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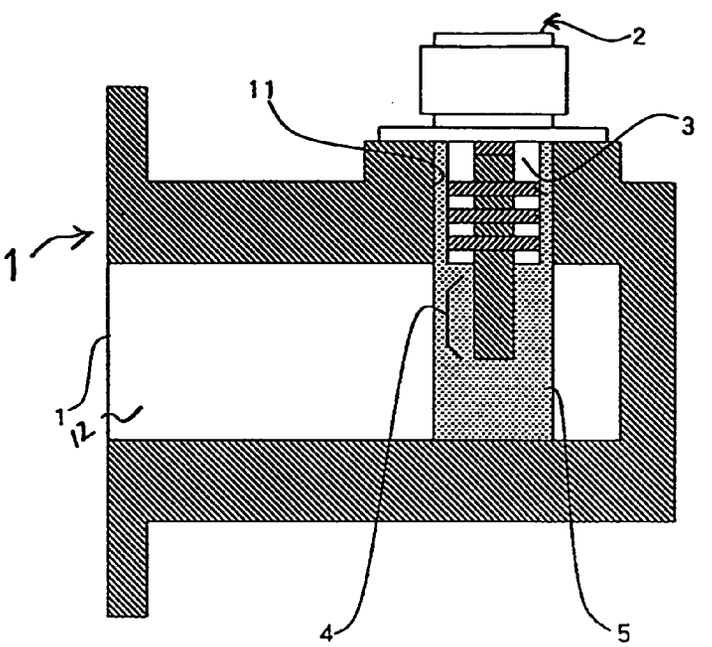
(54) Waveguide-coaxial converter

(57) A waveguide-coaxial converter is proposed that includes a low-pass filter and is characterized by simple and compact construction. A passage is formed penetrating the side wall of a square waveguide and communicating with a cavity of the square waveguide, and a connector is provided in a portion of the passage such that a core conductor passes through the passage and is directed toward the cavity. A low-pass filter made up of a plurality of joined conductors of differing impedance is provided at a portion of the core conductor within said passage, and the core conductor which extends through the low-pass filter protrudes from the inner wall of the square waveguide and into the cavity a distance matching a pass band.

Fig. 3



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Description

The present invention relates to a waveguide-coaxial converter used in connecting a coaxial line and a square waveguide used in a communication device, and particularly to waveguide-coaxial converter provided with a connector for a coaxial line connection at a prescribed portion of a square waveguide.

Waveguide-coaxial converters having a low-pass filter for eliminating higher harmonics are known in the art. The configuration of one example of such a waveguide-coaxial converter is shown in Fig. 1, which shows a coaxial low-pass filter 8 connected by means of a connector 2 to a wide outer wall portion in the vicinity of the terminal portion of a square waveguide 1, or as shown in Figs. 2A and 2B, which show a waveguide low-pass filter 9 having fine sorted blocks 10 provided on the inner wall of the waveguide.

However, as in the case of the coaxial type shown in Fig. 1, waveguide-coaxial converters of the above-described prior art having an independent coaxial low-pass filter 8 provided on the wide outer wall surface of the waveguide-coaxial converter results in a bulky shape, and this presents difficulties in miniaturization. Further, in the case of the waveguide low-pass filter 9 shown in Figs. 2A and 2B, the necessity for precise machining of the fine blocks 10 results in difficulties in manufacturing.

The object of the present invention is to provide a waveguide-coaxial converter having low-pass filter functions that features simple and compact construction.

To achieve this object, the present invention proposes a waveguide-coaxial converter wherein a passage is formed penetrating the side wall of a square waveguide and communicating with a cavity of the square waveguide; a connector is provided in a portion of the passage such that a core conductor passes through the passage and is directed toward the cavity; a low-pass filter made up of a plurality of joined conductors of differing impedance is provided at a portion of the core conductor within the passage; and the core conductor which extends through the low-pass filter, protrudes from the inner wall of the square waveguide and into the cavity a distance matching a pass band.

In the waveguide-coaxial converter according to the present invention, a low-pass filter is constructed by sequentially joining conductors of high-impedance form and conductors of low-impedance form to the core conductor of the connector, this structure being secured to the wall of the square-wave waveguide by covering (holding) it with, for example, an insulative support member. The core conductor extending from the low-pass filter matches the pass band, and therefore, possesses low-pass filter functions as well as probe functions without causing interference with the pass band. In this way, manufacturing is far easier and significantly less expensive than a construction having an added low-pass filter or a construction in which a plurality of conductors or dielectrics are arranged on the inner wall of a waveguide.

According to an embodiment of the present invention, an insulative columnar support having the same outer diameter as the passage passes through the passage and is secured to the square waveguide, and the core conductors and low-pass filter of the connector are fixed in the interior of the insulative support. In this case, a construction is possible by which the end surface on the cavity side of the insulative support directly contacts the inner wall of the square-wave waveguide.

The above and other objects, features, and advantages of the present invention will become apparent from the following description based on the accompanying drawings which illustrate examples of preferred embodiments of the present invention.

Fig. 1 is a sectional view showing a waveguide-coaxial converter of the prior art with an added coaxial low-pass filter;

Fig. 2A and Fig. 2B are a sectioned frontal view and a plan view, respectively, of one portion of a prior-art waveguide-type low-pass filter;

Fig. 3 is a sectional view of an embodiment of a waveguide-coaxial converter according to the present invention, and

Fig. 4 is an enlarged partial view of Fig. 3.

Referring to Fig. 3, according to an embodiment of the waveguide-coaxial converter of the present invention, a connector 2 for connection to an unshown exterior coaxial line is arranged at a prescribed position on the outer wall of a square-waveguide 1, the waveguide at the position of arrangement of this connector having a greater wall thickness, and a passage being formed that communicates with a cavity 12 in the square waveguide 1. In addition, a columnar insulative support, for example a Teflon support 5 made from PTFE (Polytetrafluoroethylene; commercial name: Teflon) having an outer diameter equal to the diameter of the passage 11 is inserted into the passage 11 and secured to the square waveguide 1.

One end surface portion of the Teflon support 5 is directed toward the connector 2, the other end surface portion directly contacts the inner wall of the square waveguide opposing the passage 11, and in the interior of the Teflon support 5 are secured a low-pass filter 3 and an antenna conductor 4 protruding from the inner wall of the square waveguide and into the waveguide cavity 12 a distance exactly matching the pass band, the low-pass filter 3 and the antenna conductor 4 being formed in a unit with the core conductor of the connector 2. The antenna conductor 4 extracts those microwaves propagated inside the square waveguide 1 that are in the pass band of the low-pass filter 3, and the position, shape and material of the antenna conductor 4 are matched to the above-described pass band.

As shown in Fig. 4, the low-pass filter 3 is constructed by connecting alternating high-impedance portions 6 and low-impedance portions 7 arranged in the axial direction of the coaxial line in the passage position

of the core conductor of the connector 2. The difference between the high-impedance portions 6 and low-impedance portions 7 is determined by the shape and construction of the conductor for their employed frequencies, and can be freely set in accordance with the pass band.

Because the core conductor of the connector 2 combines both a low-pass filter 3 and antenna conductor 4, and moreover, because the low-pass filter 3 and antenna conductor 4 are held by a Teflon support 5 arranged inside the square waveguide 1, a waveguide-coaxial converter of this type of configuration is more compact overall and has a simpler structure and fewer parts than the construction shown in Fig. 1 in which a low-pass filter is added. In addition, this construction is easier to manufacture than a waveguide-type low-pass filter such as is shown in Fig. 2.

The present invention is not limited to the above-described embodiment and allows a variety of modifications. For example, the insulative support may be formed from materials that do not affect microwaves other than that of the Teflon support 5, and the shape and construction shown in Fig. 3 and Fig. 4 need not be adopted as long as the material of the support is strong and secure. In addition, the structure of the low-pass filter 3 joined to the core conductor of the connector 2 is not necessarily restricted to the structure shown in the figures.

Claims

1. A waveguide-coaxial converter equipped with a connector for coaxial line connection at a prescribed position of a square waveguide, wherein:

   a passage is formed penetrating a side wall of said square waveguide and communicating with a cavity of said square waveguide;

   a connector is provided in a portion of said passage such that a core conductor passes through said passage and is directed toward said cavity;

   a low-pass filter made up of a plurality of joined conductors of differing impedance is provided at a portion of said core conductor of said passage; and

   said core conductor, which extends through said low-pass filter, protrudes from the inner wall of said square waveguide and into said cavity a distance matching a pass band.

2. A waveguide-coaxial converter according to claim 1 wherein a columnar insulative support member having an outer diameter equal to the diameter of said passage passes through said passage and is secured to said square waveguide, and a core conductor of said connector and said low-pass filter are secured inside said insulative support member.

3. A waveguide-coaxial converter according to claim 2 wherein the end surface of said insulative support member on the side of said cavity directly contacts the inner wall of said square waveguide.

Fig. 1 PRIOR ART

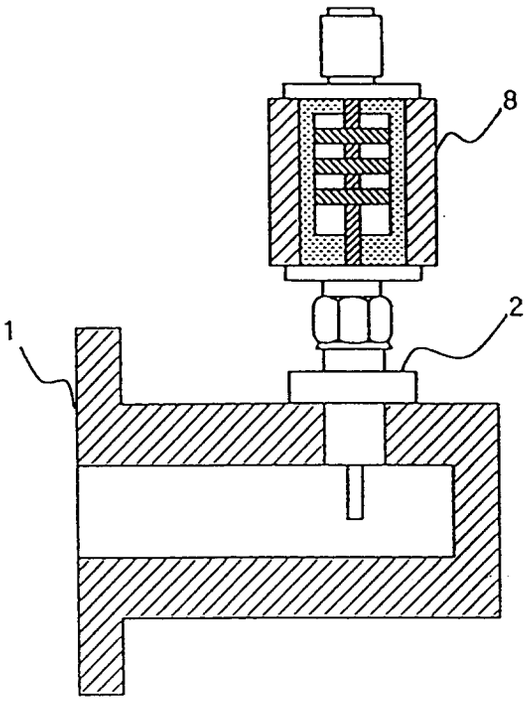


Fig. 2A PRIOR ART

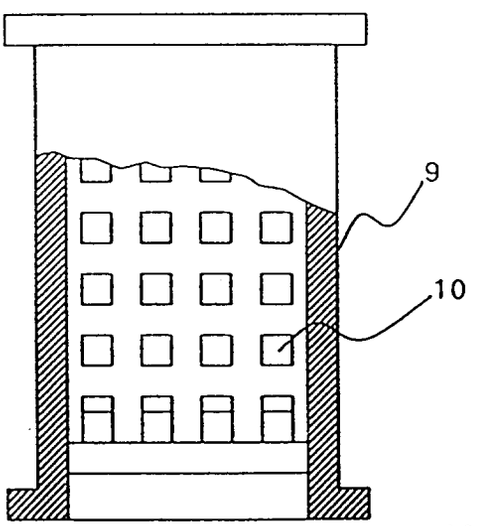


Fig. 2B PRIOR ART

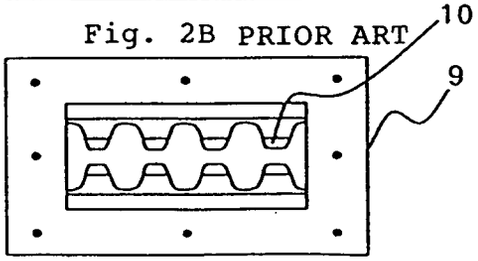


Fig. 3

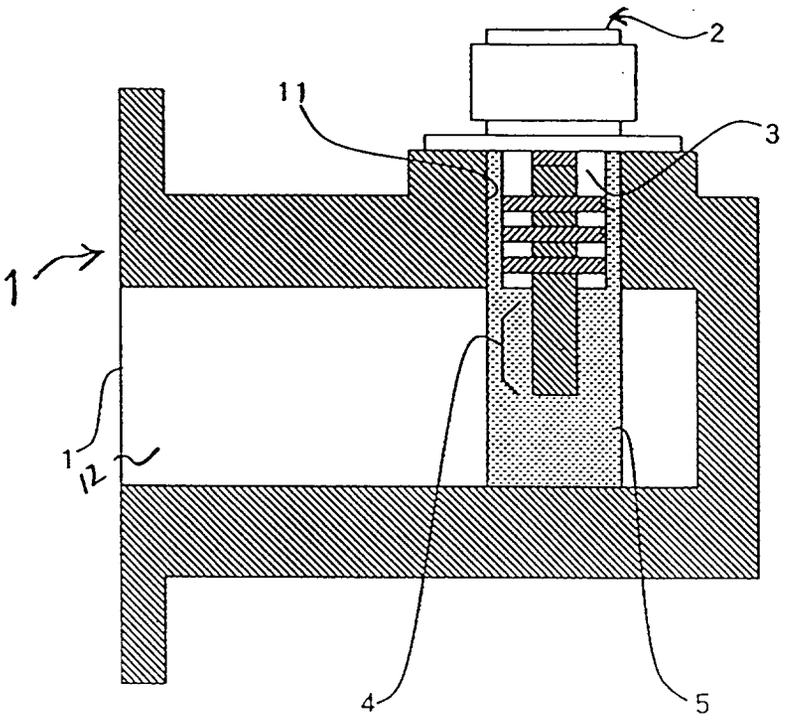
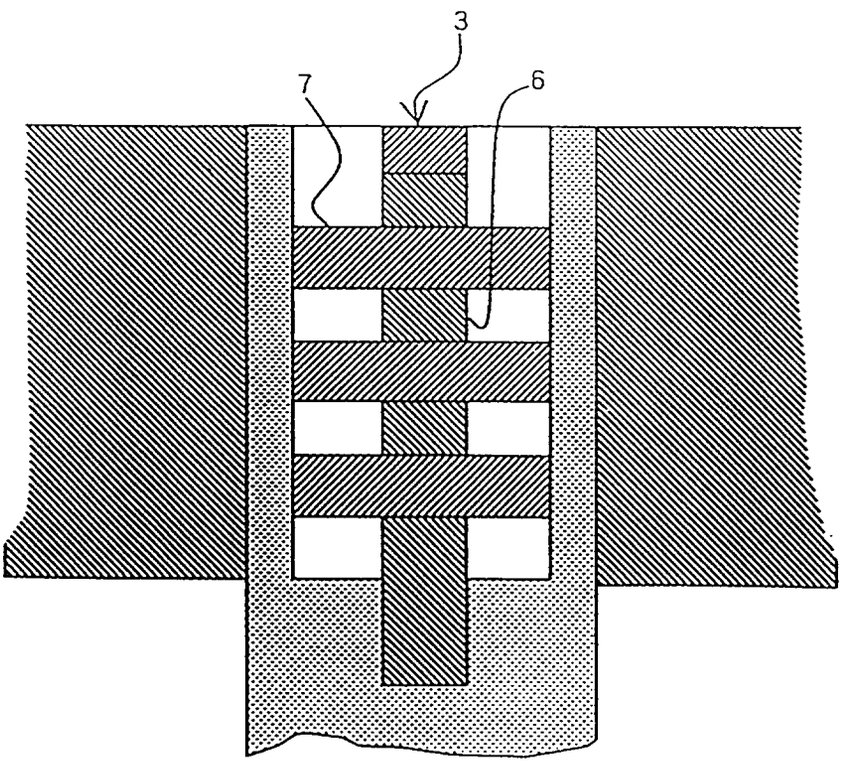


Fig. 4



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EUROPEAN SEARCH REPORT

Application Number
EP 95 11 8368

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int.Cl.6)
X Y	FR-A-2 646 562 (ALCATEL TRANSMISSION PAR FAISCEAUX HERTZIENS A.F.T.H.) * page 4, line 13 - line 23; figure 5 *	1,2 3	H01P5/103
Y	PATENT ABSTRACTS OF JAPAN vol. 12 no. 13 (E-573) ,14 January 1988 & JP-A-62 172802 (FUJITSU LTD) 29 July 1987, * abstract *	3	
A	NASA TECH BRIEFS, vol. 1, no. 2, 1976 WASHINGTON US, page 160 R.B. QUINN 'Waveguide-to-coax transition/low-pass filter' * the whole document *	1,2	
A	PATENT ABSTRACTS OF JAPAN vol. 7 no. 58 (E-163) ,10 March 1983 & JP-A-57 204605 (NIPPON DENKI K.K.) 15 December 1982, * abstract *	1	TECHNICAL FIELDS SEARCHED (Int.Cl.6) H01P
A	PATENT ABSTRACTS OF JAPAN vol. 13 no. 81 (E-719) ,23 February 1989 & JP-A-63 260301 (NEC CORP) 27 October 1988, * abstract *	2	

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
THE HAGUE	26 February 1996	Den Otter, A

CATEGORY OF CITED DOCUMENTS

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