



(11) **EP 2 006 956 A3**

(12) **EUROPEAN PATENT APPLICATION**

(88) Date of publication A3:
11.02.2009 Bulletin 2009/07

(51) Int Cl.:
H01Q 21/00 *(2006.01)* **H01Q 21/06** *(2006.01)*
H01P 5/107 *(2006.01)*

(43) Date of publication A2:
24.12.2008 Bulletin 2008/52

(21) Application number: **08252104.8**

(22) Date of filing: **19.06.2008**

(84) Designated Contracting States:
**AT BE BG CH CY CZ DE DK EE ES FI FR GB GR
HR HU IE IS IT LI LT LU LV MC MT NL NO PL PT
RO SE SI SK TR**
Designated Extension States:
AL BA MK RS

- **Wightman, Robert L., Jr.**
Seattle, WA 98144 (US)
- **Miller, Dan R.**
Puyallup, WA 98372 (US)
- **McKinley, Chris D.**
Seattle, WA 98108 (US)
- **O'Connell, John B.**
Seattle, WA 98102 (US)

(30) Priority: **22.06.2007 US 767129**
22.06.2007 US 767170

(71) Applicant: **The Boeing Company**
Chicago, IL 60606-2016 (US)

(72) Inventors:
• **Chen, Ming**
Bellevue, WA 98006 (US)

(74) Representative: **McLeish, Nicholas Alistair**
Maxwell
Boult Wade Tennant
Verulam Gardens
70 Gray's Inn Road
London WC1X 8BT (GB)

(54) **System and method for a radio frequency (RF) transition design for a phased array antenna system utilizing a beam forming network**

(57) In accordance with an embodiment, a phased array antenna system includes a printed wiring board (102) formed in rhombic shape that accommodates requirements for low observability, a beam forming network

(100) located within the printed wiring board, wherein the beam forming network is located over substantially the entire printed wiring board, and a plurality of connectors (502, 504) located on the backside of the printed wiring board configured to allow for expansion of the system.

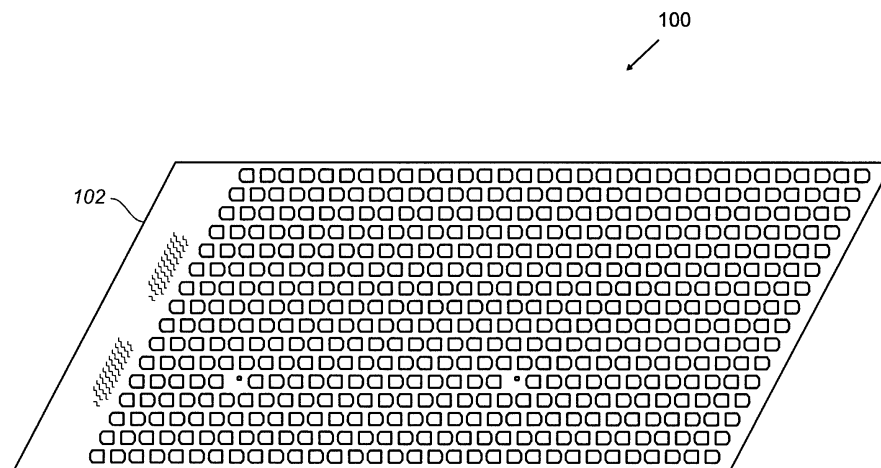


FIG. 1A

EP 2 006 956 A3



EUROPEAN SEARCH REPORT

Application Number
EP 08 25 2104

DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
Y	WO 03/049231 A (BOEING CO [US]) 12 June 2003 (2003-06-12) * the whole document *	1-6, 15, 16	INV. H01Q21/00 H01Q21/06 H01P5/107
Y	WO 2004/051805 A (ASTRIUM LTD [GB]; NOTTER MICHAEL JOHN [GB]) 17 June 2004 (2004-06-17) * the whole document *	1-6, 15, 16	
Y	US 2003/095066 A1 (BROGDEN FRANK R [US]) 22 May 2003 (2003-05-22) * paragraphs [0016], [0019]; figure 1 *	3, 6	
A	GB 2 426 876 A (BOEING CO [US]) 6 December 2006 (2006-12-06) * the whole document *	1-6, 15-18	
X	US 2004/150554 A1 (STENGER PETER A [US] ET AL) 5 August 2004 (2004-08-05) * the whole document *	7, 8, 19	
A		1-6, 9-18, 20	TECHNICAL FIELDS SEARCHED (IPC)
A	GB 865 474 A (COSSOR LTD A C) 19 April 1961 (1961-04-19) * the whole document *	7-14, 19, 20	H01Q H01P
A	WO 01/18901 A (COMMW SCIENT IND RES ORG [AU]; CUNNINGHAM SHAUN [AU]; JOHNSON MARK [AU]) 15 March 2001 (2001-03-15) * the whole document *	7-14, 19, 20	
The present search report has been drawn up for all claims			
Place of search The Hague		Date of completion of the search 22 December 2008	Examiner Moumen, Abderrahim
<p>CATEGORY OF CITED DOCUMENTS</p> <p>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</p> <p>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</p> <p>& : member of the same patent family, corresponding document</p>			

 2
EPO FORM 1503 03.82 (P04001)



Application Number

EP 08 25 2104

CLAIMS INCURRING FEES

The present European patent application comprised at the time of filing claims for which payment was due.

☐ Only part of the claims have been paid within the prescribed time limit. The present European search report has been drawn up for those claims for which no payment was due 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 those claims for which no payment was due.

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:

☐ 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 present supplementary 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 (Rule 164 (1) EPC).



**LACK OF UNITY OF INVENTION
SHEET B**

Application Number

EP 08 25 2104

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: 1-6,15-18

low observability

2. claims: 7-11,19,20

stripline coupling mechanism

3. claims: 12-14

tuning

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

EP 08 25 2104

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.

22-12-2008

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
WO 03049231 A	12-06-2003	AU 2002365772 A1 US 2003103012 A1	17-06-2003 05-06-2003
WO 2004051805 A	17-06-2004	AU 2003285555 A1	23-06-2004
US 2003095066 A1	22-05-2003	AU 2002348029 A1 WO 03044893 A1	10-06-2003 30-05-2003
GB 2426876 A	06-12-2006	US 2006270279 A1	30-11-2006
US 2004150554 A1	05-08-2004	AU 2004211179 A1 DE 602004001041 T2 EP 1590859 A1 US 2005146479 A1 WO 2004073113 A1	26-08-2004 12-10-2006 02-11-2005 07-07-2005 26-08-2004
GB 865474 A	19-04-1961	BE 581968 A1 CH 372711 A DE 1816352 U FR 1233396 A	16-12-1960 31-10-1963 11-08-1960 12-10-1960
WO 0118901 A	15-03-2001	EP 1221181 A1	10-07-2002