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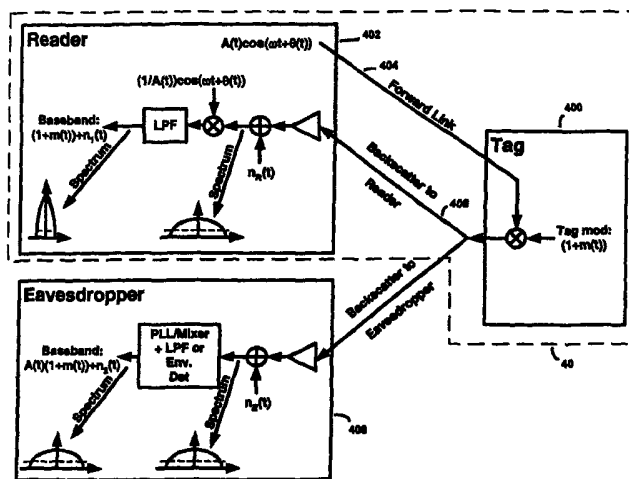
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(54) Title: SECURE TWO-WAY RFID COMMUNICATIONS



(57) Abstract: Methods and apparatus for providing secure two-way (reader-to-tag and tag-to-reader) RFID communications. According to one aspect of the invention, a (400) tag receives a noise-encrypted RF carrier signal from a reader (402) and backscatter modulates it with tag information. Eavesdroppers (408) cannot extract the tag information from the backscattered signal because it is masked by the noise encryption. According to another aspect of the invention, establishing a secure two-way RFID communication link includes a reader modulating a carrier signal with a noise encryption signal and broadcasting the noise-encrypted carrier to a singulated tag. The tag backscatter modulates the noise-encrypted carrier with a first portion of a key and/or a one-time pad pseudorandom number. If a key is used, upon receiving the backscattered signal the reader verifies that the tag is authentic, and, if verified as authentic, transmits a second portion of the key, possibly encrypted by a function depending on the one-time pad pseudorandom number, to the tag.

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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

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A. CLASSIFICATION OF SUBJECT MATTER
 IPC 7 G06K7/00

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 G06K

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, PAJ

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	EP 0 362 984 A (AMTECH TECHNOLOGY) 11 April 1990 (1990-04-11) column 2, line 20 - column 3, line 13 column 4, line 8 - column 5, line 11	1-28, 72-80
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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
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- "O" document referring to an oral disclosure, use, exhibition or other means
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- "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

2 March 2005

Date of mailing of the international search report

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INTERNATIONAL SEARCH REPORT

International Application No

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C.(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT

Category °	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
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X	WO 03/007623 A (AMERICAN EXPRESS TRAVEL RELATED SERVICES COMPAGNY, INC) 23 January 2003 (2003-01-23) page 3, line 28 - page 4, line 19 page 16, line 12 - page 19, line 22 figures 4,5 -----	31-71
A	US 6 176 427 B1 (ANTOGNINI THOMAS CHARLES ET AL) 23 January 2001 (2001-01-23) column 43, line 51 - line 60 -----	40-48, 54,55, 58-65
A	US 6 172 596 B1 (CESAR CHRISTIAN LENZ ET AL) 9 January 2001 (2001-01-09) column 3, line 66 - column 4, line 4 -----	38,39, 70,71
A	US 2003/018893 A1 (HESS ERWIN ET AL) 23 January 2003 (2003-01-23) the whole document -----	31-71

INTERNATIONAL SEARCH REPORT

International application No.
PCT/US2004/029885

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: 1-30,72-80

A RFID method, system and reader with a noise encryption signal to produce a noise-encrypted RF carrier signal.

2. claims: 31-71

A method of establishing a secure two-way communication link between a reader and a tag in a RFID system wherein the reader verifies that a singulated tag is an authentic tag based on a portion key or a one-time pad.

INTERNATIONAL SEARCH REPORT

Information on patent family members

International Application No

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Information on patent family members

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