(12) INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

(19) World Intellectual Property Organization
International Bureau

(43) International Publication Date
29 November 2012 (29.11.2012)

WIPO | PCT

(10) International Publication Number
WO 2012/162077 A3

(51) International Patent Classification:
G08B 23/00 (2006.01)

(21) International Application Number:
PCT/US2012/038277

(22) International Filing Date:
17 May 2012 (17.05.2012)

(25) Filing Language: English

(26) Publication Language: English

(30) Priority Data:
61/486,806 17 May 2011 (17.05.2011) US

(71) Applicant *(for all designated States except US)*: **NSDU RESEARCH FOUNDATION** [US/US]; 1735 NSDU Research Park Drive, Dept. No. 4440, P.O. Box 6050, Fargo, ND 58108 (US).

(72) Inventors; and

(75) Inventors/Applicants *(for US only)*: **BAUER-REICH, Cherish** [US/US]; 2824 Edgewood Drive, Fargo, ND 58102 (US). **BERGE, Layne, Albert** [US/US]; 3630 21st St. S, Fargo, ND 58104, Cass County (US).

(74) Agents: **VELDHUIS-KROEZE, John, D.** et al.; Westman, Champlin & Kelly, P.A., 900 Second Avenue South, Suite 1400, Minneapolis, MN 55402-3319 (US).

(81) Designated States *(unless otherwise indicated, for every kind of national protection available)*: AE, AG, AL, AM, AO, AT, AU, AZ, BA, BB, BG, BH, BR, BW, BY, BZ, CA, CH, CL, CN, CO, CR, CU, CZ, DE, DK, DM, DO, DZ, EC, EE, EG, ES, FI, GB, GD, GE, GH, GM, GT, HN, HR, HU, ID, IL, IN, IS, JP, KE, KG, KM, KN, KP, KR, KZ, LA, LC, LK, LR, LS, LT, LU, LY, MA, MD, ME, MG, MK, MN, MW, MX, MY, MZ, NA, NG, NI, NO, NZ, OM, PE, PG, PH, PL, PT, QA, RO, RS, RU, RW, SC, SD, SE, SG, SK, SL, SM, ST, SV, SY, TH, TJ, TM, TN, TR, TT, TZ, UA, UG, US, UZ, VC, VN, ZA, ZM, ZW.

(84) Designated States *(unless otherwise indicated, for every kind of regional protection available)*: ARIPO (BW, GH, GM, KE, LR, LS, MW, MZ, NA, RW, SD, SL, SZ, TZ, UG, ZM, ZW), Eurasian (AM, AZ, BY, KG, KZ, RU, TJ, TM), European (AL, AT, BE, BG, CH, CY, CZ, DE, DK, EE, ES, FI, FR, GB, GR, HR, HU, IE, IS, IT, LT, LU, LV, MC, MK, MT, NL, NO, PL, PT, RO, RS, SE, SI, SK, SM, TR), OAPI (BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, ML, MR, NE, SN, TD, TG).

Published:

— *with international search report (Art. 21(3))*

(88) Date of publication of the international search report:
17 January 2013

(54) Title: LOW-PROFILE ANTENNA-LESS RFID TAGS AND INTEGRATED CIRCUIT WIRELESSTRANSMISSION APPARATUS

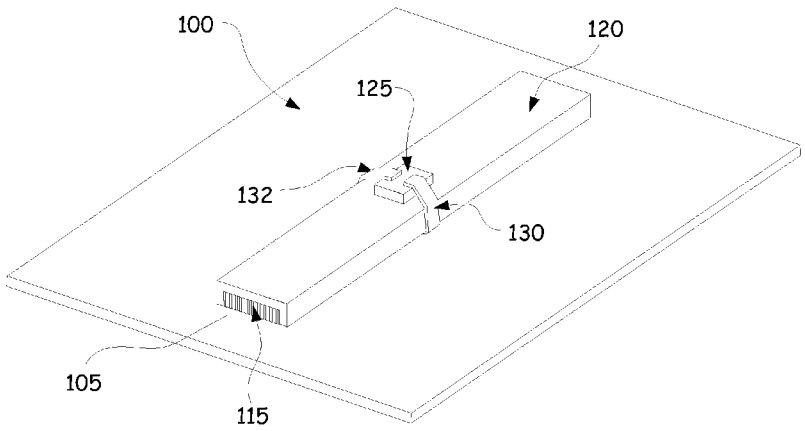

Fig. 1-1

(57) Abstract: Disclosed embodiments include a low-profile, high-permeability antenna-less radio frequency identification (RFID) tag (100; 300) for use on large metal objects and other types of objects for which traditional RFID technologies will not work or do not work well. High- permeability materials (115) are in contact with a metal surface (105; 305), such as a metal container or metallic tape, diverting current into the tag integrated circuit (IC) (125). This type of tag is essentially 'antenna-less' as it uses the ground plane or metallic object to excite currents through the IC. Tags using high-permeability materials in this manner are significantly thinner than those developed using other methods.

WO 2012/162077 A3

INTERNATIONAL SEARCH REPORT

International application No.
PCT/US 12/38277

A. CLASSIFICATION OF SUBJECT MATTER
IPC(8) - G08B 23/00 (2012.01)
USPC - 340/572.1
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)
USPC - 340/572.1
IPC(8) - G08B 23/00 (2012.01)

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched
USPC - 340/572.1-572.9, 539.1, 10.1, 10.4

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)
Database: PubWEST(PGPB,USPT,USOC,EPAB,JPAB); PatBase; Google Scholar/Patents
Search Terms Used: Radio frequency ID/identification, RFID, dielectric, metal, conductive, permeability, tag

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y	US 2006/0109124 A1 (Dixon et al.) 25 May 2006 (25.05.2006), para. [0027], [0029]-[0032]	1-15
Y	US 6,268,796 B1 (Gnadinger et al.) 31 July 2001 (31.07.2001), col. 10, ln. 57-64	1-15
Y	US 2010/0176971 A1 (Banerjee et al.) 15 July 2010 (15.07.2010), para. [0009], [0049]	4-5
Y	US 2009/0309703 A1 (Forster) 17 December 2009 (17.12.2009), abstract	6
Y	US 2007/0080233 A1 (Forster et al.) 12 April 2007 (12.04.2007), abstract	7
Y	US 2007/0241905 A1 (Himberger et al.) 18 October 2007 (18.10.2007), abstract	10
A	US 2007/0090954 A1 (Mahaffey) 20 January 2009 (20.01.2009)	1-15

☐ 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	Date of mailing of the international search report
25 October 2012 (25.10.2012)	08 NOV 2012
Name and mailing address of the ISA/US Mail Stop PCT, Attn: ISA/US, Commissioner for Patents P.O. Box 1450, Alexandria, Virginia 22313-1450 Facsimile No. 571-273-3201	Authorized officer: Lee W. Young PCT Helpdesk: 571-272-4300 PCT OSP: 571-272-7774

Form PCT/ISA/210 (second sheet) (July 2009)