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(54) **Dual band frequency reuse antenna**

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(56) References cited :
EP-A- 0 042 612
EP-A- 0 045 682
US-A- 3 754 271
BBC RESEARCH DEPARTMENT REPORT, no.
7, July 1988, TADWORTH, GB; pages 1-10;
M.C.D. MADDOCKS et al.: 'Polarisation con-
verters for a DBS flat-plane antenna'

(56) References cited :
PATENT ABSTRACTS OF JAPAN vol. 13, no.
374 (E-808) 18 August 1989 & JP-A-1 126 803
NTG-FACHBERICHTE, vol. 52, 1975, pages
203-208; G. MÖRZ et al.: "Speisesysteme zur
Erzeugung von Dualpolarisation hoher En-
tkopplung für Bodenstationsantennen mit Fre-
quenzdoppelausnutzung"

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Description

This invention relates to antennas having frequency reuse capabilities, and more particularly to antennas having a four port network or quadruplexer located in the antenna waveguide, a feed horn attached to the waveguide, and a polarizer disposed at the aperture of the antenna for converting linearly polarized signals to circularly polarized signals.

It has become well known in the field of satellite communications to utilize a single antenna to transmit and receive signals in two frequency bands with two orthogonal, linearly polarized signal components within each band. Waveguides that incorporate such features are known as four-port networks and/or quadruplexers. U.S. Patent 4,630,059 issued to Morz on December 16, 1986 teaches a four-port network suitable for satellite communication. Two orthogonal ports of the Morz waveguide are utilized to introduce orthogonal linearly polarized signals in the four GHz band which are converted to circularly polarized signals in the throat of the waveguide for transmission through the grooved conical horn. Two other orthogonally disposed ports are arranged to receive linearly polarized signals in the six GHz band.

Another prior art four port waveguide network antenna has been designed by COMSAT Laboratories. This device includes two coaxial waveguides, the outer waveguide being used for the transmission and reception of the four GHz band and the inner coaxial waveguide being utilized for the six GHz band. A tunable configuration of screws and baffles within the waveguides are utilized to convert the linearly polarized signals into circularly polarized signals. The device utilizes a grooved conical horn to transmit and receive signals.

Additional prior art antennas that are of interest include those described in U.S. Patent 4,797,681 to Kaplan et al. on January 10, 1989; U.S. Patent 4,707,702 issued to Withers on November 17, 1987; U.S. Patent 4,573,054 issued to Bouko et al. on February 25, 1986; U.S. Patent 4,358,770 issued to Satoh et al. on November 9, 1982; U.S. Patent 4,219,820 issued to Crail on August 26, 1980 and U.S. Patent 3,898,667 issued to Raab on August 5, 1975.

The efficiency of a satellite antenna which transmits and receives different information utilizing orthogonal polarizations of the same frequency band depends to a significant measure upon the elimination of cross-polarization between the orthogonal polarized signals. It is known that a circularly polarized signal can be reduced to a linearly polarized signal utilizing a meanderline polarizer. Such meanderline polarizers produce minimal cross-polarization and therefore promote efficiency. U.S. Patent 3,754,271 issued to Epis on August 21, 1973 describes a meanderline polarizer having a plurality of stacked substantially identical arrays of laterally spaced square-wave shaped meanderlines. The device is positioned at the aperture of a pyramidal horn for conversion of circularly polarized waves into linearly polarized waves.

A meanderline polarizer comprising several printed-circuit sheets each covered with an array of conductive meander lines is disclosed in a paper entitled "Polarization Converters for a DBS Flat-Plate Antenna" published as BBC Research Department Report, No. 7, July 1988. As the title of the paper suggests, the meanderline polarizer was used only for a flat-plate antenna and no other investigations were made or uses contemplated.

However, Japanese Patent Application No. A-1126803 disclosed the use of an antenna comprising a waveguide section coupled to a horn provided with a cover in the form of a meanderline polarizer. The waveguide section is provided with two orthogonal ports with one being axially positioned in order to input a linearly polarized signal into the antenna.

The present invention provides a frequency reuse antenna comprising:

a waveguide network having ports for transmitting and receiving orthogonal, linearly polarized signals of a second frequency;

a feed horn being engaged to said waveguide network and adapted to enhance the transmission and reception of signals from and to said waveguide network respectively; and

a signal polarizing means being engaged to the aperture of said feed horn and adapted to convert between linearly polarized signals and circularly polarized signals, characterised in that the antenna is a dual band antenna with the waveguide network having a central section and four ports, two of the ports being positioned to feed into the free end of the central section for receiving orthogonal, linearly polarized signals within a first-frequency band, and the other two of the ports being spaced apart at different axial positions along the central section near the end of the section to which the feed horn is attached whereby to transmit orthogonal linearly polarized signals within a second frequency band different to said first frequency band.

The meanderline polarizer (16) preferably includes five separated layers of meanderlines, wherein the first and fifth layers (50 and 58 respectively) include identical meanderlines, the second and fourth (52 and 56 respectively) layers include identical meanderlines that differ from those of the first and fifth layers, and the third layer (54) includes meanderlines that differ from the others in the first, second, fourth and fifth layers. It is an advantage of the present invention that it provides a dual band frequency reuse antenna having minimal cross-polarization.

The four port waveguide network is preferably constructed as a square waveguide, a pyramidal horn and meanderline polarizer to achieve increased signal gain and reduced cross-polarization. This provides dimensional stability over a broad thermal range, whereby the antenna is usable in an earth orbital environment.

The foregoing and other features and advantages of the present invention will be apparent from the following detailed description of the preferred embodiment which makes reference to the several figures of the drawing.

Fig. 1 is a perspective view of the present invention;

Fig. 2 is a side elevational view of the antenna of the present invention and a reflector;

Fig. 3 is a perspective view of the waveguide of the present invention;

Fig. 4 is a side elevational view of the waveguide of the present invention;

Fig. 5 is an end elevational view of the waveguide of the present invention;

Fig. 6 is a perspective view of the meanderline polarizer of the present invention having cutaway portions; and

Fig. 7 is a top plan view of portions of the meanderline traces of the meanderline polarizer.

As depicted in Fig. 1, the antenna 10 includes three main components, a waveguide 12, a horn 14 and a meanderline polarizer 16 that is attached to the aperture 17 of the horn 14. As depicted in Fig. 2, the antenna 10 is preferably designed to be used with a parabolic reflector 18, such that the antenna 10 is fixedly mounted to a structure (not shown) and the antenna beam is scanned by movement of the reflector 18 relative to the fixedly mounted antenna 10.

As depicted in Figs. 3, 4 and 5, the waveguide 12 includes a four port waveguide network. Two of the ports 20 and 22 are designed for the transmission of orthogonal, linearly polarized signals of a first frequency, which in the preferred embodiment is a 4.035 to 4.200 GHz transmission band frequency. The other two ports 24 and 26 are designed for the reception of orthogonal, linearly polarized signals of a different frequency, which in the preferred embodiment is a 6.260 to 6.425 GHz receiving band frequency. The four independent, linearly polarized signals (1 from each port) are coupled into the common square waveguide 12, which in turn excites the pyramidal feed horn 14. At the aperture 17 of the horn 14, the meanderline polarizer 16 then converts the linearly polarized signals to circular polarizations, such that two oppositely, circularly polarized fields are radiated from the antenna 10 at the transmission band frequency. The meanderline polarizer also converts two oppositely, circularly polarized signals to two orthogonal, linearly polarized signals at the receiving band frequency.

Each port 20, 22, 24 and 26 of the four port waveguide network includes an attachment flange 30, 32, 34 and 36 respectively, disposed about its outer end to which signal transmitting or receiving devices (not shown) are coupled. In the preferred embodiment depicted in Figs. 3, 4 and 5, the orthogonal ports 24 and 26 feed directly into the side and throat respectively of the waveguide 12, whereas orthogonal ports 20 and 22 are provided with additional waveguide structures 40 and 42 respectively which lead to the body of the waveguide 12.

As is known to those skilled in the art, the dimensions of the various waveguide openings and structures are of significance in obtaining acceptable antenna performance. For ease of comprehension and enablement purposes, various significant dimensions, in inches, are provided in Figs. 3, 4, and 5. The waveguide structures 40 and 42 comprise a series of rectangular corrugations formed perpendicularly to the central axis of the waveguide structures 40 and 42. In the preferred embodiment, support straps 46 are engaged across the outer surface of the corrugations to provide structural rigidity to the waveguide structures 40 and 42. The corrugated waveguide structures 40 and 42 are dimensionally configured to act as a short circuit to the six GHz signals while allowing the four GHz signals to pass therethrough. Thus, the linearly polarized six GHz receiving signal does not propagate into waveguide structures 40 and 42, but rather continues through the body of the waveguide 12 to the ports 24 and 26. Additionally, a central section 48 of the waveguide 12 located behind ports 20 and 22 is dimensionally sized to prevent the propagation of the four GHz transmission signals backwards through the waveguide 12 to the six GHz ports 24 and 26.

In the preferred embodiment, the feed horn 14 is a pyramidal horn having a flare angle of approximately 10 degrees and a square aperture having a side measurement of approximately 6 inches; its aperture 17 is located approximately 3.5 inches towards the reflector 18 from the focal point 50 of the reflector 18.

As is seen in Fig. 1, in the preferred embodiment, the meanderline polarizer is oriented relative to the square aperture 17 of the feed horn 14, such that the meanderlines run diagonally across the aperture 17 of the feed horn 14. The improved meanderline polarizer 16 serves to transform the linearly polarized signals into circularly polarized signals at the aperture 17 of the antenna horn 14. Thus, the signals that propagate within the horn 14 and waveguide 12 are entirely orthogonal, linearly polarized signals, and no circularly polarized signals propagate within the horn 14 or waveguide 12. This configuration results in the transmission and reception within the waveguide of orthogonal, linearly polarized signals with significantly reduced cross-

polarization, whereby improved signal gain and reduced noise is achieved.

In the preferred embodiment, as depicted in Fig. 6, the meanderline polarizer 16 is a sandwich structure including five thin layers 50, 52, 54, 56 and 58, each having a plurality of meanderline traces 60, 62, 64, 66 and 68, respectively, formed thereon. Four foam-like spacers 70, 72, 74 and 76 serve to separate the five meanderline layers. The use of meanderline polarizers that are generally configured as described hereinabove is well known in the art, as particularly taught in U.S. Patent 3,754,271 issued to J. Epis on August 21, 1973. A significant difference between the polarizer 16 of the present invention and the prior art polarizers resides in the utilization of meanderline traces of differing dimensions in the various layers 50, 52, 54, 56 and 58. Specifically, the meanderline traces in layers 50 and 58 are identical, the meanderline traces in layers 52 and 56 are identical, although differing in dimensions from the meanderline traces in layers 50 and 58. The meanderline traces in layer 54 are different in dimension from those of any other layer.

Proper selection of the meanderline trace dimensions provides the required dual band conversion to pure circular polarization. In the preferred embodiment, the polarizer is a 9.0" square by 2.0" thick sandwich construction. The sandwich consists of the four spacers 60, 62, 64 and 66 composed of Stanthyne 817 Foam, and the five layers 50, 52, 54, 56 and 58 are composed of etched 1/2 oz. copper clad 3 mill Kapton bonded together with Hysol 9309 adhesive. Bonding is done so as not to cover the traces. The polarizer is bonded to a fiberglass frame 19 which is bolted to the aperture 17 of the horn 14. The traces are preferably formed on the Kapton layers utilizing printed circuit board techniques to provide close tolerances and reliability to the device.

As is depicted in Fig. 7, the dimensions of the meanderline traces in each layer can be expressed by four parameters that are designated as: A, the periodicity of a meanderline trace; H, the height of the meanderline trace; W, the width of the meanderline trace; and B, the distance between adjacent meanderline traces. The following table provides the dimensions for each of the layers of the meanderline polarizer 16.

	Layers 50 & 58	Layers 52 & 56	Layer 54
A	0.046	0.174	0.134
H	0.180	0.336	0.409
W	0.011	0.043	0.034
B	0.782	0.782	0.782

It is advantageous that the present invention provides a reuse frequency capability. That is, that the same frequency can be used for transmitting two signals, one of which is circularly polarized in a first sense and the other of which is circularly polarized in an opposite sense. Additionally, the utilization of four ports in the waveguide network permits the simultaneous utilization of two reuse frequency signals, approximately 4 GHz and approximately 6 GHz. The use of a meanderline polarizer at the aperture 17 of the feed horn 14 provides improved performance as compared to prior art devices which attempt to convert signals from circular polarization to linear polarization within the waveguide. The improved meanderline polarizer reduces cross-polarization and thus contributes to the improved performance of the invention.

Claims

1. A frequency reuse antenna comprising:

a waveguide network (12) having ports for transmitting and receiving orthogonal, linearly polarized signals of a second frequency;

a feed horn (14) being engaged to said waveguide network (12) and adapted to enhance the transmission and reception of signals from and to said waveguide network (12) respectively; and

a signal polarizing means (16) being engaged to the aperture (17) of said feed horn (14) and adapted to convert between linearly polarized signals and circularly polarized signals, characterised in that the antenna is a dual band antenna with the waveguide network (12) having a central section and four ports (20,22,24,26), two of the ports (24,26) being positioned to feed into the free end of the central section for receiving orthogonal, linearly polarized signals within a first-frequency band, and the other two (20,22) of the ports being spaced apart at different axial positions along the central section near the end of the section to which the feed horn (14) is attached whereby to transmit orthogonal linearly polarized signals

within a second frequency band different to said first frequency band.

2. A dual band frequency reuse antenna as described in claim 1 wherein said signal means (16) comprises a meanderline polarizer.
- 5 3. A dual band frequency reuse antenna as described in claim 2 wherein said meanderline polarizer comprises a plurality of layers (50,52,54,56,58), each said layer comprising a plurality of substantially identical meanderline traces (60,62,64,66,68) being formed thereon.
- 10 4. A dual band frequency reuse antenna as described in claim 3 wherein said meanderline traces (60,62) formed on at least two (50,52) of said layers as formed with differing dimensions.
5. A dual band frequency reuse antenna as described in claim 4 wherein said meanderline traces (60) formed on a first layer (50) differ in dimensions from said meanderline traces (62) formed on a second layer (52), and said meanderline traces (64) formed on a third layer (54) differ in dimensions from said meanderline traces (60,62) formed on each of said first layer (50) and said second layer (52).
- 15 6. A dual band frequency reuse antenna as described in claim 3 wherein said meanderline polarizer includes five layers (50,52,54,56,58), each of said layers having a plurality of meanderline traces (60,62,64,66,68) formed thereon;
 - 20 said meanderline traces formed on said first and fifth layers (50,58) being substantially identical in dimensions;
 - said meanderline traces formed on said second and fourth layers (52,56) being substantially identical in dimensions, said meanderline traces formed on said second and fourth layers differing in dimensions from said meanderline traces formed on said first and fifth layers; and
 - 25 said meanderline traces formed on said third layer (54) differing in dimensions from said meanderline traces formed on said first, second, fourth, and fifth layers.
7. A dual band frequency reuse antenna according to any one of the preceding claims, wherein the central section of the waveguide network (12) and the horn (14) have substantially square cross-sections.
- 30 8. A dual band frequency reuse antenna according to any one of the preceding claims, and further comprising first and second corrugated waveguide waveguide structure (40,42) each having a central axis and corrugations formed perpendicularly to the corresponding central axis for short circuitry signals of the first frequency band while allowing signals of the second frequency band to pass therethrough, said corrugated waveguide structures (40,42) being coupled between said central sections and said other two parts (20,22) of the waveguide network.
- 35

Patentansprüche

- 40 1. Frequenz-Mehrfachnutzungs-Antenne mit:
 - einem Wellenleiter-Netz (12) mit Anschlüssen zum Senden und Empfangen orthogonaler, linear polarisierter Signale einer zweiten Frequenz;
 - einem an dem Wellenleiternetz (12) in Anlage gebrachten Einspeisehorn (14), das ausgelegt ist, das Senden und Empfangen von Signalen von dem Wellenleiternetz (12) bzw. durch dasselbe zu verbessern; und
 - 45 einem Signalpolarisationsmittel (16), das an der Apertur (17) des Speisehorns (14) in Anlage gebracht und ausgelegt ist, zwischen linear polarisierten Signalen und zirkular polarisierten Signalen zu wandeln, **dadurch gekennzeichnet**, daß die Antenne eine Doppelbandantenne ist, bei der das Wellenleiternetz (12) einen Zentralabschnitt und vier Anschlüsse (20, 22, 24, 26) besitzt, von denen zwei Anschlüsse (24, 26) zum Einspeisen in das freie Ende des Zentralabschnitts angeordnet sind zum Empfangen von orthogonalen linear polarisierten Signalen innerhalb eines ersten Frequenzbandes und die anderen beiden (20, 22) Anschlüsse mit Abstand voneinander an unterschiedlichen axialen Positionen längs des Zentralabschnitts in der Nähe des Abschnittendes angebracht sind, an dem das Einspeisehorn (14) angebracht ist, um dadurch orthogonale linear polarisierte Signale innerhalb eines zweiten, zum ersten Frequenzband unterschiedlichen Frequenzbandes zu senden.
 - 50
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2. Doppelband-Frequenzmehrfachnutzungs-Antenne, wie in Anspruch 1 beschrieben, bei der das Signalmittel (16) einen Mäanderleitungs-Polarisator umfaßt.

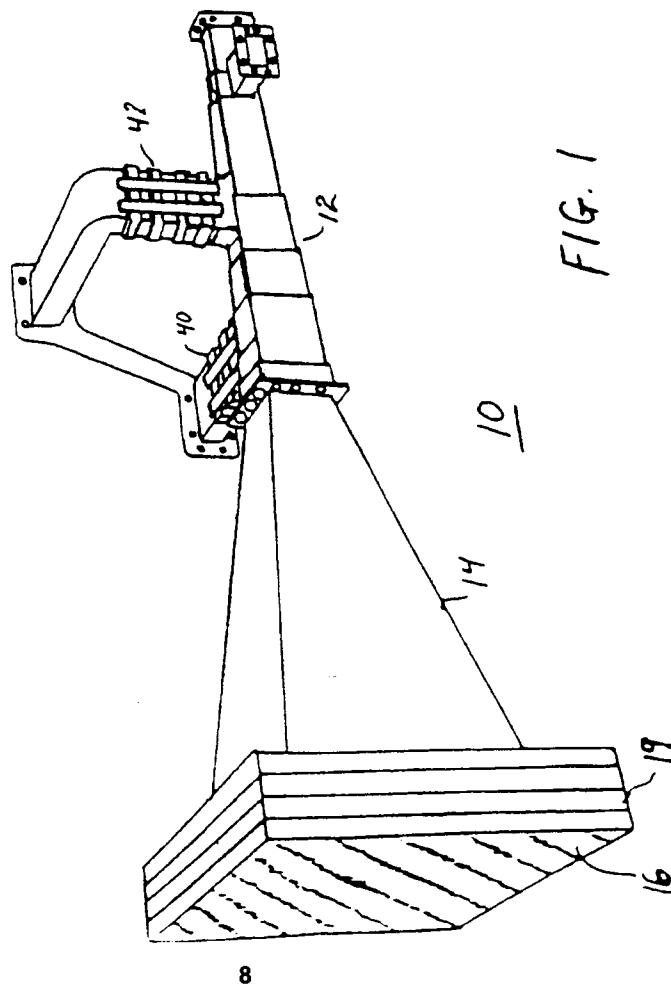
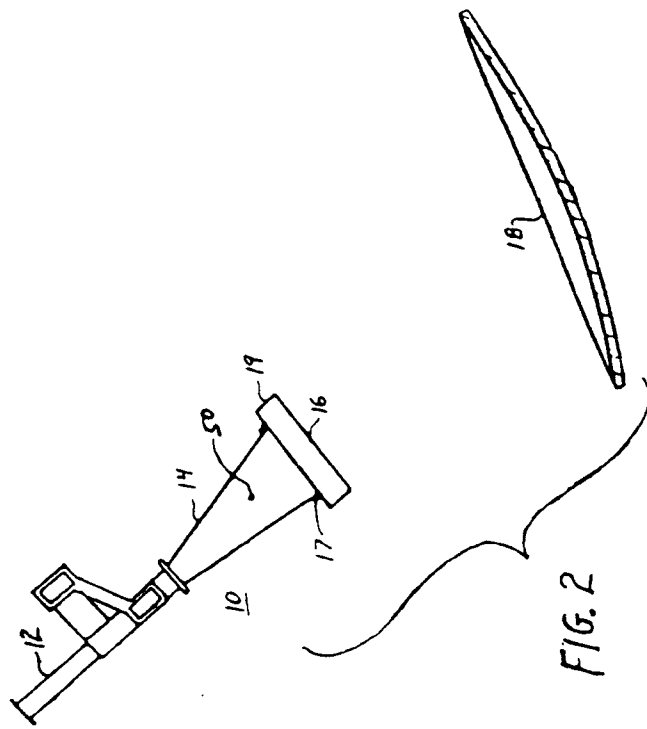
3. Doppelband-Frequenzmehrfachnutzungs-Antenne, wie in Anspruch 2 beschrieben, bei der der Mäanderleitungs-Polarisator eine Vielzahl von Schichten (50, 52, 54, 56, 58) umfaßt, von denen jede Schicht eine Vielzahl von im wesentlichen identischen Mäanderleitungs-Spuren (60, 62, 64, 66, 68) umfaßt, die daran ausgebildet sind.
4. Doppelband-Frequenzmehrfachnutzungs-Antenne, wie in Anspruch 3 beschrieben, bei der die Mäanderleitungs-Spuren (60, 62), die an mindestens zwei (50, 52) der Schichten ausgebildet sind, mit unterschiedlichen Maßen ausgebildet sind.
5. Doppelband-Frequenzmehrfachnutzungs-Antenne, wie in Anspruch 4 beschrieben, bei der die an einer ersten Schicht (50) ausgebildeten Mäanderleitungs-Spuren (60) sich in ihren Abmessungen von den an einer zweiten Schicht (52) ausgebildeten Mäanderleitungs-Spuren (62) unterscheiden, und die an einer dritten Schicht (54) ausgebildeten Mäanderleitungs-Spuren (64) sich in ihren Abmessungen von den jeweils an der ersten Schicht (50) und der zweiten Schicht (52) ausgebildeten Mäanderleitungs-Spuren (60, 62) unterscheiden.
6. Doppelband-Frequenzmehrfachnutzungs-Antenne, wie in Anspruch 3 beschrieben, bei der der Mäanderleitungs-Polarisator fünf Schichten (50, 52, 54, 56, 58) enthält, von denen jede Schicht eine Vielzahl von daran ausgebildeten Mäanderleitungs-Spuren (60, 62, 64, 66, 68) enthält; wobei die an der ersten und der fünften Schicht (50, 58) ausgebildeten Mäanderleitungs-Spuren im wesentlichen in ihren Abmessungen identisch sind; die an der zweiten und der vierten Schicht (52, 56) ausgebildeten Mäanderleitungs-Spuren im wesentlichen in ihren Abmessungen identisch sind, wobei sich die an der zweiten und der vierten Schicht ausgebildeten Mäanderleitungs-Spuren in ihren Abmessungen von den an der ersten und fünften Schicht ausgebildeten Mäanderleitungs-Spuren unterscheiden; und die an der dritten Schicht (54) ausgebildeten Mäanderleitungs-Spuren sich in ihren Abmessungen von denen an der ersten, zweiten, vierten und fünften Schicht ausgebildeten Mäanderleitungs-Spuren unterscheiden.
7. Doppelband-Frequenzmehrfachnutzungs-Antenne nach einem der vorangehenden Ansprüche, bei der der zentrale Abschnitt des Wellenleiternetzes (12) und das Horn (14) im wesentlichen quadratische Querschnitte besitzen.
8. Doppelband-Frequenzmehrfachnutzungs-Antenne nach einem der vorangehenden Ansprüche, die weiter umfaßt erste und zweite gewellte Wellenleiterstrukturen (40, 42) mit jeweils einer zentralen Achse und mit Wellungen, die senkrecht zur entsprechenden zentralen Achse ausgebildet sind zum Kurzschließen von Signalen des ersten Frequenzbandes, während sie das Durchleiten von Signalen des zweiten Frequenzbandes zulassen, wobei die gewellten Wellenleiterstrukturen (40, 42) zwischen den zentralen Abschnitten und den anderen beiden Teilen (20, 22) des Wellenleiternetzes gekoppelt sind.

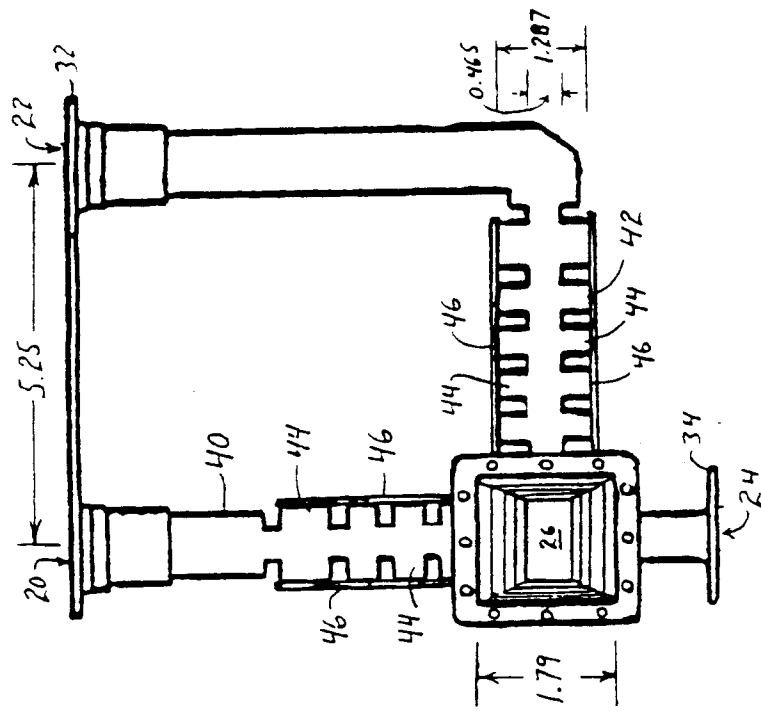
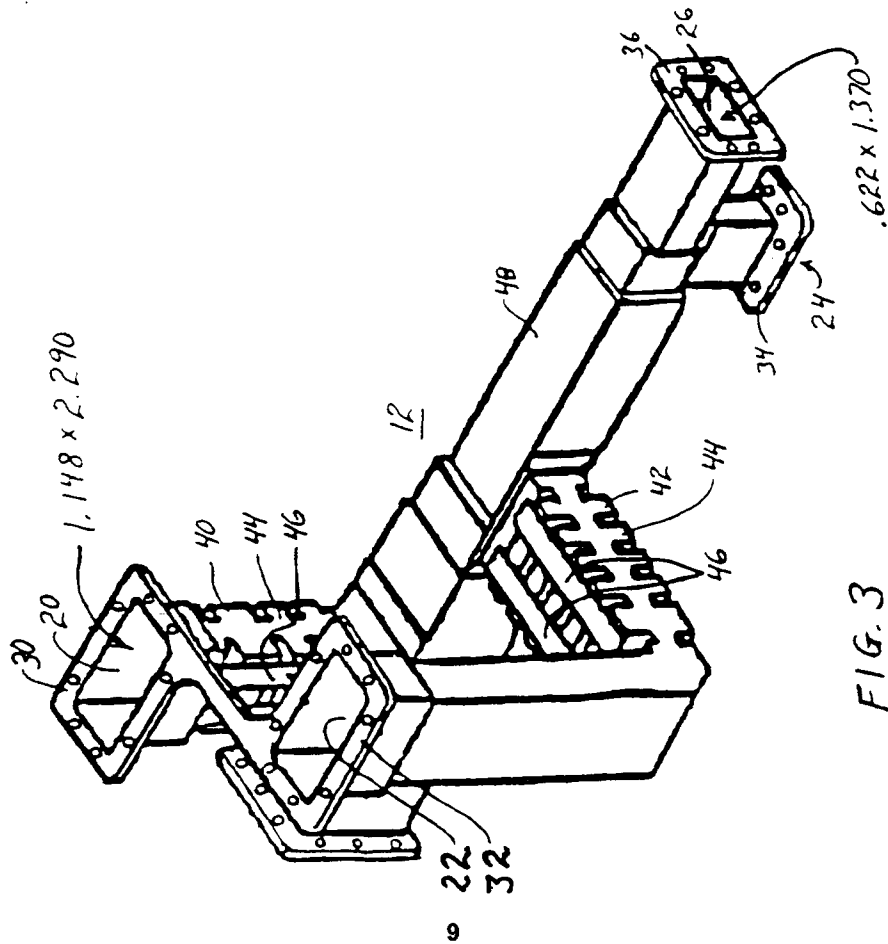
Revendications

1. Antenne à réutilisation de fréquence comprenant :
- un réseau de guide d'onde (12) possédant des connecteurs pour émettre et recevoir des signaux normaux polarisés, de façon linéaire, d'une seconde fréquence;
 - un cornet d'alimentation (14) coopérant avec ledit réseau de guide d'onde (12) et prévu pour améliorer respectivement l'émission et la réception des signaux à partir et vers ledit réseau de guide d'onde (12); et
 - un moyen de polarisation de signal (16) coopérant avec l'ouverture (17) dudit cornet d'alimentation (14) et prévu pour une conversion entre les signaux polarisés, de façon linéaire, et des signaux polarisés de façon circulaire;
- antenne caractérisée en ce que l'antenne est une antenne à double bande, le réseau de guide d'onde (12) possédant une section centrale et quatre connecteurs (20, 22, 24, 26), deux des connecteurs (24, 26) étant placés pour alimenter l'extrémité libre de la section centrale pour la réception de signaux normaux polarisés, de façon linéaire, dans une première bande de fréquences, et les deux autres connecteurs (20, 22) étant espacés sur différentes positions axiales le long de la section centrale près de l'extrémité de la section sur laquelle est fixé le cornet d'alimentation (14) afin d'émettre des signaux normaux

polarisés, de façon linéaire, dans une seconde bande de fréquences, différente de ladite première bande de fréquences.

- 5 2. Antenne à réutilisation de fréquence de double bande selon la revendication 1, dans laquelle ledit moyen de signal (16) comprend un polariseur à lignes en dents de scie.
- 10 3. Antenne à réutilisation de fréquence de double bande selon la revendication 2, dans laquelle ledit polariseur à lignes en dents de scie comprend une pluralité de couches (50, 52, 54, 56, 58), chacune desdites couches comprenant une pluralité de marques de lignes en dents de scie pratiquement identiques (60, 62, 64, 66, 68) formées dessus.
- 15 4. Antenne à réutilisation de fréquence de double bande selon la revendication 3, dans laquelle les marques de lignes en dents de scie (60, 62) formées sur au moins deux couches (50, 52) desdites couches présentent des dimensions différentes.
- 20 5. Antenne à réutilisation de fréquence de double bande selon la revendication 4, dans laquelle lesdites marques de lignes en dents de scie (60) formées sur une première couche (50) sont de dimensions différentes desdites marques de lignes en dents de scie (62) formées sur une seconde couche et lesdites marques de lignes en dents de scie (64) formées sur une troisième couche (54) sont de dimensions différentes desdites marques de lignes en dents de scie (60, 62) formées sur chacune desdites première (50) et seconde (52) couches.
- 25 6. Antenne à réutilisation de fréquence de double bande selon la revendication 3, dans laquelle ledit polariseur à lignes en dents de scie comprend cinq couches (50, 52, 54, 56, 58), chacune desdites couches possédant une pluralité de marques de lignes en dents de scie (60, 62, 64, 66, 68) formées dessus;
lesdites marques de lignes en dents de scie formées sur lesdites première et cinquième couches (50, 58) étant de dimensions pratiquement identiques;
lesdites marques de lignes en dents de scie formées sur lesdites seconde et quatrième couches (52, 56) étant de dimensions pratiquement identiques, lesdites marques de lignes en dents de scie formées sur lesdites seconde et quatrième couches étant de dimensions différentes desdites marques de lignes en dents de scie formées sur lesdites première et cinquième couches; et
lesdites marques de lignes en dents de scie formées sur ladite troisième couche (54) étant de dimensions différentes desdites marques de lignes en dents de scie formées sur lesdites première, seconde, quatrième et cinquième couches.
- 30 7. Antenne à réutilisation de fréquence de double bande selon l'une quelconque des revendications précédentes, dans laquelle la section centrale du réseau de guide d'onde (12) et le cornet (14) ont des sections droites pratiquement carrées.
- 35 8. Antenne à réutilisation de fréquence de double bande selon l'une quelconque des revendications précédentes, comprenant, de plus, des première et seconde structures de guide d'onde ondulées (40, 42) possédant chacune un axe central et des ondulations formées perpendiculairement à l'axe central correspondant pour des signaux de court-circuit de la première bande de fréquences tout en permettant le passage des signaux de la seconde bande de fréquences, lesdites structures ondulées de guide d'onde (40, 42) étant couplées entre lesdites sections centrales et lesdites deux autres parties (20, 22) du réseau de guide d'onde.
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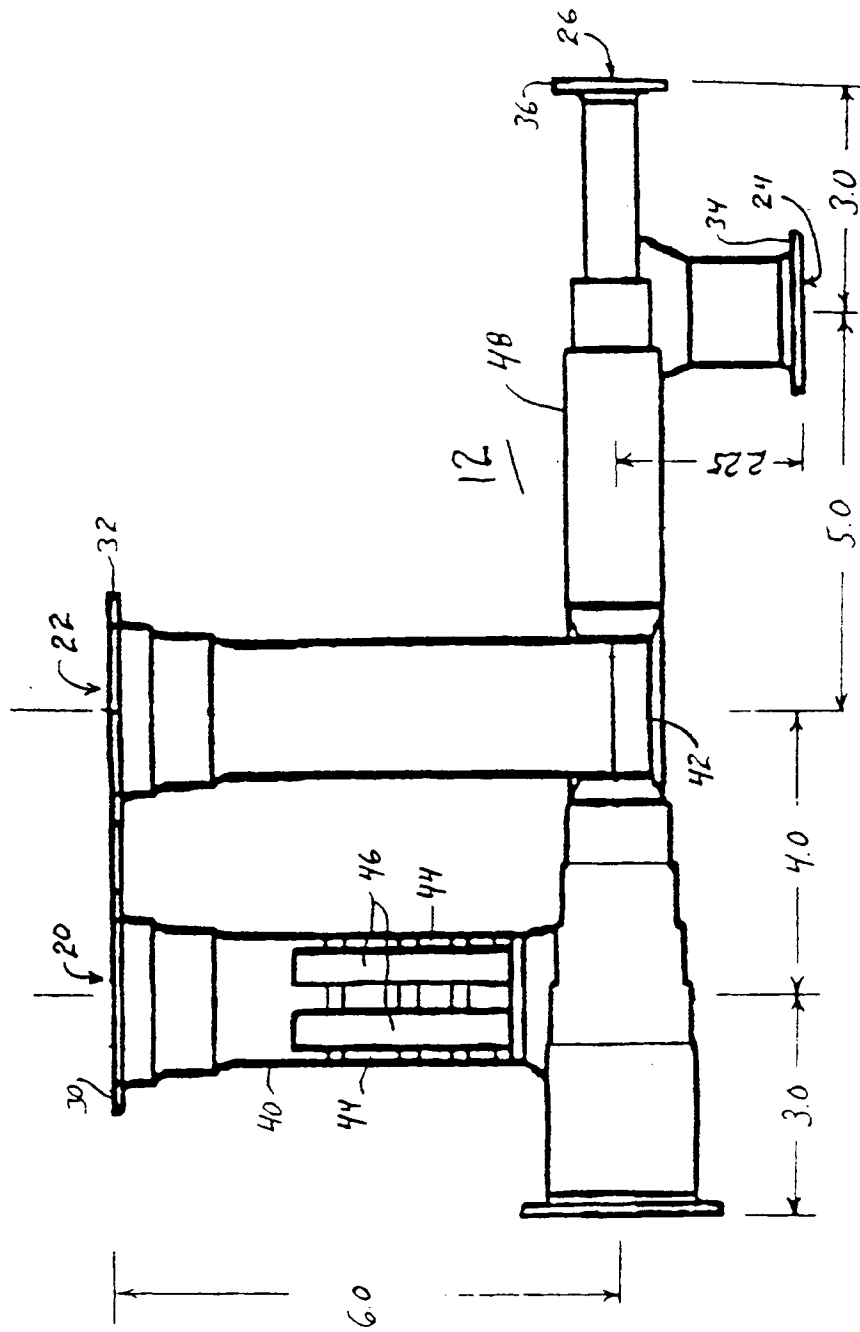


FIG. 4

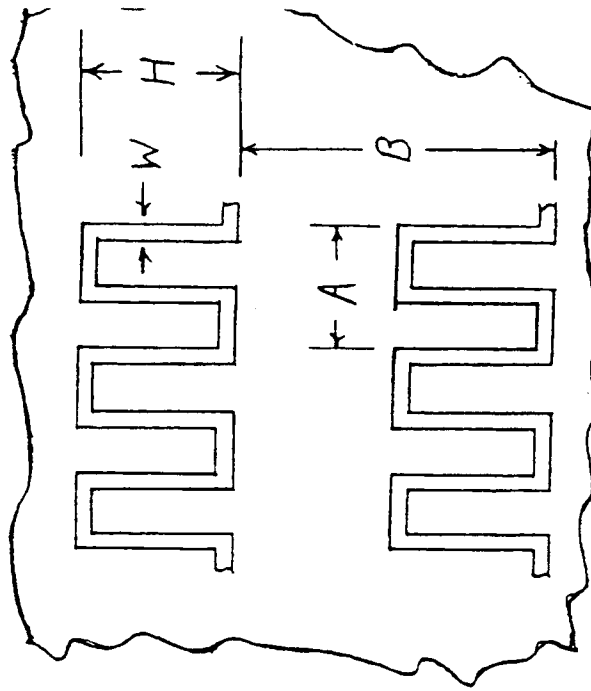


FIG. 7

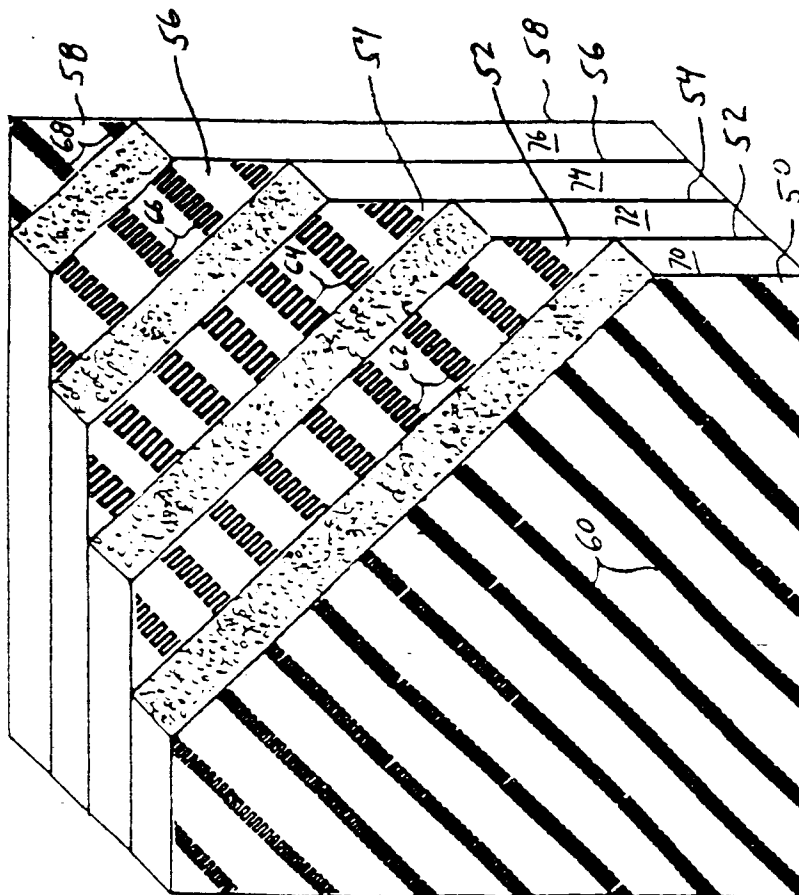


FIG. 6