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[Continued on next page]

(54) Title: MULTI-BAND ANTENNA ASSEMBLIES

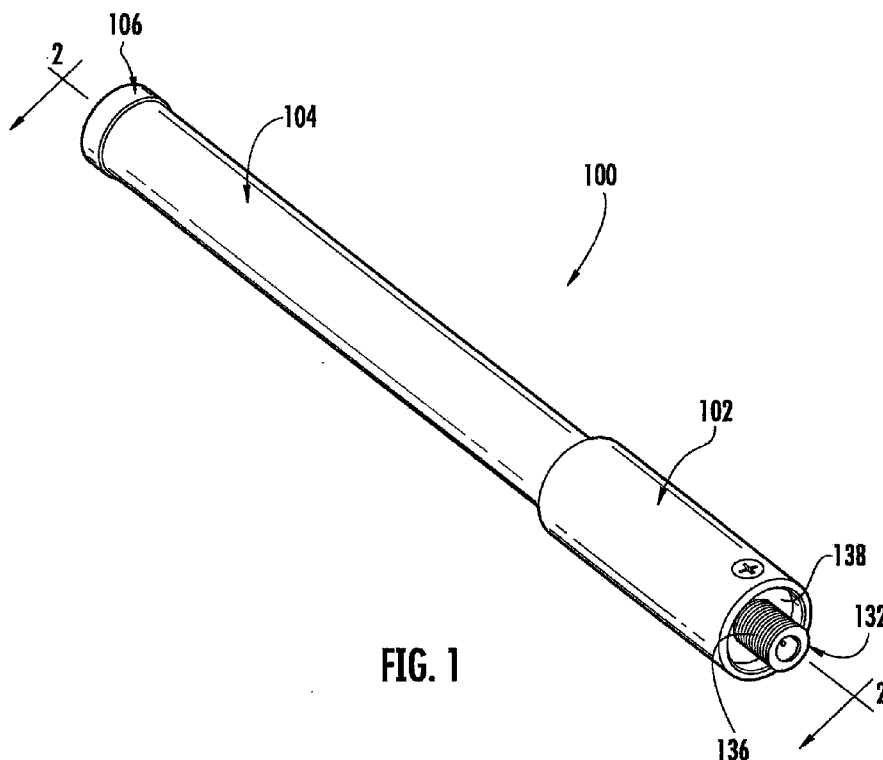


FIG. 1

(57) Abstract: A multi-band antenna assembly that is operable to receive and/or transmit signals at one or more frequencies generally includes at least two radiating elements, a transmission line coupled to each of the at least two radiating elements, and a tunable match resonator coupled to the transmission line. The tunable match resonator is operable to vary input impedance of a signal received and/or transmitted by the antenna assembly by changing an electrical field within the tunable match resonator.



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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 (Rule 48.2(h))*

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13 January 2011

**A. CLASSIFICATION OF SUBJECT MATTER****H01Q 9/30(2006.01)i, H01Q 5/00(2006.01)i, H01Q 9/14(2006.01)i**

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)

H01Q 9/30; H01Q 9/42; H01Q 9/16; H01Q 5/02; H01Q 1/38; H01Q 1/32; H01Q 9/28; H01Q 1/12; H01Q 5/00; H01Q 9/04; H01Q 1/10; H01Q 5/01; H01Q 9/14

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

Korean utility models and applications for utility models

Japanese utility models and applications for utility models

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

eKOMPASS(KIPO internal) &amp; Keywords: antenna, sleeve, tun\*, match\*, resona\*, dual, double, triple, quadruple, multi\*, band

**C. DOCUMENTS CONSIDERED TO BE RELEVANT**

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	JP 09-036632 A (NIPPON ANTENNA CO LTD) 07 February 1997 See the abstract; figures 1-4; paragraphs 10-20; and claims 1-3	1-3, 14-16, 19-25
A	JP 2004-254002 A (HARADA IND CO LTD) 09 September 2004 See the abstract; figures 1, 2; paragraphs 22-36; and claims 1-4	1-3, 14-16, 19-25
A	JP 2003-249817 A (MASPRO DENKOH CORP) 05 September 2003 See the abstract; figures 1-3; paragraphs 6-10; and claims 1, 2	1-3, 14-16, 19-25
A	US 2004-0017323 A1 (MARTISKAINEN, MATTI et al.) 29 January 2004 See the abstract; figures 1-5C; paragraphs 21-32; and claims 1-9	1-3, 14-16, 19-25
A	US 2005-0073465 A1 (OLSON, STEVEN C.) 07 April 2005 See the abstract; figures 1-7B; paragraphs 13-26; and claims 1-14	1-3, 14-16, 19-25
A	JP 2003-318616 A (VERTEX STANDARD CO LTD) 07 November 2003 See the abstract; figures 1-4; paragraphs 13-31; and claims 1-3	1-3, 14-16, 19-25
A	JP 2005-086794 A (SAKUMA, MASAO) 31 March 2005 See the abstract; figures 1-5; paragraphs 9-13; and claims 1-3	1-3, 14-16, 19-25

 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 application or patent 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 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

"&amp;" document member of the same patent family

Date of the actual completion of the international search

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**29 OCTOBER 2010 (29.10.2010)**

Name and mailing address of the ISA/KR

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**INTERNATIONAL SEARCH REPORT**

International application No.

**PCT/US2010/028172****Box No. 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.: 5-7  
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:  
  
The claims 5-7 are too unclear to make meaningful search possible because the claims 5-7 refer to claim 4, violating PCT Rule 6.4(a).
  
3.  Claims Nos.: 4, 8-13, 17, 18  
because they are dependent claims and are not drafted in accordance with the second and third sentences of Rule 6.4(a).

**Box No. 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:

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 and, where applicable, the payment of a protest fee.
- The additional search fees were accompanied by the applicant's protest but the applicable protest fee was not paid within the time limit specified in the invitation.
- No protest accompanied the payment of additional search fees.

**INTERNATIONAL SEARCH REPORT**

Information on patent family members

International application No.

**PCT/US2010/028172**

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
JP 09-036632 A	07.02.1997	None	
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