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.

4,238,732 Dec. 9, 1980

Method of Qualifying Diodes for a Microwave Power Combiner

Inventor: Richard Aston.
Assignee: General Dynamics Corporation.
Filed: Mar. 29, 1979

Abstract—The disclosed method qualifies diodes for microwave power combiners having a central cavity, and having N diode oscillator circuits spaced around the cavity for furnishing energy thereto. It includes the steps of activating only one of the N oscillator circuits, and then measuring the frequency at which the diode in that circuit supplies maximum power to the cavity This power is measured by means of a probe having an electric field coupling of N_{11} with the cavity, where N_{11} equals $N_{12}/\sqrt{N}$, and where N_{12} is the corresponding electric field coupling that is used to remove power from the cavity when all N of the oscillator circuits are simultaneously activated. These steps are repeated on each of the individual diodes to be tested. The diodes which qualify for simultaneous use in the combiner are only those which have measured frequencies of maximum power lying within a predetermined frequency band

7 Claims, 6 Drawing Figures

EQ 1 $Z_d = -Z_g$

EQ 2 $Z_d = R_d + jX_d$

EQ 3 $Z_g = R_g + jX_g$

EQ. 4 $Z_g = \frac{A_1 Z' + B_1}{C_1 Z' + D_1}$

EQ 5 $Z' = \frac{A_2 Z_N + B_2}{C_2 Z_N + D_2}$

EQ 6A $A_i = \cos \frac{2\pi L_i \sqrt{\epsilon_i}}{\lambda_o}$

EQ 6B $B_i = jZ_i \sin \frac{2\pi L_i \sqrt{\epsilon_i}}{\lambda_o}$

EQ 6C $C_i = j(1/Z_i) \sin \frac{2\pi L_i \sqrt{\epsilon_i}}{\lambda_o}$

EQ 6D $D_i = A_i \quad (i = 1, 2)$

EQ 7 $Z_N = \frac{1}{G_o} + \frac{N_2^2 N}{Y_{aN}}$

EQ. 8 $Y_{aN} = G_c + G_L N_1^2 + j(2\pi f C - \frac{1}{2\pi f L})$

EQ 9 $Z_N = \frac{1}{G_o} + \frac{N_2^2 N}{G_c + G_L N_1^2 + j(2\pi f C - \frac{1}{2\pi f L})}$

EQ. 10 $G_c \ll G_L N_1^2$

EQ 11 $f = \frac{1}{2\pi\sqrt{LC}}$

EQ 12 $Z_N = \frac{1}{G_o} + \frac{N_2^2 N}{G_L N_1^2}$

Fig. 3

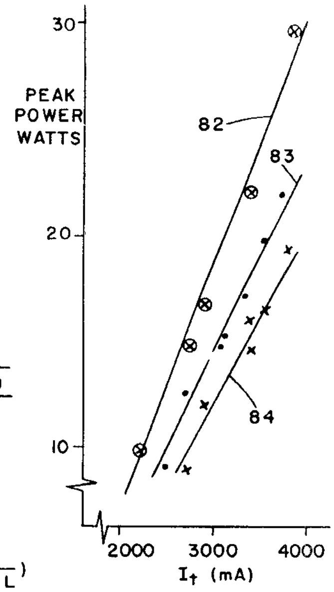
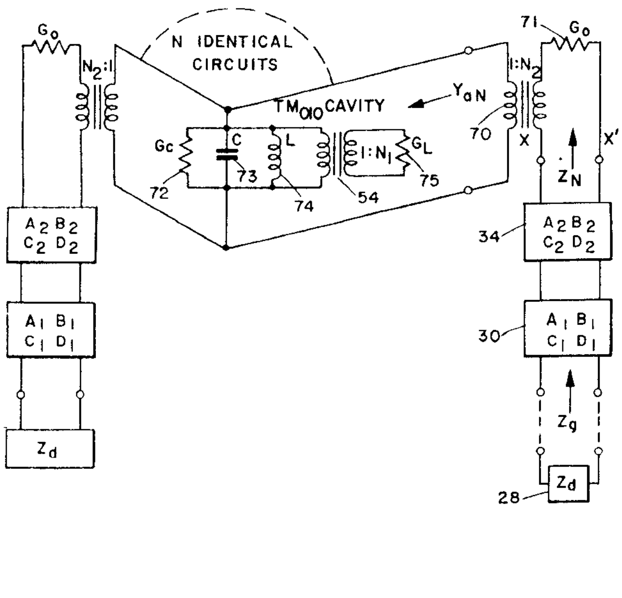


Fig. 6



4,282,458 Aug. 4, 1981

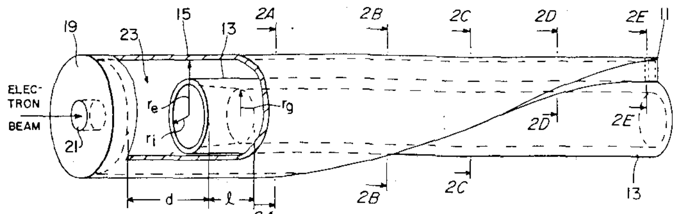
Waveguide Mode Coupler for Use with Gyrotron Traveling-Wave Amplifiers

Inventor: Larry R. Barnett.
Assignee: The United States of America as represented by the Secretary of the Navy
Filed: Mar 11, 1980

Abstract—A rectangular waveguide to circular waveguide coupler and vice versa. The coupler includes a first section of circular waveguide spaced by a gap from a reflective-plane conducting wall, the latter having a hole for passage

of an electron beam if the coupler is used in a traveling wave tube, and a second section of circular waveguide disposed external to, and coaxial with, at least a portion of the first waveguide section and extending to the wall to provide a conductive boundary surrounding the gap. The region between the first and second waveguide sections forms an input port of the coupler; the first waveguide section forms the output port of the coupler. Electromagnetic waves in a TE_{01} coaxial waveguide mode are applied to the input port from a rectangular waveguide supporting the dominant TE_{10} mode. The second waveguide section has a cutoff determining dimension r_e proportioned to support both the TE_{01} and TE_{02} circular electric modes in the region of the gap at the frequency of the applied waves. The first waveguide section has cutoff determining dimensions r_l proportioned to support the circular electric TE_{01} mode to the exclusion of all higher-numbered circular electric modes at the frequency of the applied waves.

7 Claims, 9 Drawing Figures



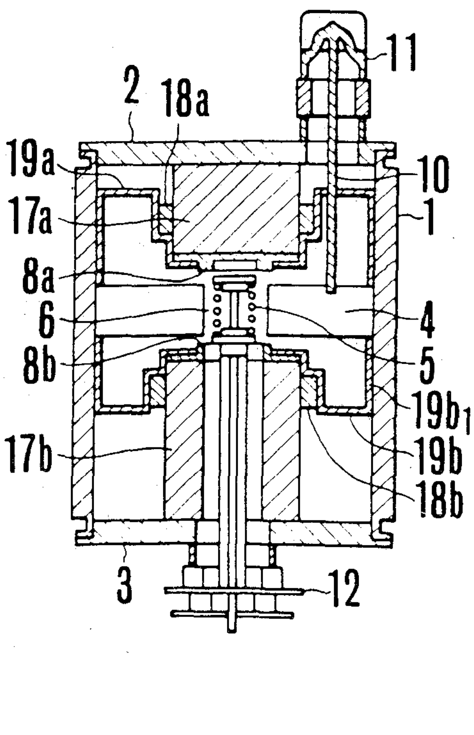
4,282,459 Aug. 4, 1981

Magnetron

Inventor: Tomokatsu Oguro.
Filed: Sep. 4, 1979.

Abstract—In an inner magnet type magnetron wherein a pair of permanent magnets axially magnetized are opposed to each other with an interaction space therebetween within a vacuum enclosure comprising a cylindrical anode, a repulsive magnet magnetized in a direction substantially perpendicular to the magnetization direction of the permanent magnet is arranged in the proximity of one end of the permanent magnet close to the interaction space, thereby preventing leakage flux from the permanent magnet to the inner wall of the cylindrical anode.

5 Claims, 3 Drawing Figures



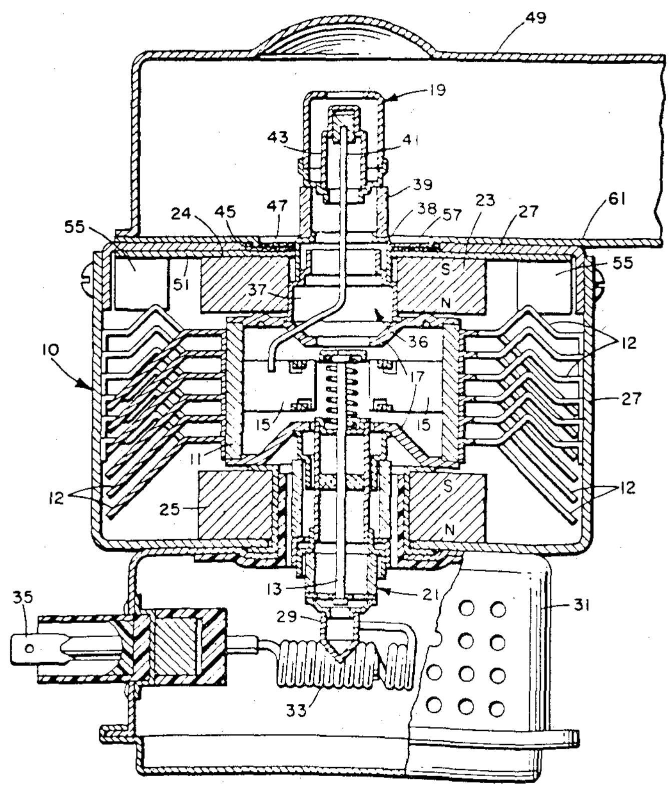
4,282,463 Aug. 4, 1981

Magnetron with Continuous Magnetic Circuit

Inventor: Kaichiro Nakai.
Assignee: Tokyo Shibaura Denki Kabushiki Kaisha.
Filed: Oct. 4, 1979.

Abstract—In a magnetron comprising a cylindrical anode, a cathode positioned coaxially in the anode, an output portion extending from the anode, an annular magnet, a yoke having a larger diameter opening extended through by the output portion, and a gasket a magnetic shim plate is provided between the permanent magnet and the yoke so that the entire surface of the permanent magnet is in magnetic contact with the yoke. A continuous magnetic circuit is thereby formed to prevent the formation of any gaps to avoid fluctuations or reduction in the magnetic flux.

9 Claims, 12 Drawing Figures



4,284,922 Aug. 18, 1981

Linear Beam Microwave Amplifier Having Section Comprising Three Resonant Coupled Circuits Two of which Are Resonant Cavities which Interact with the Beam

Inventors: Dudley Perring; Michael J. Smith; John P. Randall.
Assignee: EMI-Varian Limited.
Filed: Sep. 5, 1979.

Abstract—A linear beam tube has an input section, a buffer or buncher section, and an output section.

The buffer or buncher section comprises two circuits in series, each of which (FIG. 5) comprises two resonant cavities **C51** and **C52** through which the

electron beam passes and a third resonant cavity C53 coupled to cavity C51 by a slot **53** and to cavity C52 by a slot **54**.

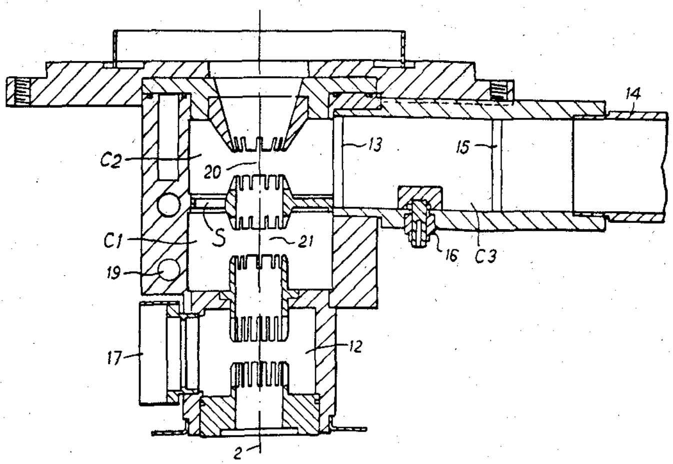
The output section (FIG. 2*a*) comprises two resonant cavities C1 and C2 through which the beam passes and which are coupled by a slot **5**. A third resonant cavity C3 is coupled to cavity C2 by an iris **13**, and to an output waveguide **14** by a further iris **15**.

The input section may comprise a travelling wavetube section, or the series arrangement of a standard klystron cavity and two buffer sections as shown in FIG. 5.

Slot or iris couplings may be replaced by a loop coupling as known in the art.

The resulting amplifier has an improved bandwidth/efficiency product.

30 Claims, 16 Drawing Figures



4,284,924 Aug. 18, 1981

Microwave Magnetron-Type Device

Inventor: Jury I. Dodonov.
Filed: Sep. 12, 1979.

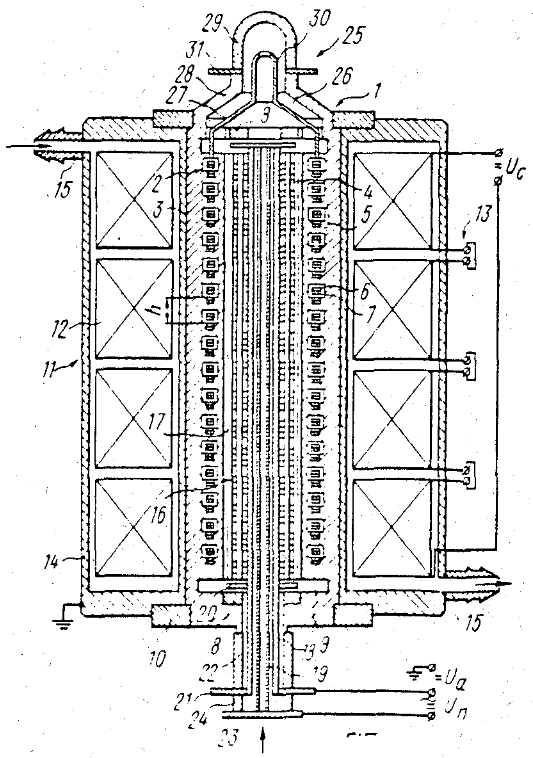
Abstract—A microwave magnetron-type device comprises at least one anode block with annular metal straps electrically associated with respective vanes of the anode block cavities, having the same polarity at -mode. The straps of different polarities, electrically associating respective vanes of the same polarity, are paired, each pair being arranged with respect to one another along the anode block axis to form a single multistage retardation system. The device also comprises a means for creating a magnetic field directed along the anode block axis enveloping said anode block, and a means for increasing the magnetic field density in direct proximity to the anode block end faces, forming a gap with the end faces of the anode block. At least some of said straps are made at least partically of a magnetic material, and the mass of this material is so distributed along the anode block axis that the magnetic field density varies along the anode block axis as follows:

$$B_x = B_0 - B_{01}\left(\sin\frac{n\pi}{1}X_1\right) + B_{02}\left(1+\cos\frac{2\pi}{h}X_1\right),$$

where
B_x is the variation in the magnetic field density along the anode block axis;
B_0 is a constant component of the homogeneous magnetic field density along the anode block axis;
B_{01} is the amplitude of variation in the magnetic field density along the anode block axis, over its length X_1, which does not exceed 50% of B_0;
B_{02} is the amplitude of fluctuation of the magnetic field density from one pair of retardation system straps to another along the anode block axis, over its length X_1, which does not exceed 20% of B_0;
h is the spacing between strap pairs:

$n = 1,2,3\ldots$ is a coefficient equal to the number of half-cycles of the cosinusoidal distribution of the amplitude of the high-frequency electric field of a respective mode.

3 Claims, 4 Drawing Figures



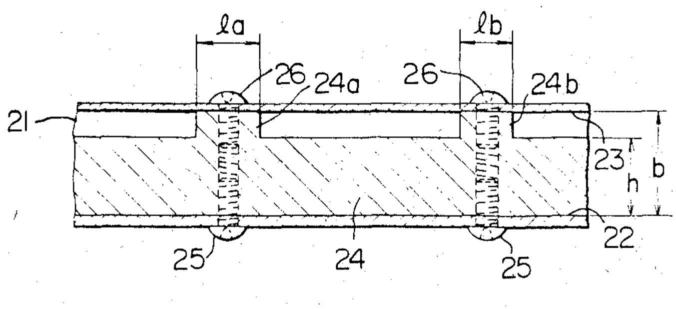
4,284,967 Aug. 18, 1981

Waveguide Device

Inventor: Yoshikazu Yoshimura.
Assignee: Matsushita Electric Industrial Co., Ltd.
Filed: Sep. 18, 1979.

Abstract—A waveguide device having a ridge conductor which is provided on one of the *H*-plane walls of a rectangular waveguide, a part of the ridge conductor extending towards the other *H*-plane wall to come into contact therewith, thus making up a reactance element.

8 Claims, 7 Drawing Figures



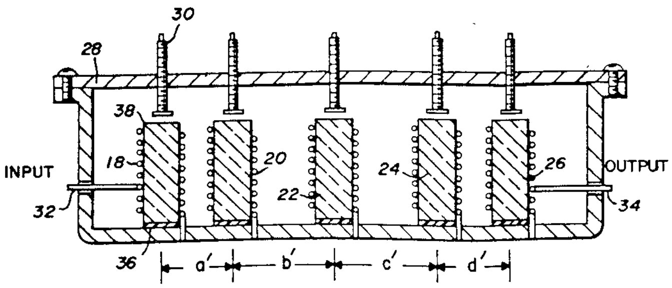
4,284,966 Aug 18, 1981

Wide Bandwidth Helical Resonator Filter

Inventor. Ronald J. Wanat.
Assignee: Motorola, Inc
Filed. Dec. 21, 1979.

Abstract—A helical resonator filter with increased bandwidth is provided for use as a wideband bandpass filter. The device is composed of a series of helical resonators cells cascaded with nonuniform cell spacing, thus providing an increase in coupling coefficients between cells. The increased bandwidth is thereby obtained without placing a burden on the exterior housing dimensions relative to a normally spaced narrow bandwidth filter and without substantially reducing the unloaded Q's or increasing insertion losses

4 Claims, 2 Drawings Figures



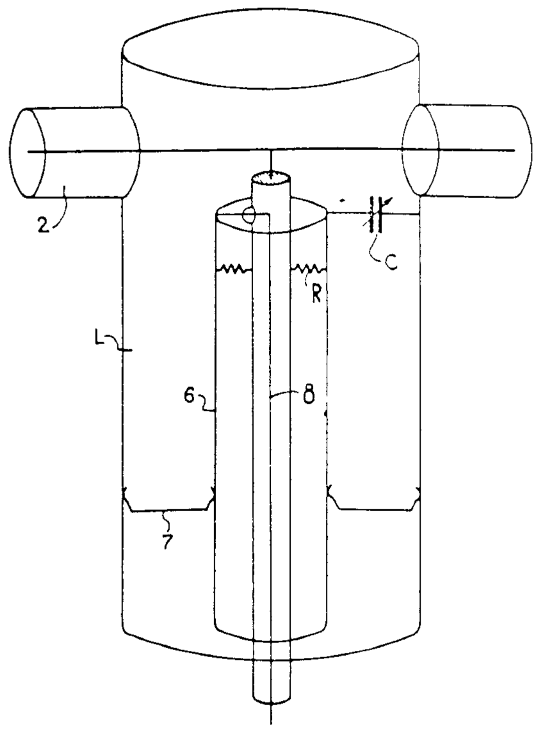
4,286,238 Aug. 25, 1981

Harmonic Filtering Device for Radio Transmitter

Inventor: François Ursenbach.
Assignee: Thomson-CSF
Filed: Dec 21, 1979.

Abstract—A harmonic filtering device placed in a high frequency line connecting a radio transmitter to its load with at least one cell in parallel on the line, constituted by an antiresonant circuit (at the transmission frequency of the transmitter) in series with a resistor, whose value is approximately 1/20th of the characteristic impedance of the line This cell is made of a coaxial line with four conductors in which inset elements (short-circuit, capacitor, load) form the inductor and the capacitor of the antiresonant circuit and the resistor The resistor of this cell has no effect at the transmission frequency of the transmitter and creates insulation between the load and the transmitter for harmonic frequencies.

3 Claims, 5 Drawing Figures



4,286,239 Aug. 25, 1981

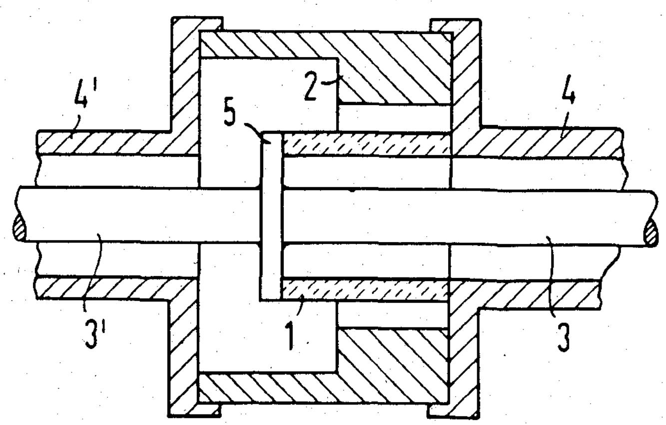
Gas-Tight, High-Frequency Permeable Window Arrangement in a Coaxial Line, Particularly for Traveling Wave Tubes

Inventor: Franz Gross.
Assignee: Siemens Aktiengesellschaft
Filed: Jan 7, 1980.

Abstract—A gas-tight, high-frequency permeable window arrangement in a coaxial line, particularly for traveling wave tubes, has a large pass band width as well as being mechanically and thermally stable For this purpose, a hollow

cylinder of dielectric material is provided between the coaxial line on the input side and the coaxial line on the output side, the hollow cylinder surrounding the inner conductor of the coaxial line on the input side and being connected with its one end face to the outer conductor of the coaxial line on the input side and being connected with its other end face to a flange which is arranged between the inner conductors of the coaxial lines of the input and output sides. A window arrangement constructed in accordance with the present invention is particularly suitable for employment in radio link traveling wave tubes.

5 Claims, 3 Drawing Figures



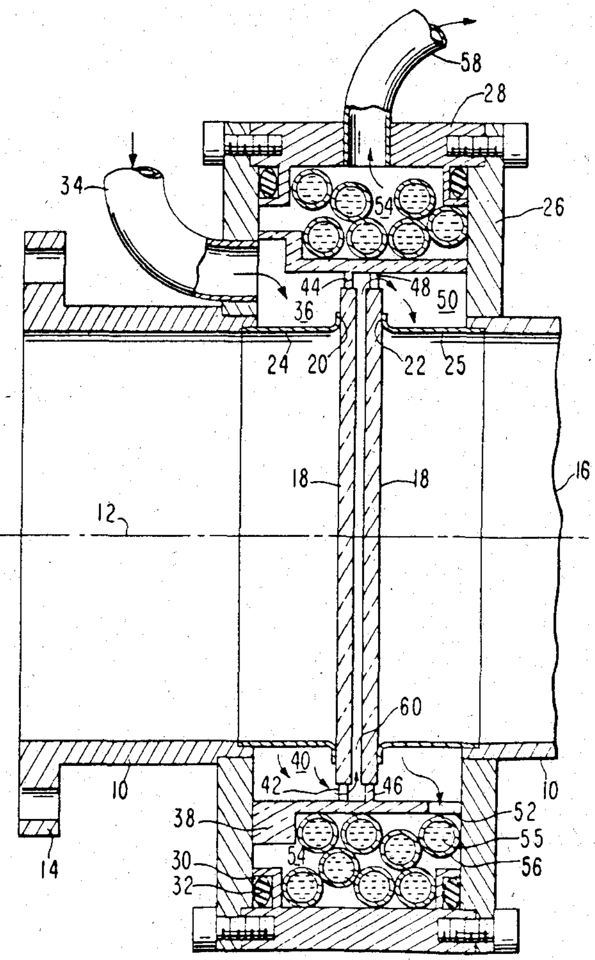
4,286,240 Aug. 25, 1981

Circular Electric Mode Microwave Window

Inventors: James F. Shively; Steven J. Evans; Howard R. Jory; M. Mizuhara.
Assignee: Varian Associates, Inc.
Filed: Dec. 3, 1979.

Abstract—For conducting very high microwave power at very high frequencies, circular waveguide transmitting a circular-electric-field mode is used. The vacuum-tight window of an electron tube is often the element with lowest power-handling capability. The inventive window has two dielectric plates with a space between them. There is a gap in the waveguide inner wall through which a dielectric fluid is circulated between the plates to cool them. The gap leads to a region containing wave-absorbing material such as water to absorb modes other than the circular-electric-field mode.

4 Claims, 2 Drawing Figures



4,287,496 Sep. 1, 1981

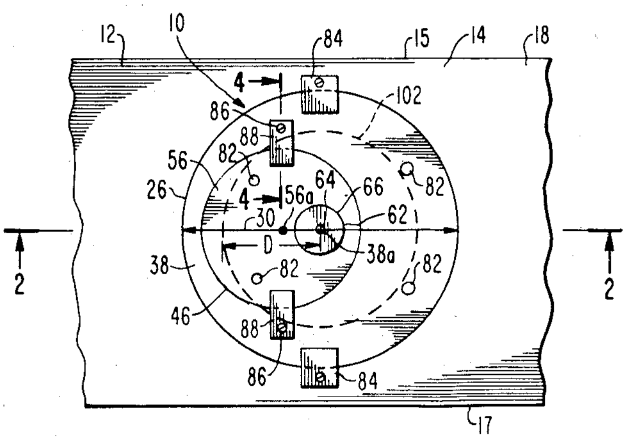
Assembly for Positioning the Coupling Probe of a Waveguide

Inventor: William C. Young.
Assignee: RCA Corporation.
Filed: May 22, 1980.

Abstract—First and a second cylinder-like members, the first located in a wall of a waveguide and rotatable about its center axis, and the second within the first member and rotatable about its central axis which is offset from the

central axis of the first member. A coupling probe extends through the second cylinder-like member near the periphery thereof.

8 Claims, 6 Drawing Figures



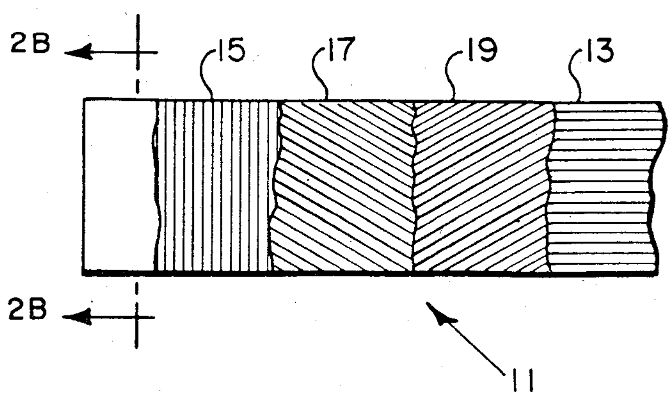
4,287,495 Sep. 1, 1981

Thermally Compensated Phase-Stable Waveguide

Inventors: Walter W. Lund, Jr; Ervin J. Nalos; Donald E. Skoumal.
Assignee: The Boeing Company.
Filed: Mar. 31, 1980.

Abstract—The waveguide is constructed with a specially designed laminate which comprises multiple plies of a graphite-epoxy composite. Thermal compensation is achieved by orienting the graphite fibers in the various plies in selected directions. Graphite fiber has a negative coefficient of thermal expansion while epoxy has a positive coefficient of thermal expansion. At least one ply in the laminate has longitudinally oriented graphite fibers while a second ply has transversely oriented fibers. Third and fourth plies, intermediate of the first and second plies, have graphite fibers which are oriented at selected angles relative to the longitudinal and transverse plies. The angles of orientation of the graphite fibers in the intermediate plies are selected by use of an equation and a set of curves relating the temperature characteristics of the laminate to fiber angle, once the width of the waveguide and the free-space wavelength of the signal propagated in the waveguide are known.

9 Claims, 4 Drawing Figures



4,288,721 Sep. 8, 1981

Microwave Magnetron-Type Device

Inventor: Jury I. Dodonov.
Filed: Jun. 20, 1979.

Abstract—A microwave magnetron-type device comprises an anode assembly or block in the form of a multistage two-dimensional periodic retarding system, including cavities with vanes, each having a lumped inductance portion defined by the vane sidewalls near the vane bases, and straps. The straps are arranged on each stage of the retarding system and pass through windows made in the vanes. Provided in the inductive portion of the cavities of the retarding system is at least one duct with the following ratios:

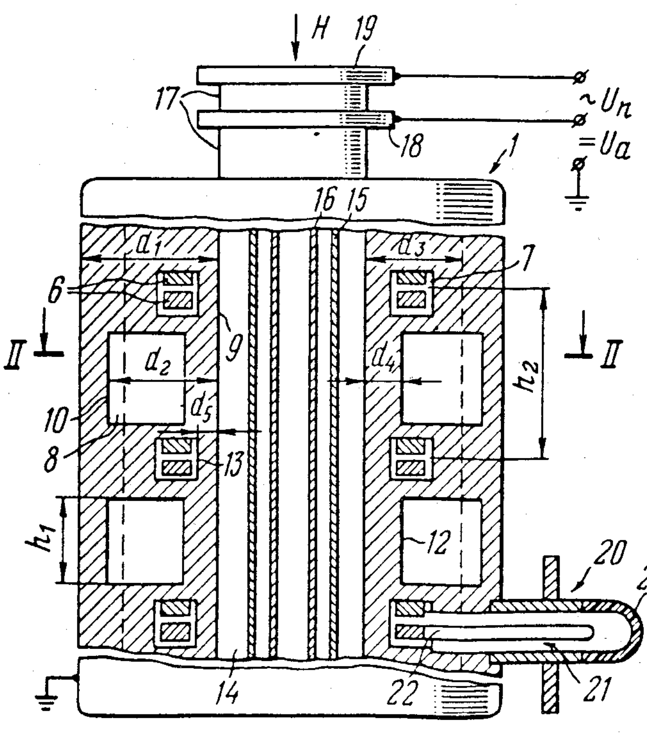
$$d_1 > d_2 > d_3,$$

$$d_3 > d_4 > d_5,$$

$$h_1 \leq h_2,$$

where d_1 is the distance between the vane ends and the outer surface of the anode assembly, d_2 is the distance between the vane ends and the duct wall adjacent to the outer surface of the anode assembly, d_3 is the distance between the vane ends and the wall of the inductive portion of the cavities, remotest from the vane ends, d_4 is the distance between the vane ends and the opposite duct wall, d_5 is the distance between the vane ends and the window wall on the side of the vane ends, h_1 is the height of the duct between two stages of the retarding system, and h_2 is the distance between adjacent stages of the retarding system.

5 Claims, 5 Drawing Figures



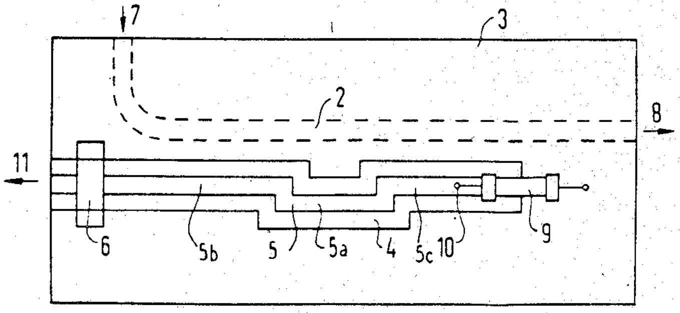
4,288,760 Sep. 8, 1981

Strip Line Directional Coupler

Inventors: Franz Beyer; Peter Schucht.
Assignee: Siemens Aktiengesellschaft.
Filed: Aug. 31, 1979.

Abstract—A directional coupler formed as a strip line which consists of two transmission lines coupled to each other and formed on opposite surfaces of a dielectric carrier plate with one of the lines comprising a microstrip line. A directional coupler is formed which has very high sharpness of directivity and high coupling attenuation, and great electrical strength. The second transmission line is formed as a coplanar line which includes a strip line which is mounted on the grounded side of the microstrip line in an area which is free of the grounded line surface and which extends essentially parallel and has current which is opposite to the strip line of the microstrip line. The invention is particularly adaptable for use where a directional coupler having high coupling attenuation is required, as, for example, in VSWR monitoring in secondary radar devices.

8 Claims, 6 Drawing Figures



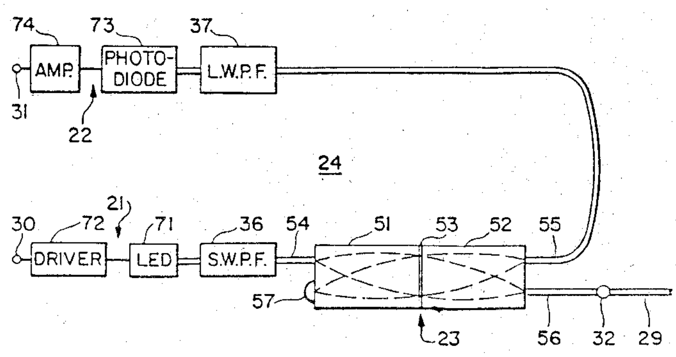
4,289,373 Sep. 15, 1981

Bidirectional Optical Fiber Transmission System

Inventors: Shigetoki Sugimoto; Kouichi Minemura.
Assignee: Nippon Electric Co., Ltd.
Filed: Aug. 9, 1979.

Abstract—There is disclosed a bidirectional optical fiber transmission system. This system includes first and second light transmitter-receiver sets and a single strand of optical fibers. The light transmitter-receiver sets each comprise (a) a light receiver, (b) a light transmitter whose light source is a light emitting diode, and (c) means to isolate downstream and upstream light from each other. The optical fibers connect the light-transmitter-receiver sets through the light isolating means. The emission spectra of the light emitting diodes at least partly overlap each other and the isolating means have wavelength pass bands which do not substantially overlap each other.

6 Claims, 8 Drawing Figures



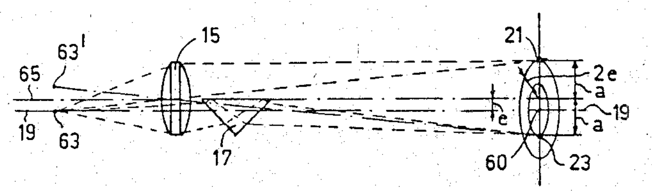
4,289,374 Sep. 15, 1981

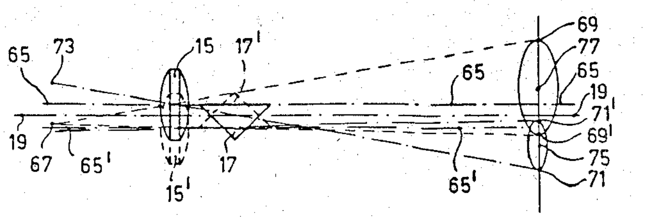
Method of and Device for Providing a Concentric Envelope on an End of an Optical Fiber, and Fiber Having an End Provided with a Concentric Envelope in Accordance with the Method

Inventors: Adrianus J. J. Franken; Giok D. Khoe; Gerard Kuyt; Johannes H. F. M. Van Leest; Antonius J. A. Nicia; Cornelis J. T. Potters; Hendricus F. G. Smulders.
Assignee: U.S. Philips Corporation.
Filed: Sep. 25, 1979.

Abstract—The invention relates to a method of and a device for providing an outer surface of an envelope which is concentric to a light-conductive core, around a monomode optical fiber. According to the invention, the eccentricity of the fiber and the envelope may be for example, 0.1 μm for a core diameter of 3 μm. This accuracy is achieved by splitting a light beam, emerging from the end of a fiber which is clamped in an envelope, into two subbeams by means of rotating optical means, each of the beams producing a circular image. By a suitable choice and adjustment of the optical means, the two light beams will form oppositely moving images when the fiber end is displaced with respect to the axis of rotation and observation. When the images are concentric, the fiber end is situated on the axis of rotation. Machining of the envelope by the use of a tool which rotates around the axis of rotation results in an envelope which is concentric to the light-conductive core of the fiber.

14 Claims, 13 Drawing Figures





4,289,375 Sep. 15, 1981

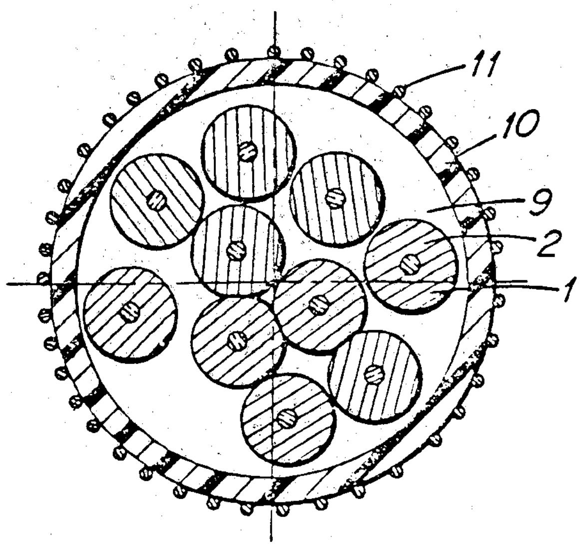
Optical Element for Incorporation into Optical Transmission Means

Inventors: Axel Andersen; Poul U. Knudsen; Knud B. Jensen.
Assignee: Aktieselskabet Nordiske Kabel-og Traadfabriker.
Filed: Nov. 4, 1977.

Abstract—An optical element for incorporation into optical transmission means and comprising an optical fiber provided with a coating with a substantially circular cross section applied essentially coaxially closely around the fiber, to which coating is imparted such an adhesion to the optical fiber that a contraction tendency in the coating brought about in connection with the application of the coating affects the fiber with such an axial compressive force in its whole length that the force causes a real shortening of the fiber and a

corresponding increase of the elongation at break of the fiber. The fiber can be provided with an intermediate protective layer, and an intermediate adhesive layer can be used. Optical transmission means comprising one or more optical elements in a sheath are described.

11 Claims, 4 Drawing Figures



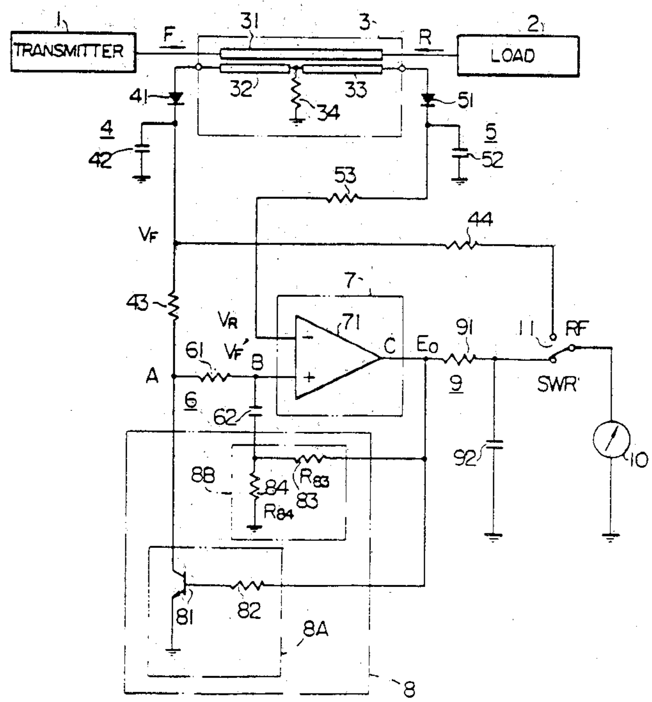
4,290,009 Sep. 15, 1981

Standing Wave Ratio Detecting Apparatus

Inventors: Konomu Sanpei; Tadaaki Fujii.
Assignee: Hitachi, Ltd.
Filed: May 11, 1979.

Abstract—A standing wave ratio detecting apparatus is disclosed which comprises an integration circuit for integrating a traveling wave detection voltage V_F, a comparator circuit for comparing the output voltage V'_F of the integration circuit with a reflected wave detection voltage V_R to a voltage E_O proportional to the voltage ratio V_R/V'_F, a control circuit receiving the output voltage E_O of the comparator circuit and turned on or off according as the output voltage E_O is put in a high level or in a low level to lower or raise the output voltage V'_F of the integration circuit, thereby conducting such a control as making the output voltage V'_F approximately equal to said reflected wave detection voltage V_R and maintaining the amplitude of the output voltage E_O constant, a smoothing circuit for deriving an average voltage corresponding to the ratio V_R/V_F of the reflected wave detection voltage V_R to the traveling wave detection voltage V_F from the output voltage E_O of the comparator circuit, and a meter for indicating the average voltage from the smoothing circuit.

5 Claims, 6 Drawing Figures



Announcements

Low-Noise Microwave Transistors and Amplifiers, a Book of Selected Reprints—H. Fukui, Ed. (IEEE Press, 1981, 472 pp. Paperback member eidition: $16.95. Clothbound edition: $33.95 (discounted to $25.45 for IEEE members). Available postpaid from IEEE Service Center, 445 Hoes Lane, Piscataway, NJ 08854. Payment should accompany orders.) *Description provided by Reed Crone, IEEE Publishing Services, New York, NY 10017.*

Low-noise amplification at microwave frequencies is of great importance in a number of applications, including satellite and terrestrial communications, radioastronomy, and radar. The use of transistors in these applications has resulted in improved performance, simplified operation, increased reliability, reduced maintenance, and better cost efficiency.

This book, sponsored by the IEEE Microwave Theory and Techniques Society, brings together a collection of sixty of the best papers on the subject, divided by subject matter into the following five parts: Noise Characterization and Measurements, Noise Properties of Bipolar Transistors, Noise Properties of Field-Effect Transistors, Low-Noise Amplifier Design, and Practical Amplifier Techniques.

Selections of reprints were made with both device and circuit engineers, as well as graduate students, in mind. The aim of the editor was to provide a basic understanding of noise characterization, its representation and measurement in active linear two-ports, noise performance of microwave transistors, and the design and use of practical low-noise transistor amplifiers.