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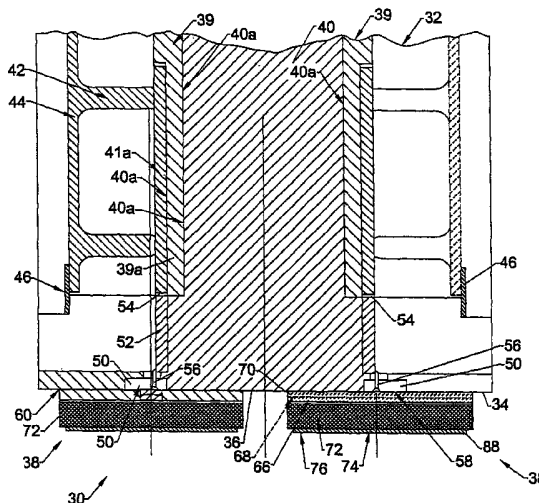
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Declarations under Rule 4.17:

— as to applicant's entitlement to apply for and be granted a patent (Rule 4.17(ii)) for the following designations AE, AG, AL, AM, AT, AU, AZ, BA, BB, BG, BR, BY, BZ, CA, CH, CN, CO, CR, CU, CZ, DE, DK, DM, DZ, EC, EE, ES, FI, GB, GD, GE, GH, GM, HR, HU, ID, IL, IN, IS, JP, KE, KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MA, MD, MG, MK, MN, MW, MX, MZ, NO, NZ, PL, PT, RO, RU, SD, SE, SG, SI, SK, SL, TJ, TM, TR, TT, TZ, UA, UG, UZ, VN, YU,

[Continued on next page]

(54) Title: PHASED ARRAY ANTENNA HAVING PATCH ANTENNA ELEMENTS WITH ENHANCED PARASITIC ANTENNA ELEMENT PERFORMANCE AT MILLIMETER WAVELENGTH RADIO FREQUENCY SIGNALS



(57) Abstract: A phased array antenna includes an antenna housing having an array face defining an electrically conductive ground layer. A plurality of millimeter wavelength patch antenna elements are positioned on the array face and each include a primary substrate having front and rear sides and a driven antenna element positioned on the front side of the primary substrate. A ground plane layer is positioned on the rear side of the primary substrate and a dielectric layer is positioned on the ground plane layer. A microstrip quadrature-to-circular polarization circuit is positioned on the dielectric layer. A parasitic antenna element layer is spaced forward from the driven antenna element and at least one spacer is positioned between the parasitic antenna element layer and the primary substrate.

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- ZA, ZW, ARIPO patent (GH, GM, KE, LS, MW, MZ, SD, SL, SZ, TZ, UG, ZW), Eurasian patent (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European patent (AT, BE, CH, CY, DE, DK, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE, TR), OAPI patent (BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, ML, MR, NE, SN, TD, TG)
- as to the applicant's entitlement to claim the priority of the earlier application (Rule 4.17(iii)) for all designations
- Published:**
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- For two-letter codes and other abbreviations, refer to the "Guidance Notes on Codes and Abbreviations" appearing at the beginning of each regular issue of the PCT Gazette.*

INTERNATIONAL SEARCH REPORT

International Application No

US 01/22667

A. CLASSIFICATION OF SUBJECT MATTER  
 IPC 7 H01Q21/06 H01Q9/04 H01Q3/26

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)  
 IPC 7 H01Q

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

EPO-Internal

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category °	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 5 995 047 A (MEDARD JOEL ET AL) 30 November 1999 (1999-11-30)	1, 3, 4, 11, 13
Y	figures 1,5 column 3, line 42 - column 4, line 10 column 4, line 47 - column 5, line 3	2, 12
Y	US 5 307 075 A (HUYNH TAN D) 26 April 1994 (1994-04-26) figure 3 column 3, line 40 - line 47	2, 12
A	ANTENNAS & PROPAGATION INT. SYMP., vol. 22, June 1984 (1984-06), pages 251-254, XP002277447 figures 1,6	1-4, 11-13
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Further documents are listed in the continuation of box C.

Patent family members are listed in annex.

° Special categories of cited documents :

- \*A\* document defining the general state of the art which is not considered to be of particular relevance
- \*E\* earlier document but published on or after the international filing date
- \*L\* document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)
- \*O\* document referring to an oral disclosure, use, exhibition or other means
- \*P\* document published prior to the international filing date but later than the priority date claimed

- \*T\* later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention
- \*X\* document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone
- \*Y\* document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art.
- \*Z\* document member of the same patent family

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 21 April 2004

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## INTERNATIONAL SEARCH REPORT

International Application No  
PCT/US 01/22667

C.(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT		
Category °	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	US 5 907 304 A (BECK DONALD J ET AL) 25 May 1999 (1999-05-25) figure 3 column 4, line 64 - column 5, line 13 -----	1-4
A	US 5 381 157 A (SHIGA NOBUO) 10 January 1995 (1995-01-10) figure 5E column 4, line 8 - line 27 -----	2,12
A	US 5 309 163 A (NGAN YIU C ET AL) 3 May 1994 (1994-05-03) figure 1 column 2, line 35 - line 56 -----	3,13

# INTERNATIONAL SEARCH REPORT

International application No.  
PCT/US 01/22667

## Box I Observations where certain claims were found unsearchable (Continuation of item 1 of first sheet)

This International Search Report has not been established in respect of certain claims under Article 17(2)(a) for the following reasons:

1.  Claims Nos.:  
because they relate to subject matter not required to be searched by this Authority, namely:
  
2.  Claims Nos.:  
because they relate to parts of the International Application that do not comply with the prescribed requirements to such an extent that no meaningful International Search can be carried out, specifically:
  
3.  Claims Nos.:  
because they are dependent claims and are not drafted in accordance with the second and third sentences of Rule 6.4(a).

## Box II Observations where unity of invention is lacking (Continuation of item 2 of first sheet)

This International Searching Authority found multiple inventions in this international application, as follows:

see additional sheet

1.  As all required additional search fees were timely paid by the applicant, this International Search Report covers all searchable claims.
  
2.  As all searchable claims could be searched without effort justifying an additional fee, this Authority did not invite payment of any additional fee.
  
3.  As only some of the required additional search fees were timely paid by the applicant, this International Search Report covers only those claims for which fees were paid, specifically claims Nos.:
  
4.  No required additional search fees were timely paid by the applicant. Consequently, this International Search Report is restricted to the invention first mentioned in the claims; it is covered by claims Nos.:

see annex

### Remark on Protest

- The additional search fees were accompanied by the applicant's protest.
- No protest accompanied the payment of additional search fees.

FURTHER INFORMATION CONTINUED FROM PCT/ISA/ 210

This International Searching Authority found multiple (groups of) inventions in this international application, as follows:

1. claims: 1-4, 11-13

1.1. claims: 1-4

A phased array antenna comprising an antenna housing, a plurality of stacked parasitic patch antennas with enhanced antenna performance and a plurality of quadrature-to-circular polarization circuits, and the corresponding implementation details.

1.2. claims: 11-13

A stacked parasitic patch antenna with enhanced antenna performance, and corresponding implementation details.

2. claims: 5-10

A phased array antenna comprising an antenna housing, a plurality of stacked parasitic patch antennas with enhanced antenna performance, a plurality of quadrature-to-circular polarization circuits,

a plurality of beamforming network modules, and a plurality of single feeds connecting the quadrature-to-circular polarization circuits with respective beam forming modules, and the corresponding implementation details.

# INTERNATIONAL SEARCH REPORT

Information on patent family members

International Application No  
PCT/US 01/22667

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
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