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.

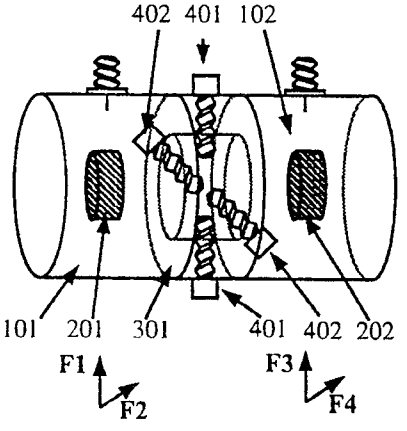
5,268,659 Dec. 7, 1993

Coupling for Dual-Mode Resonators and Waveguide Filter

Inventors: Kawthar A. Zaki and Seng-Woon Chen.
Assignee: University of Maryland.
Filed: Apr. 29, 1991.

Abstract—Dual-mode resonators are coupled together to from a highly selective bandpass filter by means of a short section of waveguide. The short sections have cutoff frequencies beyond the passband of the filter. The coupling is adjustable over a wide range by means of adjustable screws. The coupling means is applicable to both empty cavities and dielectric-resonator-loaded cavities.

12 Claims, 5 Drawing Sheets



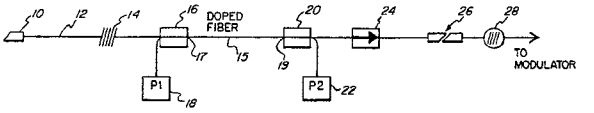
5,268,910 Dec. 7, 1993

Superluminescent Optical Source

Inventor: David R. Huber.
Assignee: General Instrument Corporation.
Filed: July 27, 1992.

Abstract—An optical source particularly suitable as a pump is provided. A gain medium such as a thulium-doped fiber has an input end and an output end. The input end is optically coupled to a reflector to cause spontaneous emissions within a predetermined band exiting the input of the gain medium to be reflected back into the medium. Spontaneous emissions outside of the predetermined band are lost. An optical isolator can be provided to prevent the optical source from lasing, resulting in a moderate bandwidth optical pump. A cascaded embodiment is disclosed, in which the gain medium is followed by an optical amplifier for increased power.

20 Claims, 3 Drawing Sheets



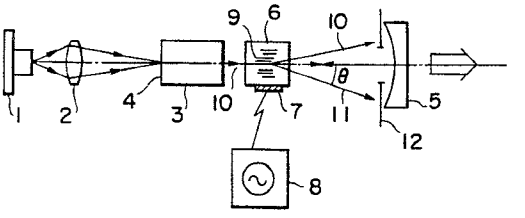
5,268,912 Dec. 7, 1993

Harmonic Light Source Capable of being Optically Modulated and Optical Information Processing Apparatus Employing the Same

Inventor: Kimio Tatsuno, Michael McLoughlin, Tsuyoshi Toda.
Assignee: Hitachi, Ltd.
Filed: May 28, 1991.

Abstract—There is disclosed a harmonic light source that comprises: a laser light source for radiating a pumping laser beam; a laser active medium for performing a laser oscillation by receiving the laser beam from said laser light source; a resonator being formed between a reflecting surface and said laser active medium; and a harmonic generating medium provided in said resonator for generating a harmonic, and which serves to modulate the harmonic by applying a supersonic wave to one of said laser active medium and said harmonic generating medium.

22 Claims, 4 Drawing Sheets



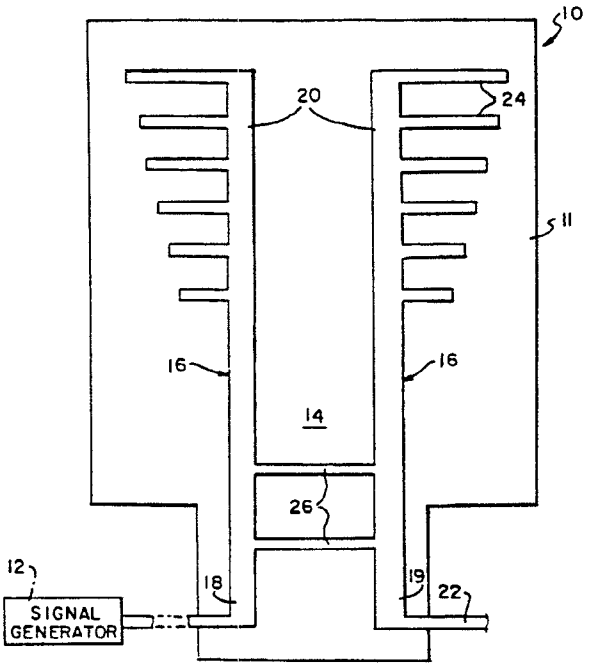
5,270,671 Dec. 14, 1993

Negative Slope Phase Skewer

Inventor: Timothy G. Waterman.
Assignee: Westinghouse Electric Corp.
Filed: Aug. 7, 1992.

Abstract—A negative slope phase skewer for use between radiating elements of series-fed antenna array. The phase skewer has a four-part coupler having two segments lying parallel to one another, each segment being a near and a far branch. The two near branches connect to the transmission line, while the far branches are at some distance from the transmission line. A series of spaced-apart, progressively longer, higher-impedance, open-circuited stubs extends outward perpendicularly from each far branch. Two conductive connections connect the two segments between the transmission line and the stubs. Each stub is designed to be one quarter wavelength long of an average frequency in a band region of an operating band width, and the stubs are spaced apart by a quarter wavelength of the midpoint of the operating band.

5 Claims, 1 Drawing Sheet



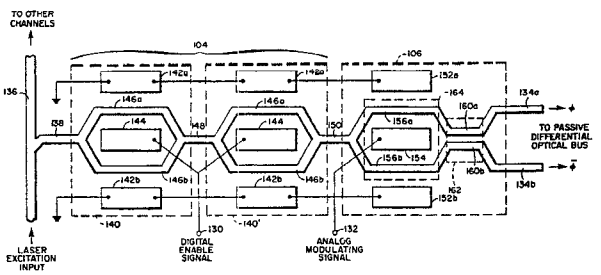
5,271,074 Dec. 14, 1993

Integrated Optical Waveguide Apparatus

Inventor: Christopher S. Tocci.
Assignee: Raytheon Company.
Filed: Nov. 18, 1991.

Abstract—A cryogenic signal coupling apparatus includes a laser that launches optical power into an integrated optical waveguide (IOW) within a cryogenic region via an imaging lens. This optical power is then equally split by a passive optical splitter and fed to one or more 1X2 IOW devices. Within the cryogenic region, a plurality of infrared sensing photodiodes provide electrical signal outputs in response to optical stimuli. These signal outputs are amplified and selected by a multiplexing arrangement for application as the modulating signal to one of the 1X2 IOW's. Control electronics also within the cryogenic region supply timing and control information to the other electronics therein. The IOW's modulate their input optical power in accordance with their respective modulating electrical input signals, and provide differential optical outputs that are directed across the thermal barrier to individual differential optical receivers. In one embodiment, the electrical signal from the light sensors is selected by an electrical multiplexer for application as the modulating signal to a single optical modulator, while in a second embodiment, there is disclosed an optical modulator associated with each light sensor and the source light power to be modulated is selectively switched to only one modulator.

17 Claims, 5 Drawing Sheets



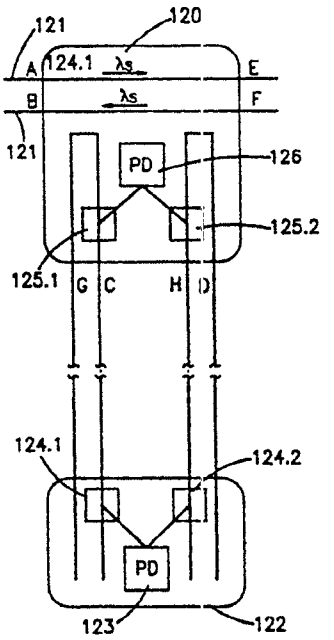
5,271,075 Dec. 14, 1993

Fiber Optic Switch with Remote Optical Powering

Inventors: Fritz Gfeller, Peter L. Heinzmann, Oliver Martin, Johann R. Mueller.
Assignee: International Business Machines Corporation.
Filed: Mar. 17, 1992.

Abstract—This invention relates to a remotely optically powered fiber optic switch, e.g. in a fiber optic network, and a GRIN-rod (graded-Refractive-Index-rod) lens with integrated planar mirror as a switching element, particularly suited for fiber optic switches. A distribution panel in which the switching element, a wavelength-division demultiplexer, a light-into-current converter, and an actuator for the switching element are situated, is remotely optically powered from a station in the network. Part of this station is a laser diode that feeds a powering lightwave via a wavelength-division multiplexer into an optical fiber interconnecting the station with the distribution panel. This fiber can also be used for data transmission. The light-into-current converter receives the powering lightwave and generates an electric current for driving the actuator and moving the switching element. A GRIN-rod lens with integrated planar mirror serves as switching element by rotating it in a ferrule and establishing different light paths depending on the position of the integrated mirror with respect to lightwaves optically coupled to the end facets of the GRIN-rod.

25 Claims, 7 Drawing Sheets



5,271,078 Dec. 14, 1993

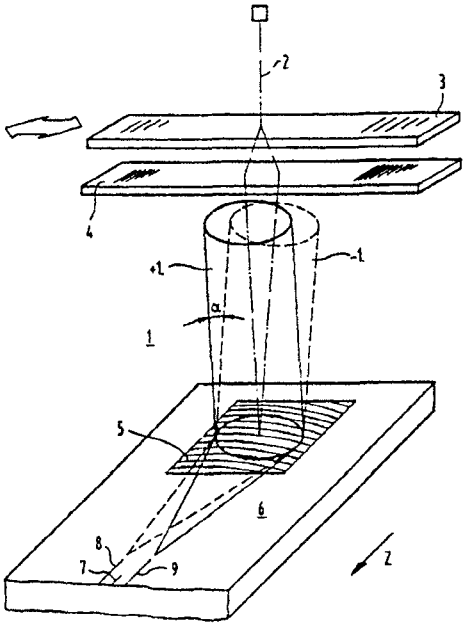
Device for Coupling and/or Decoupling Beams of Light, with an Integrated Optical Component

Inventors: Andreas Franz and Michael Allgauer.
Assignee: Dr. Johannes Heidenhain GmbH.
Filed: May 20, 1992.

A measurement device having a correction grating associated with a gauge deflects two diffracted partial beams overlappingly, at a very small angle (α), onto a single coupling grating. From there, two waveguides located closely

beside one another are used to introduce the beams into a coupler, and the beams are superimposed and evaluated in a known manner. Thus, a position measuring device can be drastically reduced in its structural size with the aid of an integrated optical component.

24 Claims, 1 Drawing Sheet



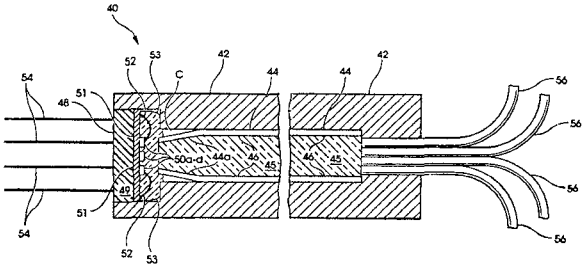
5,271,079 Dec. 14, 1993

Light-Mixing Device with Fiber Optic Output

Inventor: Frank H. Levinson.
Assignee: Finisar Corporation.
Filed: Nov. 8, 1991.

***Abstract*—A light-mixing device includes multiple light sources supplying light into a mixing rod. The mixing rod mixes the light and supplies it to a plurality of output optical fibers. The physical configuration of the mixing rod is such that light from the various light sources is coupled to each of the output fibers in such a fashion that the light carried by each of the fibers is relatively equal in intensity. The mixing rod structure is larger than the diameter of a single fiber to enable coupling light into multiple fibers. The illumination sources disclosed are narrow-band light emitting diodes wherein light having a narrow frequency range is produced by each LED. Multiple LED's producing light in several distinct ranges are used.**

24 Claims, 1 Drawing Sheet



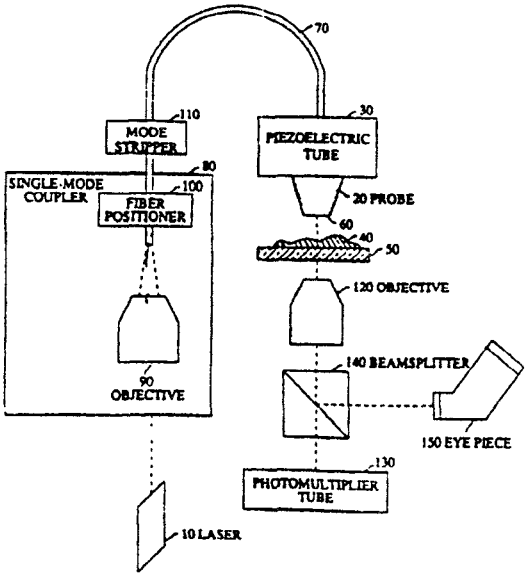
5,272,330 Dec. 21, 1993

Near Field Scanning Optical Microscope having a Tapered Waveguide

Inventors: Robert E. Betzig and Jay K. Trautman.
Assignee: Westinghouse Electric Corp.
Filed: Aug. 7, 1992.

***Abstract*—An optical system useful. e.g., for near-field scanning optical microscopy, is provided. The system incorporates a probe having improved properties. In one embodiment, the probe comprises a tapered and partially metallized portion of a single-mode optical fiber.**

15 Claims, 6 Drawing Sheets



5,272,457 Dec. 21, 1993

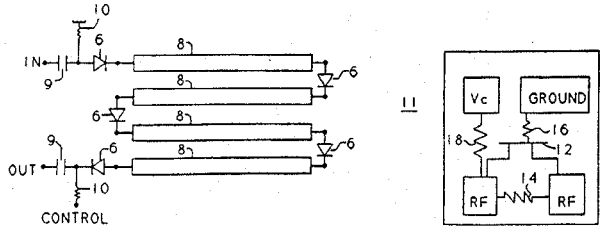
High-Isolation Integrated Switch Circuit

Inventors: Douglas Heckaman, Augusto E. Rodriguez, Jerry Schappacher.
Assignee: Harris Corporation.
Filed: Mar. 10, 1992.

***Abstract*—A high-isolation broadband switching circuit includes a plurality of switching elements alternatingly coupled in series with transmission line segments. Each switching element has a low or very high impedance between first and second points responsive to first and second values of a control voltage, respectively. In a first embodiment , the switching element includes a p-i-n diode having a cathode coupled to a first transmission line and an anode coupled to a second transmission line. In a second embodiment, the switching element includes a field effect transistor (FET) having a drain coupled to a first transmission line and a source coupled to a second transmission line. A first resistor is coupled between the drain and the source for DC continuity between the drain and the source and a second resistor coupled between a gate of the FET and ground for DC continuity. A bias voltage source is coupled through a resistor to one of a source and a drain of one of the FET's. A bias voltage propagates through each transmission line and each first resistor, so DC continuity is provided. The bias voltage has a first value that causes the switching elements to have a low impedance to place the switching circuit in an ON state and a second value that causes the switching elements to have a high impedance to place the circuit in a nonconductive state. The**

high impedance of the switching elements effectively opens the connections between the transmission lines.

5 Claims, 1 Drawing Sheet



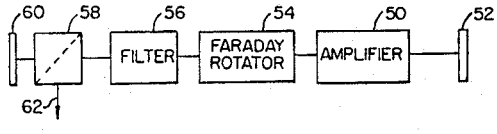
5,272,560 Dec. 21, 1993

Variable Spectral Width Multiple Pass Optical Noise Source

Inventors: Douglas M. Baney and Wayne V. Sorin.
Assignee: Hewlett-Packard Company.
Filed: Mar. 30, 1992.

Abstract—An apparatus for creating an optical noise of a predetermined bandwidth that uses an optical amplifier, which amplifies optical noise components and produces unpolarized optical noise by spontaneous emission, a mirror to reflect the optical noise components back to the optical amplifier, and a filter that filters out optical noise components outside the predetermined optical bandwidth. The filter is located so that optical noise components passed by the filter are amplified in the optical amplifier during an additional amplification. Optionally, a polarizer and Faraday rotator are used in the apparatus. The optical noise created in the optical amplifier is polarized in the polarizer after two amplifications, rotated in the Faraday rotator, then amplified two more times before leaving the apparatus.

12 Claims, 2 Drawing Sheets



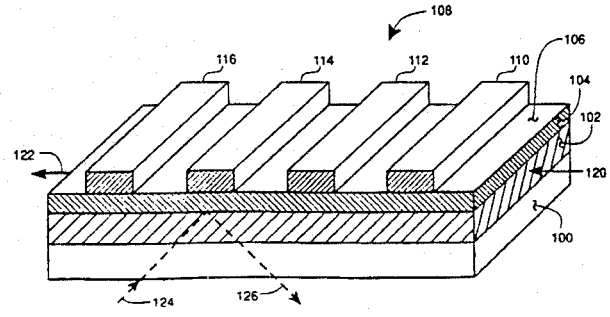
5,274,246 Dec. 28, 1993

Optical Modulation and Switching with Enhanced Third-Order Nonlinearity Multiple-Quantum–Well Effects

Inventors: Frank K. Hopkins, Joseph T. Boyd, Howard E. Jackson.
Assignee: The United States of America as represented by the Secretary of the Air Force.
Filed: May 4, 1992.

Abstract—A multiple-quantum–well arrangement that achieves significantly improved third-order optical nonlinearity in a semiconductor device by way of spatially periodic electrodes applied to the semiconductor device. The spatial period of the applied electrodes and the resulting exciton confinement dimension is improved over that of previous multiple-quantum-well structures and to the Bohr radius range of dimensions for the semiconductor material by way of available improved electrode fabrication arrangements. Use of the achieved multiple-quantum-well superlattice device in nonlinear optical apparatus, especially of the switching and modulating type, is contemplated with application in the fields of telecommunications, computing, and military equipment being probable.

20 Claims, 2 Drawing Sheets



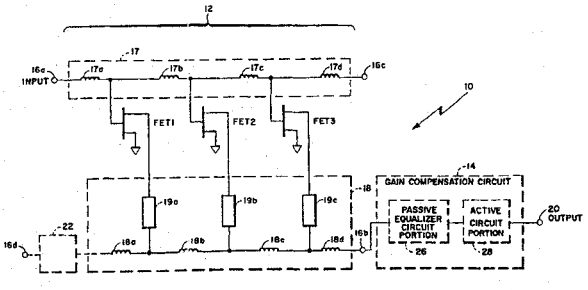
5,274,339 Dec. 28, 1993

Gain Compensation Circuit

Inventors: Gary A. Wideman and Michael Baladjanian.
Assignee: Raytheon Company.
Filed: Aug. 27, 1992.

Abstract—A circuit for compensating for GaAs FET amplifier gain variations over a frequency band as a function of temperature. The circuit includes a passive equalizer circuit having a fixed gain over the frequency band and an active equalizer circuit having a gain that varies over the frequency band as a function of temperature. The passive and active equalizers are coupled in series. The active equalizer circuit comprises varactor diodes in a low-pass filter arrangement with the bias voltage of the varactor being provided by an external driver controlled by a temperature sensitive thermistor. As the value of the varactor's junction capacitance is increased (as a function of the temperature controlled bias voltage), the cutoff frequency of the low-pass filter decreases.

15 Claims, 3 Drawing Sheets



5,274,341 Dec. 28, 1993

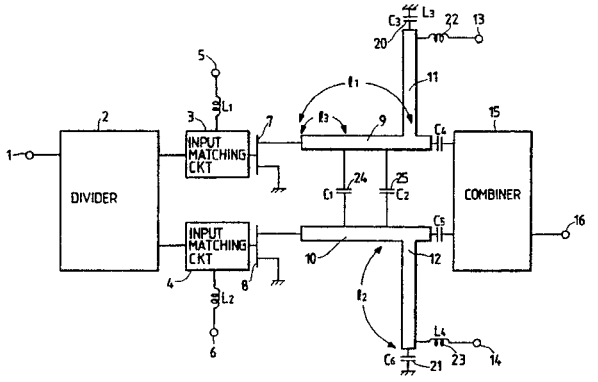
High-Frequency Power Amplifier

Inventors: Kenji Sekine, Masami Ohnishi, Haruhiko Funaki, Nobuo Masuda, Akio Iso.
Assignees: Hitachi, Ltd. and Space Communications Research Corporation.
Filed: July 17, 1992.

Abstract—A high-frequency power amplifier comprises a pair of FET's, a divider that supplies opposite-phase versions of a signal to be amplified to the FET's, distributed-parameter transmission lines connected respectively at one

ends thereof to output electrodes of the FET's, and a combiner that combines signals appearing at other ends of the transmission lines into a signal of a common phase. Stubs that short-circuit for even harmonics included in output signals of the FET's are connected, respectively, to the transmission lines at positions distant from the output electrodes of the FET's by a multiple of a quarter wavelength of the fundamental wave included in the output signals of the FET's. A first capacitor is connected between the transmission lines at positions distant from the output electrodes of the FET's by the 1/12 wavelength of the fundamental wave included in the output signals of the FET's so that the output electrodes of the FET's are open for the third harmonic, and a second capacitor is connected between the transmission lines at positions between the connecting positions of the first capacitor and the connecting positions of the stubs so as to perform impedance matching for the fundamental wave included in the output signals of the FET's.

6 Claims, 6 Drawing Sheets



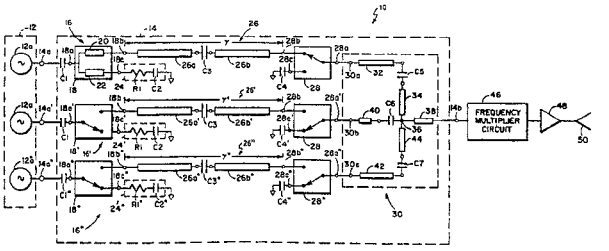
5,274,343 Dec. 28, 1993

Plural Switch Circuits having RF Propagation Networks and RF Terminations

Inventors: Mark E. Russell, John F. Mara, Jr., Edward G. Daly, III.
Assignee: Raytheon Company.
Filed: Aug. 6, 1991.

Abstract—A radio frequency circuit includes a first RF switch having a first common port coupled to an input port of the switch circuit and a first pair of branch ports and a second RF switch having a second common port coupled to an output port of the circuit and a second pair of branch ports. The radio frequency circuit further includes an RF propagation network having a first end coupled to a first one of said first pair of branch ports of said first RF switch and a second end coupled to a first one of said second pair of branch ports of said second RF switch. The radio frequency circuit further includes an RF termination having an impedance characteristic corresponding to an impedance characteristic of said first common port and having a first end coupled to a second one of said first pair of branch ports of said first RF switch and a second end coupled to a first reference potential.

9 Claims, 5 Drawing Sheets



5,274,487 Dec. 28, 1993

Photonic Switching System

Inventors: Nobuhiro Funimoto and Hiroyuki Rokugawa.
Assignee: Fujitsu Limited.
Filed: Dec. 27, 1990.

Abstract—A photonic switching system includes an optical link conversion board having a first end and a second end opposite to the first end, a plurality of wavelength converter elements arranged at a constant pitch along the first end of the optical link conversion board and converting input optical signals into optical signal components having different wavelengths, a combiner for combining the optical signal components received from the wavelength converter elements into an optical signal that includes optical signal components having a plurality of wavelengths, a plurality of light output parts arranged at a constant pitch along the second end of the optical link conversion board, and a deflector for sequentially deflecting the optical signal from the combiner to an arbitrary one of the light output parts in response to a control signal so that the optical signal at the arbitrary light output part includes a plurality of optical signal components having different wavelengths.

22 Claims, 16 Drawing Sheets