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.

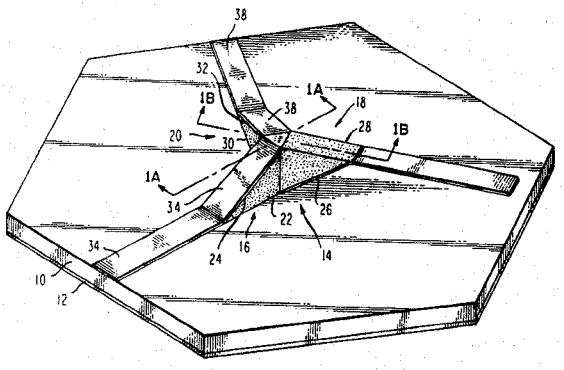
5,177,456 Jan. 5, 1993

Microstrip Ferrite Circulator for Substrate Transitioning

Inventors: Richard A. Stern and Richard W. Babbitt.
Assignee: The United States of America as represented by the Secretary of the Army.
Filed: May 22, 1992.

Abstract—A transitioning microstrip circulator. A Y-shaped circulator having two ports coupled to a first planar substrate and a third port coupled to a second planar substrate. The first and second planar substrates are substantially parallel and have the circulator sandwiched between them. The circulator selectively directs a millimeter wave signal along a millimeter wave transmission line to a selected port. Thereby, a signal can be coupled to circuit elements placed on each substrate. Circuit elements placed on the first and second substrate are stacked one on top of the other. This permits design flexibility and smaller packages for electronic devices.

6 Claims, 2 Drawing Sheets



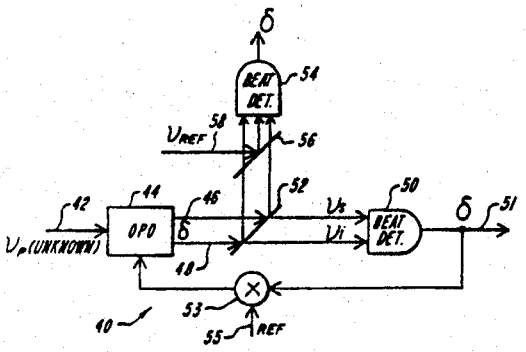
5,177,633 Jan. 5, 1993

Optical Parametric Oscillator Wideband Frequency Comb Generator

Inventor: Ngai C. Wong.
Assignee: Massachusetts Institute of Technology.
Filed: June 26, 1991.

Abstract—One or more optical parametric oscillators are arrayed selectively singly, serially, and/or in parallel, and each oscillator is responsive to an input pump beam having a fractional stability to produce output signal and idler beams having fractional stabilities that correspond to or are better than the fractional stability of the pump beam and in such a way that the sum of the frequencies of the output signal and idler beams of each optical parametric oscillator is constrained to be equal to the frequency of the input beam thereof. One or more beat detectors are responsive to selected one or more signal and idler beams and reference beams of already known frequency and fractional stability to provide one or more beat detection signals having linewidths corresponding to or better than the linewidths of the selected one or more signal and idler beams and reference frequency beams and in such a way that the frequency of the one or more beat detection signals is constrained to be equal to the difference in frequency between the selected one or more signal and idler beams and reference frequency beams. The sum and difference frequency constraints completely determine the absolute frequencies of the several beams thereby enabling in selected different configurations ultrahigh resolution optical frequency calibration and recalibration, broadband ultrahigh resolution frequency synthesis and, among others, wideband frequency combs of phase-locked reference frequency outputs.

4 Claims, 5 Drawing Sheets



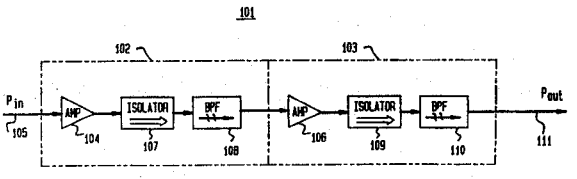
5,177,634 Jan. 5, 1993

High Gain Limiting Erbium-Doped Fiber Amplifier with Wide Dynamic Range

Inventor: Winston I. Way.
Assignee: Bell Communications Research, Inc.
Filed: Oct. 25, 1991.

Abstract—An optical limiting amplifier is disclosed having a high gain over a wide dynamic range of input power levels. The amplifier has an input stage (102) and an output stage (103), each of which includes an erbium-doped fiber amplifier (104, 106). The erbium-doped fiber amplifier in the input stage provides a high gain in order to saturate the amplifier in the second stage. The erbium-doped fiber amplifier in the output stage is fabricated with a small core diameter to saturate at reasonably small signal levels, and has a relatively lower total number of erbium ions in order to limit amplification once deep saturation is reached.

5 Claims, 2 Drawing Sheets



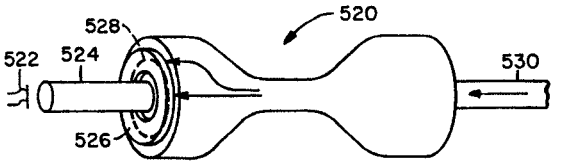
5,177,803 Jan. 5, 1993

Coaxial Optical Fiber Coupler Transmitter-Receiver Apparatus and Method of Making Same

Inventors: Mark A. Newhouse and David L. Weidman.
Assignee: Corning Incorporated.
Filed: Apr. 29, 1991.

Abstract—An optical two-way transmission-received communications system utilizing a coaxial coupler in place of a standard coupler, the optical system being capable of operation either in a single or multiple wavelength mode by designing the coupling region to have the proper length (i.e., either in 3dB or WDM operation), and further comprising a transmitter and a detector adjacent a coaxial coupler. The detector of the system is provided with a hole in its center in order to allow the transmitter access to the core waveguide of the coaxial coupler. The coaxial coupler may be formed from a rod in tube structure with a core waveguide extension adjacent the Tx/Rx and an integral pigtail on the opposite side of the coupler.

32 Claims, 4 Drawing Sheets



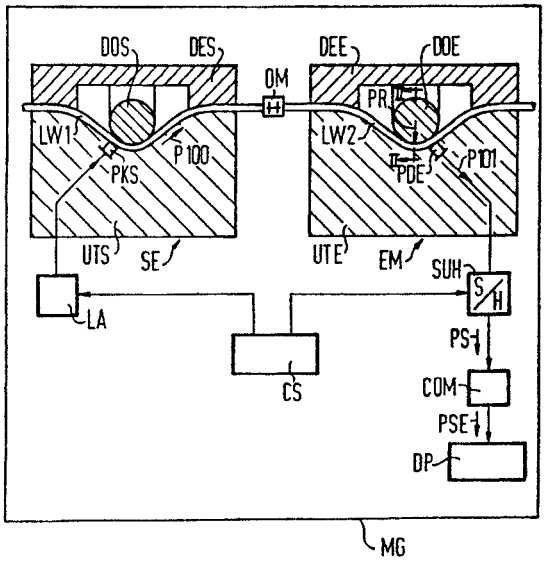
5,179,275 Jan. 12, 1993

Method for Measuring Light Being Coupled into and Out of a Light Waveguide

Inventors: Winfried Lieber and Gervin Ruegenberg.
Assignee: Siemens Aktiengesellschaft.
Filed: Oct. 28, 1991.

Abstract—During an initial pressure application on a light waveguide with a coating, which waveguide is subjected to a flexional coupling, deformation of the coating will occur and the value of an outfed light from the light waveguide will change as the deformation changes. The final intensity of the outfed light is obtained during the deformation of the coating by a process of extrapolating the final value from the initial measured values occurring during the initial deformation of the coating.

3 Claims, 3 Drawing Sheets



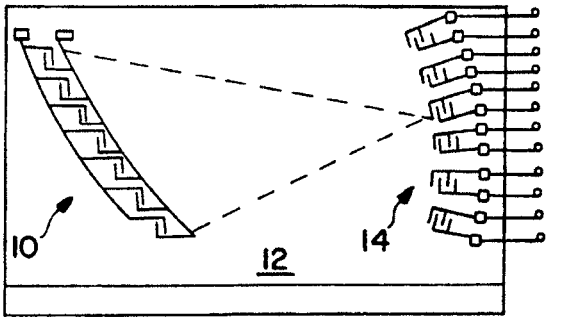
5,179,309 Jan. 12, 1993

Surface Acoustic Wave Chirp Filter

Inventors: Robert B. Stokes, Kuo-Hsiung Yen, and Jeffrey H. Elliott.
Assignee: TRW Inc.
Filed: Feb. 4, 1988.

Abstract—A surface acoustic wave (SAW) chirp signal processor having a piezoelectric substrate, an array of input transducers and an array of output transducers. In its chirp compression mode, the device has chirp signals applied in parallel to its input transducers and produces compressed output pulses at its output transducers, corresponding to selected chirp rates. The input transducers are successively offset with respect to a focal point on the array of output transducers, by distances that successively and linearly increase or decrease from transducer to transducer, consistent with the increase or decrease in the wavelength of the chirp signals. The device may also be used in a pulse expansion mode, by inputting a broadband pulse into a selected one of the output transducers. The input transducers then produce a chirp signal having a rate corresponding the selected to output transducer.

6 Claims, 1 Drawing Sheet



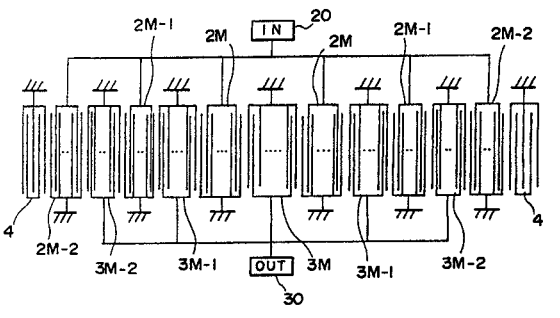
5,179,310 Jan. 12, 1993

Surface-Acoustic-Waver Filter Having a Plurality of Electrodes

Inventors: Yoshio Satoh, Osamu Ikata, Tsutomu Miyashita, Mitsuo Takamatsu, and Takashi Matsuda.
Assignee: Fujitsu Limited.
Filed: Mar. 19, 1991.

Abstract—A SAW device comprises a substrate, input and output interdigital electrodes provided on the substrate alternately to form a row of electrodes, and a pair of open strip reflectors disposed at both ends of the row, the input interdigital electrodes having a first pair number representing the number of pairs of opposing finger electrodes forming the input electrode, the output interdigital electrodes having a second pair number representing the number of pairs of opposing finger electrodes forming the output electrode, wherein the first pair number and second pair number are set different in the adjacent input and output electrodes with a predetermined ratio therebetween, the first pair number is changed in each input electrodes in the row, and the second pair number is changed in each output electrodes in the row.

15 Claims, 27 Drawing Sheets



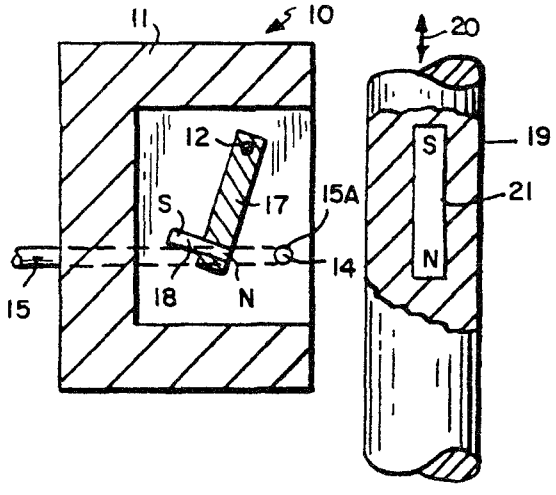
5,179,602 Jan. 12, 1993

Magnetically Operated Fiber Optic Switch forControlling Light Transmission

Inventor: Robert A. Norcross, Jr.
Assignee: Norcross Corporation.
Filed: Jul. 2, 1991.

Abstract—A switching device which uses a pivotable switching element carrying a first magnet and a movable component carrying a second magnet mounted adjacent thereto, the north and south poles of the magnets being arranged so that, when the movable component is moved to a first location, the magnets attract and the pivotable element is in a first switch position and, when the movable component is moved to a second location, the magnets repel and the pivotable element is in a second switch position.

7 Claims, 1 Drawing Sheet



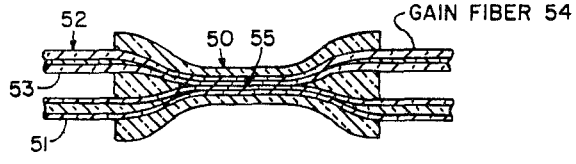
5,179,603 Jan. 12, 1993

Optical Fiber Amplifier and Coupler

Inventors: Douglas W. Hall, William J. Miller, Thomas W. Webb, and David L. Weidman.
Assignee: Corning Incorporated.
Filed: Mar. 18, 1991.

Abstract—Disclosed is a fiber amplifier system in which a gain fiber is operatively combined with a fiber optic coupler having first and second coupler optical fibers. The coupler fibers are fused together along a portion of their lengths to form a wavelength dependent coupling region, whereby most of the light power of a wavelength λ_s couples between them, and most of the light power of a wavelength λ_p that is introduced into the first fiber remains in it. The mode field diameter of the first coupler fiber is substantially matched to that of the gain fiber and is smaller than that of the second coupler fiber. One end of the first coupler fiber is spliced to the gain fiber. A transmission fiber is spliced to the second coupler fiber, and a laser diode introduces pumping light of wavelength λ_p to the first coupler fiber. The fiber optic coupler preferably includes an elongated body of matrix glass through which the first and second coupler fibers extend The matrix glass has a refractive index n_3 that is lower than that of the fiber claddings. The fibers are fused together along with the midregion of the matrix glass, the fiber cores being more closely spaced at the central portion of the midregion than at the body endfaces, thereby forming the coupling region.

31 Claims, 3 Drawing Sheets



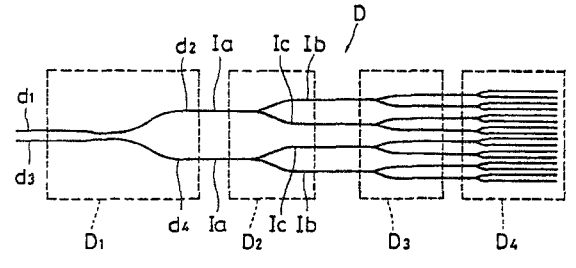
5,179,604 Jan. 12, 1993

Waveguide-Type Coupler/Splitter

Inventors: Hisaharu Yanagawa, Takeo Shimizu, Shiro Nakamura, and Isao Oyama.
Assignee: The Furukawa Electric Co., Ltd.
Filed: Dec. 24, 1991.

Abstract—A 2-input/2-output directional coupler is arranged as an element coupler/splitter for a first stage, and 1-input/2-output coupler/splitters are used as element coupler/splitters for a second stage and subsequent stages. Output ports of these element coupler/splitters are concatenated with input ports of other element coupler/splitters to form a 2-input/multi-output coupler/splitter. An optical signal can be inputted through one input port of the first-stage 2-input/2-output directional coupler, and an optical signal for optical line monitoring can be inputted through the other input port It is unnecessary, therefore, to use an optical wavelength division multiplexer/demultiplexer or other optical part which conventionally is connected at the time of optical line monitoring.

5 Claims, 3 Drawing Sheets



5,180,996 Jan. 19, 1993

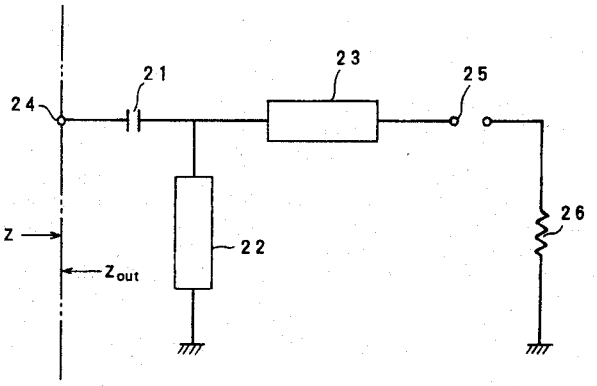
High Frequency Oscillator Having Capicitor and Microstrip Line Output Filter

Inventor: Nobuo Shiga.
Assignee: Sumitomo Electric Industries, Ltd.
Filed: Nov. 15, 1991.

Abstract—This invention relates to a high-frequency oscillator constituted by a signal generator for generating a high-frequency signal and a signal output circuit for outputting the generated high-frequency signal. The signal output circuit comprises a capacitor having one terminal to which the high-frequency signal output from the signal generator is applied, and a microstrip line having one terminal, which is connected to the other terminal of the capacitor, and

the other terminal set at a reference potential. This signal output circuit can be miniaturized compared with those constituted only by microstrip lines such as conventional signal output circuits. By properly setting the capacitance of the capacitor and the size of the microstrip line, a filter function can also be imparted to the circuit.

2 Claims, 5 Drawing Sheets



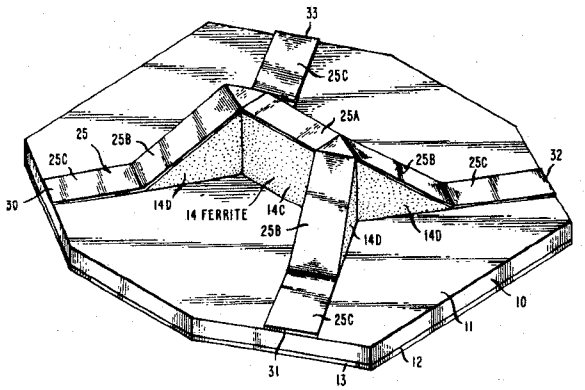
5,180,997 Jan. 19, 1993

Microstrip High Reverse Loss Isolator

Inventors: Richard A. Stern and Richard W. Babbitt.
Assignee: The United States of America as represented by the Secretary of the Army.
Filed: Oct. 24, 1991.

Abstract—A millimeter wave microstrip, high-reverse loss isolator is provided, comprising a monolithic ferrite element disposed on one surface of a section of microstrip dielectric substrate having a ground plane on the opposite substrate surface. The ferrite element has a pair of right prism-shaped central portions, each having three prism faces and two downwardly sloping transition arm portions extending radially outwardly from two of the prism faces. A bar-shaped connecting arm portion interconnects the remaining prism faces of the pair of central portions. All of the top surfaces of the ferrite element are covered with microstrip conductor and four sections of microstrip conductor are disposed on the surface of the substrate in alignment with the downwardly-sloping transition arm portions of the element. Permanent magnet biasing means mounting on the ground plane beneath the ferrite element central portions cause these portions to act as microstip Y-junction circulators. The shared connecting arm portion of the element connects the circulators in tandem so that a four port (two ports terminated) high-reverse loss isolator results.

6 Claims, 3 Drawing Sheets



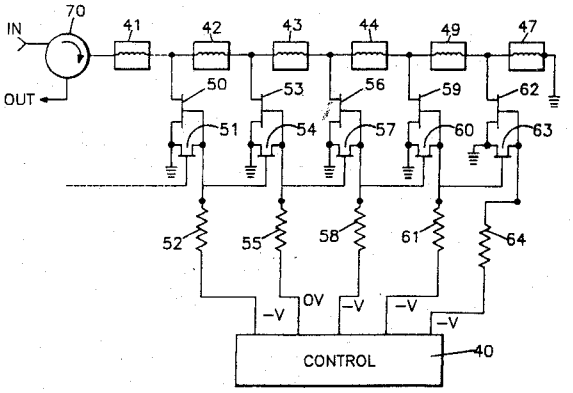
5,180,998 Jan. 19, 1993

Switched Transmission Line Phase Shifter Apparatus Employing Multiple Jets

Inventor: David A. Willems.
Assignee: ITT Corporation.
Filed: Nov. 5, 1991.

Abstract—A reflection-type phase shifter employs an artificial delay line which is constructed of high-impedance transmission line sections for the series inductive elements in the transmission line. Each junction between inductances in the transmission line is associated with a separate FET pair. The FET pair includes a first FET having the source of drain path coupled between the junction and a point of reference potential. The gate electrode of the first FET is coupled via the source to drain path of a second FET to the point of reference potential. The gate electrode of the second FET is coupled to one terminal of a resistor which is of a larger value compared to the ON resistance of the FET. This resistor has another terminal coupled to a control voltage source. Each junction or tap between inductors is returned to ground through an additional circuit where the gate electrode of the second FET in each circuit is coupled to that resistor which is also coupled to the gate electrode of each first FET in the FET pair. In this manner, when a given FET is selected and biased ON to implement a given length line, each FET device which is further down the chain is also operated, based on the cascaded arrangement of FETs. In circuit operation, each FET which is further down the chain automatically conducts due to the difference in the ON resistance of the FET as compared to the value of the above noted resistor. The circuit eliminates the need for complex digital control by automatically switching all the FETs ON between the FET selected and the shorted end of the transmission line.

15 Claims, 2 Drawing Sheets



5,181,134 Jan. 19, 1993

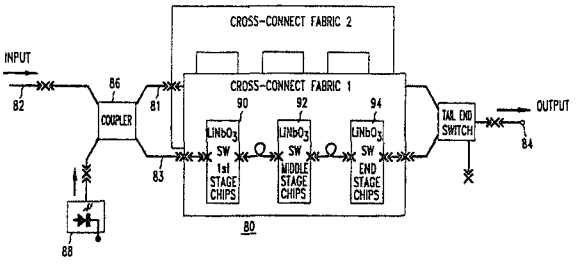
Photonic Cross-Connect Switch

Inventors: Mohammed T. Fatehi and Nattu V. Srinivasan.
Assignee: AT&T Bell Laboratories.
Filed: Mar. 15, 1991.

Abstract—This invention relates to an optical cross-connect switch which is substantially loss-less and is transparent to signal bit rate, format and modulation scheme. The optical cross-connect switch can be comprised of at least two stages of chips coupled in tandem via optical fibers. Each chip can be of lithium niobate having a plurality of digital switch elements or directional couplers which, by means of an electric field, can selectively switch optical energy from one waveguide to another. The chips are coupled together via optical fiber amplifiers and the optical fiber amplifiers are pumped by optical pumps, e.g., 1.48 μm CW, laser pumps, coupled to appropriate nodes within either one or both of the chips. In operation, the pump energy is switched

through the chips along with the optical data signals to pump only those optical fiber amplifiers which are in the optical data signal path.

8 Claims, 12 Drawing Sheets



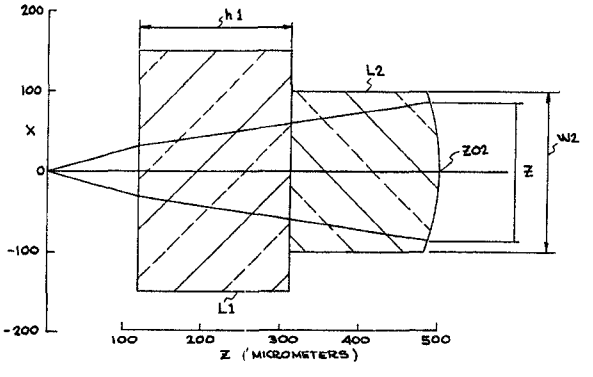
5,181,224 Jan. 19, 1993

Micro-Optic Lenses

Inventor: James J. Snyder.
Assignee: University of California.
Filed: May 10, 1991.

Abstract—The present invention provides several novel diffraction limited microlens configurations which are especially valuable for use in conjunction with laser diodes, and optical fibers. Collimators, circularizers and focusers (couplers) are provided.

35 Claims, 10 Drawing Sheets



5,182,787 Jan. 26, 1993

Optical Waveguide Structure Including Reflective Asymmetric Cavity

Inventors: Greg E. Blonder, Mark A. Cappuzzo, Harold R. Clark, Ronald E. Scotti, and Yiu-Huen Wong.
Assignee: At&T Bell Laboratories.
Filed: Mar. 5, 1992.

Abstract—A turning mirror in an optical waveguide structure is made by etching in the upper surface of the structure a cavity (18) that intercepts the path of light propagated by the waveguide (15, 16, 13). Preferably, the cavity is made to be asymmetric with the side (25) of the cavity remote from the waveguide sloping at typically a forty-five degree angle. The asymmetry can be introduced by using mask and etch techniques and treating the surface of the structure such that the etchant undercuts the mask on the side of the cavity remote from the waveguide to a greater extent than it undercuts the mask on the side of the cavity adjacent the waveguide.

8 Claims, 4 Drawing Sheets