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(54) Space-filling miniature antennas

(57) A novel geometry, the geometry of Space-Filling Curves (SFC) is defined in the present invention and it is used to shape a part of an antenna. By means of this novel technique, the size of the antenna can be reduced with respect to prior art, or alternatively, given a fixed size the antenna can operate at a lower frequency with respect to a conventional antenna of the same size.

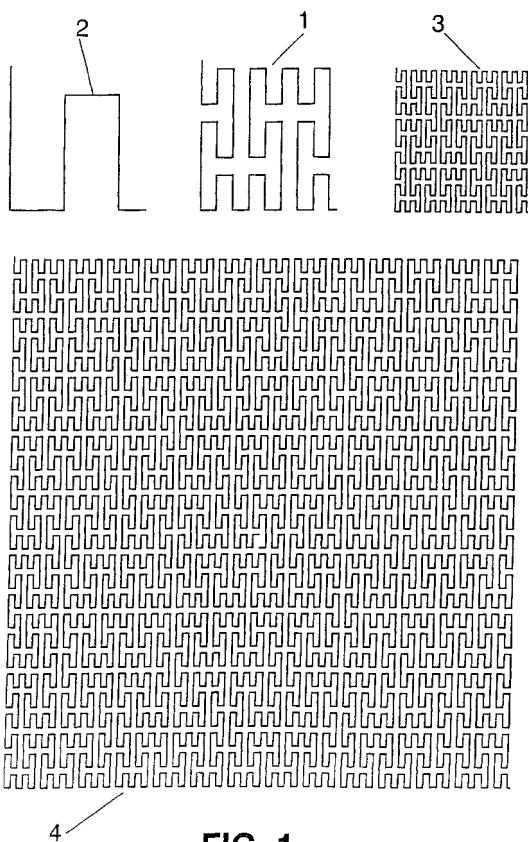


FIG. 1



European Patent
Office

PARTIAL EUROPEAN SEARCH REPORT

Application Number

which under Rule 45 of the European Patent Convention EP 06 12 0498
shall be considered, for the purposes of subsequent
proceedings, as the European search report

DOCUMENTS CONSIDERED TO BE RELEVANT			CLASSIFICATION OF THE APPLICATION (IPC)
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	
X	WO 97/06578 A (FRACTAL ANTENNA SYSTEMS, INC; COHEN, NATHAN) 20 February 1997 (1997-02-20) * the whole document * -----	1,3,9	
X	WO 99/27608 A (COHEN, NATHAN) 3 June 1999 (1999-06-03) * the whole document * -----	1,3	
X	US 4 843 468 A (DREWERY ET AL) 27 June 1989 (1989-06-27) * the whole document * -----	1,3	
X	EP 0 969 375 A (SUN MICROSYSTEMS, INC) 5 January 2000 (2000-01-05) * the whole document * -----	1,3	
X	ES 2 112 163 A1 (UNIVERSITAT POLITECNICA DE CATALUNYA) 16 March 1998 (1998-03-16) * the whole document * -----	1,3	
INCOMPLETE SEARCH			TECHNICAL FIELDS SEARCHED (IPC)
The Search Division considers that the present application, or one or more of its claims, does/do not comply with the EPC to such an extent that a meaningful search into the state of the art cannot be carried out, or can only be carried out partially, for these claims.			H01Q
Claims searched completely :			
Claims searched incompletely :			
Claims not searched :			
Reason for the limitation of the search: see sheet C			
5			
Place of search		Date of completion of the search	Examiner
The Hague		14 June 2007	Wattiaux, Véronique
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 P : intermediate document			
T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons & : member of the same patent family, corresponding document			



Claim(s) not searched:
14-16

Reason for the limitation of the search (non-patentable invention(s)):

Present claims 14 and 15 relate to an extremely large number of possible apparatus. In fact, the claims contain so many options, variables, possible permutations and provisos that a lack of clarity (and conciseness) within the meaning of Article 84 EPC arises to such an extent as to render a meaningful search of the claims impossible. Consequently, the search has been carried out for those parts of the application which do appear to be clear (and concise), namely claims 1 to 4 (taking into account the non-unity).

Article 52 (2)(a) EPC - Mathematical method : claim 16. The method used to determine the shape of the antenna uses algorithms.

**CLAIMS INCURRING FEES**

The present European patent application comprised at the time of filing more than ten claims.

Only part of the claims have been paid within the prescribed time limit. The present European search report has been drawn up for the first ten claims and for those claims for which claims fees have been paid, namely claim(s):

No claims fees have been paid within the prescribed time limit. The present European search report has been drawn up for the first ten claims.

LACK OF UNITY OF INVENTION

The Search Division considers that the present European patent application does not comply with the requirements of unity of invention and relates to several inventions or groups of inventions, namely:

see sheet B

All further search fees have been paid within the fixed time limit. The present European search report has been drawn up for all claims.

As all searchable claims could be searched without effort justifying an additional fee, the Search Division did not invite payment of any additional fee.

Only part of the further search fees have been paid within the fixed time limit. The present European search report has been drawn up for those parts of the European patent application which relate to the inventions in respect of which search fees have been paid, namely claims:

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None of the further search fees have been paid within the fixed time limit. The present European search report has been drawn up for those parts of the European patent application which relate to the invention first mentioned in the claims, namely claims:



The Search Division considers that the present European patent application does not comply with the requirements of unity of invention and relates to several inventions or groups of inventions, namely:

1. claims: 1-4

antenna with parts of it being shaped as space-filling curves.

2. claim: 5

dipole antenna.

3. claim: 6

monopole antenna.

4. claim: 7

slot antenna.

5. claim: 8

loop antenna.

6. claim: 9

patch antenna.

7. claim: 10

aperture antenna.

8. claim: 11

horn antenna.

9. claim: 12

reflector antenna.

10. claim: 13

frequency selective surface.

ANNEX TO THE EUROPEAN SEARCH REPORT
ON EUROPEAN PATENT APPLICATION NO.

EP 06 12 0498

This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report. The members are as contained in the European Patent Office EDP file on. The European Patent Office is in no way liable for these particulars which are merely given for the purpose of information.

14-06-2007

Patent document cited in search report		Publication date		Patent family member(s)		Publication date
WO 9706578	A	20-02-1997	AT DE DE EP ES US	284080 T 69633975 D1 69633975 T2 0843905 A1 2236745 T3 6140975 A		15-12-2004 05-01-2005 01-12-2005 27-05-1998 16-07-2005 31-10-2000
WO 9927608	A	03-06-1999		NONE		
US 4843468	A	27-06-1989	DE DE EP GB JP	3783525 D1 3783525 T2 0253608 A2 2193411 A 63051774 A		25-02-1993 05-08-1993 20-01-1988 03-02-1988 04-03-1988
EP 0969375	A	05-01-2000	JP US	2000112791 A 6211889 B1		21-04-2000 03-04-2001
ES 2112163	A1	16-03-1998		NONE		