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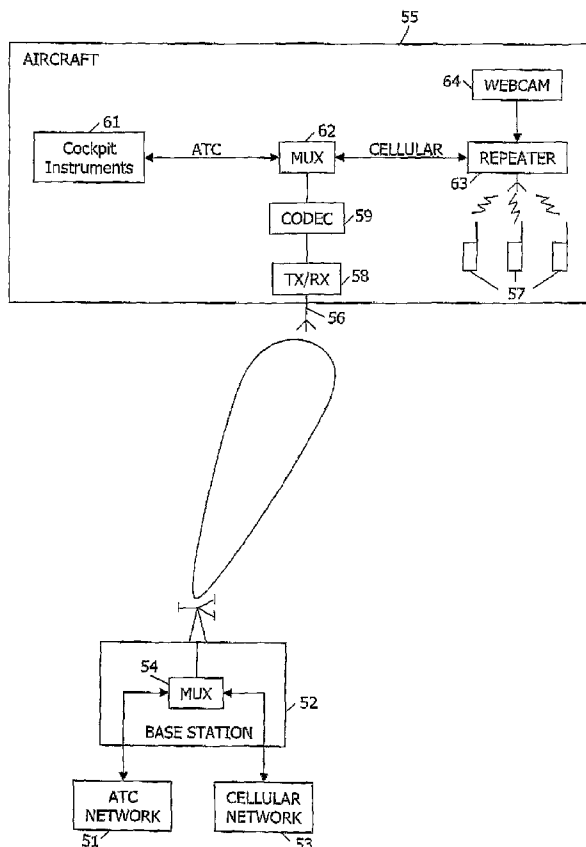
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— with international search report

[Continued on next page]

(54) Title: ARRANGEMENT, SYSTEM, AND METHOD FOR COMMUNICATING WITH AIRCRAFT THROUGH CELLULAR BASE STATION TOWERS



(57) Abstract: An antenna arrangement, method, and cellular communications system for transmitting and receiving signals between a base station tower, ground-based mobile subscribers, and an aircraft. The antenna arrangement includes a vertically oriented array of antenna elements, and a feedline arrangement that feeds the antenna elements with progressively phase-retarded signals, thereby generating an elevated antenna beam directed upward toward the aircraft and away from the ground-based mobile subscribers. In one embodiment, the antenna arrangement also generates a horizontal antenna beam for communicating with the ground-based subscribers. The horizontal beam and the elevated beam are sufficiently separated in elevation to prevent mutual interference when using the same frequency spectrum.

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— *before the expiration of the time limit for amending the claims and to be republished in the event of receipt of amendments*

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.

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INTERNATIONAL SEARCH REPORT

International application No

PCT/IB2006/001302

A. CLASSIFICATION OF SUBJECT MATTER

INV. H04Q7/36

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)

H04Q H04B

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, WPI Data

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 6 108 539 A (RAY ET AL) 22 August 2000 (2000-08-22)	1-4, 7-10, 12-15 16-27
Y	abstract column 1, line 23 - column 5, line 18 column 10, line 53 - column 16, line 19 figures	
X	US 5 557 656 A (RAY ET AL) 17 September 1996 (1996-09-17)	1-4, 7-10, 12-15
	abstract column 4, line 6 - column 10, line 3 figures	
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 Further documents are listed in the continuation of Box C. See patent family 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.
- *&* document member of the same patent family

Date of the actual completion of the international search

30 January 2007

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International application No

PCT/IB2006/001302

C(Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y	US 2003/003959 A1 (TSUI ERNEST T ET AL) 2 January 2003 (2003-01-02) the whole document	16-27
X	US 5 444 762 A (FREY RICHARD L [US] ET AL) 22 August 1995 (1995-08-22)	5,11,28
Y	the whole document	6,29-32
Y	US 4 249 181 A (LEE WILLIAM C) 3 February 1981 (1981-02-03) abstract column 2, line 23 - line 40 column 4, line 65 - column 5, line 41 figures	6
Y	WO 03/052866 A (NOKIA CORP [FI]; HAEMAELAEINEN JYRI [FI]; WICHMAN RISTO [FI]; YLITALO) 26 June 2003 (2003-06-26) abstract paragraph [0037] - paragraph [0060] paragraph [0067] - paragraph [0072] figures	29-32

INTERNATIONAL SEARCH REPORT

International application No.
PCT/IB2006/001302

Box II Observations where certain claims were found unsearchable (Continuation of item 2 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 III Observations where unity of invention is lacking (Continuation of item 3 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.:

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, 7-10, 12-27

Invention I is directed to an antenna arrangement in a cellular base station for transmitting and receiving signals between the base station and ground-based mobile subscribers within a served cell and between the base station and an aircraft flying through the served cell comprising means for generating an horizontal antenna beam for the communication with the ground-based subscribers and means for generating an elevated antenna beam for the communication with the aircraft.

2. claims: 5, 6, 11, 28-32

Invention II is directed to an antenna arrangement in a cellular base station for transmitting and receiving signals between the base station and an aircraft comprising a vertically oriented array of antenna elements and a feedline arrangement connected to each of the antenna elements for feeding the antenna elements with progressively phased-retarded signals, thereby generating an elevated antenna beam directed upward toward the aircraft.

INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No

PCT/IB2006/001302

Patent document cited in search report	Publication date	Publication date	Patent family member(s)	Publication date
US 6108539	A	22-08-2000	NONE	
US 5557656	A	17-09-1996	US 5884166 A	16-03-1999
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