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12/143,573 20 June 2008 (20.06.2008) US(71) Applicant (for all designated States except US): **3M INNOVATIVE PROPERTIES COMPANY** [US/US]; 3M Center, Post Office Box 33427, Saint Paul, Minnesota 55133-3427 (US).(72) Inventors: **BANERJEE, Swagata R.**; 3M Center, Post Office Box 33427, Saint Paul, Minnesota 55133-3427 (US). **SAINATI, Robert A.**; 3M Center, Post Office Box 33427, Saint Paul, Minnesota 55133-3427 (US). **EGBERT, William C.**; 3M Center, Post Office Box 33427, Saint Paul, Minnesota 55133-3427 (US). **MISEMER, David K.**; 3M Center, Post Office Box 33427, Saint Paul, Minnesota 55133-3427 (US).(74) Agents: **BURTIS, John A.**, et al.; 3M Center Office of Intellectual Property Counsel, Post Office Box 33427, Saint Paul, Minnesota 55133-3427 (US).

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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))
- as to the applicant's entitlement to claim the priority of the earlier application (Rule 4.17(iii))

## Published:

- with international search report (Art. 21(3))

(88) Date of publication of the international search report:  
27 May 2010

(54) Title: RADIO FREQUENCY IDENTIFICATION (RFID) TAG INCLUDING A THREE-DIMENSIONAL LOOP ANTENNA

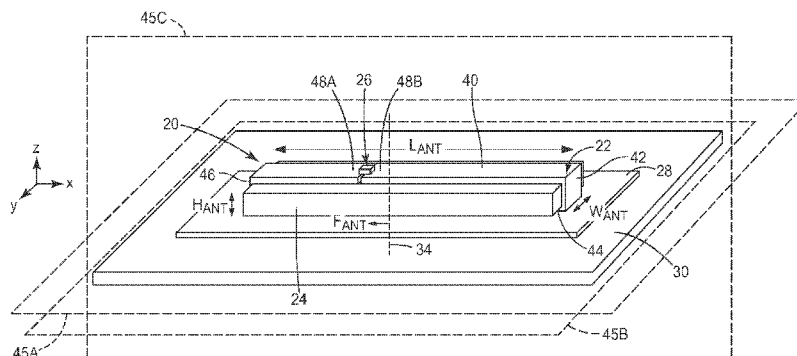


FIG. 2A

(57) Abstract: This disclosure describes a radio frequency identification (RFID) tag that includes a three-dimensional (3D) loop antenna. The 3D loop antenna includes a first conductive portion having a length and width that substantially exceed a thickness. The length and width of the first conductive portion substantially lie in a first plane. The 3D loop antenna includes a second conductive portion having a length and width that substantially exceed a thickness. The length and width of the second conductive portion substantially lie in a second plane that is substantially parallel to the first plane. An RFID circuit electrically connected to the loop antenna excites a current through the first and second conductive portions in a current loop that lies in a third plane that is not substantially parallel to the first and second planes. In some instances the third plane may be substantially perpendicular to the first and second planes.

# INTERNATIONAL SEARCH REPORT

International application No

PCT/US09/033671

## A. CLASSIFICATION OF SUBJECT MATTER

INV. G06K19/077

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)

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

## C. DOCUMENTS CONSIDERED TO BE RELEVANT

| Category* | Citation of document, with indication, where appropriate, of the relevant passages                                            | Relevant to claim No.               |
|-----------|-------------------------------------------------------------------------------------------------------------------------------|-------------------------------------|
| X         | EP 1 818 861 A2 (FUJITSU LTD [JP])<br>15 August 2007 (2007-08-15)<br>paragraphs [0004], [0005], [0044] -<br>[0080]; figure 10 | 1-47                                |
| X         | EP 1 626 364 A2 (FUJITSU LTD [JP])<br>15 February 2006 (2006-02-15)<br><br>paragraphs [0021], [0034]; figures 1,3             | 1-4,<br>6-10,<br>16-28,<br>36-42,45 |
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|           | -----<br>-/--                                                                                                                 |                                     |

☒ 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

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- \*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

4 May 2009

Date of mailing of the international search report

31/07/2009

Name and mailing address of the ISA/

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## INTERNATIONAL SEARCH REPORT

International application No  
PCT/US09/033671

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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| A         | DE 195 34 229 A1 (LICENTIA GMBH [DE])<br>20 March 1997 (1997-03-20)<br>the whole document<br>-----             | 1-47                  |
| A         | EP 1 585 191 A1 (FURUKAWA ELECTRIC CO LTD<br>[JP]) 12 October 2005 (2005-10-12)<br>the whole document<br>----- | 1-47                  |
| A         | EP 0 696 778 A1 (GEMPLUS CARD INT [FR])<br>14 February 1996 (1996-02-14)<br>the whole document<br>-----        | 1-47                  |

# INTERNATIONAL SEARCH REPORT

International application No.

PCT/US09/033671

## 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 additional sheet

1. ☐ As all required additional search fees were timely paid by the applicant, this international search report covers allsearchable claims.
2. ☐ As all searchable claims could be searched without effort justifying an 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 reportcovers 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 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.

FURTHER INFORMATION CONTINUED FROM PCT/ISA/ 210

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

1. claims: 1-47

RFID tag comprising loop antenna  
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2. claims: 48-58

Assembly for mounting an RFID tag and corresponfing  
manufacturing method  
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# INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No

PCT/US09/033671

| Patent document<br>cited in search report |    | Publication<br>date | Patent family<br>member(s) | Publication<br>date |
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