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(54) A dipole.

(57) A dipole with arms a quarter wavelength long is fed by a half wavelength deep notch.

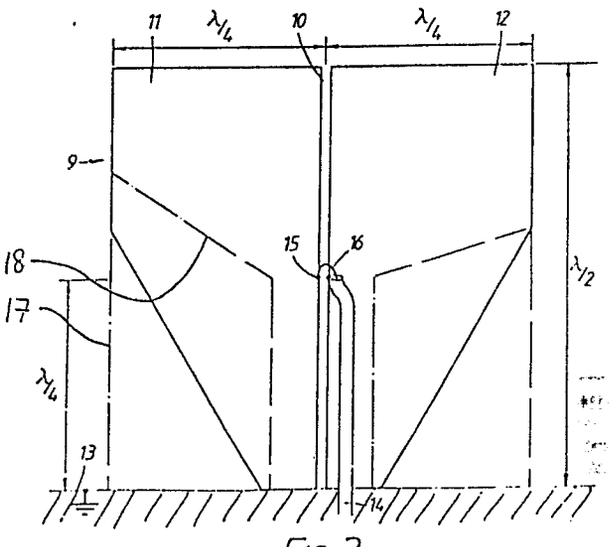

FIG. 2.

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A DIPOLE

This invention relates to dipoles.

Throughout this specification lengths of components expressed in terms of wavelengths are their electrical lengths, physical lengths will generally be slightly shorter.

A notch fed dipole is generally of the form shown in figure 1.

The radiating part of the dipole consists of two arms 1 and 2. In order to give efficient transmission of electro-magnetic energy, the length of each of the arms 1 and 2 is approximately equal to $\frac{1}{4}$ wavelength of the intended transmitting frequency. The arms 1 and 2 are separated by a slot 3 cut from the body 4 of the dipole. Slot 3 is approximately $\frac{1}{4}$ of a wavelength deep and narrow relative to its depth. A reflector, formed by a grounded conductive plane 5, is located approximately a quarter of a wavelength from dipole arms 1 and 2.

In operation a signal to be transmitted is applied across slot 3. This is done using a co-axial cable 6, connecting the signal carrying central conductor 7 to one side of the slot 3 and the outer conductor 8 to the other. This signal will set up a resonance on dipole arms 1 and 2.

Although the transmission will be most efficient at the specific frequency for which the dipole was

designed it will be acceptably efficient for a small range of frequencies above and below this.

A problem has been found in making such conventional dipoles with a low input impedance (50Ω) and a wide bandwidth.

The present invention was made while attempting to produce a dipole overcoming these problems.

This invention provides a dipole comprising two arms separated by a slot, the two arms being electrically linked by a conductive path around the slot, each arm being $\lambda/4$ long and the slot being $\lambda/2$ deep, where λ is a wavelength of radiation that the dipole is designed to receive or transmit.

Two dipoles of this type can be arranged perpendicular to one another to form a cross-dipole, such an arrangement can be used to produce a circularly polarised radiation or sensitivity pattern.

This structure provides a dipole with larger bandwidth than normal and a 50Ω input impedance.

An input impedance of 50Ω is desirable because it is the same impedance as a co-axial cable and so gives very good impedance matching.

Advantageously the dipole is fed by a feed arranged to apply a signal between the two sides of the slot.

Conveniently the dipole is fed with a signal to be radiated by a co-axial cable, the centre and outer of the cable being attached to the opposite sides of the

slot at the same distance from the bottom of the slot.

Preferably said feed is arranged to apply a signal approximately half way up the slot.

Advantageously the two arms may be made rectangular.

A reflector of a known type, for example a conductive metal sheet, may be used to give the dipole a unidirectional radiation pattern. For the best results this reflector should be placed at the level of the bottom of the slot.

One way of performing the invention will now be described with reference to figure 2.

In figure 2 a conductive body 9 is shown, with a slot 10 cut from it. The slot 10 is approximately $\frac{1}{2}$ of an intended transmission wavelength deep and is narrow compared to its depth. The width of slot 10 can be varied in order to alter the input impedance of the dipole.

Arms 11 and 12, each approximately $\frac{1}{4}$ of an intended transmission wavelength long, are formed from conductive body 9 on either side of the slot 10. The profile of arms 11 and 12 can be varied provided the top edge and the edges defining the slot 10 remain straight and the two arms are symmetrical about an axis running along the centre of the slot 10. The profile of arms 11 and 12 could be altered to that shown by the pairs of dotted lines 17,18 or 19 for example.

A grounded conductive reflector 13 is placed at

the level of the bottom of the slot 10.

Similarly to a conventional dipole the signal to be transmitted is fed to the slot, by a co-axial cable 14, the control conductor 15 and outer conductor 16 being connected to opposite sides of the slot 10, and as before a dipole resonance is set up. The position at which the co-axial cable is connected can be varied up and down the slot. It is preferred to connect it approximately half way up the slot, because this forms a balun, the exact position can be adjusted in order to optimise the dipole impedance.

The dipole arms 11 and 12 could be made a multiple of $\frac{1}{4}$ of an intended transmission wavelength long, this would however alter the impedance. It was decided for simplicity and compactness to use arms only $\frac{1}{4}$ of an intended transmission wavelength long.

Although the profile of the arms can be widely varied it does affect the bandwidth, generally the smaller the arm area the narrower the bandwidth.

CLAIMS

1. This invention provides a dipole comprising two arms separated by a slot, the two arms being electrically linked by a conductive path around the slot, each arm being $\lambda/4$ long and the slot being $\lambda/2$ deep, where λ is a wavelength of radiation that the dipole is designed to receive or transmit.

2. A dipole as claimed in claim 1 and additionally comprising a feed arranged to apply a signal between the two sides of the slot.

3. A dipole as claimed in claim 2 and wherein said feed is arranged to apply a signal approximately half way up the slot.

4. A dipole as claimed in any preceding claim and wherein the two arms are rectangular.

5. A dipole as claimed in any preceding claim and wherein a reflector is placed at the level of the bottom of the slot.

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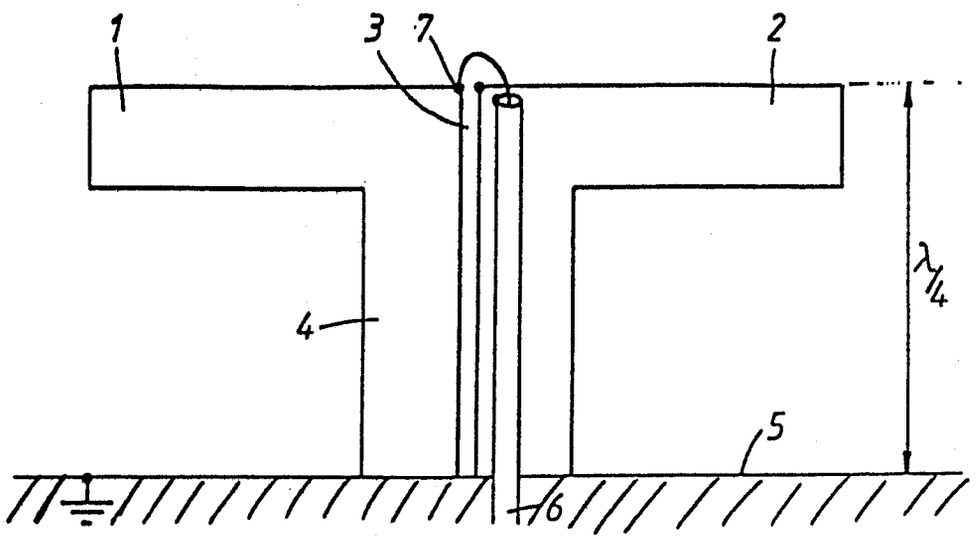

FIG. 1.

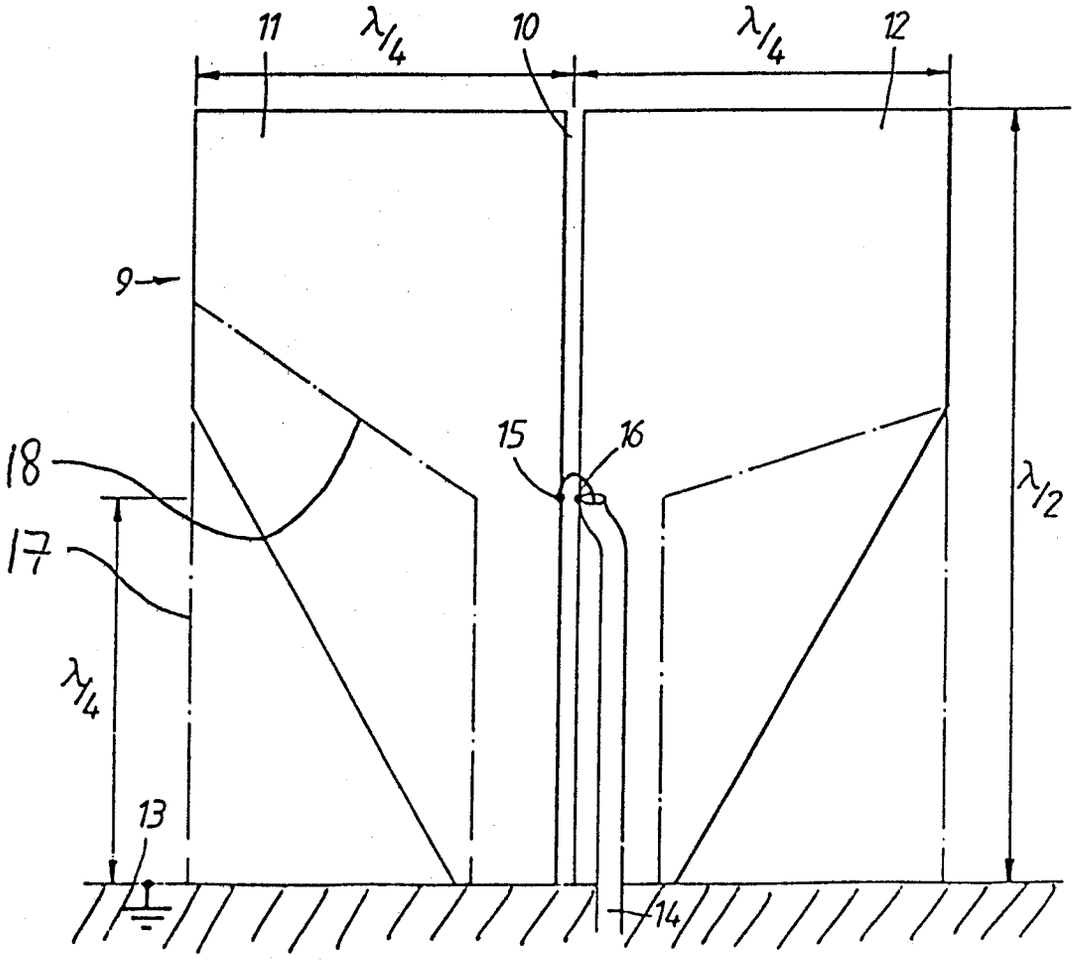

FIG. 2.

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EUROPEAN SEARCH REPORT

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Application number

EP 87 30 5606

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 4)
X	GB-A- 974 217 (WOLSEY ELECTRONICS) * figure 2; page 2, lines 9-15 *	1,2	H 01 Q 5/02 H 01 Q 9/16
A	US-A-3 845 490 (T.E. MANWARREN et al.) * figure 5; column 3, lines 17-27 *	1,2,4	
A	US-A-4 498 085 (A. SCHWARZMANN) * figure 1; column 2, lines 12-56 *	1	
A	* figure 3; column 3, lines 54-65 *	5	
A	US-A-2 883 664 (M.R. SLOPPY) * figure 1 *		TECHNICAL FIELDS SEARCHED (Int Cl 4) H 01 Q 5/00 H 01 Q 9/04 H 01 Q 9/06 H 01 Q 9/16
A	GB-A-1 348 478 (EMI LTD.) * figure 1; page 1, lines 73-90 *		

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
BERLIN	07-10-1987	BREUSING J

CATEGORY OF CITED DOCUMENTS

X : particularly relevant if taken alone
Y : particularly relevant if combined with another document of the same category
A : technological background
O : non-written disclosure
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E : earlier patent document, but published on, or after the filing date
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