Patent Abstracts

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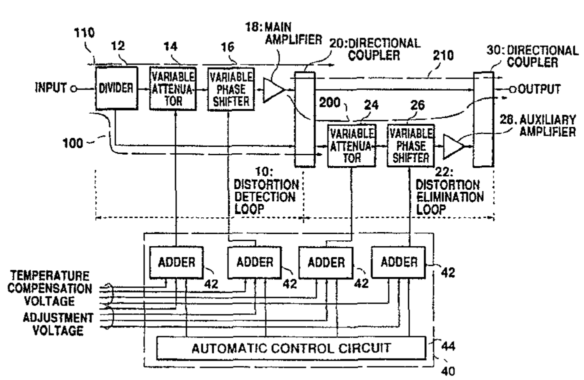
5,327,096 July 5, 1994

Control Circuit for Automatically Controlled Feed Forward Nonlinear Distortion Compensation Amplifier

Inventors: Hironori Sakamoto, Akira Ito, Toshio Nojima.
Assignees: Japan Radio Co., Ltd., Nippon Telegraph & Telephone Corporation, and NTT Mobile Communication.
Filed: Feb. 11, 1993.

Abstract—A control circuit for an automatically controlled feed forward nonlinear distortion compensation amplifier. The control circuit controls a distortion detection loop and a distortion removal loop. The distortion detection loop is a loop for feeding forward input to a main amplifier into a first directional coupler. The distortion removal loop is a loop for feeding forward distortion elements into a second directional coupler. The main amplifier is preceded by a variable attenuator and a variable phase shifter. A variable attenuator and a variable phase shifter are also located in a feed forward path to the second directional coupler. The control circuit controls the variable attenuator and the variable phase shifter preceding the main amplifier for detecting the distortion elements. The control circuit controls the variable attenuator and the variable phase shifter located in the feed forward path to the second directional coupler for removing the distortion elements. A temperature compensation signal and an adjustment signal are added to a control signal by each adder provided at the output stage of the control circuit.

25 Claims, 4 Drawing Sheets



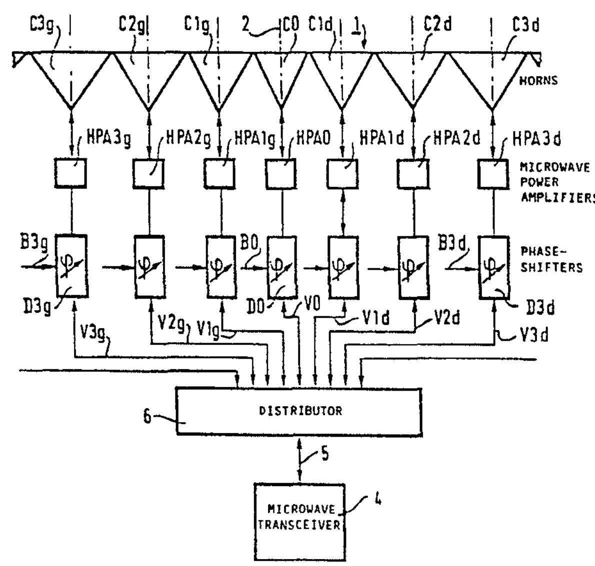
5,327,147 July 5, 1994

Microwave Array Antenna Having Sources of Different Widths

Inventors: Gérard Caille and Frédéric Magnin.
Assignee: Alcatel Espace.
Filed: July 24, 1992.

Abstract—A microwave array antenna comprises a plurality of like unit sources whose width increased progressivly from the center of the array towards its ends and which are disposed relative to each other in such a way that substantially no illumination gaps are created in the array.

17 Claims, 3 Drawing Sheets



5,327,149 July 5, 1994

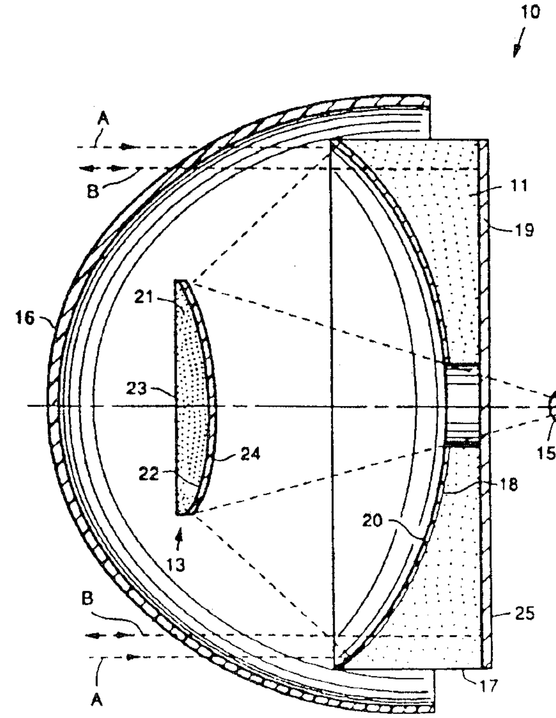
R. F. Transparent RF/UV-IR Detector Apparatus

Inventor: Fernand B. Kuffer.
Assignee: Hughes Missile Systems Company.
Filed: May 18, 1992.

Abstract—A dual-mode, radio frequency, optical-wavelength detector apparatus includes RF-transparent optical elements adapted to focusing optical energy in a wavelength range including ultraviolet through infrared wavelengths, on an optical detector, and an RF antenna located behind the optical elements. One embodiment of the apparatus employs a Cassegrain infrared optical telescope system having a concave primary mirror, the front surface of which has applied thereto multiple layers of dielectric material comprising an interference filter reflective in a band of infrared wavelengths, and transmissive to radio frequency energy. A convex secondary mirror having a similar reflective coating is so located as to reflect infrared energy backwards through a central coaxial perforation through the primary mirror onto an infrared detector. The apparatus includes a planar RF antenna rearward of the primary

mirror, which antenna utilizes the full aperture of the infrared optical system for the reception and transmission of RF energy.

33 Claims, 8 Drawing Sheets



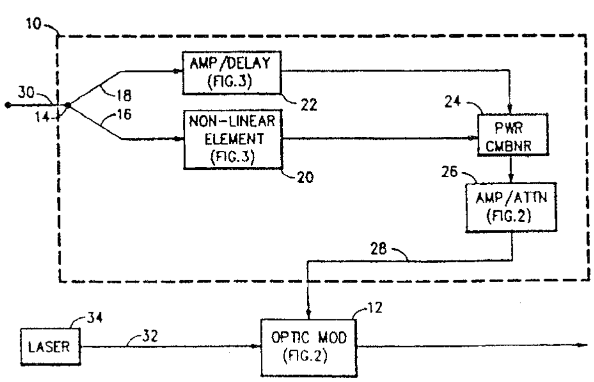
5,327,279 July 5, 1994

Apparatus for Linearization of Optic Modulators Using a Feed-Forward Predistortion Circuit

Inventors: James D. Farina and Gregory J. McBrien.
Assignee: United Technologies Corporation.
Filed: July 17, 1992.

Abstract—A feed-forward predistortion circuit to provide improved linear response in optic modulators. The circuit includes a non-linear element, an amplifier/delay means and a power combiner. The non-linear element generates a first signal sin(X), where (X) is the input signal. The amplifier/delay means generates a second signal 2(X). The first and second signals are combined in the power combiner to produce a modulating signal 2(X)-sin(X) which is fed to an optic modulator. The modulating signal 2(X)-sin(X) compensates for the transfer function of the optic modulator which has a transfer function sin(X), thereby producing a linear output.

26 claims, 3 Drawing Sheets



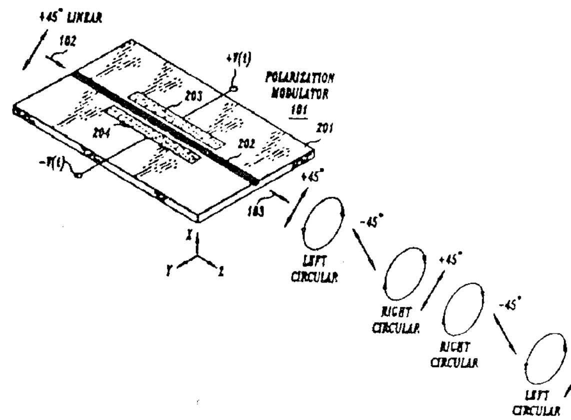
5,327,511 July 5, 1994

Apparatus and Method Employing Fast Polarization Modulation to Reduce Effects of Polarization Hole Burning and Polarization Dependent Loss

Inventors: Fred L. Heismann and Robert L. Rosenberg.
Assignee: AT&T Bell Laboratories.
Filed: June 18, 1993.

Abstract—The effects of polarization dependent hole burning and polarization dependent loss are reduced by modulating the state of polarization (SOP) of an optical signal being launched into an optical transmission path periodically between first and second states of polarization of at least one pair of orthogonal states of polarization. Preferably the SOP is modulated at a rate that is substantially higher than $1/t_s$, where t_s is the anistropic saturation time of the optical amplifier. Ideally, the state of polarization of the launched optical signal should be modulated such that it traces a complete great circle on the Poincaré sphere. In addition, the effects of polarization dependent loss are further reduced by controllably selecting the particular great circle being traced on the Poincaré sphere. In one example, the particular great circle being traced is selected such that a predetermined parameter, for example, the signal to noise ratio, of the optical information signal being received at the remote end of the optical transmission network is maintained at a prescribed value, e.g., a maximum value. In an embodiment of the invention, the great circle is traced at a uniform speed such that the launched optical signal spends equal time intervals in both states of any pair of orthogonal states of polarization on the selected great circle on the Poincaré sphere.

29 Claims, 7 Drawing Sheets



5,329,136 July 12, 1994

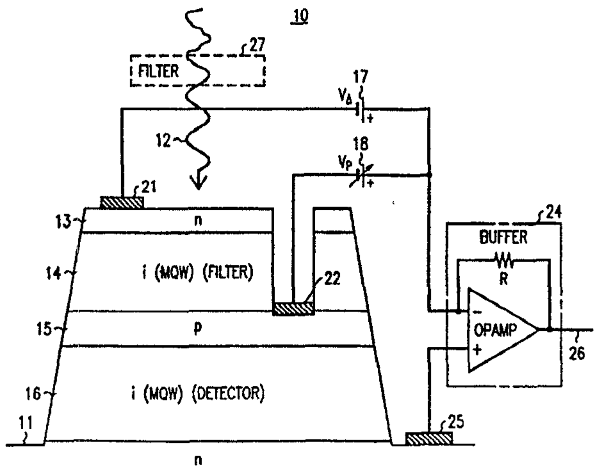
Voltage-Tunable Photodetector

Inventor: Keith W. Goossen.
Assignee: AT&T Bell Laboratories.
Filed: Apr. 30, 1993.

Abstract—A tunable monolithic integrated photodetector (10) detects a selected wavelength of incident light within a wavelength range. The photodetector comprises a multiple quantum well (MQW) filter means for receiving and filtering the incident light, and an MQW detector means for receiving light from the MQW filter means and for detecting the selected wavelength. A fixed voltage bias V_Δ is disposed between the filter means and the detector means for causing the filter means to absorb light wavelengths around the selected wavelength to thereby enhance the detectability of the selected wavelength. Further, a variable voltage bias V_P is selectively and proportionally imposed on both the filter means and the detector means for permitting tuning of the photodetector. A fixed filter may also be employed for filtering the incident

light so that light wavelengths which are outside the range of the photodetector are eliminated. Finally, a plurality of the photodetectors may be arranged in a two dimensional array for image processing.

23 Claims, 4 Drawing Sheets



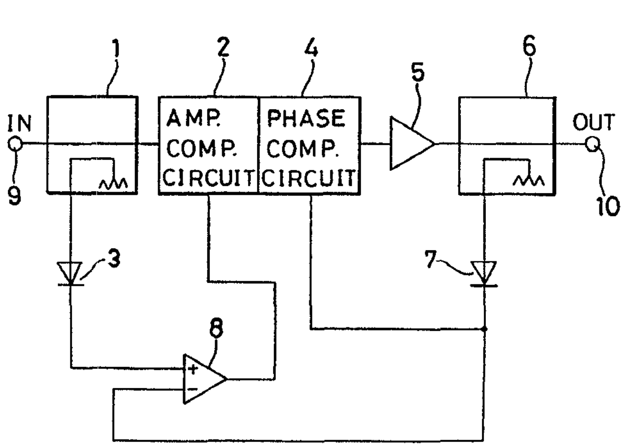
5,329,244 July 12, 1994

Linear Compensating Circuit

Inventors: Noriyuki Fujita and Masahiko Tanaka.
Filed: July 31, 1992.

Abstract—A linear compensating circuit comprises a first level detection circuit for detecting the level of an input signal to an amplifier, a second level detection circuit for detecting the level of an output signal from the amplifier, an amplitude compensating circuit for controlling the amplitude of the input signal in accordance with the difference between the signal level detected by the first detection circuit and the signal level detected by the second level detection circuit for improving the linearity of an input-output characteristic of the amplifier, and a phase compensating circuit for controlling the phase of the input signal in accordance with the signal level detected by the second detection circuit. The linear compensating circuit compensates for both amplitude and phase and, as a result, the degradation of phase characteristic caused by amplitude compensation can be prevented, resulting in a reduction in the distortion of the output signal of the amplifier even when it is being operated in the vicinity of the saturation range. This linear compensating circuit is effective when applied to a power amplifier, particularly to a high frequency power amplifier.

16 Claims, 1 Drawing Sheet



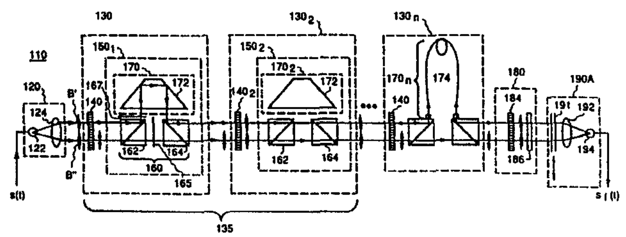
5,329,118 July 12, 1994

Optical Transversal Filter

Inventor: Nabeel A. Riza.
Filed: Dec. 23, 1992.

Abstract—An optical transversal filter includes a processing system having a light source adapted to be modulated by an input electromagnetic signal and generate a plurality of collimated optical signals, a cascade of optical time delay units sequentially coupled to act upon the collimated optical signals passing from the light source to selectively differentially time delay respective ones of the optical signals, an optical trimmer device coupled to receive the differentially time delayed optical signals and to selectively attenuate respective ones of those signals, and a filter output assembly which receives and sums the optical signals from the trimmer device optically and converts the sum to a corresponding filter electrical signal, or alternatively, converts the respective optical signals to electrical signals and electrically sums the signals. Each optical time delay unit includes a spatial light modulator having liquid crystal pixels disposed such that the polarization orientation of each respective optical signal is controlled by passing respective optical signals through respective ones of the pixels. Dependent on its polarization orientation, each optical signal passes through a delay assembly optically coupled to the respective spatial light modulator in the optical time delay unit on either a direct path or a delay path.

26 Claims, 3 Drawing Sheets



5,329,248 July 12, 1994

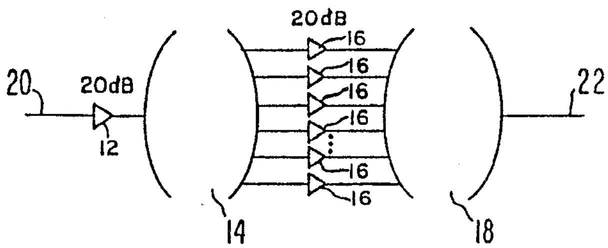
Power Divider/Combiner Having Wide-Angle Microwave Lenses

Inventor: Jamaledin Izadian.
Assignee: Loral Aerospace Corp.
Filed: Oct. 23, 1992.

Abstract—A microwave power divider/combiner (10) comprises a preamplifier (12), a first microwave lens (14), a plurality of amplifiers (16), and a second microwave lens (18). The preamplifier (12) is coupled to receive a microwave source signal (20) and amplify it. The output of the preamplifier (12) feeds the first lens (14). The first lens (14) divides the signal received on its input into a plurality of signals of equal amplitude and phase. Each output of the first lens (14) is then provided to an input of a respective amplifier (16) from the plurality of amplifiers (16). The amplifiers (16) amplify the divided signals and output them to the second lens (18). The second lens (18) has a plurality of inputs and recombines the signals on the inputs into a single

higher level signal at an output (22). The present invention also provides a compact configuration for the divider/combiner (10) of the present invention with the lenses (14, 18) mounted on top of each other separated by a mounting block (26). The amplifiers (16) are mounted on a side of the mounting block (26) proximate the output of the first lens (14) and the input on the second lens (18), between the first and second lenses (14, 18) to reduce coupling losses.

21 Claims, 7 Drawing Sheets



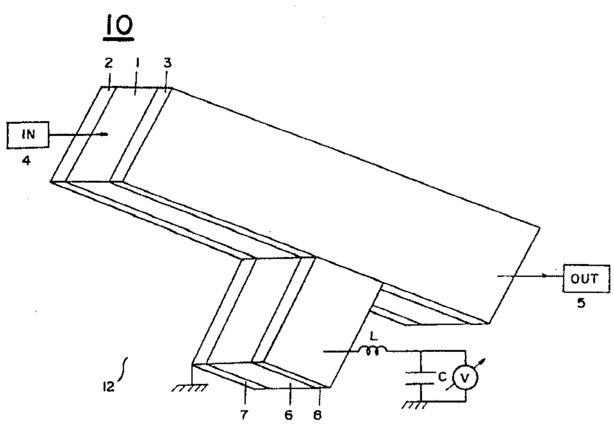
5,329,261 July 12, 1994

Ferroelectric RF Limiter

Inventor: Satyendranath Das.
Filed: May 27, 1993.

Abstract—The ferroelectric limiter utilizes the bias voltage dependent dielectric constant property of a ferroelectric material. A main transmission line having a length of two or more half wavelengths at the operating frequency is used. A branch line is connected at one half wavelength away from one end of the transmission line. The branch line presents a very high impedance on the main transmission line at a low level of signal. The branch line contains a ferroelectric material. As the signal level increases, the dielectric constant of the ferroelectric material in the branch line changes. This reduces the impedance presented by the branch line on the main transmission line reducing the impedance of the main transmission line and the resulting output of the limiter. As the signal level increases, the impedance presented by the branch line on the main transmission line becomes increasingly smaller, further reducing the output of the limiter. Two designs of the limiter are presented. The limiter can be a part of a monolithic microwave integrated circuit (MMIC). The conductive coatings of the limiter can be a film of a single crystal high Tc superconductor material. The upper frequency limit of the ferroelectric limiter is determined by the relaxation frequency of the ferroelectric material such as 95 GHz for Strontium Titanate.

10 Claims, 2 Drawing Sheets



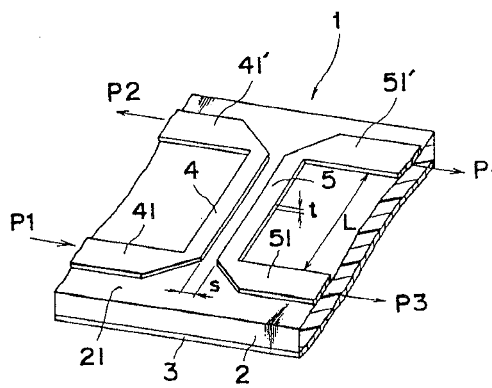
5,329,263 July 12, 1994

Directional Coupler Wherein Thickness of Coupling Lines is Smaller than the Skin Depth

Inventor: Kazuaki Minami.
Assignee: Murata Manufacturing Co., Ltd.
Filed: Jan. 12, 1993.

Abstract—An electric coupler has a dielectric substrate and a mutually parallel pair of quarter-wavelength coupling lines made of microstrip lines, formed on the top surface of the substrate separated from each other by a predetermined distance. The thickness of these coupling lines are smaller than the skin depth at a frequency at which the coupler can function as a directional coupler.

20 Claims, 3 Drawing Sheets



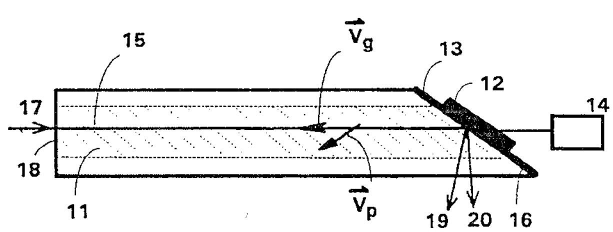
5,329,397 July 12, 1994

Acousto-Optic Tunable Filter

Inventor: I-Cheng Chang.
Filed: Aug. 4, 1992.

Abstract—An electronically tunable optical filter utilizing noncollinear acousto-optic interaction in an acoustically anisotropic, optically birefringent crystal. The directions of optical and acoustic waves are chosen so that the optical ray is collinear with the group velocity of the acoustic wave. The collinear beam configuration provides increased spectral resolution and reduced drive power.

8 Claims, 2 Drawing Sheets



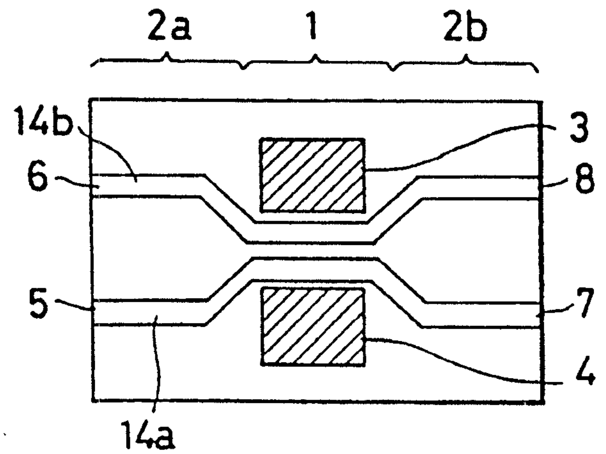
5,329,601 July 12, 1994

Semiconductor Optical Waveguide Type Switch Including Light Control Means

Inventor: Shigeru Nakamura.
Assignee: NEC Corporation.
Filed: Dec. 21, 1992.

Abstract—A semiconductor waveguide type all-optical switch of a simple structure which can switch at high speed with low switching energy. A waveguide is formed within a core layer made of a semiconductor for absorbing controlling light when an electric field is applied, and a pair of electrodes are formed for applying a voltage to a waveguide part where a refractive index change is to be caused. The controlling light together with controlled light is entered in the waveguide. When a voltage is applied, Franz-Keldysh effect causes the wavelength at the optical absorption spectrum edge in the refractive index change part to shift to the long wavelength side. If light of a wavelength satisfying a predetermined condition is used as the controlling light, the controlling light is absorbed only in the refractive index change part for changing the refractive index in the part, thus the controll light is switched. Preferably, a p-i-n structure is adopted.

18 Claims, 3 Drawing Sheets



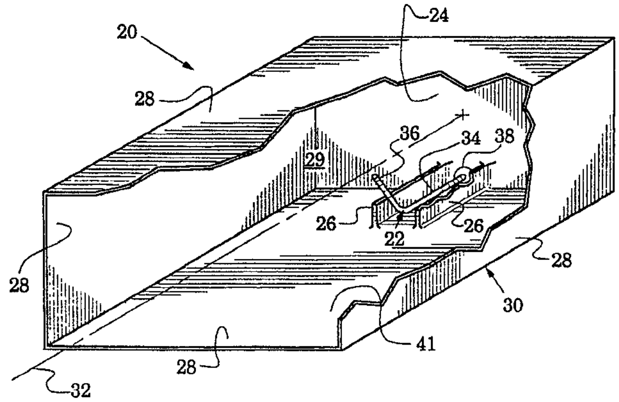
5,331,332 July 19, 1994

Waveguide Coupling Structure

Inventors: Laurice J. West and Wayne Pyatte.
Assignee: California Amplifier.
Filed: Oct. 14, 1992.

Abstract—A structure (20) coupling a microwave signal to a waveguide (30) is provided. Transmission walls (26) are supported in the waveguide to only partially surround a probe (22) extending longitudinally from the waveguide wall. The probe perferably terminates at one end in a transmit/receive portion (36) directed into the waveguide internal space and at the other end in a launch portion extending through either the waveguide endwall (24) or sidewall (28). The structure is particularly suited for economical fabrication.

12 Claims, 2 Drawing Sheets



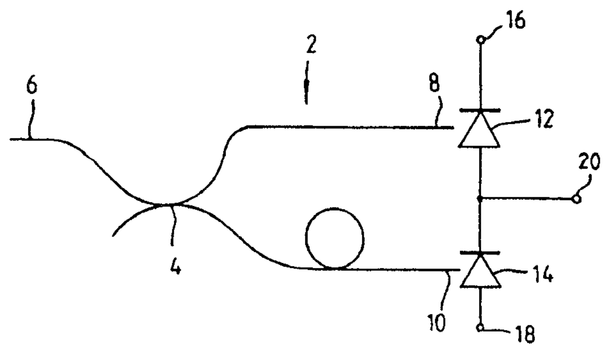
5,331,452 July 19, 1994

Optical Detector

Inventors: Peter P. Smyth and Brian R. White.
Assignee: British Telecommunciations public limited company.
Filed: Sept. 13, 1990.

Abstract—An optical detector for use in detecting digital optical signals has an optical fiber coupler which splits a received optical signal into two signal portions. The coupler has unequal length output fibers so that one signal portion impinges upon an associated photodetector delayed relative to the other. The photodetectors are connected in series nonopposed when the delay is equal to the bit period of the optical signal the output of the detector is the differential code (dicode) of the received signal which can be recovered by a high input impedance, i.e., integrating, amplifier. By forming the dicode in the optical domain in this manner large DC and AC dynamic ranges are obtained without linearity constraints on the optical transmission source that apply when the optical signal is transmitted as a dicode.

16 Claims, 3 Drawing Sheets



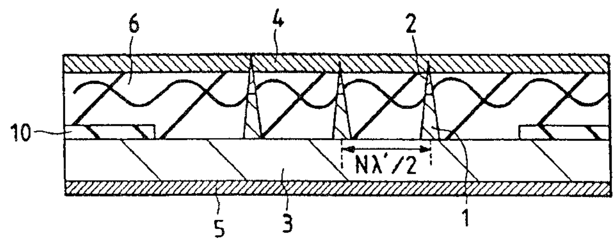
5,332,910 July 26, 1994

Semiconductor Optical Device with Nanowhiskers

Inventors: Keiichi Haraguchi, Kenji Hiruma, Kensuke Ogawa, Toshio Katsuyama, Ken Yamaguchi, Toshiyuki Usagawa, Masamits Yazawa, Toshiaki Masuhara, Gerard P. Morgan, Hiroshi Kakibayashi.
Assignee: Hitachi, Ltd.
Filed: Nov. 30, 1993.

Abstract—A semiconductor light-emitting device includes a plurality of semiconductor rods, each of which has a pn junction. The semiconductor rods are formed on a semiconductor substrate such that the plurality of semiconductor rods are arranged at a distance substantially equal to an integer multiple of the wavelength of light emitted from the semiconductor rod. With such devices, various novel optical devices such as a microcavity laser of which the threshold current is extremely small and a coherent light-emitting device having no threshold value can be realized.

24 Claims, 16 Drawing Sheets



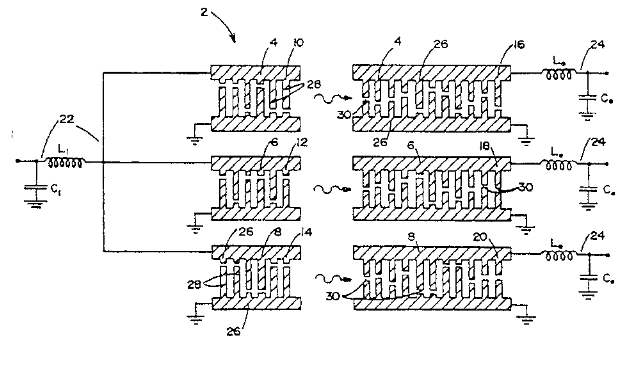
5,332,983 July 26, 1994

Filterbank Using Surface Acoustic Wave Technology

Inventor: Robert C. Peach.
Assignee: Com Dev Ltd.
Filed: Jan. 26, 1993.

Abstract—A filterbank using surface acoustic wave technology and having a plurality of filters. Each filter has an input transducer and an output transducer The input transducers are connected in parallel to a single matching circuit. The output transducers each have a separate matching circuit. The transducers are formed by a thin film of aluminum pattern on a piezoelectric substrate. The input transducers all have the same structure and the output transducers all have the same structure, though that structure is different from the input transducers. The only difference between the transducers of each filter is the location of electrode breaks for each electrode. A weighting function of the transducers is scaled and biased to provide a constant impedance across the bandwidth of the filterbank and to equalize the output amplitudes and capacitances of the output transducers. This produces a continuous level response across the bandwidth of the filterbank. Previously, while a continuous level response was theoretically achievable, it cannot be achieved in practice.

7 Claims, 7 Drawing Sheets



5,333,219 July 26, 1994

Asymmetric Y-Branch Optical Device

Inventor: Mark E. Kuznetsov.
Assignee: AT&T Bell Laboratories.
Filed: Dec. 17, 1992.

Abstract—The present invention relates to a new tunable filter which, when used as an intracavity mode selecting filter in a semiconductor laser structure, provides a large tuning range. The disclosed filter is, in one enbodiment, a two branch asymmetric Y-branch tunable filter where the ends of the two branches terminate at a common plane. In another embodiment, the invention is realized by using a cascade of two or more Y-branches to place several asymmetrical Y-branch filters in parallel.

14 Claims, 3 Drawing Sheets