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, D.C. 20231.

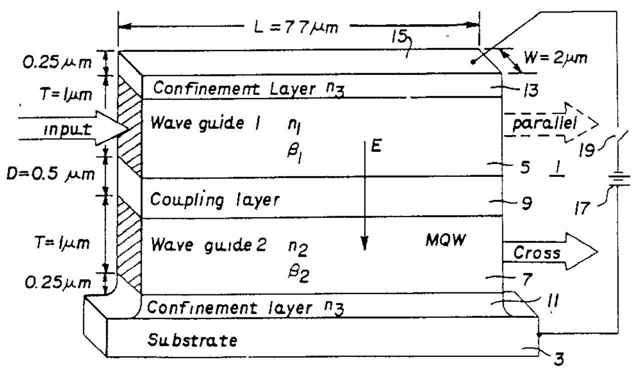
4,923,264 May 8, 1990

Resonance Coupled Optical Coupler with Semiconductor Waveguide Layer Comprising a Multi-Quantum-Well Structure

Inventors: Dietrich W. Langer and Marek Chmielowski.
Assignee: University of Pittsburgh of the Commonwealth System of Higher Education.
Filed: Jan. 18, 1989.

Abstract—An electro-optical coupler made of consecutively deposited layers of semiconductor material has a one waveguide layer a multiple-quantum-well structure which exhibits a strong index of refraction dispersion in response to an electric field. Another waveguide layer separated from the multiple-quantum-well structure by a coupling layer is made of a bulk semiconductor material having an index of refraction that is comparatively unaffected by the electric field and which is substantially equal to one of the values of the index of refraction that the quantum well structure can assume. Resonant coupling of the waveguide layers is affected by a uniform electric field generated by a voltage applied between metalization on a confinement layer covering the top waveguide and a substrate on which the waveguide layers and coupling layer are grown over a lower confinement layer. When the indexes of refraction of the two waveguides are equal, light injected into one waveguide is switched to the other. On the other hand, when the indices of refraction of the two waveguides are not equal, a parallel propagation condition exists. The coupler can be used either as a switch or an attenuator.

20 Claims, 5 Drawing Sheets



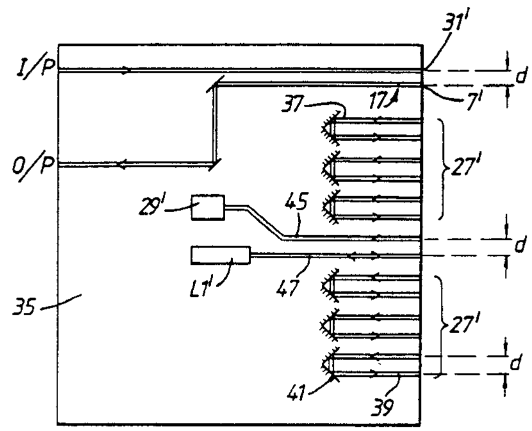
4,923,270 May 8, 1990

Apparatus for Optical Wavelength Division Multiplexing

Inventor: Andrew C. Carter.
Assignee: Plessey Overseas Limited.
Filed: Mar. 11, 1988.

Abstract—Apparatus of the type comprising an optical assembly and reflecting grating—for collimating light emitted by a laser and for refocussing the same onto an output waveguide. The waveguide is modified to enhance reflection of the refocussed light, which in turn dominates the resonant response of the laser. Laser resonance thus depends on geometrical factors—the relative positions of laser and waveguide and the dispersion properties of the assembly. Wavelength selectivity is improved by confining reflection to the core of the waveguide e.g., by using an embedded reflector, or further still by using an etalon pair. The laser may be used in conjunction with other lasers and/or detectors, or with retroreflectors. A multilaser input multiplexer and single channel drop-and-add devices are described.

23 Claims, 3 Drawing Sheets



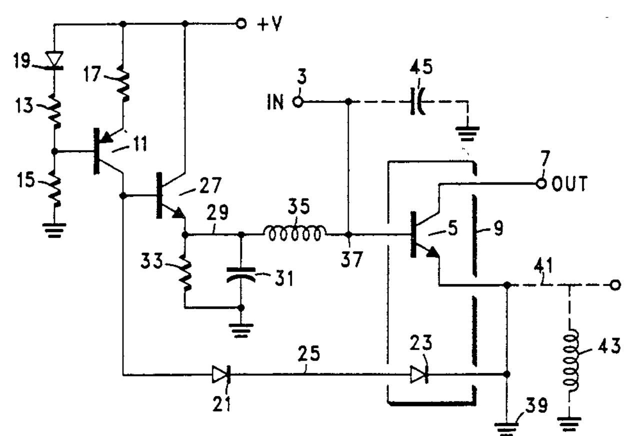
4,924,194 May 8, 1990

RF Power Amplifier

Inventors: George F. Opas and Edward C. Porrett.
Assignee: Motorola, Inc.
Filed: May 19, 1989.

Abstract—An improved RF power amplifier is disclosed whereby a PIN-type diode is utilized to provide temperature tracking for the bias supply. The PIN diode provides proper temperature tracking with the bias supply while exhibiting reduced sensitivity to self-rectification. As a result, the power amplifier's bias supply is more stable and less susceptible to inaccuracies, distortion, and oscillation that may be caused by self-rectification in the presence of high RF fields, especially at UHF and 800 MHz.

21 Claims, 1 Drawing Sheet



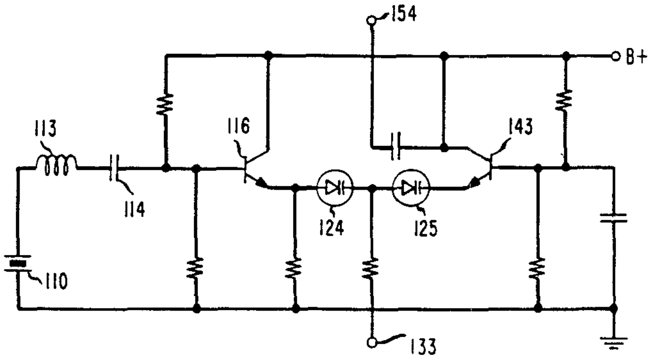
4,924,195 May 8, 1990

Crystal Oscillator with Broad Tuning Capability

Inventor: Joseph Gonda.
Assignee: AT&T Bell Laboratories.
Filed: June 19, 1989.

Abstract—A first transistor is connected in grounded-collector-emitter-follower configuration to generate a high enough negative resistance to overcome the oscillating resistance of the crystal resonator connected to the base electrode. A second transistor connected in grounded-base configuration serves as a buffer and impedance transformer between the low impedance output of the first transistor and the high impedance of a load. An inductor connected between the resonator and the first transistor input and a variable capacitance approximating the shunt capacitance of the resonator connected across the first transistor input form an impedance inverter that absorbs the resonator shunt capacitance and converts the effect of the resonator to a parallel tuned circuit that can be broadly tuned.

10 Claims, 2 Drawing Sheets



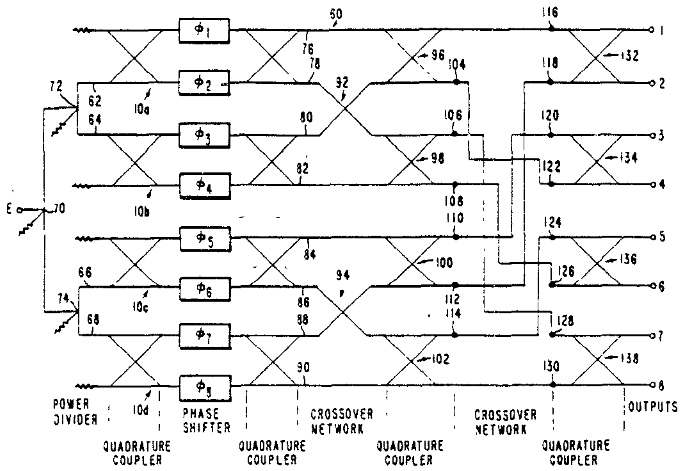
4,924,196 May 8, 1990

Waveguide Matrix Switch

Inventor: Harold A. Uyeda.
Filed: Hughes Aircraft Company.
Filed: Dec. 14, 1988.

Abstract—The invention is a low loss multiple pole multiple throw microwave switch having a transmission line for each of a plurality of outputs. A phase shifting device is provided in each transmission line operable between first and second states to shift the phase of a microwave signal transmitted therethrough. A matrix of signal dividers and cross-over networks cooperate with the phase shifting devices to produce additive and subtractive vertical signal components such that all of the components at one output are additive and the signal components at all the other outputs have a vector sum of zero.

17 Claims, 2 Drawing Sheets



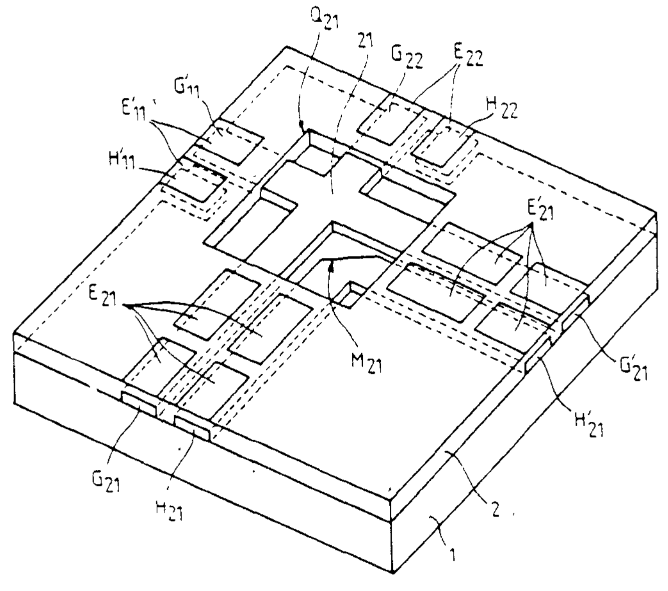
4,925,264 May 15, 1990

Optical Switching Element Comprising Two Parallel Optical Guides and Switching Matrix Constituted by Such Elements

Inventors: Marko Erman and Rémi Gamonal.
Assignee: U.S. Philips Corp.
Filed: Sept. 29, 1988.

Abstract—An optical switching element including two optical guides constituted by linear parallel strips coupled through a distance d and made of semiconductor material having an index n_1 on a semiconductor substrate having an index $n_0 < n_1$ and provided with electrodes E_{ii} to carry out the switching of the light from one guide to the other, characterized in that the first guide G_{ii} is connected on the one hand to an input IN_i and on the other hand to a direct output I_i' of the switching element, and in that the second guide H_{ii} is provided beyond the zone of the electrodes E_{ii} with a flat mirror M_{ii} at 45° with respect to its optical axis, which reflects the light into a guide H_{ii}' perpendicular to H_{ii}, in that H_{ii}' is coupled through a distance d to a guide G_{ii}', the guides H_{ii}' and G_{ii}' being provided with electrodes E_{ii}' to direct the light towards the output O_i of the guide G_{ii}', and that in the systems of the guides G_{ii}, H_{ii}, H_{ii}', G_{ii}' are covered by a planar confinement layer of a semiconductor material except the region Q_{ii} of the mirror M_{ii}. Application: switching matrix for telecommunication purposes.

18 Claims, 10 Drawing Sheets



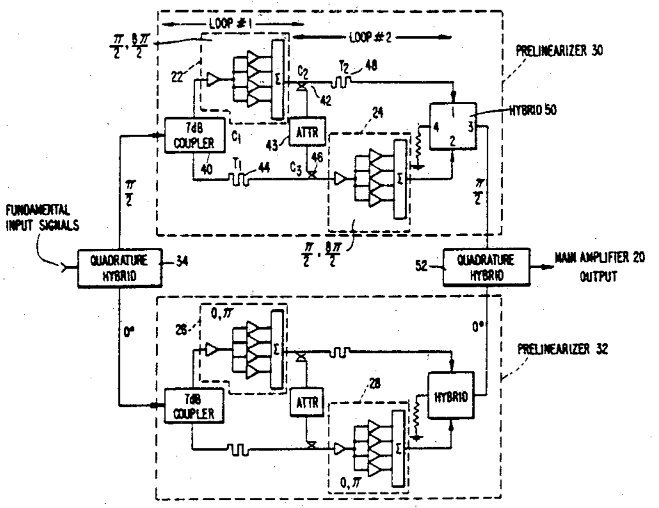
4,926,136 May 15, 1990

Power Amplifier Combiner for Improving Linearity of an Output

Inventor: Terence E. Olver.
Assignee: Westinghouse Electric Corp.
Filed: Dec. 29, 1988.

Abstract—A high power amplifier combiner for improving the linearity of an output of an amplifier. At least two prelinearizers are used to suppress all distortion products by using feedforward cancelling techniques. The effects of compression associated with the operation of the high power amplifier are reduced.

8 Claims, 2 Drawing Sheets



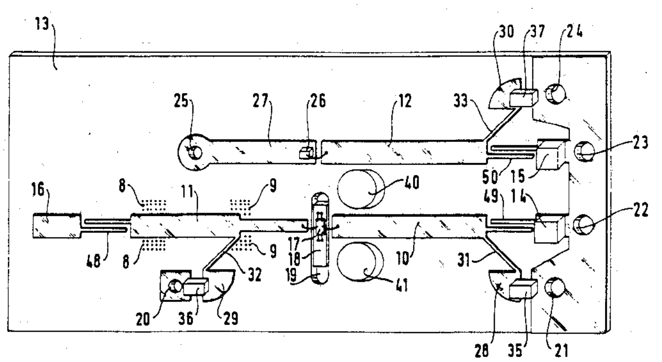
4,926,142 May 15, 1990

Oscillator Having a Dielectric Resonator, and Electronic Frequency Tuning Using a Varactor, in Particular in the 22 GHz Range

Inventor: Isaac Mettoudi.
Assignee: Alcatel Thomson Faisceaux Hertziens.
Filed: Apr. 13, 1988.

Abstract—An oscillator having a dielectric resonator and being electronically tuned in frequency by a varactor, in particular in the 22 GHz range, the oscillator comprising an active electronic component having negative resistance (17), at least two dielectric resonators (40, 41), and a substrate (13) on the surface of which there are three striplines (10, 11, 12), with the first and second striplines (10 and 11) being in line and having their adjacent ends connected to two respective electrodes of the active component (17). The third stripline (12) that runs parallel to the first two striplines (10, 11) is connected to the varactor (26), with all of the dielectric resonators (40, 41) being coupled to the first stripline (10).

12 Claims, 4 Drawing Sheets



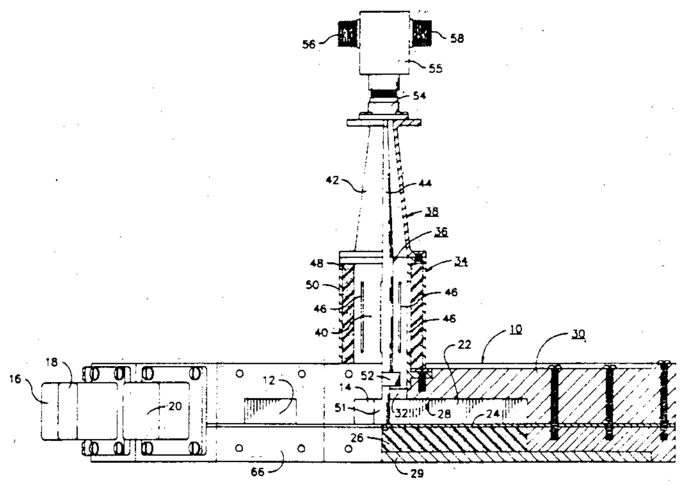
4,926,145 May 15, 1990

Radial Power Combiner/Divider with Mode Suppression

Inventors: Richard P. Flam and Jonathan P. MacGahan.
Assignee: Flam & Russell, Inc.
Filed: Dec. 16, 1988.

Abstract—In a radial power combiner/divider in which radial slots are provided for suppression of undesired modes, certain undesired modes which are not adequately suppressed by the radial slots are allowed to be propagated in a central coaxial transmission line and suppressed therein by means of longitudinal slots in the outer conductor. In an alternative embodiment, the central transmission line of the combiner/divider is in the form of a circular waveguide, and the suppression means comprises thin, spaced coaxial cylinders of dissipative material.

14 Claims, 6 Drawing Sheets



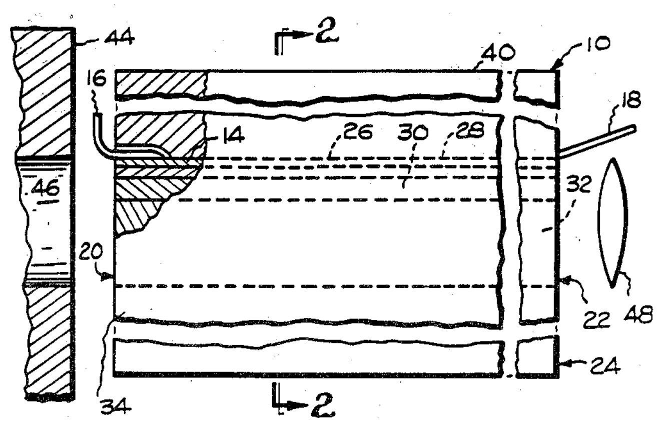
4,928,076 May 22, 1990

Ultrafast Optical Modulator

Inventors: Gerard A. Mourou, John A. Nees, and Steven L. Williamson.
Assignee: The University of Rochester.
Filed: Oct. 23, 1989.

Abstract—An ultrafast traveling wave optical modulator capable of functioning at frequencies greater than 100 GHz having an optical waveguide parallel to a transmission line. The optical waveguide is in a substrate of electrooptic material (GaAs with GaAlAs layers forming the optical waveguide). The transmission line is a pair of coplanar electrodes on the substrate. A superstrate having an effective dielectric constant substantially equal to the square of the index of refraction of the substrate (a GaAs body in which the electric field on the line is substantially confined) eliminates the mismatch in velocity of propagation of the traveling electrical and optical signals thereby increasing the response time of the modulator so that it can function when the electrical modulating signal on the line exceeds 100 GHz in bandwidth.

12 Claims, 1 Drawing Sheet



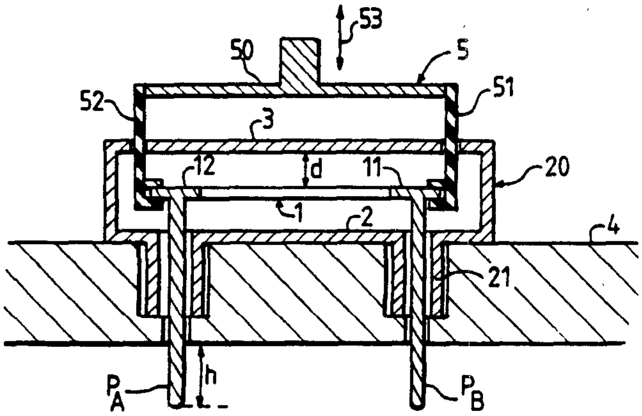
4,928,077 May 22, 1990

Tunable Microwave Coupler with Mechanically Adjustable Conductors

Inventors: Francois Devaux, Norbert Herail, Denis Lefevre, and Jean-Pierre Lehuede.
Assignee: Thomson-CSF.
Filed: Aug. 23, 1988.

Abstract—Disclosed is a three-plate type coupler providing for the partial tapping, by means of plungers, of a microwave energy which is propagated in a guide. The coupler has mechanical means to vary the height of the central conductor of the three-plate structure at the level at which the plungers are fixed, thus causing a variation in the penetration of the plungers in the waveguide and, consequently, a variation in the coupling.

3 Claims, 2 Drawing Sheets



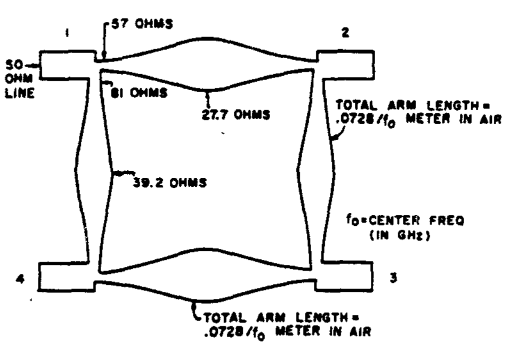
4,928,078 May 22, 1990

Branch Line Coupler

Inventor: Chandra Khandavalli.
Assignee: Avantek, Inc.
Filed: Dec. 22, 1988.

Abstract—A branch line coupler is disclosed. The device is comprised of multiple ports and branch lines, every two such lines being connected in a junction point. Each branch line has a width which is narrow at each end and increases in a curvilinear manner toward the middle. By virtue of the width design, the device performs the same functions as a conventional coupler, but for much higher frequencies.

8 Claims, 7 Drawing Sheets



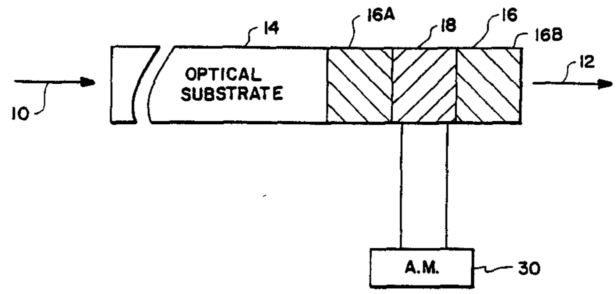
4,929,063 May 29,1990

Nonlinear Tunable Optical Bandpass Filter

Inventors: William W. Durand and Ronald E. Peterson.
Assignee: Honeywell Inc.
Filed: Jan. 22, 1986.

Abstract—A nonlinear tunable optical bandpass filter of the Fabry-Perot type is disclosed comprising an optically transparent substrate and a plurality of multilayer coatings deposited on a facing side of the substrate. One of the coating layers comprises a spacer being a nonlinear optical coating material having an externally-variable refractive index. The spacer is bounded on two ends by structures of multilayer stacks being alternating thin films of transparent, physically compatible materials. The filter of the invention can be tuned to pass various transmittance wavelengths through the application of external activation apparatus, such as heating by a laser acting on the spacer.

3 Claims, 1 Drawing Sheet



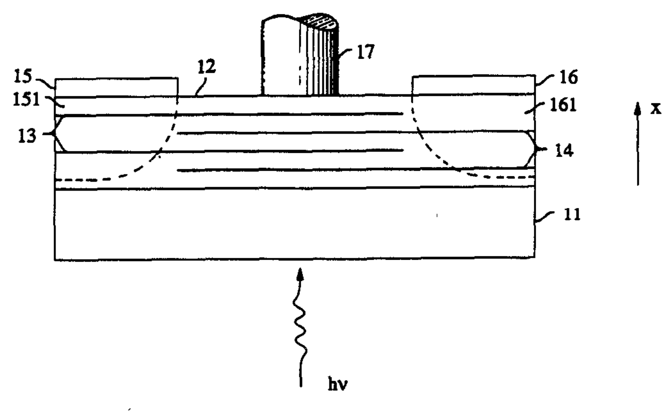
4,929,064 May 29,1990

Optical Communications Modulator Device

Inventor: Erdmann F. Schubert.
Assignee: American Telephone and Telegraph Company.
Filed: July 21, 1988.

Abstract—Electromagnetic radiation is modulated in response to an electrical signal that produces a variable electric field in a semiconductor δ-doped structure. A resulting device has a desirably broad wavelength range in which light intensity can be modulated, large contrast ratio between transparent and opaque states, small operating voltage, and high-speed capability as desirable in optical communications applications.

10 Claims, 2 Drawing Sheets



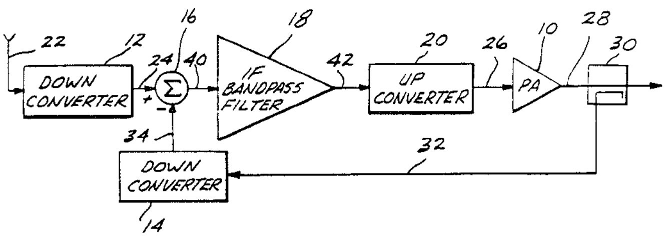
4,929,906 May 29, 1990

Amplifier Linearization Using Down/Up Conversion

Inventors: Kenneth G. Voyce and Jay H. McCandless.
Assignee: The Boeing Company.
Filed: Jan. 23, 1989.

Abstract—A feedback linearization technique for a power amplifier that does not require the availability of the modulation signals. The RF input signal is down converted to a first IF signal. A portion of the amplifier RF output signal is used to form a feedback signal that is down converted to produce a second IF signal that is subtracted from the first IF signal to produce a different signal. The difference signal is filtered and amplified, and then up converted to RF for input to the power amplifier. Use of feedback at IF avoids stability problems inherent in RF feedback techniques.

13 Claims, 4 Drawing Sheets



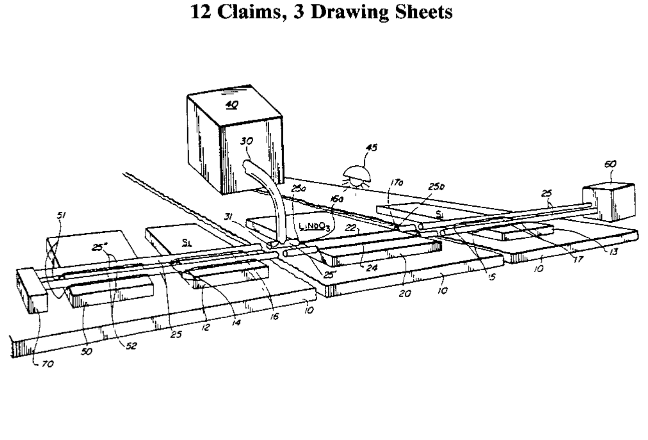
4,930,854 June 5, 1990

Optical Fiber-to-Channel Waveguide Coupler

Inventors: Donald J. Albares, David B. Cavanaugh, and Thomas. W. Trask.
Assignee: The United States of America as represented by the Secretary of the Navy.
Filed: Mar. 3, 1989.

Abstract—A micromanipulator and UV curing adhesive allows a precise end-on coupling of an optical fiber to a film optical waveguide on a substrate. Such a coupling facilitates the optical processing of data on active or passive optoelectronic chips with the inherent advantages of parallel, high speed capability. After coarse alignment by suitably arranging the chips, each fiber is cemented into an etched V-groove in its Si chip with a UV curing adhesive for coarse positioning and mechanical support a few millimeters away from the waveguide chip. A precision fine alignment of each fiber is assured by the micromanipulator which displaces a hypodermic needle-like chuck to align the fiber with the waveguide. The fiber is finally cemented in place by the curing of a small amount of the UV curable adhesive that is coated on its end.

12 Claims, 3 Drawing Sheets



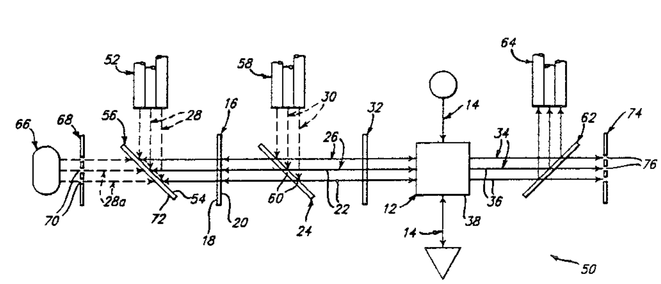
4,930,873 June 5, 1990

Optical Flip-Flop

Inventor: Bryan D. Hunter.
Filed: Sept. 23, 1988.

Abstract—An optical flip-flop comprises a phase-conjugating mirror; a one-way mirror having its reflective side facing the phase-conjugating mirror; a "set" light pulse directed towards the phase-conjugating mirror through the transmissive side of the one-way mirror for initiating a reference light beam which thereafter reflects continuously along an auto-collimating path between the mirrors; a normally transmissive optical gate along the path of the reference beam which is rendered nontransmissive relative thereto upon interaction with a "reset" light pulse; a plurality of filters positioned between the mirrors to prevent the self-starting of the reference beam therebetween; and means for deriving an output signal from the reference beam. An optical logic device comprises a plurality of such flip-flops sharing a single set of mirrors, whereby increased system compactness and simplicity is achieved.

17 Claims, 1 Drawing Sheet

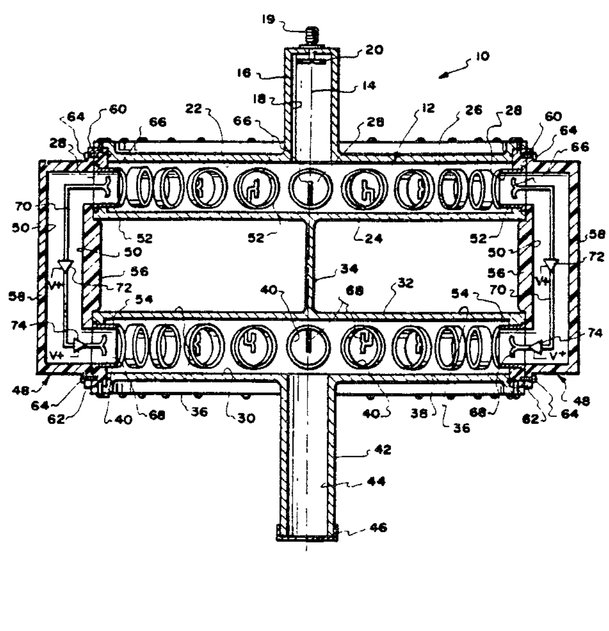


4,931,747 June 5, 1990

Microwave Power Amplifier

Inventor: Harvey K. Y. Hom.
Assignee: Microwave Components and Systems, Inc.
Filed: May 30, 1989.

Abstract—A microwave power amplifier which divides the microwave input signal into a plurality of equal segments with each segment being transmitted through a separate amplifying circuit. Each segment is then



supplied into a combiner chamber with these signals being recombined and being transmitted in the ambient through an outlet chamber. Incorporated with the amplifier are a plurality of sockets that are removably attached to the amplifier housing. Each socket is to connect between the signal divider chamber and the signal combiner chamber of the amplifier housing with each socket functioning to receive and amplify a signal.

11 Claims, 1 Drawing Sheet

4,931,753 June 5, 1990

Coplanar Waveguide Time Delay Shifter

Inventors: William W. Nelson, Camille A. Lesko, Andrew M. Kennedy, II, and Vernon E. Dunn.
Assignee: Ford Aerospace Corporation.
Filed: Jan. 17, 1989.

Abstract—A time delay shifter imparts a constant time delay to an electromagnetic signal, preferably a signal at a microwave frequency, over a band of frequencies. The phase shift imparted to the signal is a linear function of frequency. The shifter comprises a finite number of delay units (1) each having four single-pole single-throw switches (11-14). Closure of the first and third switches (11, 13) causes the signal to traverse a first path (2) containing a preselected length of transmission line that imparts a fixed time delay to the signal. Closure of the second and fourth switches (12, 14) causes the signal to traverse a minimum-delay path (3) which is shorter than the delay path (2). The paths (2, 3) are fabricated of coplanar waveguide. Each switch (11-14) is resonated by an indicator (21-24) for purposes of increasing isolation. An attenuator (70) is inserted in each minimum-delay path (3).

4 Claims, 4 Drawing Sheets