Letters

Reply to Comments on "Microwave Diffraction Tomography for Biomedical Applications"

J. CH. BOLOMEY, A. IZADNEGAHDAR, L. JOFRE, CH. PICHOT, G. PERONNET, AND M. SOLAIMANI

The comment made by Drs. L. Larsen, T. Guo, and W. Guo is worth noting and requires further explanations. Our reconstruction process is effectively based on a spectral domain approach, but does not involve identity (1), which is no longer valid inside the object under investigation. Instead, we use the relation existing between the Fourier-Transform of the normalized current distribution and the Fourier-Transform of the scattered field in the plane of measurement. The relevant equations are derived in [1] and a paper has been sumbitted for publication in the IEEE TRANSACTIONS ON ANTENNAS AND PROPAGATION [2].

On the other hand, L. Larsen, T. Guo, and W. Guo take profit from their comment to suggest another approach based on the inverse scattering theorem. This approach seems to be very attractive from its generality. It can be seen as a reaction matching technique applied to the integral equation relating the scattered field to the equivalent currents [3]. This integral has been considered recently by other authors [4] who have shown that using regularization techniques is absolutely necessary in order to get reasonable accuracy with noise corrupted samples of the scattered field.

Perhaps the reaction concept will improve the behavior of the reconstruction process. But, the practical problem remains the selection of the test functions $\{\vec{J}_n\}$ in order to get a pulse response $\vec{A}_w$ of acceptable sharpness. From a purely theoretical point of view, the pulse response can be as sharp as desired, even with a limited extent of the support of the testing functions. The price to pay is oversampling and the result is very high and oscillatory values of $\{\vec{J}_n\}$ which make that the reconstruction process is very noise sensitive. Such phenomena are usual as far as superresolution or superdirectivity is involved. This is the reason why we are expecting practical results with a great interest.

Manuscript received January 3, 1984.

The author is with the Laboratóire des Signeaux & Systèms, ÉcoleSupérieure D'Électricité, Plateau du Moulon, 91190 Gif-Sur-Yvette, France.

REFERENCES

[1] Ch. Pichot, Thèse de Doctorat es Sciences, University of Paris-XI, Apr. 1982 (available from the author).

[2] Ch. Pichot, L. Jofre, G. Peronnet, and J. Ch. Bolomey, "Active microwave imaging of inhomogeneous bodies," submitted to *IEEE Trans. Antennas Propagat.*

[3] J. H. Richmond, "A reaction theorem and its application to antenna impedance calculations," *IRE Trans. Antennas Propagat.*, pp. 515–520, 1961.

[4] M. M. Ney, S. S. Stuchly, A. M. Smith, and M. Goldberg, "Electromagnetic imaging using moment methods," in *Proceed. URSI Symp.*, Aug. 23–26, 1983, (Santiago de Compostela, Spain).

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, Washington, DC, 20231.

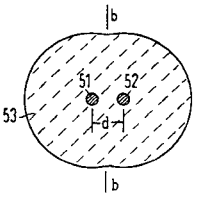
4,410,236 Oct. 18, 1983

Optical Directional Coupler and Method of Manufacture

Inventor: Gerhard Schiffner.
Assignee: Siemens Aktiengesellschaft.
Filed: Feb. 2, 1981.

Abstract—An interferometer with single-mode optical waveguide wound in a coil which waveguide has a surface at each end for the acceptance of light into the waveguide and for the display of light in the waveguide characterized by at least one polarizing filter being arranged in the path of light emerging from each end surface of the waveguide. Preferably, the interferometer includes a light source such as a laser, at least one beam dividing element which is arranged in the path of a light beam and a coupling arrangement for coupling the light of one of the partial beams into one of the end surfaces and the other partial beam into the other end surface. While the interferometer utilizes a device for detecting the superimposed images of the light exiting both end surfaces of the waveguide, preferably two devices are utilized which can be either a screen or a light sensitive element such as a photo diode.

5 Claims, 5 Drawing Figures



0018-9480/84/0600-0648$01.00 ©1984 IEEE

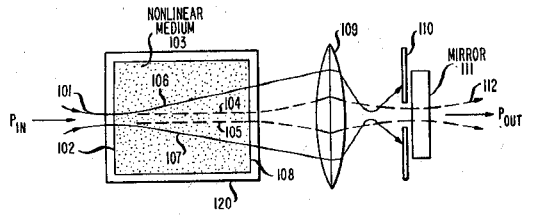
4,410,239 Oct. 18, 1983

Nonlinear Optical Device Using Self-Trapping of Light

Inventors: Alexander E. Kaplan, John E. Bjorkholm, Peter W. Smith, and Walter J. Tomlinson, III.
Assignee: Bell Telephone Laboratories, Incorporated.
Filed: Apr. 17, 1981.

Abstract—Many prior art bistable optical devices require resonant optical cavities and are therefore limited in their operation due to the long lifetimes associated with their high-finesse cavities. A bistable optical device that does not use a resonant cavity is disclosed wherein a nonlinear medium whose index of refraction increases with increased light intensity is arranged to have input and output faces into which and out of which a laser beam having a nonuniform spatial profile can be propagated. A mirror having a predetermined area of reflectivity is positioned with respect to the output face of a nonlinear medium so as to reflect only the light energy that propagates in an area at the output face that is approximately equal to the area which the beam presents at this face when the beam is propagating at a critical power level, that is, when the beam is self-trapped.

5 Claims, 2 Drawing Figures



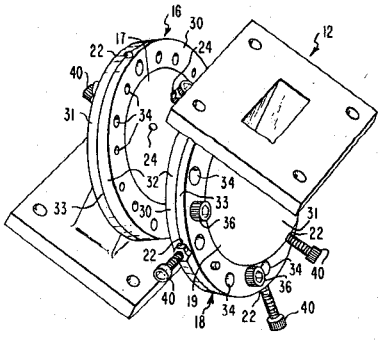
4,410,865 Oct. 18, 1983

Spherical Cavity Microwave Filter

Inventors: Frederick A. Young and Edward L. Griffin.
Assignee: Hughes Aircraft Company.
Filed: Feb. 24, 1982.

Abstract—A tri-mode spherical cavity microwave filter comprising two tandemly disposed generally spherical bodies each of which defines a spherical cavity which supports three identical, mutually orthogonal modes of electromagnetic energy, a cavity coupling aperture connecting the cavities, a plurality of cavity tuning holes, and a plurality of coupling tuning holes. One of the spherical cavities has an input aperture, and another has an output aperture. The cavity tuning holes and coupling tuning holes are adapted to receive cavity tuners and coupling tuners, respectively.

2 Claims, 7 Drawing Figures



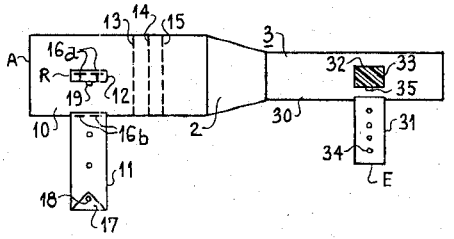
4,410,866 Oct. 18, 1983

Antenna Transducer for a Transmission-Reception Antenna

Inventor: Nhu Bui-Hai.
Assignee: Thomson-CSF.
Filed: July 29, 1981.

Abstract—A transducer for coupling to an antenna with a first polarizing duplexer for working in a low-frequency band, a between-guide transition element formed from a variable-section guide and a second polarizing duplexer for working in a high-frequency band. In the polarizing openings of the first duplexer are placed dipoles resonating at the mean frequency of the high band which cause a short-circuit for the high frequencies and let the low frequencies pass. A set of quasioptical filters, situated in the body of the first duplexer, between the polarizing openings of this first duplexer and the transition element, causes a short-circuit for the low frequencies and lets the high frequencies pass.

6 Claims, 5 Drawing Figures



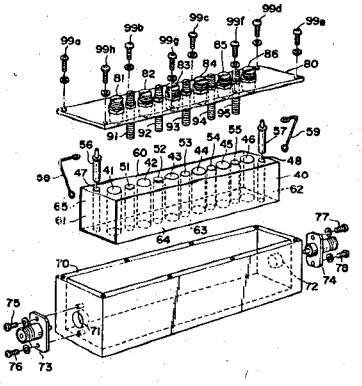
4,410,868 Oct. 18, 1983

Dielectric Filter

Inventors: Takeshi Meguro, Yukio Ito, and Bun-ichi Miyamoto.
Assignee: Fujitsu Limited.
Filed: July 1, 1981.

Abstract—A dielectric filter in which a plurality of holes are made at predetermined intervals in a dielectric block of small dielectric loss, and a conductor film is formed on the surface of the dielectric block including the interior surfaces of the holes to constitute resonators using the conductor film on the interior surface of each hole as an inner conductor of the resonator and the conductive film on the outer peripheral surface of the dielectric block as an outer conductor, the resonance frequency of the resonators being based on the depth of each hole.

15 Claims, 19 Drawing Figures



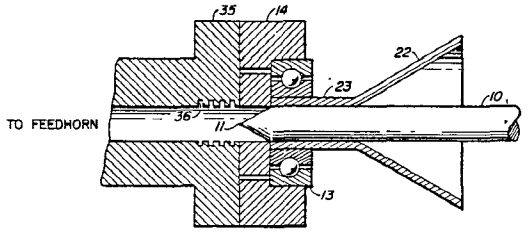
4,412,192 Oct. 25, 1983

Millimeter Wave Dielectric Waveguide Rotary Joint

Inventor: Donald D. Paolino.
Assignee: The United States of America as represented by the Secretary of the Navy.
Filed: Aug. 14, 1981.

Abstract—A dielectric waveguide is used as a connecting medium in a rotary joint transmitting waveguide energy in the 3 mm region. The dielectric waveguide is fastened within a ball bearing race to provide relative motion between the gimballed and stationary waveguide structure. Launch horns are used to enhance transmission through said dielectric waveguide.

16 Claims, 7 Drawing Figures



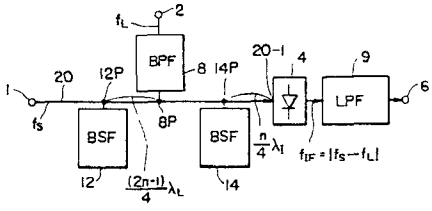
4,412,351 Oct. 25, 1983

Microwave Mixing Circuit

Inventors: Hiroshi Onishi, Sadahiko Yamashita, and Mitsuo Makimoto.
Assignee: Matsushita Electric Industrial Co., Ltd.
Filed. Oct. 23, 1981.

Abstract—A microwave mixing circuit comprises a main transmission line having an input port for receiving an input high frequency and an output port, a band pass filter responsive to a local oscillation frequency, first and second band stop filters, and a mixing diode connected to the output port. The local oscillation frequency applied via the band pass filter to the main transmission line is prevented from being transmitted toward the input port because of the first band stop filter, while an image frequency produced by the diode is reflected by the second band stop filter to be applied to the diode.

12 Claims, 9 Drawing Figures



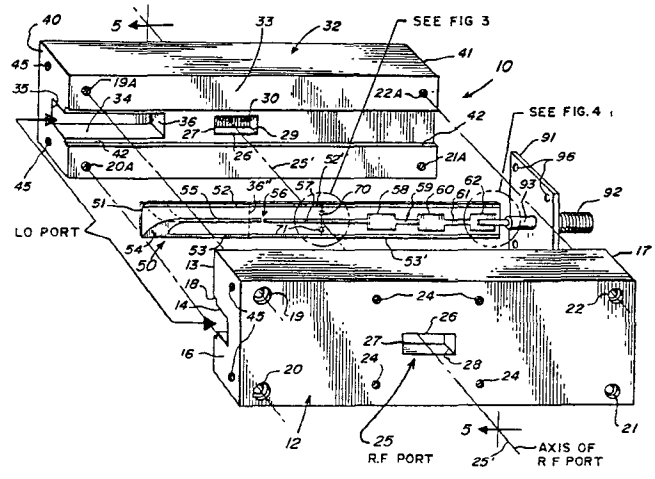
4,412,354 Oct. 25, 1983

Millimeter-Wave Stripline Planar Mixer

Inventor: Chi P. Hu.
Assignee: Honeywell Inc.
Filed: Apr. 1, 1982.

Abstract—A millimeter-wave stripline planar mixer to provide a means for mixing a local oscillator signal with a radio frequency signal to produce an intermediate frequency signal, the mixer utilizing beam lead schottky-barrier diodes in a balanced configuration.

10 Claims, 5 Drawing Figures



4,413,229 Nov. 1, 1983

Method and Apparatus for Remote Indication of Faults in Coaxial Cable R-F Transmission Systems

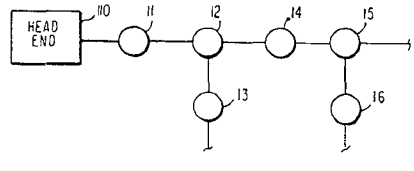
Inventor: William O. Grant.
Filed: June 2, 1981.

Abstract—A method for locating faults or failures in R-F coaxial cable TV transmission facilities is shown and described. A fault locator signal frequency is inserted into a cable system, and low magnitude signals are emitted by means of a band pass filter and radiating element. The radiated R-F is detected to determine coaxial cable system operation. Band pass filters and radiating elements are located at each point to be tested.

An apparatus for emitting a controlled narrow band of R-F energy which utilizes a band pass filter and a radiating element is also shown and described.

This is the disclosure of intentional, controlled, discriminate R-F radiation used for fault detection and a coupler-band pass filter to accomplish it.

17 Claims, 8 Drawing Figures



4,413,241 Nov. 1, 1983

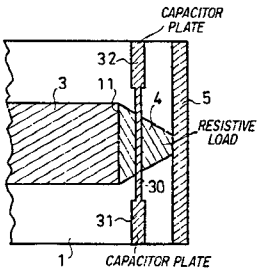
Termination Device for an Ultra-High Frequency Transmission Line with a Minimum Standing Wave Ratio

Inventors: Sylviane Bitoune, Pierre Dufond, Francois Herrbach, and Maurice Lecreff
Assignee: Thomson-CSF.
Filed: July 8, 1981.

Abstract—A termination device for a transmission line in which it is desired to reduce to a minimum the standing wave ratio resulting from the reflection of microwaves on a resistive load positioned at the end of the line. For this

purpose and more particularly for a microstrip line comprising a conductor deposited on a dielectric substrate, whose lower face is metallized (earth plane), the conductor is extended by a trapezoidal resistive film, whose narrow end is connected to a metal coating connected to earth. Moreover, in order to compensate for the inductance of the load, two capacitors formed by metal deposits deposited on the substrate are connected to the resistive film.

8 Claims, 6 Drawing Figures



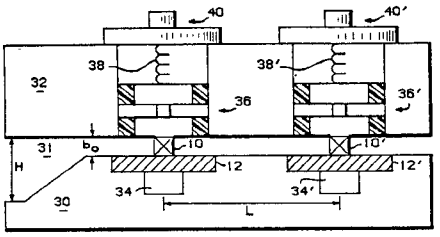
4,413,243 Nov. 1, 1983

Optimized Transmission Line Switch

Inventor: Michael Dydyk.
Assignee: Motorola Inc.
Filed: Oct. 19, 1981.

Abstract—An optimized transmission line switch comprises a first high frequency diode and means for counteracting the capacitive component of the first diode. Unpackaged diode chips are utilized to avoid parasitics introduced by diode packages. A two diode switch installed in a reduced height waveguide section provides isolation comparable to prior art switches while providing greatly improved insertion loss.

12 Claims, 10 Drawing Figures



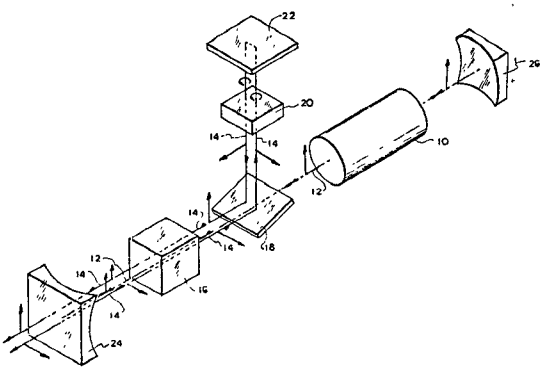
4,413,342 Nov. 1, 1983

Method and Apparatus for Frequency Doubling a Laser Beam

Inventors: Martin G. Cohen,
Kuo-ching Liu.
Assignee: Quantronix Corporation.
Filed: Nov. 20, 1980.

Abstract—A method and apparatus for providing coincident orthogonally-polarized laser beams having twice the frequency of a fundamental frequency emitted by a laser source is disclosed. A second harmonic generator within a laser resonator cavity causes frequency-doubled laser beams to travel in opposite directions along an axis thereon. One of the beams undergoes a polarization change of substantially 90° and is returned for travel along the laser axis in the same direction as a second frequency-doubled beam which has not undergone a polarization change. The orthogonally-polarized beams are then emitted through an output mirror designed for transmitting beams of twice the frequency of the fundamental beam.

10 Claims, 1 Drawing Figure



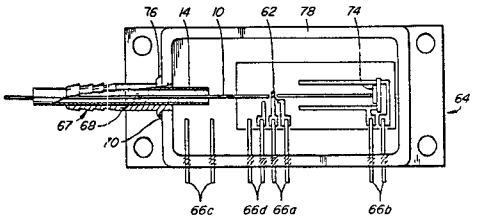
4,413,881 Nov. 8, 1983

Optical Fiber Hermetic Seal

Inventor: Tibor F. I. Kovats.
Assignee: Northern Telecom Limited.
Filed: Oct. 19, 1981.

Abstract—A hermetic seal for an optical fiber is fabricated by casting or molding a mass of fusible alloy around the fiber so that the alloy solidifies within a confined space. The alloy used is characterized by low thermal coefficient of expansion, minimal relaxation after solidification, and appreciable expansion as it solidifies, thereby to create a stable pressure contact at its interface with the optical fiber. The solidified mass may be subsequently soldered into a passage through a wall of a fiber optic device package. Alternatively, the mold within which the mass of alloy is encased or molded may, itself, be soldered into the passage.

17 Claims, 5 Drawing Figures



4,413,886 Nov. 8, 1983

Optical Switch

Inventors: Joachim Lauckner; Felix Lutz;
Gerhard Seibold; Gerhard Wessel; and Hans Volz.
Assignee: International Standard Electric Corporation.
Filed: Jan. 26, 1981.

Abstract—An optical switch comprising a controlled ferroelectric light permeable ceramic provided with electrodes. To simplify the manufacture and to realize a larger switch, the invention provides a baseplate with electrodes and the ferroelectric ceramic is secured thereon in the form of one or more strips.

2 Claims, 3 Drawing Figures