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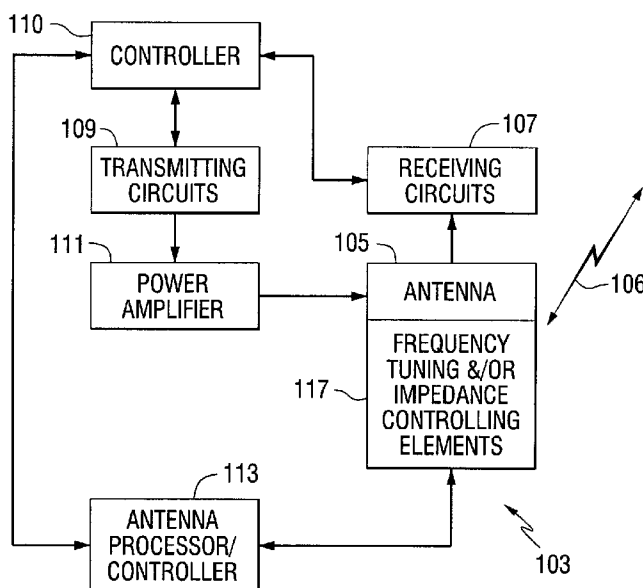
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(54) Title: METHODS AND APPARATUSES FOR ADAPTIVELY CONTROLLING ANTENNA PARAMETERS TO ENHANCE EFFICIENCY AND MAINTAIN ANTENNA SIZE COMPACTNESS



(57) Abstract: An antenna for a communications device having configurable elements controlled to modify an antenna impedance and/or an antenna resonant frequency to improve performance of the communications device. The antenna impedance is controlled to substantially match to an output impedance of a power amplifier that supplies the antenna with a signal for transmission. The antenna resonant frequency is controlled to overcome the effects of various operating conditions that can detune the antenna or in response to an operable frequency band.

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INTERNATIONAL SEARCH REPORT

International application No.

PCT/US2007/070347

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.:
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 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:

See extra 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 additional fees, this Authority did not invite payment of additional fees.
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.:
1-18, 20-28, 34-39, 54-57

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

International application No.

PCT/US2007/070347

A. CLASSIFICATION OF SUBJECT MATTER

IPC(8) - H01Q 01/50 (2008.04)

USPC - 343/861

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(8) - H01Q 01/50 (2008.04)

USPC - 343/861

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 practicable, search terms used)

MicroPatent

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X ----- Y	WO 03/058283 A1 (BOTTOMLEY) 17 July 2003 (17.07.2003) entire document	57 ----- 1-28, 34-39, 54-56
Y	US 2005/0239423 A1 (THORNELL-PERS) 27 October 2005 (27.10.2005) entire document	1-28, 34-39, 54-56
Y	US 6,812,902 B2 (ROSSMAN et al) 02 November 2004 (02.11.2004) entire document	17, 24

 Further documents are listed in the continuation of Box C.

* 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 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 October 2008

Date of mailing of the international search report

24 DEC 2008

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INTERNATIONAL SEARCH REPORT

International application No.

PCT/US2007/070347

Continuation of Box III.

This application contains claims directed to more than one species of the generic invention. These species are deemed to lack unity of invention because they are not so linked as to form a single general inventive concept under PCT Rule 13.1. In order for more than one species to be examined, the appropriate additional examination fees must be paid. The species are as follows:

- Species I) controlling impedance between a power amplifier and an antenna, figure 16
- Species II) switching of power amplifiers for controllable antenna elements, figure 14
- Species III) multiband antenna control, figures 11-12
- Species IV) switching between impedance controlling devices and amplifiers, figure 22.
- Species V) controlling meanderline between a power amplifier and an antenna, figures 19-21

The claims are deemed to correspond to the species listed above in the following manner:

- Species I) figure 16; claims 1-18, 20-28, 34-39, 54-56
- Species II) figure 14; claims 40-41
- Species III) figures 11-12; claims 19, 29-33
- Species IV) figure 22; claims 45-50
- Species V) figures 19-21; claims 42-44 and 51-53

The following claim(s) are generic: claim 57.

The species listed above do not relate to a single general inventive concept under PCT Rule 13.1 because, under PCT Rule 13.2, the species lack the same or corresponding special technical features for the following reasons:

Species I) figure 16; have the special technical feature of a power amplifier which is connected to a controller which controls load impedance to an amplifier; although controllable impedance elements are present in species IV, these technical features are all disclosed in the prior art (for instance see Thornell-Pers [US 2005/0239423 A1]. This special technical feature is not present in species II, III or V.

Species II) figure 14; have the special technical feature of a first and second power amplifier and switching elements to control frequency bands. This special technical feature is not present in species I, III, IV, or V.

Species III) figures 11-12 have the special technical feature of control of controllable antenna components to control frequency bands; although present in species I, II, and IV, but these technical features are all disclosed in the prior art (for instance see Tsukizawa et al. [US 2005/0275478 A1], Paragraphs [0017], [0026], [0029], [0124], [0125], [0133]); This special technical feature is not present in species V.

Species IV) figure 22; have the special technical feature of first and second radiating structures, a power amplifier and controllable impedance elements which are controllably connected to the power amplifier. This special technical feature is not present in species I, II, III or V.

Species V) figures 19-21; have the special technical feature of control of the antenna using meanderlines. This special technical feature is not present in species I, II, III or IV.

Since none of the special technical features of the Group I, II, III, IV, and V inventions is found in more than one of the inventions, unity of invention is lacking