values of electromagnetic signals and, more particularly, a device of the radial mode. In a combiner/divider which comprises two metallic disks defining an annular space of propagation, each channel is separated from the adjacent channel by a radial slot which is placed in the lower disk and extends from the central aperture to the peripheral ring. Furthermore, each channel thus defined has a radial ridge. The invention can be applied to transmitters, notably those used in radars.

12 Claims, 4 Drawing Sheets



4,933,652

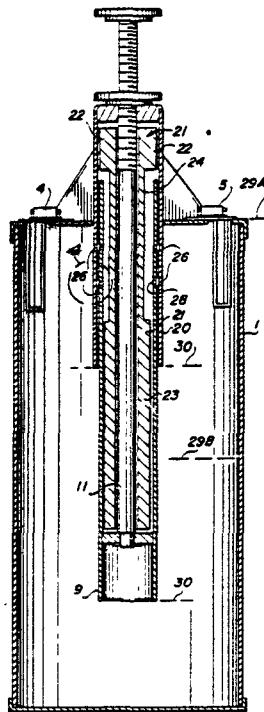
June 12, 1990

TEM Coaxial Resonator

Inventors: Kevin M. Gaukel.
Assignee: Celwave Systems Inc.
Filed: Apr. 10, 1989.

Abstract—A coaxial resonance cavity of either the fingered or unfingered variety having a metal heat conducting barbell shaped structure inside the movable tuning plunger to conduct heat from the inner surface of the movable plunger to the inner surface of the fixed stub or directly to the shield to provide for a heat conductive path to the shield to carry heat away from the inner plunger. The barbell is an integral structure machined from stock aluminum, but resembles three right circular cylinders butting end to circular end. The upper cylinder has a diameter appropriate to maintain tight contact with the stub. The lower cylinder has a smaller diameter, appropriate to maintain contact with the movable plunger. The central cylinder has a diameter which is sufficiently small to avoid contact with any portion of friction buttons located on the side of the plunger to serve as a spacer between the plunger and the stub, especially such portion of the button which may extend entirely through the plunger for support of the button.

7 Claims, 2 Drawing Sheets



4,934,776

June 19, 1990

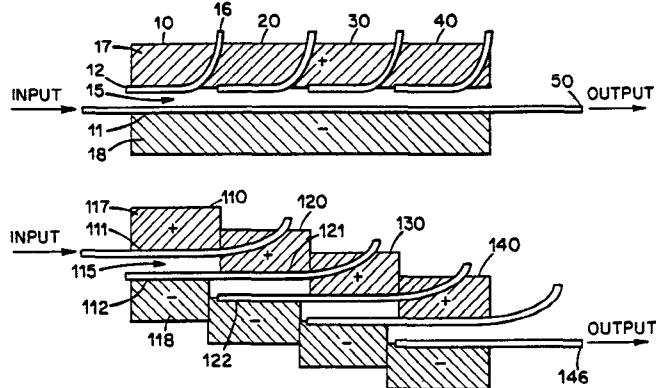
Ultra-High-Extinction Cascaded Coupled-Waveguide Optical Modulators and Optical Gate Arrays

Inventors: Kwang T. Koai.
Assignee: GTE Laboratories Incorporated.
Filed: Dec. 23, 1988.

Abstract—An integrated optical intensity modulator is constructed by cascading individual waveguide directional coupler sections, each having a primary and secondary waveguide and a pair of uniform electrodes. A modulator normally operating in an OFF state has a bar-type structure such

that the primary waveguides form one complete and straight waveguide. An input optical signal applied to this modulator propagates straight through the device. Another modulator structure normally operating in an ON state has a cross-type configuration which operates such that the coupled signal from one coupler section serves as the input signal for a next section. Each modulator is driven from its normal state into an opposite state by applying a voltage to the electrodes for inducing changes in the refractive index profile. A plurality of the optical modulators are fabricated in parallel on an integrated optical wafer to form a high-density optical gate array.

23 Claims, 3 Drawing Sheets



4,936,644

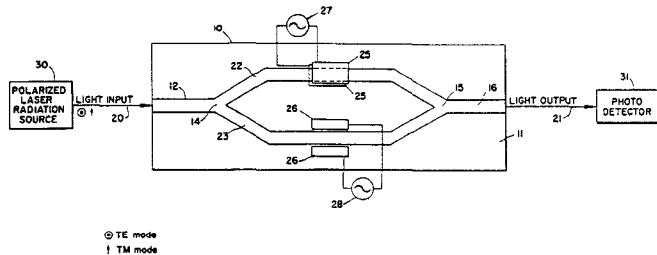
June 26, 1990

Polarization-Insensitive Interferometric Waveguide Electrooptic Modulator

Inventors: Donald Raskin and Hyun-Nam Yoon.
Assignee: Hoechst Celanese Corp.
Filed: June 13, 1989.

Abstract—In one embodiment this invention provides a polarization-insensitive interferometric waveguide electrooptic modulator device. In a Mach-Zehnder type of waveguide geometry, each of the divergent optical paths has a set of electrodes, one of which applies a horizontal electric field and the other a vertical electrical field, respectively, to a nonlinear optically responsive polymeric medium in the optical paths. The polymer medium section between each set of electrodes has a noncentrosymmetric molecular orientation parallel to the respective electric fields.

23 Claims, 1 Drawing Sheet



4,936,645

June 26, 1990

Waveguide Electrooptic Light Modulator with Low Optical Loss

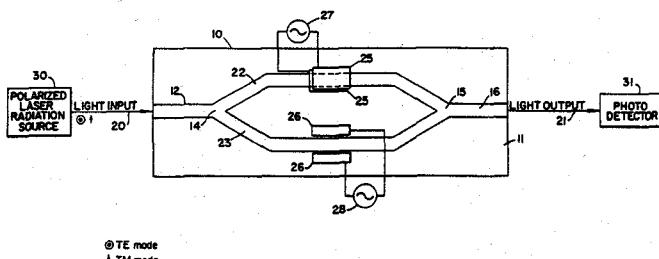
Inventors: Hyun-Nam Yoon and Chia C. Teng.
Assignee: Hoechst Celanese Corp.
Filed: Aug. 24, 1989.

Abstract—In one embodiment this invention provides a thin film waveguide electrooptic light modulator which consists of 1) a laminated assembly of a waveguiding thin film of an organic polymer that exhibits second-order

nonlinear optical response, and upper and lower organic polymer blend cladding layers, each of which has a lower index of refraction between about 0.002–0.02 lower than the waveguiding thin film and that exhibits second-order nonlinear optical response; and 2) electrodes that are positioned to apply an electric field to the laminated assembly.

18 Claims, 2 Drawing Sheets

POLARIZATION-SENSITIVE MACH-ZEHNDER MODULATOR



4,937,533

June 26, 1990

Deformable Diplexer Filter Signal Coupling Element Apparatus

Inventors: Robert M. Livingston.
Assignee: Rockwell International Corporation.
Filed: Aug. 16, 1989.

Abstract—A deformable or flexible diplexer element provides a common input to two separate bandpass filter arrays. The construction of the element and the associated diplexer filter containers are designed such that the average distance between each end of the element and its associated resonator can be easily adjusted to optimize coupling therebetween. With the individual adjustment and associated variable coupling, the filter responses are individually optimized to the appropriate frequencies.

6 Claims, 2 Drawing Sheets

