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.

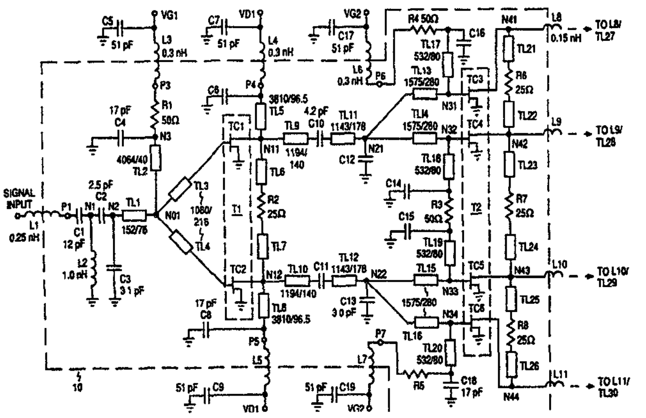
5,111,157 May 5, 1992

Power Amplifier for Broad-Band Operation at Frequencies Above One GHz and at Decade Watt Power Levels

Inventor: James J. Komiak.
Assignee: General Electric Company.
Filed: May 1, 1991.

Abstract—An octave band decade watt power amplifier is disclosed using compact and efficient MMIC fabrication techniques. The power amplifier is a two stage amplifier in which the driver transistor has two cells, and the power transistor has four cells, with each power cell double the size of the driver cells. Both transistors are of an optimized topology facilitating efficient broad-band operation at matchable impedance levels. They are interconnected by three four section impedance matching networks of which the input network is coupled to a 50-ohm signal input terminal. The input and the interstage network are both formed on the same substrate as the transistors. The output network is formed on a separate substrate having a high dielectric constant (i.e., 37) which facilitates efficient and compact matching of four power transistor cells to a single output terminal for connection to a load at the conventional (50 ohm) impedance.

16 Claims, 8 Drawing Sheets



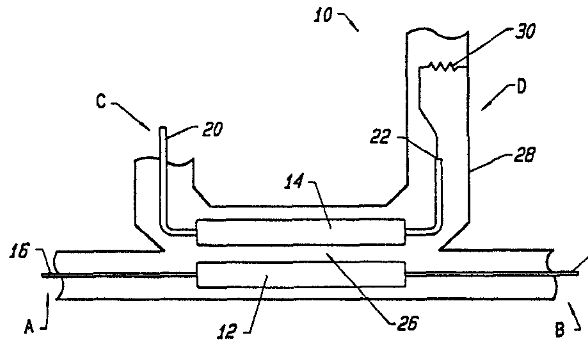
5,111,165 May 5, 1992

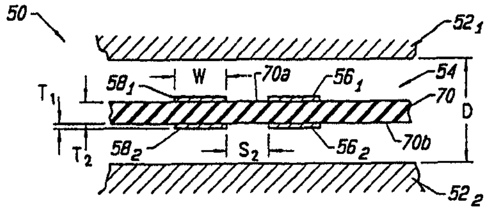
Microwave Coupler and Method of Operating Same Utilizing Forward Coupling

Inventor: William W. Oldfield.
Assignee: Wiltron Company.
Filed: July 11, 1989.

Abstract—A suspended substrate coupler for operation at frequencies of 26 GHz or higher operated in a forward coupling mode. Coupling tends to improve with increased frequency and coupling as tight as 2 dB is provided for frequencies of 40 to 60 GHz. The first and second coupled lines are suspended striplines provided on both surfaces of a dielectric supported between two parallel ground planes. The spacing between the coupled striplines is approximately an order of magnitude greater than the spacing between the coupled lines of a conventional contra-directional coupler, and the length of the coupled sections of the striplines is not required to be a multiple of a quarter wavelength.

19 Claims, 4 Drawing Sheets





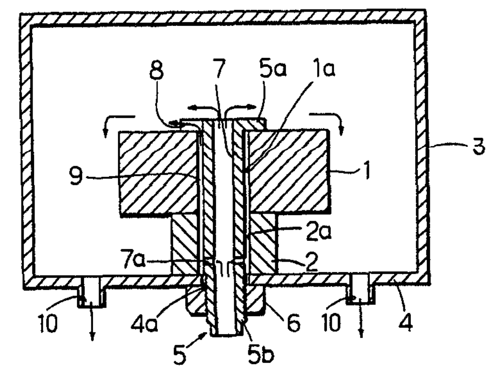
5,111,170 May 5, 1992

Dielectric Resonator Device

Inventor: Kanji Ohya.
Assignee: NGK Spark Plug, Co., Ltd.
Filed: June 19, 1991.

Abstract—A dielectric resonator device comprising a resonator body supported by a pedestal and a bolt for mounting the resonator body on a shield casing, the shield casing and the bolt being provided with openings for circulating a cooling has in the shield casing, respectively. The resonator body and pedestal are formed as a unitary one-piece structure of same material.

5 Claims, 2 Drawing Sheets



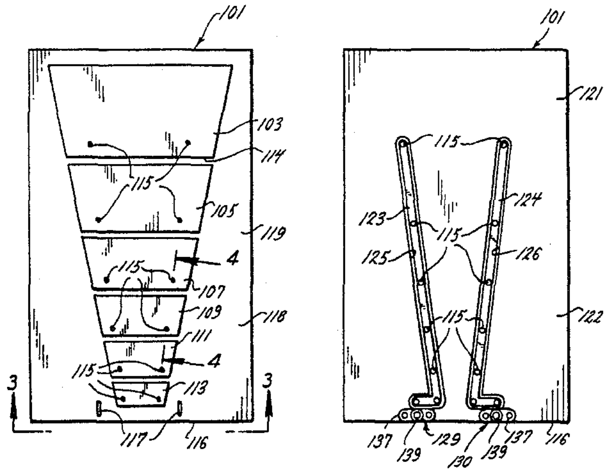
5,111,211 May 5, 1992

Broad-Band Patch Antenna

Inventor: Scott E. Dahlberg.
Assignee: McDonnell Douglas Corporation.
Filed: July 19, 1990.

Abstract—A log periodic antenna of simple, circuit board construction exhibits an average standing wave ratio of less than 2.0 over a broad-band frequency characteristic.

19 Claims, 5 Drawing Sheets



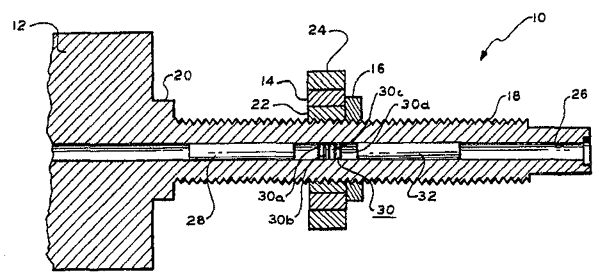
5,111,330 May 5, 1992

Optical Isolators Employing Wavelength Tuning

Inventors: Jay S. Van Delden and Donald K. Wilson.
Assignee: Optics for Research.
Filed: Nov. 13, 1990.

Abstract—An improvement in a method of rotating the plane of polarization of polarized light in a Faraday rotator, having an optical element which includes a ferromagnetic material, which comprises varying the strength of the magnetic field generated along the optical axis of the optical element in response to changes in the wavelength of the polarized light. The magnet employed in the Faraday rotator may be at least one permanent magnet or an electromagnet. Preferred optical elements are made of disc having a gadolinium–gallium–garnet (GGG) or large lattice constant (LLC) substrate, and the substrate is coated with an oxygen—and iron—containing film.

14 Claims, 3 Drawing Sheets



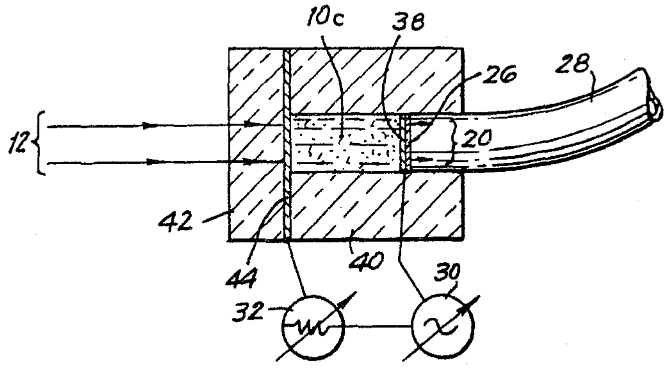
5,111,331 May 5, 1992

Electrooptical Light Modulator

Inventor: Paul Rosenberg.
Assignee: Research Frontiers Incorporated.
Filed: July 5, 1989.

Abstract—A carrier light beam transmitted through a light valve is modulated to convey information along a communications system. The modulation factor, baud rate and efficiency of the light valve can be increased by directing a modulated light beam a number of times through the valve.

11 Claims, 4 Drawing Sheets



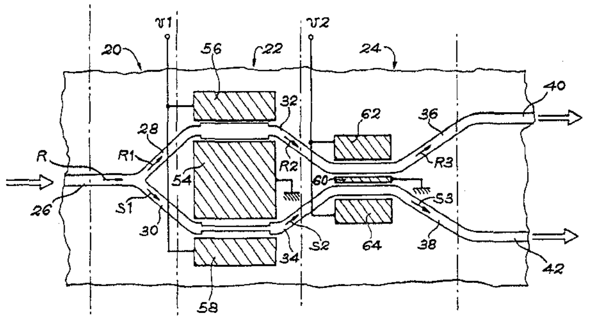
5,111,517 May 5, 1992

Polarization Beam Splitter for Guided Light

Inventor: Luc Riviere.
Assignee: France Telecom Etablissment autonome de Droit Public (Centre National d'Etudes des Telecommunications).
Filed: Feb. 12, 1991.

Abstract—This polarization beam splitter for guided light is e.g., produced on Z-propagating, X-cut LiNbO3:Ti and comprises in series a passive Y-junction (66), an active phase shifter (68) and an active directional coupler (70), independent of the polarization and able to constitute a 3 dB coupler. Thus, on supplying a light wave to the input of the Y-branch and with the coupler constituting a 3-dB coupler, the TM and TE modes of the input wave are respectively obtained at the outputs of the coupler by appropriately polarizing the phase shifter. Application to optical fiber sensors or transducers and to the coherent transmission of information by monomode optical fibers.

7 Claims, 5 Drawing Sheets



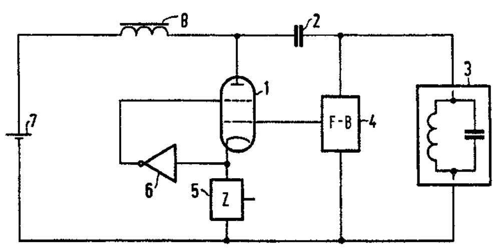
5,113,157 May 12, 1992

High-Frequency Electron Tube Power Oscillator

Inventors: Christian S. A. E. Patron and Eugene J. Sowinski.
Assignee: U. S. Philips Corporation.
Filed: Apr. 29, 1991.

Abstract—A high-frequency electron tube power oscillator includes a multi-grid electron tube (1) in which the output power is adjusted by means of an adjustable impedance element (5) connected in series with the cathode line of the tetrode (1). In order to reduce the dissipated power in the adjustable impedance element (5), the voltage across the impedance element is connected to the screen grid of the tetrode (1) through an amplifier (6) constituted by a triode (9) and a current source (10).

11 Claims, 1 Drawing Sheet



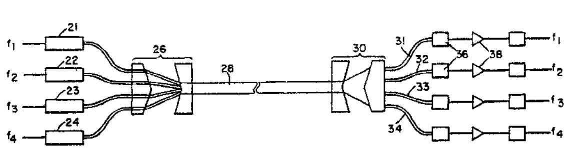
5,113,244 May 12, 1992

Fiber-Optic Combiner/Splitter

Inventor: Mark E. Curran.
Assignee: General Dynamics Corporation.
Filed: Feb. 6, 1991.

Abstract—The fiber-optic combiner/splitter is a positive and negative axicon combination that can convert a ring-shaped beam into a solid beam. The positive half of the axicon is effectively a plano-convex lens where the convex surface is generally a shallow cone. The flat surface of the lens abuts each end of an array of single mode fibers that are arranged in a ring configuration around a support member. The negative half of the axicon is effectively a plano-concave lens which is complementary to the positive lens. The focused beams from the positive half of the axicon are combined to form a single beam which is then directed into a single optical fiber. For conversions in the reverse direction, light is taken from a single multimode fiber and expanded into a ring-like pattern. The ring of light is picked up by the ring of single mode fibers. Each single mode fiber receives an equal amount of optical energy or power to provide good efficiency in splitting of the multiplexed beam.

13 Claims, 1 Drawing Sheet



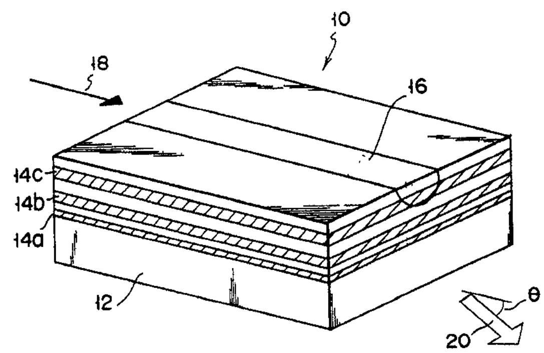
5,113,469 May 12, 1992

Optical Wavelength-Converting Device for Guided-Wave Second-Harmonic Generation in Cerenkov Radiation Mode

Inventors: Genichi Hatakoshi, Kazutaka Terashima, Masaru Kawachi, and Yutaka Uematsu.
Assignee: Kabushiki Kaisha Toshiba.
Filed: Mar. 1, 1991.

Abstract—An optical wavelength-converting device for generating the second-harmonic wave through Cerenkov radiation has a substrate made from nonlinear optical crystal which acts as a cladding layer. Formed on the top surface of the substrate is a long, narrow optical waveguide layer, whose refractive index is larger than that of the substrate. In the substrate, multilayer domain-inverted sections are formed. With this arrangement, the nonlinear coefficient is locally changed, thereby compensating for phase mismatching between the fundamental wave and the second-harmonic wave in the direction perpendicular to the substrate's surface. This compensation helps improve the efficiency in converting the laser input light of the fundamental wave into the second-harmonic wave.

15 Claims, 15 Drawing Sheets



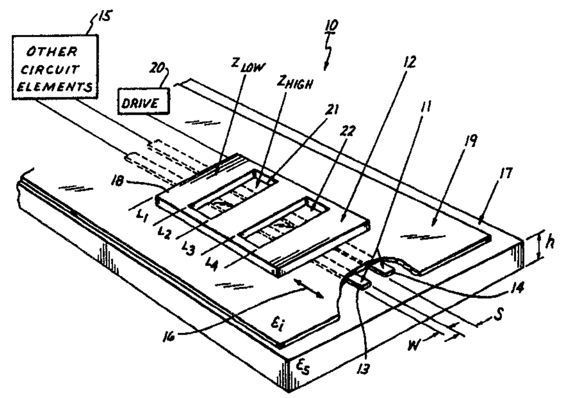
5,115,217 May 19, 1992

RF Tuning Element

Inventors: William R. McGrath and Victor M. Lubecke.
Assignee: California Institute of Technology.
Filed: Dec. 6, 1990.

Abstract—A device for tuning a circuit includes a substrate, a transmission line on the substrate that includes first and second conductors coupled to a circuit to be tuned, and a movable short-circuit for varying the impedance the transmission line presents to the circuit to be tuned. The movable short-circuit includes a dielectric layer disposed atop the transmission line and a distributed shorting element in the form of a conductive member that is configured to be slid along at least a portion of the transmission line atop the dielectric layer. The conductive member is configured to span the first and second conductors of the transmission line and to define at least a first opening that spans the two conductors so that the conductive member includes first and second sections separated by the first opening. The first and second sections of the conductive member combine with the first and second conductors of the transmission line to form first and second low-impedance sections of transmission line, and the opening combines with the first and second conductors of the transmission line and the dielectric layer to form a first high-impedance section of transmission line intermediate the first and second low-impedance sections. Each of the first low-impedance section and the first high-impedance section have a length along the transmission line of approximately one-quarter wavelength, thus providing a periodic variation of transmission line impedance. That enhances reflection of RF power.

14 Claims, 4 Drawing Sheets



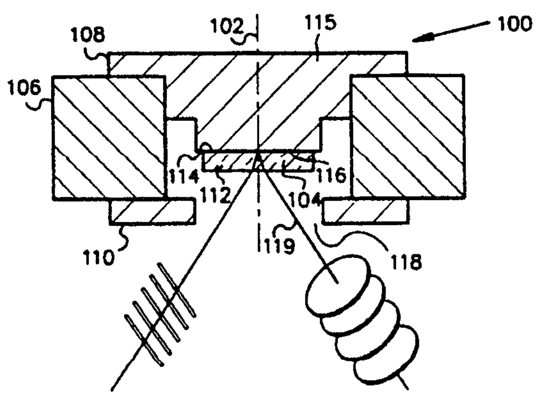
5,115,340 May 19, 1992

High-Average Power Faraday Isolator

Inventor: Steve C. Tidwell.
Assignee: Amoco Corporation.
Filed: May 2, 1990.

Abstract—A reflective Faraday isolator for handling high-average powers. The Faraday isolator includes a Faraday medium, one or more magnets, and pole pieces to concentrate the magnetic field produced by the magnet on the faraday medium. The light energy is received at a first side of the Faraday medium, transmitted through the Faraday medium, and reflected by a mirrored opposing second side of the Faraday medium. The second side of the Faraday medium is attached to a heat removal means, whereby great amounts of heat energy may be removed, producing thermal gradients in the Faraday medium which are substantially parallel to an axis of the Faraday isolator. Various embodiments of the Faraday isolator of the present invention use different heat removal means.

17 Claims, 6 Drawing Sheets



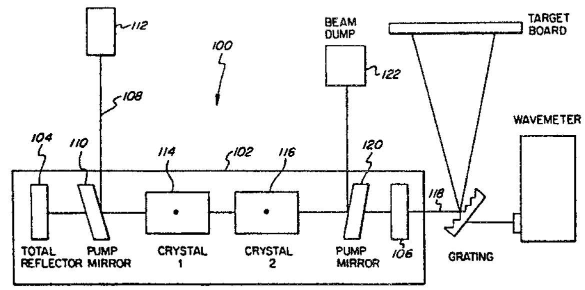
5,117,126 May 26, 1992

Stacked Optical Parametric Oscillator

Inventor: Allen R. Geiger.
Assignee: La Sen, Inc.
Filed: June 27, 1990.

Abstract—A stacked OPO is disclosed wherein two or more optically nonlinear media, such as crystals are coaxilly disposed in a single resonator. Incident radiation is coupled into the resonator, and causes parametric oscillations of the two crystals. The two crystals are independently tuned such as by angular orientation to produce distinct components of secondary radiation. A first one of the crystals is disposed nearer to the source of incident radiation, and a second one of the crystals is disposed nearer to the output coupler of the resonator. This causes the first crystal to experience a greater effective gain. Furthermore, the secondary radiation from the first crystal will tend to dominate and "seed" the secondary radiation from the second crystal, when their bandwidths are narrowly separated. The dominance of the first crystal is controlled in various ways: 1) by shortening the length of the first crystal, 2) by differential bevelling of the first crystal with respect to the optical axis of the resonator, or 3) by detuning the output coupling mirror of the resonator with respect to the output of the first crystal. Either method effectively balances the effective gains of the two crystals so that two independently tunable and efficient signal frequencies can be achieved. Seeding the OPO stack is also disclosed. Alternate techniques of seeding include the use of a tunable diode laser, a second low power OPO and a second OPO using a Faraday Anomalous Dispersion Optical Filter (FADOF). Techniques for angle tuning the OPO sack and compensating for walkoff are disclosed.

20 Claims, 7 Drawing Sheets



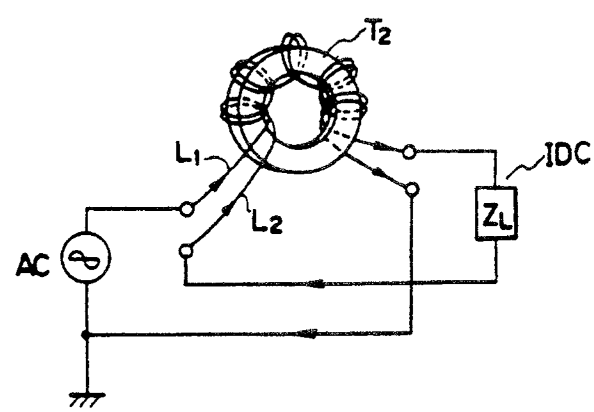
5,117,145 *May 26, 1992

Surface-Acoustic-Wave Convolver

Inventor: Katsuo Furukawa.
Assignee: Clarion Co., Ltd.
*Notice: The portion of the term of this patent subsequent to Aug. 21, 2007 has been disclaimed.
Filed: Mar. 23, 1990.

Abstract—Disclosed is a surface-acoustic-wave convolver having a toroidal coil connected to each interdigital electrode as a matching and balanced-to-unbalanced converting circuit. The use of the toroidal coil wound on an associated toroidal core permits the reduction of required parts in number thanks to its dual function, and accordingly reduction of manufacturing cost and size of the device. Still advantageously the use of such a toroidal winding permits the suppression of spurious or noise signals in an SAW device.

5 Claims, 4 Drawing Sheets



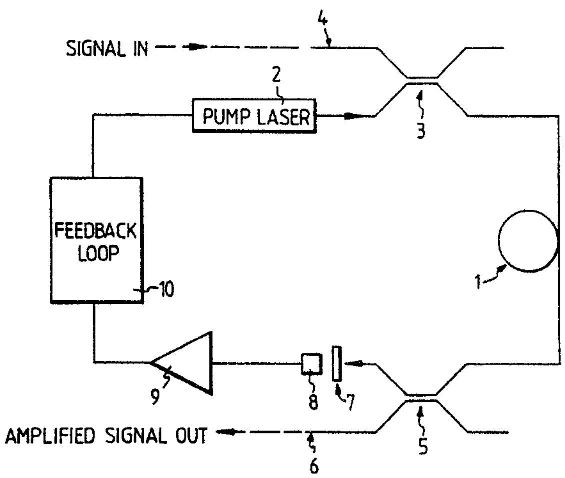
5,117,196 May 26, 1992

Optical Amplifier Gain Control

Inventors: Richard E. Epworth, Kevin C. Byron, Robert A. Baker, and Nigel Taylor.
Assignee: STC plc.
Filed: Apr. 23, 1990.

Abstract—The gain of an optical amplifier is maintained constant by employing a portion of the amplified optical signal in a feedback loop. In one arrangement this is used to control the output of a pump signal source accordingly. The portion of the said signal corresponds to spontaneous emission (ASE) at a control wavelength or band of wavelengths different to the wavelength of the optical signal output. In the case of an erbium, for example, optical fibre amplifier the portion is preferably ASE at 908 nm, the amplified signal being at 1.535 μm, i.e., completely different transitions in the amplifying medium are used for gain and ASE feedback in order to lessen requirements on the filter used to extract the portion for the feedback loop.

9 Claims, 5 Drawing Sheets



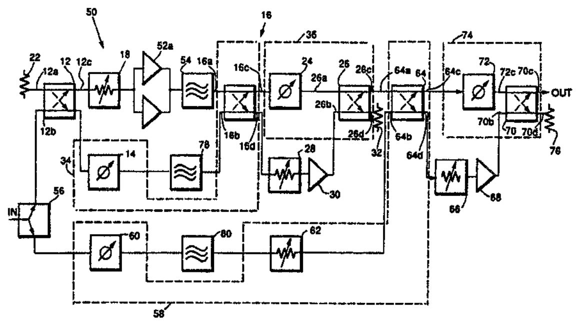
5,117,197 May 26, 1992

High-Power Feed-Forward Microwave Amplifier Apparatus with Out-of-Band Intermodulation Product Suppression

Inventors: Rui T. Hsu and Thomas M. Struas.
Assignee: Hughes Aircraft Company.
Filed: Nov. 9, 1990.

Abstract—A replica of a microwave input signal is subtracted from an amplified version of the input signal produced by main power amplifiers (52*a*, 52*b*) to produce an error signal corresponding to distortions introduced into the input signal by the power amplifiers (52*a*, 52*b*). The error signal is amplified by an error amplifier (30), and subtracted from the amplified input signal to produce an output signal in which the distortions have been canceled. A bandpass filter (54) is provided immediately following the power amplifiers (52*a*, 52*b*) to suppress or block intermodulation products generated in the power amplifiers (52*a*, 52*b*) which are outside the bandwidth of the input signal and which could overload the error amplifier (30) to generate further distortion. A second filter (78) may be provided through which the replica signal passes to better match the replica signal to the amplified and filtered input signal. Suppression of the out-of-band intermodulation products enables operation of the power amplifier (52*a*, 52*b*) very close to their saturation limit with maximum efficiency. A second error cancellation branch (56, 60, 62, 64, 66, 68, 70, 72) may be provided to produce further reduction of distortion, and may include a third bandpass filter (80).

8 Claims, 2 Drawing Sheets



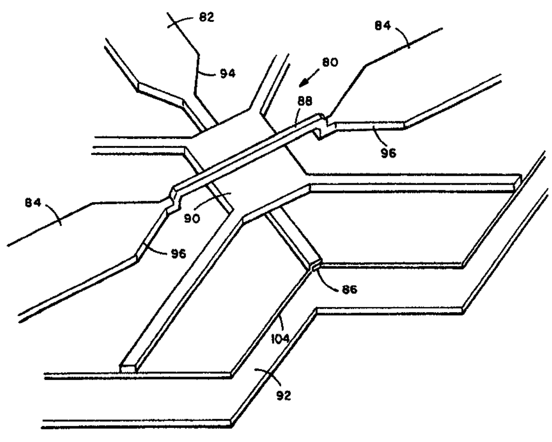
5,117,207 May 26, 1992

Monolithic Microwave Airbridge

Inventors: Scott D. Powell and David E. Meharry.
Assignee: Lockheed Sanders, Inc.
Filed: July 30, 1990.

Abstract—A monolithic microwave switch matrix includes fully monolithic construction for crossovers as well as switches and input transmission lines configured as lumped equivalent transmission lines for reduced power loss. The crossovers include a grounded conductor located between the crossing transmission lines.

1 Claim, 4 Drawing Sheets



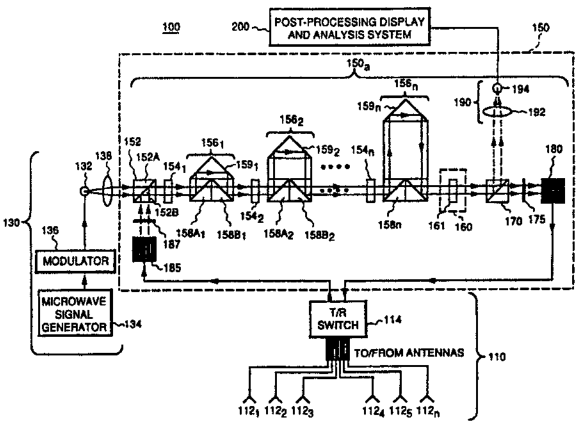
5,117,239 May 26, 1992

Reversible Time Delay Beamforming Optical Architecture for Phased-Array Antennas

Inventor: Nabeel A. Riza.
Assignee: General Electric Company.
Filed: Apr. 24, 1991.

Abstract—A phased-array antenna system has optical architecture comprising free-space delay units and associated spatial light modulators compatible for operation with temporally incoherent or coherent laser light to produce signals having selected time delays to actuate antenna elements of an antenna array to transmit electromagnetic radiation at a selected beam angle from the phase array. The same optical architecture is used to process electromagnetic signals detected by the antenna array to produce an output signal for display or processing that corresponds to the radiation detected at the selected beam angle.

21 Claims, 2 Drawing sheets



5,117,472 May 26, 1992

Optical Coupler with Mode-Mixing Refractive Microparticles

Inventors: Lee. L. Blyler, Jr. Robert W. Filas, and Gary J. Grimes.
Assignee: AT&T Bell Laboratories.
Filed: Dec. 28, 1990.

Abstract—An optical coupler having an optical core in which a small concentration of refractive microparticles has been added to a suspension material of the optical core. The result is that light from an optical source is bent slightly by the refractive effects of the microparticles and is coupled into the higher order of modes over a relatively short distance within the optical core. These microparticles are closely matched to the index of refraction of the suspension material resulting in smaller deflection angles and fewer reflections. In addition, these microparticles match the specific gravity of the suspension material such that they do not settle out of a suspension while the optical core material is being hardened from a semi-liquid state.

22 Claims, 4 Drawing Sheets