

# Patent Abstracts

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4,755,772

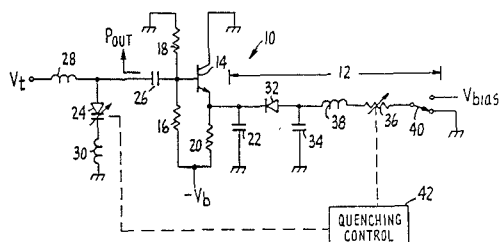
July 5, 1988

## Switchable Microwave Oscillator

Inventor: Amarpal S. Khanna.  
Assignee: Avantek, Inc.  
Filed: June 5, 1987

**Abstract**—A switchable microwave oscillator is disclosed that includes a quenching circuit for switching, attenuating, modulating, or otherwise controlling the output amplitude of frequency-stabilized, transistor-based, microwave-frequency oscillators. The quenching circuit includes a diode that is coupled to the transistor at the same port that reactive feedback is present, and includes diode biasing means for selectively applying a bias voltage to the diode. The quenching circuit selectively diverts some of the current flowing through the transistor of the oscillator to control the output thereof.

14 Claims, 2 Drawing Sheets



4,755,775

July 5, 1988

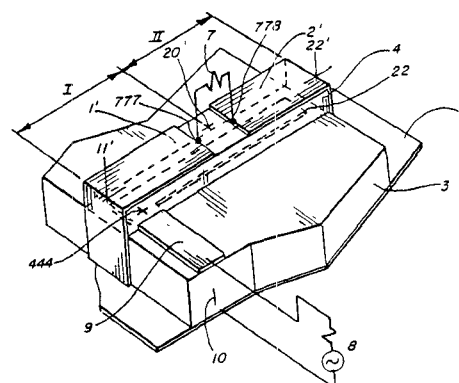
## Microwave Balun for Mixers and Modulators

Inventors: Wojciech Marczewski and Wacław Niemijski.  
Assignee: Polska Akademia Nauk Centrum Badan Kosmicznych.  
Filed: Dec 4, 1984

**Abstract**—A microwave balun using microstrip broadside coupled lines is disclosed for achieving a broadband double balanced mixer or modulator performance. The use of a double layered structure for broadside coupled microstrip lines, called overlapped microstrip lines, makes a balun design equivalent to well known double coaxial Marchand design. It is feasible by means of thin film and MMIC's technology. The most advantageous applications of the balun include its simple and inverted options useful for mixer or modulator design considering both the balun and semiconductor junctions manufactured in one compact volume of the lower substrate. A balun circuit

layout is one-sided fixed to a contiguous ground plane without using slots or holes in it and othersided open from a top side. The application is dedicated to an approximate frequency range of at least 1 to 18 GHz.

9 Claims, 6 Drawing Sheets



4,755,777

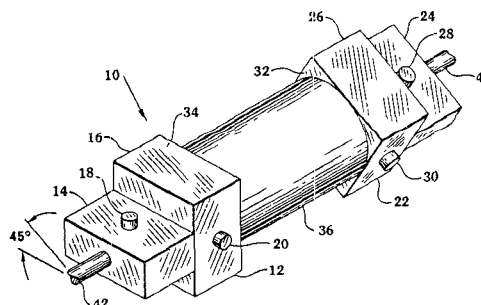
July 5, 1988

## Variable Power Divider

Inventors: Nathaniel L. Cohen and Ahmet D. Ergenc.  
Assignee: General Dynamics Corp./Convair Division.  
Filed: Mar. 3, 1986.

**Abstract**—A variable microwave power divider which includes an orthomode transducer having a first section capable of supporting a vertically polarized wave and a second section capable of supporting two orthogonal linearly polarized waves. Suitable probes for inserting or extracting RF energy are coupled to each section. A similar orthomode transducer is connected to the first transducer through a circular hollow waveguide with the transducers being angularly offset from one another a predetermined angular amount. A septum is positioned within the waveguide which is fixed thereto at one end with the other end being controlled to a predetermined spiral configuration in order to direct RF energy flowing through the waveguide to the sections of one transducer in a determinable manner.

11 Claims, 1 Drawing Sheet



4,755,778

July 5, 1988 4,756,588

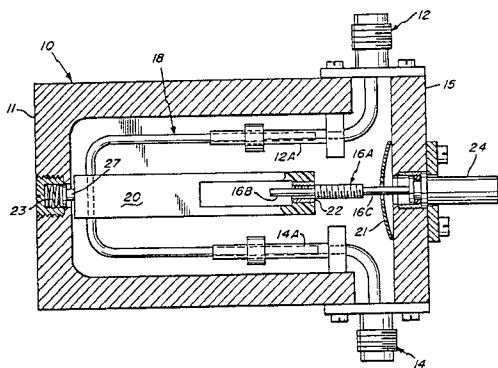
July 12, 1988

## Microwave Apparatus

Inventor: Harry F. Chapell.  
Assignee: Sage Laboratories, Inc.  
Filed: June 12, 1987.

**Abstract**—An electromagnetic signaling apparatus, particularly in which components thereof have relative adjustment therebetween. A combination lead screw and associated support nut moves one of the components, such as may appear in a phase shifter. The lead screw has thread reliefs to provide disengagement at predetermined limits of rotation so as to prevent jamming and thread stripping. Spring means are employed for reengagement.

8 Claims, 8 Drawing Sheets

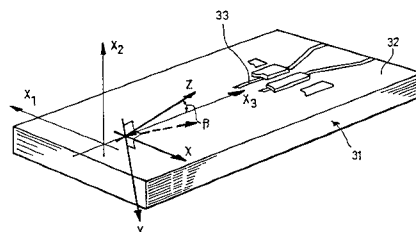


## Polarization-Independent Optoelectronic Directional Coupler

Inventor: Per O. Granstrand.  
Assignee: Telefonaktiebolaget L M Ericsson.  
Filed: June 10, 1986.

**Abstract**—This invention relates to a polarization-independent optoelectronic directional coupler. A wafer (11) e.g. of lithium niobate has light waveguides (13) at its upper surface (12). There are main electrodes (17) and secondary electrodes (18) along the interaction length ( $L_1$ ) of the light waveguides. The wafer is oriented in relation to its crystalline structure ( $X, Y, Z$ ) such that its optical axis ( $Z$ ) is in a plane at right angles to the upper surface (12) and contains the longitudinal direction of the waveguides (13). The optical axis ( $Z$ ) deviates here an angle ( $\beta$ ) of at most 15 degrees from the upper surface (12), and the  $X$  axis may have six symmetrically distributed positions, of which one is in the plane of the upper surface (12). Independent of the polarization state of a light beam, this beam entering at an input (14) can be switched in its entirety to either of the outputs (15) of the coupler. With the aid of the secondary electrodes (18) an electrical field through the waveguides can be directed at right angles to the upper surface (12). With the stated orientation of the wafer, the refractive index of the material can be changed hereby so that the desired switching is obtained. The light propagation in the direction of the optical axis ( $Z$ ) permits high pulse frequency.

6 Claims, 5 Drawing Sheets



4,756,587

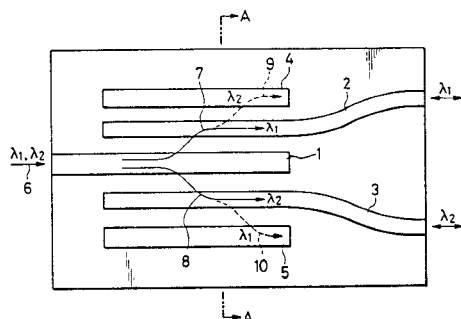
July 12, 1988

## Optical Multi/Demultiplexer

Inventors: Hirohisa Sano, Katsuyuki Imoto, and Minoru Maeda.  
Assignee: Hitachi, Ltd.  
Filed: Aug 12, 1987

**Abstract**—An optical multi/demultiplexer comprising a first waveguide for inputting/outputting light, second and third waveguides which are respectively arranged on both sides of the first waveguide, and first and second open-waveguides which are respectively arranged on sides of the second and third waveguides remote from the first waveguide.

6 Claims, 9 Drawing Sheets



4,757,278

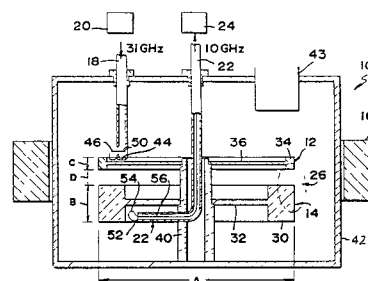
July 12, 1988

## Low-Noise Cryogenic Dielectric Resonator Oscillator

Inventor: G. John Dick.  
Assignee: The United States of America as represented by the Administrator of the National Aeronautics and Space Administration.  
Filed: Nov 5, 1987

**Abstract**—A microwave oscillator is provided which can operate at a temperature of many degrees above absolute zero while providing very low phase noise that has heretofore generally required temperatures within a few degrees K. The oscillator includes a ring-shaped resonator element of ruby (sapphire plus chromium) or iron sapphire crystal, lying adjacent to a resonator element of sapphire, so the regenerator element lies directly in the magnetic field of the resonator element. The resonator element is substantially devoid of contact with electrically conductive material. Microwave energy of a pump frequency (e.g. 31 GHz) is applied to the regenerator element, while signal energy (e.g. 10 GHz) is outputted from the resonator element.

11 Claims, 1 Drawing Sheet



4,757,281

July 12, 1988

**Rotary Microwave Joint Device**

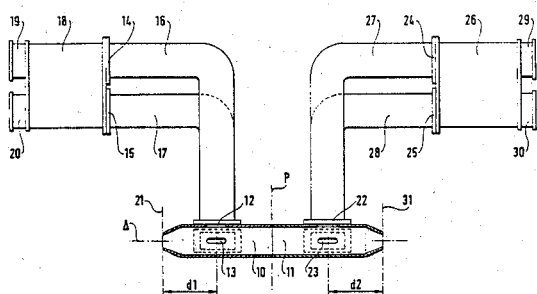
Inventors: Jean-Claude Anne, Philippe Gourlain, Régis Lenormand, and Gérard Raguenet.

Assignee: Alcatel Espace.

Filed: Apr. 22, 1987.

**Abstract**—The invention relates to a rotary microwave joint device comprising a main circular waveguide constituted by two portions (10, 11) situated as extensions to each other and rotatable relative to one another about their axis of symmetry, each of said two portions (10, 11) being provided with at least one access which is orthogonal thereto, and mechanical means enabling a circularly polarized wave to be obtained in the main waveguide. The invention is applicable to space telecommunications.

5 Claims, 3 Drawing Sheets



4,757,284

July 12, 1988

**Dielectric Filter of Interdigital Line Type**

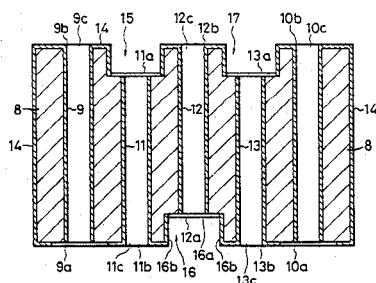
Inventor: Moriaki Ueno.

Assignee: Alps Electric Co., Ltd.

Filed: Apr. 4, 1986.

**Abstract**—An interdigital line type dielectric filter acting as a bandpass filter at radio frequencies has a dielectric body on which a grounding electrode is formed. Two parallel exciter lines extend through the block. Several resonant lines are juxtaposed to one another between the exciter lines. One short-circuited end of each resonant line is connected to the grounding electrode, while the other open end is not connected to it. The short-circuited end and the open end of any one of the resonant lines are disposed on opposite sides of those of its neighboring one resonant line. Those portions of the block which are in the vicinities of the open ends of the resonant lines are cut out so that the open ends are exposed.

4 Claims, 4 Drawing Sheets



4,757,285

July 12, 1988

**Filter for Short Electromagnetic Waves Formed as a Comb Line or Interdigital Line Filters**

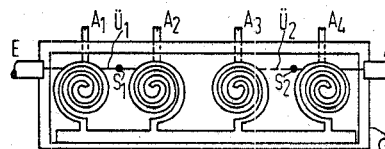
Inventor: Heinz Krause.

Assignee: Siemens Aktiengesellschaft.

Filed: July 2, 1987.

**Abstract**—Microwave filters which have the best electrical characteristics for small volumes are required in radio communications particularly in traffic broadcast communication links and the invention provides filters formed as comb line or interdigital line filters in which the inner resonator conductors are formed as flat spirals.

16 Claims, 4 Drawing Sheets



4,757,286

July 12, 1988

**Microwave Filter Device**

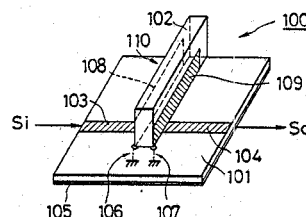
Inventors: Yoshihiro Konishi and Kenichi Konno.

Assignee: Uniden Corporation.

Filed: May 27, 1987.

**Abstract**—A microwave filter having a filtering effect against specific frequencies is fabricated by erecting a second dielectric substrate on the upper surface of a first dielectric substrate, a resonating circuit is formed by locating strip lines facing towards each other on both surfaces of this second dielectric substrate, and the strip lines are connected to input and output lines on the first dielectric substrate.

7 Claims, 7 Drawing Sheets



4,757,287

July 12, 1988

**Voltage Tunable Half Wavelength Microstrip Filter**

Inventors: John Grandfield and William Shillue.

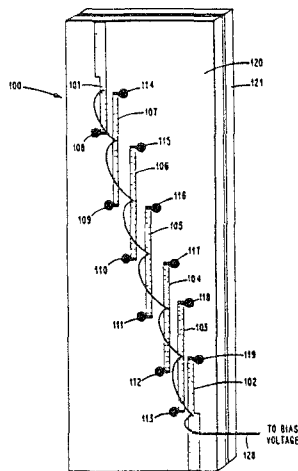
Assignee: GTE Service Corporation.

Filed: Oct. 20, 1987.

**Abstract**—A voltage tunable filter has several parallel coupled half wavelength lines. Each open end of a line is coupled to ground through a corre-

sponding varactor. Voltage may be distributed to the varactors through a thin wire attached a quarter wavelength from each varactor

4 Claims, 3 Drawing Sheets



4,757,288

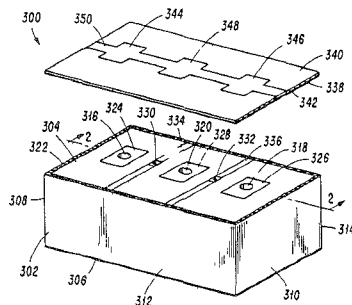
July 12, 1988

### Ceramic TEM Bandstop Filters

Inventor: James B. West.  
Assignee: Rockwell International Corporation.  
Filed: Feb. 25, 1987.

**Abstract**—A ceramic TEM resonator bandstop filter is disclosed wherein the direct inter-resonator coupling is retarded by a plurality of shorting holes which are positioned between the resonators and extend from the top surface to the bottom surface of said ceramic filters. Furthermore, there is disclosed a transverse electrical connector which electrically connects the shorting holes with the opposite sides of the typical metallization found on ceramic TEM resonator filters. Furthermore, there is disclosed a method of making a capacitor for each resonator with the bottom capacitor pad being formed directly upon the top surface of the ceramic of the filter while the top capacitor pad is formed upon the top surface of a circuit board which is placed above the top surface of the filter.

4 Claims, 2 Drawing Sheets



4,757,289

July 12, 1988

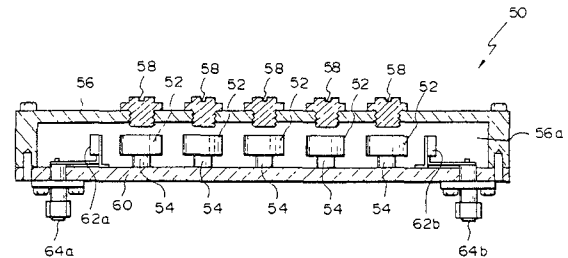
### Filter with Dielectric Resonators

Inventors: Yuhei Kosugi and Shigeo Ogawa.  
Assignee: NEC Corporation  
Filed: July 16, 1986.

**Abstract**—A dielectric resonator filter applicable to any desired frequency which is required with a microwave band or a millimeter wave band communi-

cation apparatus is disclosed. A single base plate made of metal carries therewith a single or a plurality of dielectric resonators, a pair of input/output coupling members, and a pair of input/output connectors all of which are arranged directly on the base plate in a planar configuration. This base plate subassembly is shielded by a cover having a recess in a sectional view which serves as a cutoff range waveguide

11 Claims, 5 Drawing Sheets



4,757,290

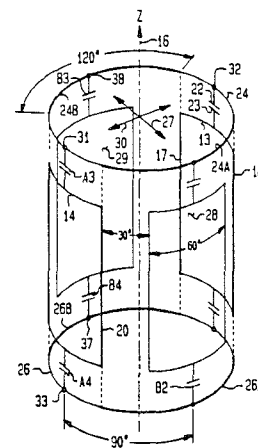
July 12, 1988

### Hybrid Resonator

Inventor: Hannan Keren.  
Assignee: Elscint Ltd.  
Filed: Feb. 6, 1987.

**Abstract**—A circularly polarized radio frequency probe for use in magnetic resonance systems, the probe comprises four effective "saddle coils" arranged to define a single cylinder. The saddle coils each comprise a pair of 120 degree arcuate conductor sectors separated by longitudinal conductors. RF power is coupled to each of said "saddle coils" so that first and second pairs of said saddle coils generate first and second fields normal to each other

13 Claims, 2 Drawing Sheets



4,757,291

July 12, 1988

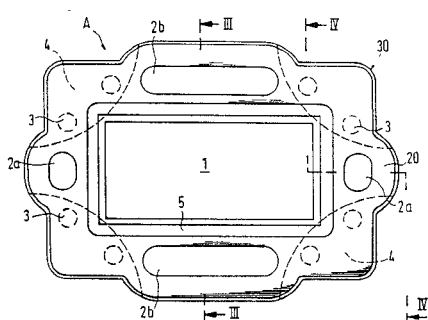
### Cooled Waveguide Assembly

Inventors: Georg Spinner and Franz-Xaver Pitschi.  
Assignee: Spinner GmbH, Elektrotechnische Fabrik.  
Filed: Feb. 24, 1987.

**Abstract**—A cooled waveguide assembly includes a plurality of extruded waveguides connected to each other via their respective flanged portion. Each waveguide has an outer profile corresponding to the outer dimensions of the flange portion which is created by suitably fabricating the end sections of each waveguide. The flange portion is provided with a plurality of boreholes which

are in alignment with pockets to allow fasteners to be inserted therein so as to connect adjoining waveguides. Integrated in the wall of each waveguide are cooling channels which are arranged in such a manner that they do not intersect with the boreholes. The cooling channels and the interior of the waveguides are sealed at the respective joints by a profiled sealing element.

9 Claims, 3 Drawing Sheets



4,757,292

July 12, 1988

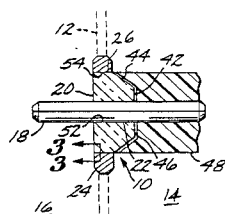
## Microwave Window

Inventors: Richard V. Basil, Jr., Meredith K. Eick, Juri G. Leetmaa, and Donald G. Swartz

Assignee: Hughes Aircraft Company.  
Filed: Aug. 8, 1986

**Abstract**—A low noise coaxial microwave window of particular utility in hermetic and high power applications, having a metallic center conductor, a metallic outer support, and a ceramic support brazed between the two conductors. The brazed joints are specially prepared to have a series of layers and sublayers extending from the ceramic to the metal, as follows: ceramic, cermet, cermet-nickel alloy, copper-nickel alloy, copper, braze metal, and metallic piece. The nickel content of the cermet-nickel and copper-nickel alloys is limited so that the alloys are non-magnetic. The nickel-containing alloys assist in bonding the copper layer to the cermet in a reliable, reproducible fashion, but control of the nickel content avoids microwave intermodulation effects. Where the window separates a vacuum from another medium, the surface of the support contacting the vacuum is formed from at least two noncoplanar segments to eliminate the possibility of multipacting. The same techniques are used in waveguide microwave windows.

12 Claims, 1 Drawing Sheet



4,758,800

July 19, 1988

## Low-Noise Magnetically Tuned Resonant Circuit

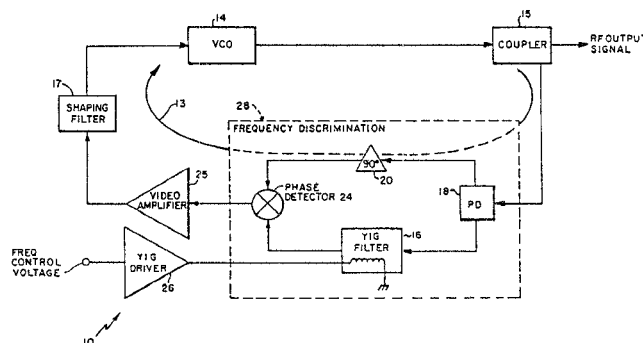
Inventors: Robert DiBiase, Zvi Galani, Raymond C. Waterman, Jr., Ernst F. R. A. Schloemann, and Ronald E. Blight.

Assignee: Raytheon Company  
Filed: Apr. 2, 1987.

**Abstract**—A magnetically tuned resonant circuit having improved noise performance includes a ferrimagnetic or gyromagnetic body such as a YIG sphere which is disposed within RF structure. The RF structure is disposed

between a pair of pole pieces of a biasing magnet and flux return path. Several techniques are described for reducing fluctuations in magnetic fields through the gyromagnetic body. The gyromagnetic body is isolated from conductive surfaces, or the bulk of conductive surfaces in the region adjacent to the magnetic body are reduced. Further, a technique is also described which provides a break in the electrical continuity around the RF structure. Each of these techniques reduce the magnitude of thermally induced eddy current flow in conductive regions adjacent to the resonant body. It is believed that such eddy current flow produce random magnetic field variations which produce random variations in the frequency characteristics of conventional magnetically tuned resonant circuits.

54 Claims, 8 Drawing Sheets



4,758,804

July 19, 1988

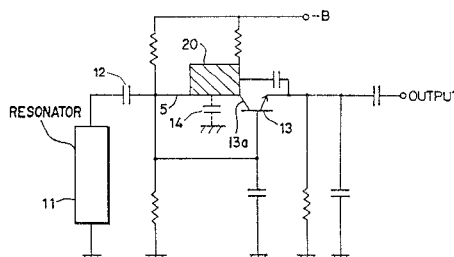
## Frequency Stabilized High-Frequency Oscillator

Inventors: Atsushi Inoue, Tsukasa Senba, and Toshiaki Fujimura.

Assignee: Murata Manufacturing Co., Ltd.  
Filed: Jan. 21, 1987.

**Abstract**—A high-frequency oscillator having a high-frequency oscillation circuit formed through use of a microstrip line. The high-frequency oscillation circuit has a resonator and a transistor connected to a reference potential and coupled with the resonator through a first capacitor. A first electrode of the transistor is connected with the resonator through the first capacitor. A second electrode of the transistor is connected to the reference potential and a third electrode thereof is adapted to derive an output. A substrate is provided with a land portion to be connected with the first electrode of the transistor, and a capacitor electrode is formed on the opposite surface of the substrate to be opposite to the first electrode connection land portion through the substrate. The capacitor electrode, the first electrode connection land portion and the substrate form a second capacitor, which is connected to the reference potential between the first capacitor and the first electrode of the transistor.

2 Claims, 4 Drawing Sheets



4,760,350

July 26, 1988

9 Claims, 5 Drawing Sheets

## Internally Matched Power Amplifier

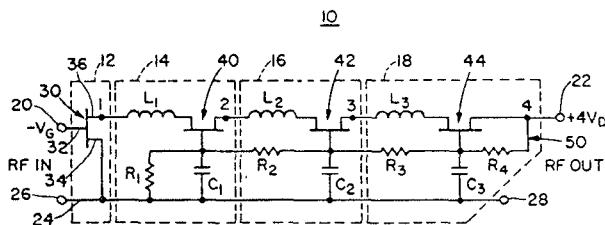
Inventor: Yalcin Ayasli.

Assignee: Hittite Microwave Corporation.

Filed: June 8, 1987.

**Abstract**—An internally matched power amplifier including an input terminal for receiving an input signal and an output terminal; a plurality of semiconductor devices connected with the load electrodes in series; transmission means for coupling the load electrodes of neighboring devices in the series and establishing an internal impedance match; the last device in the series having its other electrode connected to the output terminal; the first device in the series having its control electrode connected to the input terminal and its other load electrode connected to a common conductor and having a predetermined d.c. bias level and a predetermined signal voltage level between its control and its other electrode; first means for setting the control means of each device but the first in the series to the predetermined signal voltage level and second means for biasing the control electrode of each device but the first in the series to the predetermined dc bias level

14 Claims, 2 Drawing Sheets



4,760,361

July 26, 1988

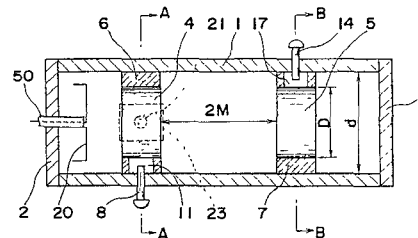
## Double-Mode Filter

Inventor: Yoshio Kobayashi.

Assignee: Murata Manufacturing Co., Ltd.

Filed: Mar. 3, 1987

**Abstract**—A double-mode filter having double-mode resonance in each resonator, with at least two dielectric resonators being accommodated within a cut-off waveguide having a given axial length. This double-mode filter is easier to design, easier to manufacture through simplified construction, and also has smaller insertion loss. No metallic bulkhead having a coupling slot is required between each pair of stages, so that lower loss is achieved or the coupling coefficient may be analytically calculated, thus realizing high-precision design.



4,760,363

July 26, 1988

## High-Frequency Signal Switching System

Inventor: Siegfried Gerendt.

Assignee: Blaupunkt-Werke GmbH.

Filed: Apr. 9, 1987

**Abstract**—A T-network with a capacitor in the shunt branch and similarly poled diodes in the series branches provides an electronic switch for the IF signals in a VHF receiver exhibiting 58 dB of attenuation in the block condition and negligible attenuation when the diodes are conducting. The resistance across the input of the IF amplifier and, if necessary, a resistance in the switching voltage path, determine the amount of current through the diodes when they are conducting under application of the switching voltage. Low-pass filtering in the switching voltage leads and blocking capacitors in the signal connections of the switch restrict signal and switching voltages to their respective paths. Applying a positive potential to one switching terminal closes the switch and applying it to the other switching terminal opens it.

2 Claims, 1 Drawing Sheet

