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.

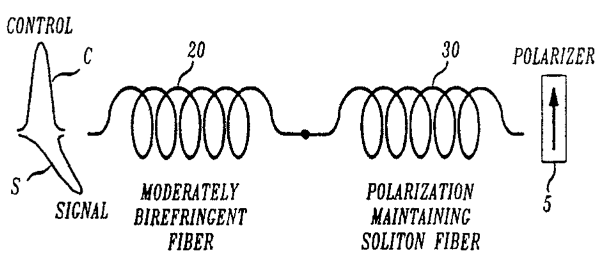
5,078,464 Jan. 7, 1992

Optical Logic Device

Inventor: Mohammed N. Islam.
Assignee: AT&T Bell Laboratories.
Filed: Nov. 7, 1990.

Abstract—An optical logic device based on the time-shift-keying architecture is described in which digital logic functions are realized by applying appropriate signal pulses to a nonlinear shift or "chirp" element whose output is supplied to a dispersive element capable of supporting soliton propagation. In an optical fiber realization of the optical logic device, two orthogonally polarized pulses are supplied to the combination of a moderately birefringent fiber acting as the nonlinear chirp element and a polarization maintaining fiber acting as the soliton dispersive delay element having a anomolous group velocity dispersion at the signal wavelengths of interest. A nonlinear frequency shift is created in one of the pulses in the former element through cross-phase modulation and, in turn, the frequency shift is translated into a temporal shift of the affected pulse in the latter element. These devices operate at switching energies approaching 1pJ.

11 Claims, 2 Drawing Sheets



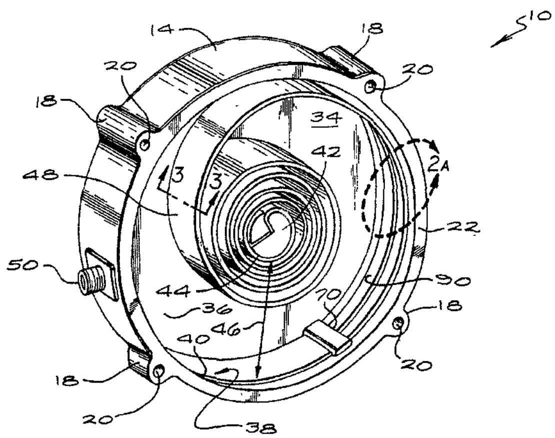
5,078,466 Jan. 7, 1992

Fiber-Optic Rotary Joint

Inventor: David B. MacCulloch.
Assignee: Allied-Signal, Inc.
Filed: Apr. 19, 1991.

Abstract—A fiber-optic rotary joint provides for a comparatively large number, up to 500 or more, of optical fibers to cross a rotary-stationary interface. A large, but finite number of turns are allowed between the rotary and stationary parts of the joint structure, but communication of optical signals along the fibers may continue uninterrupted while relative rotation of the joint components is underway. The joint also provides for environmental sealing and a possible pressure differential between the rotary and stationary environments connected by optical fibers through the inventive joint. Means are provided to safeguard the joint against overwinding as would result from an excessive number of relative rotations between the components of the joint.

24 Claims, 4 Drawing Sheets



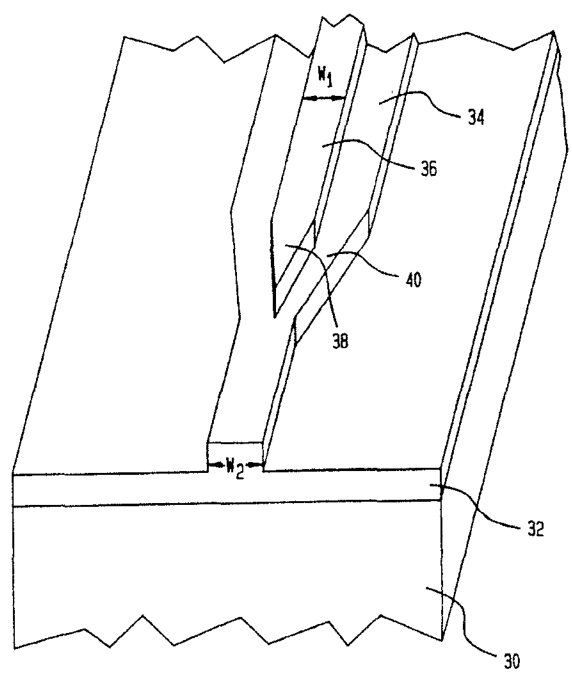
5,078,516 Jan. 7, 1992

Tapered Rib Waveguides

Inventors: Elyahou Kapon, Arie Shahar, Robert N. Thurston.
Assignee: Bell Communications Research, Inc.
Filed: Nov. 6, 1990.

Abstract—A tapered single-mode rib waveguide for which only laterally patterning is required. A sublayer is disposed between the low-index substrate and the high-index rib and has an intermediate index. Preferably a thin buffer layer of very low refractive index is disposed between the rib and the sublayer. The widths of the rib are chosen so that in a wide portion the optical power of the single-mode is concentrated in the rib or buffer layer but in a narrow portion the optical power is concentrated in the sublayer or substrate and additionally has a wide lateral distribution. A similar effect can be obtained by tapering an upper rib disposed on top of an untapered lower rib.

9 Claims, 4 Drawing Sheets



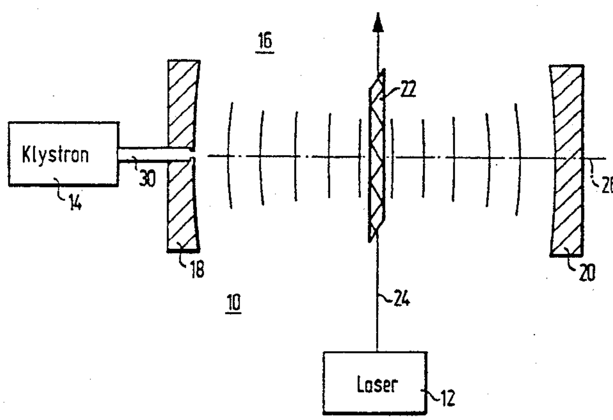
5,079,444 Jan. 7, 1992

Method and Aparauts for Producing a Nonlinear Intercation Between Two Electromagnetic Waves

Inventors: Reinald Kallenbach, Claus Zimmermann, Dieter Meschede, and Theodor Hänsch.
Assignee: Max-Planck-Gesellschaft.
Filed: Feb. 27, 1990.

Abstract—Method and apparatus for producing a non-linear interaction between two electromagnetic waves, e.g., a laser beam and a microwave beam, in a nonlinear optical medium, wherein one wave passes through a predetermined region of the medium in a zig-zag path, and the other traverses the predetermined region of the nonlinear medium in two opposed directions in such a manner that an interaction-production phase-matching of the two waves is obtained not only in the departing but also in the approaching segments of the zig-zag path.

10 Claims, 3 Drawing Sheets



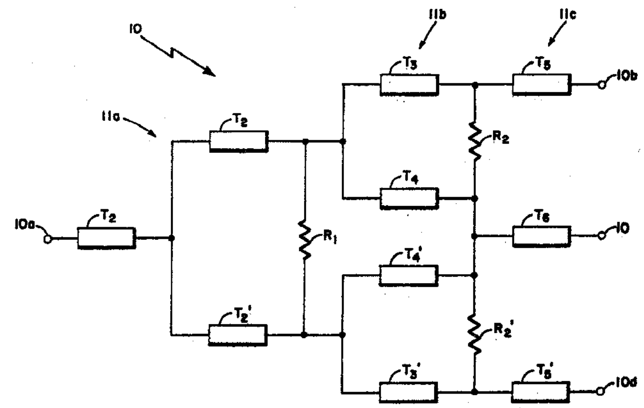
5,079,527 Jan. 7, 1992

Recombinant, In-Phase, 3-Way Power Divider

Inventor: Marc E. Goldfarb.
Assignee: Raytheon Company.
Filed: Dec. 6, 1990.

Abstract—A power divider circuit having an input port and three output ports is described. The circuit includes a first power divider stage having an input port which corresponds to the input of the power divider circuit and a pair of output ports with a first resistor coupled between the pair of output ports of the first stage. The power divider further includes first and second pairs of transmission lines with first ones of said lines of each pair having a first characteristic impedance and second ones of said lines having a second, different characteristic impedance generally equal to half of the characteristic impedance of the first ones of said lines. First ends of each one of the transmission lines of each pair are coupled to a corresponding port of the first power combined stage. Second ends of each of said lines or each pairs are coupled by second and third resistors. Second ends of the second transmission lines of each one of said first and second pairs of transmission lines are also connected together providing the one of the output ports of the power combiner circuit with the other two output ports of the power combiner circuit being provided at second ends of the first transmission lines in each one of said first and second pairs of transmission lines.

1 Claim, 3 Drawing Sheets



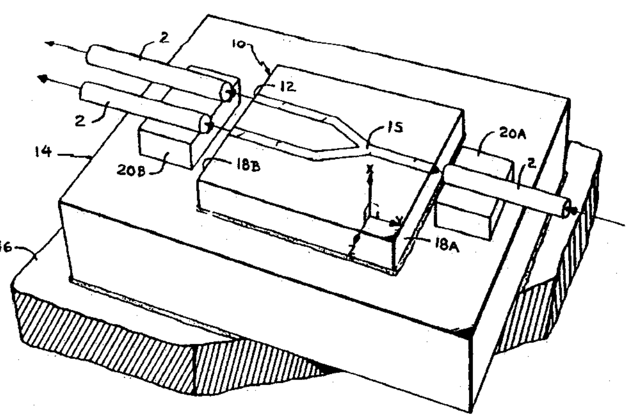
5,080,458 Jan. 14, 1992

Method and Apparatus for Positioning an Optical Fiber

Inventor: Bruce D. Hockaday.
Assignee: United Technologies Corporation.
Filed: Oct. 22, 1990.

Abstract—The alignment of an optical fiber (2) with a light port (18) of an I/O chip (10) is facilitated by a fiber carrier (20) having a surface (22) in which a plurality of closely spaced; axially extending fiber carrying grooves (30) are formed. The end (4) of an optical fiber (2) is supported in a first narrower and shallower V-shaped groove segment (32) with the tip (6) of the fiber (2) extending in a cantilevered fashion over a second wider and deeper V-shaped groove segment (34) with the tip end face (8) in facing relationship with the I/O chip (10). A ground electrode (40) is disposed on a wall of the first groove segment (32) in contact with the received end 4 of the fiber (2) for electrically grounding the fiber. A pair of independently energizible actuator electrodes (42, 44) are disposed on opposed side walls of the second groove segment (34). By selectively energizing the actuator electrodes 42, 44, an electrostatic field is imposed about the tip (6) of the fiber (2) thereby selectively moving the tip (6) relative to the I/O chip (10) in a direction normal to the axis of the groove (30).

12 Claims, 4 Drawing Sheets



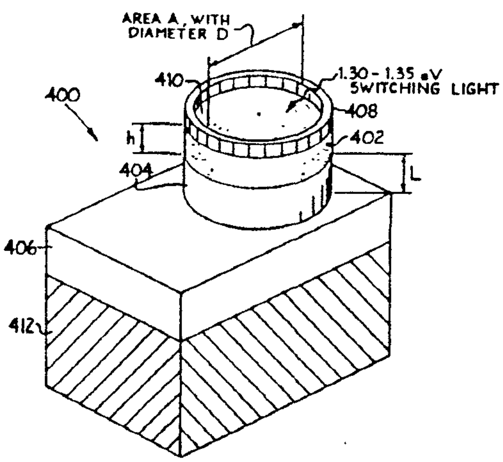
5,080,504 Jan. 14, 1992

Optical Switching Apparatus and Method

Inventors: Larry D. Partain, Gary F. Virshup, Jocelyn C. Schultz, and Maria L. Ristow.
Assignee: Varian Associates, Inc.
Filed: June 28, 1990.

Abstract—An apparatus and method for switching unpolarized light are provided. The apparatus includes GaInAs–GaAs optical switching devices that can be fabricated using conventional processes on a single wafer in matrix arrangement to provide an $n \times m$ cross bar switch. Switching is accomplished by shifting the band gap of the GaInAs material of a device using electrical or optical power to heat the material. Each switching device may comprise two-polarity (n/p) or single polarity (n or p) semiconductor materials.

23 Claims, 5 Drawing Sheets



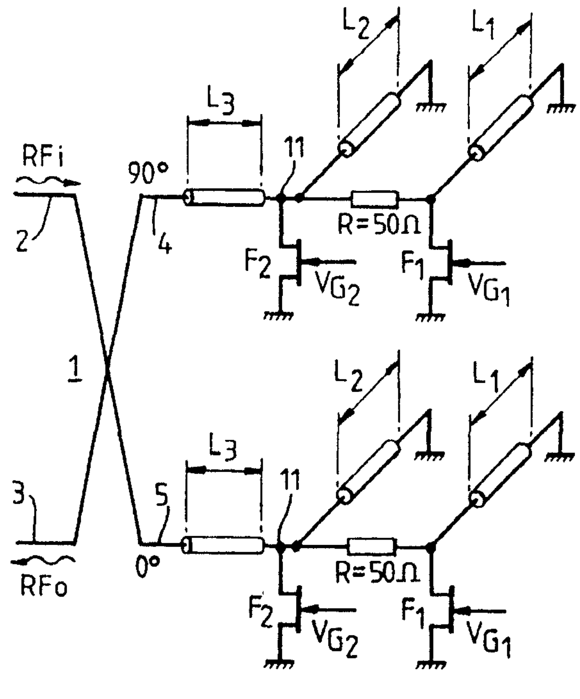
5,081,432 Jan. 14, 1992

Variable Bi-Phase Modulator Circuits and Variable Resistors for Microwave Signals

Inventors: Liam M. Devlin and Brian J. Minnis.
Assignee: U.S. Philips Corp.
Filed: Dec. 1990.

Abstract—A variable bi-phase modulator circuit for microwave signals includes a quadrature power divider (1) having signal input and output ports (2 and 3) and two control ports (4 and 5), and two variable resistors each having an input port (11). Each of the two variable resistors includes first and second microwave field-effect transistors (F1 and F2,) the drains of which are coupled together via an intermediate resistor (R). These resistors can be formed using microwave monolithic integrated circuit technology and can have very good impedance characteristics. The input port (11) of the variable resistor has a connection to the intermediate resistor (R) and to the drain of the first transistor (F2). Each transistor is connected with zero dc bias between its source and drain and has a channel resistance which changes with change in gate voltage (VG1, VG2). A shunt stub (L1, L2) is connected to the drain of each transistor (F1, F2) to at least partially compensate at the frequency of operation of the transistor for the source to drain capacitance and for shifts in reference plane due to changes in the gate voltage of each transistor.

10 Claims, 2 Drawing Sheets



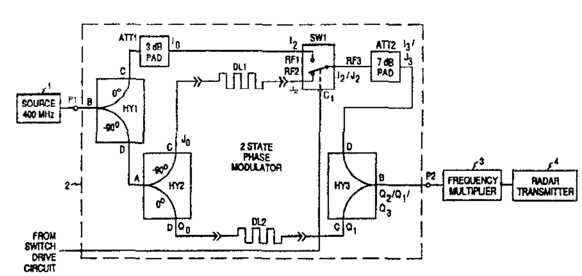
5,081,433 Jan. 14, 1992

Two-State Phase Modulator with Minimum Amplitude Modulation

Inventors: Bert K. Erickson, George C. Rosys, John F. Jureller, and Victor J. Jacek.
Assignee: General Electric Company.
Filed: Dec. 3, 1990.

Abstract—The invention relates to a two state phase modulator with minimum amplitude modulation. The modulator assumes two phase states differing by Θ where Θ is submultiple of 180° that permits a phase variation of 180° for phase-coded transmissions when the frequency of the phase-modulated carrier wave is multiplied by the reciprocal of the submultiple. Three equal components are derived in the phase modulator: an in-phase, an out of phase, and a quadrature phase component. The out of phase component is delayed in relation to the in-phase component by $\Theta/2$, while the quadrature phase component is delayed $\Theta/4$. The in-phase and out of phase components are then reduced by a factor $(2 \sin \Theta/2)$ selected such that when added to the quadrature component, the resultants have a magnitude equal to that of the quadrature component and differ in phase from the quadrature component by $\pm\Theta/2$. The modulator output is formed of the resultants supplied in alternation with the quadrature component at zero phase being supplied during the transitions. Amplitude variation during the phase modulation process is reduced to a fraction of a decibel.

9 Claims, 2 Drawing Sheets



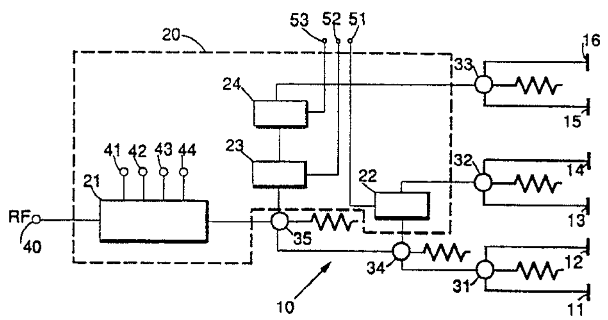
5,081,460 Jan. 14, 1992

Method and Apparatus for Testing Phase-Shifter Modules of a Phased-Array Antenna

Inventor: Sien-Chang C. Liu.
Assignee: Hughes Aircraft Company.
Filed: Jan. 22, 1991.

Abstract—Faulty subarray module circuit boards are detected in a phased array antenna having many subarray module circuit boards while the antenna is fully assembled and operationally integrated with a radar system. A far-field ratio frequency test source illuminates the antenna. Binary digital signals that control subarray steering bits are set to a reference setting. A particular subarray module circuit board that is under test has its 180° main-phase bit toggled between 0° and 180°. The radar selects the output of that particular subarray module by Doppler filter type of software filtering. The amplitude of the in-phase and quadrature phase signals from the radar is recorded. The binary digital signals that control subarray steering bits are set to a second setting. The 180° main-phase bit of the module under test is again toggle between 0° and 180°. The output of the module under test is again selected by Doppler filter type of software filtering. The amplitude of the in-phase and quadrature phase signals from the radar is recorded. The phase difference from the reference setting to the second setting is computed and compared with a predetermined threshold. If desired, the test source may have a multielement feed including multiple dipoles, each dipole having a radiation pattern wide enough to cover two rows of subarray modules, the test source being switched to the particular one of the dipoles that illuminates the row including the module under test.

14 Claims, 3 Drawing Sheets



5,082,342 Jan. 21, 1992

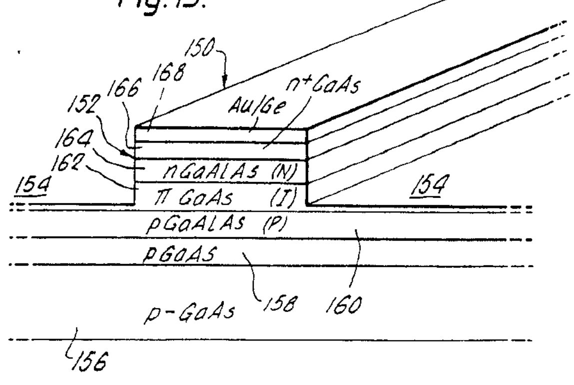
Electrooptic Waveguide Device

Inventors: David R. Wight, John M. Heaton, Meirion F. Lewis, and Christopher L. West.
Assignee: The Secretary of State for Defence in her Britannic Majesty's Government of the United Kingdom of Great Britain and Northern Ireland.
Filed: Oct. 31, 1988.

Abstract—An electrooptic waveguide device (10) comprises an assembly of waveguides (30) connected to a common light input region (41) and forming a common far field diffraction pattern (44). The device (10) comprises an n^+ GaAs substrate (14) bearing a waveguide lower cladding layer (16) of n^+ $Ga_{0.9}Al_{0.1}As$, which is in turn surmounted by a waveguide core layer (18) of n^- GaAs. The layer (18) has grooves (20) defining the waveguides (30), each of which has a respective Schottky contact (32). Each contact (32) is biased negative with respect to the substrate (14), which reverse biases the respective Schottky diode waveguide structure. The waveguide core layer (18) has electrooptic properties, and its refractive index varies with electric field. The phase of light emerging from each waveguide is therefore independently variable by means of its applied bias voltage. The waveguides (30) are arranged to provide output confined very largely to lowest order spatial modes, so that they produce a single far-field diffraction pattern (44). Varying the set of bias voltages applied to the waveguides (30) produces output phase variation which changes the position of the diffraction pattern principal maximum (46) to produce beam steering.

29 Claims, 17 Drawing Sheets

Fig. 13.



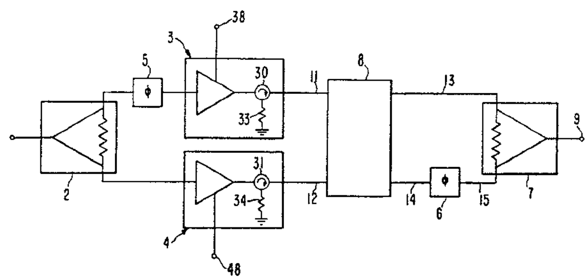
5,083,094 Jan. 21, 1992

Selective Power Combiner Using Phase Shifters

Inventor: Bjorn G. Forsber.
Assignee: Space Systems/Loral, Inc.
Filed: Sept. 28, 1990.

Abstract—A circuit for selecting and combining power signals of a pair of parallel amplifiers (3, 4) using phase shifters (5, 6) having fixed phase. Either amplifier (3, 4) may be selected to produce a power signal of power P at the circuit output (9), where P is the power at the output (11, 12) of each amplifier (3, 4). Alternatively, power from the two amplifiers (3, 4) may be combined to produce a signal of power 2P at the circuit output (9). By using a passive circuit to achieve the selection and combination, the use of heavier and less reliable relay switches is avoided.

11 Claims, 1 Drawing Sheet



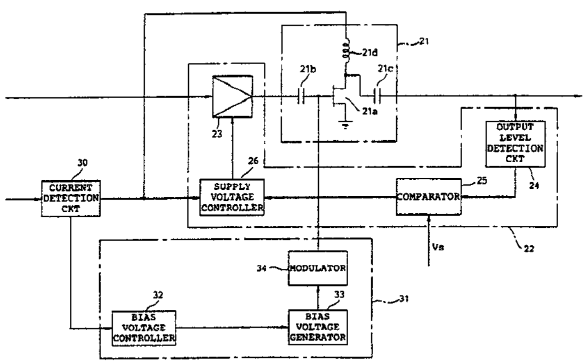
5,083,096 Jan. 21, 1992

High-Frequency Amplifier Circuit Capable of Optimizing a Total Power Consumption

Inventor: Shinichi Miyazaki.
Assignee: NEC Corporation.
Filed: May 31, 1990.

Abstract—In a high-frequency amplifier circuit comprising an input amplifier device (23) and an output amplifier (21) that are supplied with a total electric power of a supply current value variable dependent on a total power consumption in the input amplifier device and the output amplifier, a current detection circuit (30) detects the supply current value to produce a current detection signal representative of the supply current value. A bias voltage control circuit (31) controls a bias voltage of the output amplifier in response to the current detection signal to make the total power consumption have an optimum value. Preferably, the bias voltage control circuit should comprise a bias voltage generator for generating a control voltage, a bias voltage controller for producing a bias control signal dependent on the supply current value, and a modulator for modulating the control voltage into a modulated voltage for use as the bias voltage.

7 Claims, 8 Drawing Sheets



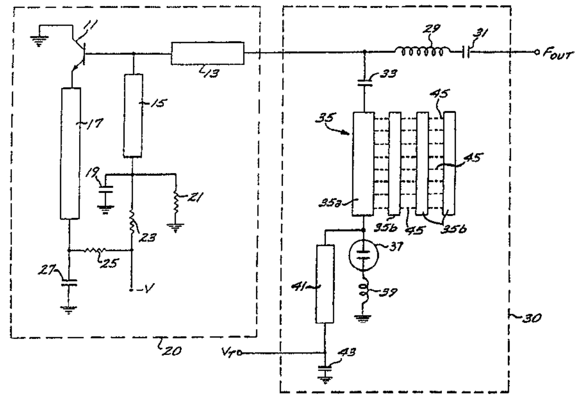
5,083,098 Jan. 21, 1992

Tunable VCO Frequency Sensitivity

Inventors: Raul Alidio and Robert Allison.
Assignee: Hughes Aircraft Company.
Filed: June 25, 1990.

Abstract—A voltage controlled oscillator having an active network and a tuning network that includes a transmission line impedance transformer having a first end coupled to an output circuit of the VCO, and having a selectable effective width that determines the tuning bandwidth of the oscillator. A varactor diode is coupled to the second end of the transformer line, and a bias line is coupled between a tuning port and the varactor diode. The transmission line impedance transformer more particularly includes a main transformer line, a plurality of transmission lines adjacent the main transformer line, and wire bonds for electrically connecting selected ones of the plurality of lines to the main transformer line, whereby connection of selected ones of the transmission lines to the main transformer line increases the effective width of the impedance transformer.

3 Claims, 2 Drawing Sheets



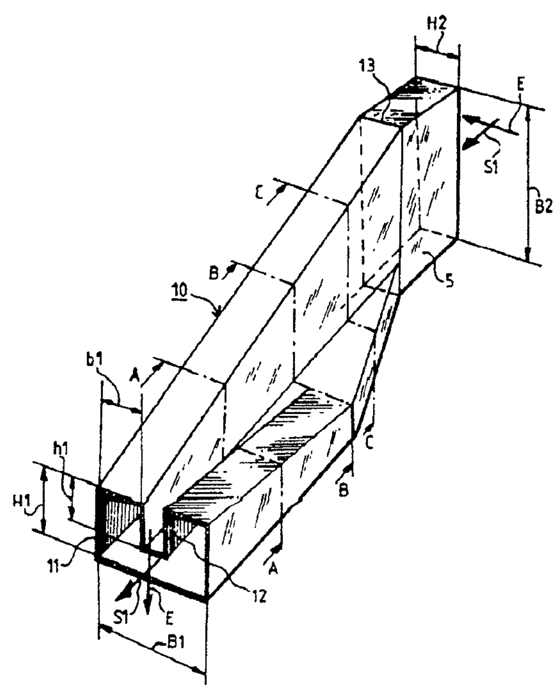
5,083,099 Jan. 21,1992

Field-Twisting Waveguide Junction

Inventor: Rolf O. E. Lagerlöf.
Assignee: Telefonaktiebolaget LM Ericsson.
Filed: Apr. 3, 1990.

Abstract—A field-twisting waveguide junction (20) for electromagnetic microwaves (S1) has a rectangle-like cross-section at one end (21) thereof. This cross-section deviates from a true rectangular shape, by virtue of an inwardly projecting ridge (22). The other end (23) of the junction (20) has a rectangular cross-sectional shape, and the cross-section of a central section (F-F) of the junction has an L-shape. The junction (20) comprises sections, in the illustrated embodiment six sections, the cross-sectional shapes of which are changed step-wise between the sections. The width direction (B2) of the rectangular cross-section (23) has the same directional sense as the height direction (h1) of the inwardly projecting ridge (22). The junction (20) is intended for connecting a rectangular waveguide to a ridge waveguide and transfer the microwaves (S1). The microwave has an electrical field vector (E) whose direction is rotated through one-quarter of a revolution during transfer of the microwave.

12 Claims, 6 Drawing Sheets



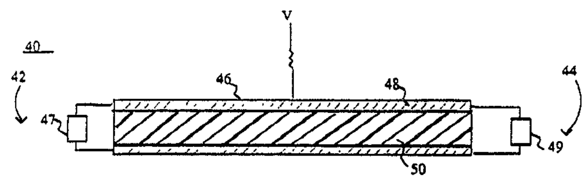
5,083,100 Jan. 21, 1992

Electronically Variable Delay

Inventors: Thomas B. Hawkins, Douglas A. MacIntyre, and Johannes A. S. Bjorner.
Assignee: Digital Equipment Corporation.
Filed: Feb. 26, 1991.

Abstract—An electronically variable delay line having adjustable delay and bandwidth characteristics is provided. A varactor diode functioning as a variable controlled capacitance is coupled between a signal conductor and a ground reference conductor, thereby segmenting the signal conductor into two, individual smaller segments of conductor that function as fixed inductances. The delay characteristic of the line is adjusted by varying the varactor's biasing voltage which, in turn, varies the varactor's capacitance. A staggered termination technique is implemented to stabilize the insertion loss characteristics of the delay line.

13 Claims, 6 Drawing Sheets



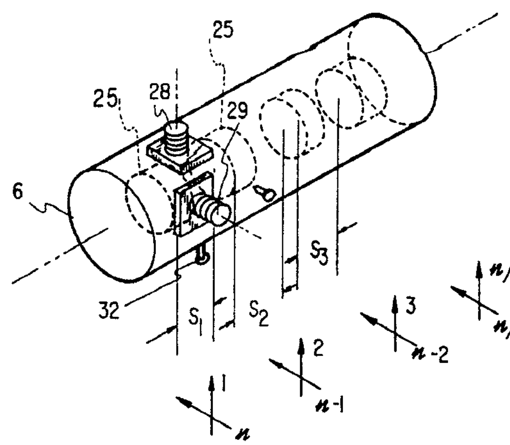
5,083,102 Jan. 21, 1992

Dual-Mode Dielectric Resonator Filters Without Iris

Inventor: Kawthar A. Zaki.
Assignee: University of Maryland.
Filed: Sept. 5, 1989.

Abstract—A microwave bandpass filter including dual-mode dielectric resonators mounted in a tubular enclosure to achieve coupling among the resonators without an iris. The filter is implemented in a canonical symmetric form, as longitudinal dual-mode realization or a canonical asymmetric form. The microwave bandpass filter has input and output coaxial probes located along the enclosure with tuning and coupling screws provided to enable adjustment control of the frequency of resonance of the dielectric resonators and to control the coupling of energy from one resonant mode to an orthogonal mode in the same resonator. Lastly, the coupling of energy from one resonator to an adjacent resonator is accomplished by properly placed coupling screws.

12 Claims, 8 Drawing Sheets



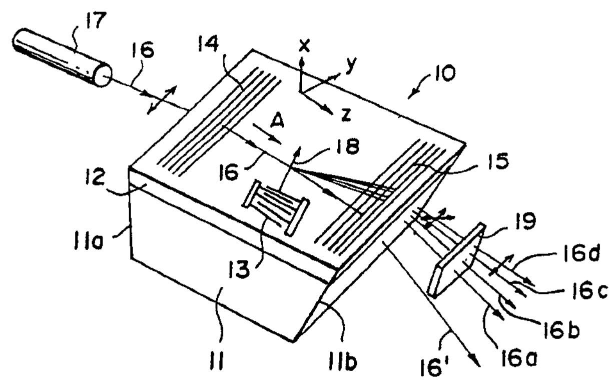
5,083,856 Jan. 28, 1992

Waveguide-Type Acoustooptic Device

Inventors: Masami Hatori and Hiroshi Sunagawa.
Assignee: Fuji Photo Film Co., Ltd.
Filed: Sept. 25, 1990.

Abstract—A light beam is introduced into an optical waveguide on a substrate of $LiNbO_3$, and diffracted by a surface elastic wave generated by a tilted-finger chirped interdigital transducer on the optical waveguide. The direction in which the light beam is guided through the optical waveguide is substantially aligned with the z-axis of the $LiNbO_3$ substrate. The light beam diffracted by the surface elastic wave and emitted out of the optical waveguide is applied to an optical member, such as a polarizing plate, a pinhole plate, or a light shield plate, which passes only a linear polarized component of the diffracted light beam.

4 Claims, 4 Drawing Sheets



5,084,681 Jan. 28, 1992

Digital Synthesizer with Phase Memory

Inventors: Albert W. Kovalick and Roland Hassun.
Assignee: Hewlett-Packard Company.
Filed: Aug. 3, 1990.

Abstract—In direct digital synthesizers in the prior art, the output signal maintains a phase continuity whenever it switches, or hops, frequency. This phase continuity shows up as a smooth change in phase from one frequency to the next; the phase of the last frequency transitions into the phase of the new frequency without any discernable disruption. Thus, whenever the output signal returns to a switched frequency that it previously has, the output signal at the newly returned switched frequency has a new phase relative to its previous one at that frequency. For some applications, like simulating continuous different frequency sources, this phase continuity is not desirable. To overcome this disadvantage, the preferred embodiment of the present invention provides phase memory to a direct digital synthesizer so that regardless of the frequency that the output signal switches to, the output signal at that frequency is able to maintain a constant phase relative to a reference system clock pulse. In other words, switching and returning the synthesizer output signal to a selected frequency does not change the phase of the output signal at that frequency; the output signal at each frequency has

the same constant phase as it has previously at that frequency. As a result, the synthesizer in accordance with the present invention appears to have a source of numerous continuous oscillators to which it can switch for a number of different frequencies, each having a constant phase.

13 Claims, 9 Drawing Sheets