UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
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APPLICATION NO.	ISSUE DATE	PATENT NO.	ATTORNEY DOCKET NO.	CONFIRMATION NO.
16/609,260	09/21/2021	11128027	07610-P0002A	1148

136531 7590 09/01/2021

The Roy Gross Law Firm, LLC
50 Washington Street, Suite 737/745
Suite 737/745
Norwalk, CT 06854

ISSUE NOTIFICATION

The projected patent number and issue date are specified above.

Determination of Patent Term Adjustment under 35 U.S.C. 154 (b)
(application filed on or after May 29, 2000)

The Patent Term Adjustment is 0 day(s). Any patent to issue from the above-identified application will include an indication of the adjustment on the front page.

If a Continued Prosecution Application (CPA) was filed in the above-identified application, the filing date that determines Patent Term Adjustment is the filing date of the most recent CPA.

Applicant will be able to obtain more detailed information by accessing the Patent Application Information Retrieval (PAIR) WEB site (http://pair.uspto.gov).

Any questions regarding the Patent Term Extension or Adjustment determination should be directed to the Office of Patent Legal Administration at (571)-272-7702. Questions relating to issue and publication fee payments should be directed to the Application Assistance Unit (AAU) of the Office of Data Management (ODM) at (571)-272-4200.

APPLICANT(s) (Please see PAIR WEB site http://pair.uspto.gov for additional applicants):

PROMAR TEXTIL INDUSTRIES S.R.L., Brasov, ROMANIA;

The United States represents the largest, most dynamic marketplace in the world and is an unparalleled location for business investment, innovation, and commercialization of new technologies. The USA offers tremendous resources and advantages for those who invest and manufacture goods here. Through SelectUSA, our nation works to encourage and facilitate business investment. To learn more about why the USA is the best country in the world to develop technology, manufacture products, and grow your business, visit SelectUSA.gov.

Document Description: Issue Fee Payment (PTO-85B)

Issue Fee Transmittal Form

Application Number	Filing Date	First Named Inventor	Atty. Docket No.	Confirmation No.
16609260	29-Oct-2019	Aurelian MORARU	07610-P0002A	1148

TITLE OF INVENTION :

RFID TAG FOR HARSH ENVIRONMENT INDUCTIVELY COUPLED IN DOUBLE LOOP

Entity Status	Application Type	Art Unit	Class - Subclass	EXAMINER
Small	U.S. National Stage under 35 USC 371	2648	041100	

Issue Fee Due	Publication Due	Total Fee(s) Due	Date Due	Prev. Paid Fee
$600	$0	$600	21-Sep-2021	$0

1.Change of Correspondence Address and/or Indication Of Fee Address (37 CFR 1.33 & 1.363)

Current Correspondence Address:	Current Indicated Fee Address :
136531 The Roy Gross Law Firm, LLC 50 Washington Street, Suite 737/745 Suite 737/745 Norwalk CT 06854 UNITED STATES 2034230235 paralegal@rgrosslaw.com	
☐ Change of correspondence address requested, system generated AIA/122-EFS form attached	☐ Fee Address indication requested, system generated SB/47-EFS form attached

2.Entity Status

Change in Entity Status

○ Applicant certifying micro entity status; system generated Micro Entity certification form attached. See 37 CFR 1.29.
Note: Absent a valid certification of micro entity status, issue fee payment in the micro entity amount will not be accepted at the risk of application abandonment. If this box is checked, you will be prompted to choose a micro entity status on the gross income basis (37 CFR 1.29(a)) or the institution of higher education basis (37 CFR 1.29(d)), and make the applicable certification online.

◉ Applicant asserting small entity status. See 37 CFR 1.27.
Note: If the application was previously under micro entity status, checking this box will be taken to be a notification of loss of entitlement to micro entity status.

○ Applicant changing to regular undiscounted fee status.
Note: Checking this box will be taken to be a notification of loss of entitlement to small or micro entity status, as applicable.

3.The Following Fee(s) Are Submitted:

☒ Issue Fee	☐ I authorize USPTO to apply my previously paid issue fee to the current fees due
☐ Publication Fee	☐ The Director is hereby authorized to apply my previously paid issue fee to the current fee due and to charge deficient fees to Deposit Account Number _____
☐ Advance Order - # of copies _____	☒ If **in addition to** the payment of the issue fee amount submitted with this form, there are any discrepancies in any amount(s) due, the Director is authorized to charge any deficiency, or credit any overpayment, to Deposit Account Number 506926 . The **issue fee must be submitted** with this form. **If payment of the issue fee does not accompany this form, checking this box and providing a deposit account number will NOT be effective to satisfy full payment of the fee(s) due.**

4.Firm and/or Attorney Names To Be Printed

NOTE: If no name is listed, no name will be printed
For printing on the patent front page, list to be displayed as entered

1. The Roy Gross Law Firm, LLC
2. Roy Gross
3.

5.Assignee Name(s) and Residence Data To Be Printed

PLEASE NOTE: Unless an assignee is identified below, no assignee data will appear on the patent. If an assignee is identified below, the document has been filed for recordation as set forth in 37 CFR 3.11. Completion of this form is NOT a substitute for filing an assignment.

Name	City	State	Country	Category
PROMAR TEXTIL INDUSTRIES S.R.L.	BRASOV		ROMANIA	other

6.Signature

I certify, in accordance with 37 CFR 1.4(d)(4) that I am an attorney or agent registered to practice before the Patent and Trademark Office who has filed and has been granted power of attorney in this application. I also certify that this Fee(s) Transmittal form is being transmitted to the USPTO via EFS-WEB on the date indicated below.

Signature	/Roy D. Gross/	**Date**	08-17-2021
Name	Roy D. Gross	**Registration Number**	63524

Electronic Patent Application Fee Transmittal

Application Number:	16609260
Filing Date:	29-Oct-2019
Title of Invention:	RFID TAG FOR HARSH ENVIRONMENT INDUCTIVELY COUPLED IN DOUBLE LOOP
First Named Inventor/Applicant Name:	Aurelian MORARU
Filer:	Roy D. Gross
Attorney Docket Number:	07610-P0002A

Filed as Small Entity

Filing Fees for U.S. National Stage under 35 USC 371

Description	Fee Code	Quantity	Amount	Sub-Total in USD($)
Basic Filing:				
UTILITY APPL ISSUE FEE	2501	1	600	600
PUBL. FEE- EARLY, VOLUNTARY, OR NORMAL	1504	1	0	0
Pages:				
Claims:				
Miscellaneous-Filing:				
Petition:				
Patent-Appeals-and-Interference:				

Description	Fee Code	Quantity	Amount	Sub-Total in USD($)
Post-Allowance-and-Post-Issuance:				
Extension-of-Time:				
Miscellaneous:				
		Total in USD ($)		**600**

Electronic Acknowledgement Receipt	
EFS ID:	43526469
Application Number:	16609260
International Application Number:	
Confirmation Number:	1148
Title of Invention:	RFID TAG FOR HARSH ENVIRONMENT INDUCTIVELY COUPLED IN DOUBLE LOOP
First Named Inventor/Applicant Name:	Aurelian MORARU
Customer Number:	136531
Filer:	Roy D. Gross
Filer Authorized By:	
Attorney Docket Number:	07610-P0002A
Receipt Date:	17-AUG-2021
Filing Date:	29-OCT-2019
Time Stamp:	10:42:43
Application Type:	U.S. National Stage under 35 USC 371

Payment information:

Submitted with Payment	yes
Payment Type	CARD
Payment was successfully received in RAM	$600
RAM confirmation Number	E20218GA42390057
Deposit Account	
Authorized User	
The Director of the USPTO is hereby authorized to charge indicated fees and credit any overpayment as follows:	

File Listing:

Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)
1	Issue Fee Payment (PTO-85B)	Web85b.pdf	62672 a12df71120596bd47b12badc8478ef9c85a52f3d	no	2
Warnings:					
Information:					
2	Fee Worksheet (SB06)	fee-info.pdf	39918 c964cd3245cde9dc9a2091e8411510fa4ebad7a9	no	2
Warnings:					
Information:					
		Total Files Size (in bytes):	102590		

This Acknowledgement Receipt evidences receipt on the noted date by the USPTO of the indicated documents, characterized by the applicant, and including page counts, where applicable. It serves as evidence of receipt similar to a Post Card, as described in MPEP 503.

New Applications Under 35 U.S.C. 111
If a new application is being filed and the application includes the necessary components for a filing date (see 37 CFR 1.53(b)-(d) and MPEP 506), a Filing Receipt (37 CFR 1.54) will be issued in due course and the date shown on this Acknowledgement Receipt will establish the filing date of the application.
National Stage of an International Application under 35 U.S.C. 371
If a timely submission to enter the national stage of an international application is compliant with the conditions of 35 U.S.C. 371 and other applicable requirements a Form PCT/DO/EO/903 indicating acceptance of the application as a national stage submission under 35 U.S.C. 371 will be issued in addition to the Filing Receipt, in due course.
New International Application Filed with the USPTO as a Receiving Office
If a new international application is being filed and the international application includes the necessary components for an international filing date (see PCT Article 11 and MPEP 1810), a Notification of the International Application Number and of the International Filing Date (Form PCT/RO/105) will be issued in due course, subject to prescriptions concerning national security, and the date shown on this Acknowledgement Receipt will establish the international filing date of the application.

UNITED STATES PATENT AND TRADEMARK OFFICE

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Alexandria, Virginia 22313-1450
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APPLICATION NUMBER	FILING or 371(c) DATE	GRP ART UNIT	FIL FEE REC'D	ATTY.DOCKET.NO	TOT CLAIMS	IND CLAIMS
16/609,260	10/29/2019	2648	790	07610-P0002A	5	1

CONFIRMATION NO. 1148

CORRECTED FILING RECEIPT

136531
The Roy Gross Law Firm, LLC
50 Washington Street, Suite 737/745
Suite 737/745
Norwalk, CT 06854

OC000000127451710

Date Mailed: 08/04/2021

Receipt is acknowledged of this non-provisional utility patent application. The application will be taken up for examination in due course. Applicant will be notified as to the results of the examination. Any correspondence concerning the application must include the following identification information: the U.S. APPLICATION NUMBER, FILING DATE, NAME OF FIRST INVENTOR, and TITLE OF INVENTION. Fees transmitted by check or draft are subject to collection.

Please verify the accuracy of the data presented on this receipt. If an error is noted on this Filing Receipt, please submit a written request for a corrected Filing Receipt, including a properly marked-up ADS showing the changes with strike-through for deletions and underlining for additions. If you received a "Notice to File Missing Parts" or other Notice requiring a response for this application, please submit any request for correction to this Filing Receipt with your reply to the Notice. When the USPTO processes the reply to the Notice, the USPTO will generate another Filing Receipt incorporating the requested corrections provided that the request is grantable.

Inventor(s)

Aurelian MORARU, Brasov, ROMANIA;
Corneliu URSACHI, Brasov, ROMANIA;

Applicant(s)

PROMAR TEXTIL INDUSTRIES S.R.L., Brasov, ROMANIA;

Power of Attorney: The patent practitioners associated with Customer Number 136531

Domestic Priority data as claimed by applicant

This application is a 371 of PCT/RO2017/000023 12/19/2017

Foreign Applications (You may be eligible to benefit from the **Patent Prosecution Highway** program at the USPTO. Please see http://www.uspto.gov for more information.)
ROMANIA A 2017 00388 06/16/2017

Permission to Access Application via Priority Document Exchange: Yes

Permission to Access Search Results: Yes

Applicant may provide or rescind an authorization for access using Form PTO/SB/39 or Form PTO/SB/69 as appropriate.

If Required, Foreign Filing License Granted: 11/26/2019

The country code and number of your priority application, to be used for filing abroad under the Paris Convention, is **US 16/609,260**

Projected Publication Date: Not Applicable

Non-Publication Request: No

Early Publication Request: No
** **SMALL ENTITY** **
Title

RFID TAG FOR HARSH ENVIRONMENT INDUCTIVELY COUPLED IN DOUBLE LOOP

Preliminary Class

455

Statement under 37 CFR 1.55 or 1.78 for AIA (First Inventor to File) Transition Applications: No

PROTECTING YOUR INVENTION OUTSIDE THE UNITED STATES

Since the rights granted by a U.S. patent extend only throughout the territory of the United States and have no effect in a foreign country, an inventor who wishes patent protection in another country must apply for a patent in a specific country or in regional patent offices. Applicants may wish to consider the filing of an international application under the Patent Cooperation Treaty (PCT). An international (PCT) application generally has the same effect as a regular national patent application in each PCT-member country. The PCT process **simplifies** the filing of patent applications on the same invention in member countries, but **does not result** in a grant of "an international patent" and does not eliminate the need of applicants to file additional documents and fees in countries where patent protection is desired.

Almost every country has its own patent law, and a person desiring a patent in a particular country must make an application for patent in that country in accordance with its particular laws. Since the laws of many countries differ in various respects from the patent law of the United States, applicants are advised to seek guidance from specific foreign countries to ensure that patent rights are not lost prematurely.

Applicants also are advised that in the case of inventions made in the United States, the Director of the USPTO must issue a license before applicants can apply for a patent in a foreign country. The filing of a U.S. patent application serves as a request for a foreign filing license. The application's filing receipt contains further information and guidance as to the status of applicant's license for foreign filing.

Applicants may wish to consult the USPTO booklet, "General Information Concerning Patents" (specifically, the section entitled "Treaties and Foreign Patents") for more information on timeframes and deadlines for filing foreign patent applications. The guide is available either by contacting the USPTO Contact Center at 800-786-9199, or it can be viewed on the USPTO website at http://www.uspto.gov/web/offices/pac/doc/general/index.html.

For information on preventing theft of your intellectual property (patents, trademarks and copyrights), you may wish to consult the U.S. Government website, http://www.stopfakes.gov. Part of a Department of Commerce initiative, this website includes self-help "toolkits" giving innovators guidance on how to protect intellectual property in specific countries such as China, Korea and Mexico. For questions regarding patent enforcement issues, applicants may call the U.S. Government hotline at 1-866-999-HALT (1-866-999-4258).

LICENSE FOR FOREIGN FILING UNDER

Title 35, United States Code, Section 184

Title 37, Code of Federal Regulations, 5.11 & 5.15

GRANTED

The applicant has been granted a license under 35 U.S.C. 184, if the phrase "IF REQUIRED, FOREIGN FILING LICENSE GRANTED" followed by a date appears on this form. Such licenses are issued in all applications where the conditions for issuance of a license have been met, regardless of whether or not a license may be required as set forth in 37 CFR 5.15. The scope and limitations of this license are set forth in 37 CFR 5.15(a) unless an earlier license has been issued under 37 CFR 5.15(b). The license is subject to revocation upon written notification. The date indicated is the effective date of the license, unless an earlier license of similar scope has been granted under 37 CFR 5.13 or 5.14.

This license is to be retained by the licensee and may be used at any time on or after the effective date thereof unless it is revoked. This license is automatically transferred to any related applications(s) filed under 37 CFR 1.53(d). This license is not retroactive.

The grant of a license does not in any way lessen the responsibility of a licensee for the security of the subject matter as imposed by any Government contract or the provisions of existing laws relating to espionage and the national security or the export of technical data. Licensees should apprise themselves of current regulations especially with respect to certain countries, of other agencies, particularly the Office of Defense Trade Controls, Department of State (with respect to Arms, Munitions and Implements of War (22 CFR 121-128)); the Bureau of Industry and Security, Department of Commerce (15 CFR parts 730-774); the Office of Foreign AssetsControl, Department of Treasury (31 CFR Parts 500+) and the Department of Energy.

NOT GRANTED

No license under 35 U.S.C. 184 has been granted at this time, if the phrase "IF REQUIRED, FOREIGN FILING LICENSE GRANTED" DOES NOT appear on this form. Applicant may still petition for a license under 37 CFR 5.12, if a license is desired before the expiration of 6 months from the filing date of the application. If 6 months has lapsed from the filing date of this application and the licensee has not received any indication of a secrecy order under 35 U.S.C. 181, the licensee may foreign file the application pursuant to 37 CFR 5.15(b).

SelectUSA

The United States represents the largest, most dynamic marketplace in the world and is an unparalleled location for business investment, innovation, and commercialization of new technologies. The U.S. offers tremendous resources and advantages for those who invest and manufacture goods here. Through SelectUSA, our nation works to promote and facilitate business investment. SelectUSA provides information assistance to the international investor community; serves as an ombudsman for existing and potential investors; advocates on behalf of U.S. cities, states, and regions competing for global investment; and counsels U.S. economic development organizations on investment attraction best practices. To learn more about why the United States is the best country in the world to develop technology, manufacture products, deliver services, and grow your business, visit http://www.SelectUSA.gov or call +1-202-482-6800.

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Applicant	PROMAR TEXTIL INDUSTRIES S.R.L.
Application No. 16/609,260	Filing Date: 10-29-2019
Title of Application:	RFID TAG FOR HARSH ENVIRONMENT INDUCTIVELY COUPLED IN DOUBLE LOOP
Confirmation No. 1148	Art Unit: 2648
Attorney Docket No.	07610-P0002A

Commissioner for Patents
Post Office Box 1450
Alexandria, VA 22313-1450

Request for Corrected Filing Receipt

Dear Sirs:

Applicant hereby requests a corrected filing receipt in response to the Notice to File Corrected Application Papers filed concurrently herewith.

Applicant believes that there is no fee associated with filing this request. However, the Commissioner is hereby authorized to charge any additional fees by this paper and during the entire pendency of this Application to Deposit Account No. 50-6926.

Respectfully submitted,

/ Roy D. Gross /

July 30, 2021

Roy D. Gross, Registration No., 63,524
Attorney for Applicant(s)
THE ROY GROSS LAW FIRM, LLC
50 Washington Street, Suite 737/745
Norwalk, CT 06854
(203) 423-0235

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Applicant	PROMAR TEXTIL INDUSTRIES S.R.L.
Application No. 16/609,260	Filing Date: 10-29-2019
Title of Application:	RFID TAG FOR HARSH ENVIRONMENT INDUCTIVELY COUPLED IN DOUBLE LOOP
Confirmation No. 1148	Art Unit: 2648
Attorney Docket No.	07610-P0002A

Commissioner for Patents
Post Office Box 1450
Alexandria, VA 22313-1450

RESPONSE TO NOTICE TO FILE CORRECTED APPLICATION PAPERS

Dear Sirs:

In Response to the Notice to File Corrected Application Papers dated June 28, 2021, Applicant encloses the following documents in Reply:

- Updated Drawings (FIG 3)
- Request for Corrected Filing Receipt

The Applicant submits that no new matter has been added.

The Commissioner is hereby authorized to charge any additional fees by this paper and during the entire pendency of this Application to Account No. 50-6926.

Respectfully submitted,

/Roy D. Gross/

July 30, 2021

Roy D. Gross, Registration No. 63,524
Attorney for Applicant
THE ROY GROSS LAW FIRM, LLC
50 WASHINGTON STREET, SUITE 737/745
Norwalk, CT 06854
(203) 423-0235

Electronic Acknowledgement Receipt	
EFS ID:	43382973
Application Number:	16609260
International Application Number:	
Confirmation Number:	1148
Title of Invention:	RFID TAG FOR HARSH ENVIRONMENT INDUCTIVELY COUPLED IN DOUBLE LOOP
First Named Inventor/Applicant Name:	Aurelian MORARU
Customer Number:	136531
Filer:	Roy D. Gross
Filer Authorized By:	
Attorney Docket Number:	07610-P0002A
Receipt Date:	30-JUL-2021
Filing Date:	29-OCT-2019
Time Stamp:	12:09:24
Application Type:	U.S. National Stage under 35 USC 371

Payment information:

Submitted with Payment	no

File Listing:

Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)
1	Drawings-only black and white line drawings	07610-P0002A-drawing-fig-3.pdf	190605 28f8d6b5d013a394be1664db98d0ea8bc5ca9d19	no	1

Warnings:

Information:					
2	Request for Corrected Filing Receipt	07610-P0002A-Request-Corr-Filing-Receipt-Title.pdf	78252 76b97996407e309c7ac021765f78887a275500c1	no	1
Warnings:					
Information:					
3	Applicant Response to Pre-Exam Formalities Notice	07610-P0002A-Response-Notice-Corr-Application-Papers.pdf	78882 f2d9b94b493e726d244c30739c1ede8b3bfdad3d	no	1
Warnings:					
Information:					
		Total Files Size (in bytes):	347739		

This Acknowledgement Receipt evidences receipt on the noted date by the USPTO of the indicated documents, characterized by the applicant, and including page counts, where applicable. It serves as evidence of receipt similar to a Post Card, as described in MPEP 503.

New Applications Under 35 U.S.C. 111

If a new application is being filed and the application includes the necessary components for a filing date (see 37 CFR 1.53(b)-(d) and MPEP 506), a Filing Receipt (37 CFR 1.54) will be issued in due course and the date shown on this Acknowledgement Receipt will establish the filing date of the application.

National Stage of an International Application under 35 U.S.C. 371

If a timely submission to enter the national stage of an international application is compliant with the conditions of 35 U.S.C. 371 and other applicable requirements a Form PCT/DO/EO/903 indicating acceptance of the application as a national stage submission under 35 U.S.C. 371 will be issued in addition to the Filing Receipt, in due course.

New International Application Filed with the USPTO as a Receiving Office

If a new international application is being filed and the international application includes the necessary components for an international filing date (see PCT Article 11 and MPEP 1810), a Notification of the International Application Number and of the International Filing Date (Form PCT/RO/105) will be issued in due course, subject to prescriptions concerning national security, and the date shown on this Acknowledgement Receipt will establish the international filing date of the application.

Drawings

Fig. 1 .

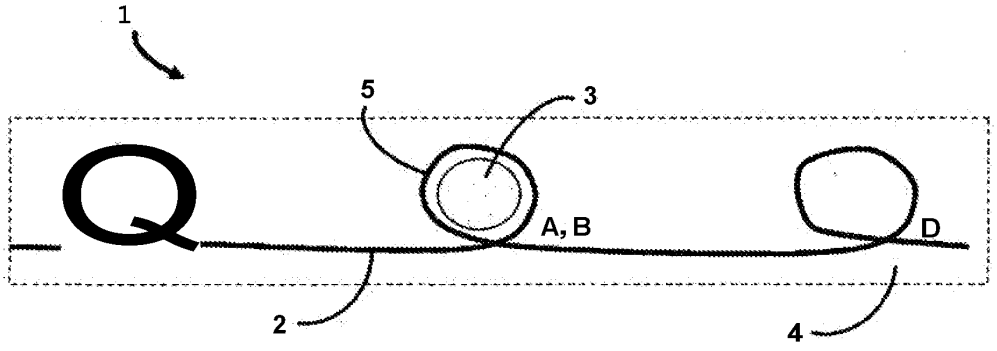


Fig. 2.

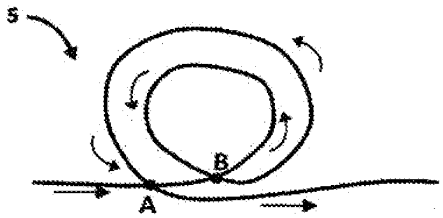
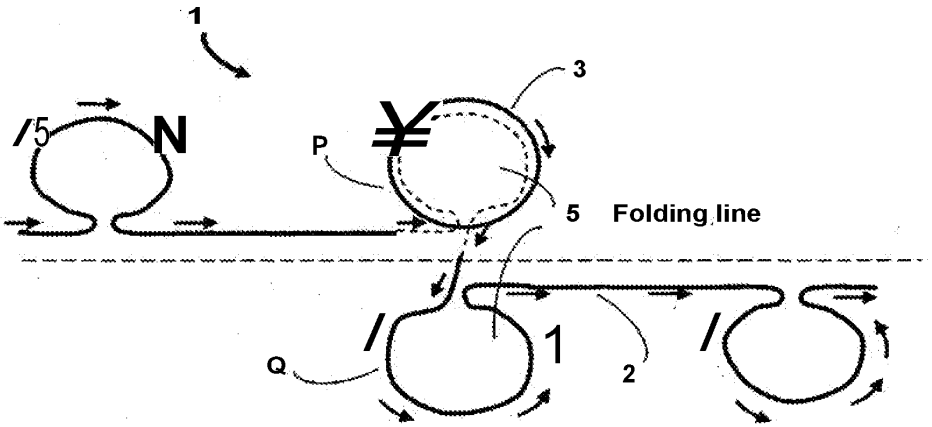


Fig. 3.



UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, Virginia 22313-1450
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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
16/609,260	10/29/2019	Aurelian MORARU	07610-P0002A	1148

136531 7590 06/28/2021

The Roy Gross Law Firm, LLC
50 Washington Street, Suite 737 745
Suite 737/745
Norwalk, CT 06854

EXAMINER	
GONZALES, APRIL GUZMAN	

ART UNIT	PAPER NUMBER
2648	

MAIL DATE	DELIVERY MODE
06/28/2021	PAPER

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

UNITED STATES PATENT AND TRADEMARK OFFICE

Commissioner for Patents
United States Patent and Trademark Office
P.O. Box 1450
Alexandria, VA 22313-1450
www.uspto.gov

Application No. : 16609260
Applicant : Moraru
Filing Date : 10/29/2019
Date Mailed : 06/28/2021

NOTICE TO FILE CORRECTED APPLICATION PAPERS

Notice of Allowance Mailed

This application has been accorded an Allowance Date and is being prepared for issuance. The application, however, is incomplete for the reasons below.

Applicant is given two (2) months from the mail date of this Notice within which to respond. This time period for reply is extendable under 37 CFR 1.136(a) for only TWO additional MONTHS.

The informalities requiring correction are indicated in the attachment(s). If the informality pertains to the abstract, specification (including claims) or drawings, the informality must be corrected with an amendment in compliance with 37 CFR 1.121 (or, if the application is a reissue application, 37 CFR 1.173). Such an amendment may be filed after payment of the issue fee if limited to correction of informalities noted herein. See Waiver of 37 CFR 1.312 for Documents Required by the Office of Patent Publication, 1280 Off. Gaz. Patent Office 918 (March 23, 2004). In addition, if the informality is not corrected until after payment of the issue fee, for purposes of 35 U.S.C. 154(b)(1)(iv), "all outstanding requirements" will be considered to have been satisfied when the informality has been corrected. A failure to respond within the above-identified time period will result in the application being ABANDONED.

See attachment(s).

A copy of this notice MUST be returned with the reply. Please address response to "Mail Stop Issue Fee, Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450".

/Naran Hem/
Publication Branch
Office of Data Management
(571) 272-4200

Application No. 16609260 **Drawings filed: 10/29/2019**

IDENTIFICATION OF DRAWING DEFICIENCIES

- [ ] There is a hole or the image thereof within the illustration. FIG(s)
- [ ] The illustration is penetrated or traversed by a solid or broken line that is not intended to be part of the drawing, such as a dark line caused by a flaw in the copying process. FIG(s)
- [ ] An ink stamp or the image thereof obscures part of the illustration. FIG(s)
- [ ] The drawing is marred by black smudges, obliterations, or fax/copier marks (for example, speckles or dots in a substantial portion of the drawing). FIG(s)
- [ ] Figure numbers are duplicated or missing. FIG(s)
- [ ] Drawing sheet or figure is missing. FIG(s)
- [ ] Numbers, letters, or reference characters in the drawing have been crossed out or are illegibly handwritten. FIG(s)
- [ ] The character of the lines, numbers, and letters is poor. FIG(s)
- [ ] The drawing's background shows that the original drawing was made on graph paper or other paper with a pattern or decoration. FIG(s)
- [ ] The FIG. number label is placed in a location that causes the drawing to be read upside down. FIG(s)
- [ ] Data, a reference number, or part of the drawing is truncated or missing, or a lead line has no reference number. FIG(s)
- [X] The drawing and/or the FIG. label contain(s) foreign language. FIG(s) 3
- [ ] This utility application contains a photograph of a view that is capable of being illustrated as a line drawing. FIG(s)
- [ ] A petition under 37 CFR 1.84(a)(2) to accept color drawings has been granted, but the brief description of the drawings in the specification does not contain (or has not been amended to contain) the paragraph required by 37 CFR 1.84(a)(2)(iii).
- [ ] This reissue application contains added and/or amended drawings that are not labeled as “New” or “Amended” or “Canceled” as required by 37 CFR 1.173(b)(3). FIG(s)
- [ ] This Design reissue application contains a drawing that is labeled as “Canceled” but is not surrounded by brackets, or a drawing that is surrounded by brackets but is not labeled as “Canceled.” See 37 CFR 1.173(b)(3). FIG(s)
- [ ] OTHER:
- [ ] COMMENTS:

UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
P.O. Box 1450
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NOTICE OF ALLOWANCE AND FEE(S) DUE

136531 7590 06/21/2021

The Roy Gross Law Firm, LLC
50 Washington Street, Suite 737/745
Suite 737/745
Norwalk, CT 06854

EXAMINER	
GONZALES, APRIL GUZMAN	
ART UNIT	PAPER NUMBER
2648	

DATE MAILED: 06/21/2021

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
16/609,260	10/29/2019	Aurelian MORARU	07610-P0002A	1148

TITLE OF INVENTION: RFID TAG FOR HARSH ENVIRONMENT INDUCTIVELY COUPLED IN DOUBLE LOOP

APPLN. TYPE	ENTITY STATUS	ISSUE FEE DUE	PUBLICATION FEE DUE	PREV. PAID ISSUE FEE	TOTAL FEE(S) DUE	DATE DUE
nonprovisional	SMALL	$600	$0.00	$0.00	$600	09/21/2021

THE APPLICATION IDENTIFIED ABOVE HAS BEEN EXAMINED AND IS ALLOWED FOR ISSUANCE AS A PATENT. PROSECUTION ON THE MERITS IS CLOSED. THIS NOTICE OF ALLOWANCE IS NOT A GRANT OF PATENT RIGHTS. THIS APPLICATION IS SUBJECT TO WITHDRAWAL FROM ISSUE AT THE INITIATIVE OF THE OFFICE OR UPON PETITION BY THE APPLICANT. SEE 37 CFR 1.313 AND MPEP 1308.

THE ISSUE FEE AND PUBLICATION FEE (IF REQUIRED) MUST BE PAID WITHIN THREE MONTHS FROM THE MAILING DATE OF THIS NOTICE OR THIS APPLICATION SHALL BE REGARDED AS ABANDONED. THIS STATUTORY PERIOD CANNOT BE EXTENDED. SEE 35 U.S.C. 151. THE ISSUE FEE DUE INDICATED ABOVE DOES NOT REFLECT A CREDIT FOR ANY PREVIOUSLY PAID ISSUE FEE IN THIS APPLICATION. IF AN ISSUE FEE HAS PREVIOUSLY BEEN PAID IN THIS APPLICATION (AS SHOWN ABOVE), THE RETURN OF PART B OF THIS FORM WILL BE CONSIDERED A REQUEST TO REAPPLY THE PREVIOUSLY PAID ISSUE FEE TOWARD THE ISSUE FEE NOW DUE.

HOW TO REPLY TO THIS NOTICE:

I. Review the ENTITY STATUS shown above. If the ENTITY STATUS is shown as SMALL or MICRO, verify whether entitlement to that entity status still applies.

If the ENTITY STATUS is the same as shown above, pay the TOTAL FEE(S) DUE shown above.

If the ENTITY STATUS is changed from that shown above, on PART B - FEE(S) TRANSMITTAL, complete section number 5 titled "Change in Entity Status (from status indicated above)".

For purposes of this notice, small entity fees are 1/2 the amount of undiscounted fees, and micro entity fees are 1/2 the amount of small entity fees.

II. PART B - FEE(S) TRANSMITTAL, or its equivalent, must be completed and returned to the United States Patent and Trademark Office (USPTO) with your ISSUE FEE and PUBLICATION FEE (if required). If you are charging the fee(s) to your deposit account, section "4b" of Part B - Fee(s) Transmittal should be completed and an extra copy of the form should be submitted. If an equivalent of Part B is filed, a request to reapply a previously paid issue fee must be clearly made, and delays in processing may occur due to the difficulty in recognizing the paper as an equivalent of Part B.

III. All communications regarding this application must give the application number. Please direct all communications prior to issuance to Mail Stop ISSUE FEE unless advised to the contrary.

IMPORTANT REMINDER: Maintenance fees are due in utility patents issuing on applications filed on or after Dec. 12, 1980. It is patentee's responsibility to ensure timely payment of maintenance fees when due. More information is available at www.uspto.gov/PatentMaintenanceFees.

PART B - FEE(S) TRANSMITTAL

Complete and send this form, together with applicable fee(s), by mail or fax, or via EFS-Web.

By mail, send to: Mail Stop ISSUE FEE
Commissioner for Patents
P.O. Box 1450
Alexandria, Virginia 22313-1450

By fax, send to: (571)-273-2885

INSTRUCTIONS: This form should be used for transmitting the ISSUE FEE and PUBLICATION FEE (if required). Blocks 1 through 5 should be completed where appropriate. All further correspondence including the Patent, advance orders and notification of maintenance fees will be mailed to the current correspondence address as indicated unless corrected below or directed otherwise in Block 1, by (a) specifying a new correspondence address; and/or (b) indicating a separate "FEE ADDRESS" for maintenance fee notifications.

CURRENT CORRESPONDENCE ADDRESS (Note: Use Block 1 for any change of address)

136531 7590 06/21/2021
The Roy Gross Law Firm, LLC
50 Washington Street, Suite 737/745
Suite 737/745
Norwalk, CT 06854

Note: A certificate of mailing can only be used for domestic mailings of the Fee(s) Transmittal. This certificate cannot be used for any other accompanying papers. Each additional paper, such as an assignment or formal drawing, must have its own certificate of mailing or transmission.

Certificate of Mailing or Transmission

I hereby certify that this Fee(s) Transmittal is being deposited with the United States Postal Service with sufficient postage for first class mail in an envelope addressed to the Mail Stop ISSUE FEE address above, or being transmitted to the USPTO via EFS-Web or by facsimile to (571) 273-2885, on the date below.

(Typed or printed name)
(Signature)
(Date)

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
16/609,260	10/29/2019	Aurelian MORARU	07610-P0002A	1148

TITLE OF INVENTION: RFID TAG FOR HARSH ENVIRONMENT INDUCTIVELY COUPLED IN DOUBLE LOOP

APPLN. TYPE	ENTITY STATUS	ISSUE FEE DUE	PUBLICATION FEE DUE	PREV. PAID ISSUE FEE	TOTAL FEE(S) DUE	DATE DUE
nonprovisional	SMALL	$600	$0.00	$0.00	$600	09/21/2021

EXAMINER	ART UNIT	CLASS-SUBCLASS
GONZALES, APRIL GUZMAN	2648	455-041100

1. Change of correspondence address or indication of "Fee Address" (37 CFR 1.363).

❑ Change of correspondence address (or Change of Correspondence Address form PTO/SB/122) attached.

❑ "Fee Address" indication (or "Fee Address" Indication form PTO/SB/47; Rev 03-09 or more recent) attached. **Use of a Customer Number is required.**

2. For printing on the patent front page, list
(1) The names of up to 3 registered patent attorneys or agents OR, alternatively,
(2) The name of a single firm (having as a member a registered attorney or agent) and the names of up to 2 registered patent attorneys or agents. If no name is listed, no name will be printed.

1 _____
2 _____
3 _____

3. ASSIGNEE NAME AND RESIDENCE DATA TO BE PRINTED ON THE PATENT (print or type)

PLEASE NOTE: Unless an assignee is identified below, no assignee data will appear on the patent. If an assignee is identified below, the document must have been previously recorded, or filed for recordation, as set forth in 37 CFR 3.11 and 37 CFR 3.81(a). Completion of this form is NOT a substitute for filing an assignment.

(A) NAME OF ASSIGNEE (B) RESIDENCE: (CITY and STATE OR COUNTRY)

Please check the appropriate assignee category or categories (will not be printed on the patent) : ❑ Individual ❑ Corporation or other private group entity ❑ Government

4a. Fees submitted: ❑Issue Fee ❑Publication Fee (if required) ❑Advance Order - # of Copies _____

4b. Method of Payment: *(Please first reapply any previously paid fee shown above)*

❑ Electronic Payment via EFS-Web ❑ Enclosed check ❑ Non-electronic payment by credit card (Attach form PTO-2038)

❑ The Director is hereby authorized to charge the required fee(s), any deficiency, or credit any overpayment to Deposit Account No. _____

5. **Change in Entity Status** (from status indicated above)

❑ Applicant certifying micro entity status. See 37 CFR 1.29

❑ Applicant asserting small entity status. See 37 CFR 1.27

❑ Applicant changing to regular undiscounted fee status.

NOTE: Absent a valid certification of Micro Entity Status (see forms PTO/SB/15A and 15B), issue fee payment in the micro entity amount will not be accepted at the risk of application abandonment.
NOTE: If the application was previously under micro entity status, checking this box will be taken to be a notification of loss of entitlement to micro entity status.
NOTE: Checking this box will be taken to be a notification of loss of entitlement to small or micro entity status, as applicable.

NOTE: This form must be signed in accordance with 37 CFR 1.31 and 1.33. See 37 CFR 1.4 for signature requirements and certifications.

Authorized Signature _____ Date _____

Typed or printed name _____ Registration No. _____

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16/609,260	10/29/2019	Aurelian MORARU	07610-P0002A	1148

136531 7590 06/21/2021

The Roy Gross Law Firm, LLC
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Suite 737/745
Norwalk, CT 06854

EXAMINER	
GONZALES, APRIL GUZMAN	
ART UNIT	PAPER NUMBER
2648	

DATE MAILED: 06/21/2021

Determination of Patent Term Adjustment under 35 U.S.C. 154 (b)
(Applications filed on or after May 29, 2000)

The Office has discontinued providing a Patent Term Adjustment (PTA) calculation with the Notice of Allowance.

Section 1(h)(2) of the AIA Technical Corrections Act amended 35 U.S.C. 154(b)(3)(B)(i) to eliminate the requirement that the Office provide a patent term adjustment determination with the notice of allowance. See Revisions to Patent Term Adjustment, 78 Fed. Reg. 19416, 19417 (Apr. 1, 2013). Therefore, the Office is no longer providing an initial patent term adjustment determination with the notice of allowance. The Office will continue to provide a patent term adjustment determination with the Issue Notification Letter that is mailed to applicant approximately three weeks prior to the issue date of the patent, and will include the patent term adjustment on the patent. Any request for reconsideration of the patent term adjustment determination (or reinstatement of patent term adjustment) should follow the process outlined in 37 CFR 1.705.

Any questions regarding the Patent Term Extension or Adjustment determination should be directed to the Office of Patent Legal Administration at (571)-272-7702. Questions relating to issue and publication fee payments should be directed to the Customer Service Center of the Office of Patent Publication at 1-(888)-786-0101 or (571)-272-4200.

OMB Clearance and PRA Burden Statement for PTOL-85 Part B

The Paperwork Reduction Act (PRA) of 1995 requires Federal agencies to obtain Office of Management and Budget approval before requesting most types of information from the public. When OMB approves an agency request to collect information from the public, OMB (i) provides a valid OMB Control Number and expiration date for the agency to display on the instrument that will be used to collect the information and (ii) requires the agency to inform the public about the OMB Control Number's legal significance in accordance with 5 CFR 1320.5(b).

The information collected by PTOL-85 Part B is required by 37 CFR 1.311. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.14. This collection is estimated to take 30 minutes to complete, including gathering, preparing, and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, Virginia 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, Virginia 22313-1450. Under the Paperwork Reduction Act of 1995, no persons are required to respond to a collection of information unless it displays a valid OMB control number.

Privacy Act Statement

The Privacy Act of 1974 (P.L. 93-579) requires that you be given certain information in connection with your submission of the attached form related to a patent application or patent. Accordingly, pursuant to the requirements of the Act, please be advised that: (1) the general authority for the collection of this information is 35 U.S.C. 2(b)(2); (2) furnishing of the information solicited is voluntary; and (3) the principal purpose for which the information is used by the U.S. Patent and Trademark Office is to process and/or examine your submission related to a patent application or patent. If you do not furnish the requested information, the U.S. Patent and Trademark Office may not be able to process and/or examine your submission, which may result in termination of proceedings or abandonment of the application or expiration of the patent.

The information provided by you in this form will be subject to the following routine uses:

1. The information on this form will be treated confidentially to the extent allowed under the Freedom of Information Act (5 U.S.C. 552) and the Privacy Act (5 U.S.C 552a). Records from this system of records may be disclosed to the Department of Justice to determine whether disclosure of these records is required by the Freedom of Information Act.
2. A record from this system of records may be disclosed, as a routine use, in the course of presenting evidence to a court, magistrate, or administrative tribunal, including disclosures to opposing counsel in the course of settlement negotiations.
3. A record in this system of records may be disclosed, as a routine use, to a Member of Congress submitting a request involving an individual, to whom the record pertains, when the individual has requested assistance from the Member with respect to the subject matter of the record.
4. A record in this system of records may be disclosed, as a routine use, to a contractor of the Agency having need for the information in order to perform a contract. Recipients of information shall be required to comply with the requirements of the Privacy Act of 1974, as amended, pursuant to 5 U.S.C. 552a(m).
5. A record related to an International Application filed under the Patent Cooperation Treaty in this system of records may be disclosed, as a routine use, to the International Bureau of the World Intellectual Property Organization, pursuant to the Patent Cooperation Treaty.
6. A record in this system of records may be disclosed, as a routine use, to another federal agency for purposes of National Security review (35 U.S.C. 181) and for review pursuant to the Atomic Energy Act (42 U.S.C. 218(c)).
7. A record from this system of records may be disclosed, as a routine use, to the Administrator, General Services, or his/her designee, during an inspection of records conducted by GSA as part of that agency's responsibility to recommend improvements in records management practices and programs, under authority of 44 U.S.C. 2904 and 2906. Such disclosure shall be made in accordance with the GSA regulations governing inspection of records for this purpose, and any other relevant (i.e., GSA or Commerce) directive. Such disclosure shall not be used to make determinations about individuals.
8. A record from this system of records may be disclosed, as a routine use, to the public after either publication of the application pursuant to 35 U.S.C. 122(b) or issuance of a patent pursuant to 35 U.S.C. 151. Further, a record may be disclosed, subject to the limitations of 37 CFR 1.14, as a routine use, to the public if the record was filed in an application which became abandoned or in which the proceedings were terminated and which application is referenced by either a published application, an application open to public inspection or an issued patent.
9. A record from this system of records may be disclosed, as a routine use, to a Federal, State, or local law enforcement agency, if the USPTO becomes aware of a violation or potential violation of law or regulation.

Notice of Allowability	Application No. 16/609,260	Applicant(s) MORARU et al.	
	Examiner APRIL G GONZALES	Art Unit 2648	AIA (FITF) Status Yes

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address--

All claims being allowable, PROSECUTION ON THE MERITS IS (OR REMAINS) CLOSED in this application. If not included herewith (or previously mailed), a Notice of Allowance (PTOL-85) or other appropriate communication will be mailed in due course. **THIS NOTICE OF ALLOWABILITY IS NOT A GRANT OF PATENT RIGHTS.** This application is subject to withdrawal from issue at the initiative of the Office or upon petition by the applicant. See 37 CFR 1.313 and MPEP 1308.

1. ☑ This communication is responsive to 03/17/2021.
   ☐ A declaration(s)/affidavit(s) under **37 CFR 1.130(b)** was/were filed on _____.

2. ☐ An election was made by the applicant in response to a restriction requirement set forth during the interview on _____; the restriction requirement and election have been incorporated into this action.

3. ☑ The allowed claim(s) is/are 1-6 . As a result of the allowed claim(s), you may be eligible to benefit from the **Patent Prosecution Highway** program at a participating intellectual property office for the corresponding application. For more information, please see **http://www.uspto.gov/patents/init_events/pph/index.jsp** or send an inquiry to **PPHfeedback@uspto.gov.**

4. ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

   Certified copies:

   a) ☐ All b) ☐ Some *c) ☐ None of the:

   1. ☐ Certified copies of the priority documents have been received.
   2. ☐ Certified copies of the priority documents have been received in Application No. _____ .
   3. ☐ Copies of the certified copies of the priority documents have been received in this national stage application from the International Bureau (PCT Rule 17.2(a)).

   * Certified copies not received: _____ .

Applicant has THREE MONTHS FROM THE "MAILING DATE" of this communication to file a reply complying with the requirements noted below. Failure to timely comply will result in ABANDONMENT of this application.
THIS THREE-MONTH PERIOD IS NOT EXTENDABLE.

5. ☐ CORRECTED DRAWINGS (as "replacement sheets") must be submitted.
   ☐ including changes required by the attached Examiner's Amendment / Comment or in the Office action of Paper No./Mail Date _____ .

   Identifying indicia such as the application number (see 37 CFR 1.84(c)) should be written on the drawings in the front (not the back) of each sheet. Replacement sheet(s) should be labeled as such in the header according to 37 CFR 1.121(d).

6. ☐ DEPOSIT OF and/or INFORMATION about the deposit of BIOLOGICAL MATERIAL must be submitted. Note the attached Examiner's comment regarding REQUIREMENT FOR THE DEPOSIT OF BIOLOGICAL MATERIAL.

Attachment(s)

1. ☑ Notice of References Cited (PTO-892)
2. ☐ Information Disclosure Statements (PTO/SB/08), Paper No./Mail Date _____.
3. ☐ Examiner's Comment Regarding Requirement for Deposit of Biological Material _____.
4. ☐ Interview Summary (PTO-413), Paper No./Mail Date. _____.
5. ☐ Examiner's Amendment/Comment
6. ☑ Examiner's Statement of Reasons for Allowance
7. ☐ Other _____.

/APRIL G GONZALES/
Primary Examiner, Art Unit 2648

DETAILED ACTION

Notice of Pre-AIA or AIA Status

The present application, filed on or after March 16, 2013, is being examined under the first inventor to file provisions of the AIA.

Response to Arguments

Applicant's arguments, see Applicant Arguments/Remarks, filed 03/17/2021, with respect to claims 1-6 have been fully considered and are persuasive. The rejection of claims 1-6 has been withdrawn.

However, upon further search and consideration in light of Applicant Arguments/Remarks, claims 1-6 are now considered novel and non-obvious over the prior art and therefore claims 1-6 are allowed.

EXAMINER'S AMENDMENT

An examiner's amendment to the record appears below. Should the changes and/or additions be unacceptable to applicant, an amendment may be filed as provided by 37 CFR 1.312. To ensure consideration of such an amendment, it MUST be submitted no later than the payment of the issue fee.

The application has been amended as follows:

1. An RFID tag (1) for use in harsh environments comprising;

an UHF-SHF antenna (2) made from a continuous electroconductive textile thread, electrically insulated, embroidered on textile substrate,

an RFID transponder (3), and

a substrate of textile material (4) on which the RFID transponder (3) and the UHF-SHF antenna (2) are placed, the whole assembly being sealed by hot-dipping of a second textile substrate,

wherein the UHF-SHF antenna (2) has a central zone formed by a double loop (5) by which it inductively couples with the encapsulated RFID transponder (3), wherein the double ~~central~~ loop (5) does not have electrical contacts at ~~the~~ intersection points (A and B).

3. The RFID tag (1) of claim 1, wherein the UHF-SHF antenna (2) does not show electrical contacts in the crossing points (C and D) in the construction of ~~the~~ simple loops located at the extremities.

4. The RFID tag (1) of claim 1, wherein the UHF-SHF antenna (2) is made by continuous embroidering of the electroconductive textile thread in the form of two open loops disposed in a upper plane in relation to a ~~the~~ longitudinal direction and two open loops disposed in a lower plane in relation to the same longitudinal direction.

5. The RFID tag (1) of claim 4, wherein, in the central area, an ~~the~~ upper plane loop (P) has a smaller diameter than a ~~the~~ loop (Q) from the lower plane, the transponder (3) being fixed and centered on the loop (P) in the upper plane, and the loop (Q) from the lower plane will overlap the loop (P) from the upper plane by bending over said longitudinal direction, so that the double loop (5) is created having the transponder (2) inside it.

Allowable Subject Matter

Claims 1-6 are allowed.

The Applicant's reply make evident the reasons for allowance. Specifically, the substance of Applicant's remarks filed on 03/17/2021 are persuasive, as such the reasons for allowance are on record and no further statement is deemed necessary.

Any comments considered necessary by applicant must be submitted no later than the payment of the issue fee and, to avoid processing delays, should preferably accompany the issue fee. Such submissions should be clearly labeled "Comments on Statement of Reasons for Allowance."

Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to APRIL GUZMAN GONZALES whose telephone number is (571)270-1101. The examiner can normally be reached on Monday - Friday 8:00 am to 4:00 pm EST.

Examiner interviews are available via telephone, in-person, and video conferencing using a USPTO supplied web-based collaboration tool. To schedule an interview, applicant is encouraged to use the USPTO Automated Interview Request (AIR) at http://www.uspto.gov/interviewpractice.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Wesley L. Kim can be reached on (571) 272-7867. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see https://ppair-my.uspto.gov/pair/PrivatePair. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/APRIL G GONZALES/
Primary Examiner, Art Unit 2648

Notice of References Cited	Application/Control No. 16/609,260	Applicant(s)/Patent Under Reexamination MORARU et al.	
	Examiner APRIL G GONZALES	Art Unit 2648	Page 1 of 2

U.S. PATENT DOCUMENTS

*		Document Number Country Code-Number-Kind Code	Date MM-YYYY	Name	CPC Classification	US Classification
*	A	US-20070095926-A1	05-2007	Zhu; Shengbo	G06K19/07756	235/492
*	B	US-7432816-B1	10-2008	Ku; Joseph	G06K19/0723	340/572.1
*	C	US-8910878-B2	12-2014	Fan; Chen-Jyh	G06K19/07794	235/492
*	D	US-8334758-B2	12-2012	Baruco; Sam	H01Q1/32	340/12.5
*	E	US-20150028107-A1	01-2015	Fischer; Jorg	H04B5/0081	235/488
*	F	US-20160048751-A1	02-2016	IMBRUGLIO; Richard	G06K19/07754	235/492
*	G	US-20140246503-A1	09-2014	Hofer; Guenter	H01Q1/38	235/492
*	H	US-20100177008-A1	07-2010	Bohn; Martin	G06K19/07749	343/878
*	I	US-20090079574-A1	03-2009	Oroku; Noriyuki	G06K19/07749	340/572.7
*	J	US-8035522-B2	10-2011	Oroku; Noriyuki	G06K19/07749	340/572.7
*	K	US-8638193-B2	01-2014	Margalef; Aurelie	H01Q9/0421	340/10.1
*	L	US-8120484-B2	02-2012	Chisholm; Brian J.	G06K19/07798	340/572.1
*	M	US-20100245182-A1	09-2010	Vicard; Dominique	H01L24/82	343/702

FOREIGN PATENT DOCUMENTS

*		Document Number Country Code-Number-Kind Code	Date MM-YYYY	Country	Name	CPC Classification
	N					
	O					
	P					
	Q					
	R					
	S					
	T					

NON-PATENT DOCUMENTS

*		Include as applicable: Author, Title Date, Publisher, Edition or Volume, Pertinent Pages)
	U	
	V	
	W	
	X	

*A copy of this reference is not being furnished with this Office action. (See MPEP § 707.05(a).)
Dates in MM-YYYY format are publication dates. Classifications may be US or foreign.

Notice of References Cited	Application/Control No. 16/609,260	Applicant(s)/Patent Under Reexamination MORARU et al.	
	Examiner APRIL G GONZALES	Art Unit 2648	Page 2 of 2

U.S. PATENT DOCUMENTS

*		Document Number Country Code-Number-Kind Code	Date MM-YYYY	Name	CPC Classification	US Classification
*	A	US-20100051699-A1	03-2010	Speich; Francisco	G06K19/07749	235/492
*	B	US-20090321531-A1	12-2009	Speich; Francisco	G06K19/07749	235/492
*	C	US-20070063895-A1	03-2007	AUGUST; Jason	H01Q7/06	342/359
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	K					
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FOREIGN PATENT DOCUMENTS

*		Document Number Country Code-Number-Kind Code	Date MM-YYYY	Country	Name	CPC Classification
	N					
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	P					
	Q					
	R					
	S					
	T					

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	X	

*A copy of this reference is not being furnished with this Office action. (See MPEP § 707.05(a).)
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Search Notes	Application/Control No.	Applicant(s)/Patent Under Reexamination
	16/609,260	MORARU et al.
	Examiner	Art Unit
	APRIL G GONZALES	2648

CPC - Searched*		
Symbol	**Date**	**Examiner**
H04B5/0062	03/27/2020	agg
H04B5/0068	03/27/2020	agg
H04B5/0081	03/27/2020	agg
H01Q7/00	03/27/2020	agg
H01Q1/40	03/27/2020	agg
H01Q1/2225	03/27/2020	agg

CPC Combination Sets - Searched*		
Symbol	**Date**	**Examiner**

US Classification - Searched*			
Class	**Subclass**	**Date**	**Examiner**
455	41.1	03/27/2020	agg

* See search history printout included with this form or the SEARCH NOTES box below to determine the scope of the search.

/APRIL G GONZALES/ Primary Examiner, Art Unit 2648	/APRIL G GONZALES/ Primary Examiner, Art Unit 2648

Search Notes	Application/Control No.	Applicant(s)/Patent Under Reexamination
	16/609,260	MORARU et al.
	Examiner	Art Unit
	APRIL G GONZALES	2648

Search Notes		
Search Notes	**Date**	**Examiner**
EAST keyword and image Search (see attached EAST report)	10/08/2020	agg
CPC Search (see attached EAST report)	10/08/2020	agg
Google Patents (see attached search report)	10/08/2020	agg
Global Dossier	03/27/2020	agg
Double Patenting Search	03/27/2020	agg
IDS filed on 03/27/2020	03/27/2020	agg
Incoming Written Opinion of the ISA	03/27/2020	agg
IEEE Xplore (see attached report)	10/08/2020	agg
Interference Search (see EAST report)	06/17/2021	agg

Interference Search			
US Class/CPC Symbol	**US Subclass/CPC Group**	**Date**	**Examiner**
	EAST keyword claim search (see EAST report)	06/17/2021	agg

/APRIL G GONZALES/ Primary Examiner, Art Unit 2648	/APRIL G GONZALES/ Primary Examiner, Art Unit 2648

Issue Classification	Application/Control No.	Applicant(s)/Patent Under Reexamination
	16/609,260	MORARU et al.
	Examiner	Art Unit
	APRIL G GONZALES	2648

CPC						
Symbol					Type	Version
H01Q	/	1	/	2225	F	2013-01-01
G06K	/	19	/	07773	I	2013-01-01
H01Q	/	1	/	14	I	2013-01-01
H01Q	/	1	/	40	I	2013-01-01
H01Q	/	7	/	00	I	2013-01-01
H04B	/	5	/	0062	I	2013-01-01
H04B	/	5	/	0068	I	2013-01-01
H04B	/	5	/	0081	I	2013-01-01

CPC Combination Sets							
Symbol					Type	Set	Ranking	Version
	/		/					

NONE		Total Claims Allowed:	
(Assistant Examiner)	(Date)	6	
/APRIL G GONZALES/ Primary Examiner, Art Unit 2648	17 June 2021	O.G. Print Claim(s)	O.G. Print Figure
(Primary Examiner)	(Date)	1	1

U.S. Patent and Trademark Office — Part of Paper No.: 20210617

Issue Classification	Application/Control No.	Applicant(s)/Patent Under Reexamination
	16/609,260	MORARU et al.
	Examiner	Art Unit
	APRIL G GONZALES	2648

INTERNATIONAL CLASSIFICATION				
CLAIMED				
H04B	/	5	/	00

NON-CLAIMED				
	/		/	

US ORIGINAL CLASSIFICATION	
CLASS	SUBCLASS
455	41.1

CROSS REFERENCES(S)						
CLASS	SUBCLASS (ONE SUBCLASS PER BLOCK)					

NONE		Total Claims Allowed:	
(Assistant Examiner)	(Date)	6	
/APRIL G GONZALES/ Primary Examiner, Art Unit 2648	17 June 2021	O.G. Print Claim(s)	O.G. Print Figure
(Primary Examiner)	(Date)	1	1

U.S. Patent and Trademark Office — Part of Paper No.: 20210617

Issue Classification	Application/Control No.	Applicant(s)/Patent Under Reexamination
	16/609,260	MORARU et al.
	Examiner	Art Unit
	APRIL G GONZALES	2648

☑ Claims renumbered in the same order as presented by applicant ☐ CPA ☐ T.D. ☐ R.1.47

CLAIMS

Final	Original	Final	Original	Final	Original	Final	Original	Final	Original	Final	Original	Final	Original	Final	Original
	1														
	2														
	3														
	4														
	5														
	6														

NONE		Total Claims Allowed:	
(Assistant Examiner)	(Date)	6	
/APRIL G GONZALES/ Primary Examiner, Art Unit 2648	17 June 2021	O.G. Print Claim(s)	O.G. Print Figure
(Primary Examiner)	(Date)	1	1

U.S. Patent and Trademark Office — Part of Paper No.: 20210617

Main Concept Text
==========
An RFID tag (1) for use in harsh environments comprising; an UHF-SHF antenna (2) made from a continuous electroconductive textile thread, electrically insulated, embroidered on textile substrate, an RFID transponder (3), and a substrate of textile material (4) on which the RFID transponder (3) and the UHF-SHF antenna (2) are placed, the whole assembly being sealed by hot-dipping of a second textile substrate, wherein the UHF-SHF antenna (2) has a central zone formed by a double loop (5) by which it inductively couples with the encapsulated RFID transponder (3), wherein the double central loop (5) does not have electrical contacts at the intersection points (A and B).

Concept Modifiers (1)
==========
1. Less Like Text: PROMAR

(No Filters)
==========

Options
=======
De-dup: None
Cut-off: None
Sort: Relevance

Content: Patent Publications (164)
==========
US Patents
US Designs
US Applications
EPO Patents
EPO Applications
China Patents
China Applications
Japan Patents
Japan Applications
Korea Patents
Korea Applications
WIPO Applications
Argentina Patents
Argentina Applications
Brazil Patents
Brazil Applications
Canada Patents
Canada Applications
Chile Patents
Chile Applications
Colombia Applications
Costa Rica Applications
Cuba Patents
Cuba Applications

Dominican Republic Applications
Ecuador Patents
Ecuador Applications
El Salvador Applications
Guatemala Applications
Honduras Applications
Mexico Patents
Mexico Applications
Nicaragua Patents
Panama Applications
Peru Applications
Trinidad & Tobago Patents
Uruguay Applications
Austria Patents
Austria Applications
Belarus Patents
Belgium Patents
Belgium Applications
Bosnia & Herzegovina Patents
Bosnia & Herzegovina Applications
Bulgaria Patents
Bulgaria Applications
Croatia Patents
Croatia Applications
Czech Republic Patents
Czech Republic Applications
Czechoslovakia Patents
Czechoslovakia Applications
Denmark Patents
Denmark Applications
Estonia Patents
Estonia Applications
EUIPO Patents
Finland Patents
Finland Applications
France Patents
France Applications
Germany Patents
Germany Applications
Great Britain Patents
Great Britain Applications
Greece Patents
Greece Applications
Hungary Patents
Hungary Applications
Iceland Patents
Iceland Applications
Ireland Patents
Ireland Applications
Italy Patents
Italy Applications
Latvia Patents
Latvia Applications
Lithuania Patents

Lithuania Applications
Luxembourg Patents
Malta Patents
Monaco Patents
Montenegro Patents
Montenegro Applications
Netherlands Patents
Netherlands Applications
Norway Patents
Norway Applications
Poland Patents
Poland Applications
Portugal Patents
Portugal Applications
Republic of Moldova Patents
Republic of Moldova Applications
Romania Patents
Romania Applications
San Marino Patents
San Marino Applications
Serbia Patents
Serbia Applications
Slovakia Patents
Slovakia Applications
Slovenia Patents
Spain Patents
Spain Applications
Sweden Patents
Sweden Applications
Switzerland Patents
Switzerland Applications
Ukraine Patents
Yugoslavia/Serbia and Montenegro Patents
Yugoslavia/Serbia and Montenegro Applications
Armenia Patents
Australia Patents
Australia Applications
Cyprus Patents
Gulf Cooperation Council Patents
Hong Kong Patents
India Patents
India Applications
Indonesia Patents
Indonesia Applications
Israel Applications
Jordan Patents
Kyrgyzstan Patents
Macao Applications
Malaysia Patents
Mongolia Patents
New Zealand Patents
Philippines Patents
Philippines Applications
Saudi Arabia Patents

Singapore Patents
Singapore Applications
Taiwan Patents
Taiwan Applications
Tajikistan Patents
Tajikistan Applications
Thailand Applications
Uzbekistan Patents
Vietnam Patents
Algeria Patents
ARIPO Patents
ARIPO Applications
Egypt Patents
Kenya Patents
Malawi Patents
Morocco Patents
Morocco Applications
OAPI Patents
South Africa Patents
Tunisia Applications
Zambia Patents
Zimbabwe Patents
EAPO Patents
EAPO Applications
Georgia Patents
Georgia Applications
Kazakhstan Patents
Kazakhstan Applications
Russia Patents
Russia Applications
Turkey Patents
Turkey Applications

EAST Search History

EAST Search History (Prior Art)

Ref #	Hits	Search Query	DBs	Default Operator	Plurals	Time Stamp
L1	0	((RFID adj tag) with (harsh adj environments) with (UHF-SHF adj antenna) with (continuous adj electroconductive adj textile adj thread) with (electrically adj insulated) with (embroidered) with (textile adj substrate) with (RFID adj transponder) with (hot-dipping) with (second adj textile adj substrate) with (central adj zone) with (double adj loop) with (encapsulated adj RFID adj transponder) with (central adj loop) with (central adj contacts) with (intersection adj points))	US-PGPUB; USPAT	OR	OFF	2021/06/17 00:39
L4	0	((RFID adj tag) with (harsh adj environments) with (UHF-SHF adj antenna) with (continuous adj electroconductive adj textile adj thread) with (electrically adj insulated) with (embroidered) with (textile adj substrate) with (RFID adj transponder) with (hot-dipping) with (second adj textile adj substrate) with (central adj zone) with (double adj loop) with (encapsulated adj RFID adj transponder) with (central adj loop) with (central adj contacts) with (intersection adj points)).clm.	US-PGPUB; USPAT	OR	OFF	2021/06/17 00:39
L5	0	moraru.in. and ((RFID adj tag) with (harsh adj environments) with (UHF-SHF adj antenna) with (continuous adj electroconductive adj textile adj thread) with (electrically adj insulated) with (embroidered) with (textile adj substrate) with (RFID adj transponder) with (hot-dipping) with (second adj textile adj substrate) with (central adj zone) with (double adj loop) with (encapsulated adj RFID adj transponder) with (central adj loop) with (central adj contacts) with (intersection adj points)).clm.	US-PGPUB; USPAT	OR	OFF	2021/06/17 00:39
L8	0	moraru.in. and ((RFID adj tag) with (harsh adj environments) with (UHF-SHF adj antenna) with (continuous adj	US-PGPUB; USPAT	OR	OFF	2021/06/17 00:39

		electroconductive adj textile adj thread) with (electrically adj insulated) with (embroidered) with (textile adj substrate) with (RFID adj transponder) with (hot-dipping) with (second adj textile adj substrate) with (central adj zone) with (double adj loop) with (encapsulated adj RFID adj transponder) with (central adj loop) with (central adj contacts) with (intersection adj points))				
L9	1	(RFID adj tag) and (RFID with transponder) and (central with loop) and (UHF-SHF)	US-PGPUB; USPAT	OR	OFF	2021/06/17 00:41
L10	3	(RFID adj tag) and (RFID with transponder) and (UHF-SHF)	US-PGPUB; USPAT	OR	OFF	2021/06/17 00:41
L11	31	(RFID adj tag) and (RFID with transponder) and (central with loop)	US-PGPUB; USPAT	OR	OFF	2021/06/17 00:42
L12	15	(RFID adj tag) and (RFID with transponder) and (central with loop) and UHF	US-PGPUB; USPAT	OR	OFF	2021/06/17 00:42
L13	2	(RFID adj tag) and (RFID with transponder) and (central with loop) and UHF and SHF	US-PGPUB; USPAT	OR	OFF	2021/06/17 00:42
L16	1	(RFID adj tag) and (RFID with transponder) and (central with loop) and UHF and SHF and (electrical with contact)	US-PGPUB; USPAT	OR	OFF	2021/06/17 00:44
S1	1	Moraru.in. and promar.as.	US-PGPUB; USPAT	OR	OFF	2020/03/25 15:24
S2	0	455/41.1.ccls. and Moraru.in.	US-PGPUB; USPAT	OR	OFF	2020/03/25 18:36
S3	1	H01Q1/2225.cpc. and Moraru.in.	US-PGPUB; USPAT	OR	OFF	2020/03/25 18:36
S4	1	H01Q1/14.cpc. and Moraru.in.	US-PGPUB; USPAT	OR	OFF	2020/03/25 18:36
S5	1	H01Q1/40.cpc. and Moraru.in.	US-PGPUB; USPAT	OR	OFF	2020/03/25 18:36
S6	1	H01Q7/00.cpc. and Moraru.in.	US-PGPUB; USPAT	OR	OFF	2020/03/25 18:36
S7	1	H04B5/0062.cpc. and Moraru.in.	US-PGPUB; USPAT	OR	OFF	2020/03/25 18:37
S8	1	H04B5/0068.cpc. and Moraru.in.	US-PGPUB; USPAT	OR	OFF	2020/03/25 18:37
S9	1	H04B5/0081.cpc. and Moraru.in.	US-PGPUB; USPAT	OR	OFF	2020/03/25 18:37

S10	4	"20070095926"	US-PGPUB; USPAT	OR	OFF	2020/03/25 18:38
S11	2,017	(RFID adj tag) with (UHF or SHF)	US-PGPUB; USPAT	OR	OFF	2020/03/25 18:42
S12	3	(RFID adj tag) with (UHF-SHF)	US-PGPUB; USPAT	OR	OFF	2020/03/25 18:42
S13	18	"7432816"	US-PGPUB; USPAT	OR	OFF	2020/03/25 19:03
S14	4	S13 and (RFID with tag) and (UHF)	US-PGPUB; USPAT	OR	OFF	2020/03/25 19:04
S15	2	"20150028107"	US-PGPUB; USPAT	OR	OFF	2020/03/25 19:05
S16	2	"20160048751"	US-PGPUB; USPAT	OR	OFF	2020/03/25 19:05
S17	6	(US-20070095926-$ or US-20150028107-$ or US-20160048751-$).did. or (US-7432816-$ or US-8910878-$ or US-8334758-$).did.	US-PGPUB; USPAT	OR	OFF	2020/03/25 19:09
S18	1	S17 and (RFID with tag) and (UHF) and transponder	US-PGPUB; USPAT	OR	OFF	2020/03/25 19:10
S19	0	S17 and (RFID with tag) and (UHF) and transponder and textile	US-PGPUB; USPAT	OR	OFF	2020/03/25 19:18
S20	0	S17 and (RFID with tag) and (UHF) and textile	US-PGPUB; USPAT	OR	OFF	2020/03/25 19:18
S21	0	S17 and (RFID with tag) and textile	US-PGPUB; USPAT	OR	OFF	2020/03/25 19:18
S22	0	S17 and (RFID with tag) and electroconductive	US-PGPUB; USPAT	OR	OFF	2020/03/25 19:18
S23	1	(RFID with tag) and hot-dipping	US-PGPUB; USPAT	OR	OFF	2020/03/25 19:19
S24	18	(RFID with tag) same (double with loop)	US-PGPUB; USPAT	OR	OFF	2020/03/25 19:22
S25	1	((RFID with tag) same (double with loop)) and (RFID with transponder)	US-PGPUB; USPAT	OR	OFF	2020/03/25 19:22
S26	12	((RFID with tag) same (double with loop)) and UHF	US-PGPUB; USPAT	OR	OFF	2020/03/25 19:22
S27	1	((RFID with tag) same (double with loop)) and UHF-SHF	US-PGPUB; USPAT	OR	OFF	2020/03/25 19:23
S28	3	(RFID with tag) and UHF-SHF	US-PGPUB; USPAT	OR	OFF	2020/03/25 19:23
S29	14	"2017060652"	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO;	OR	OFF	2020/03/27 21:43

			DERWENT; IBM_TDB			
S30	6	"20090079574"	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2020/03/27 21:45
S31	3	"20140246503"	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2020/03/27 21:46
S32	3	"20100177008"	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2020/03/27 21:46
S33	14	"8035522"	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2020/03/27 22:19
S34	11	(US-20070095926-$ or US-20150028107-$ or US-20160048751-$ or US-20140246503-$ or US-20100177008-$ or US-20090079574-$).did. or (US-7432816-$ or US-8910878-$ or US-8334758-$ or US-8035522-$).did. or (US-20090079574-$).did.	US-PGPUB; USPAT; DERWENT	OR	OFF	2020/03/27 22:21
S35	7	S34 and (RFID adj tag)	US-PGPUB; USPAT	OR	OFF	2020/03/27 22:21
S36	2	S34 and (RFID adj tag) and transponder	US-PGPUB; USPAT	OR	OFF	2020/03/27 22:21
S37	1	S34 and (RFID adj tag) and transponder and loop	US-PGPUB; USPAT	OR	OFF	2020/03/27 22:21
S38	1	S34 and (RFID adj tag) and transponder and UHF	US-PGPUB; USPAT	OR	OFF	2020/03/27 22:22
S39	5	S34 and (RFID adj tag) and UHF	US-PGPUB; USPAT	OR	OFF	2020/03/27 22:25
S40	4	S34 and (RFID adj tag) and UHF and loop	US-PGPUB; USPAT	OR	OFF	2020/03/27 22:25

S41	4	S34 and (RFID adj tag) and (UHF same antenna) and loop	US-PGPUB; USPAT	OR	OFF	2020/03/27 22:25
S42	3	S34 and (RFID adj tag) and (UHF with antenna) and loop	US-PGPUB; USPAT	OR	OFF	2020/03/27 22:25
S43	0	S34 and (RFID adj tag) and (UHF with antenna) and loop and electroconductive	US-PGPUB; USPAT	OR	OFF	2020/03/27 22:25
S44	0	S34 and (RFID adj tag) and (UHF with antenna) and loop and (electro with conductive)	US-PGPUB; USPAT	OR	OFF	2020/03/27 22:26
S45	2	S34 and (RFID adj tag) and (UHF with antenna) and loop and (conductive)	US-PGPUB; USPAT	OR	OFF	2020/03/27 22:26
S46	62,509	S34 and (RFID adj tag) and (UHF with antenna) and loop transponder	US-PGPUB; USPAT	OR	OFF	2020/03/27 22:26
S47	0	S34 and (RFID adj tag) and (UHF with antenna) and loop and transponder	US-PGPUB; USPAT	OR	OFF	2020/03/27 22:26
S48	1	S34 and (RFID adj tag) and (UHF with antenna) and transponder	US-PGPUB; USPAT	OR	OFF	2020/03/27 22:27
S49	11	(US-20070095926-$ or US-20150028107-$ or US-20160048751-$ or US-20140246503-$ or US-20100177008-$ or US-20090079574-$).did. or (US-7432816-$ or US-8910878-$ or US-8334758-$ or US-8035522-$).did. or (US-20090079574-$).did.	US-PGPUB; USPAT; DERWENT	OR	OFF	2020/03/28 01:17
S50	1	S49 and (RFID adj tag) and (UHF with antenna) and transponder	US-PGPUB; USPAT	OR	OFF	2020/03/28 01:18
S51	2	S49 and (RFID adj tag) and ((UHF with antenna) with loop)	US-PGPUB; USPAT	OR	OFF	2020/03/28 01:19
S52	0	S49 and transponder and ((UHF with antenna) with loop)	US-PGPUB; USPAT	OR	OFF	2020/03/28 01:20
S53	0	S49 and ((UHF with antenna) with transponder)	US-PGPUB; USPAT	OR	OFF	2020/03/28 01:22
S54	1	S49 and ((UHF with antenna) same transponder)	US-PGPUB; USPAT	OR	OFF	2020/03/28 01:22
S55	39	(RFID adj tag) and ((UHF with antenna) same transponder same loop)	US-PGPUB; USPAT	OR	OFF	2020/03/28 01:23
S56	36	(RFID adj tag) and ((UHF with antenna) same (RFID with transponder) same loop)	US-PGPUB; USPAT	OR	OFF	2020/03/28 01:23
S57	1	(RFID adj tag) and ((UHF-SHF with antenna) same (RFID with transponder) same loop)	US-PGPUB; USPAT	OR	OFF	2020/03/28 01:23

S58	36	(RFID adj tag) and ((UHF with antenna) same (RFID with transponder) same loop)	US-PGPUB; USPAT	OR	OFF	2020/03/28 01:24
S59	3	S58 and electroconductive	US-PGPUB; USPAT	OR	OFF	2020/03/28 01:24
S60	47	"863813"	US-PGPUB; USPAT	OR	OFF	2020/03/28 01:26
S61	3	"8638193"	US-PGPUB; USPAT	OR	OFF	2020/03/28 01:26
S62	12	(US-20070095926-$ or US-20150028107-$ or US-20160048751-$ or US-20140246503-$ or US-20100177008-$ or US-20090079574-$).did. or (US-7432816-$ or US-8910878-$ or US-8334758-$ or US-8035522-$ or US-8638193-$).did. or (US-20090079574-$).did.	US-PGPUB; USPAT; DERWENT	OR	OFF	2020/03/28 11:43
S63	0	S62 and (RF adj tag) and (UHF adj antenna) and (transponder)	US-PGPUB; USPAT	OR	OFF	2020/03/28 11:43
S64	0	S62 and (RF adj tag) and (UHF with antenna) and (transponder)	US-PGPUB; USPAT	OR	OFF	2020/03/28 11:43
S65	0	S62 and (RF adj transponder) and (UHF with antenna)	US-PGPUB; USPAT	OR	OFF	2020/03/28 11:44
S66	1	S62 and (RF with transponder) and (UHF with antenna)	US-PGPUB; USPAT	OR	OFF	2020/03/28 11:44
S67	0	S62 and (RF with transponder) and (UHF with antenna) and loop	US-PGPUB; USPAT	OR	OFF	2020/03/28 11:44
S68	6	S62 and (RF tag) and (UHF with antenna)	US-PGPUB; USPAT	OR	OFF	2020/03/28 11:44
S69	1	S62 and (RF tag) and (UHF adj antenna)	US-PGPUB; USPAT	OR	OFF	2020/03/28 11:44
S70	0	S62 and (RF adj tag) and (UHF adj antenna)	US-PGPUB; USPAT	OR	OFF	2020/03/28 11:45
S71	0	S62 and (RF with tag) and (UHF adj antenna)	US-PGPUB; USPAT	OR	OFF	2020/03/28 11:45
S72	0	S62 and seal	US-PGPUB; USPAT	OR	OFF	2020/03/28 11:48
S73	586	(RFID adj tag) with seal	US-PGPUB; USPAT	OR	OFF	2020/03/28 11:48
S74	0	(RFID adj tag) with seal with (UHF adj antenna)	US-PGPUB; USPAT	OR	OFF	2020/03/28 11:48
S75	1	seal with (UHF adj antenna)	US-PGPUB; USPAT	OR	OFF	2020/03/28 11:48

S76	13	(US-20070095926-$ or US-20150028107-$ or US-20160048751-$ or US-20140246503-$ or US-20100177008-$ or US-20090079574-$).did. or (US-7432816-$ or US-8910878-$ or US-8334758-$ or US-8035522-$ or US-8638193-$ or US-8120484-$).did. or (US-20090079574-$).did.	US-PGPUB; USPAT; DERWENT	OR	OFF	2020/03/28 22:42
S77	0	S76 and plane and overlap	US-PGPUB; USPAT	OR	OFF	2020/03/28 22:43
S78	4	S76 and plane	US-PGPUB; USPAT	OR	OFF	2020/03/28 22:43
S79	1	S76 and overlap	US-PGPUB; USPAT	OR	OFF	2020/03/28 22:43
S80	13	(US-20070095926-$ or US-20150028107-$ or US-20160048751-$ or US-20140246503-$ or US-20100177008-$ or US-20090079574-$).did. or (US-7432816-$ or US-8910878-$ or US-8334758-$ or US-8035522-$ or US-8638193-$ or US-8120484-$).did. or (US-20090079574-$).did.	US-PGPUB; USPAT; DERWENT	OR	OFF	2020/10/08 00:55
S81	5	S80 and transponder	US-PGPUB; USPAT	OR	OFF	2020/10/08 00:56
S82	3	S80 and transponder and (RFID or (radio adj frequency adj identification)) and UHF	US-PGPUB; USPAT	OR	OFF	2020/10/08 00:57
S83	0	S80 and transponder and (RFID or (radio adj frequency adj identification)) and UHF and SHF	US-PGPUB; USPAT	OR	OFF	2020/10/08 00:57
S84	1	S80 and transponder and (RFID or (radio adj frequency adj identification)) and UHF and loop	US-PGPUB; USPAT	OR	OFF	2020/10/08 00:57
S85	0	"2009079574"	US-PGPUB; USPAT	OR	OFF	2020/10/08 00:59
S86	3	"20090079574"	US-PGPUB; USPAT	OR	OFF	2020/10/08 00:59
S87	16	"2017060652"	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2020/10/08 02:02
S88	2	(RFID adj tags) with (traceability) with (textile adj products)	US-PGPUB; USPAT;	OR	OFF	2020/10/08 02:04

			USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB			
S89	13	(US-20070095926-$ or US-20150028107-$ or US-20160048751-$ or US-20140246503-$ or US-20100177008-$ or US-20090079574-$).did. or (US-7432816-$ or US-8910878-$ or US-8334758-$ or US-8035522-$ or US-8638193-$ or US-8120484-$).did. or (US-20090079574-$).did.	US-PGPUB; USPAT; DERWENT	OR	OFF	2020/10/08 23:41
S90	4	S89 and (temperature or heat)	US-PGPUB; USPAT	OR	OFF	2020/10/08 23:42
S91	0	wo2017060652	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2020/12/21 15:13
S92	16	"2017060652"	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2020/12/21 15:14
S93	442	RFID with textile	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2020/12/21 15:32
S94	17	RFID with textile with thread	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2020/12/21 15:32
S95	2	RFID with textile with thread with embroider$4	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2020/12/21 15:32

EAST Search History (Interference)

Ref #	Hits	Search Query	DBs	Default Operator	Plurals	Time Stamp
L2	0	((RFID adj tag) with (harsh adj environments) with (UHF-SHF adj antenna) with (continuous adj electroconductive adj textile adj thread) with (electrically adj insulated) with (embroidered) with (textile adj substrate) with (RFID adj transponder) with (hot-dipping) with (second adj textile adj substrate) with (central adj zone) with (double adj loop) with (encapsulated adj RFID adj transponder) with (central adj loop) with (central adj contacts) with (intersection adj points))	US-PGPUB; USPAT	OR	OFF	2021/06/17 00:39
L3	0	((RFID adj tag) with (harsh adj environments) with (UHF-SHF adj antenna) with (continuous adj electroconductive adj textile adj thread) with (electrically adj insulated) with (embroidered) with (textile adj substrate) with (RFID adj transponder) with (hot-dipping) with (second adj textile adj substrate) with (central adj zone) with (double adj loop) with (encapsulated adj RFID adj transponder) with (central adj loop) with (central adj contacts) with (intersection adj points)).clm.	US-PGPUB; USPAT	OR	OFF	2021/06/17 00:39
L6	0	moraru.in. and ((RFID adj tag) with (harsh adj environments) with (UHF-SHF adj antenna) with (continuous adj electroconductive adj textile adj thread) with (electrically adj insulated) with (embroidered) with (textile adj substrate) with (RFID adj transponder) with (hot-dipping) with (second adj textile adj substrate) with (central adj zone) with (double adj loop) with (encapsulated adj RFID adj transponder) with (central adj loop) with (central adj contacts) with (intersection adj points)).clm.	US-PGPUB; USPAT	OR	OFF	2021/06/17 00:39
L7	0	moraru.in. and ((RFID adj tag) with (harsh adj environments) with (UHF-SHF adj antenna) with (continuous adj electroconductive adj textile adj thread) with (electrically adj insulated) with (embroidered) with (textile adj substrate) with (RFID adj transponder) with (hot-dipping) with (second adj textile adj substrate) with (central adj zone) with (double adj loop) with (encapsulated adj RFID adj transponder) with (central adj loop) with (central adj contacts) with (intersection adj points))	US-PGPUB; USPAT	OR	OFF	2021/06/17 00:39
L14	2	(RFID adj tag) and (RFID with transponder) and (central with loop) and UHF and SHF	US-PGPUB; USPAT	OR	OFF	2021/06/17 00:43

L15	1	(RFID adj tag) and (RFID with transponder) and (central with loop) and UHF and SHF and (electrical with contact)	US-PGPUB; USPAT	OR	OFF	2021/06/17 00:43

6/17/2021 1:33:25 AM
C:\Users\aguzman.USPTO\Documents\EAST\Workspaces\16609260.wsp

Web Search History

date, time	web site	search string
6/17/2021 1:35:41 AM	Google Patents	Keyword Group 1 [RFID tag]
6/17/2021 1:35:49 AM	Google Patents	Keyword Group 1 [RFID tag] Keyword Group 2 [UHF-SHF]
6/17/2021 1:35:52 AM	Google Patents	Keyword Group 1 [RFID tag] Keyword Group 2 [UHF-SHF] OR [UHF]
6/17/2021 1:35:55 AM	Google Patents	Keyword Group 1 [RFID tag] Keyword Group 2 [UHF-SHF] OR [UHF] OR [SHF]
6/17/2021 1:35:59 AM	Google Patents	Keyword Group 1 [RFID tag] Keyword Group 2 [UHF-SHF] OR [UHF] OR [SHF] Keyword Group 3 [antenna]
6/17/2021 1:36:08 AM	Google Patents	Keyword Group 1 [RFID tag] Keyword Group 2 [UHF-SHF] OR [UHF] OR [SHF] Keyword Group 3 [antenna] Keyword Group 4 [RFID transponder]
6/17/2021 1:36:18 AM	Google Patents	Keyword Group 1 [RFID tag] Keyword Group 2 [UHF-SHF] OR [UHF] OR [SHF] Keyword Group 3 [antenna] Keyword Group 4 [RFID transponder] Keyword Group 5 [double loop]

date, time	web site	search string
6/17/2021 1:36:23 AM	Google Patents	Keyword Group 1 [RFID tag] Keyword Group 2 [UHF-SHF] OR [UHF] OR [SHF] Keyword Group 3 [antenna] Keyword Group 4 [RFID transponder] Keyword Group 5 [double loop] OR [double loop antenna]
6/17/2021 1:36:39 AM	Google Patents	Keyword Group 1 [RFID tag] Keyword Group 2 [UHF-SHF] OR [UHF] OR [SHF] Keyword Group 3 [antenna] Keyword Group 4 [RFID transponder] Keyword Group 5 [double loop] OR [double loop antenna] Keyword Group 6 [continuous electroconductive textile thread]

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Applicant	PROMAR TEXTIL INDUSTRIES S.R.L.
Application No. 16/609,260	Filing Date: 10-29-2019
Examiner	GONZALES, APRIL GUZMAN
Title of Application:	RFID TAG FOR HARSH ENVIRONMENT INDUCTIVELY COUPLED IN DOUBLE LOOP
Confirmation No. 1148	Art Unit: 2648
Attorney Docket No.	07610-P0002A

Mail Stop Amendment
Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

AMENDMENT AND RESPONSE TO OFFICE ACTION

Dear Examiner GONZALES:

This Amendment and Response is filed in response to the Office Action dated December 23, 2020 issued by the United States Patent and Trademark Office in connection with the above-identified Application. A Response to the Office Action is due **March 23, 2021**. Accordingly, this Amendment is being timely filed.

Remarks/Arguments begin on page 2 of this paper.

No fees are believed to be due with this response made herein. Should any fees be required, however, please charge such fees to Deposit Account 50-6926.

REMARKS

The present response is intended to be fully responsive to all points of objection and/or rejection raised by the Examiner and is believed to place the application in condition for allowance. Applicant asserts that the present invention is new, non-obvious and useful. Favorable reconsideration and allowance of the application is respectfully requested.

STATUS OF CLAIMS

No claims have been amended. Claims 1-6 as filed with the response from 06-30-2020.

RESPONSE TO CLAIMS REJECTIONS

35 U.S.C. §103 Rejections

In the last Office Action, claims 1-6 are rejected under 35 U.S.C. §103, as being obvious in view of Speich (US 2010/0051699 A1 herein Speich) and further in view of Vicard et al. (US 2010/0245182 A1 herein Vicard).

Applicant respectfully request reconsideration of the rejection in view of the content of the independent claim and the following remarks.

As a ground of discussion, the Applicant reiterates the content of the independent Claim 1, filed at 06-30-2020:

An RFID tag (1) for use in harsh environments comprising:

an UHF-SHF antenna (2) made from a continuous electroconductive textile thread, electrically insulated, embroidered on textile substrate,

an RFID transponder (3), and

a substrate of textile material (4) on which the RFID transponder (3) and the UHF-SHF antenna (2) are placed, ***the whole assembly being sealed by hot-dipping of a second textile substrate,***

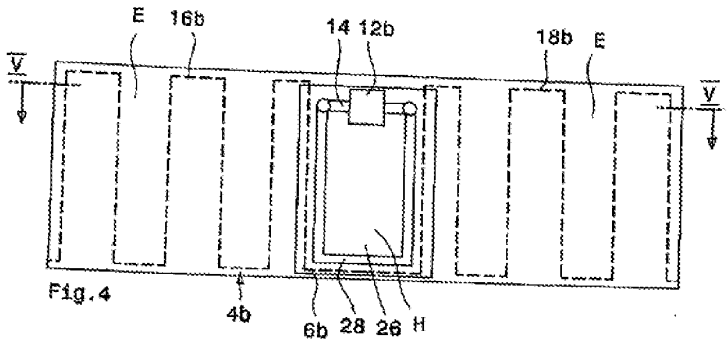
wherein ***the UHF-SHF antenna (2) has a central zone formed by a double loop (5) by which it inductively couples with the encapsulated RFID transponder (3),*** *wherein* ***the central loop (5) does not have electrical contacts at the intersection points (A and B).***

Speich

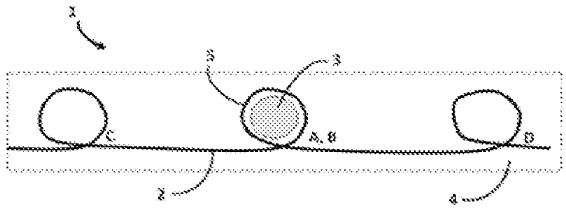
As mentioned by the Office Action and as disclosed in the paragraphs/figure indicated (e.g. [0023]-[0024] and Figure 4), Speich explicitly states that "***the RFID chip 12b is arranged on an auxiliary carrier 26 which also has a conductor loop 28 which essentially runs parallel to the antenna loop 6b***" (see [0023] lines 8-10) and furthermore "***the conductor loop can overlap or cross the antenna loop at least twice and at least partially runs parallel to the antenna loop at a distance from the latter***" (see [0024]).

Applicant respectfully submits that these statements clearly exclude the existence of an antenna having a central zone formed by a double loop, according to his invention. In view of the cited embodiment from the Speich's document, there are two distinctive parts (loops) having a completely different configuration comparing to Applicant's invention, and definitively it is not the ***antenna 6b*** which have the form of a double loop. The conductor loop 28, which can overlap or cross the antenna loop at least twice and at least partially runs parallel to the antenna loop at a distance from the latter, is not part of the antenna 6b. These differences can be simply derived from the figures below:

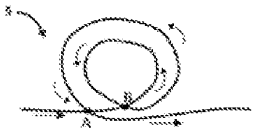
Speich



Moraru (Applicant)



RFID tag 1 and its double loop 5



Furthermore, Applicant wishes to comment the features of the embodiment depicted in the Figure 4 of the Speich's document. Using a conductor loop 28 arranged on an auxiliary carrier 26 is not in favor of reducing the tag size and adds vulnerability to the tag used in harsh environment and complicate the production process.

Applicant notes also that certainly none of the embodiments described and/or illustrated either in the Speich's document discloses an assembly [the RFID transponder (3) and the UHF-SHF antenna (2)] sealed by hot-dipping of a second textile substrate.

Last but not least, the continuous electroconductive textile thread forming the UHF-SHF antenna (2), according to invention, has intersection points (A, B), which is not the case with the antenna shown in the Figure 4 from Speich's document.

In conclusion, Applicant considers that the essential diferences mentioned above make the independent claim 1 (as filed at 06-30-2020) not only a new solution in relation to Speich's document, but also a non-obvious one in relation to the state of the art cited during the examination procedure.

Applicant considers also that it is not straight forward how a person skill in art could modify the Speich's solution in view of Vicard in order to arrive to the claimed invention.

The dependent Claims 2-6 are to be considered allowable.

Accordingly, withdrawal of the rejections under 35 U.S.C. §103 is respectfully requested.

CONCLUSION

In view of the above, each of the presently pending claims is believed to be in an immediate condition for allowance. Accordingly, the Examiner is respectfully requested to withdraw the outstanding objections and rejections and pass this application to issue.

If there are any questions, the Examiner is invited to call Applicant's representative, Roy D. Gross, at (203) 423-0235, to resolve any remaining issues to expedite the allowance of this application.

Respectfully submitted,

/Roy D. Gross/

March 17, 2021

Roy D. Gross, Registration No. 63,524
Attorney for Applicant
THE ROY GROSS LAW FIRM, LLC
50 WASHINGTON STREET, SUITE 737/745
Norwalk, CT 06854
(203) 423-0235

Electronic Acknowledgement Receipt	
EFS ID:	42206563
Application Number:	16609260
International Application Number:	
Confirmation Number:	1148
Title of Invention:	RFID TAG FOR HARSH ENVIRONMENT INDUCTIVELY COUPLED IN DOUBLE LOOP
First Named Inventor/Applicant Name:	Aurelian MORARU
Customer Number:	136531
Filer:	Roy D. Gross
Filer Authorized By:	
Attorney Docket Number:	07610-P0002A
Receipt Date:	17-MAR-2021
Filing Date:	29-OCT-2019
Time Stamp:	14:30:27
Application Type:	U.S. National Stage under 35 USC 371

Payment information:

Submitted with Payment	no

File Listing:

Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)
1		07610-P0002A-Response-OA-23-DEC-2020.pdf	208241 635a0042b223e40aea2e9d86fc238d1e8d25528f	yes	5

	Multipart Description/PDF files in .zip description		
	Document Description	**Start**	**End**
	Amendment/Req. Reconsideration-After Non-Final Reject	1	1
	Applicant Arguments/Remarks Made in an Amendment	2	5
Warnings:			
Information:			
	Total Files Size (in bytes):	208241	

This Acknowledgement Receipt evidences receipt on the noted date by the USPTO of the indicated documents, characterized by the applicant, and including page counts, where applicable. It serves as evidence of receipt similar to a Post Card, as described in MPEP 503.

New Applications Under 35 U.S.C. 111
If a new application is being filed and the application includes the necessary components for a filing date (see 37 CFR 1.53(b)-(d) and MPEP 506), a Filing Receipt (37 CFR 1.54) will be issued in due course and the date shown on this Acknowledgement Receipt will establish the filing date of the application.
National Stage of an International Application under 35 U.S.C. 371
If a timely submission to enter the national stage of an international application is compliant with the conditions of 35 U.S.C. 371 and other applicable requirements a Form PCT/DO/EO/903 indicating acceptance of the application as a national stage submission under 35 U.S.C. 371 will be issued in addition to the Filing Receipt, in due course.
New International Application Filed with the USPTO as a Receiving Office
If a new international application is being filed and the international application includes the necessary components for an international filing date (see PCT Article 11 and MPEP 1810), a Notification of the International Application Number and of the International Filing Date (Form PCT/RO/105) will be issued in due course, subject to prescriptions concerning national security, and the date shown on this Acknowledgement Receipt will establish the international filing date of the application.

UNITED STATES PATENT AND TRADEMARK OFFICE

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United States Patent and Trademark Office
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Alexandria, Virginia 22313-1450
www.uspto.gov

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
16/609,260	10/29/2019	Aurelian MORARU	07610-P0002A	1148

136531 7590 12/23/2020

The Roy Gross Law Firm, LLC
50 Washington Street
Suite 737/745
Norwalk, CT 06854

EXAMINER	
GONZALES, APRIL GUZMAN	

ART UNIT	PAPER NUMBER
2648	

MAIL DATE	DELIVERY MODE
12/23/2020	PAPER

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	**Application No.** 16/609,260	**Applicant(s)** MORARU et al.	
	Examiner APRIL G GONZALES	**Art Unit** 2648	**AIA (FITF) Status** Yes

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTHS FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☑ Responsive to communication(s) filed on 11/20/2020.

☐ A declaration(s)/affidavit(s) under **37 CFR 1.130(b)** was/were filed on _____.

2a)☐ This action is **FINAL.** 2b) ☑ This action is non-final.

3)☐ An election was made by the applicant in response to a restriction requirement set forth during the interview on _____; the restriction requirement and election have been incorporated into this action.

4)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims*

5) ☑ Claim(s) 1-6 is/are pending in the application.

5a) Of the above claim(s) _____ is/are withdrawn from consideration.

6) ☐ Claim(s) _____ is/are allowed.

7) ☑ Claim(s) 1-6 is/are rejected.

8) ☐ Claim(s) _____ is/are objected to.

9) ☐ Claim(s) _____ are subject to restriction and/or election requirement

* If any claims have been determined allowable, you may be eligible to benefit from the **Patent Prosecution Highway** program at a participating intellectual property office for the corresponding application. For more information, please see http://www.uspto.gov/patents/init_events/pph/index.jsp or send an inquiry to **PPHfeedback@uspto.gov.**

Application Papers

10)☐ The specification is objected to by the Examiner.

11)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

Certified copies:

a)☐ All b)☐ Some** c)☐ None of the:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

** See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☑ Notice of References Cited (PTO-892)

2) ☐ Information Disclosure Statement(s) (PTO/SB/08a and/or PTO/SB/08b) Paper No(s)/Mail Date _____.

3) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date _____.

4) ☐ Other: _____.

DETAILED ACTION

Notice of Pre-AIA or AIA Status

The present application, filed on or after March 16, 2013, is being examined under the first inventor to file provisions of the AIA.

Response to Arguments

Applicant's arguments, see Response After Final, filed 11/20/2020, with respect to the rejection(s) of claim(s) 1-6 have been fully considered and are persuasive. Therefore, the rejection has been withdrawn. However, upon further consideration, a new ground(s) of rejection is made in view of **Speich (US 2010/0051699 A1 herein Speich)** and further in view of **Vicard et al. (US 2010/0245182 A1 herein Vicard)**.

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103 which forms the basis for all obviousness rejections set forth in this Office action:

> A patent for a claimed invention may not be obtained, notwithstanding that the claimed invention is not identically disclosed as set forth in section 102, if the differences between the claimed invention and the prior art are such that the claimed invention as a whole would have been obvious before the effective filing date of the claimed invention to a person having ordinary skill in the art to which the claimed invention pertains. Patentability shall not be negated by the manner in which the invention was made.

The factual inquiries for establishing a background for determining obviousness under 35 U.S.C. 103 are summarized as follows:

1. Determining the scope and contents of the prior art.

2. Ascertaining the differences between the prior art and the claims at issue.

3. Resolving the level of ordinary skill in the pertinent art.

4. Considering objective evidence present in the application indicating obviousness or nonobviousness.

This application currently names joint inventors. In considering patentability of the claims the examiner presumes that the subject matter of the various claims was commonly owned as of the effective filing date of the claimed invention(s) absent any evidence to the contrary. Applicant is advised of the obligation under 37 CFR 1.56 to point out the inventor and effective filing dates of each claim that was not commonly owned as of the effective filing date of the later invention in order for the examiner to consider the applicability of 35 U.S.C. 102(b)(2)(C) for any potential 35 U.S.C. 102(a)(2) prior art against the later invention.

Claims 1-6 are rejected under 35 U.S.C. 103 as being unpatentable over **Speich (US 2010/0051699 A1 herein Speich)** and further in view of **Vicard et al. (US 2010/0245182 A1 herein Vicard)**.

Regarding **claim 1**, Speich teaches RFID tag (1) for use in harsh environments (read as) comprising:

an UHF-SHF antenna (2) made from a continuous electroconductive textile thread, electrically insulated, embroidered on textile substrate (read as RFID textile label having a textile carrier 2 made of a woven fabric into which an open antenna 4 is woven in) (Speich – Figure 4, [0003], [0011], and [0021]-[0023]);

an RFID transponder (3) (read as RFID chip 12) (Speich – [0003], [0007], and [0025]), and

a substrate of textile material (4) on which the RFID transponder (3) and the UHF-SHF antenna (2) are placed (read as RFID textile label having a textile carrier 2 made of a woven fabric into which an open antenna 4 is woven in) (Speich – Figure 4, [0003], [0011], and [0021]-[0023]),

wherein the UHF-SHF antenna (2) has a central zone formed by a double loop (5) by which it inductively couples with the encapsulated RFID transponder (3), wherein the central loop (5) does not have electrical contacts at the intersection points (A and B) (read as the conductor loop can overlap or cross the antenna loop at least twice and at least partially runs parallel to the antenna loop at a distance from the latter) (Speich – Figure 4, [0023]).

However, Speich fails to teach the whole assembly being sealed by hot-dipping of a second textile substrate.

In the related art, Vicard teaches the whole assembly being sealed by hot-dipping of a second textile substrate (read as substrate 33 is coated on both sides with an insulating and protective material 34, an epoxy resin) (Vicard – Figure 2, and [0042]).

Therefore, it would have been obvious to one of ordinary skill in the art before the effective filing to incorporate the teachings of Vicard into the teachings of Speich for the purpose of fabricating radio frequency transmission/reception devices with an insulating and protective material such as an epoxy resin.

Regarding **claim 2 as applied to claim 1**, Speich as modified by Vicard further teaches wherein the UHF-SHF antenna (2) is made of an electroconductive textile thread, electrically insulated, by continuous embroidering, starting from one end to the other, and has simple loops in each extremity (read as RFID textile label having a textile carrier 2 made of a woven fabric into which an open antenna 4 is woven in) (Speich – Figure 4, [0003], [0011], and [0021]-[0023]), and in the central area a double loop (5) consisting of a first loop with a smaller diameter, followed by a second concentric loop with a larger diameter (read as the conductor loop can overlap or cross the antenna loop at least twice and at least partially runs parallel to the antenna loop at a distance from the latter) (Speich – Figure 4, [0023]).

Regarding **claim 3 as applied to claim 1**, Speich as modified by Vicard further teaches wherein the UHF-SHF antenna (2), does not show electrical contacts in the crossing points (C and D) in the construction of the simple loops located at the extremities (Speich – [0021]-[0023]).

Regarding **claim 4 as applied to claim 1**, Speich as modified by Vicard further teaches wherein the UHF-SHF antenna (2) is made by continuous embroidering of the electroconductive textile thread in the form of two open loops disposed in a upper plane in relation to the longitudinal direction and two open loops disposed in a lower plane in relation to the same longitudinal direction (Speich – [0021]-[0023]).

Regarding **claim 5 as applied to claim 4**, Speich as modified by Vicard further teaches wherein, in the central area, the upper plane loop (P) has a smaller diameter than the loop (Q) from the lower plane, the transponder (3) being fixed and centered

on the loop (P) in the upper plane, and the loop (Q) of the lower plane will overlap the loop (P) from the upper plane by bending over said longitudinal direction, so that the double loop (5) is created having the transponder (3) inside it (read as RFID chip 12b is not connected to the antenna 4b directly but rather indirectly in an inductive manner; RFID chip 12b is arranged on an auxiliary carrier which also has a conductor loop which essentially runs parallel to the antenna loop 6b) (Speich – [0023]).

Regarding **claim 6 as applied to claim 1**, Speich as modified by Vicard further teaches wherein the harsh environment includes temperatures between 8-90°C (Vicard – [0042]).

Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to APRIL GUZMAN GONZALES whose telephone number is (571)270-1101. The examiner can normally be reached on Monday - Friday 8:00 am to 4:00 pm EST.

Examiner interviews are available via telephone, in-person, and video conferencing using a USPTO supplied web-based collaboration tool. To schedule an interview, applicant is encouraged to use the USPTO Automated Interview Request (AIR) at http://www.uspto.gov/interviewpractice.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Wesley L. Kim can be reached on (571) 272-7867. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see https://ppair-my.uspto.gov/pair/PrivatePair. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/APRIL G GONZALES/
Primary Examiner, Art Unit 2648

Notice of References Cited	Application/Control No. 16/609,260	Applicant(s)/Patent Under Reexamination MORARU et al.	
	Examiner APRIL G GONZALES	Art Unit 2648	Page 1 of 2

U.S. PATENT DOCUMENTS

*		Document Number Country Code-Number-Kind Code	Date MM-YYYY	Name	CPC Classification	US Classification
*	A	US-20070095926-A1	05-2007	Zhu; Shengbo	G06K19/07756	235/492
*	B	US-7432816-B1	10-2008	Ku; Joseph	G06K19/0723	340/572.1
*	C	US-8910878-B2	12-2014	Fan; Chen-Jyh	G06K19/07794	235/492
*	D	US-8334758-B2	12-2012	Baruco; Sam	H01Q1/32	340/12.5
*	E	US-20150028107-A1	01-2015	Fischer; Jorg	H04B5/0081	235/488
*	F	US-20160048751-A1	02-2016	IMBRUGLIO; Richard	G06K19/07754	235/492
*	G	US-20140246503-A1	09-2014	Hofer; Guenter	H01Q1/38	235/492
*	H	US-20100177008-A1	07-2010	Bohn; Martin	G06K7/10178	343/878
*	I	US-20090079574-A1	03-2009	Oroku; Noriyuki	G06K19/07749	340/572.7
*	J	US-8035522-B2	10-2011	Oroku; Noriyuki	G06K19/07749	340/572.7
*	K	US-8638193-B2	01-2014	Margalef; Aurelie	H01Q9/0421	340/10.1
*	L	US-8120484-B2	02-2012	Chisholm; Brian J.	G06K19/07798	340/572.1
*	M	US-20100245182-A1	09-2010	Vicard; Dominique	H01L24/82	343/702

FOREIGN PATENT DOCUMENTS

*		Document Number Country Code-Number-Kind Code	Date MM-YYYY	Country	Name	CPC Classification
	N					
	O					
	P					
	Q					
	R					
	S					
	T					

NON-PATENT DOCUMENTS

*		Include as applicable: Author, Title Date, Publisher, Edition or Volume, Pertinent Pages)
	U	
	V	
	W	
	X	

*A copy of this reference is not being furnished with this Office action. (See MPEP § 707.05(a).)
Dates in MM-YYYY format are publication dates. Classifications may be US or foreign.

Notice of References Cited	Application/Control No. 16/609,260	Applicant(s)/Patent Under Reexamination MORARU et al.	
	Examiner APRIL G GONZALES	Art Unit 2648	Page 2 of 2

U.S. PATENT DOCUMENTS

*		Document Number Country Code-Number-Kind Code	Date MM-YYYY	Name	CPC Classification	US Classification
*	A	US-20100051699-A1	03-2010	Speich; Francisco	G06K19/07749	235/492
*	B	US-20090321531-A1	12-2009	Speich; Francisco	G06K19/07749	235/492
	C					
	D					
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	K					
	L					
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FOREIGN PATENT DOCUMENTS

*		Document Number Country Code-Number-Kind Code	Date MM-YYYY	Country	Name	CPC Classification
	N					
	O					
	P					
	Q					
	R					
	S					
	T					

NON-PATENT DOCUMENTS

*		Include as applicable: Author, Title Date, Publisher, Edition or Volume, Pertinent Pages)
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	W	
	X	

*A copy of this reference is not being furnished with this Office action. (See MPEP § 707.05(a).)
Dates in MM-YYYY format are publication dates. Classifications may be US or foreign.

Index of Claims	Application/Control No.	Applicant(s)/Patent Under Reexamination
	16/609,260	MORARU et al.
	Examiner	**Art Unit**
	APRIL G GONZALES	2648

✓	Rejected	-	Cancelled	N	Non-Elected	A	Appeal
=	Allowed	÷	Restricted	I	Interference	O	Objected

CLAIMS

☐ Claims renumbered in the same order as presented by applicant ☐ CPA ☐ T.D. ☐ R.1.47

CLAIM		DATE								
Final	Original	03/28/2020	10/08/2020	12/21/2020						
	1	✓	✓	✓						
	2	✓	✓	✓						
	3	✓	✓	✓						
	4	✓	✓	✓						
	5	✓	✓	✓						
	6		✓	✓						

Search Notes	Application/Control No.	Applicant(s)/Patent Under Reexamination
	16/609,260	MORARU et al.
	Examiner	Art Unit
	APRIL G GONZALES	2648

CPC - Searched*		
Symbol	**Date**	**Examiner**
H04B5/0062	03/27/2020	agg
H04B5/0068	03/27/2020	agg
H04B5/0081	03/27/2020	agg
H01Q7/00	03/27/2020	agg
H01Q1/40	03/27/2020	agg
H01Q1/2225	03/27/2020	agg

CPC Combination Sets - Searched*		
Symbol	**Date**	**Examiner**

US Classification - Searched*			
Class	**Subclass**	**Date**	**Examiner**
455	41.1	03/27/2020	agg

* See search history printout included with this form or the SEARCH NOTES box below to determine the scope of the search.

/APRIL G GONZALES/ Primary Examiner, Art Unit 2648	

Search Notes	Application/Control No.	Applicant(s)/Patent Under Reexamination
	16/609,260	MORARU et al.
	Examiner	Art Unit
	APRIL G GONZALES	2648

Search Notes		
Search Notes	**Date**	**Examiner**
EAST keyword and image Search (see attached EAST report)	10/08/2020	agg
CPC Search (see attached EAST report)	10/08/2020	agg
Google Patents (see attached search report)	10/08/2020	agg
Global Dossier	03/27/2020	agg
Double Patenting Search	03/27/2020	agg
IDS filed on 03/27/2020	03/27/2020	agg
Incoming Written Opinion of the ISA	03/27/2020	agg
IEEE Xplore (see attached report)	10/08/2020	agg

Interference Search			
US Class/CPC Symbol	**US Subclass/CPC Group**	**Date**	**Examiner**

/APRIL G GONZALES/ Primary Examiner, Art Unit 2648	

EAST Search History

EAST Search History (Prior Art)

Ref #	Hits	Search Query	DBs	Default Operator	Plurals	Time Stamp
S1	1	Moraru.in. and promar.as.	US-PGPUB; USPAT	OR	OFF	2020/03/25 15:24
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S3	1	H01Q1/2225.cpc. and Moraru.in.	US-PGPUB; USPAT	OR	OFF	2020/03/25 18:36
S4	1	H01Q1/14.cpc. and Moraru.in.	US-PGPUB; USPAT	OR	OFF	2020/03/25 18:36
S5	1	H01Q1/40.cpc. and Moraru.in.	US-PGPUB; USPAT	OR	OFF	2020/03/25 18:36
S6	1	H01Q7/00.cpc. and Moraru.in.	US-PGPUB; USPAT	OR	OFF	2020/03/25 18:36
S7	1	H04B5/0062.cpc. and Moraru.in.	US-PGPUB; USPAT	OR	OFF	2020/03/25 18:37
S8	1	H04B5/0068.cpc. and Moraru.in.	US-PGPUB; USPAT	OR	OFF	2020/03/25 18:37
S9	1	H04B5/0081.cpc. and Moraru.in.	US-PGPUB; USPAT	OR	OFF	2020/03/25 18:37
S10	4	"20070095926"	US-PGPUB; USPAT	OR	OFF	2020/03/25 18:38
S11	2,017	(RFID adj tag) with (UHF or SHF)	US-PGPUB; USPAT	OR	OFF	2020/03/25 18:42
S12	3	(RFID adj tag) with (UHF-SHF)	US-PGPUB; USPAT	OR	OFF	2020/03/25 18:42
S13	18	"7432816"	US-PGPUB; USPAT	OR	OFF	2020/03/25 19:03
S14	4	S13 and (RFID with tag) and (UHF)	US-PGPUB; USPAT	OR	OFF	2020/03/25 19:04
S15	2	"20150028107"	US-PGPUB; USPAT	OR	OFF	2020/03/25 19:05
S16	2	"20160048751"	US-PGPUB; USPAT	OR	OFF	2020/03/25 19:05
S17	6	(US-20070095926-$ or US-20150028107-$ or US-20160048751-$).did. or (US-7432816-$ or US-8910878-$ or US-8334758-$).did.	US-PGPUB; USPAT	OR	OFF	2020/03/25 19:09
S18	1	S17 and (RFID with tag) and (UHF) and transponder	US-PGPUB; USPAT	OR	OFF	2020/03/25 19:10

S19	0	S17 and (RFID with tag) and (UHF) and transponder and textile	US-PGPUB; USPAT	OR	OFF	2020/03/25 19:18
S20	0	S17 and (RFID with tag) and (UHF) and textile	US-PGPUB; USPAT	OR	OFF	2020/03/25 19:18
S21	0	S17 and (RFID with tag) and textile	US-PGPUB; USPAT	OR	OFF	2020/03/25 19:18
S22	0	S17 and (RFID with tag) and electroconductive	US-PGPUB; USPAT	OR	OFF	2020/03/25 19:18
S23	1	(RFID with tag) and hot-dipping	US-PGPUB; USPAT	OR	OFF	2020/03/25 19:19
S24	18	(RFID with tag) same (double with loop)	US-PGPUB; USPAT	OR	OFF	2020/03/25 19:22
S25	1	((RFID with tag) same (double with loop)) and (RFID with transponder)	US-PGPUB; USPAT	OR	OFF	2020/03/25 19:22
S26	12	((RFID with tag) same (double with loop)) and UHF	US-PGPUB; USPAT	OR	OFF	2020/03/25 19:22
S27	1	((RFID with tag) same (double with loop)) and UHF-SHF	US-PGPUB; USPAT	OR	OFF	2020/03/25 19:23
S28	3	(RFID with tag) and UHF-SHF	US-PGPUB; USPAT	OR	OFF	2020/03/25 19:23
S29	14	"2017060652"	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2020/03/27 21:43
S30	6	"20090079574"	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2020/03/27 21:45
S31	3	"20140246503"	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2020/03/27 21:46
S32	3	"20100177008"	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2020/03/27 21:46
S33	14	"8035522"	US-PGPUB; USPAT; USOCR; FPRS;	OR	OFF	2020/03/27 22:19

			EPO; JPO; DERWENT; IBM_TDB			
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S35	7	S34 and (RFID adj tag)	US-PGPUB; USPAT	OR	OFF	2020/03/27 22:21
S36	2	S34 and (RFID adj tag) and transponder	US-PGPUB; USPAT	OR	OFF	2020/03/27 22:21
S37	1	S34 and (RFID adj tag) and transponder and loop	US-PGPUB; USPAT	OR	OFF	2020/03/27 22:21
S38	1	S34 and (RFID adj tag) and transponder and UHF	US-PGPUB; USPAT	OR	OFF	2020/03/27 22:22
S39	5	S34 and (RFID adj tag) and UHF	US-PGPUB; USPAT	OR	OFF	2020/03/27 22:25
S40	4	S34 and (RFID adj tag) and UHF and loop	US-PGPUB; USPAT	OR	OFF	2020/03/27 22:25
S41	4	S34 and (RFID adj tag) and (UHF same antenna) and loop	US-PGPUB; USPAT	OR	OFF	2020/03/27 22:25
S42	3	S34 and (RFID adj tag) and (UHF with antenna) and loop	US-PGPUB; USPAT	OR	OFF	2020/03/27 22:25
S43	0	S34 and (RFID adj tag) and (UHF with antenna) and loop and electroconductive	US-PGPUB; USPAT	OR	OFF	2020/03/27 22:25
S44	0	S34 and (RFID adj tag) and (UHF with antenna) and loop and (electro with conductive)	US-PGPUB; USPAT	OR	OFF	2020/03/27 22:26
S45	2	S34 and (RFID adj tag) and (UHF with antenna) and loop and (conductive)	US-PGPUB; USPAT	OR	OFF	2020/03/27 22:26
S46	62,509	S34 and (RFID adj tag) and (UHF with antenna) and loop transponder	US-PGPUB; USPAT	OR	OFF	2020/03/27 22:26
S47	0	S34 and (RFID adj tag) and (UHF with antenna) and loop and transponder	US-PGPUB; USPAT	OR	OFF	2020/03/27 22:26
S48	1	S34 and (RFID adj tag) and (UHF with antenna) and transponder	US-PGPUB; USPAT	OR	OFF	2020/03/27 22:27
S49	11	(US-20070095926-$ or US-20150028107-$ or US-20160048751-$ or US-20140246503-$ or US-20100177008-$ or US-20090079574-$).did. or (US-7432816-$ or US-	US-PGPUB; USPAT; DERWENT	OR	OFF	2020/03/28 01:17

		8910878-$ or US-8334758-$ or US-8035522-$).did. or (US-20090079574-$).did.				
S50	1	S49 and (RFID adj tag) and (UHF with antenna) and transponder	US-PGPUB; USPAT	OR	OFF	2020/03/28 01:18
S51	2	S49 and (RFID adj tag) and ((UHF with antenna) with loop)	US-PGPUB; USPAT	OR	OFF	2020/03/28 01:19
S52	0	S49 and transponder and ((UHF with antenna) with loop)	US-PGPUB; USPAT	OR	OFF	2020/03/28 01:20
S53	0	S49 and ((UHF with antenna) with transponder)	US-PGPUB; USPAT	OR	OFF	2020/03/28 01:22
S54	1	S49 and ((UHF with antenna) same transponder)	US-PGPUB; USPAT	OR	OFF	2020/03/28 01:22
S55	39	(RFID adj tag) and ((UHF with antenna) same transponder same loop)	US-PGPUB; USPAT	OR	OFF	2020/03/28 01:23
S56	36	(RFID adj tag) and ((UHF with antenna) same (RFID with transponder) same loop)	US-PGPUB; USPAT	OR	OFF	2020/03/28 01:23
S57	1	(RFID adj tag) and ((UHF-SHF with antenna) same (RFID with transponder) same loop)	US-PGPUB; USPAT	OR	OFF	2020/03/28 01:23
S58	36	(RFID adj tag) and ((UHF with antenna) same (RFID with transponder) same loop)	US-PGPUB; USPAT	OR	OFF	2020/03/28 01:24
S59	3	S58 and electroconductive	US-PGPUB; USPAT	OR	OFF	2020/03/28 01:24
S60	47	"863813"	US-PGPUB; USPAT	OR	OFF	2020/03/28 01:26
S61	3	"8638193"	US-PGPUB; USPAT	OR	OFF	2020/03/28 01:26
S62	12	(US-20070095926-$ or US-20150028107-$ or US-20160048751-$ or US-20140246503-$ or US-20100177008-$ or US-20090079574-$).did. or (US-7432816-$ or US-8910878-$ or US-8334758-$ or US-8035522-$ or US-8638193-$).did. or (US-20090079574-$).did.	US-PGPUB; USPAT; DERWENT	OR	OFF	2020/03/28 11:43
S63	0	S62 and (RF adj tag) and (UHF adj antenna) and (transponder)	US-PGPUB; USPAT	OR	OFF	2020/03/28 11:43
S64	0	S62 and (RF adj tag) and (UHF with antenna) and (transponder)	US-PGPUB; USPAT	OR	OFF	2020/03/28 11:43
S65	0	S62 and (RF adj transponder) and (UHF with antenna)	US-PGPUB; USPAT	OR	OFF	2020/03/28 11:44

S66	1	S62 and (RF with transponder) and (UHF with antenna)	US-PGPUB; USPAT	OR	OFF	2020/03/28 11:44
S67	0	S62 and (RF with transponder) and (UHF with antenna) and loop	US-PGPUB; USPAT	OR	OFF	2020/03/28 11:44
S68	6	S62 and (RF tag) and (UHF with antenna)	US-PGPUB; USPAT	OR	OFF	2020/03/28 11:44
S69	1	S62 and (RF tag) and (UHF adj antenna)	US-PGPUB; USPAT	OR	OFF	2020/03/28 11:44
S70	0	S62 and (RF adj tag) and (UHF adj antenna)	US-PGPUB; USPAT	OR	OFF	2020/03/28 11:45
S71	0	S62 and (RF with tag) and (UHF adj antenna)	US-PGPUB; USPAT	OR	OFF	2020/03/28 11:45
S72	0	S62 and seal	US-PGPUB; USPAT	OR	OFF	2020/03/28 11:48
S73	586	(RFID adj tag) with seal	US-PGPUB; USPAT	OR	OFF	2020/03/28 11:48
S74	0	(RFID adj tag) with seal with (UHF adj antenna)	US-PGPUB; USPAT	OR	OFF	2020/03/28 11:48
S75	1	seal with (UHF adj antenna)	US-PGPUB; USPAT	OR	OFF	2020/03/28 11:48
S76	13	(US-20070095926-$ or US-20150028107-$ or US-20160048751-$ or US-20140246503-$ or US-20100177008-$ or US-20090079574-$).did. or (US-7432816-$ or US-8910878-$ or US-8334758-$ or US-8035522-$ or US-8638193-$ or US-8120484-$).did. or (US-20090079574-$).did.	US-PGPUB; USPAT; DERWENT	OR	OFF	2020/03/28 22:42
S77	0	S76 and plane and overlap	US-PGPUB; USPAT	OR	OFF	2020/03/28 22:43
S78	4	S76 and plane	US-PGPUB; USPAT	OR	OFF	2020/03/28 22:43
S79	1	S76 and overlap	US-PGPUB; USPAT	OR	OFF	2020/03/28 22:43
S80	13	(US-20070095926-$ or US-20150028107-$ or US-20160048751-$ or US-20140246503-$ or US-20100177008-$ or US-20090079574-$).did. or (US-7432816-$ or US-8910878-$ or US-8334758-$ or US-8035522-$ or US-8638193-$ or US-8120484-$).did. or (US-20090079574-$).did.	US-PGPUB; USPAT; DERWENT	OR	OFF	2020/10/08 00:55
S81	5	S80 and transponder	US-PGPUB; USPAT	OR	OFF	2020/10/08 00:56

S82	3	S80 and transponder and (RFID or (radio adj frequency adj identification)) and UHF	US-PGPUB; USPAT	OR	OFF	2020/10/08 00:57
S83	0	S80 and transponder and (RFID or (radio adj frequency adj identification)) and UHF and SHF	US-PGPUB; USPAT	OR	OFF	2020/10/08 00:57
S84	1	S80 and transponder and (RFID or (radio adj frequency adj identification)) and UHF and loop	US-PGPUB; USPAT	OR	OFF	2020/10/08 00:57
S85	0	"2009079574"	US-PGPUB; USPAT	OR	OFF	2020/10/08 00:59
S86	3	"20090079574"	US-PGPUB; USPAT	OR	OFF	2020/10/08 00:59
S87	16	"2017060652"	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2020/10/08 02:02
S88	2	(RFID adj tags) with (traceability) with (textile adj products)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2020/10/08 02:04
S89	13	(US-20070095926-$ or US-20150028107-$ or US-20160048751-$ or US-20140246503-$ or US-20100177008-$ or US-20090079574-$).did. or (US-7432816-$ or US-8910878-$ or US-8334758-$ or US-8035522-$ or US-8638193-$ or US-8120484-$).did. or (US-20090079574-$).did.	US-PGPUB; USPAT; DERWENT	OR	OFF	2020/10/08 23:41
S90	4	S89 and (temperature or heat)	US-PGPUB; USPAT	OR	OFF	2020/10/08 23:42
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S92	16	"2017060652"	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2020/12/21 15:14

S93	442	RFID with textile	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2020/12/21 15:32
S94	17	RFID with textile with thread	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2020/12/21 15:32
S95	2	RFID with textile with thread with embroider$4	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2020/12/21 15:32

EAST Search History (Interference)

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12/21/2020 11:59:20 PM
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IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Applicant	PROMAR TEXTIL INDUSTRIES S.R.L.
Application No. 16/609,260	Filing Date: 10-29-2019
Examiner	GONZALES, APRIL GUZMAN
Title of Application:	RFID TAG FOR HARSH ENVIRONMENT INDUCTIVELY COUPLED IN DOUBLE LOOP
Confirmation No. 1148	Art Unit: 2648
Attorney Docket No.	07610-P0002A

Mail Stop Amendment
Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

AMENDMENT AND RESPONSE TO OFFICE ACTION

Dear Examiner GONZALES:

This Amendment and Response is filed in response to the Office Action dated October 13, 2020 issued by the United States Patent and Trademark Office in connection with the above-identified Application. A Response to the Office Action is due **January 13, 2021**. Accordingly, this Amendment is being timely filed.

Remarks/Arguments begin on page 2 of this paper.

No fees are believed to be due with this response made herein. Should any fees be required, however, please charge such fees to Deposit Account 50-6926.

Electronic Acknowledgement Receipt	
EFS ID:	41178397
Application Number:	16609260
International Application Number:	
Confirmation Number:	1148
Title of Invention:	RFID TAG FOR HARSH ENVIRONMENT INDUCTIVELY COUPLED IN DOUBLE LOOP
First Named Inventor/Applicant Name:	Aurelian MORARU
Customer Number:	136531
Filer:	Roy D. Gross
Filer Authorized By:	
Attorney Docket Number:	07610-P0002A
Receipt Date:	20-NOV-2020
Filing Date:	29-OCT-2019
Time Stamp:	09:01:17
Application Type:	U.S. National Stage under 35 USC 371

Payment information:

Submitted with Payment	no

File Listing:

Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)
1		07610-P0002A-Response-OA-13-OCT-2020-for-filing.pdf	158588 e1e06d2e4772f24509ea1fa7c0ebb069c6d2c494	yes	5

	Multipart Description/PDF files in .zip description		
	Document Description	**Start**	**End**
	Applicant Arguments/Remarks Made in an Amendment	2	5
	Response After Final Action	1	1
Warnings:			
Information:			
	Total Files Size (in bytes):	158588	

This Acknowledgement Receipt evidences receipt on the noted date by the USPTO of the indicated documents, characterized by the applicant, and including page counts, where applicable. It serves as evidence of receipt similar to a Post Card, as described in MPEP 503.

New Applications Under 35 U.S.C. 111
If a new application is being filed and the application includes the necessary components for a filing date (see 37 CFR 1.53(b)-(d) and MPEP 506), a Filing Receipt (37 CFR 1.54) will be issued in due course and the date shown on this Acknowledgement Receipt will establish the filing date of the application.
National Stage of an International Application under 35 U.S.C. 371
If a timely submission to enter the national stage of an international application is compliant with the conditions of 35 U.S.C. 371 and other applicable requirements a Form PCT/DO/EO/903 indicating acceptance of the application as a national stage submission under 35 U.S.C. 371 will be issued in addition to the Filing Receipt, in due course.
New International Application Filed with the USPTO as a Receiving Office
If a new international application is being filed and the international application includes the necessary components for an international filing date (see PCT Article 11 and MPEP 1810), a Notification of the International Application Number and of the International Filing Date (Form PCT/RO/105) will be issued in due course, subject to prescriptions concerning national security, and the date shown on this Acknowledgement Receipt will establish the international filing date of the application.

REMARKS

The present response is intended to be fully responsive to all points of objection and/or rejection raised by the Examiner and is believed to place the application in condition for allowance. Applicant asserts that the present invention is new, non-obvious and useful.

Favorable reconsideration and allowance of the application is respectfully requested.

STATUS OF CLAIMS

No claims have been amended.

Claims 1-6 are pending in the application.

RESPONSE TO CLAIM REJECTIONS

35 U.S.C. § 102 Rejections

In the Office Action, claims 1-6 are rejected under 35 U.S.C. §102, as being anticipated by Oroku et al. (US 2009/0079574 A1). Applicant respectfully requests reconsideration of the rejection in view of the amendments made to the claims and the following remarks.

The content of the independent Claim 1, filed at 06-30-2020 is directed to:

An RFID tag (1) for use in harsh environments comprising:

an UHF-SHF antenna (2) made from a continuous electroconductive textile thread, electrically insulated, embroidered on textile substrate,

an RFID transponder (3), and

a substrate of textile material (4) on which the RFID transponder (3) and the UHF-SHF antenna (2) are placed, the whole assembly being sealed by hot-dipping of a second textile substrate,

wherein the UHF-SHF antenna (2) has a central zone formed by a double loop (5) by which it inductively couples with the encapsulated RFID transponder (3), wherein the central loop (5) does not have electrical contacts at the intersection points (A and B).

Applicant respectfully submits that the claim is novel and inventive over Oroku, as will be further explained below.

Oroku

Applicant respectfully submits that certainly none of the embodiments described and/or illustrated either in the Oroku's document discloses a UHF-SHF antenna made of a **continuous (electrically) conductive textile thread** configured such that it forms an antenna in the form of a double loop.

As mentioned by the Office Action and as disclosed in the paragraphs indicated (e.g. Figures 8, 9A and 9B and [0071]-[0073]) Oroku explicitly states that "***the antenna 21-6 extends in a loop shape from one end of a whorl detour to the other end facing against the detour through a gap, and the one end and the other end are connected through the connection sheet 23…***". Such an indication excludes, in the Applicant's view, the existence of an antenna made of a continuous thread.

The antenna according to Applicant's invention has **no gap and no ends connected**. A connection sheet, as the sheet 23, increases the tag vulnerability to harsh environment and complicate the production process.

Moreover, there are many others features claimed which are not disclosed in the Oroku's document. To mention only a few, the claimed inventions states that:

- **the continuous electroconductive textile thread is embroidered on textile substrate**;
- **the whole assembly** [the RFID transponder (3) and the UHF-SHF antenna (2)] **are sealed by hot-dipping of a second textile substrate.**

Last but not least, **the continuous electroconductive textile thread** forming the **UHF-SHF antenna (2),** according to invention**, has intersection points (A, B),** which is not the case with the antenna shown in the Figures 8, 9A and 9B from Oroku's document.

More specifically, the antenna shown in the Figures 8, 9A and 9B from Oroku's document has a clearly planar helix configuration, as opposed to the design of the double loop claimed by invention. This double loop configuration, and taking into account the intersection points A & B, has to be understood as two loops substantially parallel with similar dimensions.

This configuration decreases the dimensions of the tag by using the double loop (5) and concentrates the electromagnetic field in the area of the transponder (3) by using two rounds, of similar dimensions, which closely surround the transponder (3). In this way, Applicant is able to meet the resonance condition at the UHF RFID tag designed by us, the reading distance being 2-10 m (depending on the power of the reader) and made the tag readable at low power levels of the reader.

Oroku acknowledges, himself, in [0070], that it's design works better "when signals at a lower carrier frequency such as HF band are exchanged between the antenna 21 and the circuit chip 1". The Okoru design is fundamentally different from the presently claimed invention: the present invention aims to concentrate the electromagnetic field in the transponder (3) area, while Okoru's invention aims to extend the electromagnetic field over as large an area as possible around the circuit chip (1).

In conclusion, Applicant respectfully submits that the essential diferences mentioned above make the independent claim 1, not only a new solution in relation to Oroku's document, but also a non-obvious one in relation to the state of the art cited during the examination procedure.

Applicant further submits that dependent claims 2-6 are to be considered allowable in view of the their dependence on allowable claim 1.

Accordingly, withdrawal of the rejections under §102(a) is respectfully requested.

CONCLUSION

In view of the above, each of the presently pending claims is believed to be in an immediate condition for allowance. Accordingly, the Examiner is respectfully requested to withdraw the outstanding objections and rejections and pass this application to issue.

If there are any questions, the Examiner is invited to call Applicant's representative, Roy D. Gross, at (203) 423-0235, to resolve any remaining issues to expedite the allowance of this application.

Respectfully submitted,

/Roy D. Gross/

November 20, 2020

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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
16/609,260	10/29/2019	Aurelian MORARU	07610-P0002A	1148

136531 7590 10/13/2020

The Roy Gross Law Firm, LLC
50 Washington Street
Suite 737/745
Norwalk, CT 06854

EXAMINER	
GONZALES, APRIL GUZMAN	

ART UNIT	PAPER NUMBER
2648	

MAIL DATE	DELIVERY MODE
10/13/2020	PAPER

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	**Application No.** 16/609,260	**Applicant(s)** MORARU et al.	
	Examiner APRIL G GONZALES	**Art Unit** 2648	**AIA (FITF) Status** Yes

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTHS FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☑ Responsive to communication(s) filed on 06/30/2020.

☐ A declaration(s)/affidavit(s) under **37 CFR 1.130(b)** was/were filed on _____.

2a)☑ This action is **FINAL.** 2b) ☐ This action is non-final.

3)☐ An election was made by the applicant in response to a restriction requirement set forth during the interview on _____; the restriction requirement and election have been incorporated into this action.

4)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims*

5) ☑ Claim(s) 1-6 is/are pending in the application.

5a) Of the above claim(s) _____ is/are withdrawn from consideration.

6) ☐ Claim(s) _____ is/are allowed.

7) ☑ Claim(s) 1-6 is/are rejected.

8) ☐ Claim(s) _____ is/are objected to.

9) ☐ Claim(s) _____ are subject to restriction and/or election requirement

* If any claims have been determined allowable, you may be eligible to benefit from the **Patent Prosecution Highway** program at a participating intellectual property office for the corresponding application. For more information, please see http://www.uspto.gov/patents/init_events/pph/index.jsp or send an inquiry to **PPHfeedback@uspto.gov.**

Application Papers

10)☐ The specification is objected to by the Examiner.

11)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

Certified copies:

a)☐ All b)☐ Some** c)☐ None of the:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

** See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☑ Notice of References Cited (PTO-892)

2) ☐ Information Disclosure Statement(s) (PTO/SB/08a and/or PTO/SB/08b) Paper No(s)/Mail Date _____.

3) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date _____.

4) ☐ Other: _____.

DETAILED ACTION

Notice of Pre-AIA or AIA Status

The present application, filed on or after March 16, 2013, is being examined under the first inventor to file provisions of the AIA.

Response to Amendment

The Examiner acknowledges the receipt of the Applicant's amendment filed on 06/30/2020. Claims 1-5 have been amended. Claim 6 has been added. **Claims 1-6** are currently pending in the present application.

Response to Arguments

Applicant's arguments with respect to claims 1-6 have been considered but are moot in view of the new grounds of rejection.

Claim Rejections - 35 USC § 102

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless –
>
> (a)(1) the claimed invention was patented, described in a printed publication, or in public use, on sale, or otherwise available to the public before the effective filing date of the claimed invention.

Claims 1-6 are rejected under 35 U.S.C. 102(a)(1) as being anticipated by **Oroku et al. (US 2009/0079574 A1)**.

Regarding **claim 1,** Oroku teaches RFID tag (1) for use in harsh environments (read as prevent application of external forces when an RFID tag is used) (Oroku - [0007]) comprising:

an UHF-SHF antenna (2) made from a continuous electroconductive textile thread, electrically insulated, embroidered on textile substrate (read as RFID tag suitable for exchanging signals with an external circuit at a higher carrier frequency such as UHF band; the RFID tag including a loop antenna or a spiral antenna; antenna 21 of the RFID tag) ([Oroku – Figure 8, Figure 9A, Figure 9B, and [0071]-[0073]);

an RFID transponder (3) (read as circuit chip 1) (Oroku – Figure 8, Figure 9A, Figure 9B, and [0072]-[0073]), and

a substrate of textile material (4) on which the RFID transponder (3) and the UHF-SHF antenna (2) are placed (read as main surface (effective area) of an oval base film 20-1 can be used as an effective area of the antenna 21 of the RFID tag) (Oroku – Figure 8, Figure 9A, Figure 9B, and [0072]-[0073]), the whole assembly being sealed by hot-dipping of a second textile substrate (read as may be protected more rigidly with a resin mold or an underfill material) (Oroku – [0007], [0046]-[0048]),

wherein the UHF-SHF antenna (2) has a central zone formed by a double loop (5) by which it inductively couples with the encapsulated RFID transponder (3), wherein the central loop (5) does not have electrical contacts at the intersection points (A and B) (read as the circuit chip 1 and the antenna 21 are not connected as an electric

circuit, there are no connection parts, which are formed by crimping or butt-welding) (Oroku – Figure 9A, Figure 9B, [0046]-[0047], [0072]-[0073]).

Regarding **claim 2 as applied to claim 1,** Oroku further teaches wherein the UHF-SHF antenna (2) is made of an electroconductive textile thread, electrically insulated, by continuous embroidering, starting from one end to the other, and has simple loops in each extremity, and in the central area a double loop (5) consisting of a first loop with a smaller diameter, followed by a second concentric loop with a larger diameter (Oroku – Figure 7A, Figure 7B, Figure 8, Figure 9A, Figure 9B, [0042], and [0073]).

Regarding **claim 3 as applied to claim 1,** Oroku further teaches wherein the UHF-SHF antenna (2), does not show electrical contacts in the crossing points (C and D) in the construction of the simple loops located at the extremities (read as the circuit chip 1 and the antenna 21 are not connected as an electric circuit, there are no connection parts, which are formed by crimping or butt-welding) (Oroku – Figure 9A, Figure 9B, [0046]-[0047], [0072]-[0073]).

Regarding **claim 4 as applied to claim 1,** Oroku further teaches wherein the UHF-SHF antenna (2) is made by continuous embroidering of the electroconductive textile thread in the form of two open loops disposed in a upper plane in relation to the longitudinal direction and two open loops disposed in a lower plane in relation to the same longitudinal direction (Oroku – Figure 9A, Figure 9B, and [0073]).

Regarding **claim 5 as applied to claim 4,** Oroku further teaches wherein, in the central area, the upper plane loop (P) has a smaller diameter than the loop (Q)

from the lower plane, the transponder (3) being fixed and centered on the loop (P) in the upper plane, and the loop (Q) of the lower plane will overlap the loop (P) from the upper plane by bending over said longitudinal direction, so that the double loop (5) is created having the transponder (3) inside it (Oroku – Figure 8, Figure 9A, Figure 9B, and [0072]-[0073]).

Regarding **claim 6 as applied to claim 1**, Oroku further teaches wherein the harsh environment includes temperatures between 8-90°C (read as in order to prevent the application of external force when an RFID tag is used, the connection parts of the terminals must be protected more rigidly with a resin mold which is known to be a high temperature synthetic material) (Oroku – [0007], and [0045]).

Conclusion

Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any

extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to APRIL GUZMAN GONZALES whose telephone number is (571)270-1101. The examiner can normally be reached on Monday - Friday 8:00 am to 4:00 pm EST.

Examiner interviews are available via telephone, in-person, and video conferencing using a USPTO supplied web-based collaboration tool. To schedule an interview, applicant is encouraged to use the USPTO Automated Interview Request (AIR) at http://www.uspto.gov/interviewpractice.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Wesley L. Kim can be reached on (571) 272-7867. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For

more information about the PAIR system, see https://ppair-my.uspto.gov/pair/PrivatePair. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/APRIL G GONZALES/
Primary Examiner, Art Unit 2648

Notice of References Cited	Application/Control No. 16/609,260	Applicant(s)/Patent Under Reexamination MORARU et al.	
	Examiner APRIL G GONZALES	Art Unit 2648	Page 1 of 1

U.S. PATENT DOCUMENTS

*		Document Number Country Code-Number-Kind Code	Date MM-YYYY	Name	CPC Classification	US Classification
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*	B	US-7432816-B1	10-2008	Ku; Joseph	G06K19/0723	340/572.1
*	C	US-8910878-B2	12-2014	Fan; Chen-Jyh	G06K19/07794	235/492
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	M					

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*		Document Number Country Code-Number-Kind Code	Date MM-YYYY	Country	Name	CPC Classification
	N					
	O					
	P					
	Q					
	R					
	S					
	T					

NON-PATENT DOCUMENTS

*		Include as applicable: Author, Title Date, Publisher, Edition or Volume, Pertinent Pages)
	U	
	V	
	W	
	X	

*A copy of this reference is not being furnished with this Office action. (See MPEP § 707.05(a).)
Dates in MM-YYYY format are publication dates. Classifications may be US or foreign.

Search Notes	Application/Control No.	Applicant(s)/Patent Under Reexamination
	16/609,260	MORARU et al.
	Examiner	Art Unit
	APRIL G GONZALES	2648

CPC - Searched*		
Symbol	**Date**	**Examiner**
H04B5/0062	03/27/2020	agg
H04B5/0068	03/27/2020	agg
H04B5/0081	03/27/2020	agg
H01Q7/00	03/27/2020	agg
H01Q1/40	03/27/2020	agg
H01Q1/2225	03/27/2020	agg

CPC Combination Sets - Searched*		
Symbol	**Date**	**Examiner**

US Classification - Searched*			
Class	**Subclass**	**Date**	**Examiner**
455	41.1	03/27/2020	agg

* See search history printout included with this form or the SEARCH NOTES box below to determine the scope of the search.

/APRIL G GONZALES/ Primary Examiner, Art Unit 2648	

Search Notes	Application/Control No.	Applicant(s)/Patent Under Reexamination
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	APRIL G GONZALES	2648

Search Notes		
Search Notes	**Date**	**Examiner**
EAST keyword and image Search (see attached EAST report)	10/08/2020	agg
CPC Search (see attached EAST report)	10/08/2020	agg
Google Patents (see attached search report)	10/08/2020	agg
Global Dossier	03/27/2020	agg
Double Patenting Search	03/27/2020	agg
IDS filed on 03/27/2020	03/27/2020	agg
Incoming Written Opinion of the ISA	03/27/2020	agg
IEEE Xplore (see attached report)	10/08/2020	agg

Interference Search			
US Class/CPC Symbol	**US Subclass/CPC Group**	**Date**	**Examiner**

/APRIL G GONZALES/ Primary Examiner, Art Unit 2648	

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	APRIL G GONZALES	2648

✓	Rejected	-	Cancelled	N	Non-Elected	A	Appeal
=	Allowed	÷	Restricted	I	Interference	O	Objected

CLAIMS										
☐ Claims renumbered in the same order as presented by applicant				☐ CPA		☐ T.D.		☐ R.1.47		
CLAIM		**DATE**								
Final	Original	03/28/2020	10/08/2020							
	1	✓	✓							
	2	✓	✓							
	3	✓	✓							
	4	✓	✓							
	5	✓	✓							
	6		✓							

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keywords: {encoding;microstrip couplers;microstrip resonators;microwave antennas;microwave resonators;radiofrequency identification;ultra wideband antennas;RT Duroid 5880 substrate;U-shaped coupled microstrip frame;cross-polarized ultrawideband antennas;multiple resonator tags;single resonator tags;high-coding-capacity chipless RFID tag applications;resonance frequency;high-coding-capacity resonator;compact coding-capacity resonator;K-state resonators;frequency 5.0 GHz;word length 1 bit;Resonators;Resonant frequency;RFID tags;Encoding;Bandwidth;Frequency-domain analysis;K-state resonator;high coding capacity;chipless RFID;ultra-wideband antenna (UWB);Internet of Things (IoT)},
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keywords: {backscatter;electromagnetic wave polarisation;orthogonal codes;radiofrequency identification;Co/cross-polarizing chipless RFID tags;orthogonal planes;frequency notches;co-polarization plane;cross-polarization plane;tag detection;Notch/Peak modulation scheme;frequency coded chipless RFID tag;Encoding;Impedance;Radiofrequency identification;Resonant frequency;Frequency modulation;Frequency selective surfaces;Chipless RFID;physical modulation;co/cross-polarizing;Notch/Peak;coding capacity},
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keywords: {electromagnetic wave polarisation;radiofrequency identification;radiofrequency interference;resonators;flower-shaped unit cell;tag ID measurement process;tracking applications;wireless identification technology;cross-polar resonators;cross-polar RCS;cross-polar chipless RFID tags;tag design level;chipless RFID systems;identification applications;cross-polar orientation-insensitive chipless RFID tags;Resonators;Reflection;RFID tags;Antenna measurements;Antennas;Strips;Chipless RFID tag;cross-polar RCS;orientation-insensitive;polarized;resonator;unit cell},
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URL: http://ieeexplore.ieee.org/stamp/stamp.jsp?tp=&arnumber=6140621&isnumber=6138694

Web Search History

date, time	web site	search string
10/7/2020 3:17:34 PM	Google Patents	**Keyword Group 1** [(reduce OR eliminate OR mitigate) (radiation) ((upper antenna) OR (second antenna)) and (memory)]
10/7/2020 3:18:24 PM	Google Patents	**Keyword Group 1** [(reduce OR eliminate OR mitigate) (radiation) ((upper antenna) OR (second antenna)) and (memory)] **Before** Priority Date: priority:20160921
10/7/2020 5:22:14 PM	Google Patents	**Keyword Group 1** [(UHF-SHF antenna) (RFID transponder) (electrical contacts)]
10/8/2020 2:56:43 PM	Google Patents	**Keyword Group 1** [(UHF-SHF antenna) (RFID transponder) (electrical contacts)] **Before** Priority Date: priority:20170616

EAST Search History

EAST Search History (Prior Art)

Ref #	Hits	Search Query	DBs	Default Operator	Plurals	Time Stamp
L1	13	(US-20070095926-$ or US-20150028107-$ or US-20160048751-$ or US-20140246503-$ or US-20100177008-$ or US-20090079574-$).did. or (US-7432816-$ or US-8910878-$ or US-8334758-$ or US-8035522-$ or US-8638193-$ or US-8120484-$).did. or (US-20090079574-$).did.	US-PGPUB; USPAT; DERWENT	OR	OFF	2020/10/08 23:41
L2	4	l1 and (temperature or heat)	US-PGPUB; USPAT	OR	OFF	2020/10/08 23:42
S1	1	Moraru.in. and promar.as.	US-PGPUB; USPAT	OR	OFF	2020/03/25 15:24
S2	0	455/41.1.ccls. and Moraru.in.	US-PGPUB; USPAT	OR	OFF	2020/03/25 18:36
S3	1	H01Q1/2225.cpc. and Moraru.in.	US-PGPUB; USPAT	OR	OFF	2020/03/25 18:36
S4	1	H01Q1/14.cpc. and Moraru.in.	US-PGPUB; USPAT	OR	OFF	2020/03/25 18:36
S5	1	H01Q1/40.cpc. and Moraru.in.	US-PGPUB; USPAT	OR	OFF	2020/03/25 18:36
S6	1	H01Q7/00.cpc. and Moraru.in.	US-PGPUB; USPAT	OR	OFF	2020/03/25 18:36
S7	1	H04B5/0062.cpc. and Moraru.in.	US-PGPUB; USPAT	OR	OFF	2020/03/25 18:37
S8	1	H04B5/0068.cpc. and Moraru.in.	US-PGPUB; USPAT	OR	OFF	2020/03/25 18:37
S9	1	H04B5/0081.cpc. and Moraru.in.	US-PGPUB; USPAT	OR	OFF	2020/03/25 18:37
S10	4	"20070095926"	US-PGPUB; USPAT	OR	OFF	2020/03/25 18:38
S11	2,017	(RFID adj tag) with (UHF or SHF)	US-PGPUB; USPAT	OR	OFF	2020/03/25 18:42
S12	3	(RFID adj tag) with (UHF-SHF)	US-PGPUB; USPAT	OR	OFF	2020/03/25 18:42
S13	18	"7432816"	US-PGPUB; USPAT	OR	OFF	2020/03/25 19:03
S14	4	S13 and (RFID with tag) and (UHF)	US-PGPUB; USPAT	OR	OFF	2020/03/25 19:04

S15	2	"20150028107"	US-PGPUB; USPAT	OR	OFF	2020/03/25 19:05
S16	2	"20160048751"	US-PGPUB; USPAT	OR	OFF	2020/03/25 19:05
S17	6	(US-20070095926-$ or US-20150028107-$ or US-20160048751-$).did. or (US-7432816-$ or US-8910878-$ or US-8334758-$).did.	US-PGPUB; USPAT	OR	OFF	2020/03/25 19:09
S18	1	S17 and (RFID with tag) and (UHF) and transponder	US-PGPUB; USPAT	OR	OFF	2020/03/25 19:10
S19	0	S17 and (RFID with tag) and (UHF) and transponder and textile	US-PGPUB; USPAT	OR	OFF	2020/03/25 19:18
S20	0	S17 and (RFID with tag) and (UHF) and textile	US-PGPUB; USPAT	OR	OFF	2020/03/25 19:18
S21	0	S17 and (RFID with tag) and textile	US-PGPUB; USPAT	OR	OFF	2020/03/25 19:18
S22	0	S17 and (RFID with tag) and electroconductive	US-PGPUB; USPAT	OR	OFF	2020/03/25 19:18
S23	1	(RFID with tag) and hot-dipping	US-PGPUB; USPAT	OR	OFF	2020/03/25 19:19
S24	18	(RFID with tag) same (double with loop)	US-PGPUB; USPAT	OR	OFF	2020/03/25 19:22
S25	1	((RFID with tag) same (double with loop)) and (RFID with transponder)	US-PGPUB; USPAT	OR	OFF	2020/03/25 19:22
S26	12	((RFID with tag) same (double with loop)) and UHF	US-PGPUB; USPAT	OR	OFF	2020/03/25 19:22
S27	1	((RFID with tag) same (double with loop)) and UHF-SHF	US-PGPUB; USPAT	OR	OFF	2020/03/25 19:23
S28	3	(RFID with tag) and UHF-SHF	US-PGPUB; USPAT	OR	OFF	2020/03/25 19:23
S29	14	"2017060652"	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2020/03/27 21:43
S30	6	"20090079574"	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2020/03/27 21:45
S31	3	"20140246503"	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO;	OR	OFF	2020/03/27 21:46

			DERWENT; IBM_TDB			
S32	3	"20100177008"	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2020/03/27 21:46
S33	14	"8035522"	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2020/03/27 22:19
S34	11	(US-20070095926-$ or US-20150028107-$ or US-20160048751-$ or US-20140246503-$ or US-20100177008-$ or US-20090079574-$).did. or (US-7432816-$ or US-8910878-$ or US-8334758-$ or US-8035522-$).did. or (US-20090079574-$).did.	US-PGPUB; USPAT; DERWENT	OR	OFF	2020/03/27 22:21
S35	7	S34 and (RFID adj tag)	US-PGPUB; USPAT	OR	OFF	2020/03/27 22:21
S36	2	S34 and (RFID adj tag) and transponder	US-PGPUB; USPAT	OR	OFF	2020/03/27 22:21
S37	1	S34 and (RFID adj tag) and transponder and loop	US-PGPUB; USPAT	OR	OFF	2020/03/27 22:21
S38	1	S34 and (RFID adj tag) and transponder and UHF	US-PGPUB; USPAT	OR	OFF	2020/03/27 22:22
S39	5	S34 and (RFID adj tag) and UHF	US-PGPUB; USPAT	OR	OFF	2020/03/27 22:25
S40	4	S34 and (RFID adj tag) and UHF and loop	US-PGPUB; USPAT	OR	OFF	2020/03/27 22:25
S41	4	S34 and (RFID adj tag) and (UHF same antenna) and loop	US-PGPUB; USPAT	OR	OFF	2020/03/27 22:25
S42	3	S34 and (RFID adj tag) and (UHF with antenna) and loop	US-PGPUB; USPAT	OR	OFF	2020/03/27 22:25
S43	0	S34 and (RFID adj tag) and (UHF with antenna) and loop and electroconductive	US-PGPUB; USPAT	OR	OFF	2020/03/27 22:25
S44	0	S34 and (RFID adj tag) and (UHF with antenna) and loop and (electro with conductive)	US-PGPUB; USPAT	OR	OFF	2020/03/27 22:26
S45	2	S34 and (RFID adj tag) and (UHF with antenna) and loop and (conductive)	US-PGPUB; USPAT	OR	OFF	2020/03/27 22:26

S46	62,509	S34 and (RFID adj tag) and (UHF with antenna) and loop transponder	US-PGPUB; USPAT	OR	OFF	2020/03/27 22:26
S47	0	S34 and (RFID adj tag) and (UHF with antenna) and loop and transponder	US-PGPUB; USPAT	OR	OFF	2020/03/27 22:26
S48	1	S34 and (RFID adj tag) and (UHF with antenna) and transponder	US-PGPUB; USPAT	OR	OFF	2020/03/27 22:27
S49	11	(US-20070095926-$ or US-20150028107-$ or US-20160048751-$ or US-20140246503-$ or US-20100177008-$ or US-20090079574-$).did. or (US-7432816-$ or US-8910878-$ or US-8334758-$ or US-8035522-$).did. or (US-20090079574-$).did.	US-PGPUB; USPAT; DERWENT	OR	OFF	2020/03/28 01:17
S50	1	S49 and (RFID adj tag) and (UHF with antenna) and transponder	US-PGPUB; USPAT	OR	OFF	2020/03/28 01:18
S51	2	S49 and (RFID adj tag) and ((UHF with antenna) with loop)	US-PGPUB; USPAT	OR	OFF	2020/03/28 01:19
S52	0	S49 and transponder and ((UHF with antenna) with loop)	US-PGPUB; USPAT	OR	OFF	2020/03/28 01:20
S53	0	S49 and ((UHF with antenna) with transponder)	US-PGPUB; USPAT	OR	OFF	2020/03/28 01:22
S54	1	S49 and ((UHF with antenna) same transponder)	US-PGPUB; USPAT	OR	OFF	2020/03/28 01:22
S55	39	(RFID adj tag) and ((UHF with antenna) same transponder same loop)	US-PGPUB; USPAT	OR	OFF	2020/03/28 01:23
S56	36	(RFID adj tag) and ((UHF with antenna) same (RFID with transponder) same loop)	US-PGPUB; USPAT	OR	OFF	2020/03/28 01:23
S57	1	(RFID adj tag) and ((UHF-SHF with antenna) same (RFID with transponder) same loop)	US-PGPUB; USPAT	OR	OFF	2020/03/28 01:23
S58	36	(RFID adj tag) and ((UHF with antenna) same (RFID with transponder) same loop)	US-PGPUB; USPAT	OR	OFF	2020/03/28 01:24
S59	3	S58 and electroconductive	US-PGPUB; USPAT	OR	OFF	2020/03/28 01:24
S60	47	"863813"	US-PGPUB; USPAT	OR	OFF	2020/03/28 01:26
S61	3	"8638193"	US-PGPUB; USPAT	OR	OFF	2020/03/28 01:26
S62	12	(US-20070095926-$ or US-20150028107-$ or US-20160048751-$ or US-20140246503-$ or US-20100177008-$ or US-20090079574-	US-PGPUB; USPAT; DERWENT	OR	OFF	2020/03/28 11:43

		$).did. or (US-7432816-$ or US-8910878-$ or US-8334758-$ or US-8035522-$ or US-8638193-$).did. or (US-20090079574-$).did.				
S63	0	S62 and (RF adj tag) and (UHF adj antenna) and (transponder)	US-PGPUB; USPAT	OR	OFF	2020/03/28 11:43
S64	0	S62 and (RF adj tag) and (UHF with antenna) and (transponder)	US-PGPUB; USPAT	OR	OFF	2020/03/28 11:43
S65	0	S62 and (RF adj transponder) and (UHF with antenna)	US-PGPUB; USPAT	OR	OFF	2020/03/28 11:44
S66	1	S62 and (RF with transponder) and (UHF with antenna)	US-PGPUB; USPAT	OR	OFF	2020/03/28 11:44
S67	0	S62 and (RF with transponder) and (UHF with antenna) and loop	US-PGPUB; USPAT	OR	OFF	2020/03/28 11:44
S68	6	S62 and (RF tag) and (UHF with antenna)	US-PGPUB; USPAT	OR	OFF	2020/03/28 11:44
S69	1	S62 and (RF tag) and (UHF adj antenna)	US-PGPUB; USPAT	OR	OFF	2020/03/28 11:44
S70	0	S62 and (RF adj tag) and (UHF adj antenna)	US-PGPUB; USPAT	OR	OFF	2020/03/28 11:45
S71	0	S62 and (RF with tag) and (UHF adj antenna)	US-PGPUB; USPAT	OR	OFF	2020/03/28 11:45
S72	0	S62 and seal	US-PGPUB; USPAT	OR	OFF	2020/03/28 11:48
S73	586	(RFID adj tag) with seal	US-PGPUB; USPAT	OR	OFF	2020/03/28 11:48
S74	0	(RFID adj tag) with seal with (UHF adj antenna)	US-PGPUB; USPAT	OR	OFF	2020/03/28 11:48
S75	1	seal with (UHF adj antenna)	US-PGPUB; USPAT	OR	OFF	2020/03/28 11:48
S76	13	(US-20070095926-$ or US-20150028107-$ or US-20160048751-$ or US-20140246503-$ or US-20100177008-$ or US-20090079574-$).did. or (US-7432816-$ or US-8910878-$ or US-8334758-$ or US-8035522-$ or US-8638193-$ or US-8120484-$).did. or (US-20090079574-$).did.	US-PGPUB; USPAT; DERWENT	OR	OFF	2020/03/28 22:42
S77	0	S76 and plane and overlap	US-PGPUB; USPAT	OR	OFF	2020/03/28 22:43
S78	4	S76 and plane	US-PGPUB; USPAT	OR	OFF	2020/03/28 22:43
S79	1	S76 and overlap	US-PGPUB; USPAT	OR	OFF	2020/03/28 22:43

S80	13	(US-20070095926-$ or US-20150028107-$ or US-20160048751-$ or US-20140246503-$ or US-20100177008-$ or US-20090079574-$).did. or (US-7432816-$ or US-8910878-$ or US-8334758-$ or US-8035522-$ or US-8638193-$ or US-8120484-$).did. or (US-20090079574-$).did.	US-PGPUB; USPAT; DERWENT	OR	OFF	2020/10/08 00:55
S81	5	S80 and transponder	US-PGPUB; USPAT	OR	OFF	2020/10/08 00:56
S82	3	S80 and transponder and (RFID or (radio adj frequency adj identification)) and UHF	US-PGPUB; USPAT	OR	OFF	2020/10/08 00:57
S83	0	S80 and transponder and (RFID or (radio adj frequency adj identification)) and UHF and SHF	US-PGPUB; USPAT	OR	OFF	2020/10/08 00:57
S84	1	S80 and transponder and (RFID or (radio adj frequency adj identification)) and UHF and loop	US-PGPUB; USPAT	OR	OFF	2020/10/08 00:57
S85	0	"2009079574"	US-PGPUB; USPAT	OR	OFF	2020/10/08 00:59
S86	3	"20090079574"	US-PGPUB; USPAT	OR	OFF	2020/10/08 00:59
S87	16	"2017060652"	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2020/10/08 02:02
S88	2	(RFID adj tags) with (traceability) with (textile adj products)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2020/10/08 02:04

EAST Search History (Interference)

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10/8/2020 11:47:09 PM
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PTO/SB/06 (09-11)
Approved for use through 1/31/2014. OMB 0651-0032
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PATENT APPLICATION FEE DETERMINATION RECORD Substitute for Form PTO-875	Application or Docket Number 16/609,260	Filing Date 10/29/2019	☐ To be Mailed

ENTITY: ☐ LARGE ☑ SMALL ☐ MICRO

APPLICATION AS FILED - PART I

FOR	(Column 1) NUMBER FILED	(Column 2) NUMBER EXTRA		RATE ($)	FEE ($)
☐ BASIC FEE (37 CFR 1.16(a), (b), or (c))	N/A	N/A		N/A	
☐ SEARCH FEE (37 CFR 1.16(k), (i), or (m))	N/A	N/A		N/A	
☐ EXAMINATION FEE (37 CFR 1.16(o), (p), or (q))	N/A	N/A		N/A	
TOTAL CLAIMS (37 CFR 1.16(i))	minus 20 =	*		x $50 =	
INDEPENDENT CLAIMS (37 CFR 1.16(h))	minus 3 =	*		x $230 =	
☐ APPLICATION SIZE FEE (37 CFR 1.16(s))	If the specification and drawings exceed 100 sheets of paper, the application size fee due is $310 ($155 for small entity) for each additional 50 sheets or fraction thereof. See 35 U.S.C. 41(a)(1)(G) and 37 CFR 1.16(s).				
☐ MULTIPLE DEPENDENT CLAIM PRESENT (37 CFR 1.16(j))					
* If the difference in column 1 is less than zero, enter "0" in column 2.				TOTAL	

APPLICATION AS AMENDED - PART II

		(Column 1)		(Column 2)	(Column 3)			
AMENDMENT	06/30/2020	CLAIMS REMAINING AFTER AMENDMENT		HIGHEST NUMBER PREVIOUSLY PAID FOR	PRESENT EXTRA		RATE ($)	ADDITIONAL FEE ($)
	Total (37 CFR 1.16(i))	* 6	Minus	** 20	= 0		x $50 =	0
	Independent (37 CFR 1.16(h))	* 1	Minus	*** 3	= 0		x $230 =	0
	☐ Application Size Fee (37 CFR 1.16(s))							
	☐ FIRST PRESENTATION OF MULTIPLE DEPENDENT CLAIM (37 CFR 1.16(j))							
							TOTAL ADD'L FEE	0

		(Column 1)		(Column 2)	(Column 3)			
AMENDMENT		CLAIMS REMAINING AFTER AMENDMENT		HIGHEST NUMBER PREVIOUSLY PAID FOR	PRESENT EXTRA		RATE ($)	ADDITIONAL FEE ($)
	Total (37 CFR 1.16(i))	*	Minus	**	=		x $0 =	
	Independent (37 CFR 1.16(h))	*	Minus	***	=		x $0 =	
	☐ Application Size Fee (37 CFR 1.16(s))							
	☐ FIRST PRESENTATION OF MULTIPLE DEPENDENT CLAIM (37 CFR 1.16(j))							
							TOTAL ADD'L FEE	

* If the entry in column 1 is less than the entry in column 2, write "0" in column 3.	LIE
** If the "Highest Number Previously Paid For" IN THIS SPACE is less than 20, enter "20".	/MONICA D FRANCIS/
*** If the "Highest Number Previously Paid For" IN THIS SPACE is less than 3, enter "3".	
The "Highest Number Previously Paid For" (Total or Independent) is the highest number found in the appropriate box in column 1.	

This collection of information is required by 37 CFR 1.16. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.14. This collection is estimated to take 12 minutes to complete, including gathering, preparing, and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, VA 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. **SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.**

If you need assistance in completing the form, call 1-800-PTO-9199 and select option 2.

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Applicant	PROMAR TEXTIL INDUSTRIES S.R.L.
Application No. 16/609,260	Filing Date: 10-29-2019
Examiner	GONZALES, APRIL GUZMAN
Title of Application:	RFID TAG FOR HARSH ENVIRONMENT INDUCTIVELY COUPLED IN DOUBLE LOOP
Confirmation No. 1148	Art Unit: 2648
Attorney Docket No.	07610-P0002A

Mail Stop Amendment
Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

AMENDMENT AND RESPONSE TO OFFICE ACTION

Dear Examiner GONZALES:

This Amendment and Response is filed in response to the Office Action dated April 1, issued by the United States Patent and Trademark Office in connection with the above-identified Application. A Response to the Office Action is due **July 1, 2020**. Accordingly, this Amendment is being timely filed.

Amendments to the **claims** begin on page 2 of this paper.

Remarks/Arguments begin on page 4 of this paper.

No fees are believed to be due with this response made herein. Should any fees be required, however, please charge such fees to Deposit Account 50-6926.

AMENDMENTS TO THE CLAIMS

Please add or amend the claims to read as follows, and cancel without prejudice or disclaimer to resubmission in a divisional or continuation application claims indicated as canceled:

1. (Currently Amended) An RFID tag (1) for use in harsh environments comprising:

an UHF-SHF antenna (2) made from a continuous electroconductive textile thread, electrically insulated, embroidered on textile substrate,

an RFID transponder (3), and

a substrate of textile material (4) on which the RFID transponder (3) and the UHF-SHF antenna (2) are placed, the whole assembly being sealed by hot-dipping of a second textile substrate, ~~characterized in that~~

wherein the UHF-SHF antenna (2) has a central zone formed by a double loop (5) by which it inductively couples with the encapsulated RFID transponder (3), wherein the central loop (5) does not have electrical contacts at the intersection points (A and B).

2. (Currently Amended) The RFID tag (1) ~~according to~~of claim 1, ~~characterized in that~~wherein the UHF-SHF antenna (2) is made of an electroconductive textile thread, electrically insulated, by continuous embroidering, starting from one end to the other, and has simple loops in each extremity, and in the central area a double loop (5) consisting of a first loop with a smaller diameter, followed by a second concentric loop with a larger diameter.

3. (Currently Amended) The RFID tag (1) ~~according to~~of claim 1, ~~characterized in that~~wherein the UHF-SHF antenna (2) does not show electrical contacts in the crossing points (C and D) in the construction of the simple loops located at the extremities ~~nor in the crossing points (A and B) by which the central loop (5) is formed~~.

4. (Currently Amended) The RFID tag (1) ~~according to~~of claim 1, ~~characterized in that~~wherein the UHF-SHF antenna (2) is made by continuous embroidering of the elctroconductive textile thread in the form of two open loops disposed in a upper plane in relation to the longitudinal direction and two open loops disposed in a lower plane in relation to the same longitudinal direction.

5. (Currently Amended) The RFID tag (1) ~~according to~~of claim 4, ~~characterized in that~~wherein, in the central area, the upper plane loop (P) has a smaller diameter than the loop (Q) from the lower plane, the transponder (3) being fixed and centered on the loop (P) in the upper plane, and the loop (Q) from the lower plane will overlap the loop (P)) from the upper plane by bending over said longitudinal direction, so that the double loop (5) is created having the transponder (3) inside it.

6. (New) The RFID tag (1) of claim 1, wherein the harsh environments include temperatures between 8-90°C.

REMARKS

The present response is intended to be fully responsive to all points of objection and/or rejection raised by the Examiner and is believed to place the application in condition for allowance. Applicant asserts that the present invention is new, non-obvious and useful.

Favorable reconsideration and allowance of the application is respectfully requested.

STATUS OF CLAIMS

Claims 1-5 have been amended. These amendments do not add new matter.

Claim 6 has been added as a new claim.

Claims 1-6 are pending in the application.

RESPONSE TO CLAIM REJECTIONS

35 U.S.C. § 103 Rejections

In the Office Action, claims 1-5 are rejected under 35 U.S.C. §103, as being unpatentable over Hofer et al. (US 2014/0246503) in view of Chisholm (US 8,120,484).

Applicant respectfully requests reconsideration of the rejection in view of the amendments made to the claims and the following remarks.

Amended Independent claim 1

Independent claim 1 is directed to:

An RFID tag (1) for use in harsh environments comprising:

an UHF-SHF antenna (2) made from a continuous electroconductive textile thread, electrically insulated, embroidered on textile substrate,

an RFID transponder (3), and

a substrate of textile material (4) on which the RFID transponder (3) and the UHF-SHF antenna (2) are placed, the whole assembly being sealed by hot-dipping of a second textile substrate,

wherein the UHF-SHF antenna (2) has a central zone formed by a double loop (5) by which it inductively couples with the encapsulated RFID transponder (3), wherein the central loop (5) does not have electrical contacts at the intersection points (A and B).

Hofer

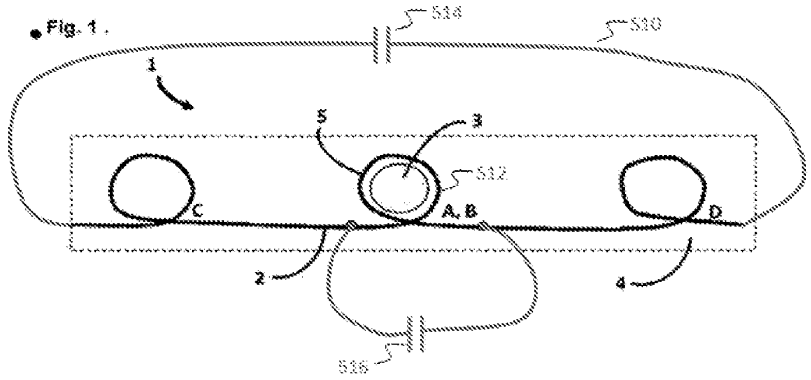
The two solutions, that of Hofer and the one according to amended claim 1, address completely different fields, as Hofer does not disclose or suggest the use of its RFID tag in harsh environments such as a garment subjected to regular washing cycles at temperatures between 8-90°C.

Applicant notes that certainly none of the embodiments described and/or illustrated in Hofer's document discloses a UHF-SHF antenna made of a **continuous (electrically) conductive textile thread** configured such that it forms an antenna in the form of a double loop (**without electrical contact points**), the inner loop forming an inductive coupling region with a transponder.

As mentioned by the Office Action and as disclosed in the paragraphs indicated (e.g., Figure 5 of US 2014/0246503 A1), Hofer explicitly states that the larger loop 510 is electrically connected to its ends with the smaller loop 512. Such an indication excludes, in the Applicant's view, the existence of an antenna made of a continuous thread configured such that it forms an antenna of the type of a double loop, as claimed in amended claim 1.

Moreover, the embodiment in para [0064] of Hofer cited by the Office Action clearly states that each of the two loops forming the antenna is coupled to a capacitor (514, 516) forming thus a first and a second electrical circuit, respectively. In addition, the same antenna construction associated with the cited embodiment comprises a dipole antenna 518 provided in the form of a third circuit, electrically connected to said second electrical circuit.

More specifically, if Applicant's antenna was modified according to the teachings of Hofer, then the modified design of Applicant's antenna would be shown below, which obviously differs structurally from the antenna illustrated in Figs. 1 and 2 of the instant application:



A construction of the type illustrated above is not only completely out of the scope with Applicant's claimed invention, but also impossible to achieve by means of a **continuous (electrically) conductive textile thread** embroidered on a textile fabric.

Thus, the solution disclosed in Hofer document differs fundamentally from the design of the antenna according to amended claim 1, which was designed to provide, by means of a **continuous (electrically) conductive textile thread**, an antenna with improved electromagnetic properties and at the same time a lower size (see para [0030] of the application as published) so that it can be integrated into a textile article subjected to harsh processing conditions when washed and/or cleaned.

In conclusion, Applicant considers that the essential differences mentioned above make amended claim 1 not only a new solution in relation to Hofer document, but also a nonobvious one in relation to the state of the art cited, as a person skilled in the art would not have reached the claimed invention for the simple reason that the two cited documents (Hofer and Chisholm), alone or in combination, do not contain sufficient essential technical features common to the claimed invention.

Accordingly, withdrawal of the rejections under §103(a) is respectfully requested.

CONCLUSION

In view of the above, each of the presently pending claims is believed to be in an immediate condition for allowance. Accordingly, the Examiner is respectfully requested to withdraw the outstanding objections and rejections and pass this application to issue.

If there are any questions, the Examiner is invited to call Applicant's representative, Roy D. Gross, at (203) 423-0235, to resolve any remaining issues to expedite the allowance of this application.

Respectfully submitted,

/Roy D. Gross/

June 30, 2020

Roy D. Gross, Registration No. 63,524
Attorney for Applicant
THE ROY GROSS LAW FIRM, LLC
50 WASHINGTON STREET, SUITE 737/745
Norwalk, CT 06854
(203) 423-0235

Electronic Acknowledgement Receipt	
EFS ID:	39865465
Application Number:	16609260
International Application Number:	
Confirmation Number:	1148
Title of Invention:	RFID TAG FOR HARSH ENVIRONMENT INDUCTIVELY COUPLED IN DOUBLE LOOP
First Named Inventor/Applicant Name:	Aurelian MORARU
Customer Number:	136531
Filer:	Roy D. Gross
Filer Authorized By:	
Attorney Docket Number:	07610-P0002A
Receipt Date:	30-JUN-2020
Filing Date:	29-OCT-2019
Time Stamp:	10:13:24
Application Type:	U.S. National Stage under 35 USC 371

Payment information:

Submitted with Payment	no

File Listing:

Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)
1		07610-P0002A-Response-OA-1-APR-2020.pdf	187476 457a022d99a9ff2eaba06dee58c8bd9a0b0760fe	yes	7

	Multipart Description/PDF files in .zip description		
	Document Description	**Start**	**End**
	Amendment/Req. Reconsideration-After Non-Final Reject	1	1
	Claims	2	3
	Applicant Arguments/Remarks Made in an Amendment	4	7
Warnings:			
Information:			
	Total Files Size (in bytes):	187476	

This Acknowledgement Receipt evidences receipt on the noted date by the USPTO of the indicated documents, characterized by the applicant, and including page counts, where applicable. It serves as evidence of receipt similar to a Post Card, as described in MPEP 503.

New Applications Under 35 U.S.C. 111
If a new application is being filed and the application includes the necessary components for a filing date (see 37 CFR 1.53(b)-(d) and MPEP 506), a Filing Receipt (37 CFR 1.54) will be issued in due course and the date shown on this Acknowledgement Receipt will establish the filing date of the application.
National Stage of an International Application under 35 U.S.C. 371
If a timely submission to enter the national stage of an international application is compliant with the conditions of 35 U.S.C. 371 and other applicable requirements a Form PCT/DO/EO/903 indicating acceptance of the application as a national stage submission under 35 U.S.C. 371 will be issued in addition to the Filing Receipt, in due course.
New International Application Filed with the USPTO as a Receiving Office
If a new international application is being filed and the international application includes the necessary components for an international filing date (see PCT Article 11 and MPEP 1810), a Notification of the International Application Number and of the International Filing Date (Form PCT/RO/105) will be issued in due course, subject to prescriptions concerning national security, and the date shown on this Acknowledgement Receipt will establish the international filing date of the application.

UNITED STATES PATENT AND TRADEMARK OFFICE

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www.uspto.gov

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
16/609,260	10/29/2019	Aurelian MORARU	07610-P0002A	1148

136531 7590 04/01/2020

The Roy Gross Law Firm, LLC
50 Washington Street
Suite 737/745
Norwalk, CT 06854

EXAMINER	
GONZALES, APRIL GUZMAN	

ART UNIT	PAPER NUMBER
2648	

MAIL DATE	DELIVERY MODE
04/01/2020	PAPER

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	Application No. 16/609,260	Applicant(s) MORARU et al.	
	Examiner APRIL G GONZALES	Art Unit 2648	AIA (FITF) Status Yes

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTHS FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☑ Responsive to communication(s) filed on 10/29/2019.

☐ A declaration(s)/affidavit(s) under **37 CFR 1.130(b)** was/were filed on _____.

2a)☐ This action is **FINAL.** 2b) ☑ This action is non-final.

3)☐ An election was made by the applicant in response to a restriction requirement set forth during the interview on _____; the restriction requirement and election have been incorporated into this action.

4)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims*

5) ☑ Claim(s) 1-5 is/are pending in the application.

5a) Of the above claim(s) _____ is/are withdrawn from consideration.

6) ☐ Claim(s) _____ is/are allowed.

7) ☑ Claim(s) 1-5 is/are rejected.

8) ☐ Claim(s) _____ is/are objected to.

9) ☐ Claim(s) _____ are subject to restriction and/or election requirement

* If any claims have been determined allowable, you may be eligible to benefit from the **Patent Prosecution Highway** program at a participating intellectual property office for the corresponding application. For more information, please see http://www.uspto.gov/patents/init_events/pph/index.jsp or send an inquiry to **PPHfeedback@uspto.gov.**

Application Papers

10)☐ The specification is objected to by the Examiner.

11)☑ The drawing(s) filed on 10/29/2019 is/are: a)☑ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

Priority under 35 U.S.C. § 119

12)☑ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

Certified copies:

a)☐ All b)☑ Some** c)☐ None of the:

1.☑ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

** See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☑ Notice of References Cited (PTO-892)

2) ☑ Information Disclosure Statement(s) (PTO/SB/08a and/or PTO/SB/08b) Paper No(s)/Mail Date 03/27/2020.

3) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date _____.

4) ☐ Other: _____.

DETAILED ACTION

Notice of Pre-AIA or AIA Status

The present application, filed on or after March 16, 2013, is being examined under the first inventor to file provisions of the AIA.

Preliminary Amendment

The present Office Action is based upon the original patent application filed on 10/29/2019 as modified by the preliminary amendment filed on 10/29/2019. **Claims 1-5** are now pending in the present application.

Priority

Applicant's claim for domestic priority under 35 U.S.C. 119(e) is acknowledged.

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103 which forms the basis for all obviousness rejections set forth in this Office action:

> A patent for a claimed invention may not be obtained, notwithstanding that the claimed invention is not identically disclosed as set forth in section 102, if the differences between the claimed invention and the prior art are such that the claimed invention as a whole would have been obvious before the effective filing date of the claimed invention to a person having ordinary skill in the art to which the claimed invention pertains. Patentability shall not be negated by the manner in which the invention was made.

The factual inquiries set forth in *Graham v. John Deere Co.*, 383 U.S. 1, 148 USPQ 459 (1966), that are applied for establishing a background for determining obviousness under 35 U.S.C. 103 are summarized as follows:

1. Determining the scope and contents of the prior art.

2. Ascertaining the differences between the prior art and the claims at issue.

3. Resolving the level of ordinary skill in the pertinent art.

4. Considering objective evidence present in the application indicating obviousness or nonobviousness.

This application currently names joint inventors. In considering patentability of the claims the examiner presumes that the subject matter of the various claims was commonly owned as of the effective filing date of the claimed invention(s) absent any evidence to the contrary. Applicant is advised of the obligation under 37 CFR 1.56 to point out the inventor and effective filing dates of each claim that was not commonly owned as of the effective filing date of the later invention in order for the examiner to consider the applicability of 35 U.S.C. 102(b)(2)(C) for any potential 35 U.S.C. 102(a)(2) prior art against the later invention.

Claims 1-5 are rejected under 35 U.S.C. 103 as being unpatentable over **Hofer et al. (US 2014/0246503 A1 herein Hofer)**, and further in view of **Chisholm (US 8,120,484 B2)**.

Consider **claim 1**, Hofer teaches an RFID tag (1) for use in harsh environments comprising a UHF-SHF antenna (2) (read as booster antenna 504) (Hofer – Figure 5, [0057]-[0060]) made from a continuous electroconductive textile thread (read as booster antenna 504 can have substantially two conductor loops 510, 512, a large conductor loop 510 and a small conductor loop 512 wherein the large conductor loop 510 is electrically conductively connected with its end to the ends of the small

conductor loop 512) (Hofer - Figure 5, and [0064]), electrically insulated, embroidered on a textile substrate (read as smart card body 502), an RFID transponder (3) (read as contactless smart card module 506) (Hofer – Figure 5, [0060]-[0061]) and a substrate of textile material (4) on which the RFID transponder (3) and the UHF-SHF antenna (2) are placed, characterized that the UHF-SHF antenna (2) has a central zone formed by a double loop (5) by which it inductively couples with the encapsulated RFID Transponder (3) (read as booster antenna 504 can be inductively coupled to the coil of the contactless smart card module 506 (also referred to as contactless smart card module) by means of the at least one inductive coupling region 218 of the booster antenna 504, the contactless smart card module 506 shown inside the double loop) (Hofer – Figure 5, [0061]).

However, Hofer fails to teach the whole assembly being sealed by hot-dipping of a second textile substrate.

In the related art, Chisholm teaches the whole assembly being sealed by hot-dipping of a second textile substrate (read as closure shell for sealing engagement; induction or conduction welded to the end surface to seal the package) (Chisholm – column 1 lines 13-40, and column 2 lines 23-34).

Therefore, it would have been obvious to one of ordinary skill in the art before the effective filing date to incorporate the teachings of Chisholm into the teachings of Hofer for the purpose of providing a plastic shell for securement wherein an RFID tag disposed within said shell including an RFID circuit and a UHF antenna coupled to said circuit (Chisholm – column 1 lines 13-40).

Consider **claim 2 as applied to claim 1**, Hofer as modified by Chisholm further teaches characterized in that the UHF-SHF antenna (2) is made of an electroconductive textile thread, electrically insulated, by continuous embroidering, starting from one end to the other (read as booster antenna 504 can have substantially two conductor loops 510, 512, a large conductor loop 510 and a small conductor loop 512 wherein the large conductor loop 510 is electrically conductively connected with its end to the ends of the small conductor loop 512) (Hofer - Figure 5, and [0064]), and has simple loops in each extremity, and in the central area a double loop (5) consisting of a first loop with a smaller diameter, followed by a second concentric loop with a larger diameter (read as booster antenna 504 can be inductively coupled to the coil of the contactless smart card module 506 (also referred to as contactless smart card module) by means of the at least one inductive coupling region 218 of the booster antenna 504, the contactless smart card module 506 shown inside the double loop) (Hofer – Figure 5, and [0061]).

Consider **claim 3 as applied to claim 1**, Hofer as modified by Chisholm further teaches characterized in that the UHF-SHF antenna (2), does not show electrical contacts in the crossing points (C and D) in the construction of the simple loops located at the extremities nor in the crossing points (A and B) by which the central double loop (5) is formed (Hofer – see Figure 5, and [0061]).

Consider **claim 4 as applied to claim 1**, Hofer as modified by Chisholm further teaches characterized in that the UHF-SHF antenna (2) is made by continuous embroidering of the electroconductive textile thread in the form of two open loops disposed in a upper plane in relation to the longitudinal direction and two open loops

disposed in a lower plane in relation to the same longitudinal direction (read as the booster antenna can be provided on a separate layer and contained in the smart card; the separate layer which contains the booster antenna can be or can have been laminated into the smart card; over used with regards to a deposited material formed "over" a surface; additional layers) (Hofer – [0005], [0028], [0057]-[0061], and [0064]).

Consider **claim 5 as applied to claim 4**, Hofer as modified by Chisholm further teaches characterized in that, in the central area, the upper plane loop (P) has a smaller diameter than the loop (Q) from the lower plane, the transponder (3) being fixed and centered on the loop (P) in the upper plane, and the loop (Q) of the lower plane will overlap the loop (P) from the upper plane by bending over said longitudinal direction, so that the double loop (5) is created having the transponder (3) inside it (Hofer – [0005], [0028], [0057]-[0061], and [0064]).

Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to APRIL GUZMAN GONZALES whose telephone number is (571)270-1101. The examiner can normally be reached on Monday - Friday 8:00 am to 4:00 pm EST.

Examiner interviews are available via telephone, in-person, and video conferencing using a USPTO supplied web-based collaboration tool. To schedule an

interview, applicant is encouraged to use the USPTO Automated Interview Request (AIR) at http://www.uspto.gov/interviewpractice.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Wesley L. Kim can be reached on (571) 272-7867. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/APRIL G GONZALES/
Primary Examiner, Art Unit 2648

Notice of References Cited	Application/Control No. 16/609,260	Applicant(s)/Patent Under Reexamination MORARU et al.	
	Examiner APRIL G GONZALES	Art Unit 2648	Page 1 of 1

U.S. PATENT DOCUMENTS

*		Document Number Country Code-Number-Kind Code	Date MM-YYYY	Name	CPC Classification	US Classification
*	A	US-20070095926-A1	05-2007	Zhu; Shengbo	G06K19/07767	235/492
*	B	US-7432816-B1	10-2008	Ku; Joseph	G06K19/0723	340/572.1
*	C	US-8910878-B2	12-2014	Fan; Chen-Jyh	G06K19/07749	235/487
*	D	US-8334758-B2	12-2012	Baruco; Sam	H01Q1/3241	340/12.5
*	E	US-20150028107-A1	01-2015	Fischer; Jorg	B42D25/455	235/488
*	F	US-20160048751-A1	02-2016	IMBRUGLIO; Richard	G06K19/02	235/492
*	G	US-20140246503-A1	09-2014	Hofer; Guenter	G06K19/07794	235/492
*	H	US-20100177008-A1	07-2010	Bohn; Martin	G06K7/10178	343/878
*	I	US-20090079574-A1	03-2009	Oroku; Noriyuki	G06K19/07749	340/572.7
*	J	US-8035522-B2	10-2011	Oroku; Noriyuki	G06K19/07749	340/572.1
*	K	US-8638193-B2	01-2014	Margalef; Aurelie	G06K19/07749	340/10.1
*	L	US-8120484-B2	02-2012	Chisholm; Brian J.	G06K7/10178	215/201
	M					

FOREIGN PATENT DOCUMENTS

*		Document Number Country Code-Number-Kind Code	Date MM-YYYY	Country	Name	CPC Classification
	N					
	O					
	P					
	Q					
	R					
	S					
	T					

NON-PATENT DOCUMENTS

*		Include as applicable: Author, Title Date, Publisher, Edition or Volume, Pertinent Pages)
	U	
	V	
	W	
	X	

*A copy of this reference is not being furnished with this Office action. (See MPEP § 707.05(a).)
Dates in MM-YYYY format are publication dates. Classifications may be US or foreign.

Index of Claims	Application/Control No.	Applicant(s)/Patent Under Reexamination
	16/609,260	MORARU et al.
	Examiner	**Art Unit**
	APRIL G GONZALES	2648

✓	Rejected	-	Cancelled	N	Non-Elected	A	Appeal
=	Allowed	÷	Restricted	I	Interference	O	Objected

CLAIMS

☐ Claims renumbered in the same order as presented by applicant ☐ CPA ☐ T.D. ☐ R.1.47

CLAIM		DATE								
Final	Original	03/28/2020								
	1	✓								
	2	✓								
	3	✓								
	4	✓								
	5	✓								

Search Notes	Application/Control No.	Applicant(s)/Patent Under Reexamination
	16/609,260	MORARU et al.
	Examiner	Art Unit
	APRIL G GONZALES	2648

CPC - Searched*		
Symbol	**Date**	**Examiner**
H04B5/0062	03/27/2020	agg
H04B5/0068	03/27/2020	agg
H04B5/0081	03/27/2020	agg
H01Q7/00	03/27/2020	agg
H01Q1/40	03/27/2020	agg
H01Q1/2225	03/27/2020	agg

CPC Combination Sets - Searched*		
Symbol	**Date**	**Examiner**

US Classification - Searched*			
Class	**Subclass**	**Date**	**Examiner**
455	41.1	03/27/2020	agg

* See search history printout included with this form or the SEARCH NOTES box below to determine the scope of the search.

/APRIL G GONZALES/ Primary Examiner, Art Unit 2648	

Search Notes	Application/Control No.	Applicant(s)/Patent Under Reexamination
	16/609,260	MORARU et al.
	Examiner	Art Unit
	APRIL G GONZALES	2648

Search Notes		
Search Notes	**Date**	**Examiner**
EAST keyword and image Search	03/27/2020	agg
CPC Search	03/27/2020	agg
IP.com Search	03/27/2020	agg
Global Dossier	03/27/2020	agg
Double Patenting Search	03/27/2020	agg
IDS filed on 03/27/2020	03/27/2020	agg
Incoming Written Opinion of the ISA	03/27/2020	agg

Interference Search			
US Class/CPC Symbol	**US Subclass/CPC Group**	**Date**	**Examiner**

/APRIL G GONZALES/ Primary Examiner, Art Unit 2648	

Doc code: IDS
Doc description: Information Disclosure Statement (IDS) Filed

PTO/SB/08a (02-18)
Approved for use through 11/30/2020. OMB 0651-0031
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INFORMATION DISCLOSURE STATEMENT BY APPLICANT
(Not for submission under 37 CFR 1.99)

Application Number	16609260
Filing Date	2019-10-29
First Named Inventor	MORAU, Aurelian
Art Unit	2648
Examiner Name	GONZALES, April Guzman
Attorney Docket Number	07610-P0002A

U.S.PATENTS Remove

Examiner Initial*	Cite No	Patent Number	Kind Code[1]	Issue Date	Name of Patentee or Applicant of cited Document	Pages,Columns,Lines where Relevant Passages or Relevant Figures Appear
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Examiner Initial*	Cite No	Publication Number	Kind Code[1]	Publication Date	Name of Patentee or Applicant of cited Document	Pages,Columns,Lines where Relevant Passages or Relevant Figures Appear
	1	20090079574		2009-03-26	OROKU, et al.	
	2	20140246503		2014-09-04	HOFER, et al.	Corresponds with DE 102013102051
	3	20100177008		2010-07-15	BOHN, M.	Corresponds with DE 102007026720

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Examiner Initial*	Cite No	Foreign Document Number[3]	Country Code[2] i	Kind Code[4]	Publication Date	Name of Patentee or Applicant of cited Document	Pages,Columns,Lines where Relevant Passages or Relevant Figures Appear	T[5]
	1	2017060652	WO		2017-04-13	ELBAZ, D.		X

ALL REFERENCES CONSIDERED EXCEPT WHERE LINED THROUGH. /A.G.G/

INFORMATION DISCLOSURE STATEMENT BY APPLICANT (Not for submission under 37 CFR 1.99)		
	Application Number	16609260
	Filing Date	2019-10-29
	First Named Inventor	MORAU, Aurelian
	Art Unit	2648
	Examiner Name	GONZALES, April Guzman
	Attorney Docket Number	07610-P0002A

	2	102013102051	DE		2014-09-04	PACHLER, et al.	Corresponds with US 2014/0246503	☐
	3	2405054	EP		2012-01-11	PACHOUD, et al.		☐
	4	102007026720	DE		2008-12-11	BOHN, Martin	Corresponds with US 2010/0177008	☐
	5	2012014005	WO		2012-02-02	BARLERIN, et al.		☐
	6	2013128299	WO		2013-09-06	USTA, Kutluhan		☐

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NON-PATENT LITERATURE DOCUMENTS Remove

Examiner Initials*	Cite No	Include name of the author (in CAPITAL LETTERS), title of the article (when appropriate), title of the item (book, magazine, journal, serial, symposium, catalog, etc), date, pages(s), volume-issue number(s), publisher, city and/or country where published.	T[5]
	1	International Search Report, International Application No. PCT/RO2017/000023, dated 7 June 2018.	

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EXAMINER SIGNATURE

Examiner Signature	/APRIL G GONZALES/ (03/27/2020)	Date Considered	03/27/2020

*EXAMINER: Initial if reference considered, whether or not citation is in conformance with MPEP 609. Draw line through a citation if not in conformance and not considered. Include copy of this form with next communication to applicant.

[1] See Kind Codes of USPTO Patent Documents at www.USPTO.GOV or MPEP 901.04. [2] Enter office that issued the document, by the two-letter code (WIPO Standard ST.3). [3] For Japanese patent documents, the indication of the year of the reign of the Emperor must precede the serial number of the patent document. [4] Kind of document by the appropriate symbols as indicated on the document under WIPO Standard ST.16 if possible. [5] Applicant is to place a check mark here if English language translation is attached.

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INFORMATION DISCLOSURE STATEMENT BY APPLICANT (Not for submission under 37 CFR 1.99)		
	Application Number	16609260
	Filing Date	2019-10-29
	First Named Inventor	MORAU, Aurelian
	Art Unit	2648
	Examiner Name	GONZALES, April Guzman
	Attorney Docket Number	07610-P0002A

CERTIFICATION STATEMENT

Please see 37 CFR 1.97 and 1.98 to make the appropriate selection(s):

That each item of information contained in the information disclosure statement was first cited in any communication from a foreign patent office in a counterpart foreign application not more than three months prior to the filing of the information disclosure statement. See 37 CFR 1.97(e)(1).

OR

☐ That no item of information contained in the information disclosure statement was cited in a communication from a foreign patent office in a counterpart foreign application, and, to the knowledge of the person signing the certification after making reasonable inquiry, no item of information contained in the information disclosure statement was known to any individual designated in 37 CFR 1.56(c) more than three months prior to the filing of the information disclosure statement. See 37 CFR 1.97(e)(2).

See attached certification statement.

The fee set forth in 37 CFR 1.17 (p) has been submitted herewith.

☒ A certification statement is not submitted herewith.

SIGNATURE

A signature of the applicant or representative is required in accordance with CFR 1.33, 10.18. Please see CFR 1.4(d) for the form of the signature.

Signature	/Roy D. Gross/	Date (YYYY-MM-DD)	2020-03-27
Name/Print	Roy D. Gross	Registration Number	63524

This collection of information is required by 37 CFR 1.97 and 1.98. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.14. This collection is estimated to take 1 hour to complete, including gathering, preparing and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, VA 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. **SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.**

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6. A record in this system of records may be disclosed, as a routine use, to another federal agency for purposes of National Security review (35 U.S.C. 181) and for review pursuant to the Atomic Energy Act (42 U.S.C. 218(c)).

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9. A record from this system of records may be disclosed, as a routine use, to a Federal, State, or local law enforcement agency, if the USPTO becomes aware of a violation or potential violation of law or regulation.

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Bibliographic Data

Application No: 16/609,260

Foreign Priority claimed: (•) Yes ( ) No

35 USC 119 (a-d) conditions met: [ ] Yes [✓] No [ ] Met After Allowance

Verified and Acknowledged: /APRIL G GONZALES/ Examiner's Signature | Initials

Title: RFID TAG FOR HARSH ENVIRONMENT INDUCTIVELY COUPLED IN DOUBLE LOOP

FILING or 371(c) DATE	CLASS	GROUP ART UNIT	ATTORNEY DOCKET NO.
10/29/2019	455	2648	07610-P0002A
RULE			

APPLICANTS

PROMAR TEXTIL INDUSTRIES S.R.L., Brasov, ROMANIA

INVENTORS

Aurelian MORARU Brasov, ROMANIA

Corneliu URSACHI Brasov, ROMANIA

CONTINUING DATA

This application is a 371 of PCT/RO2017/000023 12/19/2017

FOREIGN APPLICATIONS

ROMANIA A 2017 00388 06/16/2017

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Norwalk, CT 06854
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EAST Search History

EAST Search History (Prior Art)

Ref #	Hits	Search Query	DBs	Default Operator	Plurals	Time Stamp
S1	1	Moraru.in. and promar.as.	US-PGPUB; USPAT	OR	OFF	2020/03/25 15:24
S2	0	455/41.1.ccls. and Moraru.in.	US-PGPUB; USPAT	OR	OFF	2020/03/25 18:36
S3	1	H01Q1/2225.cpc. and Moraru.in.	US-PGPUB; USPAT	OR	OFF	2020/03/25 18:36
S4	1	H01Q1/14.cpc. and Moraru.in.	US-PGPUB; USPAT	OR	OFF	2020/03/25 18:36
S5	1	H01Q1/40.cpc. and Moraru.in.	US-PGPUB; USPAT	OR	OFF	2020/03/25 18:36
S6	1	H01Q7/00.cpc. and Moraru.in.	US-PGPUB; USPAT	OR	OFF	2020/03/25 18:36
S7	1	H04B5/0062.cpc. and Moraru.in.	US-PGPUB; USPAT	OR	OFF	2020/03/25 18:37
S8	1	H04B5/0068.cpc. and Moraru.in.	US-PGPUB; USPAT	OR	OFF	2020/03/25 18:37
S9	1	H04B5/0081.cpc. and Moraru.in.	US-PGPUB; USPAT	OR	OFF	2020/03/25 18:37
S10	4	"20070095926"	US-PGPUB; USPAT	OR	OFF	2020/03/25 18:38
S11	2017	(RFID adj tag) with (UHF or SHF)	US-PGPUB; USPAT	OR	OFF	2020/03/25 18:42
S12	3	(RFID adj tag) with (UHF-SHF)	US-PGPUB; USPAT	OR	OFF	2020/03/25 18:42
S13	18	"7432816"	US-PGPUB; USPAT	OR	OFF	2020/03/25 19:03
S14	4	S13 and (RFID with tag) and (UHF)	US-PGPUB; USPAT	OR	OFF	2020/03/25 19:04
S15	2	"20150028107"	US-PGPUB; USPAT	OR	OFF	2020/03/25 19:05
S16	2	"20160048751"	US-PGPUB; USPAT	OR	OFF	2020/03/25 19:05
S17	6	(US-20070095926-$ or US-20150028107-$ or US-20160048751-$).did. or (US-7432816-$ or US-8910878-$ or US-8334758-$).did.	US-PGPUB; USPAT	OR	OFF	2020/03/25 19:09
S18	1	S17 and (RFID with tag) and (UHF) and transponder	US-PGPUB; USPAT	OR	OFF	2020/03/25 19:10
S19	0	S17 and (RFID with tag) and (UHF) and transponder and textile	US-PGPUB; USPAT	OR	OFF	2020/03/25 19:18
S20	0	S17 and (RFID with tag) and (UHF) and textile	US-PGPUB; USPAT	OR	OFF	2020/03/25 19:18
S21	0	S17 and (RFID with tag) and textile	US-PGPUB; USPAT	OR	OFF	2020/03/25 19:18
S22	0	S17 and (RFID with tag) and	US-PGPUB;	OR	OFF	2020/03/25

		electroconductive	USPAT			19:18
S23	1	(RFID with tag) and hot-dipping	US-PGPUB; USPAT	OR	OFF	2020/03/25 19:19
S24	18	(RFID with tag) same (double with loop)	US-PGPUB; USPAT	OR	OFF	2020/03/25 19:22
S25	1	((RFID with tag) same (double with loop)) and (RFID with transponder)	US-PGPUB; USPAT	OR	OFF	2020/03/25 19:22
S26	12	((RFID with tag) same (double with loop)) and UHF	US-PGPUB; USPAT	OR	OFF	2020/03/25 19:22
S27	1	((RFID with tag) same (double with loop)) and UHF-SHF	US-PGPUB; USPAT	OR	OFF	2020/03/25 19:23
S28	3	(RFID with tag) and UHF-SHF	US-PGPUB; USPAT	OR	OFF	2020/03/25 19:23
S29	14	"2017060652"	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2020/03/27 21:43
S30	6	"20090079574"	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2020/03/27 21:45
S31	3	"20140246503"	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2020/03/27 21:46
S32	3	"20100177008"	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2020/03/27 21:46
S33	14	"8035522"	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2020/03/27 22:19
S34	11	(US-20070095926-$ or US-20150028107-$ or US-20160048751-$ or US-20140246503-$ or US-20100177008-$ or US-20090079574-$).did. or (US-7432816-$ or US-8910878-$ or US-8334758-$ or US-8035522-$).did. or (US-20090079574-$).did.	US-PGPUB; USPAT; DERWENT	OR	OFF	2020/03/27 22:21
S35	7	S34 and (RFID adj tag)	US-PGPUB; USPAT	OR	OFF	2020/03/27 22:21
S36	2	S34 and (RFID adj tag) and	US-PGPUB;	OR	OFF	2020/03/27

		transponder	USPAT			22:21
S37	1	S34 and (RFID adj tag) and transponder and loop	US-PGPUB; USPAT	OR	OFF	2020/03/27 22:21
S38	1	S34 and (RFID adj tag) and transponder and UHF	US-PGPUB; USPAT	OR	OFF	2020/03/27 22:22
S39	5	S34 and (RFID adj tag) and UHF	US-PGPUB; USPAT	OR	OFF	2020/03/27 22:25
S40	4	S34 and (RFID adj tag) and UHF and loop	US-PGPUB; USPAT	OR	OFF	2020/03/27 22:25
S41	4	S34 and (RFID adj tag) and (UHF same antenna) and loop	US-PGPUB; USPAT	OR	OFF	2020/03/27 22:25
S42	3	S34 and (RFID adj tag) and (UHF with antenna) and loop	US-PGPUB; USPAT	OR	OFF	2020/03/27 22:25
S43	0	S34 and (RFID adj tag) and (UHF with antenna) and loop and electroconductive	US-PGPUB; USPAT	OR	OFF	2020/03/27 22:25
S44	0	S34 and (RFID adj tag) and (UHF with antenna) and loop and (electro with conductive)	US-PGPUB; USPAT	OR	OFF	2020/03/27 22:26
S45	2	S34 and (RFID adj tag) and (UHF with antenna) and loop and (conductive)	US-PGPUB; USPAT	OR	OFF	2020/03/27 22:26
S46	62509	S34 and (RFID adj tag) and (UHF with antenna) and loop transponder	US-PGPUB; USPAT	OR	OFF	2020/03/27 22:26
S47	0	S34 and (RFID adj tag) and (UHF with antenna) and loop and transponder	US-PGPUB; USPAT	OR	OFF	2020/03/27 22:26
S48	1	S34 and (RFID adj tag) and (UHF with antenna) and transponder	US-PGPUB; USPAT	OR	OFF	2020/03/27 22:27
S49	11	(US-20070095926-$ or US-20150028107-$ or US-20160048751-$ or US-20140246503-$ or US-20100177008-$ or US-20090079574-$).did. or (US-7432816-$ or US-8910878-$ or US-8334758-$ or US-8035522-$).did. or (US-20090079574-$).did.	US-PGPUB; USPAT; DERWENT	OR	OFF	2020/03/28 01:17
S50	1	S49 and (RFID adj tag) and (UHF with antenna) and transponder	US-PGPUB; USPAT	OR	OFF	2020/03/28 01:18
S51	2	S49 and (RFID adj tag) and ((UHF with antenna) with loop)	US-PGPUB; USPAT	OR	OFF	2020/03/28 01:19
S52	0	S49 and transponder and ((UHF with antenna) with loop)	US-PGPUB; USPAT	OR	OFF	2020/03/28 01:20
S53	0	S49 and ((UHF with antenna) with transponder)	US-PGPUB; USPAT	OR	OFF	2020/03/28 01:22
S54	1	S49 and ((UHF with antenna) same transponder)	US-PGPUB; USPAT	OR	OFF	2020/03/28 01:22
S55	39	(RFID adj tag) and ((UHF with antenna) same transponder same loop)	US-PGPUB; USPAT	OR	OFF	2020/03/28 01:23
S56	36	(RFID adj tag) and ((UHF with antenna) same (RFID with transponder) same loop)	US-PGPUB; USPAT	OR	OFF	2020/03/28 01:23
S57	1	(RFID adj tag) and ((UHF-SHF with antenna) same (RFID with transponder) same loop)	US-PGPUB; USPAT	OR	OFF	2020/03/28 01:23
S58	36	(RFID adj tag) and ((UHF with antenna) same (RFID with transponder) same loop)	US-PGPUB; USPAT	OR	OFF	2020/03/28 01:24

S59	3	S58 and electroconductive	US-PGPUB; USPAT	OR	OFF	2020/03/28 01:24
S60	47	"863813"	US-PGPUB; USPAT	OR	OFF	2020/03/28 01:26
S61	3	"8638193"	US-PGPUB; USPAT	OR	OFF	2020/03/28 01:26
S62	12	(US-20070095926-$ or US-20150028107-$ or US-20160048751-$ or US-20140246503-$ or US-20100177008-$ or US-20090079574-$).did. or (US-7432816-$ or US-8910878-$ or US-8334758-$ or US-8035522-$ or US-8638193-$).did. or (US-20090079574-$).did.	US-PGPUB; USPAT; DERWENT	OR	OFF	2020/03/28 11:43
S63	0	S62 and (RF adj tag) and (UHF adj antenna) and (transponder)	US-PGPUB; USPAT	OR	OFF	2020/03/28 11:43
S64	0	S62 and (RF adj tag) and (UHF with antenna) and (transponder)	US-PGPUB; USPAT	OR	OFF	2020/03/28 11:43
S65	0	S62 and (RF adj transponder) and (UHF with antenna)	US-PGPUB; USPAT	OR	OFF	2020/03/28 11:44
S66	1	S62 and (RF with transponder) and (UHF with antenna)	US-PGPUB; USPAT	OR	OFF	2020/03/28 11:44
S67	0	S62 and (RF with transponder) and (UHF with antenna) and loop	US-PGPUB; USPAT	OR	OFF	2020/03/28 11:44
S68	6	S62 and (RF tag) and (UHF with antenna)	US-PGPUB; USPAT	OR	OFF	2020/03/28 11:44
S69	1	S62 and (RF tag) and (UHF adj antenna)	US-PGPUB; USPAT	OR	OFF	2020/03/28 11:44
S70	0	S62 and (RF adj tag) and (UHF adj antenna)	US-PGPUB; USPAT	OR	OFF	2020/03/28 11:45
S71	0	S62 and (RF with tag) and (UHF adj antenna)	US-PGPUB; USPAT	OR	OFF	2020/03/28 11:45
S72	0	S62 and seal	US-PGPUB; USPAT	OR	OFF	2020/03/28 11:48
S73	586	(RFID adj tag) with seal	US-PGPUB; USPAT	OR	OFF	2020/03/28 11:48
S74	0	(RFID adj tag) with seal with (UHF adj antenna)	US-PGPUB; USPAT	OR	OFF	2020/03/28 11:48
S75	1	seal with (UHF adj antenna)	US-PGPUB; USPAT	OR	OFF	2020/03/28 11:48
S76	13	(US-20070095926-$ or US-20150028107-$ or US-20160048751-$ or US-20140246503-$ or US-20100177008-$ or US-20090079574-$).did. or (US-7432816-$ or US-8910878-$ or US-8334758-$ or US-8035522-$ or US-8638193-$ or US-8120484-$).did. or (US-20090079574-$).did.	US-PGPUB; USPAT; DERWENT	OR	OFF	2020/03/28 22:42
S77	0	S76 and plane and overlap	US-PGPUB; USPAT	OR	OFF	2020/03/28 22:43
S78	4	S76 and plane	US-PGPUB; USPAT	OR	OFF	2020/03/28 22:43
S79	1	S76 and overlap	US-PGPUB; USPAT	OR	OFF	2020/03/28 22:43

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Application Number	16609260
Filing Date	2019-10-29
First Named Inventor	MORAU, Aurelian
Art Unit	2648
Examiner Name	GONZALES, April Guzman
Attorney Docket Number	07610-P0002A

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	2	20140246503		2014-09-04	HOFER, et al.	Corresponds with DE 102013102051
	3	20100177008		2010-07-15	BOHN, M.	Corresponds with DE 102007026720

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	1	2017060652	WO		2017-04-13	ELBAZ, D.		X

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	Art Unit	2648
	Examiner Name	GONZALES, April Guzman
	Attorney Docket Number	07610-P0002A

	2	102013102051	DE		2014-09-04	PACHLER, et al.	Corresponds with US 2014/0246503	☐
	3	2405054	EP		2012-01-11	PACHOUD, et al.		☐
	4	102007026720	DE		2008-12-11	BOHN, Martin	Corresponds with US 2010/0177008	☐
	5	2012014005	WO		2012-02-02	BARLERIN, et al.		☐
	6	2013128299	WO		2013-09-06	USTA, Kutluhan		☐

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	1	International Search Report, International Application No. PCT/RO2017/000023, dated 7 June 2018.	

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	Application Number	16609260
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	First Named Inventor	MORAU, Aurelian
	Art Unit	2648
	Examiner Name	GONZALES, April Guzman
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(19) Bundesrepublik Deutschland
Deutsches Patent- und Markenamt

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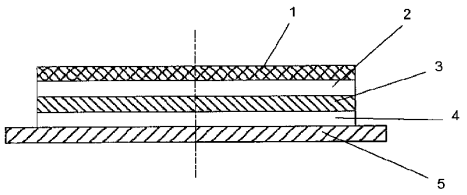
(56) Für die Beurteilung der Patentfähigkeit in Betracht gezogene Druckschriften:
US 34 97 410 A
US 56 45 932 A

Die folgenden Angaben sind den vom Anmelder eingereichten Unterlagen entnommen

Prüfungsantrag gemäß § 44 PatG ist gestellt.

(54) Bezeichnung: **Selbstklebende Antenne für ein RFID-System, insbesondere für ein RFID-Etikett, und Verfahren zu ihrer Herstellung**

(57) Zusammenfassung: Selbstklebende Antenne für ein RFID-System, insbesondere für ein RFID-Etikett, wobei erfindungsgemäß vorgesehen ist, dass die Antenne (1) aus einer Aluminiumfolie (7) einer Stärke von 1 µm-20 µm, insbesondere ca. 10 µm, auf die Vorderseite eines Haftmaterials (3) aufgeklebt und ausgestanzt ist, wobei das Haftmaterial (3) auf seiner Rückseite mit einer Haftkleberschicht (4) versehen ist.



Beschreibung

[0001] Die Erfindung betrifft eine selbstklebende Antenne für ein RFID-System, insbesondere für ein RFID-Etikett und ein Verfahren zu ihrer Herstellung.

[0002] Bekannterweise enthalten RFID-Systeme einen Transponder, der aus einem RFID-Chip und einer RFID-Antenne besteht. RFID-Etiketten werden bekannterweise so hergestellt, dass ein sogenanntes RFID-Inlay mit einem Transponder zwischen einem bahnförmigen, auf der Unterseite mit einer Haftkleberschicht versehenen Deckmaterial und einem ebenfalls bahnförmigen Trägermaterial angeordnet ist, das von der Haftkleberschicht abziehbar ist. Das RFID-Inlay enthält dabei einen auf einer flachen Antenne befestigten und mit diesem elektrisch verbundenen RFID-Chip, wobei die RFID-Antenne auf einer Antennenfolie angeordnet ist.

[0003] Es sind verschiedene Verfahren bekannt, die RFID-Antennen herzustellen: Nach einem Verfahren wird die Antennenkontur aus einer Folie ausgeätzt. Dieses Verfahren ist langsam, teuer und umweltbelastend. Alternativ kann die Antennenkontur direkt durch Metallisieren auf ein entsprechend gestaltetes Bahnmaterial aufgebracht werden. Ebenso wurde bereits vorgeschlagen, die Antennen durch Aufdrucken mit einer leitfähigen Farbe, beispielsweise Silberleitfarbe, herzustellen. Auch dieses Verfahren ist teuer und – soweit die Farben Schwermetalle enthalten – umweltbelastend. Als bahnförmiges Substrat, auf das die flachen Antennen aufgebracht werden, wird meistens PET verwendet. Dieses ist nicht recyclingfähig.

[0004] Der Erfindung liegt daher die Aufgabe zugrunde, eine Antenne für ein RFID-System bereitzustellen, die aus gut recyclebaren Material bei verminderten Kosten herstellbar ist.

[0005] Diese Aufgabe wird mit den Merkmalen des Patentanspruchs 1 gelöst. Nach der Erfindung wird die Antenne aus einer Aluminiumfolie von geringer Stärke zwischen 1 µm und 20 µm, bevorzugt von ca. 10 µm, hergestellt. Aluminiumfolien dieser Stärke werden als Massenware, beispielsweise für Haushaltsfolien, hergestellt. Als Trägermaterialien werden bevorzugt Papiere verwendet, die ebenfalls gut recyclebar sind.

[0006] Die zu Rollen aufgewickelte Aluminiumfolie läßt sich in RFID-Maschinen zur Herstellung von RFID-Etiketten mit rotativ arbeitenden Werkzeugen vereinfacht weiterverarbeiten. Es kann so vereinfacht eine elektrisch optimierte UHF-Antenne hergestellt werden. Der Patentanspruch 3 enthält das Grundverfahren zur Herstellung eines erfindungsgemäßen selbstklebenden RFID-Etikettes. Die Patentansprüche 4 bis 8 beanspruchen verschiedene, vorteilhafte Varianten des Herstellungsverfahrens für verschiedene Einsatzzwecke.

[0007] Die Zeichnung dient zur Erläuterung der Erfindung anhand vereinfacht dargestellter Ausführungsbeispiele.

[0008] Fig. 1 zeigt den Schnitt durch eine selbstklebende Antenne.

[0009] Die Fig. 2 bis Fig. 5 zeigen verschiedene Verfahren zur Herstellung von Antennen.

[0010] Fig. 6 zeigt einen Ausschnitt von einem bahnförmigen Trägermaterial mit einer Reihe von aufgeklebten Antennen.

[0011] Die in Fig. 1 im Schnitt und in Fig. 6 in Draufsicht dargestellten Antennen sind zur Verwendung in einem RFID-System, insbesondere für ein RFID-Etikett vorgesehen. Selbstklebende RFID-Etiketten enthalten bekannterweise ein RFID-Inlay, bei dem auf ein bahn- oder bogenförmiges Material ein RFID-Chip und eine RFID-Antenne aufgeklebt sind. Ein derartiges RFID-Etikett und ein Verfahren zu seiner Herstellung sind beispielsweise in der WO 2005/076206 A1 beschrieben.

[0012] Die als UHF-Antenne verwendbare Antenne **1** ist aus einer dünnen Aluminiumfolie ausgestanzt, die eine Stärke von 1 µm bis 20 µm, insbesondere von ca. 10 µm, aufweist. Mittels einer Klebeschicht **2** ist die Antenne **1** auf die Vorderseite eines bahn- oder bogenförmigen Haftmaterials **3** aufgeklebt, das bevorzugt aus Papier besteht. Auf seiner Rückseite ist das Haftmaterial **3** mit einer Haftkleberschicht **4** versehen. Die Haftkleberschicht **4** wird von einem bahn- oder bogenförmigen Trägermaterial **5** abgedeckt, das abziehbar aufgeklebt ist. Als Trägermaterial **5** wird bevorzugt silikonisiertes Papier verwendet. Die Haftklebeschicht **4** haftet stärker an dem Haftmaterial **3** als an dem Trägermaterial **5**, so dass nach dem Abziehen des Trägermaterials **5** eine Klebeschicht an der Rückseite des Haftmaterials **3** verbleibt. Mittels dieser Klebeschicht kann eine auf dem Haftmaterial **3** klebende Antenne **1** auf einem Material, beispielsweise auf einem Inlay-Material festgeklebt werden.

[0013] In den Fig. 2 bis Fig. 4 werden drei Herstellungsverfahren für die selbstklebenden Antennen **1** hergestellt, bei denen als Antennenmaterial Aluminiumfolie mit einer Stärke zwischen 10 µm und 20 µm, bevorzugt ca. 10 µm, in Bahnform von einer Rolle **6** abgezogen wird. Die Rückseite der abgezogenen Aluminiumfolie **7** wird anschließend mit der Klebeschicht **2** versehen. Bei dem Verfahren nach Fig. 2 erfolgt das Auftragen der Klebeschicht **2** in Form eines Transferklebers. Bei einem Transferkleber ist die Klebeschicht auf beiden Seiten von einem Deckmaterial **8** und einem Trägermaterial **9** abgedeckt. Der

Transferkleber wird von einer Rolle **10** abgezogen und an die Rückseite der Aluminiumfolie **7** geführt, wobei vor dem Kontakt mit der Aluminiumfolie **7** das Deckmaterial **8** abgezogen. Im Kontakt mit der Aluminiumfolie **7** gibt der Transferkleber seine Klebeschicht **2** an die Folie **7** ab, anschließend wird das Trägermaterial **9** des Transferklebers ebenfalls abgezogen und zu einer Rolle **11** aufgewickelt. Es liegt nun eine Aluminiumfolie **7** mit einer Klebeschicht **2** vor. Auf die Klebeschicht **2** wird anschließend ein bahn- oder bogenförmiges Selbstklebematerial **12** aufgeklebt, das dazu von einer Rolle **13** abgezogen wird. Das Selbstklebematerial **12** besteht aus dem Haftmaterial **3** als Deckschicht, das an seiner Rückseite mit der Haftkleberschicht **4** versehen ist, die wiederum von dem Trägermaterial **5** abgedeckt ist.

[0014] Das Verbundmaterial aus Trägermaterial **5**, Haftmaterial **3** und Aluminiumfolie **1** mit dazwischen angeordneten Klebeschichten **2**, **4** wird anschließend durch eine Rotationsstanze **14** geführt. Von der Rotationsstanze **14** wird die Aluminiumfolie **7** mit dem Haftmaterial **3** zu einzelnen Antennen **1** ausgestanzt. Das Stanzgitter **15** aus der restlichen Aluminiumfolie **7** und dem restlichen Haftmaterial **3** wird anschließend abgezogen und als recyclebarer Abfall zu einer Rolle **16** aufgewickelt. Die Antennen **1** mit dem darunter befindlichen, ebenfalls in Antennenform ausgestanzten Haftmaterial **3**, verbleiben auf dem bahnförmigen Trägermaterial **5** und werden anschließend mit diesem zu einer Rolle **17** aufgewickelt. Die Rolle **17** enthält somit die in Fig. 6 dargestellte Reihe von einzelnen Antennen **1**, die mit dem Haftmaterial **3** verklebt sind und mit diesem abziehbar auf dem Trägermaterial **5** aufgeklebt sind.

[0015] Da die dünne Aluminiumfolie **7** mit dem auf der Rückseite aufgeklebten Haftmaterial **3** verstärkt ist, ist es möglich, die einzelne Antenne **1** auszustanzen und auch das Stanzgitter **5** abzuziehen, ohne dass die Aluminiumfolie reißt. Es läßt sich so eine extrem dünne, billige Aluminiumfolie als Antennenmaterial verwenden. Zugleich ist es möglich, das Antennenmaterial in Rollenform als Ausgangsmaterial zu verwenden und auf den bekannten Maschinen zur Verarbeitung von bahnförmigem Material mit rotativ arbeitenden Werkzeugen zu verwenden. Aluminium als Antennenmaterial ist lebensmittel- und arzneiverträglich und zum Einsatz als UHF-Antenne elektrisch gut leitfähig.

[0016] Das in Fig. 3 dargestellte Verfahren entspricht dem vorstehend beschriebenen nach Fig. 1 mit der Ausnahme, dass die Klebeschicht auf der Rückseite der Aluminiumfolie **7** anders bereitgestellt wird. Dazu wird ein Trägermaterial aus Silikonpapier von einer Rolle **18** abgezogen und zunächst an seiner Oberseite mittels eines von einer Breitschlitzdüse **19** aufgetragenen Hot-Melts mit der Klebeschicht **2** versehen. Die Klebeschicht **2** wird dann auf die vorstehend beschriebene Weise auf die Rückseite der Aluminiumfolie **7** übertragen. Dabei wird das Trägermaterial **9** wieder von der Aluminiumfolie **7** abgezogen und zu einer Rolle **11** aufgewickelt.

[0017] Bei dem Verfahren nach Fig. 4 erfolgt der Auftrag der Klebeschicht **2** zunächst auf die Oberseite der Deckschicht des Selbstklebematerials **12**, bevor dieses mit der Aluminiumfolie **7** verbunden wird. Der Auftrag erfolgt ebenfalls mittels einer Breitschlitzdüse **19** als Hot-Melt-Auftrag. Bei dieser Variante dient die Deckschicht des Selbstklebematerials **12** zugleich als Haftmaterialschicht **3**.

[0018] In Fig. 5 ist eine weitere Variante dargestellt, bei der als Ausgangsmaterial ein Verbundmaterial aus Aluminiumfolie **7** und einem Silikonträgermaterial **20** verwendet wird, wobei das Trägermaterial **20** abziehbar auf die Rückseite der Aluminiumfolie **7** aufgeklebt ist. Beim Abziehen des Trägermaterials **20** verbleibt die Klebeschicht **2** auf der Rückseite der Aluminiumfolie. Das Verbundmaterial **7**, **20** wird von einer Rolle **21** abgezogen, anschließend wird das Trägermaterial **20** entfernt und zu einer Rolle **22** aufgewickelt. Es liegt nun eine Aluminiumfolie **7** mit einer Klebeschicht **2** auf der Rückseite vor, die auf die bei den vorherigen Ausführungsbeispielen beschriebene Weise zunächst mit einem Selbstklebematerial **12** verbunden wird, bevor die Antennen **1** ausgestanzt werden.

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Zitierte Patentliteratur

- WO 2005/076206 A1 [0011]

Patentansprüche

1. Selbstklebende Antenne für ein RFID-System, insbesondere für ein RFID-Etikett, **dadurch gekennzeichnet**, dass die Antenne (**1**) aus einer Aluminiumfolie (**7**) einer Stärke von 1 µm–20 µm, insbesondere ca. 10 µm, auf die Vorderseite eines Haftmaterials (**3**) aufgeklebt und ausgestanzt ist, wobei das Haftmaterial (**3**) auf seiner Rückseite mit einer Haftkleberschicht (**4**) versehen ist.

2. Antenne nach Anspruch 1, dadurch gekennzeichnet, dass die Haftkleberschicht (**4**) auf der Rückseite des Haftmaterials (**3**) von einem abziehbaren Trägermaterial (**5**) abgedeckt ist.

3. Verfahren zur Herstellung einer selbstklebenden Antenne gemäss Patentanspruch 1 oder 2 mit folgenden Schritten:
1. Von einer Rolle (**6**, **21**) wird eine bahnförmige Aluminiumfolie (**7**) abgezogen,
2. die Aluminiumfolie (**7**) wird auf ihrer Rückseite mit einer Klebeschicht (**2**) versehen,
3. auf die Klebeschicht (**2**) wird ein bahnförmiges Haftmaterial (**3**) aufgeklebt, das auf seiner Rückseite eine Haftkleberschicht (**4**) aufweist,
4. danach werden aus der Aluminiumfolie (**7**) einzelne Antennen (**1**) ausgestanzt, und
5. das restliche Stanzgitter (**15**) aus Aluminiumfolie (**7**) wird abgezogen.

4. Verfahren nach Anspruch 3, dadurch gekennzeichnet, dass in Schritt 3 ein Haftmaterial (**3**) auf die Rückseite der Aluminiumfolie (**7**) aufgeklebt wird, das an seiner abgewandten Rückseite von einem abziehbar aufgeklebten Trägermaterial (**5**) abgedeckt ist und das beim Stanzen der die Aluminiumfolie (**7**) mit dem Haftmaterial (**3**) ausgestanzt wird und so Antennen (**1**) mit in Antennenform ausgestanzten Haftmaterial (**2**) auf dem Trägermaterial (**5**) verbleiben.

5. Verfahren nach Anspruch 3 oder 4, dadurch gekennzeichnet, dass die Klebeschicht (**2**) in Form eines Transferklebers auf die Rückseite der Aluminiumfolie (**7**) aufgetragen wird.

6. Verfahren nach Anspruch 3 oder 4, dadurch gekennzeichnet, dass die Klebeschicht (**2**) zunächst auf ein bahnförmiges Trägermaterial (**18**) aufgetragen und anschließend von diesem an die Rückseite der Aluminiumfolie (**7**) übergeben wird.

7. Verfahren nach Anspruch 3 oder 4, dadurch gekennzeichnet, dass auf die Rückseite der Aluminiumfolie vor dem Stanzen ein Selbstklebematerial (**12**) aufgetragen wird, wobei auf die als Haftmaterial (**3**) dienende Deckschicht des Selbstklebematerials (**12**) die Klebschicht (**2**) vor dem Zusammenführen mit der Aluminiumfolie (**7**) aufgetragen wird.

8. Verfahren nach Anspruch 3 oder 4, dadurch gekennzeichnet, dass als Ausgangsmaterial ein Verbundmaterial aus Aluminiumfolie (**7**) und einem Trägermaterial (**20**) verwendet wird, das abziehbar auf die Rückseite der Aluminiumfolie (**7**) aufgeklebt ist, wobei nach dem Abziehen die Klebeschicht (**2**) auf der Aluminiumfolie (**7**) verbleibt.

Es folgen 6 Blatt Zeichnungen

Anhängende Zeichnungen

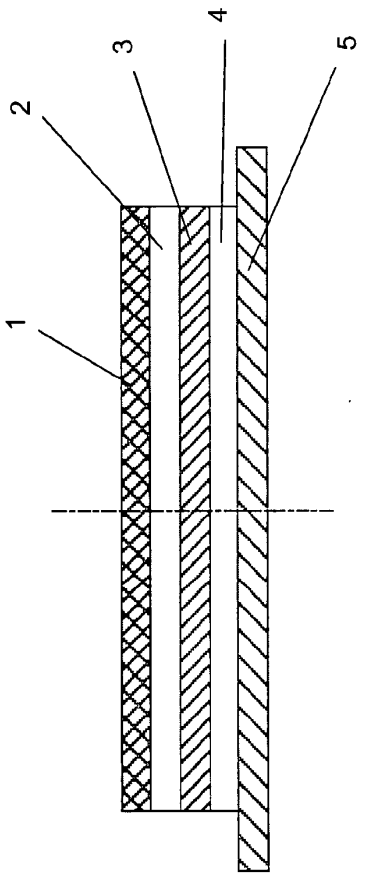


Fig. 1

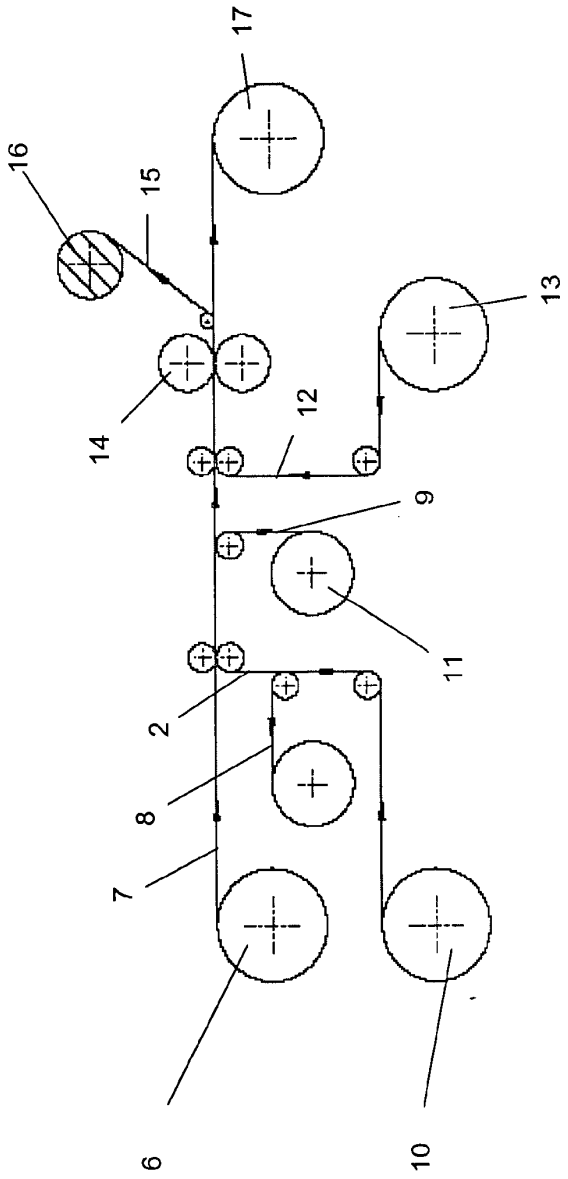
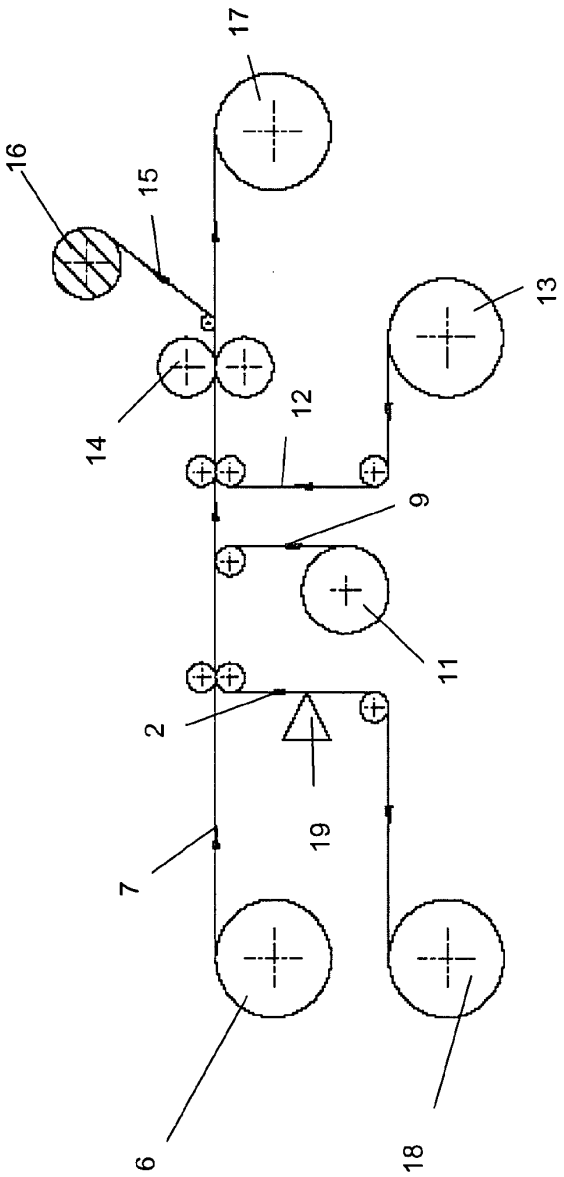


Fig. 2



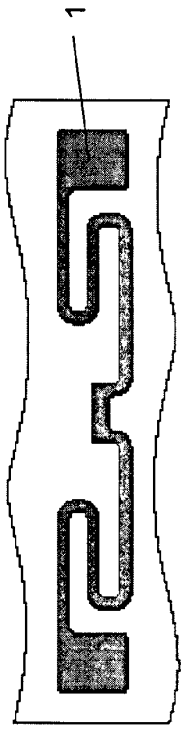
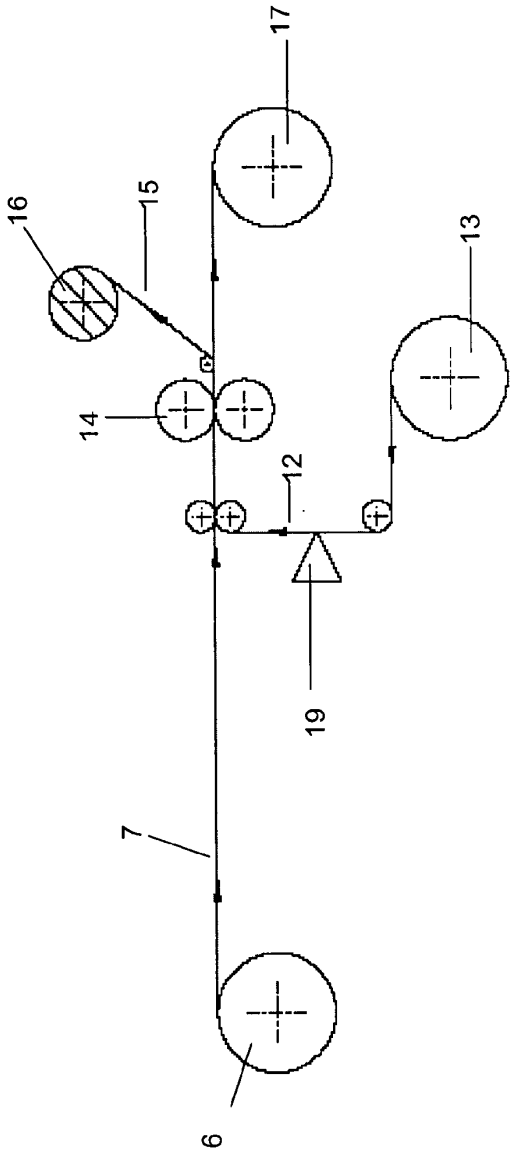


Fig. 3



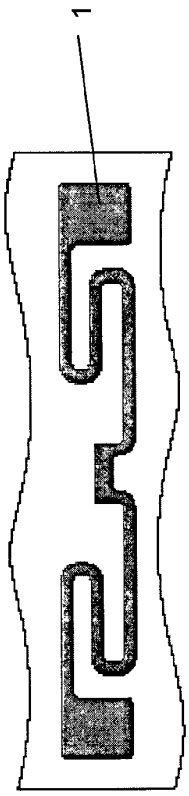
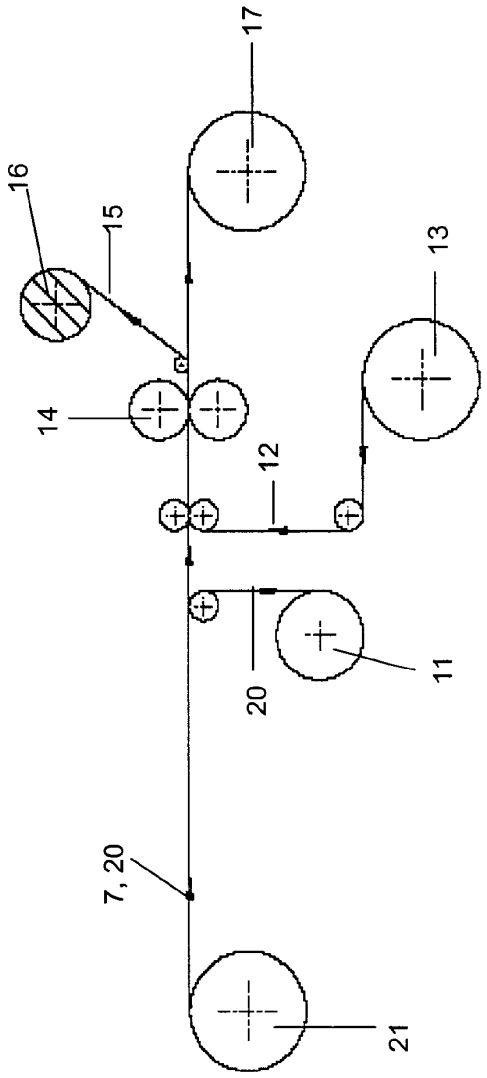


Fig. 4



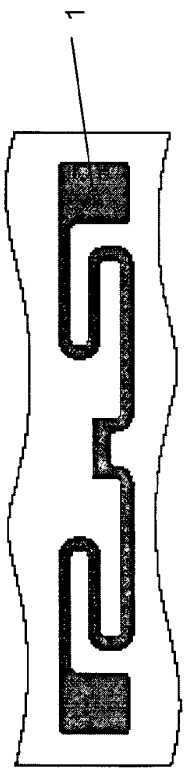
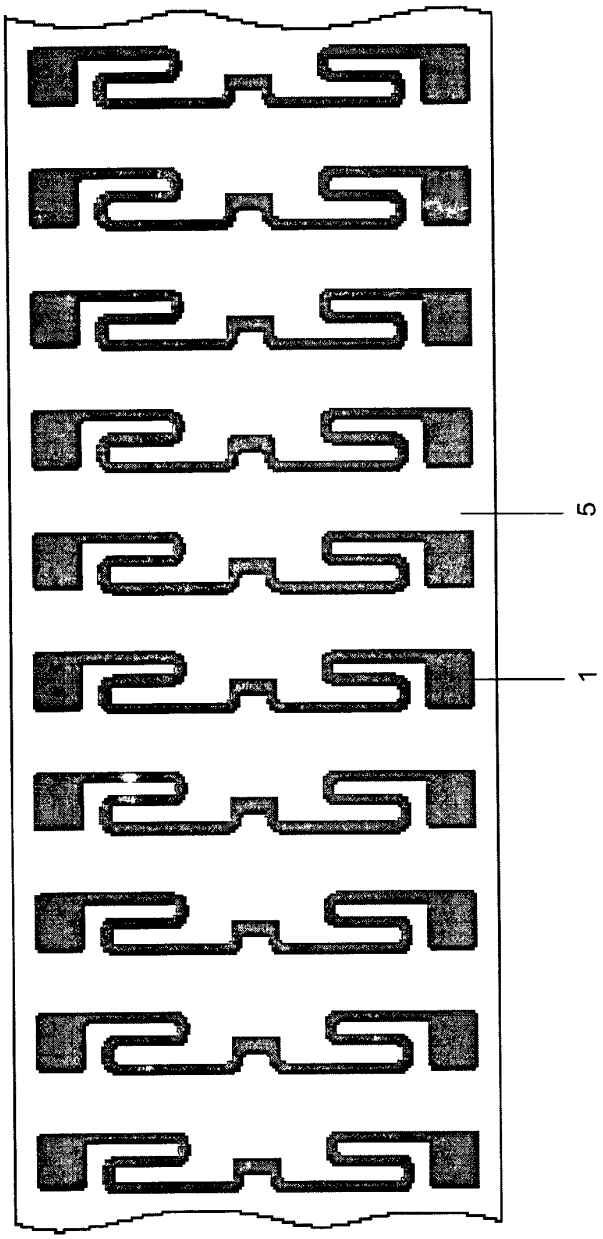


Fig. 5

Fig. 6



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(74) Agent: **ANKARA PATENT BUREAU LIMITED**; Bestekar Sokak No.10, Kavaklidere, 06680 Ankara (TR).

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Published:

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(54) **Title**: ENHANCED ANTENNA STRUCTURE FOR RFID TAGS

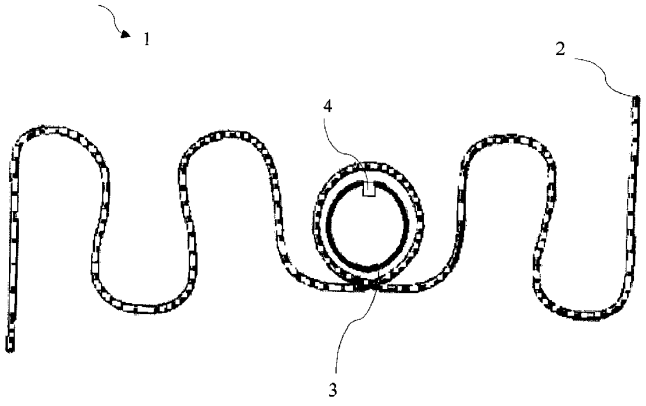


Figure 1

(57) **Abstract**: The present invention relates to RFID (Radio Frequency identification) tags which communicate by radio frequencies and can store information therein. The objective of the present invention is to provide an RFID tag which provides a stronger action/reaction, thus better communication.

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ENHANCED ANTENNA STRUCTURE FOR RFID TAGS

Field of the Invention

The present invention relates to RFID (Radio Frequency Identification) tags which communicate by radio frequencies and can store information therein.

Background of the Invention

RFID is a method for automatic identification of objects by using radio frequencies. It is basically comprised of a reader and a tag. The tags comprise a chip for performing the functions of receiving, storing and sending information related to the object and antennas which surround the said chip for supplying energy to it and activating it. The chip and antennas are coated with a coating and attached to the object to be identified.

There are two types of tags, namely active and passive. The passive tags do not have their own power supplies. The antennas collect energy from the electromagnetic waves emitted by the reader serving as a transmitter in order to activate the chip. Energy collection is the technique of keeping the energy coming from the reader for an instant, activating the chip and then sending it back to the reader. This technique can enhance the performance of the passive tags significantly. The electromagnetic waves emitted by the reader meet with the chip as an energy and activate it, and data transfer is made from the tag to the reader via antennas.

The structure of the antennas is generally comprised of a loop antenna and a dipole antenna. The chip including information is positioned on the loop antenna. When data is being transferred from the antennas to the reader, initially the dipole antenna collects energy from the electromagnetic waves emitted by the reader, a

current is generated thereon. When this current generated on the dipole antenna moves, it causes a current on the loop antenna as well.

This current on the loop antenna is created by either the physical connection or inductive coupling between the dipole antenna and loop antenna. If the current is provided by the physical connection, these two antennas behave as parallel connected circuit elements. On the other hand, the same physical connection serves as a kind of short circuit. This prevents the entire current on the dipole antenna from passing also over the loop antenna.

In systems which utilize inductive coupling and in which there is no physical connection between the dipole antenna and the loop antenna, the two antennas are positioned close to each other. The magnetic field created by the current on the dipole antenna creates induction current on the loop antenna. In this case, since the current on the dipole antenna cannot make a full trip around the loop antenna, only a part of its potential reaches the chip. The chip is energized in proportion to the current on the loop antenna and provides an action and reaction again in the same proportion. The fact that the inductive coupling area where the two antennas come close to each other is limited causes the current generated on the chip to be weak and thus the action-reaction obtained to be low in power.

Summary of the Invention

The objective of the present invention is to provide an RFID tag with enhanced performance.

Detailed Description of the Invention

Enhanced antenna structure for RFID tags developed to fulfill the objective of the present invention is illustrated in the accompanying figures wherein,

Figure 1 is the top perspective view of the enhanced antenna structure.

Figure 2 is the side perspective view of the enhanced antenna structure.

Figure 3 is the schematic view of operation of RFID tags with the reader and computer.

The components in the figures are assigned reference numerals as follows:

1. Enhanced antenna structure
2. Dipole antenna
    - **21.** Sinusoidal part
    - **22.** Circular part
    - **23.** Crossing part
3. Loop antenna
4. Microchip

E. RFID tag

F. Reader

G. Computer

The antenna structure (1) of the present invention, which allows realizing an RFID tag that provides enhanced action/reaction, essentially comprises

- at least one dipole antenna (2) which is coated with an insulating film and is comprised of a conductive material,
    - o at least one sinusoidal part (21) forming one pole of the dipole antenna (2),
    - o at least one circular part (22) which produces a toroidal magnetic field around itself,
    - o at least one crossing part (23) which overlaps when the dipole antenna (2) bends to form the circular part (22) and which does not cause short circuit since the dipole antenna is insulated,

which constitute the dipole antenna (2);

- at least one loop antenna (3) which is surrounded by the circular part (22) and comprised of a conductive material,
- at least one microchip (4) which is located on the loop antenna and which is adapted to receive, store and/or send the information related to the object to be identified.

In the antenna structure (1) of the present invention, an electric current is generated on the dipole antenna (2) when it is positioned in the electromagnetic field generated by the electromagnetic waves at the predetermined frequencies sent by the reader (F). While the said electric current flows on the dipole antenna (2), an electric current is generated also on the loop antenna (3) with the impact of inductive coupling.

The loop antenna (3) is surrounded by the circular part (22) of the dipole antenna (2). As the dipole antenna (2) bends to form the circular part (22) surrounding the loop antenna (3), a crossing (23) is formed between the sinusoidal parts (21) which overlap. Since the dipole antenna (2) is coated with an insulating film material, a short circuit is prevented from occurring at the overlapping crossing part (23). Thus the electric current is allowed to flow along the entire dipole antenna (2) such that it will completely surround the loop antenna (3).

Thus the electric current flowing along the dipole antenna (2) makes a full trip around the loop antenna (3) remaining in the circular part (22). Throughout the full circumference, the loop antenna (3) is inducted. The loop antenna (3), on which enhanced induction current is generated, activates the microchip (4) that includes the information related to the object to be identified.

The information on the activated microchip (4) is sent to the reader (F) by radio waves via the loop antenna (3) and the dipole antenna (2) comprising sinusoidal part (21), circular part (22) and crossing part (23). The reader (F), upon receiving

the information, converts this information into digital data and transfers it to the computer.

By means of the enhanced antenna structure for RFID tags (1) of the present invention, better communication quality between the RFID tags (E) and the readers (F) is achieved. The current flowing on the dipole antenna (2) coated with an insulating film induces current on the loop antenna (3) with full capacity and the energizing rate of the microchip (4) on the loop antenna (2) is increased. This increase enables the microchip (4) to provide a stronger response than the structures used in the prior art and thereby allows designing stronger and more efficient RFID tags (E).

In another preferred embodiment of the invention, the crossing part (23) is insulated by placing an insulating material between the overlapping parts and thus short circuit is again prevented.

Within the framework of these basic concepts, it is possible to develop a wide variety of embodiments of the enhanced antenna structure for RFID tags (1) of the present invention. The invention can not be limited to the examples described herein and it is essentially as defined in the claims.

CLAIMS

1. Enhanced antenna structure for RFID tags (1), which allows realizing an RFID tag that provides strong action/reaction, essentially **comprising**
   - at least one microchip (4) which is located on the loop antenna and which is adapted to receive, store and/or send the information related to the object to be identified; and **characterized by**
   - at least one dipole antenna (2) which is coated with an insulating film and is comprised of a conductive material;
   -
     - o at least one sinusoidal part (21) forming one pole of the dipole antenna (2),
     - o at least one circular part (22) which produces a toroidal magnetic field around itself,
     - o at least one crossing part (23) which overlaps when the dipole antenna (2) bends to form the circular part (22) and which does not cause short circuit since the dipole antenna (2) is insulated,

     which constitute the dipole antenna (2);
   - at least one loop antenna (3) which is surrounded by the circular part (22) and comprised of a conductive material.

2. Enhanced antenna structure for RFID tags (1) according to Claim 1, **characterized by** the loop antenna (3) on which an electric current is generated with the impact of inductive coupling when an electric current flows on the dipole antenna (2).

3. Enhanced antenna structure for RFID tags (1) according to any one of the preceding claims, **characterized by** the loop antenna (3) which activates the microchip (4).

4. Enhanced antenna structure for RFID tags (1) according to any one of the preceding claims, **characterized by** the loop antenna (3) and the dipole antenna (2) which send the information on the activated microchip (4) to the reader (F) by radio waves.

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5. Enhanced antenna structure for RFID tags (1) according to any one of the preceding claims, **characterized by** the crossing part (23) which is insulated by placing an insulating material between the overlapping parts.

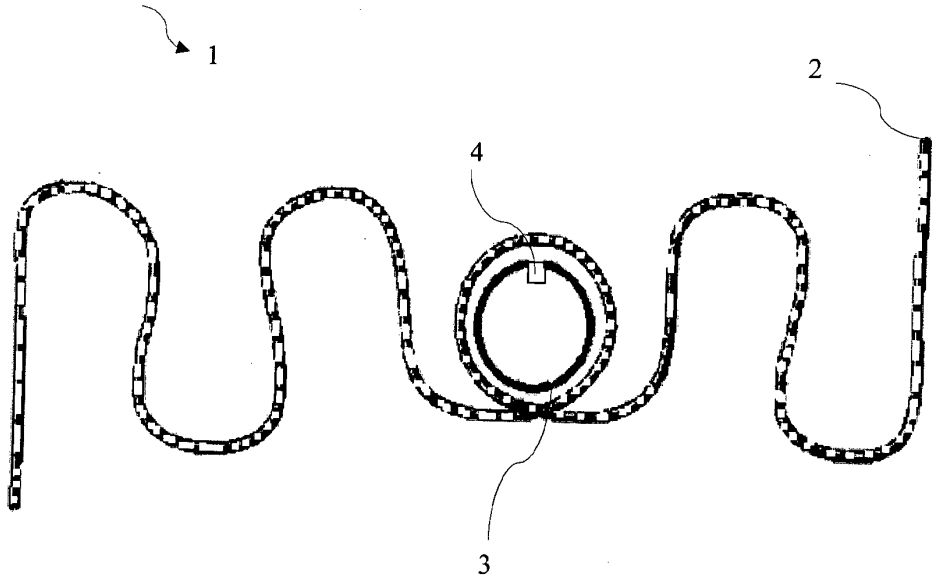


Figure 1

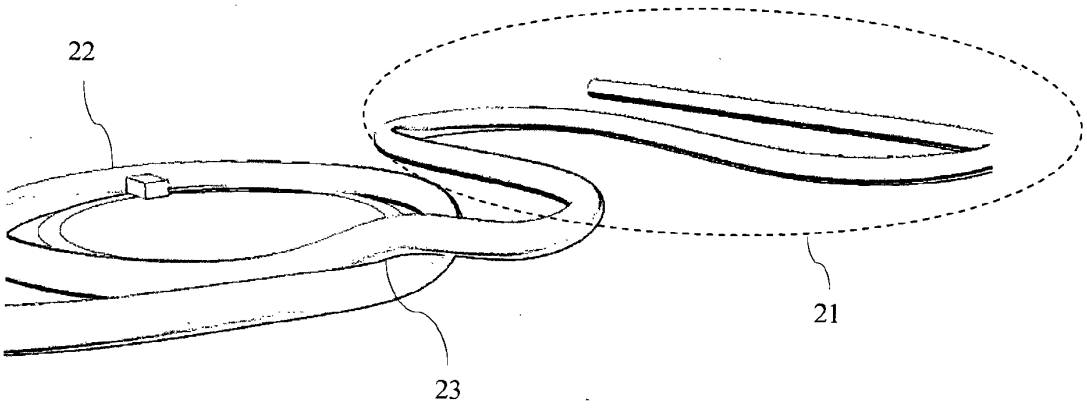


Figure 2

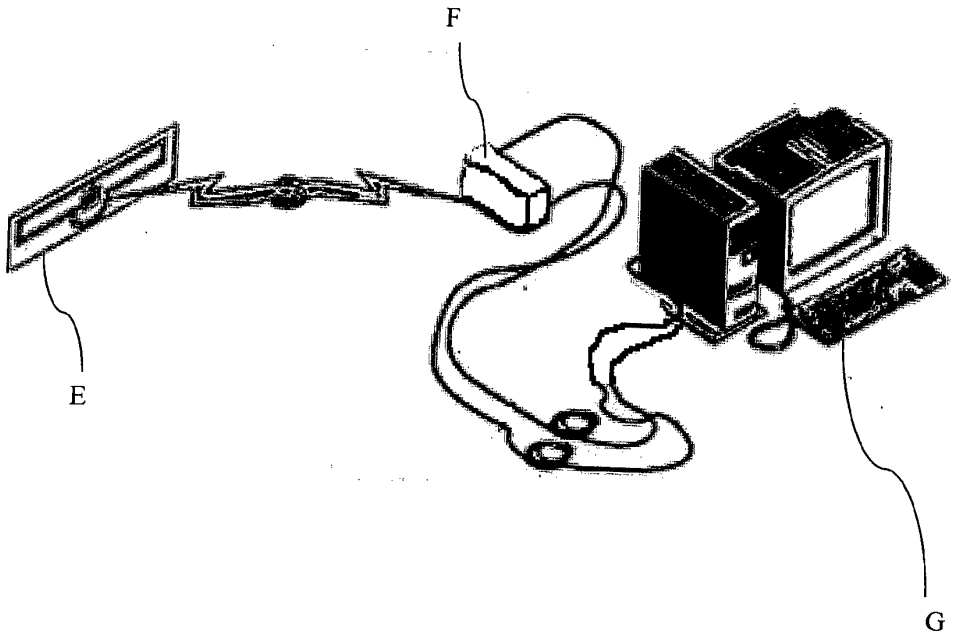


Figure 3

INTERNATIONAL SEARCH REPORT

International application No
PCT/IB2013/050028

A. CLASSIFICATION OF SUBJECT MATTER
INV. H01Q7/00 H01Q1/22 G06K19/077 H01Q9/16 H01Q9/24
ADD.

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 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 practicable, 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	US 2009/079574 A1 (OROKU NORIYUKI [JP] ET AL) 26 March 2009 (2009-03-26) paragraphs [0042], [0043], [0051], [0064] - [0070]; figures 3b, 7b	1-5
X	DE 10 2007 041752 A1 (BIELOMATIK LEUZE GMBH & CO KG [DE]) 5 March 2009 (2009-03-05) paragraphs [0021], [0030]; figure 1	1-5
A	US 2007/095926 A1 (ZHU SHENGBO [US] ET AL) 3 May 2007 (2007-05-03) paragraphs [0014], [0015], [0036], [0037]; figure 4	1-5

☐ 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

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"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
17 April 2013	24/04/2013

Name and mailing address of the ISA/	Authorized officer
European Patent Office, P.B. 5818 Patentlaan 2 NL - 2280 HV Rijswijk Tel. (+31-70) 340-2040, Fax: (+31-70) 340-3016	Hueso González, J

Form PCT/ISA/210 (second sheet) (April 2005)

INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No
PCT/IB2013/050028

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
US 2009079574 A1	26-03-2009	CN 101393614 A	25-03-2009
		JP 2009075687 A	09-04-2009
		KR 20090030241 A	24-03-2009
		TW 200931320 A	16-07-2009
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		CN 101663678 A	03-03-2010
		DE 102007041752 A1	05-03-2009
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		JP 2010538556 A	09-12-2010
		KR 20100051039 A	14-05-2010
		US 2010187316 A1	29-07-2010
		WO 2009030463 A1	12-03-2009
US 2007095926 A1	03-05-2007	TW 200838029 A	16-09-2008
		US 2007095926 A1	03-05-2007

Form PCT/ISA/210 (patent family annex) (April 2005)

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(56) Ermittelter Stand der Technik:
US 2009 / 0 033 467 A1

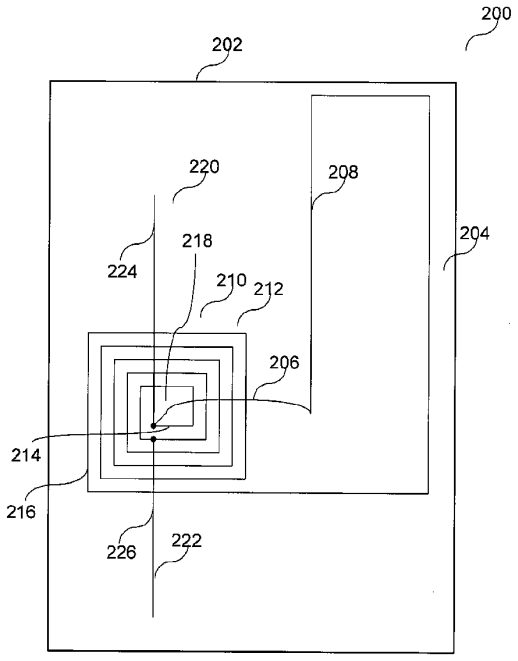
Chipkarte. 29.01.2013, Wikipedia [online].
Lecher-Leitung. 06.12.2012, Wikipedia [online].
Schwingkreis. 21.12.2012, Wikipedia [online].

Prüfungsantrag gemäß § 44 PatG ist gestellt.

Die folgenden Angaben sind den vom Anmelder eingereichten Unterlagen entnommen

(54) Bezeichnung: **Boosterantenne, Kontaktlos-Chip-Anordnung, Antennenstruktur, und Chip-Anordnung**

(57) Zusammenfassung: In verschiedenen Ausführungsbeispielen wird eine Boosterantenne für eine Chip-Anordnung, insbesondere für eine Chipkarte, bereitgestellt, wobei die Boosterantenne aufweist: einen ersten Schaltkreis, der einen ersten Resonanzkreis bildet; einen zweiten Schaltkreis, der einen zweiten Resonanzkreis bildet, wobei der erste Schaltkreis mit dem zweiten Schaltkreis elektrisch leitend verbunden ist; und einen dritten Schaltkreis, der einen dritten Resonanzkreis bildet, wobei der dritte Schaltkreis mit dem zweiten Schaltkreis elektrisch leitend verbunden ist.



Beschreibung

[0001] Die Erfindung betrifft eine Boosterantenne, eine Kontaktlos-Chip-Anordnung, eine Antennenstruktur, und eine Chip-Anordnung.

[0002] Bei einer herkömmlichen Chipkarte, welche beispielsweise im elektronischen Zahlungsverkehr weite Verbreitung findet, erfolgt die Kommunikation zwischen dem sich auf der Chipkarte befindlichen Chip und einem Lesegerät kontaktbasiert, d. h. über zur Außenseite der Chipkarte hin freiliegende Chipkartenkontakte.

[0003] Dazu ist jedoch die Chipkarte bei Gebrauch stets in ein entsprechendes Lesegerät einzuführen, was ein Benutzer als störend empfinden kann. Eine Erweiterung, welche dieses Problem löst, bieten so genannte Dual-Interface (Doppel-Schnittstelle) Chipkarten, bei welchen der Chip zusätzlich zu der üblichen kontaktbasierten Schnittstelle auch mittels einer kontaktlosen Schnittstelle kommunizieren kann. Die kontaktlose Schnittstelle auf der Chipkarte kann eine Chipkartenantenne aufweisen, welche in der Chipkarte enthalten ist und mit dem Chip verbunden ist. Die Chipkartenantenne und der Chip können gemeinsam auf einem Chipkartenmodul angeordnet sein, wobei dann eine solche miniaturisierte Form der Chipkartenantenne als eine Chipkartenmodulantenne bezeichnet werden kann. Die gemeinsame Anordnung der Spule und des Chips auf einem Chipkartenmodul wird auch als CoM (Coil on Module – Spule auf Modul) bezeichnet. Unabhängig von der Art der Chipkartenantenne ist zwischen dieser und dem Chipkartenmodul bzw. dem Chip eine galvanische Verbindung ausgebildet.

[0004] Bei einem elektronischen Zahlungssystem wird beispielsweise ein Funktionsabstand von bis zu 4 cm zwischen dem Chip und der Leseeinheit gefordert. Die Erfüllung dieser Sollvorgabe kann sich jedoch als problematisch herausstellen, da auf der kleinen Fläche, welche auf dem Chipkartenmodul zur Verfügung steht, unter Umständen keine genügend große Chipkartenmodulantenne angeordnet werden kann, so dass eine drahtlose Kommunikation in dem geforderten Abstand erfolgen kann. Um die Leistungsfähigkeit der kontaktlosen Kommunikation zu verbessern, kann zusätzlich eine so genannte Verstärker-Antenne (auch Boosterantenne genannt) in eine Chipkarte eingebaut werden und mit dem Chipkartenmodul bzw. der auf dem Chipkartenmodul angeordneten Chipkartenmodulantenne induktiv gekoppelt werden. Ebenfalls kann eine solche Boosterantenne mit dem CoM einer reinen Kontaktlos-Chipkarte zur Verbesserung der Leistungsfähigkeit der kontaktlosen Kommunikation induktiv gekoppelt werden. Die Boosterantenne kann auf einer gesonderten Schicht bereitgestellt sein und in der Chipkarte enthalten sein. Die gesonderte Schicht, welche die Boosterantenne enthält, kann bei der Chipkartenherstellung beispielsweise in diese einlaminiert werden oder sein. Im Wesentlichen wird durch die Boosterantenne die mögliche Lese- bzw. Schreibdistanz zwischen einen Schreib- bzw. Lesegerät und dem Chipkartenmodul erhöht.

[0005] **Fig.** 1 zeigt eine Kontaktlos-Chipkarte **100** mit einem Chipkartenkörper **102**, einer darin integrierten (beispielsweise einlaminierten) Boosterantenne **104** und einer Kontaktlos-Chipkartenmodul-Anordnung (beispielsweise auch bezeichnet als Coil-on-Module, CoM) **106**, wobei die Boosterantenne **104** teilweise die Kontaktlos-Chipkartenmodul-Anordnung **106** umgibt.

[0006] Die Boosterantenne **104** wird von einer großen ringförmigen Leiterschleife **108** gebildet, wobei ein kleiner Teil der Leiterschleife zu einer kleinen Leiterschleife **110** ausgebildet ist, die die Kontaktlos-Chipkartenmodul-Anordnung **106**, beispielsweise ein Coil-on-Module **106**, welches innerhalb eines Randbereichs der großen Leiterschleife **108** angeordnet ist, teilweise umschließt.

[0007] Weiterhin gibt es mehrere Ansätze und Realisierung für so genannte Comprehensive UHF-HF Antennen. Deren Dimensionen und Abmaße sind üblicherweise entsprechend herkömmlichen RFID (Radio Frequency Identification, Funkfrequenzidentifikation)-Etiketten (Label), wie beispielsweise gemäß einer Chipkarte, ausgeprägt, und werden üblicherweise mittels einer Kombination von Dipol und HF-Spule realisiert.

[0008] In verschiedenen Ausführungsbeispielen wird es ermöglicht, sehr kleine Kommunikationsmodule und/oder Chips mit einer integrierten Antenne in verschiedenen Frequenzbändern auszulesen.

[0009] In verschiedenen Ausführungsbeispielen wird eine Boosterantenne für eine Chip-Anordnung, beispielsweise für eine Chipkarte, bereitgestellt, wobei die Boosterantenne aufweist: einen ersten Schaltkreis, der einen ersten Resonanzkreis bildet; einen zweiten Schaltkreis, der einen zweiten Resonanzkreis bildet, wobei der erste Schaltkreis mit dem zweiten Schaltkreis elektrisch leitend verbunden ist; und einen dritten Schaltkreis, der einen dritten Resonanzkreis bildet, wobei der dritte Schaltkreis mit dem zweiten Schaltkreis elektrisch leitend verbunden ist.

[0010] In einer Ausgestaltung kann der erste Schaltkreis den ersten Resonanzkreis mit einer ersten Phasenresonanz bilden; wobei der zweite Schaltkreis den zweiten Resonanzkreis mit einer zweiten Betragsresonanz bilden kann.

[0011] In nach einer Ausgestaltung können der erste elektrische Schaltkreis und der zweite elektrische Schaltkreis derart eingerichtet sein, dass die erste Phasenresonanz und/oder die zweite Betragsresonanz ungefähr 13,56 MHz betragen/beträgt.

[0012] In noch einer Ausgestaltung kann der dritte Schaltkreis den dritten Resonanzkreis mit einer dritten Phasenresonanz bilden.

[0013] In noch einer Ausgestaltung kann der dritte elektrische Schaltkreis derart eingerichtet sein, dass die dritte Phasenresonanz größer ist als die erste Phasenresonanz.

[0014] In noch einer Ausgestaltung kann der dritte elektrische Schaltkreis derart eingerichtet sein, dass die dritte Phasenresonanz in einem Bereich von ungefähr 0,3 GHz bis ungefähr 3 GHz liegt.

[0015] In noch einer Ausgestaltung kann der dritte elektrische Schaltkreis derart eingerichtet sein, dass die dritte Phasenresonanz ungefähr 868 MHz beträgt.

[0016] In noch einer Ausgestaltung kann der dritte Schaltkreis eine Dipol-Antenne aufweisen.

[0017] In noch einer Ausgestaltung kann die Dipol-Antenne eine invertierte F-Antenne (IFA) aufweisen oder als eine solche ausgebildet sein.

[0018] In nach einer Ausgestaltung kann der zweite elektrische Schaltkreis eine induktive Koppelstruktur aufweisen.

[0019] In noch einer Ausgestaltung kann der erste elektrische Schaltkreis zu dem zweiten elektrischen Schaltkreis in Serie geschaltet sein.

[0020] In noch einer Ausgestaltung können der erste Resonanzkreis und der zweite Resonanzkreis so eingerichtet sein, dass ein erster Strom in dem ersten Resonanzkreis in dem zweiten Resonanzkreis bezüglich des ersten Stroms einen erhöhten zweiten Strom bewirkt.

[0021] In noch einer Ausgestaltung kann der erste Resonanzkreis ein Serienresonanzkreis sein.

[0022] In noch einer Ausgestaltung kann der zweite Resonanzkreis ein Parallelresonanzkreis sein.

[0023] In noch einer Ausgestaltung kann der zweite Schaltkreis mindestens eine Spulenwindung aufweisen.

[0024] Noch einer Ausgestaltung kann der zweite Schaltkreis mehrere Spulenwindungen aufweisen.

[0025] In noch einer Ausgestaltung kann der zweite Schaltkreis eine äußere Spulenwindung und mehrere innere Spulenwindungen aufweisen.

[0026] In noch einer Ausgestaltung kann der dritte Schaltkreis nur mit den inneren Spulenwindungen elektrisch leitend verbunden sein.

[0027] In noch einer Ausgestaltung kann die Boosterantenne ferner aufweisen einen flexiblen Träger, beispielsweise ein Pflaster; wobei der erste elektrische Schaltkreis, der zweite elektrische Schaltkreis, und der dritte elektrische Schaltkreis auf dem flexiblen Träger angeordnet sein können.

[0028] In verschiedenen Ausführungsbeispielen wird eine Kontaktlos-Chip-Anordnung bereitgestellt, beispielsweise eine Kontaktlos-Chipkartenmodul-Anordnung, aufweisend: eine Boosterantenne, wie sie oben beschrieben wurde und im Folgenden noch näher erläutert wird; und ein Kontaktlos-Chipmodul, beispielsweise ein Kontaktlos-Chipkartenmodul, das aufweist: einen Chip; und eine Spule, die mit dem Chip elektrisch gekoppelt ist; wobei die Boosterantenne mit der Spule des Kontaktlos-Chipmoduls, beispielsweise des Kontaktlos-Chipkartenmoduls, induktiv gekoppelt ist mittels mindestens eines induktiven Kopplungsbereichs der Boosterantenne.

[0029] Die Chip-Anordnung kann eine beliebige Anordnung sein, die einen Chip aufweist, beispielsweise eine tragbare Anordnung mit einem Chip. Die Boosterantenne kann beispielsweise mit auf einem flexiblen Träger angeordnet sein, beispielsweise auf einem Textil-Träger, beispielsweise auf einem Pflaster (beispielsweise auf einem Heftpflaster).

[0030] Durch entsprechende Dimensionierung und Auslegung der einzelnen Komponenten des ersten elektrischen Schaltkreises und/oder des zweiten elektrischen Schaltkreises ergibt sich eine Vielzahl möglicher Anwendungsfälle. Sowohl der erste, als auch der zweite Resonanzkreis lassen sich durch entsprechende Dimensionierung der Schaltungskomponenten sehr einfach auf eine bestimmte Phasenresonanz oder Betragsresonanz einstellen. Durch den getrennten Aufbau wird zusätzlich die Parametrisierung und Verifikation der Boosterantenne erheblich vereinfacht.

[0031] In einer Ausgestaltung kann das Kontaktlos-Chipmodul, beispielsweise Kontaktlos-Chipkartenmodul, ein Modul mit integrierter Spule (Spule-auf-Modul, Coil-On-Module (CoM)) oder ein Modul mit integrierter Antenne (Auf-dem-Chip-Antenne, On-Chip Antenna (OCA)) sein.

[0032] In noch einer Ausgestaltung kann das Kontaktlos-Chipmodul mit integrierter Spule (Spule-auf-Modul, Coil-On-Module (CoM)) oder ein Modul mit integrierter Antenne (Auf-dem-Chip-Antenne, On-Chip Antenna (OCA)) einen vorgebbaren, beispielsweise vordefinierten, bestimmten Abstand zum Koppelelement der Boosterantenne aufweisen.

[0033] In noch einer Ausgestaltung kann sich das Kontaktlos-Chipmodul mit integrierter Spule (Spule-auf-Modul, Coil-On-Module (CoM)) oder ein Modul mit integrierter Antenne (Aufdem-Chip-Antenne, On-Chip Antenna (OCA)) in einer anderen Materie befinden. (beispielsweiße in einen Muskel oder im Körper eines Lebewesens implantiert sein).

[0034] In einer Ausgestaltung kann die Boosterantenne mindestens einen weiteren Kopplungsbereich aufweisen zum Koppeln mit einem Schreib- und/oder Lesegerät.

[0035] In noch einer Ausgestaltung kann der erste elektrische Schaltkreis den weiteren Kopplungsbereich zum Koppeln mit einem Schreib- und/oder Lesegerät bilden.

[0036] In noch einer Ausgestaltung kann der induktive Kopplungsbereich Teil des zweiten elektrischen Schaltkreises sein; wobei der induktive Kopplungsbereich im Wesentlichen deckungsgleich zu dem Kontaktlos-Chipmodul, beispielsweise Kontaktlos-Chipkartenmodul, angeordnet sein kann.

[0037] In noch einer Ausgestaltung kann der weitere Kopplungsbereich zum Koppeln mit einem Schreib- und/oder Lesegerät von einem Dipol gebildet sein.

[0038] In noch einer Ausgestaltung kann der induktive Kopplungsbereich der Boosterantenne zum Koppeln mit einem Chip vollständig innerhalb des weiteren Kopplungsbereichs zum Koppeln mit einem Schreib- und/oder Lesegerät angeordnet sein.

[0039] In noch einer Ausgestaltung kann der induktive Kopplungsbereich der Boosterantenne zum Koppeln mit einem Chip vollständig außerhalb des weiteren Kopplungsbereichs zum Koppeln mit einem Schreib- und/oder Lesegerät angeordnet sein.

[0040] In noch einer Ausgestaltung kann das Kontaktlos-Chipmodul, beispielsweise Kontaktlos-Chipkartenmodul, ferner Chipkontakte, beispielsweise Chipkartenkontakte aufweisen, welche eingerichtet sein können, eine kontaktbasierte Chip-Schnittstelle, beispielsweise Chipkartenschnittstelle, bereitzustellen.

[0041] In noch einer Ausgestaltung kann die Kontaktlos-Chip-Anordnung, beispielsweise Kontaktlos-Chipkartenmodul Anordnung eingerichtet sein als eine Dual-Interface-Chipmodul-Anordnung, beispielsweise als eine Dual-Interface-Chipkartenmodul-Anordnung.

[0042] In verschiedenen Ausführungsbeispielen wird eine Kontaktlos-Chip-Anordnung bereitgestellt, beispielsweise eine Chipkarte, aufweisend: eine Chipmodul-Anordnung, beispielsweise eine Kontaktlos-Chipkartenmodul-Anordnung, wie sie oben beschrieben wurde und im Folgenden noch näher erläutert wird.

[0043] So ist es beispielsweise möglich, die Bemessung und Dimensionierung der Komponenten der Schaltkreise so vorzunehmen, dass es möglich ist, mit einem äußeren, schwachen elektromagnetischen Feld den ersten Schwingkreis (anders ausgedrückt den ersten Resonanzkreis) in Schwingung zu versetzen, beispielsweise in Phasenresonanz oder Betragsresonanz zu versetzen. Letzteres hätte zur Folge, dass der Betrag der Impedanz des ersten Serienresonanzkreises minimal und der in dem ersten Resonanzkreis induzierte Strom maximal werden würde. Durch die Kopplung des ersten Schaltkreises mit dem zweiten Schaltkreis kann Letzterer ebenfalls angeregt werden. Wird der zweite Schwingkreis beispielsweiße als Parallelresonanzkreis ausgeführt, kommt es innerhalb des Kreises zu einer Stromerhöhung. Diese Ströme in den Zweigen des Parallelresonanzkreises können entsprechend der Güte des Kreises sehr viel größer als der Anregungsstrom sein.

[0044] Dadurch wird zusätzlich zum herkömmlichen geometrischen Boostereffekt auch noch eine elektromagnetische Eigenschaft ausgenutzt, die zu einem elektrischen Boostereffekt führt.

[0045] In einer Ausgestaltung bildet zumindest ein Teil des zweiten elektrischen Schaltkreises der Boosterantenne einen induktiven Kopplungsbereich zur Kopplung mit einer Antenne eines Chipmoduls, beispielsweise eines Chipkartenmoduls. Der induktive Kopplungsbereich kann beispielsweise durch die Ausformung einer Leiterschleife oder einer Spule erfolgen. Beispielsweise kann die Form der Leiterschleife oder der Spule des induktiven Kopplungsbereichs der Boosterantenne der Form der Antenne des Kontaktlos-Chipmoduls, beispielsweise des Kontaktlos-Chipkartenmoduls, entsprechen oder ihr angenähert sein. Darüber hinaus kann es vorgesehen sein, dass auch die Dimensionen, anders ausgedrückt die Größenabmessungen der Leiterschleife oder der Spule des induktiven Kopplungsbereichs der Boosterantenne der Form der Antenne des Kontaktlos-Chipmoduls, beispielsweise des Kontaktlos-Chipkartenmoduls, entsprechen oder ihr zumindest angenähert sind. Eine Verbesserung der Kopplung zwischen Boosterantenne und Kontaktlos-Chipmodul, beispielsweise Kontaktlos-Chipkartenmodul, kann zudem erreicht werden, wenn die Leiterschleife oder die Spule des induktiven Kopplungsbereiches der Boosterantenne die Antenne des Kontaktlos-Chipmoduls, beispielsweise des Kontaktlos-Chipkartenmoduls, eng umschließt oder deckungsgleich über oder unterhalb von ihr angeordnet ist, so dass ein von der Spule oder der Leiterschleife erzeugtes Magnetfeld die Spule des Kontaktlos-Chipmoduls, beispielsweise des Kontaktlos-Chipkartenmoduls, möglichst gut durchsetzt.

[0046] Der erste elektrische Schaltkreis der Boosterantenne kann beispielsweise ein HF-Schwingkreis sein oder einen solchen bilden. Der dritte elektrische Schaltkreis der Boosterantenne kann beispielsweise ein UHF-Schwingkreis (beispielsweise ein UHF-Dipol) sein oder einen solchen bilden.

[0047] Der zweite elektrische Schaltkreis kann eine Mehrzahl von Spulenwindungen und somit mindestens eine innere Spulenwindungen und mindestens eine äußere Spulenwendung aufweisen. Der dritte elektrische Schaltkreis und damit beispielsweise der UHF-Dipol kann in verschiedenen Ausführungsformen nur mit der oder den inneren Spulenwindungen elektrisch leitend verbunden bzw. angeschlossen sein.

[0048] Dadurch kann sich ein hoher induktive Widerstand der restlichen Spulenwindungen nach außen ergeben und der UHF-Pfad kann nicht durch die benötigte HF-Kapazität kurz geschlossen werden.

[0049] Anschaulich sind der erste elektrische Schaltkreis und der dritte elektrische Schaltkreis derart eingerichtet und miteinander und mit dem zweiten elektrischen Schaltkreis der Art elektrisch leitend verbunden bzw. gekoppelt, dass der erste elektrische Schaltkreis und der dritte elektrische Schaltkreis (also beispielsweise der HF-Schwingkreis und der UHF-Schwingkreis) ein magnetisches Feld auf derselben Koppelstruktur (als ein Beispiel des zweiten elektrischen Schaltkreises) erzeugen, welches für eine induktive Kopplung zu einer Antenne auf einem Chip oder zu einer Antenne auf einem anderen Objekt verwendet werden kann.

[0050] In verschiedenen Ausführungsbeispielen wird eine Antennenstruktur bereitgestellt mit einer Spulenantenne mit mehreren Spulenwindungen, wobei die Antennenstruktur derart eingerichtet ist, dass sich auf ihr bei einer vorgegebenen Betriebsfrequenz eines Antennensignals eine stehende Welle des Antennensignals ausbildet.

[0051] In einer Ausgestaltung kann die Antennenstruktur eine Lecherleitungsstruktur aufweisen oder von einer solchen gebildet werden.

[0052] In verschiedenen Ausführungsbeispielen wird eine Chip-Anordnung bereitgestellt, aufweisend: mindestens einen Chip; und eine mit dem Chip gekoppelte Antennenstruktur, wie sie oben beschrieben wurde und im Folgenden noch näher erläutert wird.

[0053] In einer Ausgestaltung können der Chip und die Antennenstruktur auf einem gemeinsamen Träger aufgebracht sein.

[0054] In noch einer Ausgestaltung können der Chip und die Antennenstruktur auf einem gemeinsamen Träger monolithisch integriert aufgebracht sein.

[0055] Ausführungsbeispiele der Erfindung sind in den Figuren dargestellt und werden im Folgenden näher erläutert.

[0056] Es zeigen

[0057] **Fig.** 1 eine herkömmliche Kontaktlos-Chipkarte mit einem Chipkartenkörper, einer darin integrierten Boosterantenne und einer Kontaktlos-Chipkartenmodul-Anordnung;

[0058] **Fig.** 2 eine Boosterantenne gemäß verschiedenen Ausführungsbeispielen;

[0059] **Fig.** 3 eine Boosterantenne gemäß verschiedenen Ausführungsbeispielen;

[0060] **Fig.** 4 einen vergrößerten Ausschnitt des oberen linken Bereichs der Boosterantenne gemäß **Fig.** 3;

[0061] **Fig.** 5 eine Chipkarte mit einer Boosterantenne gemäß verschiedenen Ausführungsbeispielen;

[0062] **Fig.** 6 ein reales Ersatzschaltbild der Boosterantenne gemäß **Fig.** 5;

[0063] **Fig.** 7 ein vereinfachtes Ersatzschaltbild der Boosterantenne gemäß **Fig.** 5;

[0064] **Fig.** 8A und **Fig.** 8B die zugehörigen Ortskurven sowie den Verlauf des Betrags (in einem Betragsdiagramm) des in **Fig.** 7 dargestellten Schaltkreises;

[0065] **Fig.** 9 das Verhältnis der Ströme die im zweiten Schaltkreis fließen zum Strom der im ersten Schaltkreis induziert wird, bei einer entsprechenden Güte des zweiten Resonanzkreises (in einem Stromdiagram);

[0066] **Fig.** 10 eine Draufsicht auf einen Chip mit einer (monolithisch) integrierten Antennenstruktur gemäß verschiedenen Ausführungsbeispielen;

[0067] **Fig.** 11 eine Draufsicht auf eine Spule gemäß verschiedenen Ausführungsbeispielen;

[0068] **Fig.** 12 eine Simulationsdarstellung eines ersten Resonanzfalls in der Spule gemäß **Fig.** 11;

[0069] **Fig.** 13 eine Simulationsdarstellung eines zweiten Resonanzfalls in der Spule gemäß **Fig.** 11;

[0070] **Fig.** 14 eine Darstellung der Ausbreitung einer stehenden Welle entlang einer Lecherleitung zu unterschiedlichen Zeitpunkten; und

[0071] **Fig.** 15 eine anschauliche Erläuterung der Struktur der Spule gemäß **Fig.** 11, weshalb diese Struktur ebenfalls eine Lecherleitung bildet.

[0072] In der folgenden ausführlichen Beschreibung wird auf die beigefügten Zeichnungen Bezug genommen, die Teil dieser bilden und in denen zur Veranschaulichung spezifische Ausführungsformen gezeigt sind, in denen die Erfindung ausgeübt werden kann. In dieser Hinsicht wird Richtungsterminologie wie etwa „oben", „unten", „vorne", „hinten", „vorderes", „hinteres", usw. mit Bezug auf die Orientierung der beschriebenen Figur(en) verwendet. Da Komponenten von Ausführungsformen in einer Anzahl verschiedener Orientierungen positioniert werden können, dient die Richtungsterminologie zur Veranschaulichung und ist auf keinerlei Weise einschränkend. Es versteht sich, dass andere Ausführungsformen benutzt und strukturelle oder logische Änderungen vorgenommen werden können, ohne von dem Schutzumfang der vorliegenden Erfindung abzuweichen. Es versteht sich, dass die Merkmale der hierin beschriebenen verschiedenen beispielhaften Ausführungsformen miteinander kombiniert werden können, sofern nicht spezifisch anders angegeben. Die folgende ausführliche Beschreibung ist deshalb nicht in einschränkendem Sinne aufzufassen, und der Schutzumfang der vorliegenden Erfindung wird durch die angefügten Ansprüche definiert.

[0073] Im Rahmen dieser Beschreibung werden die Begriffe "verbunden", "angeschlossen" sowie "gekoppelt" verwendet zum Beschreiben sowohl einer direkten als auch einer indirekten Verbindung, eines direkten oder indirekten Anschlusses sowie einer direkten oder indirekten Kopplung. In den Figuren werden identische oder ähnliche Elemente mit identischen Bezugszeichen versehen, soweit dies zweckmäßig ist.

[0074] In verschiedenen Ausführungsbeispielen wird eine Kombination von einer oder mehreren UHF-Boosterantennen (UHF: Ultrahochfrequenz) und einer oder mehreren HF-Boosterantennen (HF: Hochfrequenz) bereitgestellt. Durch eine geschickte geometrische Anordnung der einzelnen Komponenten ist es nun ermöglicht, auch sehr kleine Kommunikationsmodule und/oder Chips mit einer integrierten Antenne in verschiedenen Frequenzbändern auszulesen. Eine UHF-Boosterantenne kann eingerichtet sein, elektromagnetische Wellen mit einer Frequenz in einem Bereich von ungefähr 0,3 GHz bis ungefähr 3 GHz auszusenden oder zu empfangen. Weiterhin kann eine HF-Boosterantenne eingerichtet sein, elektromagnetische Wellen mit einer Frequenz in einem Bereich von ungefähr 0,3 kHz bis ungefähr 30 MHz auszusenden oder zu empfangen.

[0075] Wird an die vorgesehene Stelle (auch bezeichnet als Kopplungsbereich, anschaulich der Bereich, in dem der zweite elektrische Schaltkreis vorgesehen ist zum Erzeugen einer induktiven Kopplung mit einem Chip oder einem anderen Objekt) ein UHF Chip angebracht, so fungiert die Boosterantenne anschaulich als UHF-Tag. Wird ein HF-OCA (OCA: On-Chip Antenna, Chip mit (monolithisch) integrierter Antenne) verwendet, so entsteht ein konventioneller HF-Transponder.

[0076] Zusätzlich gibt es in verschiedenen Ausführungsbeispielen die Möglichkeit, einen oder mehrere Chips mit einer speziellen On-Chip-Antenne zu verwenden, so dass das System ähnlich wie ein so genannter Comprehensive-Transponder funktioniert. D. h. sowohl der Chip als auch die Boosterantenne können auf beiden Frequenzen (bzw. Frequenzbereichen) arbeiten. Dadurch entsteht ein Comprehensive-Transponder-System.

[0077] Anschaulich wird in verschiedenen Ausführungsbeispielen wie auch bei standardmäßigen Comprehensive Antennen, eine Ableitung des Dipols mit einer HF-Spule in einer Boosterantenne kombiniert. In verschiedenen Ausführungsbeispielen ist bei der Comprehensive-Boosterantenne anschaulich eine Mittelanzapfung des sekundären Koppelelements (d. h. das Koppelelement, das zur induktiven Kopplung mit einem Chip vorgesehen ist) vorgesehen. Während in verschiedenen Ausführungsbeispielen die gesamte sekundäre Koppelspule für HF verwendet werden kann, findet für UHF beispielsweise nur der innere Teil der Spulenwicklung eine Verwendung. So ist die ideale Kopplung für beide Frequenzbänder möglich.

[0078] Anschaulich wird in verschiedenen Ausführungsbeispielen eine unterschiedliche Spulenspeisung von einem UHF-Dipol und einer HF-Spule bei einer Boosterantenne bereitgestellt.

[0079] In verschiedenen Ausführungsbeispielen versorgt ein HF-Schwingkreis (als ein Beispiel des ersten elektrischen Schaltkreises) mit einer großen Spule den HF-Resonanzkreis mit einer kleinen Koppelspule (als ein Beispiel des zweiten elektrischen Schaltkreises). Diese weist mehrere Spulenwindungen auf, um eine dementsprechend hohe Induktivität für HF zu erreichen. Der UHF-Dipol (in der Abbildung ausgeführt als IFA) ist nur an den inneren Spulenwindungen dieser Koppelspule angeschlossen. Dadurch ergibt sich ein hoher induktiver Widerstand der restlichen Spulenwindungen nach außen und der UHF-Pfad kann nicht durch die benötigte HF-Kapazität kurzgeschlossen werden. Somit erzeugen die HF-Antennenstruktur und die UHF-Antennenstruktur also auf derselben Koppelstruktur ein magnetisches Feld, das beispielsweise für eine induktive Kopplung zu OCAs bzw. CoMs verwendet werden kann.

[0080] **Fig.** 2 zeigt eine Boosterantenne **200** gemäß verschiedenen Ausführungsbeispielen.

[0081] Die Boosterantenne **200**, die beispielsweise für eine Chip-Anordnung vorgesehen ist, beispielsweise für eine Chipkarte, kann einen Träger **202** sowie einen auf dem Träger **202** aufgebrachten ersten Schaltkreis **204** aufweisen, der einen ersten Resonanzkreis bildet. Der erste Schaltkreis **204** kann eine erste Spule **206** mit mindestens einer Spulenwindung **208** aufweisen. Der erste elektrische Schaltkreis **204** kann einen Kopplungsbereich zum induktiven Koppeln mit einem Schreib- und/oder Lesegerät (nicht dargestellt) bilden. Der Träger **202** kann beispielsweise eine Folie, beispielsweise eine Plastikfolie sein.

[0082] In noch einer Ausgestaltung kann der Kopplungsbereich zum Koppeln mit einem Schreib- und/oder Lesegerät von einer Leiterschleife gebildet sein.

[0083] Die Größe der Leiterschleife bzw. der ersten Spule **206** kann in verschiedenen Ausführungsbeispielen im Wesentlichen durch die äußeren Abmessungen eines Trägersubstrates (anders ausgedrückt des Trägers

202), oder auch beispielsweise der Chip-Anordnung, beispielsweise der Chipkarte, selbst, begrenzt werden, wenn beispielsweise der Träger **202** in der Chip-Anordnung integriert ist (beispielsweise in den Chipkartenkörper einlaminiert ist). Um eine möglichst große vom elektromagnetischen Wechselfeld durchsetzte Fläche zu erhalten, kann die Form der Leiterschleife bzw. Spule der Form des Substrates bzw. der Chip-Anordnung, beispielsweise der Chipkarte angeglichen werden. Ferner können hinsichtlich der Ausgestaltung der Form und Größe der Leiterschleife bzw. Spule Normen wie beispielsweise ISO 7816 berücksichtig werden, die Bereiche definieren, die für die Beschriftungen Einprägungen oder ähnlichem auf den Karten von elektrischen Komponenten wie Leiterbahnen freizuhalten sind.

[0084] In einer Ausgestaltung kann die Wicklungsrichtung der Spulenwindung(en) **208** gleichsinnig sein.

[0085] In noch einer Ausgestaltung kann der Kopplungsbereich zum Koppeln mit einem Schreib- und/oder Lesegerät von einer HF-Antennenstruktur gebildet sein.

[0086] Die Boosterantenne **200** kann ferner einen auf dem Träger **202** aufgebrachten zweiten Schaltkreis **210** aufweisen, der einen zweiten Resonanzkreis bildet. Der zweite Schaltkreis **210** kann eine zweite Spule **212** mit mindestens einer Spulenwindung **214**, **216** aufweisen. In verschiedenen Ausführungsbeispielen können mehrere Spulenwindungen **214**, **216** vorgesehen sein, wobei die mehreren Spulenwindungen **214**, **216** mindestens eine innere Spulenwindung **214** und mindestens eine um die innere Spulenwindung **214** herum verlaufende äußere Spulenwindung **216** aufweisen können. Der zweite elektrische Schaltkreis **210** kann einen Kopplungsbereich **218** zum induktiven Koppeln mit einem Chip (nicht dargestellt) bilden.

[0087] In noch einer Ausgestaltung kann der induktive Kopplungsbereich **218** Teil des zweiten elektrischen Schaltkreises **210** sein, wobei der induktive Kopplungsbereich **218** im Wesentlichen deckungsgleich zu dem Kontaktlos-Chipmodul, beispielsweise dem Kontaktlos-Chipkartenmodul angeordnet sein kann.

[0088] In noch einer Ausgestaltung kann der induktive Kopplungsbereich **218** von einer Leiterschleife gebildet sein.

[0089] In noch einer Ausgestaltung kann der induktive Kopplungsbereich **218** von einer Spule, beispielsweise von der innersten Spulenwindung **214** der Spule **212**, definiert sein.

[0090] In noch einer Ausgestaltung kann der induktive Kopplungsbereich **218** der Boosterantenne **200** zum Koppeln mit einem Chip vollständig innerhalb des weiteren Kopplungsbereichs zum Koppeln mit einem Schreib- und/oder Lesegerät angeordnet sein.

[0091] In noch einer Ausgestaltung kann der induktive Kopplungsbereich **218** der Boosterantenne **200** zum Koppeln mit einem Chip vollständig außerhalb des weiteren Kopplungsbereichs zum Koppeln mit einem Schreib- und/oder Lesegerät angeordnet sein.

[0092] Die Boosterantenne **200** kann weiterhin einen auf dem Träger **202** aufgebrachten dritten Schaltkreis **220** aufweisen, der einen dritten Resonanzkreis bildet. Der dritte Schaltkreis **220** kann eine Dipol-Antenne **222** aufweisen oder von ihr gebildet werden. Die Dipol-Antenne **222** kann zwei elektrische (beispielsweise gerade linienförmige) Leitungen **224**, **226** aufweisen, wobei eine erste Leitung **224** mit ihrem ersten Ende beispielsweise mit dem innersten Ende der inneren Spulenwindung **214** der zweiten Spule **212** elektrisch leitend verbunden ist (das zweite Ende der ersten Leitung **224** liegt frei), und wobei eine zweite Leitung **226** mit ihrem ersten Ende beispielsweise ebenfalls mit einer inneren Spulenwindung **214** der zweiten Spule **212** elektrisch leitend verbunden ist (das zweite Ende der zweiten Leitung **226** liegt frei). Die erste Leitung **224** und die zweite Leitung **226** erstrecken sich voneinander weg, liegen jedoch entlang einer gemeinsamen Gerade.

[0093] Die Dipol-Antenne **222** kann jedoch in alternativen Ausgestaltungen auch eine andere gewünschte oder geeignete Form aufweisen, beispielsweise eine Form, wie sie im Folgenden noch näher erläutert wird.

[0094] **Fig.** 3 zeigt eine Boosterantenne **300** gemäß verschiedenen Ausführungsbeispielen.

[0095] Die Boosterantenne **300** gemäß **Fig.** 3 hat einen ähnlichen Aufbau wie die Boosterantenne **200** gemäß **Fig.** 2, weshalb im Folgenden nur die Unterschiede zwischen den beiden Boosterantennen dargelegt werden.

[0096] Bei der Boosterantenne **300** gemäß **Fig.** 3 ist die Dipol-Antenne als eine invertierte F-Antenne (IFA) **302** ausgebildet. Weiterhin weist die zweite Spule **212** in diesen Ausführungsbeispiel eine Vielzahl von Spu-

lenwindungen **214**, **216** auf, wobei eine Vielzahl von inneren Spulenwindungen **214** und eine Vielzahl von äußeren Spulenwindungen **216** vorgesehen sind. Wie in **Fig.** 3 dargestellt ist, ist ein erster (oberster) (Quer-) Schenkel **304** des „F's" der IFA **302** mit einer ersten inneren Spulenwindung **214** der zweiten Spule **212** mittels einer ersten elektrisch leitfähigen Leitung **306** elektrisch leitend verbunden. Ferner ist ein zweiter (mittlerer) (Quer-)Schenkel **308** des „F's" der IFA **302** mit einer zweiten inneren Spulenwindung **214** der zweiten Spule **212** mittels einer zweiten elektrisch leitfähigen Leitung **310** elektrisch leitend verbunden.

[0097] **Fig.** 4 zeigt einen vergrößerten Ausschnitt des oberen linken Bereichs der Boosterantenne **300** gemäß **Fig.** 3.

[0098] In verschiedenen Ausgestaltungen kann der erste Schaltkreis den ersten Resonanzkreis mit einer ersten Phasenresonanz bilden, und der zweite Schaltkreis kann den zweiten Resonanzkreis mit einer zweiten Betragsresonanz bilden.

[0099] **Fig.** 5 zeigt eine Chipkarte **500** mit einer Boosterantenne **504** gemäß verschiedenen Ausführungsbeispielen

[0100] Es ist darauf hinzuweisen, dass auch wenn verschiedene Ausführungsbeispiele anhand einer Chipkarte **500** erläutert werden, alternative Ausführungsbeispiele auch in anderen Anwendungsbereichen vorgesehen sein können. So kann beispielsweise die Boosterantenne **504** auch auf einem anderen Träger angeordnet sein, beispielsweise einem flexiblen Träger, beispielsweise einem Textil-Träger (beispielsweise einem Pflaster, beispielsweise einem Heftpflaster). Das Chipmodul muss auch nicht unbedingt als ein Chipkartenmodul implementiert sein, sondern kann beispielsweise ein Chipmodul sein, das beispielsweise unter die Haut eines Lebewesens implantiert sein kann.

[0101] Die Boosterantenne **504** gemäß **Fig.** 5 hat einen ähnlichen Aufbau wie die Boosterantenne **200** gemäß **Fig.** 2, weshalb im Folgenden nur die Unterschiede zwischen den beiden Boosterantennen dargelegt werden.

[0102] Die Chipkarte **500** weist einen Chipkartenkörper **502** auf sowie eine Boosterantenne **504** gemäß verschiedenen Ausführungsbeispielen. Ferner weist die Chipkarte **500** ein Kontaktlos-Chipkartenmodul **506** auf, beispielsweise eine On-Chip-Antenna (OCA) oder ein Chip-on-Module (CoM). In verschiedenen Ausführungsbeispielen ist die Boosterantenne **504** in den Chipkartenkörper **502** integriert, beispielsweise einlaminiert.

[0103] Das Kontaktlos-Chipkartenmodul **506** kann einen Chip sowie eine Spule aufweisen, die mit dem Chip elektrisch gekoppelt (beispielsweise elektrisch leitend verbunden) ist, beispielsweise mittels einer Leiterbahn. Die Boosterantenne **504** kann mit der Spule des Kontaktlos-Chipkartenmoduls **506** (auch bezeichnet als Kontaktlos-Chipkartenmodul) induktiv gekoppelt sein mittels des mindestens einen induktiven Kopplungsbereichs **218** der Boosterantenne **504**, wie oben beschrieben wurde und auch im Folgenden noch näher erläutert wird. Ferner kann die Boosterantenne **504** mindestens einen weiteren Kopplungsbereich aufweisen zum induktiven Koppeln mit einem Schreib- und/oder Lesegerät.

[0104] Die Chipkarte **500** und damit auch die Kontaktlos-Chipkartenmodul-Anordnung können als eine rein kontaktlose Chipkartenmodul-Anordnung eingerichtet sein. Alternativ kann die Chipkarte **500** und damit auch die Kontaktlos-Chipkartenmodul-Anordnung optional zusätzlich eine kontaktbasierte Chipkartenschnittstelle (beispielsweise ein Kontaktfeld **508** mit einer Vielzahl von elektrisch leitfähigen Kontakten), beispielsweise in Form von Chipkartenkontakten (beispielsweise gemäß ISO 7816), aufweisen und somit als eine Dual-Interface-Chipkartenmodul-Anordnung eingerichtet sein.

[0105] Die Boosterantenne **504** kann den ersten elektrischen Schaltkreis aufweisen, der einen ersten Resonanzkreis mit einer ersten Phasenresonanz bildet sowie den zweiten elektrischen Schaltkreis, der einen zweiten Resonanzkreis mit einer zweiten Betragsresonanz bildet. Der erste elektrische Schaltkreis und der zweite elektrische Schaltkreis sind miteinander, beispielsweise elektrisch, gekoppelt.

[0106] Die Boosterantenne **504** kann im Wesentlichen zwei Leiterschleifen **510**, **512** aufweisen, eine große Leiterschleife **510** und eine kleine Leiterschleife **512**. Die kleine Leiterschleife **512** umschließt das CoM **506** bzw. OCA **506**. Die große Leiterschleife **510** ist mit ihren Enden mit den Enden der kleinen Leiterschleife **512** elektrisch leitend verbunden und umschließt teilweise die kleine Leiterschleife **512**. Zu den Enden beider Leiterschleifen **510**, **512** ist ein zweiter Kondensator **516**, der Teil des zweiten elektrischen Schaltkreises ist, parallel geschaltet. Ferner weist die große Leiterschleife **510** in ihrem linken Bereich einen in Serie geschalteten ersten Kondensator **514** auf. Weiterhin ist eine Dipol-Antenne **518** als dritter Schaltkreis vorgesehen, wobei die Dipol-

Antenne **518** mit einer inneren Spulenwindung **520** der Spule **522** des zweiten Schaltkreises elektrisch leitend verbunden ist. Eine erste Induktivität des ersten Kopplungsbereichs des ersten Schaltkreises und eine zweite Induktivität des zweiten Kopplungsbereichs des zweiten Schaltkreises der Boosterantenne **500** sind jeweils als eine Leiterschleife **510**, **512** (eine erste, große Leiterschleife **510** sowie eine zweite, kleine Leiterschleife **512**) ausgeführt sind, wobei die zweite Leiterschleife **512** des zweiten Kopplungsbereiches exzentrisch innerhalb der ersten Leiterschleife **510** angeordnet sein kann. Die erste Leiterschleife **510** kann in ihrem linken Bereich unterbrochen sein, wobei die Enden der ersten Leiterschleife **510** an der Unterbrechungsstelle T-förmig ausgeformt sind und damit einen Plattenkondensator, nämlich den ersten Kondensator **514**, bilden. Die Enden der Leiterschleifen **510**, **512** im rechten Bereich der Boosterantenne **500** sind über parallel zueinander verlaufende Leitungen, die sich über die erste Leiterschleife **510** hinaus erstrecken, miteinander elektrisch leitend verbunden; die parallel verlaufenden Leitungen bilden wiederum einen Plattenkondensator, nämlich den zweiten Kondensator **516**. Die Kapazität dieses zweiten Kondensators **516** ist die Kapazität des Parallelresonanzkreises. Die zweite Leiterschleife **512** weist eine Spule mit mehreren, beispielsweise drei (alternativ zwei, vier, fünf, sechs, sieben oder mehr) Spulenwindungen auf.

[0107] Somit weist die Boosterantenne **500** in verschiedenen Ausführungsbeispielen einen getrennten Aufbau zweier Resonanzkreise (einen Serienresonanzkreis (gebildet von dem ersten elektrischen Schaltkreis) und einen Parallelresonanzkreis (gebildet von dem zweiten elektrischen Schaltkreis)) auf, welche dieselbe Phasenresonanz und Betragsresonanz aufweisen können. Wird der zweite Schwingkreis beispielsweiße als Parallelresonanzkreis ausgeführt, kommt es innerhalb des Kreises zu einer Stromerhöhung. Diese Ströme in den Zweigen des Parallelresonanzkreises können entsprechend der Güte des Kreises sehr viel größer als der Eingangsstrom sein. Einfach ausgedrückt versorgt der Serienresonanzkreis (auch bezeichnet als Serienschwingkreis), in dem der Strom induziert wird, den Parallelresonanzkreis (auch bezeichnet als Parallelschwingkreis), in dem es dann zu einer erneuten Stromüberhöhung kommt. Diese Stromüberhöhung kann proportional zu der Güte des jeweiligen Parallelschwingkreises sein.

[0108] **Fig.** 6 zeigt ein reales Ersatzschaltbild **600** der Boosterantenne **500** gemäß **Fig.** 5.

[0109] Weiterhin ist in **Fig.** 6 eine Schreib-/Lesevorrichtung **602** dargestellt, die induktiv mit der Chipkarte **500** gekoppelt ist (mittels einer ersten induktiven Kopplung **620**) und damit mittels der Boosterantenne **500**, wiederum induktiv, mit dem Kontaktlos-Chipkartenmodul **506** (mittels einer zweiten induktiven Kopplung **622**) gekoppelt ist.

[0110] Das reale Ersatzschaltbild **600** der Boosterantenne **500** gemäß **Fig.** 5 weist eine (auf der Kopplungsseite zu der Schreib-/Lesevorrichtung **602**) eine erste Induktivität ($L_{groß}$) **604**, einen ersten Kondensator ($C_{groß}$) **606**, einen ersten ohmschen Widerstand ($R_{groß}$) **608** und eine (vernachlässigbare) erste parasitäre Kapazität ($C_{groß\_para}$) **610** der großen Leiterschleife auf, sowie eine zweite Induktivität (L_{klein}) **612**, einen zweiten Kondensator (C_{klein}) **614**, einen zweiten ohmschen Widerstand (R_{klein}) **616** und eine (vernachlässigbare) zweite parasitäre Kapazität (C_{klein_para}) **618** der kleinen Leiterschleife auf.

[0111] Durch Vernachlässigen der parasitären Anteile erhält man das in **Fig.** 7 gezeigte, vereinfachte Ersatzschaltbild **700**.

[0112] Das vereinfachte Ersatzschaltbild **700** weist nur noch die erste Induktivität ($L_{groß}$) **604**, den ersten Kondensator ($C_{groß}$) **606**, den ersten ohmschen Widerstand ($R_{groß}$) **608** der großen Leiterschleife auf, sowie die zweite Induktivität (L_{klein}) **612**, den zweiten Kondensator (C_{klein}) **614**, und den zweiten ohmschen Widerstand (R_{klein}) **616** der kleinen Leiterschleife auf.

[0113] Wie dem vereinfachten Ersatzschaltbild **700** zu entnehmen ist, bilden die Komponenten der großen Leiterschleife einen Serienresonanzkreis (anders ausgedrückt den ersten elektrischen Schaltkreis) und die die Komponenten der kleinen Leiterschleife einen Parallelresonanzkreis (anders ausgedrückt den zweiten elektrischen Schaltkreis); der Serienresonanzkreis **702** ist dabei zu der Kapazität des Parallelresonanzkreises **704** seriell geschaltet. Über die erste Induktivität **604** der großen Leiterschleife erfolgt die erste induktive Kopplung (k) **620** zu dem Schreib- und/oder Lesegerät (Reader) **602**; über die zweite Induktivität **612** der kleinen Leiterschleife erfolgt die Kopplung zu dem CoM bzw. der OCA, allgemein dem Kontaktlos-Chipkartenmodul **506**.

[0114] Die Phasenresonanzen der Schwingkreise **702**, **704** können mit folgenden Formeln ermittelt:

$$fr_{klein} = \frac{1}{2 \cdot Pi} \cdot \sqrt{\frac{1}{L_{klein}C_{klein}} - \frac{R_{klein}^2}{L_{klein}^2}}, \quad (1)$$

$$fr_{groß} = \frac{1}{2 \cdot Pi \cdot \sqrt{L_{groß}C_{groß}}}. \quad (2)$$

[0115] Im vorliegenden Fall können die beiden Resonanzkreise **702**, **704** derart dimensioniert sein, dass die Phasenresonanz für den Serienresonanzkreis **702** und die Betragsresonanz für den Parallelresonanzkreis **704** 13,56 MHz beträgt.

[0116] **Fig.** 8A und **Fig.** 8B zeigen die zugehörigen Ortskurven in einem Ortskurvendiagramm **800**, sowie den Verlauf des Betrags (in einem Betragsdiagramm **801**) mit unterschiedlichen Güten des zweiten Schwingkreises. Es ist zu erkennen, dass ab einer bestimmten Güte des zweiten Schwingkreises bis zu 3 Phasenresonanzen (erste Phasenresonanz **801**, zweite Phasenresonanz **802** und dritte Phasenresonanz **803**) des Gesamtsystems möglich sind. Dies ist auch mittels Extremstellen zweier Höcker **804** und **805** in einem Betragsdiagramm **806** veranschaulicht.

[0117] Es ist dargestellt, dass in dem zweiten Resonanzfall (erste Phasenresonanz **803** und zugehöriges Betragsminimum **805**) die Impedanz nur nach den Realteil aufweist. Diese Punkte entsprechen der Betriebsfrequenz der Boosterantenne. Würde die Güte des ersten Serienschwingkreises verändert werden, verschieben sich die in dem Ortskurvendiagramm **800** dargestellten Kurven entlang der x-Achse.

[0118] **Fig.** 9 zeigt ein Stromdiagramm **900**. Hier wird das Verhältnis der Ströme **901** die im zweiten Schaltkreis fließen (IL und IC), zum Strom der im ersten Schaltkreis induziert wird, bei einer entsprechenden Güte des zweiten Resonanzkreises dargestellt.

[0119] In **Fig.** 9 ist verdeutlicht, dass der Strom in der Koppelstruktur der kleinen Induktivität (zweiter Schaltkreis) im Vergleich zu dem Strom in der großen Induktivität (erster Schaltkreis) deutlich erhöht ist. Der stark erhöhte Strom in der kleinen Leiterschleife ruft in weiterer Folge ein verstärktes Magnetfeld hervor, wodurch die Kopplung zu dem Kontaktlos-Chipkartenmodul **506** signifikant verbessert wird.

[0120] Je höher die Güte des zweiten Schwingkreises ist, desto weniger sind die Strommaxima **902** gegenüber der Betriebsfrequenz verschoben. Das Verhältnis von Stromüberhöhung **902** und dem Eingangsstrom entspricht in etwa der Güte des zweiten Resonanzkreises.

[0121] Wie oben beschrieben wurde, können allgemein der erste elektrische Schaltkreis und der zweite elektrische Schaltkreis derart eingerichtet sind, dass die erste Phasenresonanz (d. h. die Phasenresonanz des ersten elektrischen Schaltkreises) und die zweite Betragsresonanz (d. h. die Betragsresonanz des zweiten elektrischen Schaltkreises) identisch sind. Der erste elektrische Schaltkreis und der zweite elektrische Schaltkreis können derart eingerichtet sein (anders ausgedrückt derart dimensioniert sein), dass die erste Phasenresonanz und/oder die zweite Betragsresonanz ungefähr 13,56 MHz betragen/beträgt.

[0122] Die Boosterantenne gemäß verschiedenen Ausgestaltungen kann derart eingerichtet und dimensioniert sein, dass die Chipkarte in dem HF-Frequenzbereich (beispielsweise mittels des ersten elektrischen Schaltkreises) oder in dem UHF-Frequenzbereich (beispielsweise mittels des dritten elektrischen Schaltkreises) betrieben werden kann.

[0123] Die kombinierte Boosterantenne, d. h. eine Boosterantenne, die gemäß verschiedenen Ausführungsbeispielen mehrere Frequenzbänder unterstützt, kann nun mit HF-OCAs und/oder UHF-OCAs eingesetzt werden.

[0124] Durch den Einsatz von einem so genannten Comprehensive-OCA entsteht ein Comprehensive Transponder der sowohl bei UHF als auch bei HF funktioniert.

[0125] Verschiedene Ausführungsbeispiele können beispielsweise in folgendem Anwendungsbeispiel eingesetzt werden:

Ein passives Sensordevice (OCA-Chip mit einem oder mehreren Sensoren) das unter die Haut eines Lebewesens, beispielsweise eines Menschens implantiert wird, ist kann vorgesehen sein zum Auslesen von Biosignalen wie Temperatur, Glucose, oder dergleichen.

[0126] Versorgt wird dieser Chip beispielsweise mit Energie über HF (die Koppelstruktur liefert genügend Energie, um den Betrieb des Chips aufrechtzuhalten). Diese HF-Energie kommt aus unmittelbarer Nähe; einer Basisstation oder einem Energieharvester, der auf dem Pflaster (auf dem sich auch die Boosterantenne befinden kann) implementiert ist. Die gemessenen Sensordaten werden jedoch in verschiedenen Ausführungsbeispielen über UHF gesendet. Dies erhöht die Reichweite erheblich. Patienten in einem Krankenzimmer können auf diese Weise einfach, über eine leicht zu realisierende, gesundheitsverträgliche Methode überwacht werden.

[0127] Ein weiteres Anwendungsbeispiel ist in einer Kombination von Markenschutz und Logistikanwendung zu sehen, wobei UHF für den Logistikbereich eingesetzt werden kann (EPC, Evolved Packet Core, anschaulich Kommunikation über ein 3GPP Kommunikationsnetzwerk) und wobei HF für die Kommunikation mit dem Nutzer eingesetzt werden kann als Nahfeld-Kommunikation (NFC, Near Field Communication).

[0128] Durch den Einsatz von einer oder mehreren Comprehensive Boosterantennen werden die Vorteile beider Frequenzbänder vereint. UHF bietet eine hohe Lese/Schreib-Reichweite und wird in der Logistik überall eingesetzt. Verpackungen können auf diese Weise einfach lokalisiert und überwacht werden.

[0129] Für den Endnutzer ist beispielsweise die NFC-Anwendung von Bedeutung. Hier werden beispielsweise mittels eines NFC-fähigen Mobilfunk-Kommunikationsendgeräts detaillierte Informationen über das Produkt aus unmittelbarer Nähe abgerufen.

[0130] **Fig.** 10 zeigt eine Draufsicht auf einen Chip **1000** mit einem Träger **1002**, beispielsweise aufweisend Silizium (oder ein anders geeignetes Halbleitermaterial oder ein anderes geeignetes Verbundhalbleitermaterial), und mit einer in dem Träger **1002** (monolithisch) integrierten Antennenstruktur **1004**.

[0131] In dem Träger **1002** ist mindestens ein Schaltkreis (nicht dargestellt), beispielsweise ein Logik-Schaltkreis und/oder ein Speicher-Schaltkreis enthalten.

[0132] Der Chip **1000** stellt somit anschaulich eine On-Chip-Antenne (OCA) dar.

[0133] Wie im Folgenden noch näher erläutert wird stellt der Chip **1000** eine Comprehensive-Antenne dar, die sowohl HF als auch UHF unterstützt.

[0134] Mittels dieser Bauweise kann die im Folgenden beschriebene Antenne auf mehreren verschiedenen Frequenzen (bzw. Frequenzbereichen) betrieben werden.

[0135] Beispielsweise bei Anwendungen mit On-Chip-Antennen ermöglicht diese Variante eine sehr einfach zu realisierende Multifrequenzband-Funktion.

[0136] Durch die speziell geformte Spule der im Folgenden beschriebenen Antennenstruktur **1004** des Chips **1000** kommt es zu mehreren Resonanzfällen, die je nach Geometrie bei unterschiedlichen Frequenzbändern auftritt.

[0137] Hierdurch ist es möglich, durch die kleine Bauweise dieser Antennenstruktur **1004**, dieser als Comprehensive-On-Chip-Antenne einzusetzen.

[0138] Dieser (beispielsweise) RFID-Chip **1000**, kann somit mit verschiedenen Frequenzen betrieben werden.

[0139] Die Antennenstruktur **1004** kann eine Spulenantenne mit mehreren Spulenwindungen aufweisen, wobei die Antennenstruktur derart eingerichtet ist, dass sich auf ihr bei einer vorgegebenen Betriebsfrequenz eines Antennensignals eine stehende Welle des Antennensignals ausbildet. Die Antennenstruktur **1004** kann eine Lecherleitungsstruktur aufweisen, wie im Folgenden noch näher erläutert wird.

[0140] Dies kann beispielsweise erreicht werden durch Bereitstellen einer speziellen geometrischen Struktur der Spule.

[0141] So kann die Spule **1100** beispielsweise eine Struktur aufweisen, wie sie in **Fig.** 11 in Draufsicht dargestellt ist.

[0142] Die Spule **1100** kann zwei Spulenwindungen **1102**, **1104** aufweisen, wobei eine erste Spulenwindung **1102** im Wesentlichen vollständig innerhalb einer zweiten Spulenwindung **1104** verläuft. Ein erster Spulenanschluss **1106** sowie ein zweiter Spulenanschluss **1108** sind an den jeweiligen Enden der Spule **1100** vorgesehen, und zwar beispielsweise an der äußeren zweiten Spulenwindung **1104**. An die beiden Spulenanschlüsse **1106**, **1108** ist die entsprechende Potenzialdifferenz des Antennensignals bereitzustellen. Im Verlauf der beiden Spulenwindungen **1102**, **1104** kreuzen sich die beiden Spulenwindungen, so dass ein jeweiliger Anschluss **1110**, **1112** der ersten Spulenwindung **1102** paarweise angeschlossen ist (das heißt elektrisch leitend verbunden ist) mit einem jeweiligen Anschluss **1114**, **1116** der zweiten Spulenwindung **1104**. Genauer ausgedrückt bedeutet dies, dass ein erster Anschluss **1110** der ersten Spulenwindung **1102** elektrisch leitend verbunden ist mit einem ersten Anschluss **1114** der zweiten Spulenwindung **1104** mittels einer ersten Verbindungsleitung **1118**, und dass ein zweiter Anschluss **1112** der ersten Spulenwindung **1102** elektrisch leitend verbunden ist mit einem zweiten Anschluss **1116** der zweiten Spulenwindung **1104** mittels einer zweiten Verbindungsleitung **1120**, wobei die erste Verbindungsleitung **1118** und die zweite Verbindungsleitung **1120** einander kreuzen, wobei die beiden Verbindungsleitungen **1118**, **1120** übereinander verlaufen und voneinander elektrisch isoliert sind, beispielsweise mittels eines Oxids (beispielsweise Siliziumoxid) und/oder mittels eines Nitrids (beispielsweise Siliziumnitrid) oder eines oder mehrerer anderer Isolationsmaterialien oder Isolationsschichten.

[0143] Die Spule **1100** weist beispielsweise eine rechteckförmige (beispielsweise quadratische) Form oder eine runde Form (beispielsweise elliptische oder kreisförmige) auf. In **Fig.** 11 ist die Spule mit einer im Wesentlichen quadratischen Form dargestellt, wobei die Spule eine erste Seite **1122** (auf der die Spulenanschlüsse **1106**, **1108** vorgesehen sind), eine der ersten Seite gegenüberliegende zweite Seite **1124** (auf der die Verbindungsleitungen **1118**, **1120** vorgesehen sind), sowie eine dritte Seite **1126**, welche die Leitungen der Spulenwindungen **1102**, **1104** der ersten Seite **1122** mit den Leitungen der Spulenwindungen **1102**, **1104** der zweiten Seite **1124** an deren ersten Enden elektrisch leitend verbindet, sowie eine vierte Seite **1128**, welche die Leitungen der Spulenwindungen **1102**, **1104** der ersten Seite **1122** mit den Leitungen der Spulenwindungen **1102**, **1104** der zweiten Seite **1124** an deren zweiten Enden elektrisch leitend verbindet.

[0144] Diese Struktur kann beliebig oft in der Antennenstruktur **1004** wiederholt vorgesehen sein, so dass sich beispielsweise die in **Fig.** 10 dargestellt Antennenstruktur **1004** ergibt.

[0145] Eine erste Resonanzfrequenz ergibt sich bei der Antennenstruktur **1004** wie bei einer konventionellen Spule. In diesem Fall heben sich die Induktivitäten und die parasitären Chip-Kapazitäten auf, und es kommt zum Resonanzfall, wie er in einer ersten Simulationsdarstellung **1200** in **Fig.** 12 für die Spule **1100** dargestellt ist. Wie in **Fig.** 12 dargestellt ist, bildet sich in der Spule **1200** in dem ersten Resonanzfall das stärkste Magnetfeld auf der linken Seite, d. h. anschaulich ungefähr in der Mitte **1202** der Leitungen der Spulenwindungen **1102**, **1104** auf der dritten Seite **1126**.

[0146] Bei höheren Frequenzen kann man sich die Wellenausbreitung auf den Leitungen wie bei der einer Lecherleitung vorstellen. Wenn die Struktur also so gewählt wird, dass sich ein Lambda (oder ein Vielfaches) (also eine Wellenlänge oder ein Vielfaches der Wellenlänge des Antennensignals) auf der Leitung ausbreitet, so kommt es zu einem zweiten Resonanzfall, wie er in einer zweiten Simulationsdarstellung **1300** in **Fig.** 13 für die Spule **1100** dargestellt ist. Wie in **Fig.** 13 dargestellt ist, bildet sich in der Spule **1200** in dem zweiten Resonanzfall das stärkste Magnetfeld sowohl auf der linken Seite, d. h. anschaulich ungefähr in der Mitte **1202** der Leitungen der Spulenwindungen **1102**, **1104** auf der dritten Seite **1126**, als auch auf der rechten Seite, d. h. anschaulich ungefähr in der Mitte **1302** der Leitungen der Spulenwindungen **1102**, **1104** auf der vierten Seite **1128**.

[0147] **Fig.** 14 zeigt eine Darstellung **1400** der Ausbreitung einer stehenden Welle entlang einer Lecherleitung **1402** zu unterschiedlichen Zeitpunkten. So ist zu einem Zeitpunkt $t = 0$ eine sinusförmige elektromagnetische Welle **1404** mit einer Wellenlänge λ und einer maximalen Amplitude u_0 dargestellt in einem ersten Diagramm **1406**. Weiterhin ist in **Fig.** 14 zu den jeweiligen Zeitpunkten $t = 0$, $t = T/4$, $t = T/2$, und $t = 3T/4$, die Ausbreitung des Magnetfeldes **1404** zwischen den Elementen der Lecherleitung **1402** dargestellt.

[0148] **Fig.** 15 zeigt eine anschauliche Erläuterung der Struktur der Spule gemäß **Fig.** 11, weshalb diese Struktur ebenfalls eine Lecherleitung bildet.

[0149] **Fig.** 15 zeigt zunächst in einer ersten Darstellung **1500** eine herkömmliche Lecherleitung **1502**, die einen U-förmigen Verlauf aufweist. Die Lecherleitung **1502** weist zwei einander gegenüberliegende, parallel verlaufende Leitungen **1504**, **1506** auf, welche an ihren ersten Enden **1508**, **1510** voneinander elektrisch isoliert sind und an ihren zweiten Enden **1512**, **1514** mittels eines elektrisch leitfähigen Verbindungselements **1516** miteinander elektrisch leitend verbunden sind.

[0150] Weiterhin zeigt **Fig.** 15 in einer zweiten Darstellung **1518**, dass die Lecherleitung **1502** aus der ersten Darstellung **1500** einerseits gefaltet und zum anderen um 180° rotiert ist. Die korrespondierenden Endpunkte der Lecherleitung **1502** aus der ersten Darstellung **1500** sind in der zweiten Darstellung **1518** entsprechend angegeben.

[0151] Wird die Lecherleitung **1502** aus der zweiten Darstellung **1518** noch bei gleich bleibenden Dimensionierung hinsichtlich der Wellenausbreitung in einer quadratische Form gebracht, so ergibt sich die Lecherleitungsstruktur **1522**, wie sie in einer dritten Darstellung **1520** angegeben ist. Diese Lecherleitungsstruktur **1522** entspricht der Struktur der Spule **1100**, wie sie in **Fig.** 11 dargestellt ist und entsprechend oben erläutert wurde.

ZITATE ENTHALTEN IN DER BESCHREIBUNG

Diese Liste der vom Anmelder aufgeführten Dokumente wurde automatisiert erzeugt und ist ausschließlich zur besseren Information des Lesers aufgenommen. Die Liste ist nicht Bestandteil der deutschen Patent- bzw. Gebrauchsmusteranmeldung. Das DPMA übernimmt keinerlei Haftung für etwaige Fehler oder Auslassungen.

Zitierte Nicht-Patentliteratur

- ISO 7816 [0083]
- ISO 7816 [0104]

Patentansprüche

1. Boosterantenne für eine Chip-Anordnung, insbesondere für eine Chipkarte, wobei die Boosterantenne aufweist:
• einen ersten Schaltkreis, der einen ersten Resonanzkreis bildet;
• einen zweiten Schaltkreis, der einen zweiten Resonanzkreis bildet, wobei der erste Schaltkreis mit dem zweiten Schaltkreis elektrisch leitend verbunden ist;
• einen dritten Schaltkreis, der einen dritten Resonanzkreis bildet, wobei der dritte Schaltkreis mit dem zweiten Schaltkreis elektrisch leitend verbunden ist.

2. Boosterantenne gemäß Anspruch 1,
• wobei der erste Schaltkreis den ersten Resonanzkreis mit einer ersten Phasenresonanz bildet;
• wobei der zweite Schaltkreis den zweiten Resonanzkreis mit einer zweiten Betragsresonanz bildet.

3. Boosterantenne gemäß Anspruch 2, wobei der erste elektrische Schaltkreis und der zweite elektrische Schaltkreis derart eingerichtet sind, dass die erste Phasenresonanz und/oder die zweite Betragsresonanz ungefähr 13,56 MHz betragen/beträgt.

4. Boosterantenne gemäß einem der Ansprüche 1 bis 3, wobei der dritte Schaltkreis den dritten Resonanzkreis mit einer dritten Phasenresonanz bildet.

5. Boosterantenne gemäß Anspruch 4, wobei der dritte elektrische Schaltkreis derart eingerichtet ist, dass die dritte Phasenresonanz größer ist als die erste Phasenresonanz.

6. Boosterantenne gemäß Anspruch 4 oder 5, wobei der dritte elektrische Schaltkreis derart eingerichtet ist, dass die dritte Phasenresonanz in einem Bereich von ungefähr 0,3 GHz bis ungefähr 3 GHz liegt.

7. Boosterantenne gemäß Anspruch 6, wobei der dritte elektrische Schaltkreis derart eingerichtet ist, dass die dritte Phasenresonanz ungefähr 868 MHz beträgt.

8. Boosterantenne gemäß einem der Ansprüche 1 bis 7, wobei der dritte Schaltkreis eine Dipol-Antenne aufweist.

9. Boosterantenne gemäß Anspruch 8, wobei die Dipol-Antenne eine invertierte F-Antenne (IFA) aufweist oder als eine solche ausgebildet ist.

10. Boosterantenne gemäß einem der Ansprüche 1 bis 9, wobei der zweite elektrische Schaltkreis eine induktive Koppelstruktur aufweist.

11. Boosterantenne gemäß einem der Ansprüche 1 bis 10, wobei der erste elektrische Schaltkreis zu dem zweiten elektrischen Schaltkreis seriell geschaltet ist.

12. Boosterantenne gemäß einem der Ansprüche 1 bis 11, wobei der erste Resonanzkreis und der zweite Resonanzkreis so eingerichtet sind, dass ein erster Strom in dem ersten Resonanzkreis in dem zweiten Resonanzkreis bezüglich des ersten Stroms einen erhöhten zweiten Strom bewirkt.

13. Boosterantenne (**304**) gemäß einem der Ansprüche 1 bis 12, wobei der erste Resonanzkreis ein Serienresonanzkreis ist.

14. Boosterantenne (**304**) gemäß einem der Ansprüche 1 bis 13, wobei der zweite Resonanzkreis ein Parallelresonanzkreis ist.

15. Boosterantenne (**304**) gemäß einem der Ansprüche 1 bis 14, wobei der zweite Schaltkreis mindestens eine Spulenwindung aufweist.

16. Boosterantenne gemäß Anspruch 15, wobei der zweite Schaltkreis mehrere Spulenwindungen aufweist.

17. Boosterantenne gemäß Anspruch 16, wobei der zweite Schaltkreis eine äußere Spulenwindung und mehrere innere Spulenwindungen aufweist.

18. Boosterantenne gemäß Anspruch 17, wobei der dritte Schaltkreis nur mit den inneren Spulenwindungen elektrisch leitend verbunden ist.

19. Boosterantenne (**304**) gemäß einem der Ansprüche 1 bis 18, ferner aufweisend:
• einen flexiblen Träger, insbesondere ein Pflaster;
• wobei der erste elektrische Schaltkreis, der zweite elektrische Schaltkreis, und der dritte elektrische Schaltkreis auf dem flexiblen Träger angeordnet ist.

20. Kontaktlos-Chip-Anordnung, insbesondere Kontaktlos-Chipkartenmodul-Anordnung, aufweisend:
eine Boosterantenne (**304**) gemäß einem der Ansprüche 1 bis 19; und
ein Kontaktlos-Chipmodul, insbesondere ein Kontaktlos-Chipkartenmodul, das aufweist:
• einen Chip; und
• eine Spule, die mit dem Chip elektrisch gekoppelt ist;
wobei die Boosterantenne mit der Spule des Kontaktlos-Chipmoduls, insbesondere des Kontaktlos-Chipkartenmoduls, induktiv gekoppelt ist mittels mindestens eines induktiven Kopplungsbereichs der Boosterantenne.

21. Kontaktlos-Chip-Anordnung, insbesondere Kontaktlos-Chipkartenmodul-Anordnung gemäß Anspruch 20, wobei die Boosterantenne mindestens einen weiteren Kopplungsbereich aufweist zum Koppeln mit einem Schreib- und/oder Lesegerät.

22. Kontaktlos-Chip-Anordnung, insbesondere Kontaktlos-Chipkartenmodul-Anordnung gemäß Anspruch 21, wobei der erste elektrische Schaltkreis den weiteren Kopplungsbereich zum Koppeln mit einem Schreib- und/oder Lesegerät bildet.

23. Kontaktlos-Chip-Anordnung, insbesondere Kontaktlos-Chipkartenmodul-Anordnung gemäß einem der Ansprüche 20 bis 22,
• wobei der induktive Kopplungsbereich Teil des zweiten elektrischen Schaltkreises ist; und
• wobei der induktive Kopplungsbereich im Wesentlichen deckungsgleich zu dem Kontaktlos-Chipmodul, insbesondere Kontaktlos -Chipkartenmodul, angeordnet ist.

24. Kontaktlos-Chip-Anordnung, insbesondere Kontaktlos-Chipkartenmodul-Anordnung gemäß einem der Ansprüche 21 bis 23, wobei der weitere Kopplungsbereich zum Koppeln mit einem Schreib- und/oder Lesegerät von einem Dipol gebildet ist.

25. Kontaktlos-Chip-Anordnung, insbesondere Kontaktlos-Chipkartenmodul-Anordnung gemäß einem der Ansprüche 20 bis 24, wobei der induktive Kopplungsbereich der Boosterantenne zum Koppeln mit einem Chip vollständig innerhalb des weiteren Kopplungsbereichs zum Koppeln mit einem Schreib- und/oder Lesegerät angeordnet ist.

26. Kontaktlos-Chip-Anordnung, insbesondere Kontaktlos-Chipkartenmodul-Anordnung gemäß einem der Ansprüche 21 bis 25, wobei der induktive Kopplungsbereich der Boosterantenne zum Koppeln mit einem Chip vollständig außerhalb des weiteren Kopplungsbereichs zum Koppeln mit einem Schreib- und/oder Lesegerät angeordnet ist.

27. Kontaktlos-Chip-Anordnung, insbesondere Kontaktlos-Chipkartenmodul-Anordnung gemäß einem der Ansprüche 20 bis 26, wobei das Kontaktlos-Chipmodul, insbesondere Kontaktlos-Chipkartenmodul, ferner Chipkontakte, insbesondere Chipkartenkontakte aufweist, welche eingerichtet sind, eine kontaktbasierte Chip-Schnittstelle, insbesondere Chipkartenschnittstelle, bereitzustellen.

28. Kontaktlos-Chip-Anordnung, insbesondere Kontaktlos-Chipkartenmodul-Anordnung gemäß einem der Ansprüche 20 bis 27, eingerichtet als eine Dual-Interface-Chipmodul-Anordnung, insbesondere als eine Dual-Interface-Chipkartenmodul-Anordnung.

29. Kontaktlos-Chip-Anordnung, insbesondere Chipkarte, aufweisend:
eine Chipmodul-Anordnung, insbesondere eine Kontaktlos-Chipkartenmodul-Anordnung, gemäß einem der Ansprüche 20 bis 28.

30. Antennenstruktur, aufweisend:
• eine Spulenantenne mit mehreren Spulenwindungen;

• wobei die Antennenstruktur derart eingerichtet ist, dass sich auf ihr eine stehende Welle eines Antennensignals ausbildet.

31. Antennenstruktur gemäß Anspruch 30, wobei die Antennenstruktur eine Lecherleitungsstruktur aufweist.

32. Chip-Anordnung, aufweisend:
• mindestens einen Chip;
• eine mit dem Chip gekoppelte Antennenstruktur gemäß einem der Ansprüche 30 bis 31.

33. Chip-Anordnung gemäß Anspruch 32, wobei der Chip und die Antennenstruktur auf einem gemeinsamen Träger aufgebracht sind.

34. Chip-Anordnung gemäß Anspruch 33, wobei der Chip und die Antennenstruktur auf einem gemeinsamen Träger monolithisch integriert aufgebracht sind.

Es folgen 10 Seiten Zeichnungen

Anhängende Zeichnungen

FIG 1

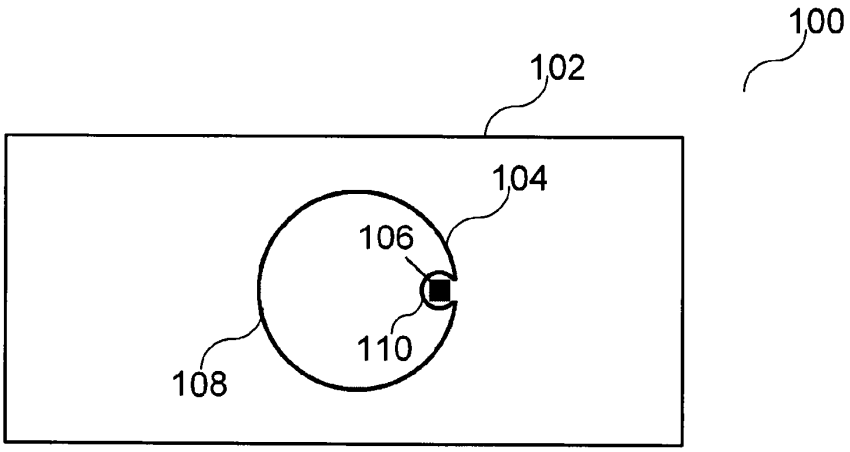


FIG 2

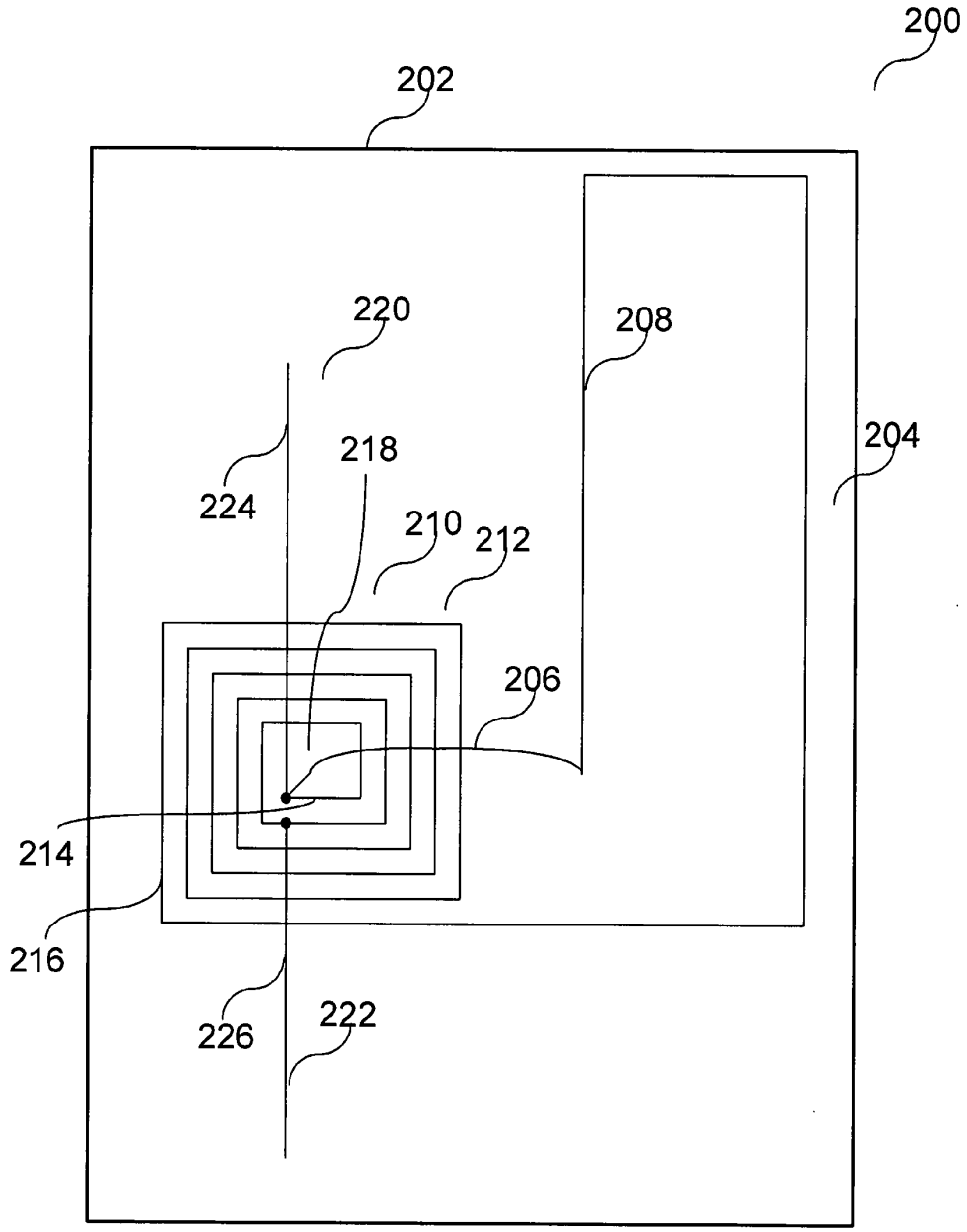


FIG 3

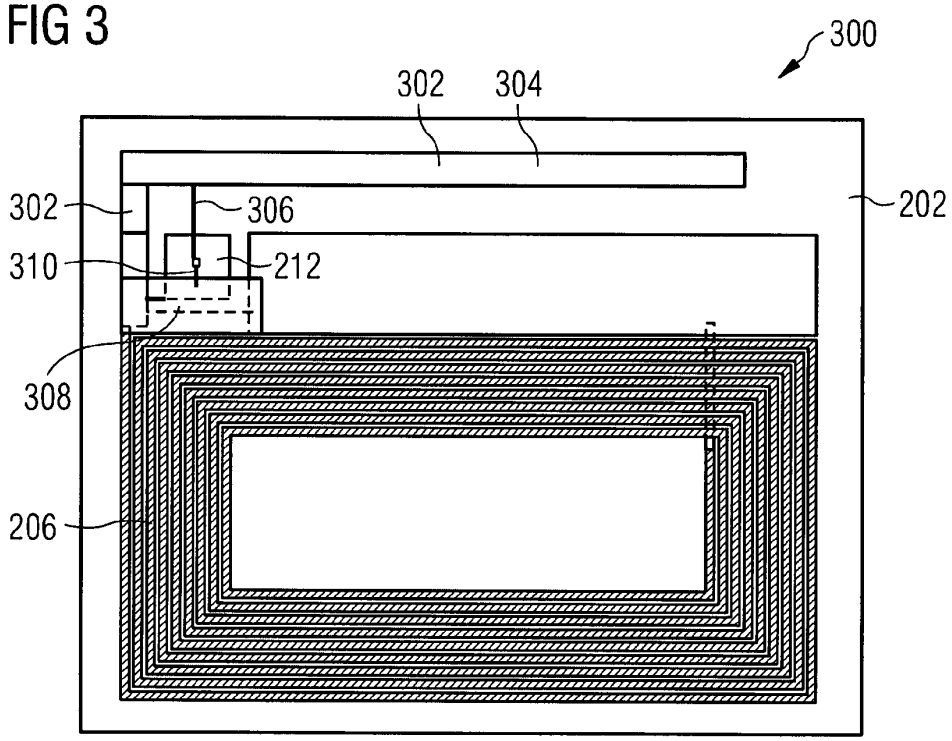

300
302
304
302
306
202
310
212
308
206

FIG 4

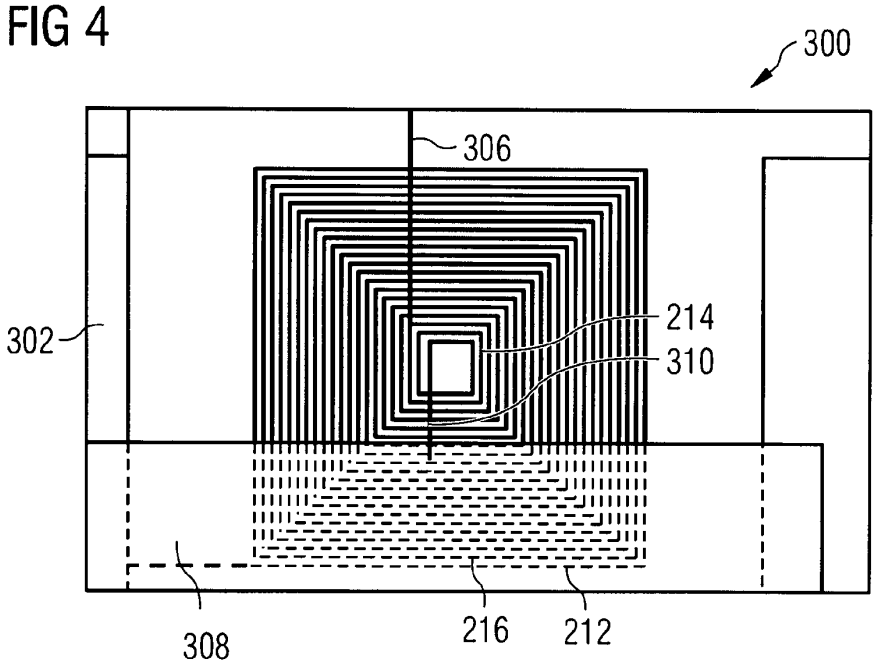

300
306
302
214
310
308
216
212

FIG 5

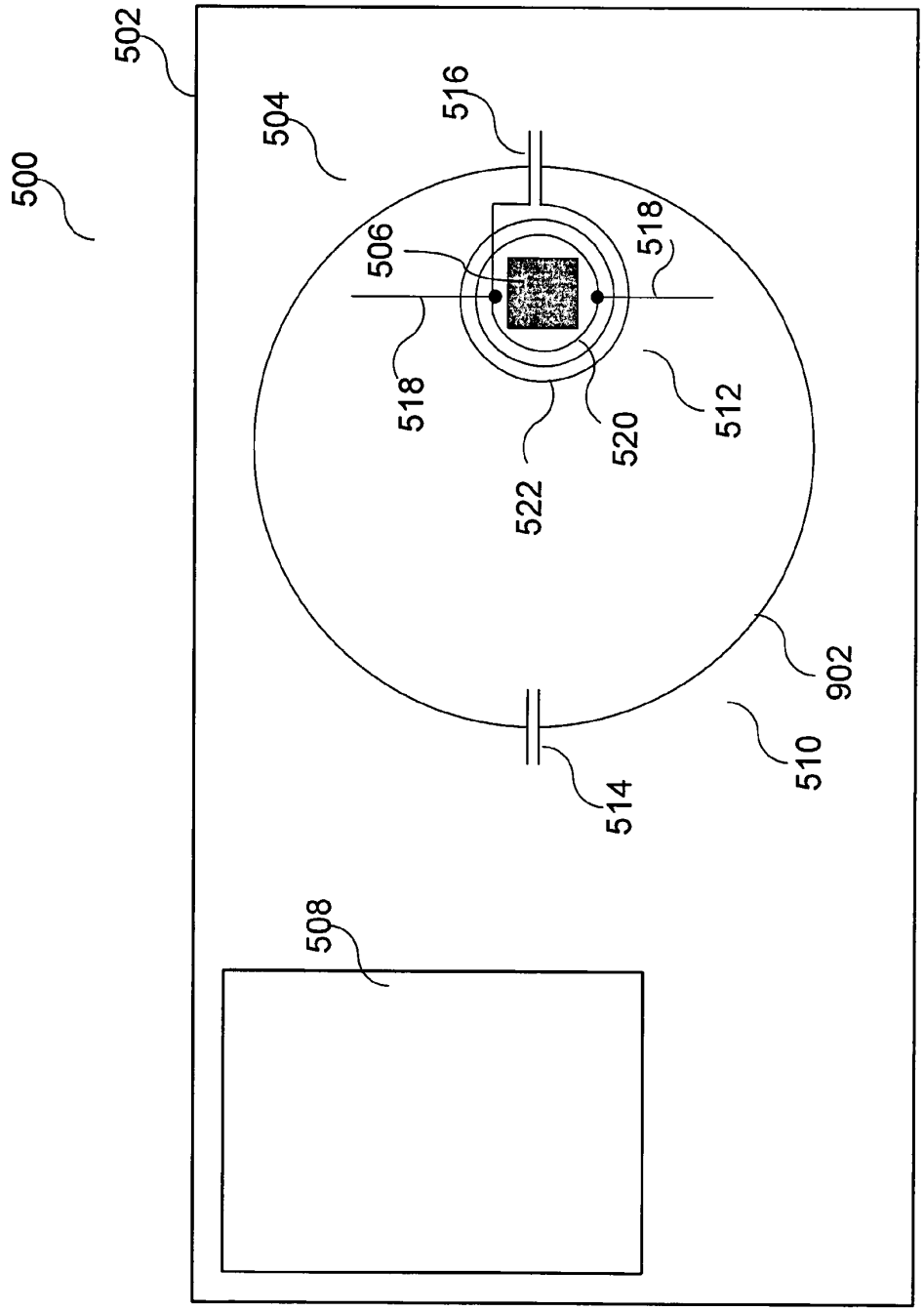


FIG 6

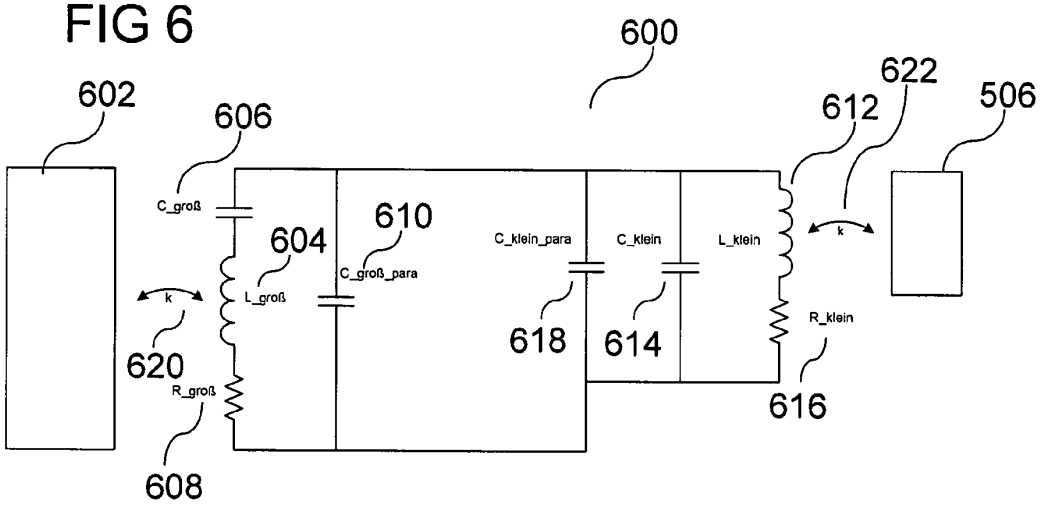

600
602
606
622
612
506
C_groß
610
604
C_klein_para
C_klein
L_klein
k
C_groß_para
L_groß
k
620
618
614
R_klein
R_groß
616
608

FIG 7

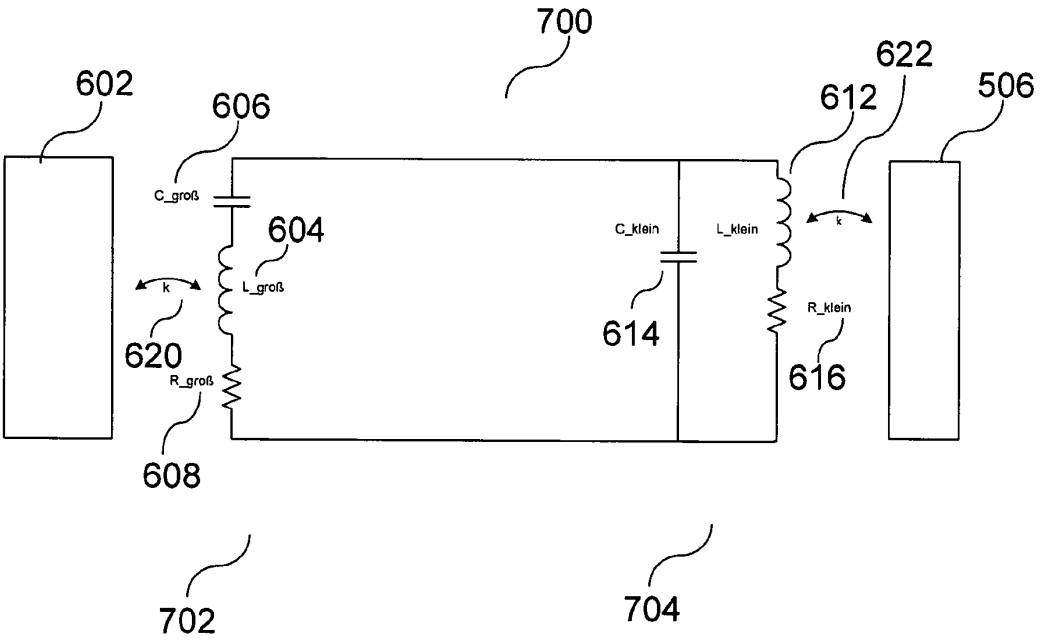

700
602
606
622
612
506
C_groß
604
C_klein
L_klein
k
k
L_groß
620
614
R_klein
R_groß
616
608
702
704

FIG 8A

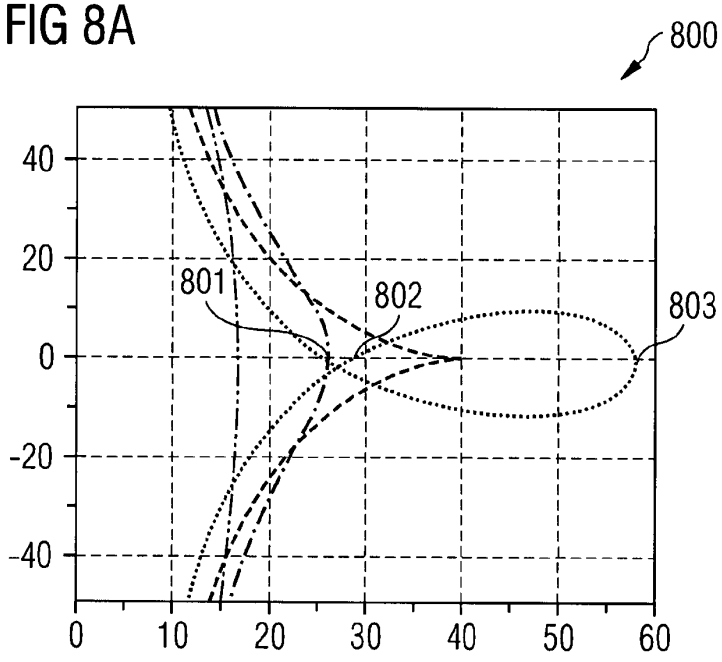

800
40
20
0
-20
-40
0
10
20
30
40
50
60
801
802
803

FIG 8B

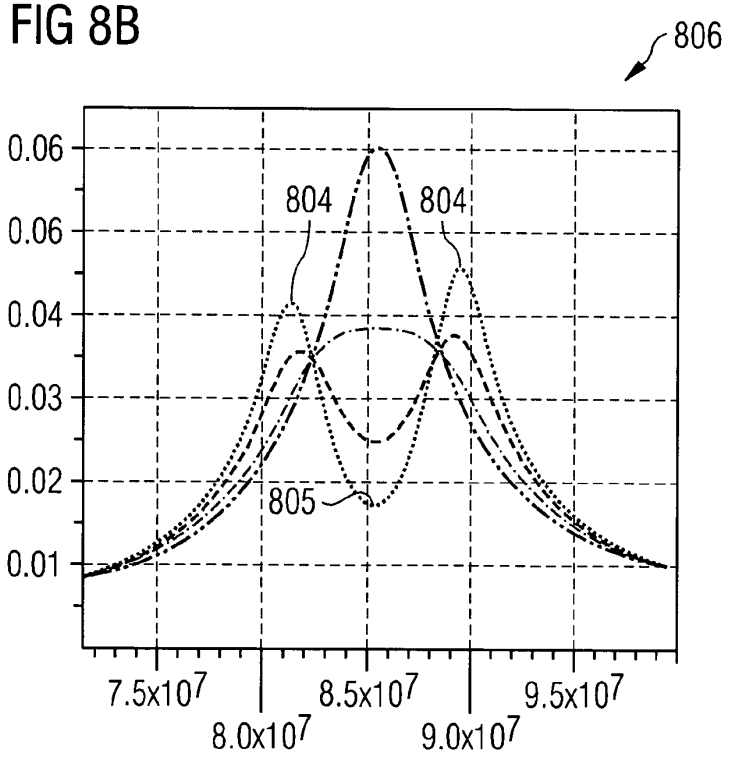

806
0.06
0.06
0.04
0.03
0.02
0.01
804
804
805
7.5x10^7
8.0x10^7
8.5x10^7
9.0x10^7
9.5x10^7

FIG 9

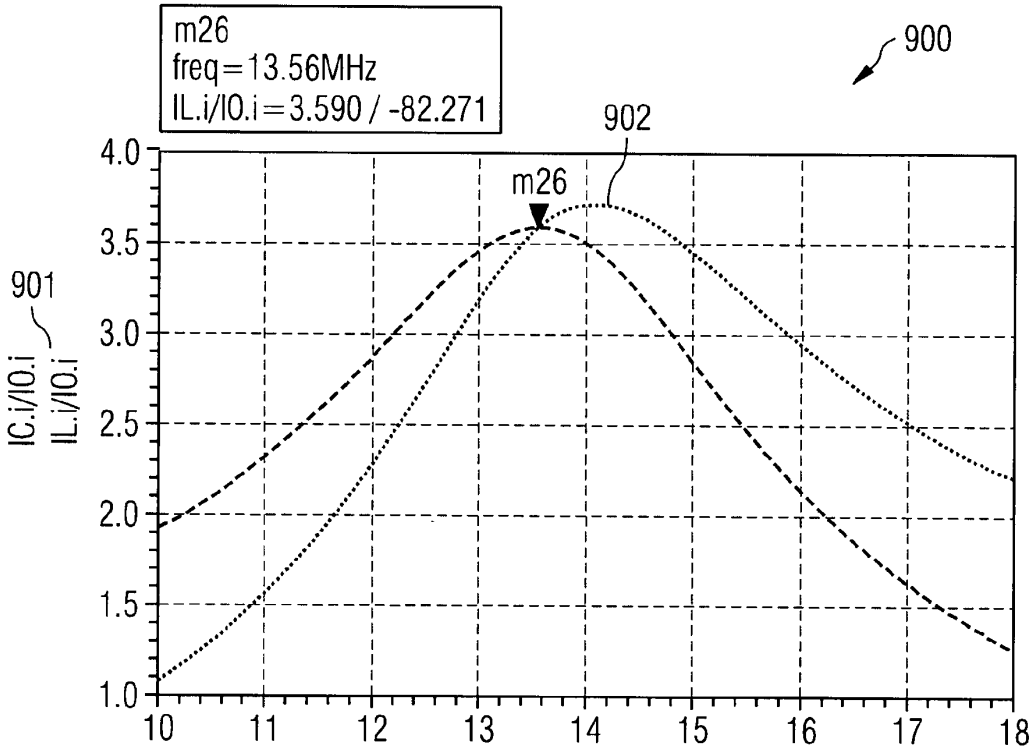

m26
freq=13.56MHz
IL.i/I0.i=3.590 / -82.271
900
902
m26
901
IC.i/I0.i
IL.i/I0.i
4.0
3.5
3.0
2.5
2.0
1.5
1.0
10
11
12
13
14
15
16
17
18

FIG 10

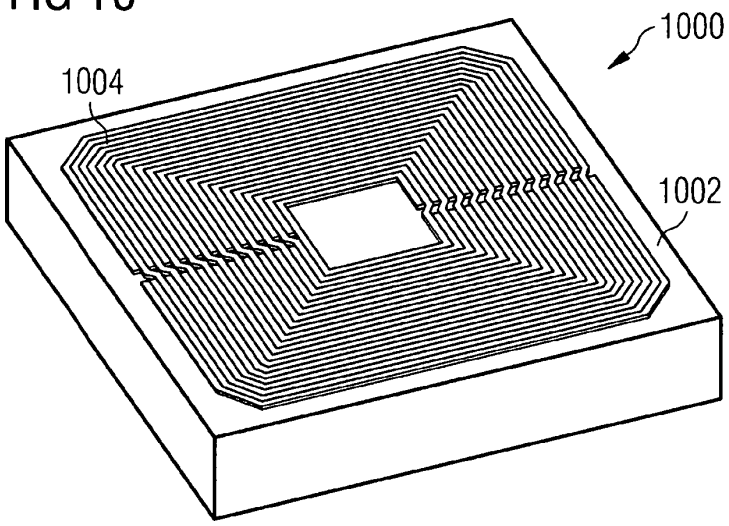
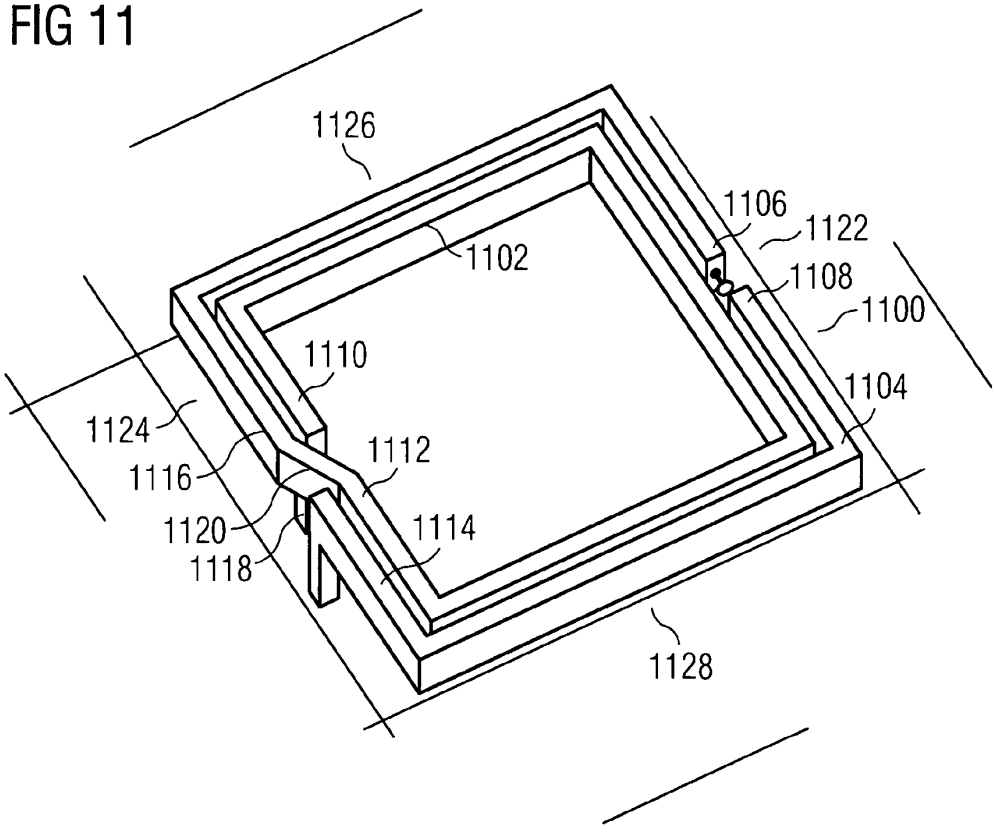

1000
1004
1002

FIG 11


1126
1106
1122
1102
1108
1100
1110
1104
1124
1112
1116
1120
1114
1118
1128

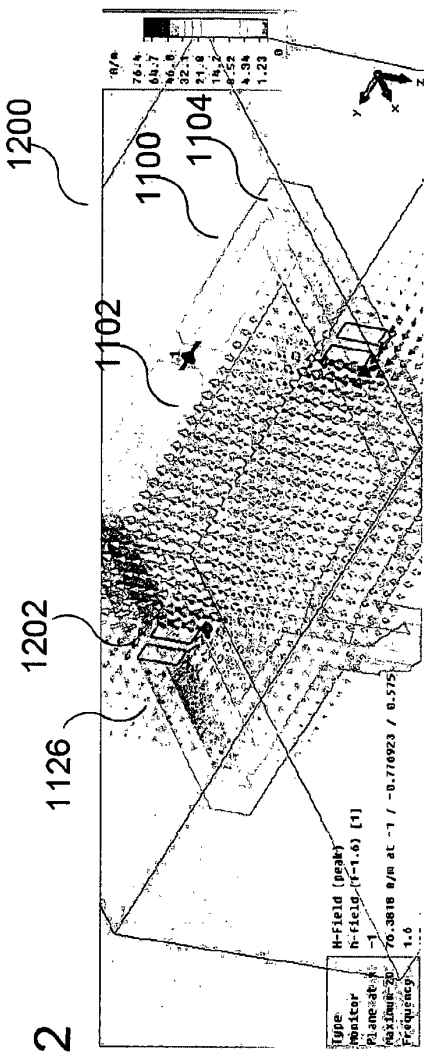

1200
1100
1104
1102
1202
1126
H-Field (peak)
h-field (f=1.6) [1]
-1
Maximum
Frequency
1.6

FIG 12

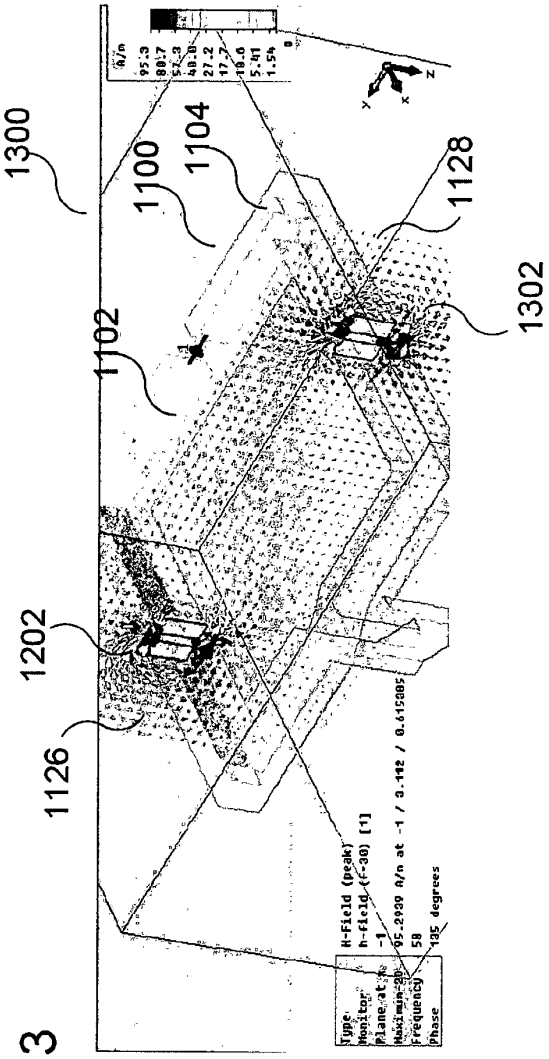

1300
1100
1104
1128
1102
1302
1202
1126
H-Field (peak)
h-field (f=30) [1]
-1
Maximum
Frequency
58
Phase
135 degrees

FIG 13

FIG 14

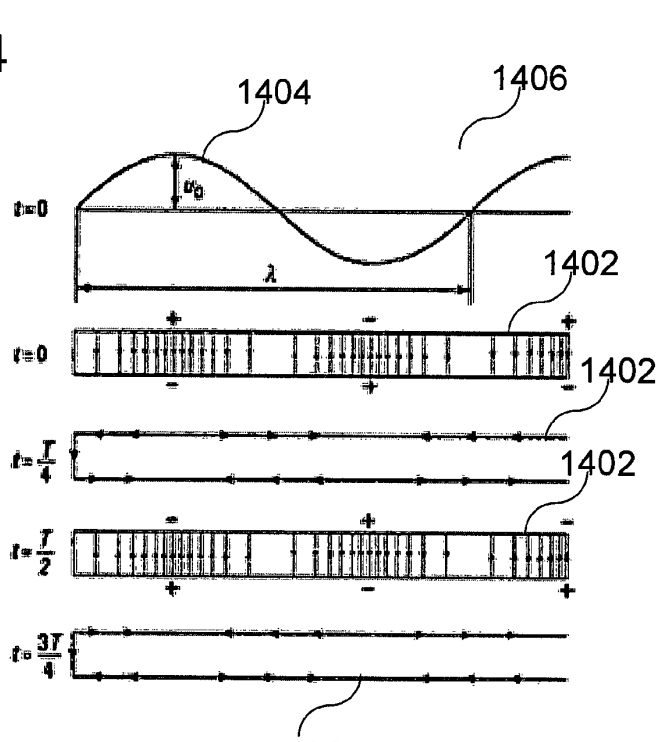
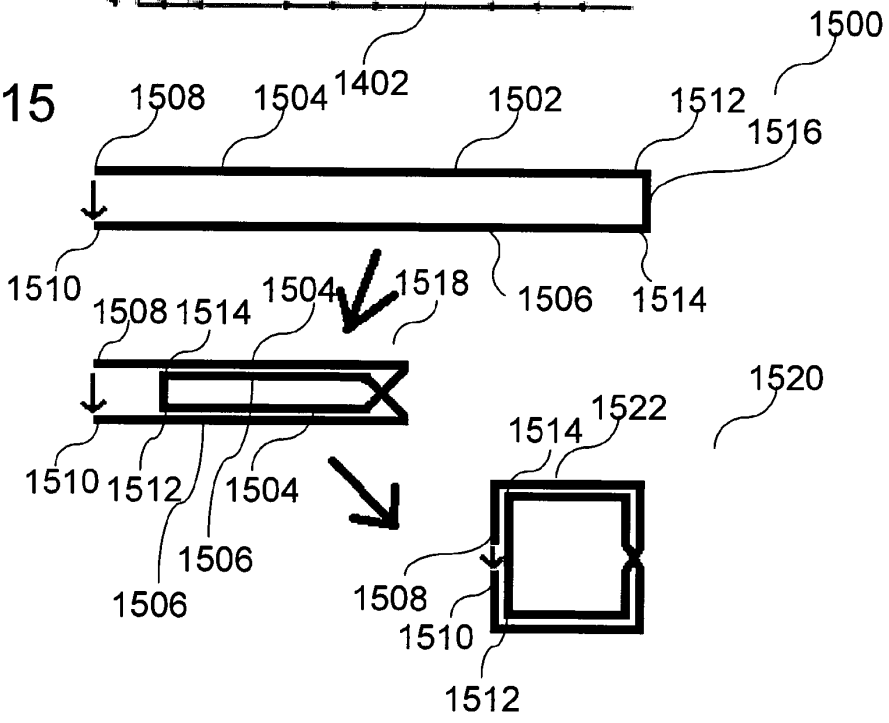

1400
1404
1406
1402
1402
1402
1402
t=0
t=0
t=T/4
t=T/2
t=3T/4
λ

FIG 15


1500
1508
1504
1502
1512
1516
1510
1506
1514
1518
1520
1522
1514
1512
1504
1506
1506
1508
1510
1512

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(54) Textile item identification tag

(57) The present invention relates to a textile item identification tag (1) to be attached to a piece of laundry or garment (9) with an encapsulated RFID transponder (5,5'), which comprises an integrated circuit (10) and at least one near-field antenna (2,3), which is electronically coupled to the integrated circuit (10). The tag (1) also comprises at least one far-field antenna (4) positioned in coupling condition with the at least one near-field antenna (2,3) and a pouch-type enclosure (8) for holding the RFID transponder (5,5'), wherein the at least one far-field antenna (4) comprises at least one curved section (9), which at least partially encloses a circumference of said RFID transponder (5,5').

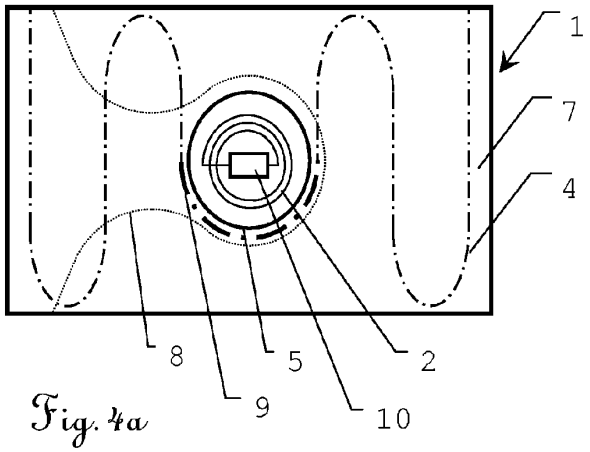


Fig. 4a

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Description

[0001] The present invention relates generally to a textile item identification tag for RFID identification according to claim 1, and to a method of producing a textile item identification tag according to claim 15.

[0002] Radio Frequency Identification (RFID) transponders have found widespread use in a variety of applications. As the name RFID suggests, the basic idea is the identification of the goods, which can be done from a distance by wireless radio means by reading a code which is stored on the attached RFID transponder. Such transponders found lots of different fields of usage which even go beyond those basics, for example also things like

- identification of goods,
- storage and readout of information for counting, accounting, marking, etc.
- encryption or ciphering of information as for access control, security or validation purposes,
- wireless sensor applications or even
- complex microcontroller applications for lots of other purposes.

[0003] The word transponder, short for transmitter-responder, is used to describe a device which is capable of transmitting a reply signal in response to a received signal, wherein a signal is embodied as some kind of modulation of an energy source which can comprise information.

[0004] As the name implies, RFID transponders comprise at least one electromagnetic antenna or aerial for receiving and/or transmitting alternating electromagnetic radio-fields. In the present application, the reference to an electromagnetic field does also comprise fields where either the electrical or the magnetic part of the field is dominating, often referred to as magnetic-fields or electric-fields only.

[0005] There are different embodiments of such antennas known, which can be designed in many different shapes and sizes to fit the desired form factor and purpose (spectral characteristics, antenna gain, directional characteristics, etc.), for example by dedicated computer programs. For RFID-purposes, an aerial of a design which is suitable to be integrated into the desired form factor of the RFID transponder device is chosen, in particular patch- or microstrip-antennas, loop- or loopstick-antennas, frame-, folded- or spiral-dipole-antennas for rather flat RFID-transponders, or ferrite-antennas for rather pill- or bean-shaped designs are often used examples.

[0006] RFID Transponders working in the HF-Band are predominantly coupled by magnetic fields with relatively short ranges, mostly below one meter, and achieve good results with coil-like antennas for picking up the magnetic part of the radio field. Transponders in the UHF- or SHF-Band allow a longer range coupling of electromagnetic dipole fields.

[0007] In passive RFID transponders, the antenna is electronically coupled to an integrated circuit, which does not have a power supply such as a battery, but is energized by the electrical radio-energy picked up by the antenna. In response to the received energy, which can for example be stored by a small capacitor, the transponder generates a response signal which is retransmitted (usually by load modulation in HF and by backscattering in UHF) to and through the antenna to a nearby RFID-reader which often also transmits the energizing electromagnetic field. The field transmitted by the reader can also comprise data-information, but is not necessarily required to do so.

[0008] There are also active RFID transponders known which comprise a battery. Although most examples presented herein refer to passive transponders, the principle of the invention is applicable to semi passive, semi active or active transponders in an analogous way.

[0009] The usage of an RFID transponder can, for example, be described as follows. The RFID-reader transmits a radio signal of a certain frequency which is modulated by a "read ID command". The RFID-transponder, which is within range of the transmitted radio signal, which allows the transponder to gain enough energy from the radio signal to energize the RFID transponder, is thereby activated. For bidirectional communication, also the signal quality of the received radio signal needs to be good enough to identify the command or data transmitted by the RFID-reader. Alternatively, there are also known embodiments where the powering radio signal does not contain information and the transponder just responds to the powering signal.

[0010] The response of the transponder is either another radio signal, modulated according to the requested or a predefined information from the transponder, which is transmitted by the same or another aerial as used for receiving and/or energizing or the signal received is modulated by varying the load of the transponder. The radio signal transmitted or load modulated by the RFID transponder will be received by the RFID-Reader and its information content can be provided for further processing. The transponder-electronics may be embodied as a discrete electronic circuit, but most common are single integrated circuits, which can be used as a die-only piece of silicon (with sizes down to 0.05 x 0.05 mm) or encapsulated in a standard integrated circuit package, which may be mounted on a printed circuit board (PCB) or directly contacted to the antenna. Alternatively, the integrated circuit or the whole PCB can also be embodied as thin-film or thick-film circuit or as a printed organic circuit.

[0011] To get a functioning transponder, the electronic circuit has to be coupled to at least one antenna, which enables the transponder to receive and utilize incident electromagnetic, magnetic or electrical wave energy for power as well as for receiving and/or transmitting data-information. There are also some integrated circuits known which do comprise the antenna as well, whereby

no external antenna will be needed but only minimal reading distances are achieved. Other designs comprise an antenna-structure on the PCB onto which the electronics are mounted. The PCB can, for example, also be a foil-type flexo-print. Also, wire-structures can be attached as antennas. In practice, the connection of the antenna to the electronics is often a critical part in case of mechanical or chemical stress.

[0012] For protection of the transponder which comprises the electronics and the antenna, a coating can be applied, for example by an integration into a plastic confinement, by injection moulding, by placing it inside a plastic cover, or between two pieces of a foil material.

[0013] Concerning the tagging of textile items with RFID-Systems, the following devices and configurations are known.

[0014] In European patent application EP 2 131 304, a method for determining an order of objects which are tagged by an RFID transponder and transported by a conveyor along a conveyor path is disclosed. Besides others, garments are also examples of such tagged objects in this document.

[0015] So-called "Smart Tags" are commonly used for the marking of garments. "Smart tags" are very thin transponders that are disposed on a film together with the HF antenna. This film can be further processed (e.g. rolled, etc.) like paper. In particular, it can be laminated between layers of paper and thus integrated into conventional paper labels or also integrated in so-called chip cards like banking cards or access cards. Due to widespread use made possible by mass production, prices of such tags based on a HF antenna are very low.

[0016] The textile item tags or laundry tags as described above, however, are hardly suited to fulfil requirements of a laundry-cleaning-process, as they are imposed by laundry processes on a professional scale, including washing, drying, or ironing processes. A particular example is the de-watering process in industrial type laundries, for which heavy-duty centrifuges, generating accelerations up to 800 g, and high-power mechanical presses, exerting pressures higher than 50 bar, or air-drying-machinery at high temperatures of up to 300° Celsius are used. Common RFID-transponders are not designed to withstand such extreme processing conditions.

[0017] As the Garment tags have to withstand those laundry and dry cleaning conditions, RFID tags being at least partially designed to withstand such conditions are disclosed in the patent applications US 2005/01883990 and WO 2007/012810. U.S. patent No. 7,247,214 discloses a fabric label which preferably has a closed or essentially closed pocket, into which a marker, such as an RFID tag, is inserted. In one embodiment, the marker is inserted through a slit into the pocket, while in another embodiment, the marker is inserted into a closed pocket by a hollow needle which has penetrated through a wall of the pocket. It also addresses briefly the harsh conditions when RFID tags, attached to garments, are exposed to washing and dry cleaning conditions. However, in particular no specific embodiments to overcome the problems arising from this are disclosed.

[0018] For laundry processing, the capability to read-out whole carts or boxes filled with tagged laundry or batches of laundry on hangers or clamps closely aligned to one another, read-out distances of up to several meters (for example about 2 or 3 meters) would be advantageous, in particular in industrial laundry processing.

[0019] An object of the invention is to provide an improved RFID textile item tag, in particular optimized for professional laundry processes.

[0020] A particular object is to provide an RFID laundry tag with resistance against harsh external conditions such as high temperatures, high acceleration and high pressure.

[0021] A more particular object is to further provide a resistant RFID laundry tag for a read-out distance of up to several meters, at least in dry condition of the laundry.

[0022] A very special object is to provide a highly resistant RFID textile item tag which allows a simple and cost effective production and application of the textile item tag.

[0023] This task is solved by the subject matter of claim 1, i.e. by a textile item identification tag to be attached to a piece of laundry or garment with

- an encapsulated RFID transponder which is comprising an integrated circuit and at least one near-field antenna, which is electronically coupled to the integrated circuit,
- at least one far-field antenna positioned in inductive coupling condition with the at least one near-field antenna, and
- a pouch type enclosure for holding the RFID transponder.

Therein, the at least one far-field antenna comprises at least one curved section, which at least partially encloses a circumference of RFID transponder.

[0024] The textile item identification tag comprises a far field antenna for an RFID transponder. The RFID transponder comprises an integrated circuit and a near-field antenna. The far-field antenna is positioned to be in inductive coupling condition with the near-field antenna of the RFID transponder. The textile item tag also comprises a pouch type enclosure for receiving the RFID transponder and holding it in place. The textile item identification tag is designed to be attached to a piece of laundry or garment for allowing its identification.

[0025] To withstand the harsh laundry environments, a sufficient encapsulation of the transponder has to be ensured. This can be achieved by partially or fully enclosing the RFID transponder (comprising electronics and antenna) by materials like polyphenylene sulphide (PPS) so that water and chemicals used in laundry processing can not affect its function and also a protection against mechanical impacts can be assured.

[0026] Another advantage for withstanding the harsh

conditions can be achieved by keeping the transponder small and thereby reduce the area for possible mechanical interactions and impacts like pressure, bending, folding, hitting, etc.

[0027] RFID transponders for textile item tags as described above, can for example be coin-shaped

[0028] A disadvantage of a small size transponder is based on the fact that with the overall size, also the size of the antenna is decreased. As known in the art, a smaller antenna - in comparison to larger ones - in general has a reduced antenna gain or, in other words, a reduced capability for transmitting and receiving radio signals.

[0029] On the one hand, this can be overcome by an increase of the radio frequency used, as shorter wavelength in general requires smaller antenna structures. Therefore, the present invention is preferably related to UHF- or SHF-RFID transponders, although the underlying principles are applicable to other frequency ranges as well.

[0030] On the other hand, the connection of a large external far-field antenna would be a possible solution. For example, a loop or dipole antenna made from a wire which can be quite easily designed to meet the harsh environment of laundry processing, can be used. Such a far-field antenna can, for example, be applied by couching with a thread that comprises conductive materials, by soutache-application of a conductive material or by a sewing machine equipped with a braiding-foot. However, the electrical connection of such a far-field antenna to the circuit of the RFID transponder has to be considered as a weak point, which can easily be subject to ripping off, loosing contact or even breaking during laundry processing. An encapsulation of the whole antenna is not desirable, since this would result in an enlargement of the encapsulation, resulting in the rather mechanical problems already discussed above.

[0031] Another problem can be the quite difficult manufacturing process, needed to conductively connect a comparably large antenna to a comparably small transponder circuit, when fabricating a laundry identification tag, in particular when a proper connection of those two parts has to be guaranteed over a long lifetime of the textile item tag and many washing cycles.

[0032] The solution according to the present invention can overcome these concerns by a separate production of a small sized RFID transponder, for example encapsulated by a flat, coin shaped or pill-shaped, resistant enclosure made of sturdy polypropylene sulphide (PPS) material, which comprises transponder-electronics and a small sized near-field antenna, for example a loop- or chip-antenna.

[0033] PPS is a production material providing favourable properties: high chemical resistance, thermal stability, dimensional stability under harsh mechanical conditions like high pressure, fire resistance and high inertness against organic solvents, inorganic salts and bases. An RFID transponder, capable of withstanding the harsh conditions, can be produced in a standard mass-production environment, e.g. by injection moulding with PPS material. In addition, the resulting RFID transponder can also be used in many other - also non-laundry - applications which allow an advantageous increase of the production quantities.

[0034] However, the near field antenna, which is designed to fit within the enclosure of the RFID transponder, can in general not achieve the desired readout distances, since it is too small and a conductive path thorough the PPS-enclosure for connection of a far-field antenna is not desirable, as discussed above.

[0035] According to the invention, this aspect is overcome by a inductive mode coupling of an external far-field antenna to the internal near-field antenna of the RFID transponder, usually done by aligning parts of them in close distance to achieve an electromagnetic (in particular a dominantly magnetic) "crosstalk" among the two antennas.

[0036] In other words, the principle could also be described as a ("large") far-field antenna for communication with the RFID-reader, a section of which can be seen as a first near-field antenna. The RFID transponder comprises a second near-field antenna, conductively connected to the transponder electronics. According to the invention, the first and the second near-field antenna are designed and arranged to achieve an inductive coupling, whereby the RFID-electronics can make "indirect" use of the far-field antenna, without a conductive connection to it. Such inductive coupling is known to those skilled in the art.

[0037] In particular, the radio coupling can be achieved by arranging and shaping the far-field antenna and the near-field antenna in such a way that an inductive coupling section of the far-field antenna is aligned in or close to the inductive coupling range of a coupling section of the near-field antenna of the transponder.

[0038] The inductive coupling of the near-field antenna of the RFID transponder with a far-field antenna enables an extension of operation or read range for the laundry tag up to several meters, since the external far-field antenna can be much bigger sized than the internal antenna of the small RFID transponder, which results in an increased antenna-gain. The far-field antenna can, for example, be provided as a dipole antenna, or, alternatively, as another type of "flat" antenna previously mentioned.

[0039] The far-field antenna is comprised in, or attached to, the textile item tag. This can be done by various methods such as couching, embroidering, sewing, soutache, weaving or stitching of a yarn or wire comprising a conductive material as well as gluing, adhesive bonding, printing of conductive materials, insertion or application of a metal foil, etc.

[0040] The kind of attachment of the far-field antenna to the textile item tag can further effect at least a supporting functionality for keeping the RFID transponder in place and maintaining constant and well-defined conditions for the coupling of the near-field antenna of the RFID transponder to the far-field antenna of the tag.

[0041] In order to ensure a good coupling, it is one possible solution that the far-field antenna encircles the near-field antenna at least partially. To achieve this, the far-field antenna comprises a loop-shaped section, and the RFID transponder is at least partially surrounded by said loop-shaped section. This not only can achieve a sufficient coupling between the far-field and the near-field antenna, but can also improve the mechanical fixation of the RFID transponder to its holding means. As known in the art of antenna design, different embodiments of antennas will have different transmission characteristics which have to be considered when designing the antennas for decent coupling results.

[0042] For combining the far-field antenna and the RFID transponder, the textile item tag which comprises the far-field antenna can have a pouch-type enclosure (e.g. a strip, sachet or pocket, etc.) for receiving the RFID transponder which is designed and aligned to ensure the radio coupling of the antennas. The RFID transponder can be fixed in the pouch by closing it, for example by stitching, sewing, embroidering, filling it with glue or PPS-Material, glueing, moulding, thermo-patching or ultrasonic-welding.

[0043] The pouch can be formed out of the textile item tag material itself, as well as by application of another material, e.g. textile. For combining the RFID transponder and the textile item tag holding it in the pouch, for example the usage of flexible materials is one possible solution as well as a direct application using one of the methods for fixation described above like sewing, gluing, etc.. In particular a complete enclosure of the RFID transponder and possibly also the far-field antenna, can help protecting it from environmental impacts.

[0044] This approach, according to the present invention, allows an easy combination of two separately manufactured (or pre-assembled) parts (RFID transponder, textile item tag with far field antenna) as a simple process, which can take place e.g. as two stand alone products later combined during production of the garment or when the garment is prepared for the laundry process. Thereby, also the problem of how to fix a small-sized RFID transponder to the laundry or garment is solved. For example, the RFID transponder can just be slipped into a pouch type enclosure of the textile item tag. The transponder can additionally be fixed in the pouch by closing its entry e.g. by gluing, stitching, etc. If the pouch is made of flexible material and properly designed, the transponder can just be plunged into the pouch and does not necessarily need to be additionally fixed inside of it.

[0045] In particular, when using the antenna as fixation-means for the RFID transponder, the textile item tag already comprising the RFID transponder can also be pre-assembled to its final state before attaching it to the garment or laundry.

[0046] Subject of the invention is also a special RFID transponder for tagging laundry or garments, the RFID transponder comprising one near-field antenna designed for operation in a UHF frequency range and a second near-field antenna designed for operation in a HF frequency range. Thereby, the first near-field antenna is designed in such a way that it can be coupled to a far-field antenna. Using this setup, the tag can be used with HF and with UHF readers.

[0047] The textile item tag according to the invention is described or explained in more detail below, purely by way of example, with reference to working examples shown schematically in the drawings. Specifically,

Fig. 1 illustrates a first embodiment of an RFID transponder, for a textile item tag according to the invention;

Fig. 2 shows a second RFID transponder for a textile item tag according to the invention, which differs from the transponder of Fig. 1 in that the integrated circuit is further coupled to a second antenna;

Fig. 3a depicts an RFID transponder inserted into a sachet with a stitched opening as a first example for an embodiment of a textile item tag according to the invention;

Fig. 3b shows a three dimensional view of a second example for an embodiment of an RFID transponder inserted into a pouch of a textile item tag according to the invention;

Fig. 4a, 4b and 4c are illustrating a third, fourth and fifth example of embodiments of the textile item identification tags according to the invention;

Fig. 5 illustrates a first example of laundry or garment being equipped with a washing-note as an embodiment of a textile item tag according to the invention;

Fig. 6 illustrates a second example of laundry or garment being equipped with a brand label for a pair of trousers as an embodiment of a textile item tag according to the invention;

Fig. 7 illustrates a third example of laundry or garment being equipped with a button and button facing of a shirt or blouse as an embodiment of a textile item tag according to the invention;

Fig. 8 illustrates a fourth example of a T-shirt as a textile item or garment which is equipped with two embodiments of a textile item tag according to the invention comprised in the collar and hemline of the T-shirt.

[0048] In the following, the invention is described with reference to the figures. Equal reference numbers indicate equal system components or components used for equivalent functionality.

[0049] Fig. 1 illustrates a first embodiment of an RFID

transponder 5 as it is known in the art. The RFID transponder 5 comprises an integrated circuit 10 which is electronically coupled to a near-field antenna 2 provided in the shape of a coil around the integrated circuit 10. The near-field antenna 2 may be operable in the HF, UHF and/or SHF frequency range. It is emphasized that the depicted geometrical shapes have only exemplary purpose. Different shapes, in particular of the antenna, like rectangles, squares etc. which serve the same purposes are included in the scope of the invention. The size of such an RFID transponder suitable for laundry processing is usually below about 20 mm in diameter and 3 mm in thickness, in particular below about 15 mm in diameter and 2 mm in thickness, or more particularly even less, like 10 mm in diameter and 1 mm in thickness.

[0050] In preferred embodiments of the method according to the invention, communication between the RFID reader and the RFID transponder is performed on frequencies of the UHF or SHF frequency range.

[0051] When referring to a circumference of the RFID transponder (5, 5'), in particular the circumference of the RFID transponder is meant, which is at least approximately on the same plane as the near-field antenna of the RFID transponder - or, more particularly on the plane with the best near-field coupling rate.

[0052] Fig. 2 shows a second exemplary embodiment of an RFID transponder 5' for a textile item tag according to the invention, which differs from the transponder 5 of the first embodiment in that the integrated circuit 10 is further coupled to a second near-field antenna 3. In this example, near-field antenna 2 is designed for operation in the HF range, and near-field antenna 3 for operation in the UHF range.

[0053] The lower part of the drawing illustrates a cut through the centre of the RFID transponder.

[0054] When using the RFID transponder, initially an RFID reader antenna directs an electromagnetic, magnetic or electrical field towards the transponder. After being energized, the transponder device sends back the identification information - usually a kind of digital code - to the reader, thus enabling identification of the transponder and, consequently, the object carrying the transponder. In this way, objects tagged with an RFID transponder can be identified and recognized individually.

[0055] The received identification may be displayed on a display device, stored on a storage medium, provided on an interface and/or processed for further use

[0056] In particular for the latter embodiment of the invention, it is preferred that the far-field antenna is designed in such a way that coupling with a near-field antenna operating in the UHF frequency range is enabled.

[0057] A near-field antenna for high frequency (HF) is designed to operate at frequencies between 3 MHz and 300 MHz, typically at 13.56 MHz. In contrast thereto, an antenna designed for operation in an ultra-high frequency (UHF) range typically operates between 860 MHz and 950 MHz, but also 2.45 GHz or even micro-wave frequency ranges around 5.8 GHz may be used as antennas for RFID applications. As mentioned, higher frequencies are in general associated with the advantage of smaller antenna dimensions and potential for increased data-rate.

[0058] In Fig. 3a an RFID transponder 5 is depicted which is inserted into a sachet with a stitched opening 8 as an example for a textile item tag 1 made of flexible material for holding the transponder 5.

[0059] Fig. 3b illustrates a three dimensional view of a textile item tag comprising a pouch type enclosure formed by e.g. weaving, sewing, gluing along the line 8 as an example of a textile item tag 1 for comprising an RFID transponder 5 which can be inserted into the pouch. The tag 1 can then be attached to a piece of laundry or garment 9. The RFID transponder 5 is thereby surrounded by the sheet-like material 7 of which the tag is made.

[0060] The tag can be woven as a tube having one continuous, one-piece, seamless side panel or wall. Alternatively, the wall of the tag can be a folded web, heat-sealed, stitched, ultrasonically sealed, welded, adhesively bonded or otherwise attached along one side to provide a wall. The material of the fabric tag may, for example, be acetate, cotton, nylon, polyester and combinations thereof, in woven or non-woven form. The pouch can also be made of a different material than the textile item tag itself which is attached to the tag material. For example, an elastic piece of cloth can be stitched to a non-elastic textile item tag for forming the pouch.

[0061] The RFID transponder can be directly glued or welded into the tag material 7 or be held in place by closing the pouch by sewing or stitching or other means. It is also a possible embodiment to hold the tag in place by pocketing it into an elastic pouch that is shaped in such a way that an inserted transponder is fixated by the elastic material and will not slip out any more.

[0062] For ease of illustration of the presented examples of such a pouch-type enclosure, the far-field antenna, which is comprised by the textile item tag, is not drawn in Fig 3a and 3b, although it is, nevertheless, present according to the invention.

Fig. 4a, 4b and 4c show a third, fourth and fifth embodiment of a textile item tag 1 according to the invention, where the far field antenna 4 which is applied to or comprised by the textile item tag is explicitly depicted.

Fig. 4a shows the same textile item tag 1 with an RFID transponder 5 inserted into the pouch or sachet, similar to the one of Fig. 3a. In the embodiment of Fig. 4a which illustrates an embodiment of a textile item identification tag according to the invention, the far-field antenna 4 is stitched onto the sachet, and the antenna 4 is provided with a loop-shaped section 9 (indicated by a bold line).

[0063] The RFID transponder is placed partially surrounded by the loop-shaped section 9, resulting in a cou-

pling between the far-field antenna 4 and the at least one near-field antenna 2, 3 comprised in the RFID transponder 5. Additionally, this particular arrangement of the RFID transponder 5 in the loop-shaped section 9 of the far-field antenna 4 improves the fixation of the RFID transponder 5 to the textile item tag 1 by closing the open end of the pouch.

[0064] The RFID transponder 5, inserted into a pouch with a stitched opening 8 is shown in Fig. 4a and Fig 4b. In Fig. 4c the transponder is glued in-between the pouch made of two sheets of the tag-material 7. Also, three different shapes of tags and antennas are shown, whereas a person skilled in the art of RFID and/or antenna design will be able to adopt the shape and alignment of the far field antenna and/or the RFID transponder, as this is a routine task in these fields of the art.

[0065] As a particular embodiment, the pouch of Fig. 4a is closed by applying (e.g. sewing or embroidering with a thread comprising a conductive material) the far-field antenna, whereby the RFID transponder is also held in place.

[0066] In all three embodiments, section 9 of the far-field antenna can be seen, which at least partially encloses the RFID transponder 5. This partial surrounding of the near-field patch antenna of the RFID transponder by the far-field dipole antenna of the textile item tag is a preferred embodiment of the inductive coupling of those two antennas according to the invention.

[0067] Again, as for all the exemplary embodiments, a person skilled in the art of designing antennas will be capable of designing many other geometrical shapes of one or both of the antennas resulting in a coupling.

[0068] In a particular embodiment, the textile item tag according to the invention can be a stand alone piece of cloth (e.g. a textile, such as acetate, cotton, nylon, polyester and combinations thereof, in woven or non-woven form) a foil or another sheet-like, flexible material which can be attached to the garment or has already been attached during the production of the garment.

[0069] Furthermore, the textile item tag can also be used as e.g. a washing note or slip as shown in Fig. 5, where a well known washing tag 1, comprising product information - in this example washing instructions 11 - is shown, which is applied to a piece of linen 9 by sewing 12. Again, the washing tag 1 comprises a far-field antenna 4 and a pouch type enclosure. In advance of applying the washing note 1 to the laundry 9, the RFID transponder 5 has been inserted or applied to the tag 1.

[0070] The term textile item tag or laundry tag - as used in the present application - is not restricted to those classical textile item or laundry tags, containing writings, laundry symbols, sizes or the like. Since the laundry tags of the present application are designed to be, at least primarily, RFID tags, they are not restricted to the classical embodiments of such tags. They can even be almost invisibly integrated into the piece of laundry or garment, not noticeable by human beings.

[0071] Therefore, in an advanced embodiment, the washing note does not even need to comprise the literal washing instructions, as those can advantageously also be stored on the RFID transponder, e.g. allowing the usage of the slip for other purposes. Also, the marking of the clothes size could be stored, although it is likely that an, at least additional, literal mentioning of the size on the tag would be preferred by the customers.

[0072] Fig. 6 shows a similar example, wherein the textile item tag according to the invention is embodied as a branding label 1 for trousers 9 which is applied by stitching 12. The far-field antenna of the branding label according to the invention comprises the far field antenna 4, in this particular example embodied as an accordingly shaped piece of metal foil laminated into the label material 7'. The RFID transponder 5 can also be laminated into to the label or be applied later on by gluing it in, by ultrasonic welding or other known techniques.

[0073] Also, sewing the label to the garment with conductive thread, to be used as far-field antenna, could be a possible solution.

[0074] Fig 7. shows a third example of a garment equipped with a special embodiment of a laundry tag according to the invention. The illustrated solution comprises an RFID transponder 5" as button of the garment and a button facing 7" comprises the far-field antenna 4. In this embodiment, the textile item tag 1 is an integral part of the garment itself. One of the buttons 13 is or comprises the RFID transponder and a part of the shirt itself is the textile item tag, comprising the far-field antenna, e.g. as a piece of conductive thread comprised in the cloth of the shirt, like the button facing or buttonhole, which is aligned in a coupling position with the RFID-transponder-button. A button-like transponder, for example can be fixed as an ordinary button.

[0075] Fig 8. shows a fourth, very special example of a piece of garment with an embodiment of a textile item tag according to the invention, wherein the laundry tag 1 is embodied as a collar or a hemline of a T-shirt 9. In this figure, two examples of different possibilities for placement are shown.

Claims

1. A textile item identification tag (1) to be attached to a piece of laundry or garment (9) with

   - an encapsulated RFID transponder (5, 5') which comprises an integrated circuit (10) and at least one near-field antenna (2, 3), which is electronically coupled to the integrated circuit (10),
   - at least one far-field antenna (4) positioned in coupling condition with the at least one near-field antenna (2, 3), and
   - a pouch-type enclosure (8) for holding the RFID transponder (5, 5'),

characterized in that
the at least one far-field antenna (4) comprises at least one curved section (9), which at least partially encloses a circumference of the RFID transponder (5, 5').

2. The textile item identification tag (1) according to claim 1,
characterized in that
the RFID transponder (5, 5') is enclosed by said at least one curved section (9) to an extent of at least half of the circumference, in particular to an extent of at least two-thirds of the circumference, more particularly completely enclosed by said at least one curved section (9).

3. The textile item identification tag (1) according to any one of the preceding claims,
characterized in that
the at least one far-field antenna (4) has at least one further curved section.

4. The textile item identification tag (1) according to any one of the preceding claims,
characterized in that
the encapsulated RFID transponder (5, 5') is completely sealed off from the environment, in particular by an encapsulation made partially or entirely of PPS material.

5. The textile item identification tag (1) according to any one of the preceding claims,
characterized in that
the RFID transponder (5, 5') operates in the UHF or SHF frequency range.

6. The textile item identification tag (1) according to any one of the preceding claims,
characterized in that
the textile item identification tag (1) is implemented as a piece of cloth or foil to be attached to a piece of laundry or garment (9), in particular a washing-note, slip, label, collar or hemline.

7. The textile item identification tag (1) according to any one of the preceding claims,
characterized in that
the pouch type enclosure (8) is shaped to firmly hold the RFID transponder (5) in place with respect to the far-field antenna (4) by a tight mechanically fit of the pouch (8) and the transponder (5).

8. The textile item identification tag (1) according to any one of the preceding claims,
characterized in that
the pouch type enclosure (8) and/or the textile item tag (1) is made of flexible material.

9. The textile item identification tag (1) according to any one of the preceding claims 1 to 7,
characterized in that
the far-field antenna (4) is applied by stitching a thread comprising conductive material, in particular wherein the applied far-field antenna closes an open end of the pouch.

10. The textile item identification tag (1) according to any one of the preceding claims 1 to 7,
characterized in that
the far-field antenna (4) is applied by printing conductive material or applying a conductive polymerizable liquid to the textile item tag (1) or pouch (8) material.

11. The textile item identification tag (1) according to any one of the preceding claims 1 to 7,
characterized in that
the far-field antenna (4) is applied by gluing, laminating or thermo-patching a conductive foil material to the pouch (8) or textile item tag (1) material.

12. The textile item identification tag (1) according to any one of the preceding claims 1 to 7,
characterized in that
the pouch type enclosure (8) comprises the far-field antenna (4) integrated into the pouch (8) material, in particular wherein the far-field antenna (4) is applied to the textile item tag (1) material by weaving of conductive material.

13. The textile item identification tag (1) according to any one of the preceding claims,
characterized in that
the far-field antenna (4) is arranged on the inner side of the pouch-type enclosure (8).

14. The textile item identification tag (1) according to any one of the preceding claims,
characterized in that
the at least one far-field antenna (4) is a dipole-antenna and the at least one near-field antenna (2, 3) is a loop-antenna, in particular wherein the far-field antenna (4) and the near-field antenna (2, 3) are arranged and shaped in such a way that the curved section (9) of the far-field antenna (4) resides, at least partially, in inductive coupling range to a portion of the near-field antenna (2, 3) of the transponder.

15. Production method for a textile item identification tag (1) according to claim 1 by the steps of:

- providing a pre-assembled, encapsulated RFID transponder (5), which comprises
an integrated circuit (10) and
at least one first antenna (2, 3) which is electronically coupled to the integrated circuit;

- providing a textile item tag (1) comprising a pouch type enclosure (8) for enclosing the RFID transponder (5) and
at least one second antenna (4), which at least partially encloses a circumference of the pouch (8) for the RFID-transponder (5) by at least one curved section (9) of the second antenna (4) in such a way to radio-couple the second antenna (4) with the first antenna (2, 3) of an enclosed RFID transponder (5);
- inserting the RFID transponder (5) into the pouch type enclosure (8);
- fixing the RFID transponder (5) in the pouch (8).

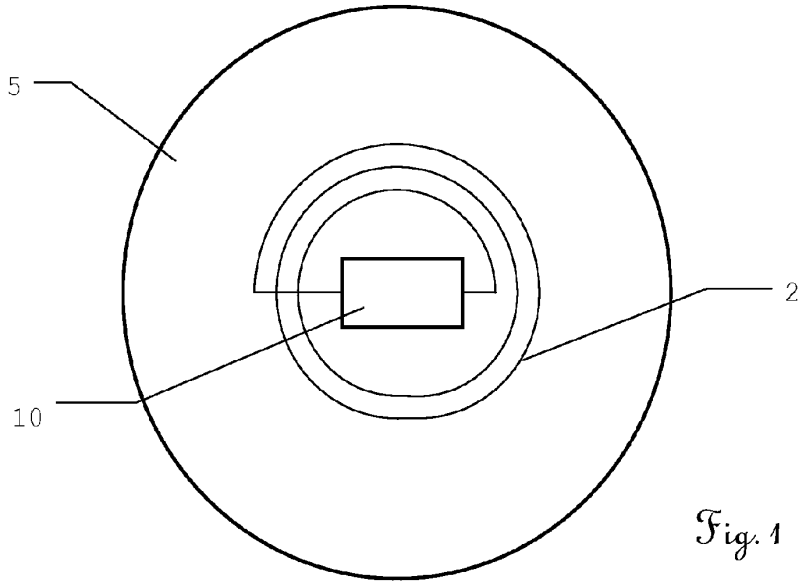


Fig. 1

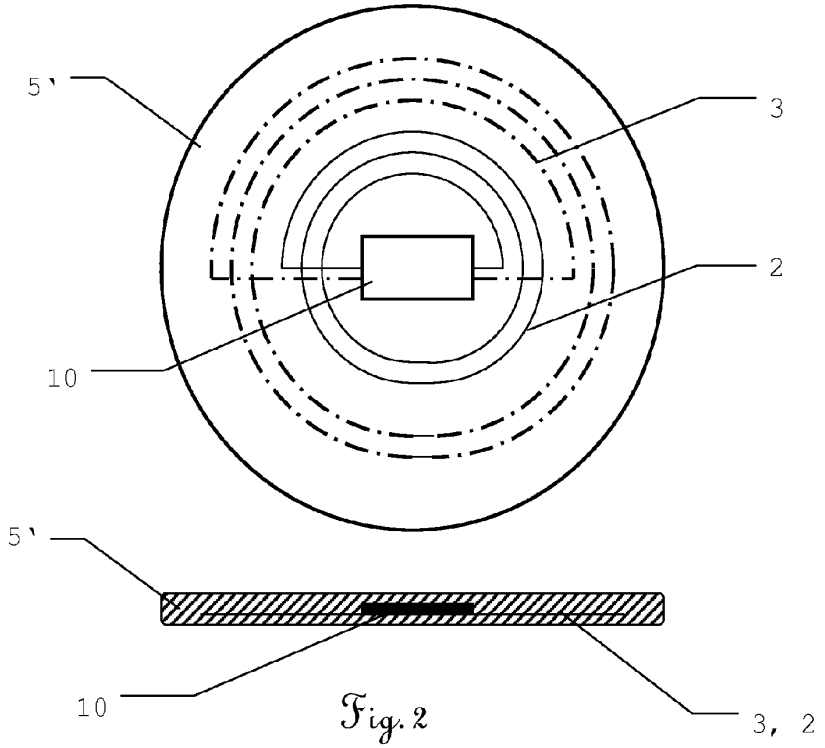


Fig. 2

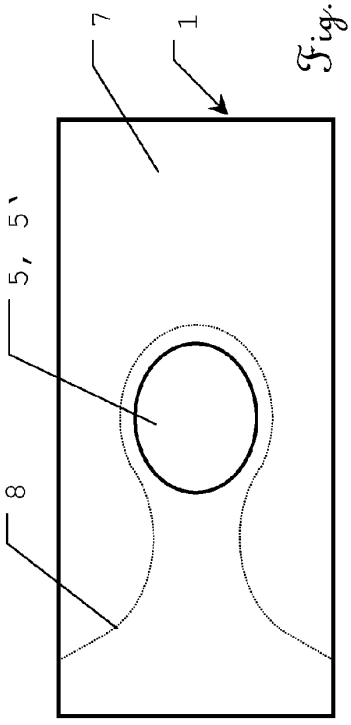


Fig. 3a

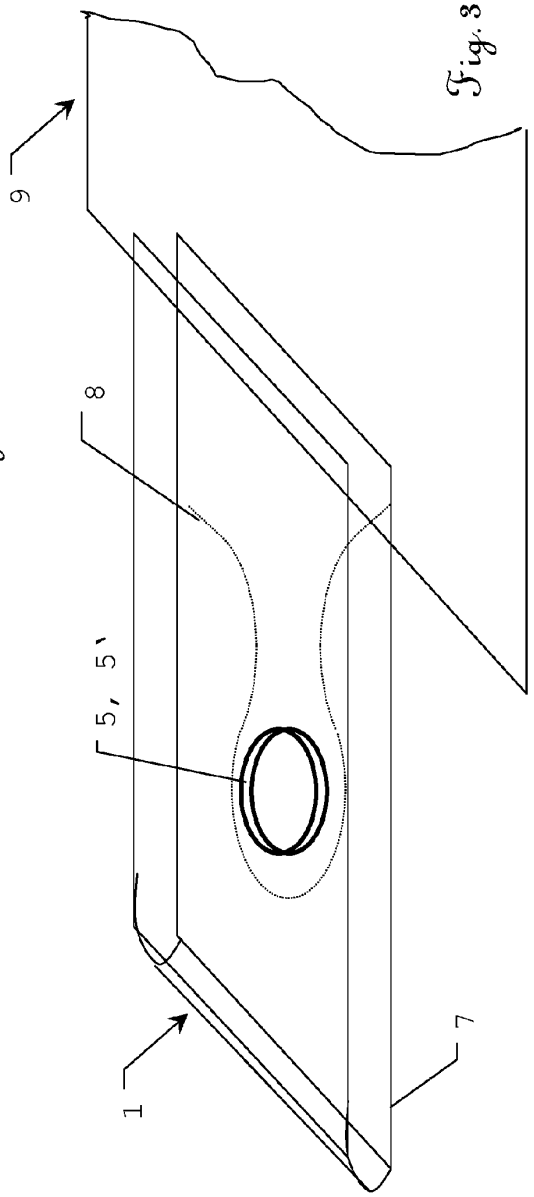


Fig. 3b

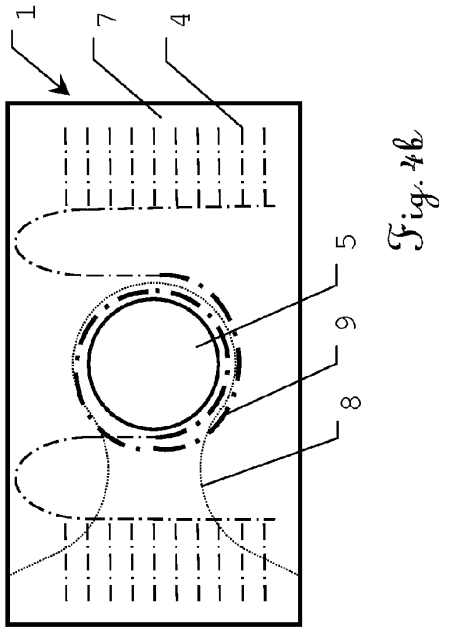


Fig. 4b

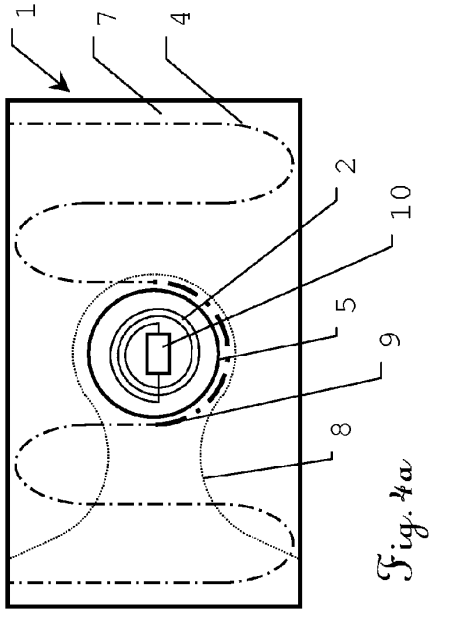


Fig. 4a

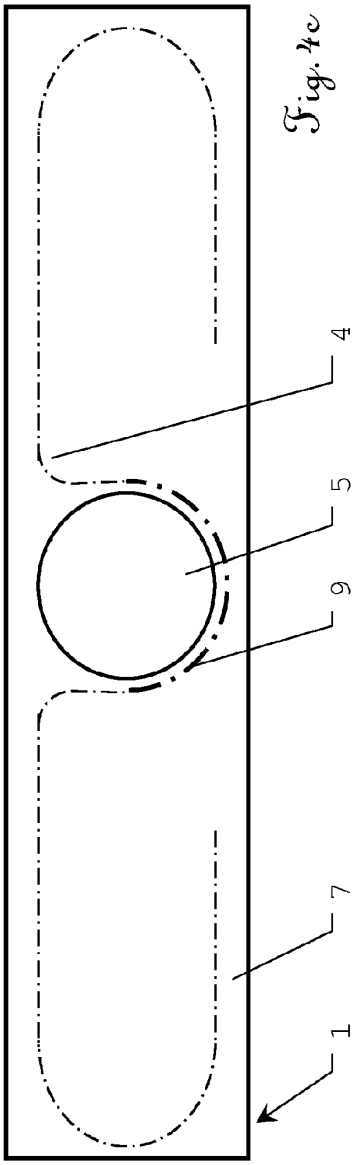


Fig. 4c

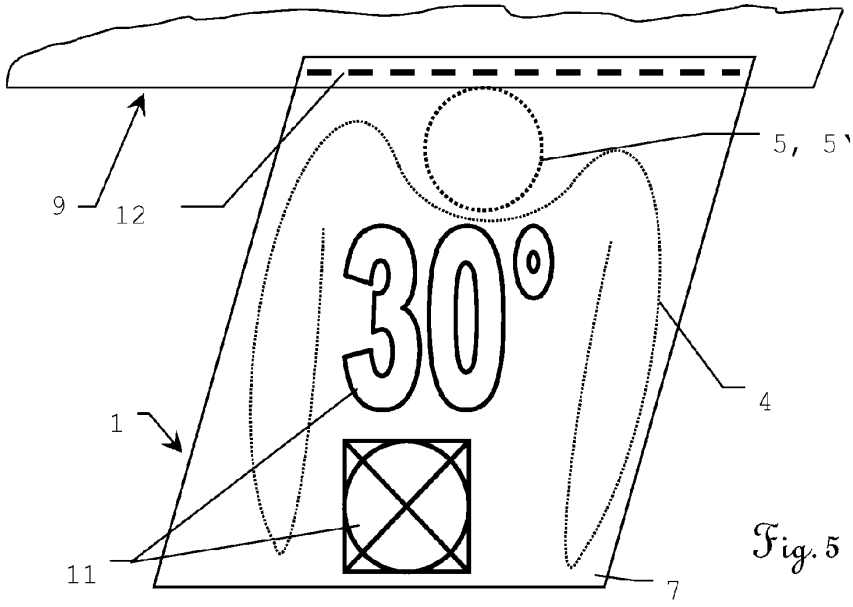


Fig. 5

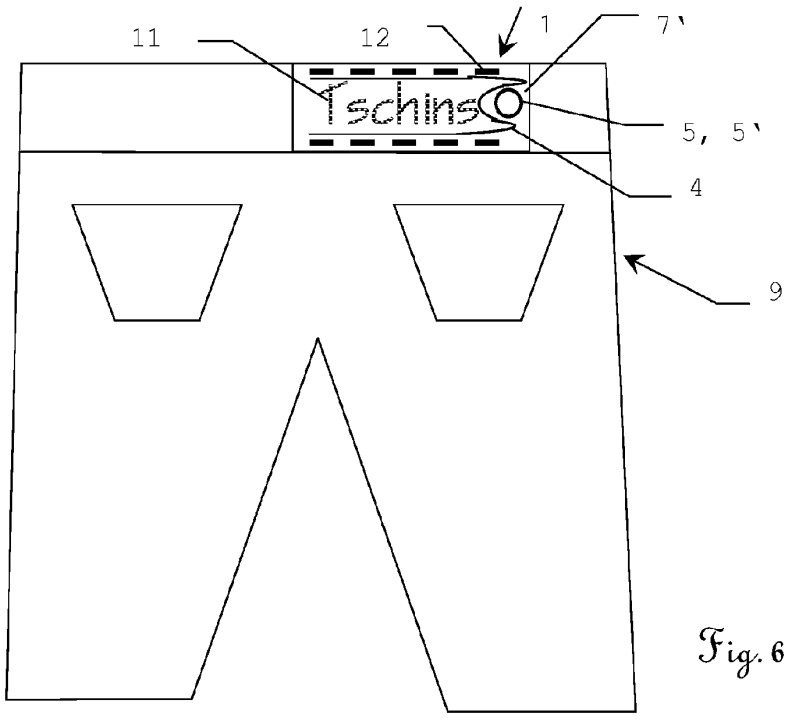


Fig. 6

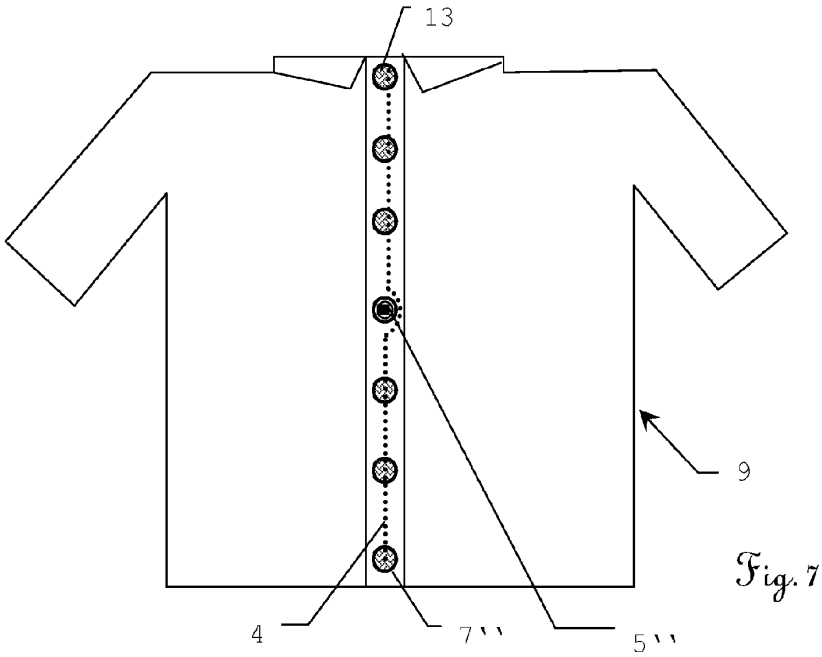


Fig. 7

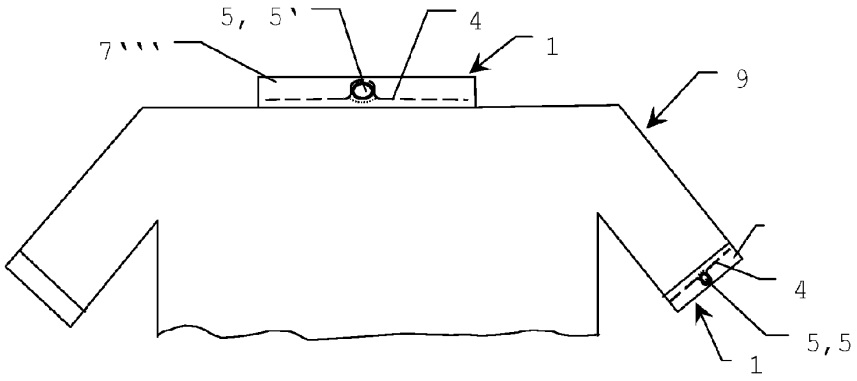


Fig. 8

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EUROPEAN SEARCH REPORT

Application Number
EP 10 16 8663

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
A,D	US 7 247 214 B2 (CHAMANDY PAUL A [US] ET AL) 24 July 2007 (2007-07-24) * column 2, lines 23-26; column 3, line 16 - column 4, line 23claims; figures *	1-15	INV. D06F93/00
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TECHNICAL FIELDS SEARCHED (IPC)
D06F
G06K

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
Munich	17 January 2011	Clivio, Eugenio

CATEGORY OF CITED DOCUMENTS
X : particularly relevant if taken alone
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ANNEX TO THE EUROPEAN SEARCH REPORT ON EUROPEAN PATENT APPLICATION NO. EP 10 16 8663

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17-01-2011

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For more details about this annex : see Official Journal of the European Patent Office, No. 12/82

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

(54) **Title**: RFID TAG AND METHOD FOR MANUFACTURING SUCH A RFID TAG

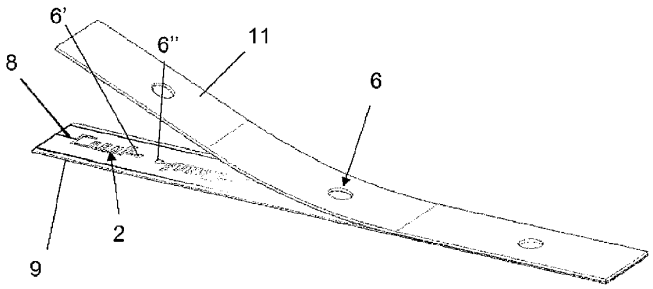


Fig. 3a

(57) **Abstract**: The present invention relates to an RFID tag comprising a substrate (1). A plurality of conductive patterns (2) is formed onto a first surface of the substrate (1). Each conductive pattern has at least a first and a second connection ends. An electronic chip (3) is electrically connected the first and the second connection ends. Laminated cover layer overlays the conductive patterns. The cover layer is provided with through-holes (6) of a dimension larger than the electronic chip (3) so as to expose the electronic chip. The through-holes (6) are filled with an encapsulation material (7).

WO 2012/014005 A1

RFID TAG AND METHOD FOR MANUFACTURING SUCH A RFID TAG

Field of the invention

The invention relates to an RFID (Radio Frequency Identification) tag and a "ready-to-use" endless RFID circuit tape. In this document, "endless" intends to define a tape adapted for use in reel-to-reel processes, as opposed to substrate sheets for discontinuous processes and/or processes by batch.

The invention also relates to a method for manufacturing such a RFID tag and the endless RFID circuit tape.

Description of prior art

Radio Frequency Identification (RFID) is becoming an important identification technology for tracking objects such as luggage, packages, merchandise, and the like through distribution networks and processes.

A typical RFID tag or transponder consists of a semiconductor chip having RF circuits, logic, and memory, an antenna (and a battery in the case of active tags), mounted to a substrate. Such an RFID tag is capable to exchange information with a reader via its antenna.

There is still a demand for RFID tag which is adapted to work in harsh environment. In the context of the present invention "harsh environment" relates to high temperature and/or corrosive and/or humid environment. One example of the harsh applications is the tracking of manufacturing process of printed circuit boards in which a substrate is usually subjected to metallization and chemical etching steps; these steps being definitely harsh conditions in terms of temperature, corrosivity.

It is known from the international application WO 2008/132287 (Fig. 1), a RFID tag comprising a substrate layer 23 supporting an antenna pattern 24 which is electrically connected to an IC chip 25. In the area of IC chip, it is provided a protective glop-top material 26. The tag also includes a laminated film 27 covering not only the substrate layer 23 but also the encapsulated IC chip 25.

Although functionally valid, such a RFID tag structure may present weak point located at the junction point between the substrate layer, the glob-top and the laminated film as shown by the circle of Fig. 1. In use, over a period of time, the prior art RFID tag may present performance failure due to, for instance, moisture and/or dust contamination through the layer stack.

Summary of the invention

It is therefore an object of the invention to provide an improved RFID tag, which is adapted to work in harsh environment over a large period of time and which is less expensive to manufacture with regard to the prior art RFID tags.

To this end, the invention relates to a RFID tag according to claim 1 and a method for manufacturing such a RFID tag according to claim 8.

Thus, by providing a laminated cover layer, on top of the conductive pattern, having a small through-hole (of substantially the size of the IC chip), it is possible to form an intimately-attached layered tag assembly by lamination process. This provides a layer stack structure for which risk of detachment of the cover layer from the substrate, due to the presence of weak sticking points, is reduced.

Further the RFID tag of the present invention can be produced by a "reel-to-reel" process which delivers benefits in terms of productivity and reliability. Since the implementation of a "reel-to-reel process implies the use of relatively flexible material, one may propose a thin flexible tag for applications in which the tag is exposed to bending and/or torsional actions.

According to another aspect of the invention, it is proposed a "ready-to-use" continuous (or endless) circuit tape of claim 10. With the present endless circuit tape, the RFID tag manufacturer is able to manage his production line depending on the bookings on a daily basis, with reduce time out, i.e. the manufacturer only needs to change the endless tape and then proceed to the IC chip connection to shift to a different RFID tag part number.

Short description of the drawings

These and further aspects of the invention will be explained in greater detail by way of example and with reference to the accompanying drawings in which:

Fig.1 shows a partial cross sectional view of a prior art RFID tag;

Fig.2 shows a partial cross sectional view of an RFID tag according to the invention;

Fig.3a shows a perspective view of an exemplary "ready-to-use" RFID tape comprising conductive pattern with a laminated cover layer tape prior to IC chip mounting;

Fig. 3b is a perspective view of the "ready-to-use" RFID circuit tape with an IC chip connected to the RFID circuit.

Fig.4 is a schematic process line.

The figures are not drawn to scale. Generally, identical components are denoted by the same reference numerals in the figures.

Detailed description of preferred embodiments

Fig. 2 is an enlarged partial cross-sectional view of a RFID tag according to the present invention. This RFID tag includes a support substrate 1 on which is formed conductive pattern 2 providing an electrical circuit of an antenna. The support substrate is made of insulating material, preferably made of a flexible high temperature polymer. For instance, the flexible material may be chosen a polyimide film.

The circuit pattern 2 is formed onto the upper surface of the support substrate 1 by plating, by printing, by etching, by chemical deposition, etc… The conductive material of the circuit pattern may be chosen among silver, copper, aluminium, etc.. According to the present invention, the circuit pattern forms either a HF or an UHF antenna pattern.

The RFID tag further comprises an IC chip 3 electrically connected to the first and second connection ends of the circuit pattern. As shown in Fig. 2, the IC chip is connected to the circuit pattern connection ends by a wire bonding technique implementing conductive leads (for instance silver, gold or copper). It should be noted that the IC chip may be also directly attached to the antenna circuit by flip-chip technology or by implementing IC chips provided with SMT (Surface Mount) contact (e.g. SOT type Chip) which are directly soldered to the antenna pads.

The RFID tag according to the invention further includes a cover layer 5, provided with a through-hole 6, which has been attached on top of the upper surface of the support substrate 1 so as to overlay the circuit pattern and thereby protecting it from external environment. The through-hole 6 is located at a position in respect to the circuit pattern so as to give an access to the antenna connection end 6', 6" for connecting the IC chip 3. Finally the through-hole 6 is filled with an encapsulation material or glob-top material 7, the purpose of which is to isolate the IC chip 3 from external environment and to provide mechanical reinforcement.

According to a preferred embodiment, the cover layer 5 is a flexible film of high temperature polymer type provided with an adhesive means 5'. The flexible film is laminated over the upper surface of the substrate and is firmly fixed to it via the adhesive means 5'. For instance the flexible film is about 75µm thick.

As previously-mentioned, the substrate and the cover layer are flexible material, i.e. the material is flexible enough to withstand flexure force without permanent deformation or breaking. By virtue to the fact of their flexibility, the substrate and the cover layer can be implemented in a high speed line using a "reel-to-reel" technology. Further providing an encapsulation material in replacement of a laminated cover layer in the IC chip area highly reduces risk of air bubble formation which may impart attachment of the cover layer to the substrate over a period of use.

Fig. 3a is a schematic representation of the lamination step of the manufacturing process of the RFID tag, in which a cover layer tape 11 is applied over the

upper surface of the substrate tape 9. The substrate tape 9 has been beforehand plated with a metallic layer to provide a circuit pattern 2.

Now is described an exemplary way, among other available technique, to form the conductive circuit pattern 2 onto the substrate tape 1. In a first step, an electrically conductive ink, which behaves as a priming electrically conductive layer, is applied to the substrate tape. The application of the conductive ink can be performed by gravure printing or screen printing to constitute a primary circuit pattern. In subsequent step, the substrate tape is put into contact with an electro-plating bath comprising the metallic ions to be deposited by an electro-reduction reaction. The reduction reaction is achieved by applying a current or a voltage between an anode (for instance a soluble anode of the metal to be deposited) and a cathode. The cathode of the electrochemical cell is electrically connected to the priming conductive ink through a connection bridge 8. As shown in Fig. 3a, the circuit pattern 2 is centrally disposed in respect to the edges of the substrate tape and when the cathode is located on at one edge of the substrate, it is necessary to provide a connection bridge 8 extending from the edge towards the centrally positioned circuit pattern.

Advantageously, the connection bridge 8 comprises a corrugated profile (not shown). Thus in the event where undesired liquid soaks between the substrate 1 and the cover layer 5, the liquid will preferentially follow the path defined along the connection bridge 6. Thanks to the corrugated profile, the length of the path from the edge of the substrate to the circuit pattern is substantially increased, with the benefit that the time required for

reaching the circuit pattern 2 is also increased, thereby improving the product lifetime further to liquid contamination.

Fig. 3b shows the RFID tape with an IC chip 3 positioned through the through-hole and electrically connected to the antenna circuit pattern.

In reference to Fig. 4, is described a possible process line for manufacturing a RFID tag according to the invention. A tape of flexible support substrate 9 with its circuit patterns is unwound from roll 10. Parallel to this step, a cover tape 11 of flexible material is unwounded from roll 12. The cover tape 11 is provided with an adhesive film (not shown), covered by a protective film 14, over a first surface 13. The protective film 14 is removed from the cover tape 11 and wound on roll 15. After protective film removal, the cover tape 11 is subjected to a "stamping" unit 16 wherein through-holes (not shown) are formed. The cover tape 11 and the substrate tape 9 are subsequently laminated so as to glue both parts together to form a layered tape. The resulting tape is submitted to a "die attach" unit 17 in which an IC chip is put in place in the through-hole of the layered tape. The IC chip is then electrically connected to the circuit pattern for instance in a "wire bonding" unit 18. The circuit tape with its IC chips is brought into a "casting" unit 19 in which a glob top material is cast in order to fill up the through-holes. During casting, the walls formed by the through-holes serve as a limiting frame for the glob-top material so as to prevent material overflow. The resulting cast layered tape is subsequently submitted to a "Curing" unit 20 to harden the glob-top material. The finalized tape 21 is then either wound onto

roll 22 or immediately processed, for instance by stamping, to provide individualized RFID tags.

According to a variant of the above described process, the tape obtained just before being submitted to the "die attach" unit 17 is wound on a roll (and possibly sold as such) for a subsequent mounting of the chip 3.

The RFID tag according to the present invention is therefore of simple construction which is especially adapted to be manufactured through a reel-to-reel process. In addition, a RFID tag product, in which the constituents are intimately associated, is fabricated via the above-mentioned process. Such an intimate structure is beneficial for proposing a harsh environment RFID tag.

The present invention has been described in terms of specific embodiments, which are illustrative of the invention and not to be construed as limiting.

CLAIMS

1. RFID tag comprising:

- a substrate;
- a conductive pattern formed onto a first surface of the substrate and having at least a first and a second connection ends;
- an electronic chip electrically connected the first and the second connection ends;
- a laminated cover layer overlaying the conductive pattern;

wherein the cover layer is provided with a through-hole of a dimension larger than the electronic chip so as to expose the electronic chip and wherein the through-hole is filled with an encapsulation material.

2. RFID tag according to claim 1, wherein the electronic chip is electrically connected to the first and the second connection free ends by wire-bonding.

3. RFID tag according to claim 1 or 2, wherein the cover member is attached to the first surface of the substrate with an adhesive material.

4. RFID tag according to any preceding claims, wherein the substrate, the cover member and the encapsulation material are chosen among high temperature polymers.

5. RFID tag according to claim 4, wherein the high temperature polymers have a glass transition temperature above 300°C.

6. RFID tag according to any preceding claims, wherein the conductive pattern forms an UHF or HF antenna.

7. RFID tag according to any preceding claims, wherein the cover member comprises an adhesive layer on a surface opposite to that one facing the first surface of the substrate.

8. Reel-to-reel method for manufacturing an RFID tag web comprising the following steps:

a) providing a continuous web of substrate having a plurality of conductive patterns, each one of which comprising a first and a second free connection ends and being formed on a first surface of the substrate;

b) laminating a cover web having through-holes over the conductive patterns so that the first and the second free connection ends are exposed through the through-holes;

c) electrically connecting an electronic chip to the first and a second free connection ends so that the electronic chip is received in the through-hole;

d) encapsulating the through-holes with an encapsulating material.

9. Reel-to-reel method for manufacturing a continuous RFID tape comprising the following steps:

a) providing a continuous web of substrate having a plurality of conductive patterns, each one of which comprising a first and a second free connection ends and being formed on a first surface of the substrate;

b) laminating a cover web having through-holes over the conductive pattern such that the first and the second free connection ends are exposed through the through-holes.

10. Continuous RFID tape comprising:

- a substrate;
- a plurality conductive patterns formed onto a first surface of the substrate and each one of which having at least a first and a second connection ends;
- a laminated cover layer overlaying the conductive patterns;

wherein the cover layer is provided with through-holes, each one of which, exposing the first and the second connection ends and being sized to receive an IC chip.

1/2

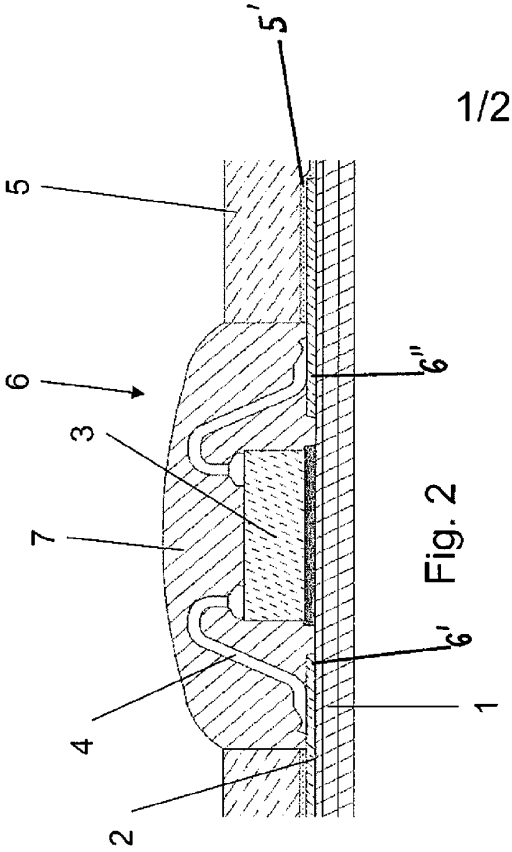


Fig. 2

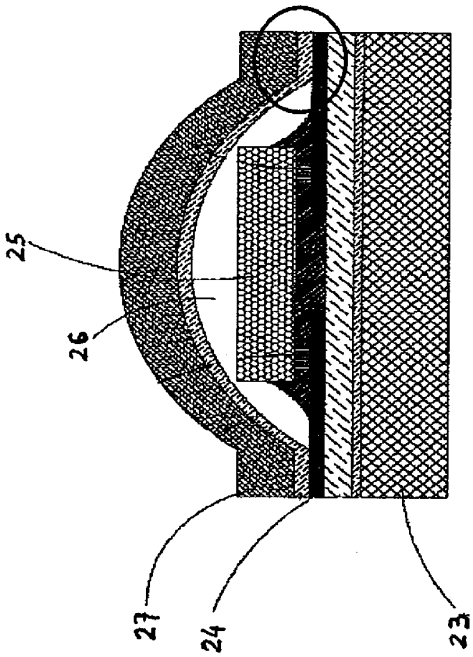


Fig.1 (PRIOR ART)

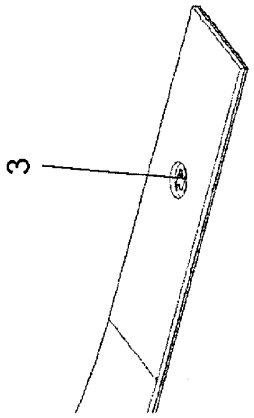


Fig. 3b

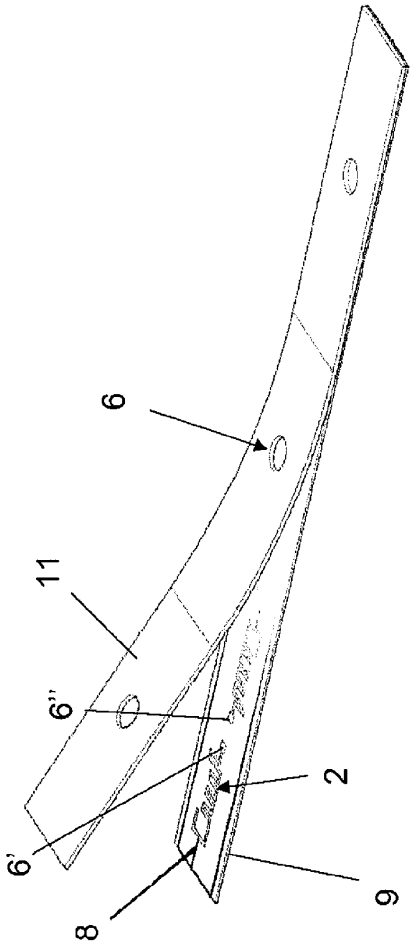


Fig. 3a

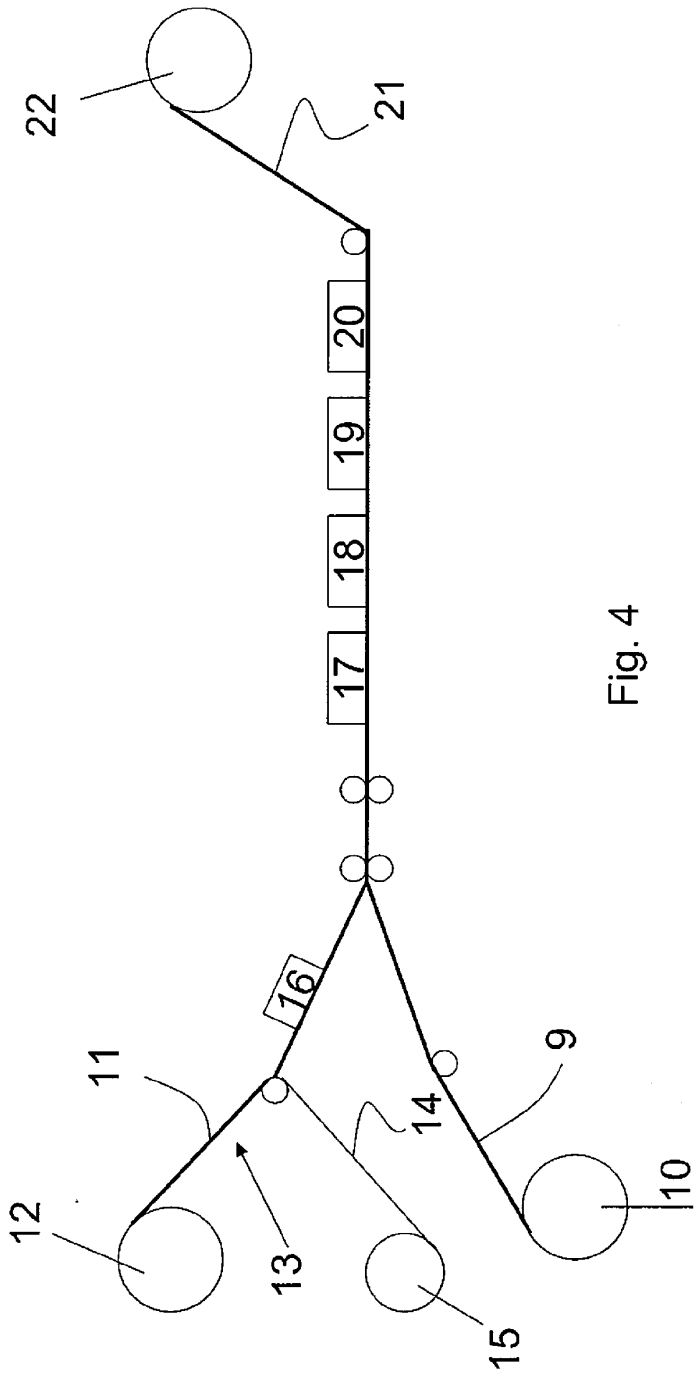


Fig. 4

INTERNATIONAL SEARCH REPORT

International application No
PCT/IB2010/002187

A. CLASSIFICATION OF SUBJECT MATTER
INV. G06K19/077 H01Q1/22 H05K3/00
ADD.

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 H01Q H05K

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	US 6 607 135 B1 (HIRAI MINORU [JP] ET AL) 19 August 2003 (2003-08-19) figure 13 column 5, line 1 - line 62 column 8, line 4 - line 36	1-10
X	US 6 437 985 B1 (BLANC RENE-PAUL [FR] ET AL) 20 August 2002 (2002-08-20) figures 10,11 column 6, line 7 - line 42 column 10, line 19 - column 13, line 54	1
X	US 5 952 713 A (TAKAHIRA KENICHI [JP] ET AL) 14 September 1999 (1999-09-14) column 7, line 65 - column 8, line 14; figure 12	1,8-10

-/--

[X] Further documents are listed in the continuation of Box C.

[X] See patent family annex.

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"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
4 January 2011	12/01/2011

Name and mailing address of the ISA/	Authorized officer
European Patent Office, P.B. 5818 Patentlaan 2 NL - 2280 HV Rijswijk Tel. (+31-70) 340-2040, Fax: (+31-70) 340-3016	Heusler, Nikolaus

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INTERNATIONAL SEARCH REPORT

International application No
PCT/IB2010/002187

C(Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 2006/086804 A1 (TAKAYAMA TOSHIHARU [JP]) 27 April 2006 (2006-04-27) paragraphs [0006], [0037]; figure 5	1
X	HAGHIRI YAHYA ET AL: "Vom Plastik zur Chipkarte; 7.2 Kontaktlose Chipkarte", VOM PLASTIK ZUR CHIPKARTE: WEGWEISER ZUM AUFBAU UND ZURHERSTELLUNG VON CHIPKARTEN, 1 January 1999 (1999-01-01), pages 181-192, XP002364832, figure 7.2-1 on page 182	1
A	US 2008/001759 A1 (KOBAYASHI HIROSHI [JP] ET AL) 3 January 2008 (2008-01-03) figures 5,6	1-10

Form PCT/ISA/210 (continuation of second sheet) (April 2005)

INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No
PCT/IB2010/002187

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		EP 0919950 A1	02-06-1999
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		EP 1873694 A1	02-01-2008
		JP 2008009881 A	17-01-2008
		KR 20080003192 A	07-01-2008

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(72) Inventor; and
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(74) Agent: **ANKARA PATENT BUREAU LIMITED**; Bestekar Sokak No.10, Kavaklidere, 06680 Ankara (TR).

(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, BN, 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, PA, 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))*

(54) **Title**: ENHANCED ANTENNA STRUCTURE FOR RFID TAGS

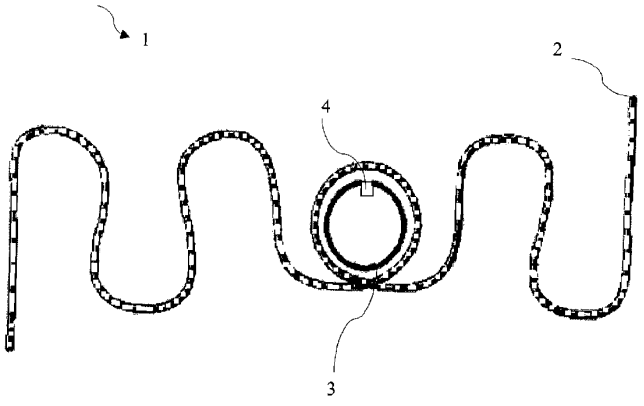


Figure 1

(57) **Abstract**: The present invention relates to RFID (Radio Frequency identification) tags which communicate by radio frequencies and can store information therein. The objective of the present invention is to provide an RFID tag which provides a stronger action/reaction, thus better communication.

WO 2013/128299 A1

ENHANCED ANTENNA STRUCTURE FOR RFID TAGS

Field of the Invention

The present invention relates to RFID (Radio Frequency Identification) tags which communicate by radio frequencies and can store information therein.

Background of the Invention

RFID is a method for automatic identification of objects by using radio frequencies. It is basically comprised of a reader and a tag. The tags comprise a chip for performing the functions of receiving, storing and sending information related to the object and antennas which surround the said chip for supplying energy to it and activating it. The chip and antennas are coated with a coating and attached to the object to be identified.

There are two types of tags, namely active and passive. The passive tags do not have their own power supplies. The antennas collect energy from the electromagnetic waves emitted by the reader serving as a transmitter in order to activate the chip. Energy collection is the technique of keeping the energy coming from the reader for an instant, activating the chip and then sending it back to the reader. This technique can enhance the performance of the passive tags significantly. The electromagnetic waves emitted by the reader meet with the chip as an energy and activate it, and data transfer is made from the tag to the reader via antennas.

The structure of the antennas is generally comprised of a loop antenna and a dipole antenna. The chip including information is positioned on the loop antenna. When data is being transferred from the antennas to the reader, initially the dipole antenna collects energy from the electromagnetic waves emitted by the reader, a

current is generated thereon. When this current generated on the dipole antenna moves, it causes a current on the loop antenna as well.

This current on the loop antenna is created by either the physical connection or inductive coupling between the dipole antenna and loop antenna. If the current is provided by the physical connection, these two antennas behave as parallel connected circuit elements. On the other hand, the same physical connection serves as a kind of short circuit. This prevents the entire current on the dipole antenna from passing also over the loop antenna.

In systems which utilize inductive coupling and in which there is no physical connection between the dipole antenna and the loop antenna, the two antennas are positioned close to each other. The magnetic field created by the current on the dipole antenna creates induction current on the loop antenna. In this case, since the current on the dipole antenna cannot make a full trip around the loop antenna, only a part of its potential reaches the chip. The chip is energized in proportion to the current on the loop antenna and provides an action and reaction again in the same proportion. The fact that the inductive coupling area where the two antennas come close to each other is limited causes the current generated on the chip to be weak and thus the action-reaction obtained to be low in power.

Summary of the Invention

The objective of the present invention is to provide an RFID tag with enhanced performance.

Detailed Description of the Invention

Enhanced antenna structure for RFID tags developed to fulfill the objective of the present invention is illustrated in the accompanying figures wherein,

Figure 1 is the top perspective view of the enhanced antenna structure.

Figure 2 is the side perspective view of the enhanced antenna structure.

Figure 3 is the schematic view of operation of RFID tags with the reader and computer.

The components in the figures are assigned reference numerals as follows:

1. Enhanced antenna structure
2. Dipole antenna
    - **21.** Sinusoidal part
    - **22.** Circular part
    - **23.** Crossing part
3. Loop antenna
4. Microchip

E. RFID tag

F. Reader

G. Computer

The antenna structure (1) of the present invention, which allows realizing an RFID tag that provides enhanced action/reaction, essentially comprises

- at least one dipole antenna (2) which is coated with an insulating film and is comprised of a conductive material,
    - o at least one sinusoidal part (21) forming one pole of the dipole antenna (2),
    - o at least one circular part (22) which produces a toroidal magnetic field around itself,
    - o at least one crossing part (23) which overlaps when the dipole antenna (2) bends to form the circular part (22) and which does not cause short circuit since the dipole antenna is insulated,

which constitute the dipole antenna (2);

- at least one loop antenna (3) which is surrounded by the circular part (22) and comprised of a conductive material,
- at least one microchip (4) which is located on the loop antenna and which is adapted to receive, store and/or send the information related to the object to be identified.

In the antenna structure (1) of the present invention, an electric current is generated on the dipole antenna (2) when it is positioned in the electromagnetic field generated by the electromagnetic waves at the predetermined frequencies sent by the reader (F). While the said electric current flows on the dipole antenna (2), an electric current is generated also on the loop antenna (3) with the impact of inductive coupling.

The loop antenna (3) is surrounded by the circular part (22) of the dipole antenna (2). As the dipole antenna (2) bends to form the circular part (22) surrounding the loop antenna (3), a crossing (23) is formed between the sinusoidal parts (21) which overlap. Since the dipole antenna (2) is coated with an insulating film material, a short circuit is prevented from occurring at the overlapping crossing part (23). Thus the electric current is allowed to flow along the entire dipole antenna (2) such that it will completely surround the loop antenna (3).

Thus the electric current flowing along the dipole antenna (2) makes a full trip around the loop antenna (3) remaining in the circular part (22). Throughout the full circumference, the loop antenna (3) is inducted. The loop antenna (3), on which enhanced induction current is generated, activates the microchip (4) that includes the information related to the object to be identified.

The information on the activated microchip (4) is sent to the reader (F) by radio waves via the loop antenna (3) and the dipole antenna (2) comprising sinusoidal part (21), circular part (22) and crossing part (23). The reader (F), upon receiving

the information, converts this information into digital data and transfers it to the computer.

By means of the enhanced antenna structure for RFID tags (1) of the present invention, better communication quality between the RFID tags (E) and the readers (F) is achieved. The current flowing on the dipole antenna (2) coated with an insulating film induces current on the loop antenna (3) with full capacity and the energizing rate of the microchip (4) on the loop antenna (2) is increased. This increase enables the microchip (4) to provide a stronger response than the structures used in the prior art and thereby allows designing stronger and more efficient RFID tags (E).

In another preferred embodiment of the invention, the crossing part (23) is insulated by placing an insulating material between the overlapping parts and thus short circuit is again prevented.

Within the framework of these basic concepts, it is possible to develop a wide variety of embodiments of the enhanced antenna structure for RFID tags (1) of the present invention. The invention can not be limited to the examples described herein and it is essentially as defined in the claims.

CLAIMS

1. Enhanced antenna structure for RFID tags (1), which allows realizing an RFID tag that provides strong action/reaction, essentially **comprising**
   - at least one microchip (4) which is located on the loop antenna and which is adapted to receive, store and/or send the information related to the object to be identified; and **characterized by**
   - at least one dipole antenna (2) which is coated with an insulating film and is comprised of a conductive material;
   -
     - o at least one sinusoidal part (21) forming one pole of the dipole antenna (2),
     - o at least one circular part (22) which produces a toroidal magnetic field around itself,
     - o at least one crossing part (23) which overlaps when the dipole antenna (2) bends to form the circular part (22) and which does not cause short circuit since the dipole antenna (2) is insulated,

     which constitute the dipole antenna (2);
   - at least one loop antenna (3) which is surrounded by the circular part (22) and comprised of a conductive material.

2. Enhanced antenna structure for RFID tags (1) according to Claim 1, **characterized by** the loop antenna (3) on which an electric current is generated with the impact of inductive coupling when an electric current flows on the dipole antenna (2).

3. Enhanced antenna structure for RFID tags (1) according to any one of the preceding claims, **characterized by** the loop antenna (3) which activates the microchip (4).

4. Enhanced antenna structure for RFID tags (1) according to any one of the preceding claims, **characterized by** the loop antenna (3) and the dipole antenna (2) which send the information on the activated microchip (4) to the reader (F) by radio waves.

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5. Enhanced antenna structure for RFID tags (1) according to any one of the preceding claims, **characterized by** the crossing part (23) which is insulated by placing an insulating material between the overlapping parts.

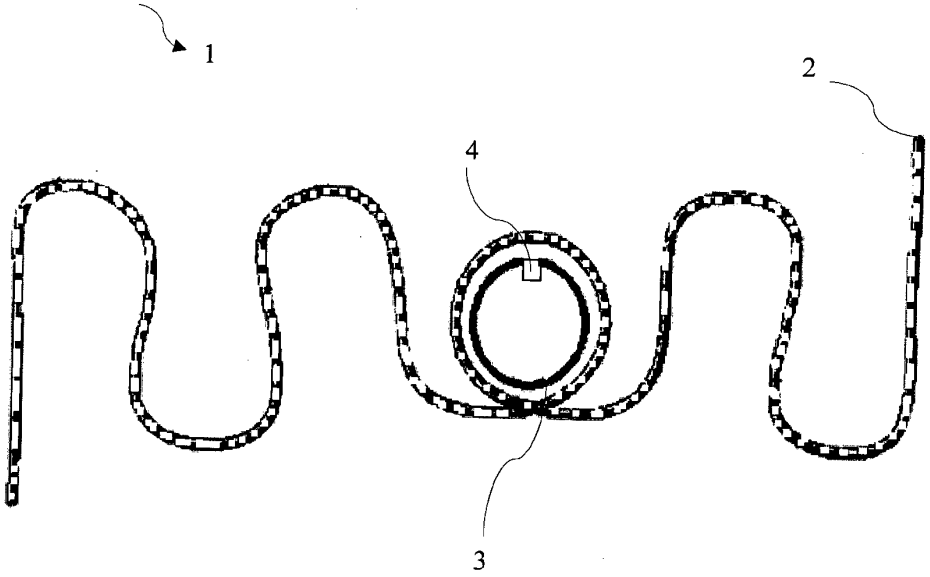


Figure 1

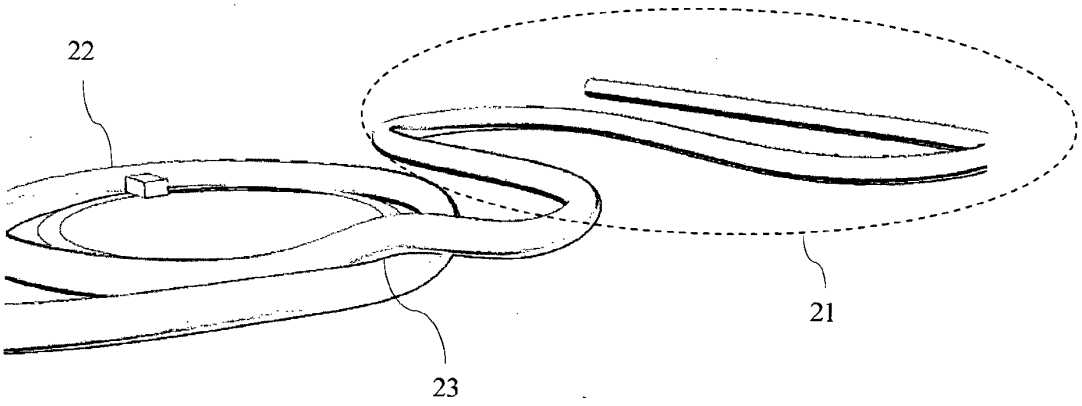


Figure 2

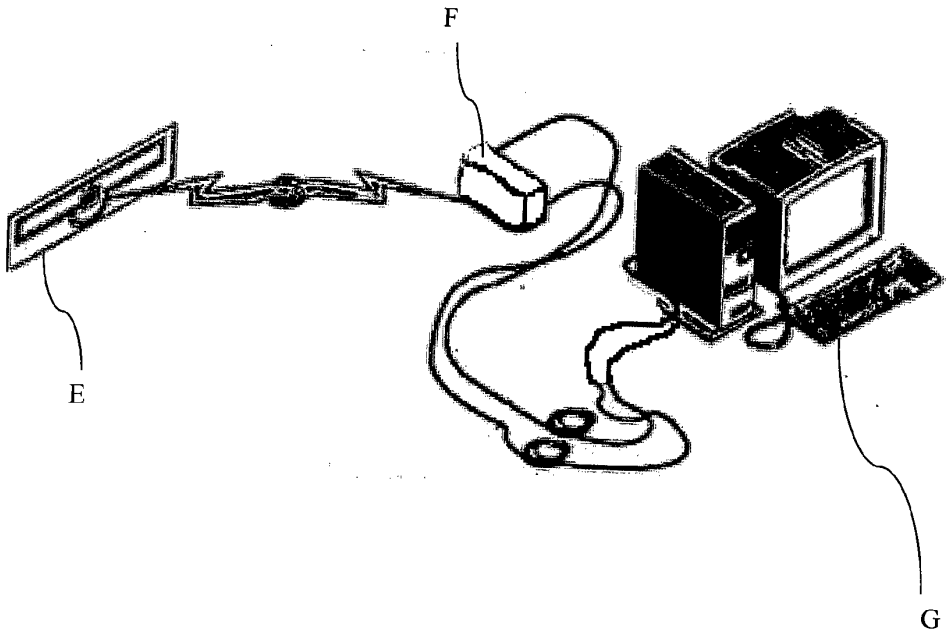


Figure 3

INTERNATIONAL SEARCH REPORT

International application No
PCT/IB2013/050028

A. CLASSIFICATION OF SUBJECT MATTER
INV. H01Q7/00 H01Q1/22 G06K19/077 H01Q9/16 H01Q9/24
ADD.

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 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 practicable, 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	US 2009/079574 A1 (OROKU NORIYUKI [JP] ET AL) 26 March 2009 (2009-03-26) paragraphs [0042], [0043], [0051], [0064] - [0070]; figures 3b, 7b	1-5
X	DE 10 2007 041752 A1 (BIELOMATIK LEUZE GMBH & CO KG [DE]) 5 March 2009 (2009-03-05) paragraphs [0021], [0030]; figure 1	1-5
A	US 2007/095926 A1 (ZHU SHENGBO [US] ET AL) 3 May 2007 (2007-05-03) paragraphs [0014], [0015], [0036], [0037]; figure 4	1-5

☐ Further documents are listed in the continuation of Box C.

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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	Date of mailing of the international search report
17 April 2013	24/04/2013

Name and mailing address of the ISA/	Authorized officer
European Patent Office, P.B. 5818 Patentlaan 2 NL - 2280 HV Rijswijk Tel. (+31-70) 340-2040, Fax: (+31-70) 340-3016	Hueso González, J

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INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No
PCT/IB2013/050028

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		US 2007095926 A1	03-05-2007

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(71) Déposant : **FENOTAG** [FR/FR]; 73 Boulevard Larrat, 1010 Marseille (FR).

(72) Inventeur : **ELBAZ, Didier**; 73 Boulevard Larrat, 13010 Marseille (FR).

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(81) États désignés *(sauf indication contraire, pour tout titre de protection nationale disponible)* : AE, AG, AL, AM, AO, AT, AU, AZ, BA, BB, BG, BH, BN, BR, BW, BY, BZ, CA, CH, CL, CN, CO, CR, CU, CZ, DE, DJ, DK, DM, DO, DZ, EC, EE, EG, ES, FI, GB, GD, GE, GH, GM, GT, HN, HR, HU, ID, IL, IN, IR, IS, JP, KE, KG, KN, KP, KR, KW, KZ, LA, LC, LK, LR, LS, LU, LY, MA, MD, ME, MG, MK, MN, MW, MX, MY, MZ, NA, NG, NI, NO, NZ, OM, PA, PE, PG, PH, PL, PT, QA, RO, RS, RU, RW, SA, 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.

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Déclarations en vertu de la règle 4.17 :

— *relative à l'identité de l'inventeur (règle 4.17.i))*

— *relative au droit du déposant de demander et d'obtenir un brevet (règle 4.17.ii))*

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(54) **Title** : PRODUCT, METHOD AND INDUSTRIAL TOOL ALLOWING THE PRODUCTION OF RFID TAGS IN THE FIELD OF TRACEABILITY OF TEXTILE PRODUCTS SUCH AS, FOR EXAMPLE, IN INDUSTRIAL LAUNDRIES

(54) **Titre** : PRODUIT, PROCEDE ET OUTIL INDUSTRIEL PERMETTANT LA FABRICATION DE TAGS RFID DANS LE DOMAINE DE LA TRACABILITE DE PRODUITS TEXTILES COMME PAR EXEMPLE DANS LES BLANCHISSERIES INDUSTRIELLES

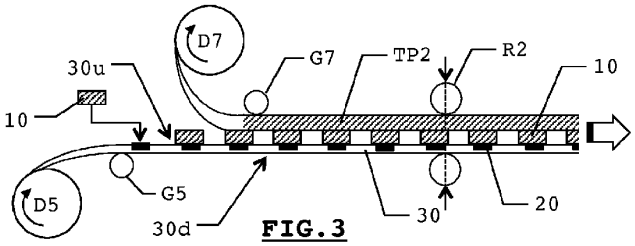


FIG.3

(57) **Abstract** : The invention relates to a method (100) for assembling an electronic radio-frequency identification tag (1) comprising a dielectric carrier (30) arranged so as to receive a radio-frequency identification module (10) and a conductive antenna (20). Such a method particularly comprises a step (150) of depositing, on the upper face (30u) of the support (30), following the deposition of said radio-frequency identification module (10), a layer of a thermoplastic material (TP2), said layer at least partially covering the first conductive antenna (20) and the radio-frequency identification module (10).

(57) **Abrégé** : L'invention concerne un procédé d'assemblage (100) d'une étiquette électronique de radio-identification (1) comprenant un support (30) diélectrique agencé pour accueillir un module de radio-identification (10) et une antenne conductrice (20). Un tel procédé comportant notamment une étape (150) pour déposer sur la face supérieure (30u) du support (30), après le dépôt dudit module de radio-identification (10), une couche d'un matériau thermoplastique (TP2), ladite couche recouvrant au moins partiellement la première antenne conductrice (20) et le module de radio-identification (10).

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Produit, procédé et outil industriel permettant la fabrication de tags RFID dans le domaine de la traçabilité de produits textiles comme par exemple dans les blanchisseries industrielles

L'invention concerne un procédé d'assemblage d'une étiquette électronique de radio-identification. Elle concerne également une étiquette électronique de radio-identification obtenue par la mise en œuvre d'un tel procédé.

Les étiquettes électroniques de radio-identification, souvent désignées par le terme anglo-saxon « RFID tags », RFID étant l'acronyme de la dénomination Radio Frequency IDdentification, sont des objets de petites tailles utilisés pour mémoriser et restituer des données, à travers une communication par radiofréquences, généralement en lien avec un objet hôte. Une étiquette électronique de radio-identification est donc généralement apposée, c'est-à-dire collée ou cousue par exemple, voire même incorporée, sur ou dans un objet. Une étiquette électronique de radio-identification consiste généralement en un support ou substrat sur lequel est déposée une antenne conductrice associée, c'est-à-dire connectée ou couplée de manière électromagnétique, à un composant électronique. L'antenne confère au composant électronique une interface de communication sans contact ou sans fil pour lui permettre de recevoir des requêtes émises depuis un émetteur ou lecteur par voie radio. En retour, le composant électronique élabore une réponse également transmise via ladite antenne par voie radio. Ces communications sont généralement opérées sur une bande de fréquences de 900 mégahertz environ (ou UHF, acronyme de Ultra Hautes Fréquences) ou 13,56

mégahertz (ou HF, acronyme de Hautes Fréquences) dans le cadre de communication à courtes distances.

La majorité des étiquettes électroniques est dite passive. En effet, l'énergie électrique, nécessaire au fonctionnement du composant électronique d'une telle étiquette, est tirée du champ électromagnétique généré par l'émetteur d'une requête, lorsque celui-ci se trouve à portée de communication de l'étiquette, c'est-à-dire à quelques dizaines de centimètres, voire pour les plus performantes à quelques mètres. D'autres étiquettes électroniques sont dites actives car elles intègrent une source énergétique apte à décupler la puissance et donc la portée d'émission de l'étiquette.

Les étiquettes électroniques fournissent notamment une alternative aux balises ou tags graphiques, tels que les code-barres par exemple, car elles ne nécessitent pas une lecture directe.

Le support constituant la plus grande partie du corps d'une étiquette électronique est composé généralement d'un ou plusieurs matériaux adaptés aux conditions d'utilisation ou d'exploitation de l'étiquette ou de l'objet sur lequel ladite étiquette est apposée ou intégrée. Un tel support peut être rigide ou souple. A titre d'exemples non limitatifs, un tel support peut comporter des matériaux plastiques, cellulosiques ou textiles.

Le choix des matériaux, des constituants utilisés pour confectionner une étiquette électronique de radio-identification, ainsi que le procédé d'assemblage de ladite étiquette influent grandement sur le coût de celle-ci, la pertinence au regard d'une application visée, la robustesse et la pérennité d'une telle étiquette électronique.

Dans la suite du document, nous allons décrire un exemple de réalisation ou d'assemblage d'une étiquette électronique de radio-identification au travers d'un exemple préféré et non limitatif d'application, en lien avec le suivi d'un flux de production d'une blanchisserie ou laverie industrielle. Selon cette application, une étiquette électronique est apposée, généralement cousue, sur un linge, par exemple un drap, pour tracer le flux et la périodicité de lavage dudit linge, en milieu hospitalier ou en hôtellerie. Une telle étiquette électronique doit nécessairement être confectionnée pour être apposée facilement sur ledit linge et résister, c'est-à-dire demeurer opérationnelle, aux environnements et/ou conditions particulièrement sévères rencontrés dans le nettoyage de textiles. Ainsi, l'étiquette doit être peu encombrante et ne pas se détacher ou se déliter au gré du nettoyage ou du repassage du linge. Elle doit notamment résister aux attaques de différents produits chimiques présents dans les produits de nettoyage, tels que des acides, bases ou encore détergents, et aux contraintes thermiques de séchage et mécaniques de pressage et/ou d'essorage.

De nombreuses étiquettes électroniques, telles que celles décrites dans le document WO2012/1206063, comporte un support ou corps principal comportant un matériau textile sélectionné pour être soudé par ultrasons, afin d'enceindre une antenne conductrice ou conductrice couplée à un module de radio-identification de type RFID. Ledit module comporte un composant électronique connecté à une deuxième antenne conductrice agencée pour être couplée à ladite première antenne et ainsi améliorer la portée de

communication. Cette dernière se charge de la réception et de l'émission de messages à une portée plus grande. Une telle étiquette résulte d'un procédé d'assemblage nécessitant une quantité importante de textile ou de tissu onéreux car un tel textile ou tissu doit fondre sous l'effet d'ultrasons. Le support textile consiste en une bande pliée en deux dans le sens de la longueur pour enceindre la première antenne, ladite première antenne étant préalablement tissée sur ledit support textile, voire déposée, à l'instar du module de radio-identification, sur une couche d'un matériau adhésif assurant le collage à température ambiante des éléments sur le support. Les deux demi-bandes de tissus sont soudées entre elles par un procédé de soudure par ultrasons, particulièrement complexe à industrialiser et donc coûteux in fine. Pour appliquer une telle étiquette sur un objet hôte, tel que par exemple un linge, dont on souhaite tracer le parcours durant un processus de blanchisserie, ladite étiquette est généralement cousue sur ledit objet au risque d'endommager l'antenne et/ou le module durant la couture de l'étiquette.

Pour réduire notamment le volume de tissus requis pour constituer le support d'une étiquette telle que décrite précédemment, un procédé, tel que celui décrit dans le document EP2405054, consiste à utiliser un support textile comprenant une poche dans laquelle est inséré le module de radio-identification de la future étiquette. Une antenne conductrice, agencée pour assurer une communication à champ lointain, est fixée sur le support textile par couture, impression laser, ou encore via une colle appliquée sur ladite poche. Un tel procédé

réduit la quantité de tissus nécessaire pour constituer le support de l'étiquette et évite de requérir à l'utilisation de la soudure par ultrasons. Toutefois, l'obturation de la poche est complexe pour que ladite poche enceigne le module de radio-identification après insertion de celui-ci. Le gain économique découlant d'une diminution de la quantité de tissus pour constituer le corps de l'étiquette ou encore, de la sélection des matériaux pour agencer le corps de l'étiquette, est compensé ou annulé par la mise en œuvre d'un processus délicat de couture pour réaliser la poche hébergeant le module puis pour clôturer ladite poche.

Une autre technique divulguée par le document FR3012682 consiste, pour réaliser le corps de l'étiquette, à utiliser un matériau textile sous la forme d'une bande comportant une antenne conductrice, préalablement brodée sur ledit textile ou imprimée sur celui-ci. Selon cet enseignement, un adhésif thermodurcissable est déposé sur ledit support, du moins sur une zone recouvrant en partie l'antenne pour assurer une future communication par couplage, ladite zone étant prévue pour accueillir un module de radio-identification. Un tel procédé consiste à recouvrir le module d'une bande de textile, par pliage de la bande initiale ou par dépôt d'une deuxième bande. Le support textile est ainsi « rabattu » sur le module et l'antenne. Pour enceindre les éléments, les deux bandes textiles sont collées l'une contre l'autre par pression à chaud, entraînant irréversiblement la polymérisation de l'adhésif thermodurcissable disposé au cœur dudit support. Un tel procédé permet de prévenir l'utilisation de la soudure à ultrasons précédemment évoquée et s'affranchit

d'une confection d'une poche à obturer par couture. Un tel procédé reproduit cependant certains inconvénients d'ores et déjà évoqués et inhérents, notamment à l'emploi d'une grande quantité de matériaux textiles pour constituer une enveloppe support afin d'enceindre antenne et module de radio-identification. Un tel procédé sous-entend également l'emploi d'un élément raidisseur en matériau souple et résilient, pour donner une certaine tenue à l'étiquette électronique de sorte que celle-ci recouvre naturellement sa forme initiale, c'est-à-dire sensiblement plane, après pliage de l'étiquette. En effet, une étiquette confectionnée selon l'enseignement tiré du document FR3012682, ne comportant pas d'élément raidisseur, demeurerait repliée sur elle-même sous l'action d'une opération de repassage ou d'essorage d'un textile sur lequel l'étiquette serait appliquée. La communication sans fil conférée par l'antenne d'une étiquette repliée sur elle-même en serait clairement altérée, du moins pénalisée. Un tel élément raidisseur, sous la forme d'un élément tubulaire ou d'un plan en silicone par exemple, intégré au sein de l'étiquette avant l'opération de pressage à chaud pour clore l'enveloppe de celle-ci, procure une force élastique suffisante pour que l'étiquette recouvre sa configuration de repos. L'assemblage d'une telle étiquette se révèle finalement toujours peu satisfaisant et efficace. De plus, pour rendre « thermopatchable » ou positionnable à chaud une telle étiquette électronique sur un objet hôte, afin notamment de ne pas altérer l'intégrité de celui-ci, il est nécessaire d'adjoindre à ladite étiquette un adhésif supplémentaire, ce qui augmente le coût de fabrication de celle-ci.

L'invention permet de répondre aux inconvénients soulevés par les solutions connues en proposant un procédé innovant d'assemblage d'une étiquette électronique de radio-identification.

De conception modulaire et particulièrement innovante, un tel procédé procure de nombreux avantages parmi lesquels nous pouvons mentionner :

- la fabrication d'une étiquette électronique de radio-identification robuste et exploitable dans le cadre d'une grande diversité d'applications ;
- l'assemblage d'une étiquette électronique résiliente offrant, de par sa conception, une excellente protection du module de radio-identification et de l'antenne ;
- l'obtention d'une étiquette électronique comportant des éléments de sécurité attestant toute tentative malveillante de désassemblage de ladite étiquette ;
- l'élaboration d'une étiquette électronique naturellement dotée d'une mémoire de forme, pour préserver sa capacité de communication sans requérir à des éléments raidisseurs ;
- l'agencement d'une étiquette facilitant la fixation de celle-ci sur tout support prévenant tout risque d'altération de l'intégrité du module de radio-identification et/ou de l'antenne de ladite étiquette électronique.

A cette fin, l'invention concerne un procédé d'assemblage d'une étiquette électronique de radio-identification comprenant un module de radio-identification, une première antenne conductrice, un premier support diélectrique agencé pour accueillir ledit module radio-identification et

ladite antenne conductrice, ledit procédé comportant une étape pour déposer le module de radio-identification sur la face supérieure du premier support, ce dernier comportant la première antenne conductrice, ledit module de radio-identification étant positionné à proximité immédiate de la première antenne conductrice.

Pour fabriquer une étiquette électronique de radio-identification robuste et exploitable dans le cadre d'une grande diversité d'applications, un tel procédé comporte :

- une étape préalable pour déposer sur les faces supérieure et inférieure du module de radio-identification une couche d'un premier matériau thermoplastique ;
- une étape pour presser l'ensemble à une température suffisante pour activer le premier matériau thermoplastique ;
- une étape pour déposer sur la face supérieure du premier support une couche d'un deuxième matériau thermoplastique et pour presser l'ensemble à une température suffisante pour activer le deuxième matériau thermoplastique, ladite couche de deuxième matériau thermoplastique recouvrant au moins partiellement la première antenne conductrice et le module de radio-identification.

Préférentiellement mais non limitativement, l'étape pour déposer sur la face supérieure du premier support d'un procédé d'assemblage d'une étiquette électronique de radio-identification peut consister à déposer une couche d'un deuxième matériau thermoplastique réactivable à chaud.

Pour assurer un positionnement correct du module de radio-identification avant la mise en

œuvre de l'étape pour déposer, sur la face supérieure du premier support, une couche d'un deuxième matériau thermoplastique, un procédé selon l'invention peut comporter avantageusement, préalablement à l'étape pour déposer le module de radio-identification sur la face supérieure du premier support, une étape pour déposer au moins sur une zone de la face supérieure du premier support, une couche d'un matériau adhésif dont la pégosité à température ambiante est suffisante pour maintenir la position du module de radio-identification sur le premier support, ladite zone de la face supérieure du premier support étant destinée à accueillir le module de radio-identification.

En variante ou en complément, un tel procédé peut, préalablement à l'étape pour déposer le module de radio-identification sur la face supérieure du premier support, une étape pour déposer sur la face du module de radio-identification destinée à coopérer avec la face supérieure du premier support, une couche d'un matériau adhésif dont la pégosité à température ambiante est suffisante pour maintenir la position du module de radio-identification sur le premier support.

En variante encore, un procédé conforme à l'invention peut comporter, préalablement à l'étape pour déposer le module de radio-identification sur la face supérieure du premier support, une étape pour chauffer le premier matériau déposé sur la face du module de radio-identification destinée à coopérer avec la face supérieure du premier support, au-delà de la température de fusion dudit premier matériau.

Préalablement à l'assemblage d'une étiquette électronique en tant que telle, un procédé conforme à l'invention peut comporter une étape pour assembler le module de radio-identification. Une telle étape préalable peut consister à :

- déposer ou graver sur un deuxième support diélectrique une deuxième antenne conductrice agencée pour assurer une communication électromagnétique à champ proche et un composant électronique ;
- assurer une coopération électrique entre ladite deuxième antenne conductrice et ledit composant électronique et,
- déposer une couche d'une résine de protection sur les faces demeurant exposées dudit composant électronique et ladite deuxième antenne conductrice.

Pour protéger le module de radio-identification d'éventuels chocs ou contraintes mécaniques et par ailleurs offrir une fonction de sécurité attestant toute tentative de désassemblage frauduleux d'une étiquette électronique assemblée selon un procédé conforme à l'invention, ce dernier peut comporter une étape pour déposer, au moins sur la face demeurant exposée du module de radio-identification, un treillis fibreux agencé pour être irrémédiablement déstructuré lors d'une tentative de désassemblage de l'étiquette électronique visant à arracher ledit module de radio-identification du premier support, ladite étape étant mise en œuvre préalablement à l'étape pour déposer sur la face supérieure du premier support une couche d'un deuxième matériau thermoplastique.

En variante ou en complément, un tel procédé peut comporter une étape pour inscrire, au moins

sur la face exposée du module de radio-identification et sur une partie de la face supérieure du premier support demeurant exposée, un message dont la teneur est irrémédiablement altérée lors d'une tentative de désassemblage de l'étiquette électronique visant à arracher ledit module de radio-identification du premier support, ladite étape étant mise en œuvre préalablement à l'étape pour déposer sur la face supérieure du premier support une couche d'un deuxième matériau thermoplastique.

Pour diminuer le nombre de rebuts en fin de processus d'assemblage, un procédé selon l'invention peut comporter une étape pour tester électriquement le module de radio-identification et pour lequel l'étape pour déposer ledit module de radio-identification sur la face supérieure du premier support n'est effectuée que si ledit module de radio-identification est opérationnel.

Le premier support constituant le corps principal d'une étiquette électronique selon l'invention peut comporter initialement la première antenne conductrice. En variante, ledit premier support peut en être dénué. Dans ce cas, l'invention prévoit qu'un procédé d'assemblage puisse comporter une étape préalable pour déposer la première antenne conductrice sur le premier support ou pour broder, imprimer, laminer ou tisser ladite première antenne sur ledit premier support.

Selon la portée de communication désirée, afin de diminuer l'encombrement de l'étiquette, l'invention prévoit que la première antenne conductrice portée par le premier support puisse comporter avantageusement une ou plusieurs boucles d'une piste et/ou d'un fil conducteurs.

Pour permettre de déposer un module de radio-identification sur la face supérieure du premier support, ledit module de radio-identification comportant une antenne conductrice interne, sans que ladite antenne conductrice interne audit module ne recouvre avantageusement, ne serait-ce que partiellement, la première antenne, cette dernière peut être agencée pour former une ou plusieurs boucles d'un diamètre supérieur aux dimensions de l'antenne conductrice interne au module de radio-identification.

Selon un mode de réalisation préféré, les premier et deuxième matériaux thermoplastiques peuvent être sélectionnés parmi des polyuréthanes thermoplastiques, des polyphénylènes oxydes, des polyamides, des polyacétates, des polyethylènes, des polypropylènes, des polyoléfines ou des Ethylènes-Acétates de Vinyles.

Selon le domaine d'application dans lequel l'étiquette électronique doit être exploité, les premier et deuxième matériaux thermoplastiques peuvent être sélectionnés pour présenter des températures de fusion respectives supérieures à un seuil de température déterminé. Un tel seuil devrait être supérieur aux températures auxquelles sera exposée ladite étiquette. Il peut en être de même pour le choix du ou des matériaux constituant le premier support. Ce dernier pourra comporter un matériau sélectionné parmi le coton, le nylon, la viscose, un polyester, ou une matière synthétique.

Pour exploiter un conditionnement sous la forme d'une bande comportant une pluralité d'étiquettes électroniques et en faciliter la dissociation, un procédé d'assemblage selon l'invention peut comporter une étape pour prédécouper transversalement le premier support lorsque que

celui-ci se présente sous la forme d'une bande, chaque section ainsi matérialisée entre deux prédécoupes étant agencée pour comporter la première antenne conductrice et accueillir le module de radio-identification.

Pour accroître la protection des éléments internes d'une étiquette électronique assemblée selon l'invention, voire pour faciliter la fixation de ladite étiquette sur un objet hôte, un procédé d'assemblage peut comporter une étape pour déposer sur la face du premier support opposée à celle destinée à accueillir le module de radio-identification, une couche d'un troisième matériau thermoplastique.

L'invention prévoit avantageusement que les premier et deuxième, voire troisième, matériaux thermoplastiques puissent être sensiblement identiques.

L'invention concerne, selon un deuxième objet, un module de radio-identification comportant un support diélectrique, une antenne conductrice agencée pour assurer une communication électromagnétique à champ proche et un composant électronique, ledit composant électronique étant connecté électriquement à ladite antenne conductrice, toute face exposée dudit composant électronique et de l'antenne conductrice étant recouverte par une résine de protection, ledit module de radio-identification présentant principalement une face supérieure et une face inférieure. Lesdites faces supérieure et inférieure d'un tel module comportent une couche d'un matériau thermoplastique réactivable à chaud.

L'invention concerne également une étiquette électronique de radio-identification obtenue par la mise en œuvre d'un procédé d'assemblage tel que

celui exposé précédemment. Celle-ci comporte un support, une antenne conductrice d'étiquette, un module de radio-identification tel évoqué ci-dessus, ledit module de radio-identification étant positionné sur ledit support de sorte que l'antenne interne audit module de radio-identification ne recouvre pas ladite antenne conductrice d'étiquette. Pour résoudre les inconvénients des étiquettes connues, la face supérieure du support, c'est-à-dire celle sur laquelle le module est posé, comporte une couche d'un matériau thermoplastique, ladite couche recouvrant au moins partiellement l'antenne conductrice et ledit module de radio-identification.

Pour préserver le module de radio-identification d'une telle étiquette lors de sa fixation par exemple par couture sur un objet hôte, ladite antenne conductrice d'étiquette et ledit module de radio-identification peuvent être mutuellement agencés sur le support pour que ledit module occupe une position excentrée sur ledit support, ce dernier comportant une plage d'une hauteur minimale déterminée, ladite plage englobant partiellement ladite antenne d'étiquette mais non ledit module de radio-identification.

D'autres caractéristiques et avantages apparaîtront plus clairement à la lecture de la description qui suit et à l'examen des figures qui l'accompagnent parmi lesquelles :

- la figure 1 présente les principales étapes d'un procédé pour fabriquer et/ou adapter un module de radio-identification sur une ligne de production et/ou sur une machine d'assemblage conforme à l'invention ;

- la figure 1A illustre un mode de réalisation préféré pour adapter ou produire des modules de radio-identification disposés en colonnes transversales sur un support diélectrique sous la forme d'une bande ;
- la figure 1B décrit les configurations respectives d'un module de radio-identification, avant et après adaptation dudit module ;
- la figure 2 présente schématiquement une ligne de production pour fabriquer et/ou assembler une étiquette électronique de radio-identification comportant une antenne de communication à champ lointain ;
- les figures 2A, 2B et 2C illustrent respectivement trois situations successives durant un assemblage d'une étiquette électronique de radio-identification conforme à l'invention ;
- la figure 3 présente schématiquement une ligne de production pour fabriquer et/ou assembler une étiquette électronique de radio-identification comportant une antenne de communication à champ proche sur une ligne de production conforme à l'invention, ladite étiquette électronique étant adaptée pour coopérer avec une deuxième antenne de communication à champ lointain agencée sur l'objet hôte de l'étiquette électronique ;
- les figures 3A et 3B illustrent respectivement deux situations successives durant un assemblage d'une étiquette électronique de radio-identification conforme à l'invention ;

- la figure 3C décrit une étiquette électronique conforme à l'invention connectée et cousue sur un objet hôte ;
- la figure 3D décrit un exemple d'une étiquette assemblée selon l'invention dont l'agencement est particulièrement avantageux ;
- la figure 4 illustre l'ensemble des étapes d'un exemple préféré d'un procédé d'assemblage conforme à l'invention, lesdites étapes étant mises en œuvre par une ligne de production conforme à l'invention.

La figure 1 illustre un exemple préféré de mise en œuvre d'une ligne de production ou d'une machine pour assembler et/ou adapter un module de radio-identification 10 conforme à l'invention. Ladite figure 1 sera décrite en liaison avec la figure 4 qui illustre, quant à elle, une séquence globale d'un procédé d'assemblage 100 d'une étiquette électronique de radio-identification intégrant un tel module 10.

L'assemblage en tant que tel d'une étiquette électronique 1 sera décrit, quant à lui, en liaison avec les figures 2 et 3, selon la configuration de l'étiquette électronique que l'on souhaite produire.

En liaison avec les figures 1, 1A, 1B et 4, une première étape d'un procédé d'assemblage 100 conforme à l'invention consiste à assembler ou adapter un module de radio-identification 10 destiné à coopérer par couplage avec une antenne conductrice, ladite antenne étant agencée pour

assurer une communication à champ lointain, c'est-à-dire à quelques mètres de distance.

Comme mentionné précédemment, un tel module 10 comporte principalement un support 13 diélectrique, tel qu'un époxy, un polyimide ou encore un polytéréphtalate d'éthylène, communément connu sous l'abréviation anglo-saxonne « PET » pour PolyEthylene Terephtalate. Un tel support peut être avantageusement conditionné sous la forme d'une bande actionnée en translation au moyen d'un dérouleur D1 associé à un guide G1, tel qu'un rouleau motorisé. Un procédé d'assemblage 100 conforme à l'invention peut comporter une première étape 120 pour assembler un module de radio-identification 10. Une telle étape préalable 120 consiste avantageusement à déposer, graver ou imprimer 121 une antenne conductrice 12 sur une face 13u, dite face supérieure, du support 13. Ladite étape 120 consiste en outre à déposer un composant électronique ou microcontrôleur 11 sur ladite face supérieure 13u du support 13. Pour que ledit composant électronique 11 puisse communiquer par couplage avec un dipôle tiers, ledit composant 11 est connecté électriquement 122 à l'antenne 12. Une telle opération 122 peut résulter d'une connexion de plages de contacts du composant 11 sur une ou plusieurs pistes ou spires de l'antenne 12 au moyen d'un ou plusieurs fils conducteurs 16, comme l'indique la figure 1. En variante, certains composants électroniques 11 comportent une face active. Ledit composant est déposé, face active contre l'antenne 12, cette opération assurant ainsi directement une connexion électrique. On parle alors d'un procédé dit « flip chip » selon une terminologie anglo-saxonne. Pour protéger le composant 11, les fils éventuels 16 et l'antenne

12, l'étape 120 peut consister à recouvrir lesdits éléments exposés 11, 12, 16 par une résine de protection non conductrice 14. On entend par « élément exposé » ou « face exposée d'un élément », tout élément ou partie de celui-ci qui n'est pas en contact direct avec un élément tiers.

Le composant 11, l'antenne 12 et éventuellement les fils 16 sont ainsi recouverts par ladite résine de protection. Celle-ci est durcie par exemple par polymérisation aux ultraviolets, par réticulation thermique ou par toute autre technique. L'étape 120, telle que décrite en liaison avec la figure 4, correspond à un procédé d'assemblage d'un module de radio-identification classique et connu. En revanche, l'invention prévoit une étape supplémentaire 130 pour déposer sur les faces supérieure 10u et inférieure 10d du module de radio-identification 10, une couche d'un premier matériau thermoplastique TP1.

Ainsi, à l'issue de cette étape 130, un module de radio-identification 10 conforme à l'invention présente une face supérieure 10u' et une face inférieure 10d' comportant une telle couche du premier matériau thermoplastique TP1.

A titre d'exemple non limitatif, le matériau TP1 peut consister en un polyuréthane thermoplastique, connu également sous l'acronyme TPU. En variante, un tel matériau thermoplastique TP1 peut être sélectionné parmi des polyuréthanes thermoplastiques, des polyphénylènes oxydes, des polyamides, des polyacétates, des polyethylènes, des polypropylènes, des polyoléfines ou des Ethylènes-Acétates de Vinyles, avantageusement conditionnés sous forme de films.

Plus généralement, on entendra, au sens de l'invention, par « matériau thermoplastique », tout

matériau ou polymère susceptible d'être activé de manière répétée sous l'effet d'une augmentation de température, ladite température dépassant une température de fusion déterminée. L'activation d'un tel matériau traduit un changement d'état de l'état solide (à température ambiante) à un état liquide visqueux. Ainsi, lorsque l'on atteint ou dépasse une température de fusion du matériau, ce dernier se ramollit et peut être aisément mis en forme. Il durcit par refroidissement. Ainsi, au sens de l'invention et dans tout le document, ledit matériau thermoplastique est avantageusement réactivable à chaud. Un tel matériau se distingue d'un matériau thermodurcissable qui ne peut être mis en œuvre qu'une seule fois par polymérisation. En outre, un tel matériau thermoplastique peut comporter des fonctions d'adhésion, qui, lorsque celui-ci est réactivé, c'est-à-dire chauffé au-delà de la température de fusion dudit matériau, permet de repositionner le module de radio-identification ou plus généralement l'étiquette électronique de radio-identification sur un support ou tout objet hôte.

L'invention prévoit en outre que l'épaisseur de la couche de premier matériau thermoplastique TP1 déposée sur les faces 10u et 10d soit de cinquante à cinq cents micromètres, typiquement deux cents micromètres. En effet, une telle épaisseur permet de disposer d'un module de radio-identification présentant des propriétés intéressantes de résilience, tout en gardant une éventuelle souplesse. Les éléments actifs, c'est-à-dire le composant 11 et l'antenne 12, sont ainsi protégés contre l'occurrence de chocs, ces derniers étant absorbés par le matériau thermoplastique TP1 ou les attaques physicochimiques de l'environnement de

l'étiquette. Pour réaliser un tel module 10, la figure 1 décrit un exemple de réalisation d'une ligne de production ou d'une machine selon lequel, un deuxième dérouleur D2, associé au moyen guide G1, entraîne en translation une bobine du premier matériau thermoplastique TP1 pour déposer une couche de celui-ci sur la face supérieure 10u du module de radio-identification 10. De même, un troisième dérouleur D3, associé à un guide G3, peut être exploité pour entraîner en translation une bobine de premier matériau thermoplastique TP1 pour en déposer en couche sur la face inférieure 10d dudit module de radio-identification 10. Une étape 130a de laminage ou de pressage à chaud, c'est-à-dire à une température supérieure à la température de fusion du premier matériau thermoplastique TP1 assure une coopération pérenne des couches supérieure et inférieure de premier matériau TP1 sur les faces supérieure 10u et inférieure 10d du module. Une telle opération 130a de pressage peut être réalisée au moyen d'une paire R1 de rouleaux, en miroir l'un de l'autre, assurant une fonction de pressage de l'assemblage lorsque ce dernier est tracté entre lesdits rouleaux, pour que l'adhésion des deux couches du matériau TP1 soit durable. En variante, des presseurs parallèles, dont la température, le temps de pressage et la pression peuvent être ajustés au besoin, peuvent être utilisés en lieu et place desdits rouleaux R1.

La figure 1 décrit également un exemple de réalisation du dépôt d'une couche de matériau thermoplastique TP1 sur les faces supérieures et inférieures respectives de plusieurs modules simultanément. Comme l'indique la figure 1A, des modules de radio-identification 10 peuvent avantageusement être positionnés sur un support

sous la forme d'une bande de trente-cinq millimètres de largeur. Une telle configuration permet de positionner lesdits modules 10 par colonnes de trois modules transversales à l'axe longitudinal de la bande. Après une application 130 du matériau thermoplastique TP1, les modules de radio-identification sont découpés 132 et isolés les uns des autres.

Un procédé 100 conforme à l'invention prévoit, préalablement à l'assemblage d'une étiquette électronique en tant que telle, une étape 133 pour tester électriquement le bon fonctionnement des modules de radio-identification recouverts par le matériau thermoplastique TP1. Une telle opération 133 peut être mise en œuvre avant ou après la dissociation 132 desdits modules 10. Les modules défectueux sont rejetés, situation illustrée par le lien 133-n en figure 4. Dans le cas contraire, situation illustrée par le lien 133-y en figure 4, le module est opérationnel et pourra être exploité dans le cadre de l'assemblage ultérieur d'une étiquette électronique. Cette étape de test 133 peut en outre permettre d'initialiser ou mettre à jour le contenu de certaines mémoires du composant électronique inclus dans un module de radio-identification jugé opérationnel.

En outre, un procédé 100 d'assemblage conforme à l'invention peut comporter, après le dépôt 130 de la couche de matériau thermoplastique TP1, une étape optionnelle 131 visant à déposer sur une face inférieure ou supérieure du module 10, c'est-à-dire une des faces du module de radio-identification 10 destinée à coopérer avec la face supérieure 30u d'un support 30 constituant une étiquette électronique (nous étudierons cette étape d'assemblage ultérieurement en liaison avec les

figures 2 et 3), une couche d'un matériau adhésif A dont la pégosité à température ambiante est suffisante pour maintenir la position future du module de radio-identification 10 sur ledit support 30. Sur l'exemple décrit en liaison avec la figure 1B, un tel adhésif A est déposé sur la face inférieure 10d' du module de radio-identification 10. Ledit adhésif A pourrait tout aussi bien être déposé en variante ou en complément sur la face supérieure 10u'. Un tel matériau peut être avantageusement sélectionné parmi des adhésifs sensibles ou activables par pression (ou connus sous l'acronyme « PSA » ou la dénomination anglo-saxonne « Pressure-Sensitive Adhesive »).

A l'instar des couches de matériau thermoplastique TP1, l'adhésif A peut être déposé sur l'une des faces 10d' ou 10u' d'un module de radio-identification 10 au moyen d'un dérouleur D4, associé à un guide G4, actionnant une bande de matériau adhésif A appliqué par un rouleau presseur ou une presse R1. Préalablement à l'opération 131 pour déposer l'adhésif A, un procédé 100 conforme à l'invention peut comporter une étape 130b avantageuse pour accélérer un retour à température ambiante du module 10, ladite étape 130b n'étant pas représentée sur la figure 4.

Comme l'indique la figure 1B, à l'issue de la mise en œuvre des étapes précédemment décrites, un ou plusieurs modules de radio-identification sont produits, chacun étant adapté conformément à l'invention. Plus précisément, un tel module 10 comporte un support diélectrique 13, une antenne conductrice 12 agencée pour assurer une communication électromagnétique à champ proche et un composant électronique 11. Ledit composant électronique 11 est connecté électriquement à

ladite antenne conductrice 12. Toute face exposée dudit composant électronique 11 et de l'antenne conductrice 12 est recouverte par une résine diélectrique 14. Lesdites faces supérieure 10u' et inférieure 10d' d'un tel module 10 comportent une couche d'un matériau thermoplastique TP1, voire pour au moins l'une d'entre elles, une couche externe d'un adhésif A. Nous pouvons mentionner que les étapes 121, 122 et 123 peuvent être facultatives, si des modules de radio-identification 10 sont d'ores et déjà assemblés. L'invention consiste dès lors à adapter lesdits modules 10 pour que leurs faces supérieure 10u' et inférieure 10d' comportent chacune une couche d'un matériau thermoplastique TP1, voire pour que l'une des faces inférieure 10d' ou supérieure 10u', comporte en outre une couche externe d'un adhésif A activable par pression à température ambiante.

Décrivons à présent en liaison avec les figures 2, 2A, 2B, 2C et 4, les étapes d'un premier exemple d'un procédé d'assemblage d'une étiquette électronique en tant que telle, conformément à l'invention. Selon lesdites figures 2, 2A, 2B et 2C l'étiquette électronique que l'on souhaite produire comporte une antenne à champ lointain 20 pour assurer une communication sans contact avec un dispositif tiers, distant de plusieurs dizaines de centimètres à plusieurs mètres. Pour en réduire l'encombrement, le dipôle conducteur sensiblement plan, constitué par ladite antenne, comporte avantageusement une pluralité de boucles 20L. La figure 2A décrit un exemple préféré d'un support 30 sous la forme d'une bande pour constituer le corps d'une étiquette électronique conforme à l'invention. Comme l'indique la figure 2, une telle

bande 30 peut être actionnée en traction par un dérouleur D5 associé à un guide G5. Le support 30 peut comporter un matériau pouvant être sélectionné parmi le coton, le nylon, la viscose, un polyester ou une matière synthétique, telle qu'à titre d'exemple non limitatif le Tyvek (marque déposée), selon le domaine d'application visé pour exploiter la future étiquette 1. La figure 2A décrit en outre un agencement particulier d'une antenne conductrice 20. Contrairement aux techniques connues selon lesquelles une telle antenne décrit généralement un méandre ou une sinusoïde, une antenne conductrice 20, conforme au mode de réalisation décrit par la figure 2A, décrit une pluralité de boucles 20L dont le ou les diamètres respectifs peuvent être choisis pour être supérieurs aux dimensions (largeurs, longueurs, voire diamètre) d'un module de radio-identification. Un tel diamètre de boucle 20L sera plus précisément et de manière avantageuse, déterminé pour être supérieur aux dimensions de l'antenne conductrice interne audit module de radio-identification, soit l'antenne 12 du module 10 décrit en liaison avec la figure 1B. Ainsi, comme nous le verrons ultérieurement, une telle configuration d'antenne 20 permet de positionner un module de radio-identification à proximité immédiate de ladite antenne, assurant ainsi un excellent couplage tout en prévenant tout recouvrement de l'antenne 20, notamment par l'antenne interne dudit module de radio-identification susceptible de provoquer une rupture partielle de l'antenne 20, voire du module 10 lors d'une étape ultérieure de pressage à chaud de l'ensemble. Toute autre configuration de l'antenne 20 dont l'agencement permettrait un tel positionnement d'un module de radio-identification

10, c'est-à-dire présentant une distance minimale d de l'ordre d'un demi millimètre entre l'antenne interne 12 audit module 10 et l'antenne 20, pourrait être utilisée, comme le décrit à titre d'exemple la figure 3D en liaison avec un second exemple d'assemblage d'une mini étiquette 1 conforme à l'invention.

Un support 30 peut d'ores et déjà comporter une ou plusieurs antennes conductrices 20. En variante, comme indiqué par la figure 4, un procédé d'assemblage 100 selon l'invention peut comporter une étape 110 pour élaborer ledit support 30. Ainsi, une première étape 111 peut consister à déposer une antenne conductrice 20 sur le support 30. Une telle antenne peut consister en un plusieurs fils conducteurs. Dans ce cas, lesdits fils peuvent être brodés ou tissés sur ledit support 30. En variante, une telle antenne 20 peut être imprimée par toute technique connue ou déposée par laminage et ainsi consister en une piste conductrice.

Comme l'indique l'exemple préféré décrit en liaison avec la figure 2A et la figure 4, un procédé 100 conforme à l'invention peut comporter une étape 112 pour prédécouper transversalement le support 30. Chaque section 30s ainsi matérialisée entre deux prédécoupes 30c est agencée pour comporter l'antenne conductrice 20 et accueillir un module de radio-identification 10. Le support 30 présente une face que nous nommerons face supérieure 30u et une face opposée à la précédente que nous nommerons face inférieure 30d.

Comme l'indique la figure 2B, un procédé d'assemblage 100 conforme à l'invention comporte une étape 140 pour déposer, sur la face supérieure 30u du support 30, un module de radio-

identification 10, préalablement adapté selon la technique décrite précédemment en liaison avec les figures 1A, 1B et 1. Un tel module 10 comporte ainsi une couche d'un premier matériau thermoplastique TP1 sur ses faces inférieure 10d' et supérieure 10u'. L'invention prévoit que le positionnement dudit module de radio-identification 10 puisse être précisément déterminé, par exemple au moyen d'un système de vision, symbolisé en figure 2B par un capteur vidéo C, afin que l'antenne interne audit module de radio-identification 10 ne recouvre avantageusement pas, ne serait-ce que partiellement, l'antenne conductrice 20, à l'instar de l'exemple de réalisation avantageux d'une étiquette 1 d'un format réduit décrit en liaison avec la figure 3D. Ledit système de vision permet ainsi de maîtriser les coordonnées du module de radio-identification 10 dans le plan du support 30. Toute autre technique, permettant de positionner correctement et précisément un module de radio-identification 10 sur le support 30, pourrait en variante être utilisée. Selon l'exemple de réalisation décrit par la figure 2B, un tel module 10 occupe, une fois déposé sur ledit support 30, une position sensiblement centrale au sein d'une section prédécoupée 30s. En variante, ledit module pourrait être positionné au sein d'une autre boucle 20L de ladite antenne 20 et occuper ainsi une position plus excentrée au sein de l'étiquette. En outre, la figure 2B décrit un exemple avantageux d'une ligne de production et/ou d'assemblage pour laquelle une pluralité de modules de radio-identification, en l'espèce, trois par trois, est positionnée simultanément et respectivement dans trois sections 30s consécutives du support 30.

Pour maintenir la position d'un module de radio-identification 10 durant le déplacement du support 30, l'invention prévoit l'exploitation avantageuse d'un adhésif A dont la pégosité à température ambiante est suffisante pour maintenir la position dudit module de radio-identification 10. Nous avons étudié précédemment un mode de réalisation d'un procédé 100 selon lequel une étape optionnelle 131 consiste à déposer sur la face 10u' ou 10d' destinée à être en contact avec le support 30, une couche d'un tel adhésif A. Dans ce cas, lors de la pose 140 d'un tel module de radio-identification sur le support 30, ledit module est maintenu en position sous l'action dudit adhésif A.

L'invention prévoit une première variante ou un premier complément selon lequel un tel adhésif A, par exemple sélectionné parmi des adhésifs sensibles ou activables par pression (ou connus sous l'acronyme « PSA » ou la dénomination anglo-saxonne « Pressure-Sensitive Adhesive ») puisse être déposé au moins sur une zone de la face supérieure 30u du support 30 avant que ne soit posé un module de radio-identification 10. Selon ce mode de réalisation décrit en liaison avec la figure 2B (non représenté en figure 2), une couche d'un matériau adhésif A est déposée depuis un dérouleur, sur les boucles 20L centrales des antennes 20 respectives des sections 30s du support 30. En variante, un tel adhésif A pourrait être déposé sur l'intégralité de la face supérieure 30u du support 30 ou sur d'autres portions de ladite face 30u correspondant à des sections d'antenne 20 différentes que celle décrivant les boucles centrales 20L, tel que décrit à titre d'exemple sur la figure 2B, si le ou les modules de radio-

identification 10 ne sont pas destinés à occuper une position sensiblement centrale.

Selon un troisième mode de réalisation, l'invention prévoit que l'on ne puisse pas nécessairement utiliser un tel adhésif A. En effet, le matériau thermoplastique TP1, déposé en couche préalablement sur le module de radio-identification, peut être chauffé au-delà de la température de fusion dudit matériau TP1, juste avant d'entrer en contact avec la face supérieure du support 30. Ledit module 10 est alors posé puis pressé à chaud sur le support 30. En l'absence d'adhésif A, le matériau thermoplastique TP1 assure une fonction d'adhésion ou d'adhérence, une fois que ledit matériau thermoplastique TP1 est chauffé au-delà de la température de fusion dudit matériau TP1, et permet ainsi de ne pas recourir à un adhésif supplémentaire en tant que tel.

Un procédé d'assemblage 100 conforme à l'invention, tel que celui décrit à titre d'exemple en liaison avec les figures 2C, 2 et 4, peut comporter, après qu'un module de radio-identification ait été positionné sur le support 30, une étape 142 pour déposer au moins sur la face demeurant exposée 10u' dudit module de radio-identification 10, un treillis fibreux 50. Ce dernier est avantageusement agencé pour être irrémédiablement déstructuré lors d'une tentative malveillante de désassemblage de l'étiquette électronique 1, visant à arracher ledit module de radio-identification 10 du premier support 30. Comme l'indique la figure 2, un tel treillis peut être déroulé depuis un dérouleur D6 et guidé par un rouleau G6. Pour optimiser la quantité de treillis nécessaire, ce dernier peut être conditionné sous la forme d'une bande d'une largeur sensiblement

supérieure à celle du module de radio-identification. Au-delà d'une fonction de sécurité visant à révéler une tentative de désassemblage d'une étiquette, la présence dudit treillis peut contribuer à la protection du composant électronique hébergé par le module de radio-identification contre d'éventuels chocs ou contraintes mécaniques.

En variante ou en complément, pour apporter un élément de sécurité supplémentaire visant à attester une tentative de fraude, l'invention prévoit qu'un procédé 100 puisse comporter une étape 143 pour inscrire, au moins sur la face exposée du module de radio-identification 10 et sur une partie de la face supérieure 30u du premier support 30 demeurant exposée, un message 60 dont la teneur est irrémédiablement altérée lors d'une tentative de désassemblage de l'étiquette électronique, visant à arracher ledit module de radio-identification 10, du premier support 30. Un tel message peut être textuel par exemple « void if removed » selon une terminologie anglo-saxonne ou figuratif (comportant un logo), voire mixte.

Qu'un treillis 50 et/ou un message 60 soi(en)t respectivement déposé(s) et/ou imprimé(s), un procédé 100 comporte une étape essentielle visant à déposer sur la face supérieure 30u du premier support 30 une couche d'un deuxième matériau thermoplastique TP2, ladite couche recouvrant au moins partiellement la première antenne conductrice 20 et le module de radio-identification 10. Une telle couche peut être déposée, comme l'indique la figure 2 à titre d'exemple, sous l'action d'un dérouleur D7 d'une bande de matériau thermoplastique. L'étape 150 consiste en outre à presser à chaud, c'est-à-dire à une température

supérieure à la température de fusion du matériau thermoplastique TP2, l'assemblage pour assurer une coopération pérenne de la couche de matériau thermoplastique TP2 sur la face supérieure 30u du support 30. Une telle opération de pressage peut être réalisée au moyen d'une paire R2 de rouleaux en miroir l'un de l'autre, assurant une fonction de pressage de l'assemblage ou l'ensemble lorsque ce dernier est tracté entre lesdits rouleaux, pour que l'adhésion des deux couches du matériau TP2 soit durable. En variante, des presseurs parallèles, dont la température, le temps de pressage et la pression peuvent être ajustés au besoin, peuvent être utilisés en lieu et place desdits rouleaux R2.

A l'instar du premier matériau TP1 utilisé pour adapter un module de radio-identification, le matériau thermoplastique TP2 peut être sélectionné parmi des polyuréthanes thermoplastiques, des polyphénylènes oxydes, des polyamides, des polyacétates, des polyethylènes, des polypropylènes, des polyoléfines ou des Ethylènes-Acétates de Vinyles, avantageusement conditionnés sous forme de films. Selon le domaine d'application visé, le choix du matériau TP2 sera fonction de la température de fusion au-delà de laquelle ledit matériau peut être activé une ou plusieurs fois. Pour le domaine des étiquettes électronique pour laverie industrielle, un polyuréthane thermoplastique dont la température de fusion est supérieure à 180°C sera avantageusement privilégié.

Grâce à l'exploitation d'un tel matériau thermoplastique TP2, une étiquette électronique produite selon l'invention présente des propriétés intéressantes de résilience, tout en gardant une éventuelle souplesse. Elle dispose en quelque sorte naturellement d'une mémoire de forme, ne

nécessitant pas l'emploi d'élément raidisseur additionnel. Le matériau TP2, ainsi que le matériau TP1, confère au corps de l'étiquette une très bonne tenue de sorte que ladite étiquette recouvre naturellement sa forme initiale, c'est-à-dire sensiblement plane, après pliage de l'étiquette. La qualité de la communication sans fil conférée par l'antenne 20 est donc préservée.

Un procédé d'assemblage 100 peut à présent être terminé. Selon la figure 2, une pluralité d'étiquettes électroniques est ainsi conditionnée sous la forme d'une bande. Ledit procédé 100 peut comporter toutefois des étapes additionnelles. Une première étape, non représentée en figure 4, peut consister à tester électriquement le fonctionnement de chaque étiquette produite. Une étiquette non opérationnelle peut être marquée, par exemple par jet d'encre, afin d'être identifiée et mise au rebut. Une telle étape de test peut en outre permettre de mettre à jour certaines mémoires du composant électronique du module de radio-identification de chaque étiquette produite. Cette étape de discrimination des étiquettes opérationnelles, permet ainsi de gérer et maîtriser la séquence des numéros de séries ou autres références uniques associées respectivement aux étiquettes et d'en assurer la cohérence avec une étape optionnelle dudit procédé 100 d'impression graphique, étape également non représentée sur la figure 4, pour permettre de personnaliser chaque étiquette, voire d'inscrire visuellement ledit numéro de série ou référence unique.

La bande comportant avantageusement une pluralité d'étiquettes, résultant d'un procédé d'assemblage 100 décrit en liaison avec la figure

2, peut aussi comporter une étape 160 pour découper ladite bande, afin de dissocier les étiquettes les unes des autres, voire des les conditionner chacune sous un blister. En variante, notamment si le support 30 n'est pas préalablement prédécoupé, une telle étape 160 peut consister à prédécouper ladite bande comportant les étiquettes produites pour rendre ces dernières dissociables aisément les unes des autres, tout en conservant un mode de conditionnement par bande comportant chacune une pluralité d'étiquettes.

Un procédé 100 peut en outre comporter une étape 151 pour déposer sur la face inférieure 30d du support 30, c'est-à-dire la face opposée à celle 30u accueillant un module de radio-identification 10, une couche d'un troisième matériau thermoplastique TP3. A l'issue de cette étape, le recto mais aussi le verso d'une étiquette électronique sensiblement plane peut être recouvert de matériau thermoplastique. Pour les raisons évoquées précédemment, ledit matériau TP3 peut être sélectionné avantageusement pour être sensiblement similaire aux premier et/ou deuxième matériaux thermoplastiques TP2 et/ou TP1.

Que cette dernière étape 151 soit réalisée ou non, nous pouvons en outre mentionner que l'emploi de la couche de matériau TP2, notamment si celle-ci est réalisée sur l'intégralité de la face supérieure du support 30, réduit ou supprime sensiblement tout relief au niveau de l'étiquette, facilitant ainsi l'application ultérieure de ladite étiquette 1 sur un objet hôte. Ladite application peut être réalisée par pressage à chaud. L'activation du matériau thermoplastique TP2, suivie d'un refroidissement, assure un positionnement pérenne de l'étiquette.

Les figures 3A, 3B et 3 décrivent un deuxième exemple d'un procédé d'assemblage d'une étiquette électronique conforme à l'invention. Selon cette variante, le format d'une étiquette obtenue est moindre que celui d'une étiquette électronique assemblée selon le procédé décrit précédemment en liaison avec les figures 2 et 2A.

En effet, comme l'indique l'exemple de la figure 3A, le support 30 consiste en une bande de moindre largeur, éventuellement prédécoupée. Le support 30 comporte une antenne 20 ne comportant, à titre d'exemple, qu'une boucle 20L. Le dipôle ainsi constitué par l'antenne 20 est donc plus court que celui d'une étiquette telle qu'assemblée avec une antenne 20 comportant une pluralité de boucles 20L, comme indiqué par la figure 2A.

La portée de communication procurée par l'antenne 20 selon l'exemple de la figure 3A, voire de la figure 3D, est donc plus faible mais suffisante pour servir de relai entre le module d'identification 10 couplé avec ladite antenne 20 et une antenne tierce 2, cousue par exemple sur un objet hôte 3 tel qu'un linge et traversant l'antenne 20, comme l'indique la figure 3C. Un procédé d'assemblage 100, tel que celui décrit en liaison avec les figures 3A, 3B et 3, est proche ou similaire de celui décrit précédemment. Nous pouvons constater qu'il comporte une étape 140 pour déposer, sur la face supérieure 30u du support 30, un module de radio-identification 10 préalablement adapté selon la technique décrite précédemment en liaison avec les figures 1A, 1B et 1. Un tel module comporte ainsi une couche d'un premier matériau thermoplastique TP1 sur ses faces inférieure 10d' et supérieure 10u'. L'invention prévoit que le

positionnement dudit module de radio-identification 10 soit précisément déterminé, par exemple au moyen d'un système de vision, symbolisé en figure 3B par un capteur vidéo C, afin que l'antenne interne audit module de radio-identification 10 ne recouvre avantageusement pas, ne serait-ce que partiellement, l'antenne conductrice 20. Ledit système de vision permet ainsi de maîtriser les coordonnées du module de radio-identification 10 dans le plan du support 30. Toute autre technique permettant de positionner correctement et précisément un module de radio-identification 10 sur le support 30 pourrait en variante être utilisée. Contrairement à la position sensiblement centrale d'un module déposé selon l'exemple de la figure 2B, un module de radio-identification 10 est déposé, selon ce deuxième mode de réalisation, sensiblement excentré au sein d'une section éventuellement prédécoupée 30s. Comme l'indique à titre d'exemple la figure 3D, un positionnement du module de radio-identification 10 excentré au sein d'une étiquette électronique 1 conforme à l'invention permet de disposer, en fin de processus d'assemblage, d'un corps principal d'étiquette électronique 1 comportant une plage P accrue, par exemple d'une hauteur h de quatre à cinq millimètres ou plus, comprenant partiellement l'antenne 20 mais n'englobant pas le module de radio-identification 10. Un tel processus d'assemblage 100 permet de minimiser la taille d'une étiquette électronique 1 tout en gardant une grande facilité pour coudre, par exemple comme l'indique la figure 3C, une antenne 2 traversant l'antenne 20 de ladite « mini étiquette », sans risque d'altérer le module de radio-identification de celle-ci. Ladite antenne 2 assure ainsi les

fonctions respectives d'amélioration des performances électromagnétiques et de fixation de la mini étiquette sur l'objet hôte 3. Un tel agencement d'étiquette électronique 1, décrit en liaison avec la figure 3D illustrant un exemple d'étiquette assemblée conformément à l'invention, permet de présenter une configuration d'une antenne 20 différente de celle illustrée par la figure 3A, mais qui est agencée de sorte à demeurer par partie proche, c'est-à-dire une distance d de l'ordre d'un demi millimètre, de l'antenne 12 interne au module de radio-identification de l'étiquette, sans qu'à aucun moment ladite antenne 20 ne soit recouverte par ladite antenne interne 12. Un tel agencement assure un excellent couplage et minimise les risques de cassure lors des phases de pressage. Ainsi, indépendamment des matériaux utilisés pour constituer une telle étiquette électronique 1, un tel agencement selon lequel l'étiquette comporte une plage P préservant le module de radio-identification est particulièrement innovant et prévient toute destruction du module de radio-identification lors de la fixation, notamment par couture, de l'étiquette sur l'objet hôte 3.

En outre, la figure 3B décrit un exemple avantageux d'une ligne de production et/ou d'assemblage pour laquelle une pluralité de modules de radio-identification, en l'espèce, trois par trois, sont positionnés simultanément et respectivement dans trois sections 30s consécutives du support 30.

A l'instar d'un procédé d'assemblage décrit précédemment en liaison avec la figure 2, un procédé selon la figure 3 prévoit l'exploitation avantageuse d'un adhésif A dont la pégosité à température ambiante est suffisante pour maintenir

la position d'un module de radio-identification 10 sur le support 30. En variante, la couche de matériau thermoplastique TP1, déposée préalablement sur le module de radio-identification, peut être chauffée au-delà de la température de fusion dudit matériau TP1, juste avant de poser ledit module de radio-identification sur la face supérieure du support 30. Ledit module 10 est alors posé, puis pressé à chaud sur le support 30.

Un procédé d'assemblage 100 conforme à l'invention et tel que celui décrit à titre d'exemple en liaison avec les figures 3 et 4, peut comporter, après qu'un module de radio-identification ait été positionné sur le support 30, une étape 142 pour déposer au moins sur la face supérieure demeurant exposée dudit module de radio-identification 10, un treillis fibreux 50 avantageusement agencé pour être irrémédiablement déstructuré lors d'une tentative malveillante de désassemblage de l'étiquette électronique 1, visant à arracher ledit module de radio-identification 10 du premier support 30. Un tel procédé 100 pourrait en outre comporter une étape 143 pour inscrire, au moins sur la face exposée du module de radio-identification 10 et sur une partie de la face supérieure 30u du premier support 30 demeurant exposée, un message 60 dont la teneur est irrémédiablement altérée lors d'une tentative de désassemblage de l'étiquette électronique visant à arracher ledit module de radio-identification 10 du premier support 30. Un tel message peut être textuel par exemple « void if removed » selon une terminologie anglo-saxonne ou figuratif, comportant un logo, voire mixte.

Ces étapes sont toutefois optionnelles. Par mesure de simplification, et pour illustrer une

variante de réalisation selon laquelle l'emploi de moyens attestant une tentative d'altération de l'intégrité d'une étiquette électronique n'est pas requis, la figure 3 décrit un procédé d'assemblage ne comportant pas d'étapes 142 et/ou 143.

En revanche, un procédé 100 selon la figure 3 comporte une étape 150 essentielle pour déposer sur la face supérieure 30u du premier support 30 une couche d'un deuxième matériau thermoplastique TP2, ladite couche recouvrant au moins la première antenne conductrice 20 et le module de radio-identification 10. Compte tenu de la faible superficie de l'antenne électronique produite, ladite couche de matériau thermoplastique TP2 recouvre avantageusement toute la surface du support 30. Une telle couche peut être déposée, comme l'indique la figure 3 à titre d'exemple, sous l'action d'un dérouleur D7 d'une bande de matériau thermoplastique. L'étape 150 consiste en outre à presser à chaud, c'est-à-dire à une température supérieure à la température de fusion du matériau thermoplastique TP2, l'assemblage pour assurer une coopération pérenne de la couche de matériau thermoplastique TP2 sur la face supérieure 30u du support 30. Une telle opération de pressage peut être réalisée au moyen d'une paire R2 de rouleaux, en miroir l'un de l'autre, assurant une fonction de pressage de l'assemblage lorsque ce dernier est tracté entre lesdits rouleaux, pour que l'adhésion des deux couches du matériau TP2 soit durable.

Le deuxième matériau thermoplastique TP2 peut être sélectionné parmi des polyuréthanes thermoplastiques, des polyphénylènes oxydes, des polyamides, des polyacétates, des polyethylènes, des polypropylènes, des polyoléfines ou des

Ethylènes-Acétates de Vinyles, avantageusement conditionnés sous forme de films.

L'exemple du procédé d'assemblage 100 décrit en liaison avec la figure 3 peut à présent être terminé. Une pluralité d'étiquettes électroniques peut ainsi être conditionnée sous la forme d'une bande. Ledit procédé 100 peut comporter toutefois des étapes additionnelles. Une première étape peut consister à tester électriquement le fonctionnement de chaque étiquette produite. Une étiquette électronique jugée non opérationnelle peut être marquée, par exemple par impression de type jet d'encre, afin d'être mise au rebut. Une telle étape de test peut en outre permettre de mettre à jour certaines mémoires du composant électronique du module de radio-identification de chaque étiquette produite. Cette étape de discrimination des étiquettes opérationnelles, permet ainsi de gérer et maîtriser la séquence des numéros de séries ou autres références uniques associées respectivement aux étiquettes et d'en assurer la cohérence avec une étape optionnelle dudit procédé 100 d'impression graphique, étape également non représentée sur la figure 4, pour permettre de personnaliser chaque étiquette, voire d'inscrire visuellement ledit numéro de série ou référence unique. Une telle étape peut en outre permettre de matérialiser graphiquement, par exemple par l'impression d'un repère, la plage P de couture éventuelle au sein de laquelle le module de radio-identification est préservé.

Une bande d'étiquettes résultant d'un procédé d'assemblage 100 décrit en liaison avec la figure 3 peut aussi comporter une étape 160 pour découper ladite bande, afin de dissocier les étiquettes les unes des autres, voire des les conditionner chacune

sous un blister. En variante, notamment si le support 30 n'est pas préalablement prédécoupé, une telle étape 160 peut consister à prédécouper ladite bande comportant les étiquettes produites pour rendre ces dernières dissociables aisément les unes des autres, tout en conservant un mode de conditionnement par bande comportant chacune une pluralité d'étiquettes.

Selon cet exemple décrit en liaison avec la figure 3, un procédé 100 ne comporte pas d'étape pour déposer sur la face 30d du support 30, c'est-à-dire, la face opposée à celle 30u accueillant un module de radio-identification 10, une couche d'un troisième matériau thermoplastique TP3. Toutefois, une telle étape pourrait également être effectuée.

Les figures 2 et 3 décrivent ainsi des exemples d'un procédé d'assemblage d'étiquette de radio-identification particulièrement innovant et adaptable selon les exigences du domaine d'application. Les étiquettes produites peuvent être de différentes dimensions, comme l'indiquent les figures 2A et 3A, et comporter des antennes leur permettant de communiquer directement avec un lecteur distant, couplées ou encore connectées à une antenne tierce positionnée sur un objet hôte. L'emploi de matériaux thermoplastiques confère aux étiquettes conformes à l'invention, quel que soit leur agencement, une grande facilité de positionnement, voire de repositionnement, ainsi qu'une fiabilité inégalées. Elles sont particulièrement adaptées au domaine des laveries industrielles, exigent et sévère en matière d'exploitation compte tenu des températures élevées et de la chimie auxquelles sont exposées lesdites étiquettes.

Toutefois, un tel procédé ne saurait être limité à la production d'étiquettes électroniques pour ce seul domaine. Les matériaux exploités peuvent être avantageusement choisis pour satisfaire aux conditions et contraintes imposées par toute autre application.

REVENDICATIONS

1. Procédé d'assemblage (100) d'une étiquette électronique de radio-identification (1) comprenant un module de radio-identification (10), une première antenne conductrice (20), un premier support (30) diélectrique agencé pour accueillir ledit module radio-identification (10) et ladite antenne conductrice (20), ledit procédé comportant une étape (140) pour déposer le module de radio-identification (10) sur la face supérieure (30u) du premier support (30), ce dernier comportant la première antenne conductrice (20), ledit module de radio-identification (10) étant positionné à proximité immédiate de la première antenne conductrice (20), ledit procédé (100) étant caractérisé en ce qu'il comporte :
   - une étape préalable (130) pour déposer sur les faces supérieure (10u) et inférieure (10d) du module de radio-identification (10) une couche d'un premier matériau thermoplastique (TP1) ;
   - une étape (130a) pour presser l'ensemble à une température suffisante pour activer le premier matériau thermoplastique (TP1) ;
   - une étape (150) pour déposer sur la face supérieure (30u) du premier support (30) une couche d'un deuxième matériau thermoplastique (TP2) et pour presser l'ensemble à une température suffisante pour activer le deuxième matériau thermoplastique (TP2), ladite couche de deuxième matériau thermoplastique (TP2) recouvrant au moins partiellement la première antenne

conductrice (20) et le module de radio-identification (10).

2. Procédé (100) selon la revendication précédente, pour lequel l'étape (150) pour déposer sur la face supérieure (30u) du premier support (30) consiste à déposer une couche d'un deuxième matériau thermoplastique (TP2) réactivable à chaud.

3. Procédé (100) selon l'une quelconque des revendications précédentes, comportant, préalablement à l'étape (140) pour déposer le module de radio-identification (10) sur la face supérieure (30u) du premier support (30), une étape (134) pour déposer au moins sur une zone de la face supérieure (30u) du premier support (30), une couche d'un matériau adhésif (A) dont la pégosité à température ambiante est suffisante pour maintenir la position du module de radio-identification (10) sur le premier support (30), ladite zone de la face supérieure (30u) du premier support (30) étant destinée à accueillir le module de radio-identification (10).

4. Procédé (100) selon l'une quelconque des revendications 1 ou 2, comportant, préalablement à l'étape (140) pour déposer le module de radio-identification (10) sur la face supérieure (30u) du premier support (30), une étape (131) pour déposer sur la face (10d') du module de radio-identification (10) destinée à coopérer avec la face supérieure (30u) du premier support (30), une couche d'un matériau adhésif (A) dont la pégosité à température ambiante est suffisante

pour maintenir la position du module de radio-identification (10) sur le premier support (30).

5. Procédé (100) selon l'une quelconque des revendications 1 ou 2, comportant, préalablement à l'étape (140) pour déposer le module de radio-identification (10) sur la face supérieure (30u) du premier support (30), une étape (135) pour chauffer le premier matériau (TP1) déposé sur la face (10d') du module de radio-identification (10) destinée à coopérer avec la face supérieure (30u) du premier support (30), au-delà de la température de fusion dudit premier matériau (TP1).

6. Procédé selon l'une quelconque des revendications précédentes, comportant une étape préalable (120) pour assembler le module de radio-identification (10), ladite étape (120) consistant :

- à déposer ou graver (121) sur un deuxième support diélectrique (13) une deuxième antenne conductrice (12) agencée pour assurer une communication électromagnétique à champ proche et un composant électronique (11) ;
- à assurer (122) une coopération électrique entre ladite deuxième antenne conductrice (12) et ledit composant électronique (11) et,
- à déposer (123) une couche d'une résine (14) sur les faces demeurant exposées dudit composant électronique (11) et ladite deuxième antenne conductrice (12).

7. Procédé (100) selon l'une quelconque des revendications précédentes, comportant une étape (142) pour déposer au moins sur la face demeurant exposée (10u') du module de radio-identification (10), un treillis fibreux (50) agencé pour être irrémédiablement déstructuré lors d'une tentative de désassemblage de l'étiquette électronique (1) visant à arracher ledit module de radio-identification (10) du premier support (30), ladite étape (142) étant mise en œuvre préalablement à l'étape (150) pour déposer sur la face supérieure (30u) du premier support (30) une couche d'un deuxième matériau thermoplastique (TP2).

8. Procédé (100) selon l'une quelconque des revendications précédentes, comportant une étape (143) pour inscrire, au moins sur la face exposée (10u') du module de radio-identification (10) et sur une partie de la face supérieure (30u) du premier support (30) demeurant exposée, un message (60) dont la teneur est irrémédiablement altérée lors d'une tentative de désassemblage de l'étiquette électronique visant à arracher ledit module de radio-identification (10) du premier support (30), ladite étape (143) étant mise en œuvre préalablement à l'étape (150) pour déposer sur la face supérieure (30u) du premier support (30) une couche d'un deuxième matériau thermoplastique (TP2).

9. Procédé (100) selon l'une quelconque des revendications précédentes, comportant une étape (133) pour tester électriquement le module de radio-identification (10) et pour lequel l'étape

(140) pour déposer ledit module de radio-identification (10) sur la face supérieure (30u) du premier support (30) n'est effectuée que si ledit module de radio-identification est opérationnel (133-y).

10. Procédé (100) selon l'une quelconque des revendications précédentes, comportant une étape (111) préalable pour déposer la première antenne conductrice (20) sur le premier support (30) ou pour broder, imprimer, laminer ou tisser ladite antenne (20) sur ledit premier support (30).

11. Procédé (100) selon l'une quelconque des revendications précédentes, pour lequel la première antenne conductrice (20) portée par le premier support (30) comporte une ou plusieurs boucles (20b) d'une piste et/ou d'un fil conducteurs.

12. Procédé (100) selon la revendication précédente, pour lequel, le module de radio-identification comportant une antenne conductrice interne (12), la première antenne conductrice (20) est agencée pour former une ou plusieurs boucles (20L) d'un diamètre supérieur aux dimensions de ladite antenne conductrice (12) interne au module de radio-identification (10).

13. Procédé (100) selon l'une quelconque des revendications précédentes, pour lequel les premier (TP1) et deuxième (TP2) matériaux thermoplastiques sont sélectionnés parmi des polyuréthanes thermoplastiques, des polyphénylènes oxydes, des polyamides, des

polyacétates, des polyethylènes, des polypropylènes, des polyoléfines ou des Ethylènes-Acétates de Vinyles.

14. Procédé (100) selon l'une quelconque des revendications précédentes, pour lequel les premier (TP1) et deuxième (TP2) matériaux thermoplastiques sont sélectionnés pour présenter des températures de fusion respectives supérieures à un seuil de température déterminé.

15. Procédé (100) selon l'une quelconque des revendications précédentes, pour lequel le premier support (30) comporte un matériau parmi le coton, le nylon, la viscose, un polyester, ou une matière synthétique.

16. Procédé (100) selon l'une quelconque des revendications précédentes, comportant une étape (112) pour prédécouper transversalement le premier support (30) lorsque que celui-ci se présente sous la forme d'une bande, chaque section (30s) ainsi matérialisée entre deux prédécoupes (30c) étant agencée pour comporter la première antenne conductrice (20) et accueillir le module de radio-identification (10).

17. Procédé (100) selon l'une quelconque des revendications précédentes, pour lequel les premier (TP1) et deuxième (TP2) matériaux thermoplastiques sont sensiblement identiques.

18. Procédé (100) selon l'une quelconque des revendications précédentes, comportant une étape (151) pour déposer sur la face (30d) du premier

support (30), opposée à celle (30u) destinée à accueillir le module de radio-identification (10), une couche d'un troisième matériau thermoplastique (TP3).

19. Procédé selon la revendication précédente, pour lequel le troisième matériau thermoplastique (TP3) est identique au deuxième matériau thermoplastique (TP2).

20. Procédé (100) selon l'une quelconque des revendications précédentes, pour lequel tout matériau (TP1, TP2, TP3) thermoplastique déposé sur le premier support (30) et/ou sur le module de radio-identification (10) présente une température de fusion supérieure à 150°c.

21. Module de radio-identification (10) comportant un support diélectrique (13), une antenne conductrice (12) agencée pour assurer une communication électromagnétique à champ proche et un composant électronique (11), ledit composant électronique (11) étant connecté électriquement à ladite antenne conductrice (12), toute face exposée dudit composant électronique (11) et de l'antenne conductrice (12) étant recouverte par une résine de protection (14), ledit module de radio-identification (10) présentant principalement une face supérieure (10u') et une face inférieure (10d'), caractérisé en ce que lesdites faces supérieure (10u') et inférieure (10d') comportent une couche d'un matériau thermoplastique (TP1) réactivable à chaud.

22. Etiquette électronique de radio-identification (1) comportant un support (30), une antenne conductrice (20) d'étiquette, un module de radio-identification (10) selon la revendication précédente, caractérisée en en ce que ledit module de radio-identification (10) est positionné sur une face (30u) dite supérieure dudit support (30) de sorte que l'antenne conductrice interne (12) audit module de radio-identification (10) ne recouvre pas ladite antenne conductrice (20) d'étiquette, et en ce que ladite face supérieure (30u) du support (30) comporte une couche d'un matériau thermoplastique (TP2), ladite couche recouvrant au moins partiellement l'antenne conductrice (20) d'étiquette et le module de radio-identification (10).

23. Etiquette selon la revendication précédente, pour laquelle l'antenne conductrice d'étiquette (20) et le module de radio-identification (10) sont mutuellement agencés sur le support (30) pour que ledit module occupe une position excentrée sur ledit support (30), ce dernier comportant une plage (P) d'une hauteur minimale (h) déterminée, ladite plage (P) englobant partiellement ladite antenne d'étiquette (20) mais non ledit module de radio-identification (10).

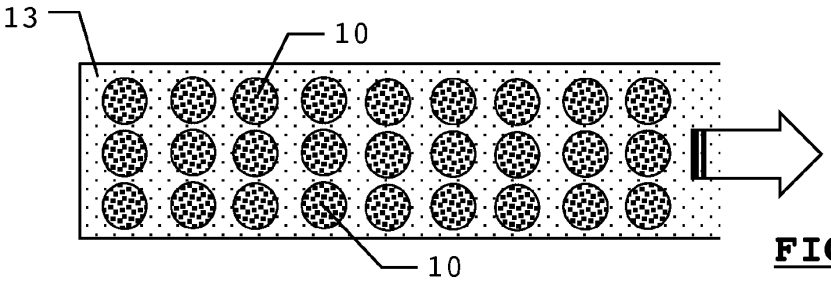


FIG.1A

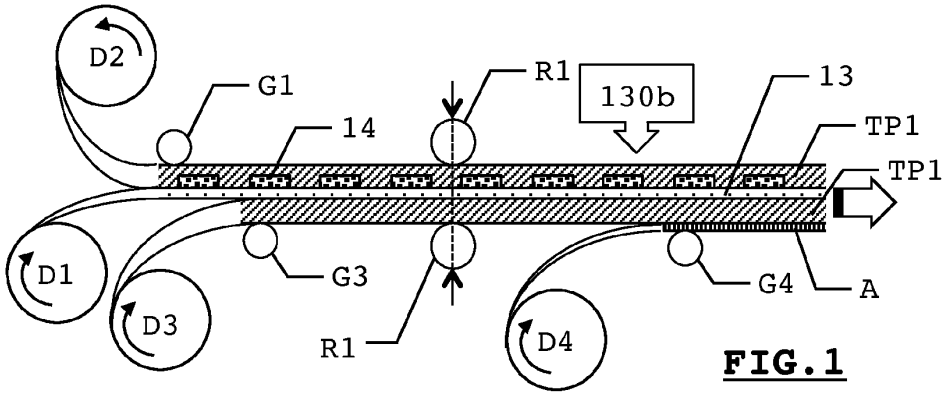


FIG.1

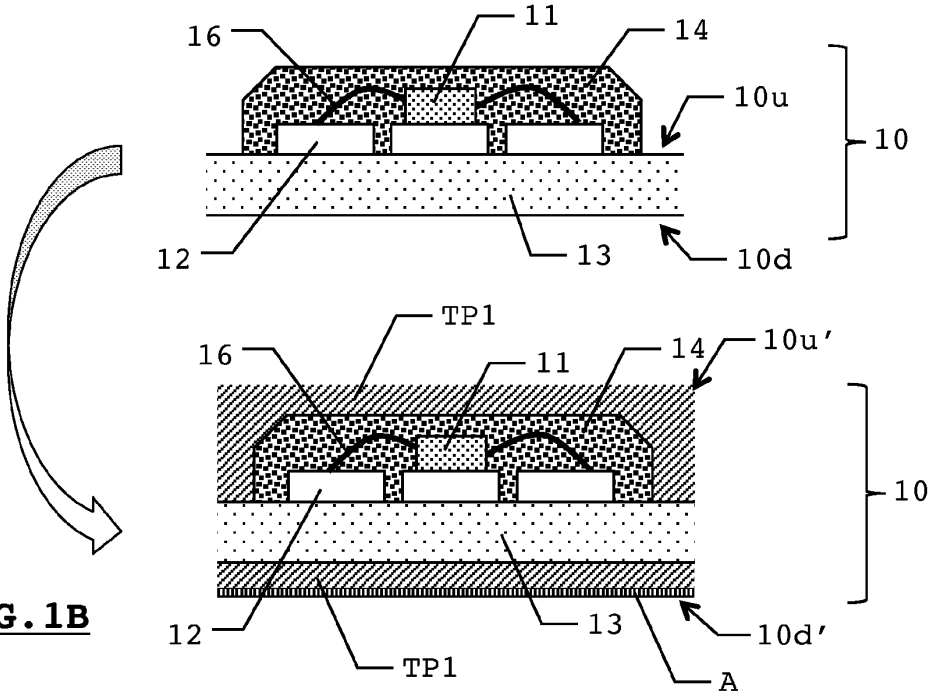


FIG.1B

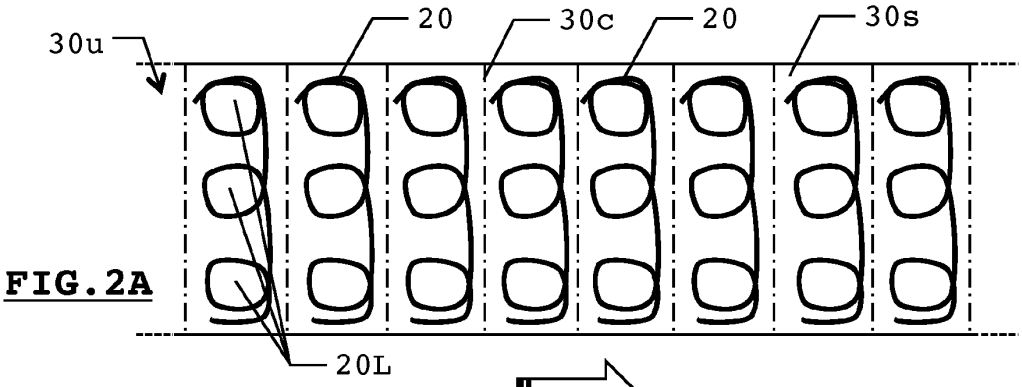


FIG.2A

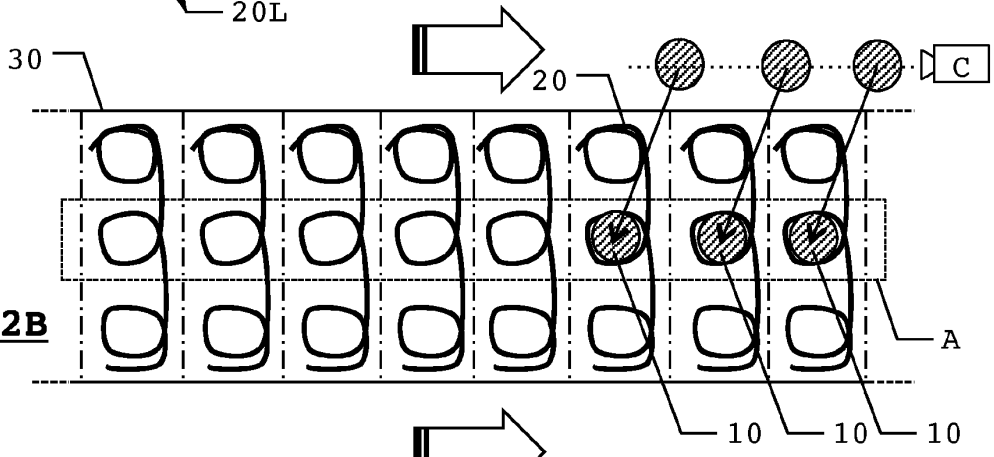


FIG.2B

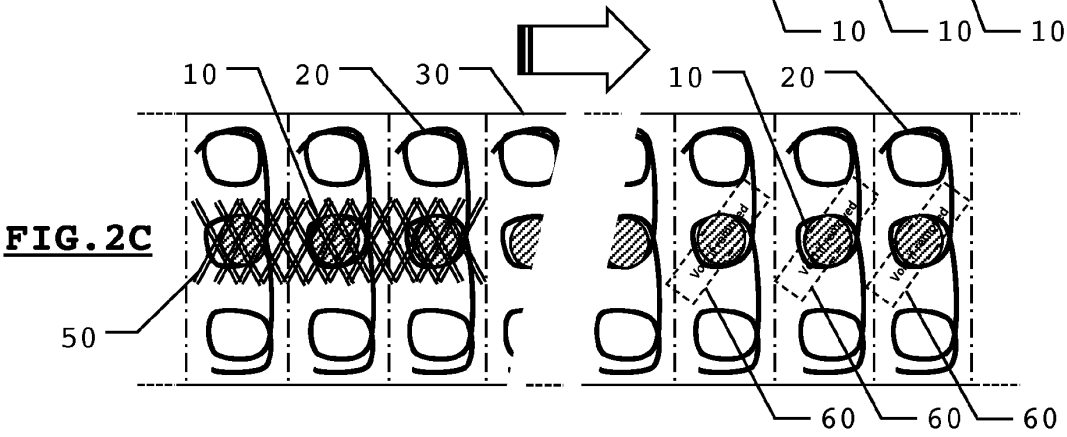


FIG.2C

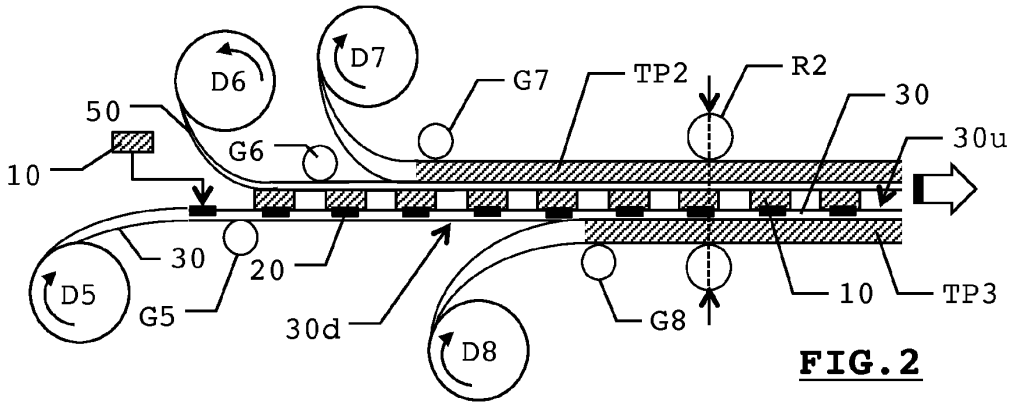


FIG.2

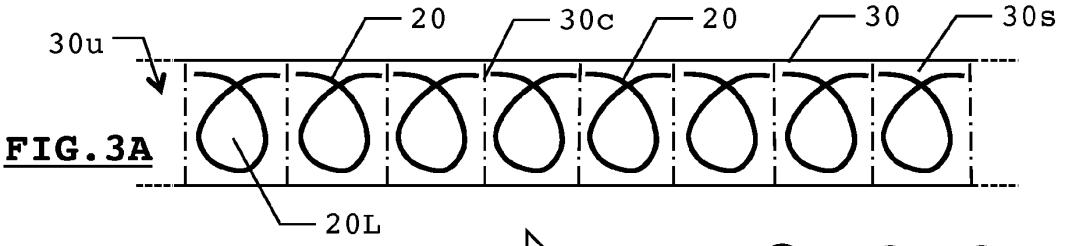


FIG.3A

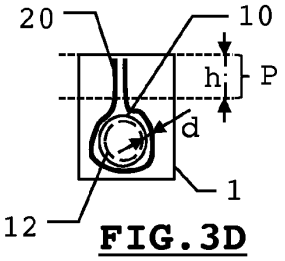


FIG.3D

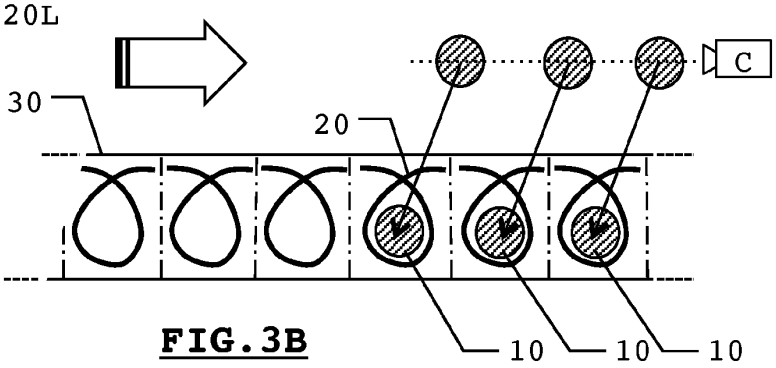


FIG.3B

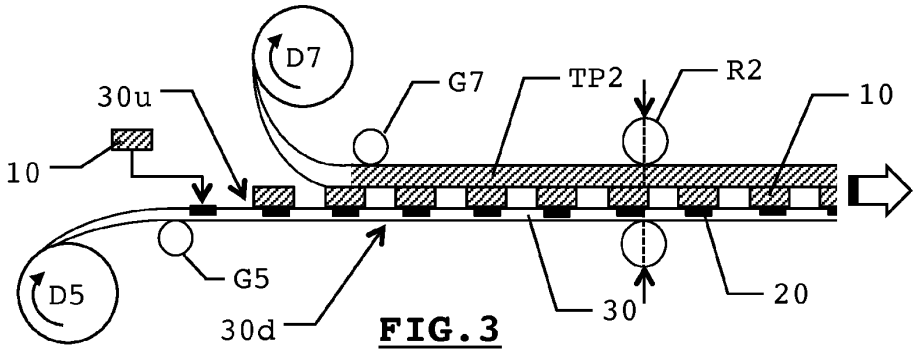


FIG.3

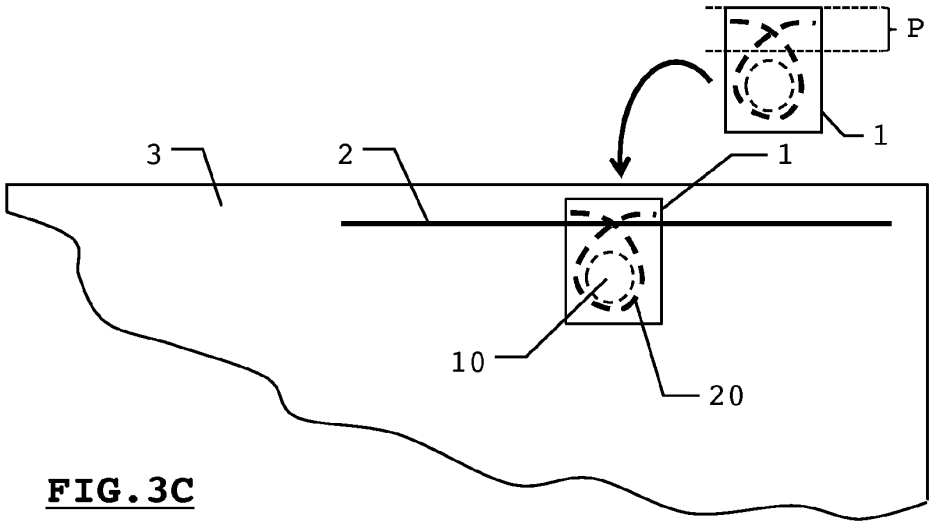


FIG.3C

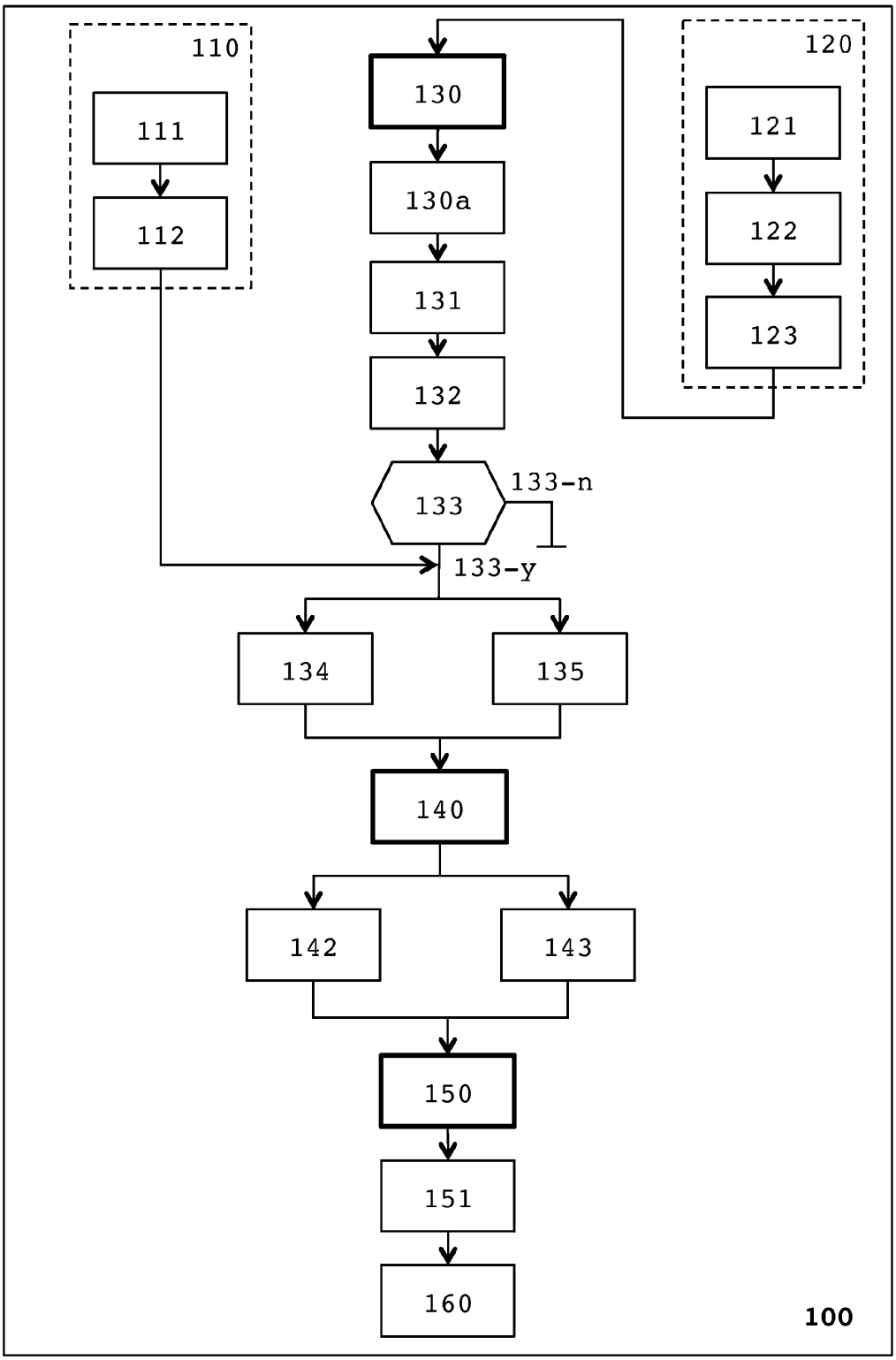

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FIG.4

INTERNATIONAL SEARCH REPORT

International application No
PCT/FR2016/052601

A. CLASSIFICATION OF SUBJECT MATTER
INV. G06K19/077
ADD.

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 practicable, 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.
Y	EP 2 019 425 A1 (SEMICONDUCTOR ENERGY LAB [JP]) 28 January 2009 (2009-01-28) paragraph [0016] - paragraph [0054]; figures 1a-5b	1-23
Y	EP 1 914 671 A1 (ASSA ABLOY IDENTIFICATION TECH [DE]) 23 April 2008 (2008-04-23) abstract	1-23
Y	WO 2004/084130 A1 (ASK SA [FR]; KAYANAKIS GEORGES [FR]; BENATO PIERRE [FR]; HALOPE CHRIST) 30 September 2004 (2004-09-30) abstract	1-23

☐ 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 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
16 January 2017	24/01/2017

Name and mailing address of the ISA/	Authorized officer
European Patent Office, P.B. 5818 Patentlaan 2 NL - 2280 HV Rijswijk Tel. (+31-70) 340-2040, Fax: (+31-70) 340-3016	Degrendel, Antoine

1

Form PCT/ISA/210 (second sheet) (April 2005)

INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No
PCT/FR2016/052601

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
EP 2019425 A1	28-01-2009	CN 101354755 A	28-01-2009
		EP 2019425 A1	28-01-2009
		JP 5189429 B2	24-04-2013
		JP 2009054145 A	12-03-2009
		KR 20090012173 A	02-02-2009
		KR 20130090392 A	13-08-2013
		TW 200924154 A	01-06-2009
		US 2009085182 A1	02-04-2009
		US 2011186949 A1	04-08-2011
		US 2015014419 A1	15-01-2015
EP 1914671 A1	23-04-2008	AT 534970 T	15-12-2011
		AU 2007221922 A1	01-05-2008
		CA 2606079 A1	12-04-2008
		EP 1914671 A1	23-04-2008
		ES 2376760 T3	16-03-2012
		US 2008131669 A1	05-06-2008
WO 2004084130 A1	30-09-2004	AU 2003276335 A1	11-10-2004
		FR 2851674 A1	27-08-2004
		TW I328773 B	11-08-2010
		WO 2004084130 A1	30-09-2004

Form PCT/ISA/210 (patent family annex) (April 2005)

RAPPORT DE RECHERCHE INTERNATIONALE

Demande internationale n°
PCT/FR2016/052601

A. CLASSEMENT DE L'OBJET DE LA DEMANDE
INV. G06K19/077
ADD.

Selon la classification internationale des brevets (CIB) ou à la fois selon la classification nationale et la CIB

B. DOMAINES SUR LESQUELS LA RECHERCHE A PORTE

Documentation minimale consultée (système de classification suivi des symboles de classement)
G06K

Documentation consultée autre que la documentation minimale dans la mesure où ces documents relèvent des domaines sur lesquels a porté la recherche

Base de données électronique consultée au cours de la recherche internationale (nom de la base de données, et si cela est réalisable, termes de recherche utilisés)
EPO-Internal, WPI Data

C. DOCUMENTS CONSIDERES COMME PERTINENTS

Catégorie*	Identification des documents cités, avec, le cas échéant, l'indication des passages pertinents	no. des revendications visées
Y	EP 2 019 425 A1 (SEMICONDUCTOR ENERGY LAB [JP]) 28 janvier 2009 (2009-01-28) alinéa [0016] - alinéa [0054]; figures 1a-5b	1-23
Y	EP 1 914 671 A1 (ASSA ABLOY IDENTIFICATION TECH [DE]) 23 avril 2008 (2008-04-23) abrégé	1-23
Y	WO 2004/084130 A1 (ASK SA [FR]; KAYANAKIS GEORGES [FR]; BENATO PIERRE [FR]; HALOPE CHRIST) 30 septembre 2004 (2004-09-30) abrégé	1-23

☐ Voir la suite du cadre C pour la fin de la liste des documents

☒ Les documents de familles de brevets sont indiqués en annexe

* Catégories spéciales de documents cités:

"A" document définissant l'état général de la technique, non considéré comme particulièrement pertinent
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"T" document ultérieur publié après la date de dépôt international ou la date de priorité et n'appartenant pas à l'état de la technique pertinent, mais cité pour comprendre le principe ou la théorie constituant la base de l'invention
"X" document particulièrement pertinent; l'invention revendiquée ne peut être considérée comme nouvelle ou comme impliquant une activité inventive par rapport au document considéré isolément
"Y" document particulièrement pertinent; l'invention revendiquée ne peut être considérée comme impliquant une activité inventive lorsque le document est associé à un ou plusieurs autres documents de même nature, cette combinaison étant évidente pour une personne du métier
"&" document qui fait partie de la même famille de brevets

Date à laquelle la recherche internationale a été effectivement achevée	Date d'expédition du présent rapport de recherche internationale
16 janvier 2017	24/01/2017

Nom et adresse postale de l'administration chargée de la recherche internationale	Fonctionnaire autorisé
Office Européen des Brevets, P.B. 5818 Patentlaan 2 NL - 2280 HV Rijswijk Tel. (+31-70) 340-2040, Fax: (+31-70) 340-3016	Degrendel, Antoine

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Formulaire PCT/ISA/210 (deuxième feuille) (avril 2005)

RAPPORT DE RECHERCHE INTERNATIONALE

Renseignements relatifs aux membres de familles de brevets

Demande internationale n°
PCT/FR2016/052601

Document brevet cité au rapport de recherche	Date de publication	Membre(s) de la famille de brevet(s)	Date de publication
EP 2019425 A1	28-01-2009	CN 101354755 A	28-01-2009
		EP 2019425 A1	28-01-2009
		JP 5189429 B2	24-04-2013
		JP 2009054145 A	12-03-2009
		KR 20090012173 A	02-02-2009
		KR 20130090392 A	13-08-2013
		TW 200924154 A	01-06-2009
		US 2009085182 A1	02-04-2009
		US 2011186949 A1	04-08-2011
		US 2015014419 A1	15-01-2015
EP 1914671 A1	23-04-2008	AT 534970 T	15-12-2011
		AU 2007221922 A1	01-05-2008
		CA 2606079 A1	12-04-2008
		EP 1914671 A1	23-04-2008
		ES 2376760 T3	16-03-2012
		US 2008131669 A1	05-06-2008
WO 2004084130 A1	30-09-2004	AU 2003276335 A1	11-10-2004
		FR 2851674 A1	27-08-2004
		TW I328773 B	11-08-2010
		WO 2004084130 A1	30-09-2004

Electronic Acknowledgement Receipt	
EFS ID:	38986906
Application Number:	16609260
International Application Number:	
Confirmation Number:	1148
Title of Invention:	RFID TAG FOR HARSH ENVIRONMENT INDUCTIVELY COUPLED IN DOUBLE LOOP
First Named Inventor/Applicant Name:	Aurelian MORARU
Customer Number:	136531
Filer:	Roy D. Gross
Filer Authorized By:	
Attorney Docket Number:	07610-P0002A
Receipt Date:	27-MAR-2020
Filing Date:	29-OCT-2019
Time Stamp:	11:45:25
Application Type:	U.S. National Stage under 35 USC 371

Payment information:

Submitted with Payment	no

File Listing:

Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)
1	Information Disclosure Statement (IDS) Form (SB08)	07610-P0002A-IDS.pdf	1034973 328c4cead51138d3f50d02089b930956617 7130d	no	4

Warnings:

Information:					
2	Foreign Reference	DE102007026720.pdf	1599633 1181bf02f19917af24b27a9cf54c919eccd68ab8	no	23
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Information:					
3	Foreign Reference	DE102013102051A1.pdf	2828118 25d0faaef37a7ac1e49abb88bbece56acdd d9826	no	28
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4	Foreign Reference	EP2405054.pdf	1501936 983024e3562bbae75dc57aed8bcef468218 b620d	no	17
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Information:					
			Total Files Size (in bytes):	13513910	

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If a timely submission to enter the national stage of an international application is compliant with the conditions of 35 U.S.C. 371 and other applicable requirements a Form PCT/DO/EO/903 indicating acceptance of the application as a national stage submission under 35 U.S.C. 371 will be issued in addition to the Filing Receipt, in due course.

New International Application Filed with the USPTO as a Receiving Office

If a new international application is being filed and the international application includes the necessary components for an international filing date (see PCT Article 11 and MPEP 1810), a Notification of the International Application Number and of the International Filing Date (Form PCT/RO/105) will be issued in due course, subject to prescriptions concerning national security, and the date shown on this Acknowledgement Receipt will establish the international filing date of the application.

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APPLICATION NUMBER	FILING OR 371(C) DATE	FIRST NAMED APPLICANT	ATTY. DOCKET NO./TITLE
16/609,260	10/29/2019	Aurelian MORARU	07610-P0002A

CONFIRMATION NO. 1148

136531
The Roy Gross Law Firm, LLC
50 Washington Street
Suite 737/745
Norwalk, CT 06854

PUBLICATION NOTICE

OC000000115207593

Title:RFID TAG FOR HARSH ENVIRONMENT INDUCTIVELY COUPLED IN DOUBLE LOOP

Publication No.US-2020-0076048-A1
Publication Date:03/05/2020

NOTICE OF PUBLICATION OF APPLICATION

The above-identified application will be electronically published as a patent application publication pursuant to 37 CFR 1.211, et seq. The patent application publication number and publication date are set forth above.

The publication may be accessed through the USPTO's publically available Searchable Databases via the Internet at www.uspto.gov. The direct link to access the publication is currently http://www.uspto.gov/patft/.

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In addition, information on the status of the application, including the mailing date of Office actions and the dates of receipt of correspondence filed in the Office, may also be accessed via the Internet through the Patent Electronic Business Center at www.uspto.gov using the public side of the Patent Application Information and Retrieval (PAIR) system. The direct link to access this status information is currently https://portal.uspto.gov/pair/PublicPair. Prior to publication, such status information is confidential and may only be obtained by applicant using the private side of PAIR.

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Office of Data Managment, Application Assistance Unit (571) 272-4000, or (571) 272-4200, or 1-888-786-0101

MULTIPLE DEPENDENT CLAIM FEE CALCULATION SHEET Substitute for Form PTO-1360 (For use with Form PTO/SB/06)	Application Number 16609260	Filing Date
	Applicant(s) Aurelian MORARU	

* May be used for additional claims or amendments

CLAIMS	AS FILED		AFTER FIRST AMENDMENT		AFTER SECOND AMENDMENT	
	Indep	Depend	Indep	Depend	Indep	Depend
1	1					
2		1				
3		1				
4		1				
5		1				
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Total Indep	1		0		0	
Total Depend	4	↵	0	↵	0	↵
Total Claims	5		0		0	

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	Indep	Depend	Indep	Depend	Indep	Depend
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APPLICATION NUMBER	FILING or 371(c) DATE	GRP ART UNIT	FIL FEE REC'D	ATTY.DOCKET.NO	TOT CLAIMS	IND CLAIMS
16/609,260	10/29/2019		790	07610-P0002A	5	1

CONFIRMATION NO. 1148

136531
The Roy Gross Law Firm, LLC
50 Washington Street
Suite 737/745
Norwalk, CT 06854

FILING RECEIPT

OC000000112917157

Date Mailed: 11/27/2019

Receipt is acknowledged of this non-provisional utility patent application. The application will be taken up for examination in due course. Applicant will be notified as to the results of the examination. Any correspondence concerning the application must include the following identification information: the U.S. APPLICATION NUMBER, FILING DATE, NAME OF FIRST INVENTOR, and TITLE OF INVENTION. Fees transmitted by check or draft are subject to collection.

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Inventor(s)

Aurelian MORARU, Brasov, ROMANIA;
Corneliu URSACHI, Brasov, ROMANIA;

Applicant(s)

PROMAR TEXTIL INDUSTRIES S.R.L., Brasov, ROMANIA;

Power of Attorney: The patent practitioners associated with Customer Number 136531

Domestic Priority data as claimed by applicant

This application is a 371 of PCT/RO2017/000023 12/19/2017

Foreign Applications (You may be eligible to benefit from the **Patent Prosecution Highway** program at the USPTO. Please see http://www.uspto.gov for more information.)
ROMANIA A 2017 00388 06/16/2017

Permission to Access Application via Priority Document Exchange: Yes

Permission to Access Search Results: Yes

Applicant may provide or rescind an authorization for access using Form PTO/SB/39 or Form PTO/SB/69 as appropriate.

If Required, Foreign Filing License Granted: 11/26/2019

The country code and number of your priority application, to be used for filing abroad under the Paris Convention, is **US 16/609,260**

Projected Publication Date: 03/05/2020

Non-Publication Request: No

Early Publication Request: No
** **SMALL ENTITY** **
Title

RFID TAG FOR HARSH ENVIRONMENT INDUCTIVELY COUPLED IN DOUBLE LOOP

Preliminary Class

Statement under 37 CFR 1.55 or 1.78 for AIA (First Inventor to File) Transition Applications: No

PROTECTING YOUR INVENTION OUTSIDE THE UNITED STATES

Since the rights granted by a U.S. patent extend only throughout the territory of the United States and have no effect in a foreign country, an inventor who wishes patent protection in another country must apply for a patent in a specific country or in regional patent offices. Applicants may wish to consider the filing of an international application under the Patent Cooperation Treaty (PCT). An international (PCT) application generally has the same effect as a regular national patent application in each PCT-member country. The PCT process **simplifies** the filing of patent applications on the same invention in member countries, but **does not result** in a grant of "an international patent" and does not eliminate the need of applicants to file additional documents and fees in countries where patent protection is desired.

Almost every country has its own patent law, and a person desiring a patent in a particular country must make an application for patent in that country in accordance with its particular laws. Since the laws of many countries differ in various respects from the patent law of the United States, applicants are advised to seek guidance from specific foreign countries to ensure that patent rights are not lost prematurely.

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Title 35, United States Code, Section 184

Title 37, Code of Federal Regulations, 5.11 & 5.15

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PATENT APPLICATION FEE DETERMINATION RECORD

Substitute for Form PTO-875

Application or Docket Number: 16/609,260

APPLICATION AS FILED - PART I

FOR	(Column 1) NUMBER FILED	(Column 2) NUMBER EXTRA	SMALL ENTITY RATE($)	SMALL ENTITY FEE($)	OR	OTHER THAN SMALL ENTITY RATE($)	OTHER THAN SMALL ENTITY FEE($)
BASIC FEE (37 CFR 1.16(a), (b), or (c))	N/A	N/A	N/A	150		N/A	
SEARCH FEE (37 CFR 1.16(k), (i), or (m))	N/A	N/A	N/A	260		N/A	
EXAMINATION FEE (37 CFR 1.16(o), (p), or (q))	N/A	N/A	N/A	380		N/A	
TOTAL CLAIMS (37 CFR 1.16(i))	5 minus 20 =	*	x 50 =	0.00	OR		
INDEPENDENT CLAIMS (37 CFR 1.16(h))	1 minus 3 =	*	x 230 =	0.00			
APPLICATION SIZE FEE (37 CFR 1.16(s))	If the specification and drawings exceed 100 sheets of paper, the application size fee due is $310 ($155 for small entity) for each additional 50 sheets or fraction thereof. See 35 U.S.C. 41(a)(1)(G) and 37 CFR 1.16(s).			0.00			
MULTIPLE DEPENDENT CLAIM PRESENT (37 CFR 1.16(j))				0.00			
* If the difference in column 1 is less than zero, enter "0" in column 2.			TOTAL	790		TOTAL	

APPLICATION AS AMENDED - PART II

		(Column 1) CLAIMS REMAINING AFTER AMENDMENT		(Column 2) HIGHEST NUMBER PREVIOUSLY PAID FOR	(Column 3) PRESENT EXTRA	SMALL ENTITY RATE($)	SMALL ENTITY ADDITIONAL FEE($)	OR	OTHER THAN SMALL ENTITY RATE($)	OTHER THAN SMALL ENTITY ADDITIONAL FEE($)
AMENDMENT A	Total (37 CFR 1.16(i))	*	Minus	**	=	x =		OR	x =	
	Independent (37 CFR 1.16(h))	*	Minus	***	=	x =		OR	x =	
	Application Size Fee (37 CFR 1.16(s))									
	FIRST PRESENTATION OF MULTIPLE DEPENDENT CLAIM (37 CFR 1.16(j))							OR		
						TOTAL ADD'L FEE		OR	TOTAL ADD'L FEE	

		(Column 1) CLAIMS REMAINING AFTER AMENDMENT		(Column 2) HIGHEST NUMBER PREVIOUSLY PAID FOR	(Column 3) PRESENT EXTRA	RATE($)	ADDITIONAL FEE($)	OR	RATE($)	ADDITIONAL FEE($)
AMENDMENT B	Total (37 CFR 1.16(i))	*	Minus	**	=	x =		OR	x =	
	Independent (37 CFR 1.16(h))	*	Minus	***	=	x =		OR	x =	
	Application Size Fee (37 CFR 1.16(s))									
	FIRST PRESENTATION OF MULTIPLE DEPENDENT CLAIM (37 CFR 1.16(j))							OR		
						TOTAL ADD'L FEE		OR	TOTAL ADD'L FEE	

* If the entry in column 1 is less than the entry in column 2, write "0" in column 3.
** If the "Highest Number Previously Paid For" IN THIS SPACE is less than 20, enter "20".
*** If the "Highest Number Previously Paid For" IN THIS SPACE is less than 3, enter "3".
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U.S. APPLICATION NO.	FIRST NAMED INVENTOR	ATTY. DOCKET NO.
16/609,260	Aurelian MORARU	07610-P0002A

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INTERNATIONAL APPLICATION NO.	
PCT/RO2017/000023	
I.A. FILING DATE	PRIORITY DATE
12/19/2017	06/16/2017

CONFIRMATION NO. 1148
371 ACCEPTANCE LETTER

OC000000112917158

Date Mailed: 11/27/2019

NOTICE OF ACCEPTANCE OF APPLICATION UNDER 35 U.S.C 371 AND 37 CFR 1.495

The applicant is hereby advised that the United States Patent and Trademark Office, in its capacity as a Designated / Elected Office (37 CFR 1.495), has ACCEPTED the above identified international application for national patentability examination in the United States Patent and Trademark Office.

The United States Application Number assigned to the application is shown above. A Filing Receipt will be issued for the present application in due course. **THE DATE APPEARING ON THE FILING RECEIPT AS THE "FILING DATE or 371(c) DATE" IS THE DATE ON WHICH THE LAST OF THE 35 U.S.C. 371 (c)(1) and (c)(2) REQUIREMENTS HAS BEEN RECEIVED IN THE OFFICE. THIS DATE IS SHOWN BELOW.** The filing date of the above identified application is the international filing date of the international application (Article 11(3) and 35 U.S.C. 363)

10/29/2019
DATE OF RECEIPT OF 35 U.S.C.
371(c)(1) and (c)(2) REQUIREMENTS

The following items have been received:

- Indication of Small Entity Status
- Copy of the International Application filed on 10/29/2019
- Copy of the International Search Report filed on 10/29/2019
- Copy of Article 19 Amendments filed on 10/29/2019
- Preliminary Amendments filed on 10/29/2019
- Inventor's Oath or Declaration filed on 10/29/2019
- Request for Immediate Examination filed on 10/29/2019
- U.S. Basic National Fees filed on 10/29/2019
- Authorize Access to Search Results filed on 10/29/2019
- Priority Documents filed on 10/29/2019
- Power of Attorney filed on 10/29/2019
- Authorization to Permit Access filed on 10/29/2019
- Application Data Sheet (37 CFR 1.76) filed on 10/29/2019

FORM PCT/DO/EO/903 (371 Acceptance Notice)

Applicant is reminded that any communications to the United States Patent and Trademark Office must be mailed to the address given in the heading and include the U.S. application no. shown above (37 CFR 1.5)

ROSA M WEST

Telephone: (571) 272-1019

RFID tag for harsh environment inductively coupled in double loop

DESCRIPTION

[0001] A Minimum Radio Frequency Identification (RFID) system consists of a interrogator reader connected to a PC and a population of tags attached to the products they uniquely identify. An application software handles RFID information to trace and inventory these products. Passive RFID tags operating in the UIF (860-960MHz) or SIF (2.45GHz) frequency range are used.

Objects identified using RFID tags and intended for use in harsh environments shall withstand the following requirements:

- repeated immersion in the aquatic environment
- exposure to high temperatures of up to 200 ° C, more than 20 minutes
- high temperature variations - (8 ° C / 90 ° C),
- corrosive chemicals
- mechanical pressures of 40-60 bar,
- repeated mechanical stresses (bending, pressing, etc.)
- number of cycles of use greater than 300

[0003] From a historical point of view, for RFID applications, passive RFID tags operating in the HF domain (13.65MHz) were used first. Constructively, they were made up of an integrated circuit galvanically connected to a multi-spiral coil. The reading range was under one meter, and the reading speed was about one label per second. With the introduction of passive RFID tags operating in the UHF range, and with the development of communications protocols, performance has increased spectacularly at high read speeds (10 RFID tags / sec) and read ranges of up to 7m.

[0004] For textile tracking applications, the design of an RFID tag composed of a capsulated traponder, thus protected by the harsh environment of industrial laundries, and a UHF antenna made of metallic wire, has been widely adopted. The encapsulated transponder contains an integrated circuit and a near-field antenna by which it is inductively coupled to a segment of the UHF antenna.

[0005] This category includes the RFID UHF tags, the subject of patents EP 2405054 A1, DE 102007026720 A1, US 20090079574 A1.

[0006] But even this design has its limits. Capsulation is achieved by protecting the contacts between the integrated circuit (IC) pins and the near field antenna terminals, but at the UHF antenna there are major discrepancies relative to the mechanical and thermal characteristics of the textile substrate relative to the metallic conductors of the UHF antenna .

Here's a short list of problems with using these labels in industrial laundries:

- loosening the seams and breaking the textile fabric, to which the RFID tag is attached,
- the metal wire from which the UHF antenna is made oxidizes in contact with the water and the oxidant chemicals used in the washing process, stains the fabric and compromises its appearance. Also due to oxidation the electrical parameters of the antenna material, and implicitly its electromagnetic performances, are affected.
- the material of the metal wire from which the antenna is made stores much more thermal energy than the textile support, this difference leading to the piercing/ perforation of the textile material by the metal wire of the antenna that protrudes out of it.
- because of the rigidity of the metal wire, the entire tag is a little flexible compared to the textile material from which the article to be identified is being made. Low flexibility creates break lines on the RFID tagline.

These lead to the detachment of the encapsulated RFID transponder **3** and consequently to the loss of the identity of the textile objects being monitored, to the appearance problems of the textile item, but especially to the problems for the customers, respectively their injury to the use of textile articles (towels, pillows, sheets) that were pierced by the metal wires.

At the same time, current UHF tags have considerable dimensions that make them inappropriate, unsightly for identifying small items (tablecloths).

[0007] The ideal passive RFID tag for the identification of textile items that are maintained in laundries and dry cleaners is:

- electromagnetic performance (high reading distance),
- of small size,
- flexible and resistant to bending,
- resistant to chemical stress,
- resistant to a number of exposures greater than the product it identifies, over 200 washing cycles.

So an electromagnetically performant, resistant and discreet RFID tag.

[0008] The ways to approach this ideal prototype are:
- the use of encapsulating materials to effectively protect the integrated circuit and its contacts with the near field antenna at the transponder level,
- designing a UHF/SHF antenna geometry to give it superior electromagnetic properties and at the same time to have as small a size as possible,
- use of electrically conductive materials with mechanical parameters close to the textile, to the construction of the UHF/SHF antenna
- tag components that are in direct interaction, have close thermal expansion coefficients.

[0009] The UHF antennas of the RFID tags available on the market are made of electrically insulated metallic wire, attached to a textile support by sewing or embroidering. They have the meandered shape (EP 2405054 A1), or crossed loops (WO 2013128299 A1). All have the vulnerabilities and limitations described in paragraph [0006].

[0010] The present invention overcomes the aforementioned drawbacks associated with prior art solutions by providing a tag having the features mentioned in the independent claim 1.

[0011] Other preferred features of the present invention are set forth in the appended dependent claims.

[0012] The present invention proposes for the UHF-SHF antenna an electroconductive yarn made of metallic stainless steel wire that resists the action of oxidizing agents. By using the electroconductive textile wire to make the UHF-SHF antenna, due to its flexibility, the electroconductive textile thread allows for the realization of geometries impossible to achieve with an electrically isolated metal wire. It is possible to make very small radius curves without creating mechanical stresses in the tag structure. Also the UHF-SHF antenna made of electroconductive textile thread is very discreet and does not feel, it naturally integrates into the textile material of the product it identifies.

[0013] Other features and advantages of the present invention will become more apparent from the following detailed description, given in connection with the accompanying drawings, in which:
- Figure 1 shows a schematic view of the double-loop RFID tag according to a first embodiment of the invention;
- Figure 2 shows a the double loop in detail according to the first embodiment of the invention;
- Figure 3 shows a schematic view of the double-loop RFID tag according to a second embodiment of the invention;

[0014] The UHF-SHF antenna **2** has a particularly innovative geometry characterized in that it has in the central region a double loop **5** through which an efficient inductive coupling with the encapsulated RFID transponder **3** is provided, thereby obtaining an electromagnetically efficient RFID tag.

[0015] The double loop 5 also allows for a small, discreet and easy-to-integrate RFID tag even in small-sized textile articles.

[0016] The RFID passive UHF-SHF antenna can be made in two variants Fig. 2 and Fig. 3. In the first embodiment, Fig. 2, the electroconductive textile thread is electrically insulated and allows the thread overlapping at certain points (A, B, C, D) without electrical contact. For the second embodiment, Fig. 3, the UHF-SHF antenna geometry allows the use of a non-insulated electroconductive textile thread. Both variants are embroidered.

[0017] In the first embodiment, Fig. 2, the double loop **5** of the UHF antenna **2** through which the inductive coupling with the encapsulated RFID transponder 3 is made, has created an UHF antenna with efficient power transfer and information integrity, with substantially reduced design dimensions. There is no electrical contact at points A, B, C, and D.

[0018] In the second embodiment of the UHF-SHF antenna, Fig. 3, the drawing of the embroidery is made so that the electroconductive textile thread is continuously embroidered without crossings in its path.

After embroidering, by bending over the dotted line and overlapping the two P and Q loops, a double loop **(5)** will form. The loop P has a smaller diameter than the Q loop. It is noted that, after bending and overlap, the currents in the two loops have the same direction, contributing together to an efficient inductive coupling. Prior to bending between the two loops P and Q, the encapsulated transponder **(3)** will be fixed with adhesive on the loop P. After folding and overlapping the encapsulated transponder **(3)** will be secured between the two loops P and Q.

[0019] The present invention is complementary to patent No. a 2016 00791, which proposed an RFID Transponder designed to operate in aggressive environments. The RFID transponder was described as being designed to be used both independently for RFID applications for which the reading range is in centimeters and with a UHF-SHF antenna for RFID applications for which the reading range is of meters order.

[0020] The design of this tag by embedding in its structure the encapsulated transponder **3**, object of the patent **a 2016 00791**, overcomes the problems created by the dimensional discrepancies between tiny integrated cicuits and the antennas, they are galvanically

connected, which require the use of expensive technologies (wire bonding) or inadequate to the harsh environment of industrial laundry (bonding with conductive adhesives).

[0021] The tag design looks for a straight measure relative to the dimensions of the objects it identifies and the size of the tag. It does not fall into excessive miniaturization when it is not. necessary.

[0022] A maximal design is proposed for the maximum achievable design with the currently available components, keeping the measure.

- transponder with a minimum number of galvanic contacts, equal to the number of active integrated circuit pins, robust galvanic contacts using an integrated circuit in SOT323 package, welded in the cheap and mature SMT technology, at the near-field antenna terminals, encapsulated and thus protected from the harsh environment of industrial laundry,
- inductive coupling between encapsulated transponder **(3)** and UIF-SIF antenna **(2)**,
- the homogeneity of the components of the UIF-SIF antenna **(2)** - textile substrate and the antenna, both of textile material,
- substantially reduced length of the tag by using the double loop of the UHF-SHF antenna.
- a tag born and not made for the textile world by the materials used (textile thread on a textile substrate), and the methods of making (embroidering the textile thread on the textile substrate).

Referinţe bibliografice

Brevet citat	Data înregistrării	Data publicării	Solicitant	Titlul
EP 2405054 A1	07 Iulie 2010	11 Ianuarie 2012	Datamars SA (CH)	Textile item identification tag
DE 102007026720 A1	06 Iunie 2007	11 Decembrie 2008	Bielomatik	Chip module for an RFID system
US 20090079574 A1	19 Septembrie 2008	26 Martie 2009	Noriyuki	Rfid tag
WO 2013128299 A1	02 Martie 2012	06 Septembrie 2013	Usta	Enhanced antenna structure for RFID tags

Statement under Article 19(1)

IA Number:
PCT/RO2017/000023

International Filing Date:
19 December 2017

Date of submission:
15 October 2018

the amendments dont have any impact on the description and the drawings.

Drawings

Fig. 1 .

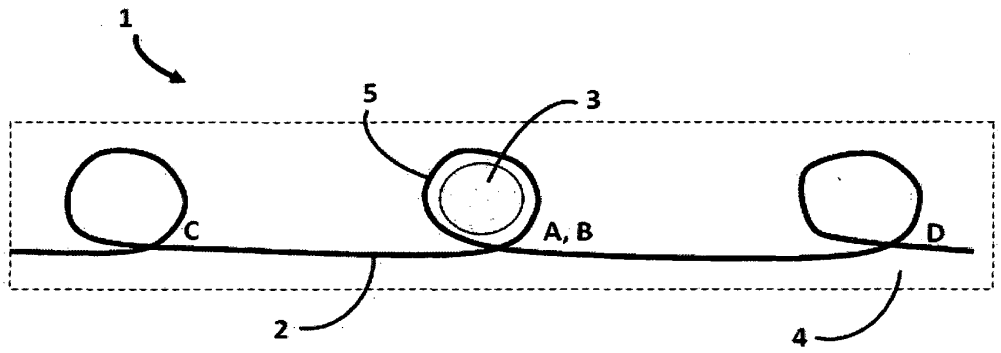


Fig. 2.

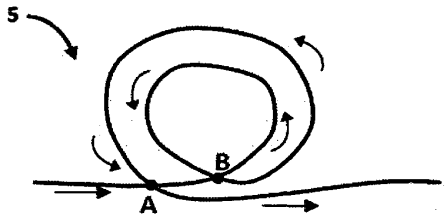
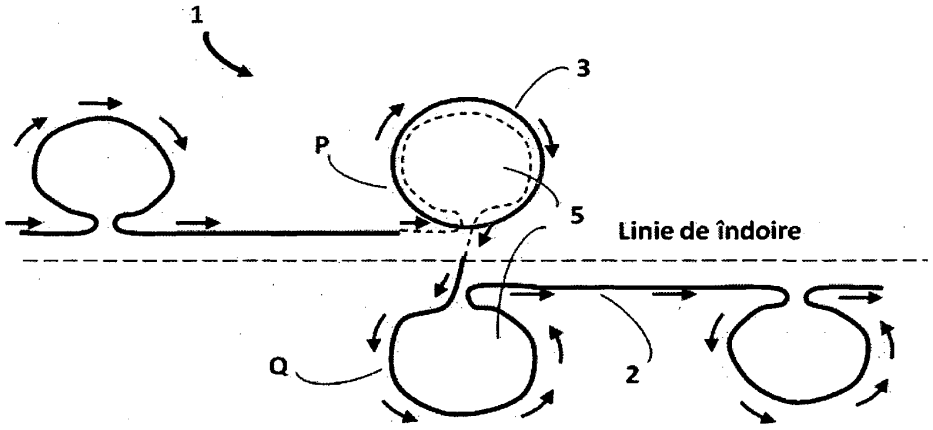


Fig. 3.



CLAIMS

1. An RFID tag **(1)** for use in harsh environments comprising a UHF-SHF antenna **(2)** made of an textile electroconductive thread, electrically insulated, embroidered on a textile substrate, an RFID transponder **(3)**, and a substrate of textile material **(4)** on which the RFID transponder **(3)** and the UIF-SIF antenna **(2)** are placed, the whole assembly being sealed by hot-dipping of a second textile substrate, wherein the UIF-SIF antenna **(2)** has a central zone formed by a double loop **(5)** by which it inductively couples with the encapsulated IDRF Transponder **(3).**

2. An IDRF tag **(1)** according to claim 1, characterized in that the UIF-SIF antenna **(2)** is made of an electrically insulated electroconductive textile thread, by continuous embroidering, **starting from one end to the other**, and has simple loops in each extremity, and in the central area, a double loop **(5)** consisting of a first loop with a smaller diameter, followed by a second concentric loop with a larger diameter.

3. An IDRF tag **(1)** according to claim 1, characterized in that the UIF-SIF antenna **(2),** does not show electrical contacts at the crossing points C and D in the construction of the loops in the extremities nor in the crossing points A and B of the central double loop **(5)**.

4. An RFID tag **(1)** according to claim 1, characterized in that the UHF-SHF antenna **(2)** is made by continuous embroidering of the electroconductive textile thread in the form of two open loops disposed in a plane superior to the longitudinal direction, and two open loops disposed in a lower plane relative to the same longitudinal axis.

5. An RFID tag **(1)** according to claim 4, characterized in that, in the central area, the upper plane loop **(P)** has a smaller diameter than the loop **(Q)** from the lower plane, the transponder **(3)** being fixed and centered on the loop **(P)** in the superior plane, and the loop (Q) of the lower plane will overlapp the loop (P) by bending over the longitudinal axis, comprising the transponder **(3)** inside between the two planes, this overlap creating the double loop **(5).**

PCT

REQUEST

The undersigned requests that the present international application be processed according to the Patent Cooperation Treaty.

For receiving Office use only

PCT/RO2017/000023

International Application No.

19. December. 2017 (19.12.2017)

International Filing Date

STATE OFFICE FOR INVENTIONS AND TRADEMARKS, ROMANIA

Name of receiving Office and "PCT International Application"

Applicant's or agent's file reference *(if desired) (12 characters maximum)*

Box No. I TITLE OF INVENTION

RFID tag for harsh environment inductively coupled in double loop

Box No. II APPLICANT ☐ This person is also inventor

Name and address: *(Family name followed by given name; for a legal entity, full official designation. The address must include postal code and name of country. The country of the address indicated in this Box is the applicant's State (that is, country) of residence if no State of residence is indicated below.)*

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☒ Further applicants and/or (further) inventors are indicated on a continuation sheet.

Box No. IV AGENT OR COMMON REPRESENTATIVE; OR ADDRESS FOR CORRESPONDENCE

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This person is:
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- ☐ applicant and inventor
- ☒ inventor only *(If this check-box is marked, do not fill in below.)*

Applicant's registration No. with the Office

State *(that is, country)* of nationality: România

State *(that is, country)* of residence: România

This person is applicant for the purposes of: ☐ all designated States ☐ the States indicated in the Supplemental Box

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This person is:
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- ☐ applicant and inventor
- ☒ inventor only *(If this check-box is marked, do not fill in below.)*

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State *(that is, country)* of nationality: România

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This person is:
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State *(that is, country)* of residence:

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- ☐ applicant and inventor
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☐ Further applicants and/or (further) inventors are indicated on another continuation sheet.

Box No. V DESIGNATIONS

The filing of this request **constitutes under Rule 4.9(a) the designation** of all Contracting States bound by the PCT on the international filing date, for the grant of every kind of protection available and, where applicable, for the grant of both regional and national patents.

However,

☐ DE Germany **is not designated** for any kind of national protection

☐ JP Japan **is not designated** for any kind of national protection

☐ KR Republic of Korea **is not designated** for any kind of national protection

(The check-boxes above may only be used to exclude (irrevocably) the designations concerned if, at the time of filing or subsequently under Rule 26bis.1, the international application contains in Box No. VI a priority claim to an earlier national application filed in the particular State concerned, in order to avoid the ceasing of the effect, under the national law, of this earlier national application.)

Box No. VI PRIORITY CLAIM AND DOCUMENT

The priority of the following earlier application(s) is hereby claimed:

Filing date of earlier application *(day/month/year)*	Number of earlier application	Where earlier application is:		
		national application: country or Member of WTO	regional application: regional Office	international application: receiving Office
item (1) 16/06/2017	a 2017 00388	România		
item (2)				
item (3)				

☐ Further priority claims are indicated in the Supplemental Box.

Furnishing the priority document(s):

☒ The **receiving Office** is requested to prepare and transmit to the International Bureau a certified copy of the earlier application(s) *(only if the earlier application(s) was filed with the receiving Office which, for the purposes of this international application, is the receiving Office)* identified above as:

☐ all items ☒ item (1) ☐ item (2) ☐ item (3) ☐ other, see Supplemental Box

☐ The **International Bureau** is requested to obtain from a digital library a certified copy of the earlier application(s) identified above, using, where applicable, the access code(s) indicated below *(if the earlier application(s) is available to it from a digital library)*:

☐ item (1) access code _____ ☐ item (2) access code _____ ☐ item (3) access code _____ ☐ other, see Supplemental Box

Restore the right of priority: the receiving Office is requested to restore the right of priority for the earlier application(s) identified above or in the Supplemental Box as item(s) (_____). *(See also the Notes to Box No. VI; further information **must** be provided to support a request to restore the right of priority.)*

Incorporation by reference: where an element of the international application referred to in Article 11(1)(iii)(d) or (e) or a part of the description, claims or drawings referred to in Rule 20.5(a) is not otherwise contained in this international application but is completely contained in an earlier application whose priority is claimed on the date on which one or more elements referred to in Article 11(1)(iii) were first received by the receiving Office, that element or part is, subject to confirmation under Rule 20.6, incorporated by reference in this international application for the purposes of Rule 20.6.

Box No. VII INTERNATIONAL SEARCHING AUTHORITY

Choice of International Searching Authority (ISA) *(if more than one International Searching Authority is competent to carry out the international search, indicate the Authority chosen; the two-letter code may be used)*:

ISA/ EP

Continuation of Box No. VII USE OF EARLIER SEARCH AND CLASSIFICATION RESULTS

1. Request by the applicant under Rule 4.12

1.1 ☒ The ISA indicated in Box No. VII **is requested to take into** account **the results of the earlier search(es)** indicated below (*see also Notes to Continuation of Box No. VII, item 1: use of results of more than one earlier search*)

Filing date *(day/month/year)*	Application Number	Country *(or regional Office)*
16/06/2017	a 2017 00388	România

☐ **Statement (Rule 4.12(ii)):** this international application is the same, or substantially the same, as the application in respect of which the earlier search was carried out except, where applicable, that it is filed in a different language.

1.2 **Submission of the earlier search results, where necessary***

☐ **Availability of documents (Rules 12*bis*.1(c) and (d) and 12*bis*.2(b)):** the following documents **are available to the ISA** in a form and a manner acceptable to it, and therefore **DO NOT need** to be submitted by the applicant to the receiving Office, or to the ISA.

- ☐ a copy of the results of the earlier search,
- ☐ a copy of the earlier application,
- ☐ a translation of the earlier application into a language which is accepted by the ISA,
- ☐ a translation of the results of the earlier search into a language which is accepted by the ISA,
- ☐ a copy of any document cited in the earlier search results *(if known, please indicate below the documents available to the ISA)*:

☐ **Request from the applicant to the receiving Office to transmit to the ISA a copy of the earlier search results (Rule 12*bis*.1(b) and (d)):** (*where the earlier search **was not** carried out by the ISA indicated in Box No. VII **but** by the **same Office** as that which is acting as receiving Office; or where the earlier search results are otherwise **available** to the receiving Office*): the applicant **requests** the receiving Office **to prepare and transmit** to the ISA a copy of the earlier search results.

* The applicant **only** needs to furnish a copy of the earlier search results to the receiving Office, or the ISA, if none of the scenarios mentioned under item 1 applies. (*See item 10 in the check-list and also Notes to Continuation of Box No. VII, item 1*).

☐ Further earlier searches are indicated on a continuation sheet.

2. Transmission of the earlier search and classification results to the ISA by the receiving Office where the applicant DID NOT make a request under Rule 4.12

2.1 Where the international application claims priority of an earlier application, subject to Article 30(2)(a) and (3), **the receiving Office**:

- **shall transmit** a copy of the earlier search and classification results to the ISA (unless such copy is already available to the ISA), where the earlier application was filed with the **same Office** as that which is acting as **the receiving Office and** that Office **has carried out** the earlier search in respect of the earlier application (Rule 23*bis*.2(a));
- **may transmit** such a copy if the earlier application was filed with a different Office, but where the results of that earlier search and classification are nevertheless available to the receiving Office (Rule 23*bis*.2(c)).

However, where the applicant did not request the receiving Office to transmit to the ISA a copy of the earlier search results under Rule 4.12 (see above item 1), in respect of an earlier search carried out on the following earlier application, the priority of which is subsequently claimed in this international application, the applicant may consider (*see also Notes to Continuation of Box No. VII, item 2: use of more than one earlier search*):

Filing date *(day/month/year)*	Application Number	Country *(or regional Office)*

2.2 **Request not to transmit the earlier search results by the receiving Office to the ISA (Rule 23*bis*.2(b))**

☐ to **request** that the receiving Office **DOES NOT transmit** the results of the earlier search to the ISA (Rule 23*bis*.2(b)) (*may only be checked where the international application is filed with the following receiving Offices: DE, FI and SE*)

2.3 **Authorization to transmit the earlier search and classification results by the receiving Office to the ISA (Rule 23*bis*.2(a) and (e))**

☐ to **authorize** the receiving Office **to transmit** the results of the earlier search and classification to the ISA (Rule 23*bis*.2(e)) (*may only be checked where the international application is filed with the following receiving Offices: AU, CH, CZ, FI, HU, IL, JP, NO, SE, SG and US*)

☐ to **authorize** the receiving Office **to transmit** the results of the earlier international search and classification to the ISA (Rule 23*bis*.2(a) and Article 30(2)(a) and (3)) (*may only be checked where the earlier search concerns an **international application**, the priority of which is subsequently claimed in this international application and where the earlier international search was carried out by a **different** ISA than the ISA chosen in Box No. VII*)

☐ Further earlier searches are indicated on a continuation sheet.

Box No. VIII DECLARATIONS

The following **declarations** are contained in Boxes Nos. VIII (i) to (v) *(mark the applicable check-boxes below and indicate in the right column the number of each type of declaration)*:			Number of declarations
☐	Box No. VIII (i)	Declaration as to the identity of the inventor :	
☐	Box No. VIII (ii)	Declaration as to the applicant's entitlement, as at the international filing date, to apply for and be granted a patent :	
☐	Box No. VIII (iii)	Declaration as to the applicant's entitlement, as at the international filing date, to claim the priority of the earlier application :	
☐	Box No. VIII (iv)	Declaration of inventorship (only for the purposes of the designation of the United States of America) :	
☐	Box No. VIII (v)	Declaration as to non-prejudicial disclosures or exceptions to lack of novelty :	

Sheet No. 5

Box No. IX CHECK LIST for PAPER filings – this sheet is only to be used when filing an international application on **PAPER**

This international application **contains the following**:	Number of sheets
(a) request form PCT/RO/101 (including any declarations and supplemental sheets) :	5
(b) description (excluding any sequence listing part of the description, see (f), below) :	6
(c) claims :	1
(d) abstract :	1
(e) drawings (if any) :	1
(f) sequence listing part of the description (if any) :	
Total number of sheets :	14

This international application is **accompanied by** the following item(s) *(mark the applicable check-boxes below and indicate in right column the number of each item)*:	Number of items
1. ☐ fee calculation sheet :	
2. ☐ original separate power of attorney :	
3. ☐ original general power of attorney :	
4. ☐ copy of general power of attorney; reference number: :	
5. ☐ priority document(s) identified in Box No. VI as item(s) :	
6. ☐ Translation of international application into *(language)*: ENGLISH :	
7. ☐ separate indications concerning deposited microorganism or other biological material :	
8. ☐ *(only where item (f) is marked in the left column)* copy in electronic form (Annex C/ST.25 text file) on physical data carrier(s) of the sequence listing, not forming part of the international application, which is **furnished only for the purposes of international search** under Rule 13*ter* *(type and number of physical data carriers)* :	
9. ☐ *(only where item (f) (in the left column) and item 8 (above) are marked)* a statement confirming that "the information recorded in electronic form submitted under Rule 13*ter* is identical to the sequence listing as contained in the international application" as filed on paper :	
10. ☐ copy of results of earlier search(es) (Rule 12*bis*.1(a)) :	
11. ☐ other *(specify)*: :	

Figure of the drawings which should accompany the abstract:	1	**Language of filing** of the international application:	ro

Box No. X SIGNATURE OF APPLICANT, AGENT OR COMMON REPRESENTATIVE

Next to each signature, indicate the name of the person signing and the capacity in which the person signs (if such capacity is not obvious from reading the request).



For receiving Office use only

1. Date of actual receipt of the purported international application:	19 - December, 2017 (19.12.2017)	2. Drawings: ☒ received:
3. Corrected date of actual receipt due to later but timely received papers or drawings completing the purported international application:		
4. Date of timely receipt of the required corrections under PCT Article 11(2):		☐ not received:
5. International Searching Authority (if two or more are competent): ISA /EP	6. ☐ Transmittal of search copy delayed until search fee is paid	

For International Bureau use only

Date of receipt of the record copy by the International Bureau:

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

(19) World Intellectual Property Organization
International Bureau

(43) International Publication Date
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19 December 2017 (19.12.2017)

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(26) Publication Language: English

(30) Priority Data:
a 2017 00388 16 June 2017 (16.06.2017) RO

(71) Applicant: **PROMAR TEXTIL INDUSTRIES SRL** [RO/RO]; str. Lanurilor, nr.1A, Brasov (RO).

(72) Inventors: **MORARU, Aurelian**; str. Crisului, nr 14, bl. D14, sc. E, ap.11, Mun. Brasov, jud. Brasov (RO). **URSACHI, Corneliu**; str. Nicolae Titulesc, nr .37, bl. 7, sc. B, ap. 16, Mun. Brasov, Jud. Brasov (RO).

(74) Agent: **WEIZMANN ARIANA & PARTNERS AGENTIE DE PROPRIETATE INTELLECTUALA S.R.L.**; Str. 11 Iunie, nr. 51, sc. A, Etaj 1, ap. 4, sector 4, 040171 Bucuresti (RO).

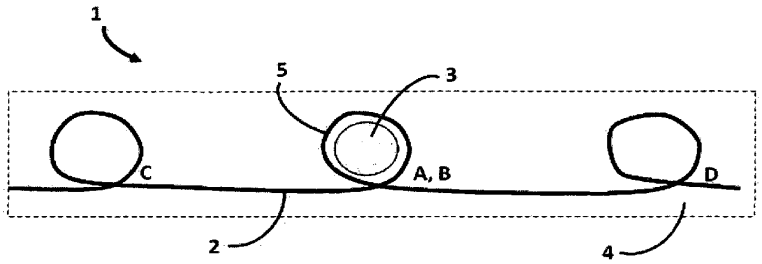
(81) Designated States *(unless otherwise indicated, for every kind of national protection available)*: AE, AG, AL, AM, AO, AT, AU, AZ, BA, BB, BG, BH, BN, BR, BW, BY, BZ, CA, CH, CL, CN, CO, CR, CU, CZ, DE, DJ, DK, DM, DO, DZ, EC, EE, EG, ES, FI, GB, GD, GE, GH, GM, GT, HN, HR, HU, ID, IL, IN, IR, IS, JO, JP, KE, KG, KH, KN, KP, KR, KW, KZ, LA, LC, LK, LR, LS, LU, LY, MA, MD, ME, MG, MK, MN, MW, MX, MY, MZ, NA, NG, NI, NO, NZ, OM, PA, PE, PG, PH, PL, PT, QA, RO, RS, RU, RW, SA, 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, ST, 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, KM, ML, MR, NE, SN, TD, TG).

Published:
— *with international search report (Art. 21(3))*
— *with amended claims and statement (Art. 19(1))*

(54) Title: RFID TAG FOR HARSH ENVIRONMENT INDUCTIVELY COUPLED IN DOUBLE LOOP

Fig. 1 .



(57) Abstract: The invention relates to an IDRF label for use in aggressive environments. The IDRF label (1) according to the invention comprises a UIF-SIF (2) antenna made of an electrically conductive textile, electrically insulated, embroidered on a textile backing, an IDRF transponder (3) and a textile substrate (4) and the UIF-SIF antenna (2), the whole assembly being sealed by hot-dipping a second textile substrate, wherein the UIF-SIF (2) antenna has a central loop formed by a loop (5) by which it inductively couples with the encapsulated IDRF transponder 3.

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PCT /RO2017/000023

ROMÂNIA

OFICIUL DE STAT PENTRU INVENȚII ȘI MĂRCI

CERTIFICAT DE PRIORITATE

Solicitant: PROMAR TEXTIL S.R.L., BRAŞOV, BV, RO

Cerere de brevet de invenţie nr.: a 2017 00388

Data de depozit: 16/06/2017

Titlul invenţiei: ETICHETĂ IDRF PENTRU MEDII AGRESIVE CU CUPLAJ INDUCTIV ÎN BUCLĂ DUBLĂ

Certificăm că documentaţia anexată, în număr de 6 file, este copia descrierii, revendicărilor şi desenelor din cererea de brevet de invenţie aşa cum a fost depusă la Oficiul de Stat pentru Invenţii şi Mărci.

Confirm cele de mai sus prin semnarea şi aplicarea sigiliului
Director General

OSIM

CERERE DE BREVET DE INVENTIE

OSIM

Nr. referinta solicitant/mandatar	Registratura OSIM (numarul si data primirii):
	a 2017 00388 16 -06- 2017

Se completeaza de catre OSIM	
Numarul cererii de brevet de inventie	a 2017 00388
Data primirii la Registratura Generala a OSIM	
Data de depozit	16 -06- 2017
Data primirii partii lipsa la Registratura Generala a OSIM	
Data de depozit după primirea părţii lipsă la Registratura Generală a OSIM	
Data primirii cererii de retragere a partii lipsa la Registratura Generala a OSIM	
Data de depozit atribuita cererii de brevet	

1.Solicitanţi (nume şi prenume/denumire,adresă de domiciliu/sediu,telefon, fax, e- mail)

S.C. PROMAR TEXTIL S.R.L.

ROMANIA, BRASOV, BRASOV, STRADA LANURILOR, NR. 1

☐ continuare pe pag.3

2. Solicitam în baza Legii nr. 64/1991 privind brevetele de invenţie, republicată, modificată prin Legea nr.83/2014 privind invenţiile de serviciu acordarea unui brevet de invenţie cu titlul: **Etichetă IDRF pentru medii agresive cu cuplaj inductiv în buclă dublă**

2.1. Solicitantul este îndreptăţit la depunerea cererii de brevet de invenţie în baza :

- ☐ Legii nr. 64/1991 privind brevetele de invenţie, republicată;
- ☐ Legii nr.83/2014 privind invenţiile de serviciu.
- ☐ unui contract de cercetare

2.2. Referinta la o cerere depusă anterior (numar, data de depozit, tara/oficiul):

3. **Declarăm că inventatorii sunt cei desemnaţi în formularul „ Declaraţie conţinând desemnarea inventatorilor"** X - anexat ☐ care va fi transmis ulterior

4. Rezumatul invenţiei se publică împreună cu figura numarul:

5. Revendicăm prioritatea convenţională (stat, numar, data depozit):

6. Revendicăm prioritatea internă (numar cerere de brevet, data depozit):

FORM. B 01 - citiţi Ghidul de completare

7. Cererea de brevet este:

- ☐ divizionara din cererea de brevet (numar, data depozit):
- ☐ transformată din cererea de brevet european (nr., data de depozit)
- ☐ rezultată din conversia unei cereri de înregistrare a unui model de utilitate (nr. cerere înreg, dată depozit)

8. La data depunerii cererii solicităm următoarele proceduri:

8.1. Publicarea de urgenţă a cererii de brevet de invenţie	☐
8.2. Întocmirea unui raport de documentare	☐
8.3. Întocmirea unui raport de documentare cu opinie scrisă privind brevetabilitatea	☐
8.4. Examinarea cererii cerută la data de depozit	☐

9. Mandatar autorizat (denumire, sediu) : WEIZMANN ARIANA & PARTNERS AGENTIE DE PROPRIETATE INTELECTUALA, prin consilier VIOLETA BOZOCEA
ROMANIA, Bucuresti, BUCURESTI, Str. 11 Iunie Nr. 51, Sc. A, Et. 1, Ap. 4, Sector 4
prin ☐ procura ; sau X - procura generală (nr, dată): 31.10.2016

10. Solicitantul/reprezentantul desemnat de solicitant (nume, prenume / denumire, adresă/ sediu) pentru corespondenţa cu OSIM: WEIZMANN ARIANA & PARTNERS AGENTIE DE PROPRIETATE INTELECTUALA
ROMANIA, Brasov, BRASOV, B-dul Mihail Kogalniceanu, Nr. 17, Bl. C4, et. 7

11. Semnătură solicitanţi/mandatar autorizat:
Semnătură
L.S. Data 15.06.2017

12. Documente depuse la OSIM de solicitant/mandatar			**14.** Documente primite la OSIM	
12.1. Formular de cerere	în 3 exemplare, a 2 file	X	în 3 exemplare, a 2 file	☑
12.2. Descriere	în 3 exemplare, a 3 file	X	în 3 exemplare, a 4 file	☑
12.3. Revendicari	în 3 exemplare, a 1 file	X	în 3 exemplare, a 1 file	☑
12.4. Desene	în 3 exemplare, a 1 file	X	în 3 exemplare, a 1 file	☑
12.5. Rezumat	în 3 exemplare, a 1 file	X	în 3 exemplare, a 1 file	☑
12.6. Lista de secvente de nucleotide si/sau aminoacizi, parte a descrierii		☐		☐
12.6.1. pe suport hârtie	în ....exemplare, a .... file	☐	în ....exemplare, a .... file	☐
12.6.2. pe suport electronic	tip .... , în .... exemplare	☐	tip..... , în ....exemplare	☐
12.7. Actul din care rezultă dreptul la acordarea brevetului		☐		☐
12.8. Declaraţia conţinând desemnarea inventatorilor	a 1 file	X	a 1 file	☑
12.9. Procura/copie procura generala	a 1 file	X	a 1 file	☑
12.10. Document referitor la plata taxelor	a 1 file	X	a 1 file	☑
12.11. Act privind solicitarea reducerii taxelor	a .... file	☐	a .... file	☐
12.12. Autorizatia privind transmiterea dreptului de prioritate	a .... file	☐	a .... file	☐
12.13. Act de prioritate	a .... file	☐	a .... file	☐
12.14. Act referitor la depozitul microorganismului/materialului biologic		☐	a .... file	☐
12.15. Document privind o divulgare a inventiei	a ...file	☐	a .... file	☐
12.16. Copie/traducere a cererii anterioare de la rubrica 2.2.	a....file	☐	a .... file	☐
12.17. Alte documente	a ....file	☐	a 1 file	☑

13. Persoana care a depus cererea, alta decât solicitantul, mandatarul (nume, prenume, act identitate) :

Confirmare OSIM (nume, prenume şi dată)
L.S.

REFERENT BRÂNDUŞA TĂRNĂUCEANU

OFICIUL DE STAT PENTRU INVENŢII ŞI MĂRCI * ROMANIA * OSIM 213

FORM. B 01 - citiţi Ghidul de completare

Declaraţie

conţinand desemnarea inventatorilor invenţiei cu titlul:

Etichetă IDRF pentru medii agresive

cu cuplaj inductiv în buclă dublă

care face obiectul cererii de brevet cu ..... şi data de depozit .....

Aceasta declaraţie este făcută si depusă la OSIM până la data luării unei hotărâri privind cererea de brevet de inventie

*Semnatura:*_____ *Data: 15.06.2017*

L.S. _____

PROMAR TEXTIL SRL

Nume si prenume: MORARU AURELIAN

Adresa de domiciliu ROMANIA, BRASOV, BRASOV, STR CRISULUI NR 14, BL D14, SC E, AP 11

Locul de munca la data crearii inventiei: PROMAR TEXTIL SRL

Nume si prenume: _URSACHI CORNELIU

Adresa de domiciliu___ROMANIA, BRASOV, BRASOV STR NICOLAE TITULESCU, NR 37, BL 7, SC B, ET 3, AP 16

Locul de munca la data crearii inventiei:___ PROMAR TEXTIL SRL

Semnatura solicitantului sau a mandatarului autorizat *(numele si prenumele precum si calitatea persoanei cu capacitate de reprezentare a solicitantului sau a mandatarului autorizat):*

WEIZMANN ARIANA & PARTNERS AGENTIE DE PROPRIETATE INTELECTUALA, prin consilier VIOLETA BOZOCEA

_____

*Semnatura:*_____ *Data: 15.06.2017*

L.S. _____

OFICIUL DE STAT PENTRU INVENȚII ȘI MĂRCI
Cerere de brevet de invenție
Nr. a 2017 00 388
Data depozit 16 -06- 2017

Etichetă IDRF pentru medii agresive cu cuplaj inductiv în buclă dublă

DESCRIERE

[0001] Un sistem de identificare prin radio frecvență (IDRF) minimal este compus dintr-un cititor-interogator conectat la un PC și o populație de etichete sau taguri atașate produselor pe care le identifică în mod unic. Un software de aplicație gestionează informația IDRF în scopul urmăririi și inventarierii acestor produse. Sunt utilizate etichete IDRF pasive care funcționează în domeniul de frecvență UIF(860-960MHz) sau SIF(2,45GHz).

[0002] În ceea ce privește articolele textile identificate IDRF care sunt întreținute în spălătoriile și curățătoriile industriale, solicitările la care sunt supuse acestea și implicit etichetele atașate sunt următoarele:

- introducere repetată în mediu acvatic,
- temperaturi de spălare de până la 90°C, mai mult de 20 minute,
- variații mari de temperatură - rece/fierbinte (8°C/90°C),
- agenți chimici utilizați în procedurile de spălare,
- presiuni de stoarcere de 40-60 bari,
- temperaturi de finisare/călcare de 220°C, 20 secunde.
- solicitări mecanice (indoiri, presări etc) repetate,
- număr de cicluri de spălare mai mare de 200.

[0003] Din punct de vedere istoric, pentru aplicațiile IDRF, mai întâi au fost utilizate etichete IDRF pasive, care funcționau în domenioul IF(13,65MHz). Constructiv, erau alcătuite dintr-un circuit integrat conectat galvanic la o bobină spirală plană cu multe spire. Raza de citire era de sub un metru, iar viteza de citire era de circa o etichetă pe secundă. Odată cu introducerea etichetelor IDRF pasive care operau în domeniul UIF și dezvoltarea protocoalelor de comunicații, performanțele au crescut spectaculos ajungându-se la viteze ridicate de citire (10 etichete IDRF/s) și distanțe de citire de până la 7m.

[0004] Pentru aplicațiile destinate urmăririi textilelor a fost adoptat pe scară largă designul unei etichete IDRF compusă dintr-un trasponder capsulat, protejat astfel de mediului agresiv al spălătoriilor industriale, și dintr-o antenă UIF din fir metalic. Transponderul capsulat conține un circuit integrat și o antenă de câmp apropiat prin care este cuplat inductiv la un segment al antenei UIF.

[0005] În această categorie se încadrează etichetele UIF IDRF, obiect al brevetelor EP 2405054 A1, DE 102007026720 A1, US 20090079574 A1.

[0006] Dar chiar și acest design are limitele sale. Se reușește prin capsulare, protejarea contactelor dintre pinii circuitului integrat (CI) și terminalele antenei de câmp apropiat, dar la nivelul antenei UIF rămân discrepanțe majore relativ la caracteristicile mecanice și termice ale substratului textil față de cele ale firului metalic din care este realizată antena UIF.
Iată o scurtă listă a problemelor apărute la utilizarea acestor taguri în spălătoriile industriale:
-slăbirea cusăturilor și ruperea materialului textil, pe care este fixată eticheta IDRF,
-firul metalic din care este realizată antena UHF oxidează în contact cu apa și substanțele chimice oxidante utilizate în procesul de spălare, pătează materialul textil și compromite aspectul acestuia. De asemenea în urma oxidării sunt modificați parametrii electrici ai

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materialului antenei și implicit performanțele electromagnetice.
-materialul firului metalic din care este realizată antena înmagazinează mult mai multă energie termică decât suportul textil, această diferență ducând la străpungerfea, perforarea materialului textil de către firul metalic al antenei care iese în afara acestuia.
Acestea duc la desprinderea transponderului IDRF capsulat **3** și prin urmare la pierderea identității obiectelor textile monitorizate, la probleme de aspect al articolului textil, dar mai ales probleme pentru clienți, respectiv rănirea lor la utilizarea articolului textil (prosoape, fețe de pernă, cearceafuri) care a fost străpuns de firul metalic.
Totodată tagurile UIF actuale au dimensiuni considerabile care fac nepotrivită, inestetică utilizarea lor pentru identificarea articolelor de mici dimensiuni (șervete de masă).

[0007] Eticheta IDRF pasivă ideală pentru identificarea articolelor textile a căror întreținere se face în spălătorii și curățătorii chimice este:
- performantă din punct de vedere electromagnetic(distanță de citire mare),
- de dimensiuni mici,
- flexibilă și rezistentă la îndoire,
- rezistentă la stres chimic,
- rezistentă la un număr de expuneri mai mare decât produsul pe care îl identifică;la peste 200 de cicluri de spălare.

Așadar o etichetă IDRF performantă din punct de vedere electromagnetic, rezistentă și discretă.
[0008] Căile de apropiere de acest prototip ideal sunt:
- utilizarea unor materiale de capsulare care să protejeze eficient, la nivelul transponderului, circuitul integrat și contactele acestuia cu antena de câmp apropiat,
- proiectarea unei geometri a antenei UIF care să-i confere proprietăți electromagnetice superioare și în același timp să aibă dimensiuni cât mai reduse,
- la construcția antenei UIF să fie utilizate materiale electro conductoare cu parametrii mecanici apropiați articolului textil,
- componentele tagului care sunt în interacțiune directă, să aibă coeficienți de dilatare termică apropiați.

[0009] Antenele UIF ale etichetelor IDRF existente pe piață sunt realizate din fir metalic izolat electric, fixat pe un suport textil prin coasere sau brodare. Ele au formă de meandre(EP 2405054 A1), sau bucle încălecate(WO 2013128299 A1). Toate prezintă vulnerabilitățile și limitările descrise la paragraful [0006].

[0010] Prezentul brevet propune pentru antena UIF fire textile electroconductive realizate din fire metalice, din oțel inox, care rezistă la acțiunea agenților oxidanți. Prin utilizarea firului textil electroconductiv la realizarea antenei UIF, dată fiind flexibilitatea sa, firul textil electroconductiv, permite realizarea unor geometri imposibil de realizat cu un fir metalic izolat electric. Devine posibilă realizarea unor curbe cu rază foarte mică fără a crea tensiuni mecanice în structura tagului. De asemenea antena UIF realizată din fir textil electroconductiv este foarte discretă, nici nu se simte, se integrează natural în materialul textil al produsului pe care îl identifică.

[0011] Antena UIF **2** are o geometrie particulară, inovativă, caracterizată prin aceea că are în zona centrală o buclă dublă **5** prin care este realizat un cuplaj inductiv eficient cu transponderul IDRF capsulat **3**, obținându-se astfel o eticheta IDRF performantă din punct de vedere electromagnetic.

[0012] De asemenea bucla dublă **5** permite realizarea unei etichete IDRF de dimensiuni reduse,

materialului antenei și implicit performanțele electromagnetice.
-materialul firului metalic din care este realizată antena înmagazinează mult mai multă energie termică decât suportul textil, această diferență ducând la străpungerfea, perforarea materialului textil de către firul metalic al antenei care iese în afara acestuia.
Acestea duc la desprinderea transponderului IDRF capsulat **3** și prin urmare la pierderea identității obiectelor textile monitorizate, la probleme de aspect al articolului textil, dar mai ales probleme pentru clienți, respectiv rănirea lor la utilizarea articolului textil (prosoape, fețe de pernă, cearceafuri) care a fost străpuns de firul metalic.
Totodată tagurile UIF actuale au dimensiuni considerabile care fac nepotrivită, inestetică utilizarea lor pentru identificarea articolelor de mici dimensiuni (șervete de masă).

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- performantă din punct de vedere electromagnetic(distanță de citire mare),
- de dimensiuni mici,
- flexibilă și rezistentă la îndoire,
- rezistentă la stres chimic,
- rezistentă la un număr de expuneri mai mare decât produsul pe care îl identifică;la peste 200 de cicluri de spălare.
Așadar o etichetă IDRF performantă din punct de vedere electromagnetic, rezistentă și discretă.
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- proiectarea unei geometri a antenei UIF care să-i confere proprietăți electromagnetice superioare și în același timp să aibă dimensiuni cât mai reduse,
- la construcția antenei UIF să fie utilizate materiale electro conductoare cu parametrii mecanici apropiați articolului textil,
- componentele tagului care sunt în interacțiune directă, să aibă coeficienți de dilatare termică apropiați.

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[0011] Antena UIF **2** are o geometrie particulară, inovativă, caracterizată prin aceea că are în zona centrală o buclă dublă **5** prin care este realizat un cuplaj inductiv eficient cu transponderul IDRF capsulat **3**, obținându-se astfel o eticheta IDRF performantă din punct de vedere electromagnetic.

[0012] De asemenea bucla dublă **5** permite realizarea unei etichete IDRF de dimensiuni reduse,

discretă și ușor de integrat chiar și în articole textile de mici dimensiuni.

[0013] Antena UIF a etichetei pasive IDRF poate fi realizată în două variante Fig. **2** și Fig. **3**. La prima variantă, Fig. **2**, firul textil electroconductiv este izolat electric și permite încălecarea firului în anumite puncte (A, B, C, D) fără contact electric. Pentru a doua variantă, Fig. **3**, geometria antenei UIF permite și utilizarea unui fir textil electroconductiv neizolat. Ambele variante sunt realizate prin broadare.

[0014] În prima variantă constructivă, Fig. **2**, bucla dublă **5** a antenei UIF **2** prin care este realizat cuplajul inductiv cu transponderul IDRF capsulat **3,** este o spirală cu două spire, (în care prima spiră are diametrul de 7mm, iar cea de-a doua are un diametru de 9mm), geometrie care a creat o antenă UHF eficientă din punct de vedere al transferului de putere și al asigurării integrității informației, și permite dimensiuni constructive substanțial reduse. În punctele A, B, C, și D nu există contact electric.

[0014] În a doua variantă constructivă a antenei UIF, Fig. **3**, desenul broderiei e realizat astfel încât firul textil electroconductiv să fie brodat continuu, fără să se încrucișeze pe parcurs.
După realizarea broderiei, prin îndoirea pe linia punctată și suprapunerea celor două bucle P și Q, se va forma bucla dublă. Bucla P are diametrul de 7mm iar bucla Q are diametrul de 9mm. Se observă că, după îndoire și suprapunere, curenții în cele două bucle au același sens, contribuind împreună la realizarea unui cuplaj inductiv eficient. Înainte de îndoire intre cele două planuri P și Q se va fixa cu adeziv pe bucla P, transponderul capsulat **3**. După îndoire și suprapunere transponderul capsulat **3** va fi fixat între cele două bucle, Pși Q.

[0015] Prezentul Brevet de invenție vine în completarea brevetului de invenție nr **a 2016 00791**, care propunea un Transponder IDRF destinat funcționării în medii agresive. Transponderul IDRF, era descris ca fiind proiectat să poată fi utilizat atât independent, în cazul aplicațiilor IDRF pentru care distnța de citire este de ordinul centimetrilor, cât și împreună cu o antenă UIF-SIF, în cazul aplicațiilor IDRF pentru care distnța de citire este de ordinul metrilor.

[0016]Designul prezentului tag, prin înglobarea în structura sa a transponderului capsulat **3**, obiect al brevetului **a 2016 00791** depășește problemele create de discrepanțele dimensionale dintre minusculele CI și antenele la care sunt conectate galvanic, conectare care necesită utilizarea unor tehnologii de conectare scumpe(wire bonding) sau inadecvate mediului agresiv din spălătoriile industriale(lipire cu adezivi conductori).

[0017] Designul tagului caută o dreaptă măsură relativ dimensiunile obiectelor pe care le identifică și dimensiunile tagului. Nu cade în plasa miniturizării excesive când nu este cazul.

[0018] Este propus un design maximal- maximul realizabil cu componenetele disponibile la ora actuală, păstrând măsura.
- transponder cu număr minim de contacte galvanice, două, egal cu numărul pinilor IC, contacte galvanice robuste prin utilizarea unui CI în carcasă SOT323, sudat în tehnologie SMT ieftină și matură, la terminalele antenei de câmp apropiat, capsulat și protejat astfel la mediul agresiv din spălătoriile industriale,
- cuplaj inductiv între transponderul capsulat 3 și antena UIF,
- omogenitatea componenetelor ansmblului antena UIF-substrat textil, ambele din material textil,
- lungime substanțial redusă a tagului prin utilizarea buclei duble a antenei UIF.
- Tag Născut și nu făcut pentru lumea textilelor prin materialele utlizate (fir textil pe suport textil), și metodele de realizare (brodare a firului textil electroconductiv pe syportul textil).

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REVENDICĂRI

1. O etichetă IDRF **1**, care conține:
   - o antenă UIF **2** cu o geometrie particulară, caracterizată prin aceea că are în zona centrală o buclă dublă **5** prin care este realizat cuplajul inductiv cu Transponderul IDRF capsulat **3**. Antenă UIF 2 este realizată din fir textil electroconductiv, brodat pe suport textil,
   - un Transponder IDRF capsulat destinat funcționării în medii agresive **3**,
   - un substart din material textil **4** pe care sunt plasate Transponderul IDRF pentru medii agresive **3** și Antena UIF **2**. Întregul ansamblu este etanșat prin lipirea la cald a unui al doilea substrat textil

2. Domeniul de frecvență în care poate opera eticheta IDRF 1, este UIF (860-960MHz) sau SIF(2,5GHz RFID).

3. Antena UIF **2** este realizată dintr-un fir textil electroconductiv sau fir metalic izolat, în două variante constructive.

4. În prima variantă constructivă, bucla dublă **5** a antenei UIF **2** prin care este realizat cuplajul inductiv cu Transponderul IDRF capsulat **3,** este o spirală cu două spire, (în care prima spiră are diametrul de 7mm, iar cea de a doua are un diametru de 10mm, geometrie care realizează un transfer de energie electromagnetică eficient, și permite dimensiuni constructive substanțial reduse. În punctele A și B (Fig. 2). nu există contact electric. De asemenea, și buclele din capetele antenei UIF 2, sunt realizate fără contact electric în punctele C și D(Fig. 1).

5. În a doua variantă constructivă antena UIF, desenul broderiei e realizat astfel încât firul textil electroconductiv să fie cusut continuu fără să se încrucișeze pe parcurs. După realizarea broderiei, prin îndoirea pe linia punctată și suprapunerea celor două bucle P și Q, se va forma bucla dublă. Bucla P are diametrul de 7mm iar bucla Q are diametrul de 9mm. Se observă că, după îndoire și suprapunere, curenții în cele două bucle au același sens, contribuind împreună la realizarea unui cuplaj inductiv eficient. Înainte de îndoire, intre cele două planuri P și B se va fixa cu adeziv pe bucla P, transponderul capsulat **3**. După îndoire și suprapunere transponderul capsulat 3 va fi fixat între cele două bucle, Pși Q.

FIGURI

Fig. 1 . Etichetă RFID **1** în buclă dublă **5**

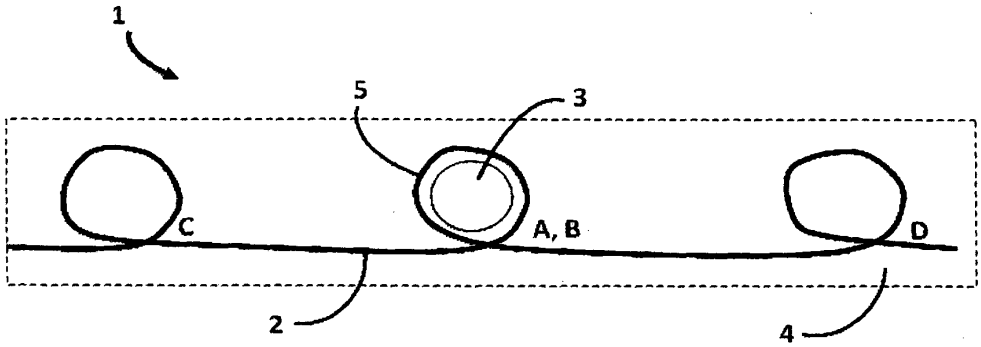


Fig. 2. Detaliu, bucla dublă **5** de cuplaj inductiv cu transponderul IDRF capsulat **3**

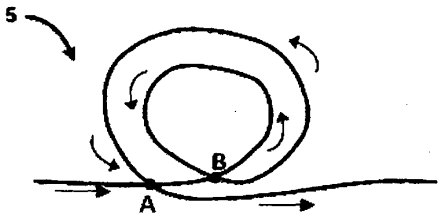
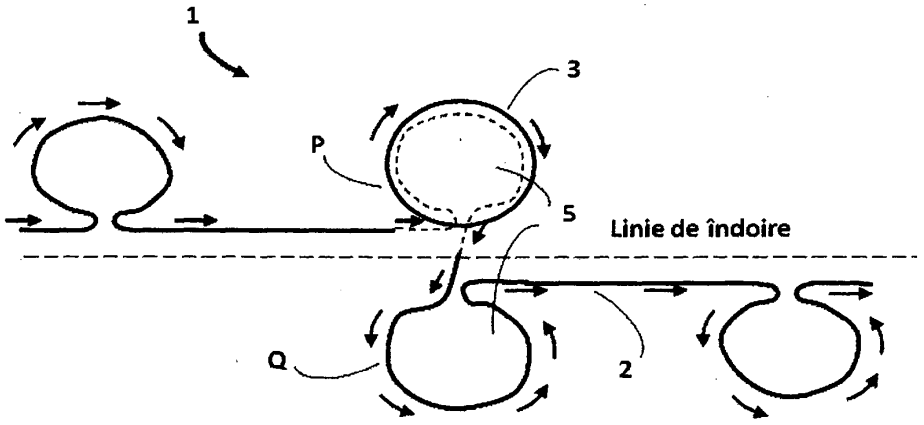


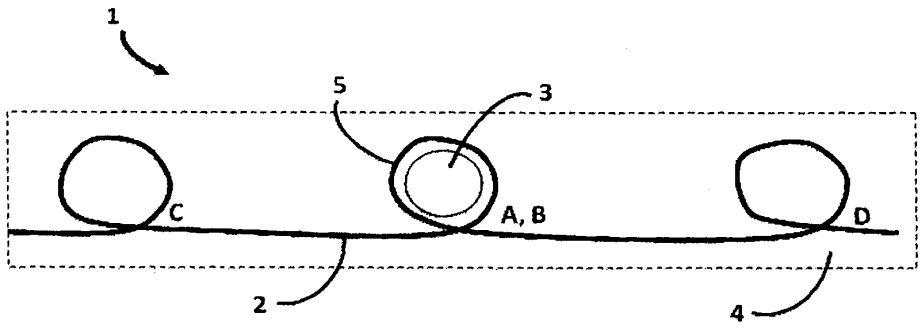
Fig. 3. Etichetă RFID **1** în buclă dublă **5** realizată prin îndoire



REZUMAT

Prezentul Brevet de invenție, se referă la o etichetă IDRF (IDentificare prin Radio Frecvență) **1**, pentru domeniul de frcvență UIF-SIF, proiectatăt să funcționeze în domeniul mediilor industriale agresive. Eticheta IDRF **1**, este compusă dintr-un Transponder IDRF capsulat **3**, cuplat inductiv cu antena UIF **2**, realizată din fir textil electroconductiv, fixată prin brodare pe un substrat de material textil **4**. Antena UIF **2** are o geometrie particulară, caracterizată de o buclă de cuplare inductivă dublă **5**, geometrie care generează un transfer de energie superior și permite realizarea unor etichete IDRF de dimensiuni reduse.

Fig. 1 . Etichetă RFID **1** în buclă dublă **5**



Ursa Ulian

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1211 Geneva 20, Switzerland
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PCT

NOTIFICATION OF THE RECORDING OF A CHANGE

(PCT Rule 92*bis*.1 and Administrative Instructions, Section 422)

To:

WEIZMANN ARIANA & PARTNERS AGENTIE DE PROPRIETATE INTELLECTUALA S.R.L.
Str. 11 Iunie, nr. 51, sc. A
Etaj 1, ap. 4, sector 4
040171 Bucuresti
ROUMANIE

Date of mailing *(day/month/year)*
30 May 2018 (30.05.2018)

Applicant's or agent's file reference

IMPORTANT NOTIFICATION

International application No.
PCT/RO2017/000023

International filing date *(day/month/year)*
19 December 2017 (19.12.2017)

1. The following indications appeared on record concerning:

☒ the applicant ☐ the inventor ☐ the agent ☐ the common representative

Name and Address
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str. Lanurilor, nr.1, Brasov
Romania

State of Nationality: RO
State of Residence: RO
Telephone No.
Facsimile No.
E-mail address

2. The International Bureau hereby notifies the applicant that the following change has been recorded concerning:

☐ the person ☒ the name ☒ the address ☐ the nationality ☐ the residence

Name and Address
PROMAR TEXTIL INDUSTRIES SRL
str. Lanurilor, nr.1A, Brasov
Romania

State of Nationality: RO
State of Residence: RO
Telephone No.
Facsimile No.
E-mail address
☐ Notifications by e-mail authorized

3. Further observations, if necessary:

4. A copy of this notification has been sent to:

☒ the receiving Office
☒ the International Searching Authority
☐ the Authority(ies) specified for supplementary search
☐ the International Preliminary Examining Authority
☐ the designated Offices concerned
☐ the elected Offices concerned
☐ other:

The International Bureau of WIPO
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Form PCT/IB/306 (January 2009) 1/JTV34TNANGXMD0

Doc Code: PA..
Document Description: Power of Attorney

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07610 - P0002A

POWER OF ATTORNEY BY APPLICANT

I hereby revoke all previous powers of attorney given in the application identified in either the attached transmittal letter or the boxes below.

Application Number	Filing Date
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☑ I hereby appoint the Patent Practitioner(s) associated with the following Customer Number as my/our attorney(s) or agent(s), and to transact all business in the United States Patent and Trademark Office connected therewith for the application referenced in the attached transmittal letter (form PTO/AIA/82A) or identified above: 136531

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I am the Applicant (if the Applicant is a juristic entity, list the Applicant name in the box):

PROMAR TEXTIL INDUSTRIES S.R.L.

☐ Inventor or Joint Inventor (title not required below)

☐ Legal Representative of a Deceased or Legally Incapacitated Inventor (title not required below)

☑ Assignee or Person to Whom the Inventor is Under an Obligation to Assign (provide signer's title if applicant is a juristic entity)

☐ Person Who Otherwise Shows Sufficient Proprietary Interest (e.g., a petition under 37 CFR 1.46(b)(2) was granted in the application or is concurrently being filed with this document) (provide signer's title if applicant is a juristic entity)

SIGNATURE of Applicant for Patent

The undersigned (whose title is supplied below) is authorized to act on behalf of the applicant (e.g., where the applicant is a juristic entity).

Signature		Date (Optional)	18.10.2019.
Name	MORARU AURELIAN		
Title	of PROMAR TEXTIL INDUSTRIES S.R.L.		

NOTE: Signature - This form must be signed by the applicant in accordance with 37 CFR 1.33. See 37 CFR 1.4 for signature requirements and certifications. If more than one applicant, use multiple forms.

☐ Total of forms are submitted.

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DECLARATION (37 CFR 1.63) FOR UTILITY OR DESIGN APPLICATION USING AN APPLICATION DATA SHEET (37 CFR 1.76)

Title of Invention	RFID TAG FOR HARSH ENVIRONMENT INDUCTIVELY COUPLED IN DOUBLE LOOP

As the below named inventor, I hereby declare that:

This declaration is directed to:

- [x] The attached application, or
- [ ] United States application or PCT international application number _____ filed on _____.

The above-identified application was made or authorized to be made by me.

I believe that I am the original inventor or an original joint inventor of a claimed invention in the application.

I hereby acknowledge that any willful false statement made in this declaration is punishable under 18 U.S.C. 1001 by fine or imprisonment of not more than five (5) years, or both.

WARNING:

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LEGAL NAME OF INVENTOR

Inventor: Aurelian MORARU Date (Optional): 18.10.2019

Signature: _____

Note: An application data sheet (PTO/SB/14 or equivalent), including naming the entire inventive entity, must accompany this form. Use an additional PTO/AIA/01 form for each additional inventor.

This collection of information is required by 35 U.S.C. 115 and 37 CFR 1.63. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.11 and 1.14. This collection is estimated to take 1 minute to complete, including gathering, preparing, and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, VA 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. **SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.**

If you need assistance in completing the form, call 1-800-PTO-9199 and select option 2.

PTO/AIA/01 (06-12)
Approved for use through 01/31/2014. OMB 0651-0032
U.S. Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE
Under the Paperwork Reduction Act of 1995, no persons are required to respond to a collection of information unless it displays a valid OMB control number.

DECLARATION (37 CFR 1.63) FOR UTILITY OR DESIGN APPLICATION USING AN APPLICATION DATA SHEET (37 CFR 1.76)

Title of Invention	RFID TAG FOR HARSH ENVIRONMENT INDUCTIVELY COUPLED IN DOUBLE LOOP

As the below named inventor, I hereby declare that:

This declaration is directed to:

- [x] The attached application, or
- [ ] United States application or PCT international application number _____ filed on _____.

The above-identified application was made or authorized to be made by me.

I believe that I am the original inventor or an original joint inventor of a claimed invention in the application.

I hereby acknowledge that any willful false statement made in this declaration is punishable under 18 U.S.C. 1001 by fine or imprisonment of not more than five (5) years, or both.

WARNING:

Petitioner/applicant is cautioned to avoid submitting personal information in documents filed in a patent application that may contribute to identity theft. Personal information such as social security numbers, bank account numbers, or credit card numbers (other than a check or credit card authorization form PTO-2038 submitted for payment purposes) is never required by the USPTO to support a petition or an application. If this type of personal information is included in documents submitted to the USPTO, petitioners/applicants should consider redacting such personal information from the documents before submitting them to the USPTO. Petitioner/applicant is advised that the record of a patent application is available to the public after publication of the application (unless a non-publication request in compliance with 37 CFR 1.213(a) is made in the application) or issuance of a patent. Furthermore, the record from an abandoned application may also be available to the public if the application is referenced in a published application or an issued patent (see 37 CFR 1.14). Checks and credit card authorization forms PTO-2038 submitted for payment purposes are not retained in the application file and therefore are not publicly available.

LEGAL NAME OF INVENTOR

Inventor: Corneliu URSACHI Date (Optional) :_____

Signature: Ursa0

Note: An application data sheet (PTO/SB/14 or equivalent), including naming the entire inventive entity, must accompany this form. Use an additional PTO/AIA/01 form for each additional inventor.

This collection of information is required by 35 U.S.C. 115 and 37 CFR 1.63. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.11 and 1.14. This collection is estimated to take 1 minute to complete, including gathering, preparing, and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, VA 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. **SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.**

If you need assistance in completing the form, call 1-800-PTO-9199 and select option 2.

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Applicant(s):	Aurelian MORARU et al.	Examiner:	Not Yet Known
Serial No.:	National Phase of PCT/RO2017/000023	Group Art Unit:	Not Yet Known
Filed:	Herewith	Confirmation No.:	Not Yet Known
Title:	RFID TAG FOR HARSH ENVIRONMENT INDUCTIVELY COUPLED IN DOUBLE LOOP	Attorney Docket No.:	07610-P0002A

Commissioner for Patents
P. O. Box 1450
Alexandria, VA 22313-1450

PRELIMINARY AMENDMENT

Dear Sirs:

Please enter the following preliminary amendment in the above-referenced application:

Amendments to the Specification begin on page 2 of this paper.

Remarks begin on page 3 of this paper.

AMENDMENTS TO THE SPECIFICATION

Please insert the following paragraph after the Title of the application:

RELATED APPLICATIONS

This application is a National Phase of PCT Patent Application No. PCT/RO2017/000023 having International filing date of December 20, 2018, which claims the benefit of priority of Romanian Application No. a 2017 00388 filed on June 16, 2017. The contents of the above applications are all incorporated by reference as if fully set forth herein in their entirety.

REMARKS

Applicant respectfully requests that the above Amendments be entered before the case is examined. By the foregoing Amendment, the Specification has been amended.

Conclusion

In view of the above Amendment and Remarks, this application is believed to be ready for examination.

Respectfully submitted,

/ Roy D. Gross /

October 29, 2019

Roy D. Gross, Registration No. 63,524
Attorney for Applicant(s)
THE ROY GROSS LAW FIRM, LLC
50 Washington Street, Suite 737/745
Norwalk, CT 06854
Tel. (203) 423-0235

PTO-1390 (01-18)
Approved for use through 8/31/2019. OMB 0651-0021
U.S. Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE
Under the Paperwork Reduction Act of 1995, no persons are required to respond to a collection of information unless it displays a valid OMB control number.

TRANSMITTAL LETTER TO THE UNITED STATES DESIGNATED/ELECTED OFFICE (DO/EO/US) CONCERNING A SUBMISSION UNDER 35 U.S.C. 371

Attorney Docket No.	
07610-P0002A	
U.S. Application No. (if known, see 37 CFR 1.5)	

International Application No.	International Filing Date	Priority Date Claimed
PCT/RO2017/000023	2017-12-19	2017-06-16

Title of Invention
RFID TAG FOR HARSH ENVIRONMENT INDUCTIVELY COUPLED IN DOUBLE LOOP

First Named Inventor
Aurelian MORARU

Applicant herewith submits to the United States Designated/Elected Office (DO/EO/US) the following items and other information.

1. ■ This is an express request to begin national examination procedures (35 U.S.C. 371(f)). NOTE: The express request under 35 U.S.C. 371(f) will not be effective unless the requirements under 35 U.S.C. 371(c)(1), (2), and (4) for payment of the basic national fee, copy of the International Application and English translation thereof (if required), and the oath or declaration of the inventor(s) have been received.
2. ■ A copy of the International Application (35 U.S.C. 371(c)(2)) is attached hereto (not required if the International Application was previously communicated by the International Bureau or was filed in the United States Receiving Office (RO/US)).
3. An English language translation of the International Application (35 U.S.C. 371(c)(2))
   a. ☐ is attached hereto.
   b. ☐ has been previously submitted under 35 U.S.C. 154(d)(4).
4. An oath or declaration of the inventor(s) (35 U.S.C. 371(c)(4))
   a. ■ is attached.
   b. ☐ was previously filed in the international phase under PCT Rule 4.17(iv).

Items 5 to 8 below concern amendments made in the international phase.

PCT Article 19 and 34 amendments

5. ☐ Amendments to the claims under PCT Article 19 are attached (not required if communicated by the International Bureau) (35 U.S.C. 371(c)(3)).
6. ☐ English translation of the PCT Article 19 amendment is attached (35 U.S.C. 371(c)(3)).
7. ☐ English translation of annexes (Article 19 and/or 34 amendments only) of the International Preliminary Examination Report is attached (35 U.S.C. 371(c)(5)).

Cancellation of amendments made in the international phase

8a. ☐ Do not enter the amendment made in the international phase under PCT Article 19.

8b. ☐ Do not enter the amendment made in the international phase under PCT Article 34.

NOTE: A proper amendment made in English under Article 19 or 34 will be entered in the U.S. national phase application absent a clear instruction from applicant not to enter the amendment(s).

The following items 9 to 17 concern a document(s) or information included.

9. ☐ An Information Disclosure Statement under 37 CFR 1.97 and 1.98.
10. ■ A preliminary amendment.
11. ■ An Application Data Sheet under 37 CFR 1.76.
12. ☐ A substitute specification. NOTE: A substitute specification cannot include claims. See 37 CFR 1.125(b).
13. ■ A power of attorney and/or change of address letter.
14. ☐ A computer-readable form of the sequence listing in accordance with PCT Rule 13*ter*.3 and 37 CFR 1.821-1.825 (not required if sequence listing in text format was indicated on the PCT Request as part of the International Application and the sequence listing was published as part of the international application).
15. ☐ Assignment papers *(cover sheet and document(s))*. Name of Assignee: _____
16. ☐ 37 CFR 3.73(c) Statement *(when there is an Assignee)*.

This collection of information is required by 37 CFR 1.414 and 1.491-1.492. The information is required to obtain or retain a benefit by the public, which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.11 and 1.14. This collection is estimated to take 15 minutes to complete, including gathering, preparing, and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, VA 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. SEND TO: Mail Stop PCT, Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.

U.S. APPLN. No. (if known – see 37 CFR 1.5)	INTERNATIONAL APPLICATION No.	ATTORNEY DOCKET No.
	PCT/RO2017/000023	07610-P0002A

17. ☐ Other items or information:

The following fees have been submitted.	CALCULATIONS
18. ■ Basic national fee (37 CFR 1.492(a)) **$300**	$ 300
19. ■ Examination fee (37 CFR 1.492(c)) • If the written opinion prepared by ISA/US or the international preliminary examination report prepared by IPEA/US indicates all claims satisfy provisions of PCT Article 33(1)-(4)..... **$0** • All other situations **$760**	$ 760
20. ■ Search fee (37 CFR 1.492(b)) • If the written opinion prepared by ISA/US or the international preliminary examination report prepared by IPEA/US indicates all claims satisfy provisions of PCT Article 33(1)-(4)..... **$0** • Search fee (37 CFR 1.445(a)(2)) has been paid on the international application to the USPTO as an International Searching Authority .....**$140** • International Search Report prepared by an ISA other than the US and provided to the Office or previously communicated to the US by the IB.....**$520** • All other situations **$660**	520 $
TOTAL OF 18, 19, and 20 =	$ 1580
☐ Additional fee for specification and drawings filed in paper over 100 sheets (excluding sequence listing in compliance with 37 CFR 1.821(c) or (e) in an electronic medium or computer program listing in an electronic medium) (37 CFR 1.492(j)). Fee for each additional 50 sheets of paper or fraction thereof **$400**	

Total Sheets	Extra Sheets	Number of each additional 50 or fraction thereof (round **up** to a whole number)	RATE	
- 100 =	/ 50 =		x **$400**	$

Surcharge for furnishing any of the search fee, examination fee, or the oath or declaration after the date of commencement of the national stage (37 CFR 1.492(h))..... **$140**	$

CLAIMS	NUMBER FILED	NUMBER EXTRA	RATE	
Total claims	- 20 =		x **$100**	$
Independent claims	- 3 =		x **$460**	$
MULTIPLE DEPENDENT CLAIM(S) (if applicable)			**+ $820**	$

Fee for submission of Sequence Listing text file of 300 MB to 800 MB (37 CFR 1.21(o)(1))..... **$1,000**	$
Fee for submission of Sequence Listing text file of more than 800 MB (37 CFR 1.21(o)(2))..... **$10,000**	$
Processing fee for furnishing the English translation later than 30 months from the earliest claimed priority date (37 CFR 1.492(i))..... **$140 +**	$
TOTAL OF ABOVE CALCULATIONS =	$ 1580
■ **Applicant asserts small entity status.** See 37 CFR 1.27. Fees above are reduced by ½.	
☐ **Applicant certifies micro entity status.** See 37 CFR 1.29. Fees above are reduced by ¾. Applicant must attach form PTO/SB/15A or B or equivalent.	
TOTAL NATIONAL FEE =	$ 790
Fee for recording the enclosed assignment (37 CFR 1.21(h)). The assignment must be accompanied by an appropriate cover sheet (37 CFR 3.28, 3.31)..... **$50.00** per property **+**	$
TOTAL FEES ENCLOSED =	$ 790

a. ☐ A check in the amount of $_____ to cover the above fees is enclosed.

b. ☐ Please charge my Deposit Account No. _____ in the amount of $_____ to cover the above fees.

c. ☒ The Director is hereby authorized to charge additional fees which may be required, or credit any overpayment, to Deposit Account No. 506926 as follows:

i. ☐ any required fee.

ii. ☒ any required fee except for excess claims fees required under 37 CFR 1.492(d) and (e) and multiple dependent claim fee required under 37 CFR 1.492(f).

d. ☐ Fees are to be charged to a credit card. **WARNING:** Information on this form may become public. Credit card information should not be included on this form. Provide credit card information and authorization on PTO-2038. The PTO-2038 should only be mailed or faxed to the USPTO. However, when paying the basic national fee, the PTO-2038 may NOT be faxed to the USPTO.

ADVISORY: If filing by EFS-Web, do **NOT** attach the PTO-2038 form as a PDF along with your EFS-Web submission. Please be advised that this is **not** recommended and by doing so your **credit card information may be displayed via PAIR**. To protect your information, it is recommended to pay fees online by using the electronic payment method.

NOTE: Where an appropriate time limit under 37 CFR 1.495 has not been met, a petition to revive (37 CFR 1.137(a) or (b)) must be filed and granted to restore the International Application to pending status.

Statement under 37 CFR 1.55 or 1.78 for AIA (First Inventor to File) Transition Applications

☐ This application (1) claims priority to or the benefit of an application filed before March 16, 2013, and (2) also contains, or contained at any time, a claim to a claimed invention that has an effective filing date on or after March 16, 2013.

NOTE 1: By providing this statement under 37 CFR 1.55 or 1.78, **this application, with a filing date on or after March 16, 2013, will be examined under the first inventor to file provisions of the AIA**.

NOTE 2: A U.S. national stage application may not claim priority to the international application of which it is the national phase. The filing date of a U.S. national stage application is the international filing date. See 35 U.S.C. 363.

Correspondence Address

☒ The address associated with Customer Number: 136531 **OR** ☐ Correspondence address below

Name					
Address					
City		State		Zip Code	
Country			Telephone		
Email					

Signature	/Roy D. Gross/	Date	October 29, 2019
Name (Print/Type)	Roy D. Gross	Registration No. (Attorney/Agent)	63524

Privacy Act Statement

The **Privacy Act of 1974 (P.L. 93-579)** requires that you be given certain information in connection with your submission of the attached form related to a patent application or patent. Accordingly, pursuant to the requirements of the Act, please be advised that: (1) the general authority for the collection of this information is 35 U.S.C. 2(b)(2); (2) furnishing of the information solicited is voluntary; and (3) the principal purpose for which the information is used by the U.S. Patent and Trademark Office is to process and/or examine your submission related to a patent application or patent. If you do not furnish the requested information, the U.S. Patent and Trademark Office may not be able to process and/or examine your submission, which may result in termination of proceedings or abandonment of the application or expiration of the patent.

The information provided by you in this form will be subject to the following routine uses:

1. The information on this form will be treated confidentially to the extent allowed under the Freedom of Information Act (5 U.S.C. 552) and the Privacy Act (5 U.S.C 552a). Records from this system of records may be disclosed to the Department of Justice to determine whether disclosure of these records is required by the Freedom of Information Act.
2. A record from this system of records may be disclosed, as a routine use, in the course of presenting evidence to a court, magistrate, or administrative tribunal, including disclosures to opposing counsel in the course of settlement negotiations.
3. A record in this system of records may be disclosed, as a routine use, to a Member of Congress submitting a request involving an individual, to whom the record pertains, when the individual has requested assistance from the Member with respect to the subject matter of the record.
4. A record in this system of records may be disclosed, as a routine use, to a contractor of the Agency having need for the information in order to perform a contract. Recipients of information shall be required to comply with the requirements of the Privacy Act of 1974, as amended, pursuant to 5 U.S.C. 552a(m).
5. A record related to an International Application filed under the Patent Cooperation Treaty in this system of records may be disclosed, as a routine use, to the International Bureau of the World Intellectual Property Organization, pursuant to the Patent Cooperation Treaty.
6. A record in this system of records may be disclosed, as a routine use, to another federal agency for purposes of National Security review (35 U.S.C. 181) and for review pursuant to the Atomic Energy Act (42 U.S.C. 218(c)).
7. A record from this system of records may be disclosed, as a routine use, to the Administrator, General Services, or his/her designee, during an inspection of records conducted by GSA as part of that agency's responsibility to recommend improvements in records management practices and programs, under authority of 44 U.S.C. 2904 and 2906. Such disclosure shall be made in accordance with the GSA regulations governing inspection of records for this purpose, and any other relevant (*i.e.*, GSA or Commerce) directive. Such disclosure shall not be used to make determinations about individuals.
8. A record from this system of records may be disclosed, as a routine use, to the public after either publication of the application pursuant to 35 U.S.C. 122(b) or issuance of a patent pursuant to 35 U.S.C. 151. Further, a record may be disclosed, subject to the limitations of 37 CFR 1.14, as a routine use, to the public if the record was filed in an application which became abandoned or in which the proceedings were terminated and which application is referenced by either a published application, an application open to public inspection or an issued patent.
9. A record from this system of records may be disclosed, as a routine use, to a Federal, State, or local law enforcement agency, if the USPTO becomes aware of a violation or potential violation of law or regulation.

PATENT COOPERATION TREATY

PCT

INTERNATIONAL SEARCH REPORT

(PCT Article 18 and Rules 43 and 44)

Applicant's or agent's file reference	**FOR FURTHER ACTION**	see Form PCT/ISA/220 as well as, where applicable, item 5 below.
International application No.	International filing date *(day/month/year)*	(Earliest) Priority Date *(day/month/year)*
PCT/RO2017/000023	19 December 2017 (19-12-2017)	16 June 2017 (16-06-2017)
Applicant		
PROMAR TEXTIL INDUSTRIES SRL		

This international search report has been prepared by this International Searching Authority and is transmitted to the applicant according to Article 18. A copy is being transmitted to the International Bureau.

This international search report consists of a total of 3 sheets.

[X] It is also accompanied by a copy of each prior art document cited in this report.

1. **Basis of the report**
   a. With regard to the **language,** the international search was carried out on the basis of:
      [X] the international application in the language in which it was filed
      [ ] a translation of the international application into _____, which is the language of a translation furnished for the purposes of international search (Rules 12.3(a) and 23.1(b))
   b. [ ] This international search report has been established taking into account the **rectification of an obvious mistake** authorized by or notified to this Authority under Rule 91 (Rule 43.6*bis*(a)).
   c. [ ] With regard to any **nucleotide and/or amino acid sequence** disclosed in the international application, see Box No. I.

2. [ ] **Certain claims were found unsearchable** (See Box No. II)

3. [ ] **Unity of invention is lacking** (see Box No III)

4. With regard to the **title,**
   [X] the text is approved as submitted by the applicant
   [ ] the text has been established by this Authority to read as follows:

5. With regard to the **abstract,**
   [X] the text is approved as submitted by the applicant
   [ ] the text has been established, according to Rule 38.2, by this Authority as it appears in Box No. IV. The applicant may, within one month from the date of mailing of this international search report, submit comments to this Authority

6. With regard to the **drawings,**
   a. the figure of the **drawings** to be published with the abstract is Figure No. 1
      [X] as suggested by the applicant
      [ ] as selected by this Authority, because the applicant failed to suggest a figure
      [ ] as selected by this Authority, because this figure better characterizes the invention
   b. [ ] none of the figures is to be published with the abstract

INTERNATIONAL SEARCH REPORT

International application No
PCT/RO2017/000023

A. CLASSIFICATION OF SUBJECT MATTER
INV. G06K19/077 G06K19/02
ADD.

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 practicable, 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.
Y	WO 2017/060652 A1 (FENOTAG [FR]) 13 April 2017 (2017-04-13) page 3, lines 7-24 page 23, line 20 - page 25, line 21; figures 2, 2A, 2B	1-5
Y	US 2009/079574 A1 (OROKU NORIYUKI [JP] ET AL) 26 March 2009 (2009-03-26) cited in the application paragraphs [0069], [0070]; figure 7(b)	1-5
Y	DE 10 2013 102051 A1 (INFINEON TECHNOLOGIES AG [DE]) 4 September 2014 (2014-09-04) paragraphs [0057] - [0059]; figure 2B	1-5

☐ 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 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
7 June 2018	14/06/2018

Name and mailing address of the ISA/	Authorized officer
European Patent Office, P.B. 5818 Patentlaan 2 NL - 2280 HV Rijswijk Tel. (+31-70) 340-2040, Fax: (+31-70) 340-3016	Schmidt, Rainer

1

Form PCT/ISA/210 (second sheet) (April 2005)

INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No
PCT/RO2017/000023

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
WO 2017060652 A1	13-04-2017	FR 3042296 A1	14-04-2017
		WO 2017060652 A1	13-04-2017
US 2009079574 A1	26-03-2009	CN 101393614 A	25-03-2009
		JP 2009075687 A	09-04-2009
		KR 20090030241 A	24-03-2009
		TW 200931320 A	16-07-2009
		US 2009079574 A1	26-03-2009
DE 102013102051 A1	04-09-2014	CN 104022340 A	03-09-2014
		DE 102013102051 A1	04-09-2014
		US 2014246503 A1	04-09-2014

Form PCT/ISA/210 (patent family annex) (April 2005)

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

(19) World Intellectual Property Organization
International Bureau

(43) International Publication Date
20 December 2018 (20.12.2018)

WIPO | PCT

(10) International Publication Number
WO 2018/231083 A1

(51) International Patent Classification:
G06K 19/077 (2006.01) *G06K 19/02* (2006.01)

(21) International Application Number:
PCT/RO2017/000023

(22) International Filing Date:
19 December 2017 (19.12.2017)

(25) Filing Language: Romanian

(26) Publication Language: English

(30) Priority Data:
a 2017 00388 16 June 2017 (16.06.2017) RO

(71) Applicant: **PROMAR TEXTIL INDUSTRIES SRL** [RO/RO]; str. Lanurilor, nr.1A, Brasov (RO).

(72) Inventors: **MORARU, Aurelian**; str. Crisului, nr 14, bl. D14, sc. E, ap.11, Mun. Brasov, jud. Brasov (RO). **URSACHI, Corneliu**; str. Nicolae Titulesc, nr .37, bl. 7, sc. B, ap. 16, Mun. Brasov, Jud. Brasov (RO).

(74) Agent: **WEIZMANN ARIANA & PARTNERS AGENTIE DE PROPRIETATE INTELLECTUALA S.R.L.**; Str. 11 Iunie, nr. 51, sc. A, Etaj 1, ap. 4, sector 4, 040171 Bucuresti (RO).

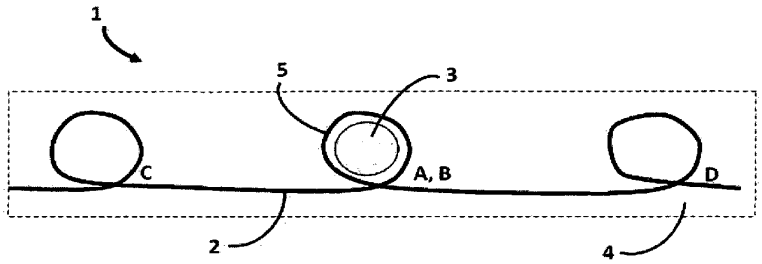
(81) Designated States *(unless otherwise indicated, for every kind of national protection available)*: AE, AG, AL, AM, AO, AT, AU, AZ, BA, BB, BG, BH, BN, BR, BW, BY, BZ, CA, CH, CL, CN, CO, CR, CU, CZ, DE, DJ, DK, DM, DO, DZ, EC, EE, EG, ES, FI, GB, GD, GE, GH, GM, GT, HN, HR, HU, ID, IL, IN, IR, IS, JO, JP, KE, KG, KH, KN, KP, KR, KW, KZ, LA, LC, LK, LR, LS, LU, LY, MA, MD, ME, MG, MK, MN, MW, MX, MY, MZ, NA, NG, NI, NO, NZ, OM, PA, PE, PG, PH, PL, PT, QA, RO, RS, RU, RW, SA, 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, ST, 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, KM, ML, MR, NE, SN, TD, TG).

Published:
— *with international search report (Art. 21(3))*
— *with amended claims and statement (Art. 19(1))*

(54) Title: RFID TAG FOR HARSH ENVIRONMENT INDUCTIVELY COUPLED IN DOUBLE LOOP

Fig. 1 .



(57) Abstract: The invention relates to an IDRF label for use in aggressive environments. The IDRF label (1) according to the invention comprises a UIF-SIF (2) antenna made of an electrically conductive textile, electrically insulated, embroidered on a textile backing, an IDRF transponder (3) and a textile substrate (4) and the UIF-SIF antenna (2), the whole assembly being sealed by hot-dipping a second textile substrate, wherein the UIF-SIF (2) antenna has a central loop formed by a loop (5) by which it inductively couples with the encapsulated IDRF transponder 3.

WO 2018/231083 A1

RFID tag for harsh environment inductively coupled in double loop

DESCRIPTION

[0001] A Minimum Radio Frequency Identification (RFID) system consists of a interrogator reader connected to a PC and a population of tags attached to the products they uniquely identify. An application software handles RFID information to trace and inventory these products. Passive RFID tags operating in the UIF (860-960MHz) or SIF (2.45GHz) frequency range are used.

Objects identified using RFID tags and intended for use in harsh environments shall withstand the following requirements:

- repeated immersion in the aquatic environment
- exposure to high temperatures of up to 200 ° C, more than 20 minutes
- high temperature variations - (8 ° C / 90 ° C),
- corrosive chemicals
- mechanical pressures of 40-60 bar,
- repeated mechanical stresses (bending, pressing, etc.)
- number of cycles of use greater than 300

[0003] From a historical point of view, for RFID applications, passive RFID tags operating in the HF domain (13.65MHz) were used first. Constructively, they were made up of an integrated circuit galvanically connected to a multi-spiral coil. The reading range was under one meter, and the reading speed was about one label per second. With the introduction of passive RFID tags operating in the UHF range, and with the development of communications protocols, performance has increased spectacularly at high read speeds (10 RFID tags / sec) and read ranges of up to 7m.

[0004] For textile tracking applications, the design of an RFID tag composed of a capsulated traponder, thus protected by the harsh environment of industrial laundries, and a UHF antenna made of metallic wire, has been widely adopted. The encapsulated transponder contains an integrated circuit and a near-field antenna by which it is inductively coupled to a segment of the UHF antenna.

[0005] This category includes the RFID UHF tags, the subject of patents EP 2405054 A1, DE 102007026720 A1, US 20090079574 A1.

[0006] But even this design has its limits. Capsulation is achieved by protecting the contacts between the integrated circuit (IC) pins and the near field antenna terminals, but at the UHF antenna there are major discrepancies relative to the mechanical and thermal characteristics of the textile substrate relative to the metallic conductors of the UHF antenna .

Here's a short list of problems with using these labels in industrial laundries:

- loosening the seams and breaking the textile fabric, to which the RFID tag is attached,
- the metal wire from which the UHF antenna is made oxidizes in contact with the water and the oxidant chemicals used in the washing process, stains the fabric and compromises its appearance. Also due to oxidation the electrical parameters of the antenna material, and implicitly its electromagnetic performances, are affected.
- the material of the metal wire from which the antenna is made stores much more thermal energy than the textile support, this difference leading to the piercing/ perforation of the textile material by the metal wire of the antenna that protrudes out of it.
- because of the rigidity of the metal wire, the entire tag is a little flexible compared to the textile material from which the article to be identified is being made. Low flexibility creates break lines on the RFID tagline.

These lead to the detachment of the encapsulated RFID transponder 3 and consequently to the loss of the identity of the textile objects being monitored, to the appearance problems of the textile item, but especially to the problems for the customers, respectively their injury to the use of textile articles (towels, pillows, sheets) that were pierced by the metal wires.

At the same time, current UHF tags have considerable dimensions that make them inappropriate, unsightly for identifying small items (tablecloths).

[0007] The ideal passive RFID tag for the identification of textile items that are maintained in laundries and dry cleaners is:

- electromagnetic performance (high reading distance),
- of small size,
- flexible and resistant to bending,
- resistant to chemical stress,
- resistant to a number of exposures greater than the product it identifies, over 200 washing cycles.

So an electromagnetically performant, resistant and discreet RFID tag.

[0008] The ways to approach this ideal prototype are:
- the use of encapsulating materials to effectively protect the integrated circuit and its contacts with the near field antenna at the transponder level,
- designing a UHF/SHF antenna geometry to give it superior electromagnetic properties and at the same time to have as small a size as possible,
- use of electrically conductive materials with mechanical parameters close to the textile, to the construction of the UHF/SHF antenna
- tag components that are in direct interaction, have close thermal expansion coefficients.

[0009] The UHF antennas of the RFID tags available on the market are made of electrically insulated metallic wire, attached to a textile support by sewing or embroidering. They have the meandered shape (EP 2405054 A1), or crossed loops (WO 2013128299 A1). All have the vulnerabilities and limitations described in paragraph [0006].

[0010] The present invention overcomes the aforementioned drawbacks associated with prior art solutions by providing a tag having the features mentioned in the independent claim 1.

[0011] Other preferred features of the present invention are set forth in the appended dependent claims.

[0012] The present invention proposes for the UHF-SHF antenna an electroconductive yarn made of metallic stainless steel wire that resists the action of oxidizing agents. By using the electroconductive textile wire to make the UHF-SHF antenna, due to its flexibility, the electroconductive textile thread allows for the realization of geometries impossible to achieve with an electrically isolated metal wire. It is possible to make very small radius curves without creating mechanical stresses in the tag structure. Also the UHF-SHF antenna made of electroconductive textile thread is very discreet and does not feel, it naturally integrates into the textile material of the product it identifies.

[0013] Other features and advantages of the present invention will become more apparent from the following detailed description, given in connection with the accompanying drawings, in which:
- Figure 1 shows a schematic view of the double-loop RFID tag according to a first embodiment of the invention;
- Figure 2 shows a the double loop in detail according to the first embodiment of the invention;
- Figure 3 shows a schematic view of the double-loop RFID tag according to a second embodiment of the invention;

[0014] The UHF-SHF antenna **2** has a particularly innovative geometry characterized in that it has in the central region a double loop **5** through which an efficient inductive coupling with the encapsulated RFID transponder **3** is provided, thereby obtaining an electromagnetically efficient RFID tag.

[0015] The double loop 5 also allows for a small, discreet and easy-to-integrate RFID tag even in small-sized textile articles.

[0016] The RFID passive UHF-SHF antenna can be made in two variants Fig. 2 and Fig. 3. In the first embodiment, Fig. 2, the electroconductive textile thread is electrically insulated and allows the thread overlapping at certain points (A, B, C, D) without electrical contact. For the second embodiment, Fig. 3, the UHF-SHF antenna geometry allows the use of a non-insulated electroconductive textile thread. Both variants are embroidered.

[0017] In the first embodiment, Fig. 2, the double loop **5** of the UHF antenna **2** through which the inductive coupling with the encapsulated RFID transponder 3 is made, has created an UHF antenna with efficient power transfer and information integrity, with substantially reduced design dimensions. There is no electrical contact at points A, B, C, and D.

[0018] In the second embodiment of the UHF-SHF antenna, Fig. 3, the drawing of the embroidery is made so that the electroconductive textile thread is continuously embroidered without crossings in its path.

After embroidering, by bending over the dotted line and overlapping the two P and Q loops, a double loop **(5)** will form. The loop P has a smaller diameter than the Q loop. It is noted that, after bending and overlap, the currents in the two loops have the same direction, contributing together to an efficient inductive coupling. Prior to bending between the two loops P and Q, the encapsulated transponder **(3)** will be fixed with adhesive on the loop P. After folding and overlapping the encapsulated transponder **(3)** will be secured between the two loops P and Q.

[0019] The present invention is complementary to patent No. a 2016 00791, which proposed an RFID Transponder designed to operate in aggressive environments. The RFID transponder was described as being designed to be used both independently for RFID applications for which the reading range is in centimeters and with a UHF-SHF antenna for RFID applications for which the reading range is of meters order.

[0020] The design of this tag by embedding in its structure the encapsulated transponder **3**, object of the patent **a 2016 00791**, overcomes the problems created by the dimensional discrepancies between tiny integrated cicuits and the antennas, they are galvanically

connected, which require the use of expensive technologies (wire bonding) or inadequate to the harsh environment of industrial laundry (bonding with conductive adhesives).

[0021] The tag design looks for a straight measure relative to the dimensions of the objects it identifies and the size of the tag. It does not fall into excessive miniaturization when it is not. necessary.

[0022] A maximal design is proposed for the maximum achievable design with the currently available components, keeping the measure.

- transponder with a minimum number of galvanic contacts, equal to the number of active integrated circuit pins, robust galvanic contacts using an integrated circuit in SOT323 package, welded in the cheap and mature SMT technology, at the near-field antenna terminals, encapsulated and thus protected from the harsh environment of industrial laundry,
- inductive coupling between encapsulated transponder **(3)** and UIF-SIF antenna **(2)**,
- the homogeneity of the components of the UIF-SIF antenna **(2)** - textile substrate and the antenna, both of textile material,
- substantially reduced length of the tag by using the double loop of the UHF-SHF antenna.
- a tag born and not made for the textile world by the materials used (textile thread on a textile substrate), and the methods of making (embroidering the textile thread on the textile substrate).

Referinţe bibliografice

Brevet citat	Data înregistrării	Data publicării	Solicitant	Titlul
EP 2405054 A1	07 Iulie 2010	11 Ianuarie 2012	Datamars SA (CH)	Textile item identification tag
DE 102007026720 A1	06 Iunie 2007	11 Decembrie 2008	Bielomatik	Chip module for an RFID system
US 20090079574 A1	19 Septembrie 2008	26 Martie 2009	Noriyuki	Rfid tag
WO 2013128299 A1	02 Martie 2012	06 Septembrie 2013	Usta	Enhanced antenna structure for RFID tags

CLAIMS

1. An RFID tag **(1)** for use in harsh environments comprising a UHF-SHF antenna **(2)** made of an textile electroconductive thread, electrically insulated, embroidered on a textile substrate, an RFID transponder **(3)**, and a substrate of textile material **(4)** on which the RFID transponder **(3)** and the UIF-SIF antenna **(2)** are placed, the whole assembly being sealed by hot-dipping of a second textile substrate, wherein the UIF-SIF antenna **(2)** has a central zone formed by a double loop **(5)** by which it inductively couples with the encapsulated IDRF Transponder **(3).**

2. An IDRF tag **(1)** according to claim 1, characterized in that the UIF-SIF antenna **(2)** is made of an electrically insulated electroconductive textile thread, by continuous embroidering, **starting from one end to the other**, and has simple loops in each extremity, and in the central area, a double loop **(5)** consisting of a first loop with a smaller diameter, followed by a second concentric loop with a larger diameter.

3. An IDRF tag **(1)** according to claim 1, characterized in that the UIF-SIF antenna **(2),** does not show electrical contacts at the crossing points C and D in the construction of the loops in the extremities nor in the crossing points A and B of the central double loop **(5)**.

4. An RFID tag **(1)** according to claim 1, characterized in that the UHF-SHF antenna **(2)** is made by continuous embroidering of the electroconductive textile thread in the form of two open loops disposed in a plane superior to the longitudinal direction, and two open loops disposed in a lower plane relative to the same longitudinal axis.

5. An RFID tag **(1)** according to claim 4, characterized in that, in the central area, the upper plane loop **(P)** has a smaller diameter than the loop **(Q)** from the lower plane, the transponder **(3)** being fixed and centered on the loop **(P)** in the superior plane, and the loop (Q) of the lower plane will overlapp the loop (P) by bending over the longitudinal axis, comprising the transponder **(3)** inside between the two planes, this overlap creating the double loop **(5).**

AMENDED CLAIMS
received by the International Bureau on 15 October 2018 (15.10.2018)

1. An RFID tag (**1**) for use in harsh enviroments comprising an UHF-SHF antenna (**2**) made from a continuous electroconductive textile thread, electrically insulated, embroided on textile substrate, an RFID transponder (**3**) and a substrate of textile material (**4**) on which the RFID transponder (**3**) and the UHF-SHF antenna (**2**) are placed, the whole assembly being sealed by hot-dipping of a second textile substrate, **characterized in that** the UHF-SHF antenna (**2**) has a central zone formed by a double loop (**5**) by which it inductively couples with the encapsulated RFID transponder (**3**).

2. The RFID tag (**1**) according to claim 1, **characterised in that** the UHF-SHF antenna (**2**) is made of an electroconductive textile thread, electrically insulated, by continuous embroidering, starting from one end to the other, and has simple loops in each extremity, and in the central area a double loop (**5**) consisting of a first loop with a smaller diameter, followed by a second concentric loop with a larger diameter.

3. The RFID tag (**1**) according to claim 1, **characterized in that** the UHF-SHF antenna (**2**) does not show electrical contacts in the crossing points (**C** and **D**) in the construction of the simple loops located at the extremities nor in the crossing points (**A** and **B**) by which the central loop (**5**) is formed.

4. The RFID tag (**1**) according to claim 1, **characterized in that** the UHF-SHF antenna (**2**) is made by cotinuous embroidering of the elctroconductive textile thread in the form of two open loops disposed in a upper plane in relation to the longitudinal direction and two open loops disposed in a lower plane in relation to the same longitudinal direction.

5. The RFID tag (**1**) according to claim 4, **characterized in that**, in the central area, the upper plane loop (**P**) has a smaller diameter than the loop (**Q**) from the lower plane, the transponder (**3**) being fixed and centered on the loop (**P**) in the upper plane, and the loop (**Q**) from the lower plane will overlapp the loop (**P**)) from the upper plane by bending over said longitudinal direction, so that the double loop (**5**) is created having the transponder (**3**) inside it.

Statement under Article 19(1)

IA Number:
PCT/RO2017/000023

International Filing Date:
19 December 2017

Date of submission:
15 October 2018

the amendments dont have any impact on the description and the drawings.

Drawings

Fig. 1 .

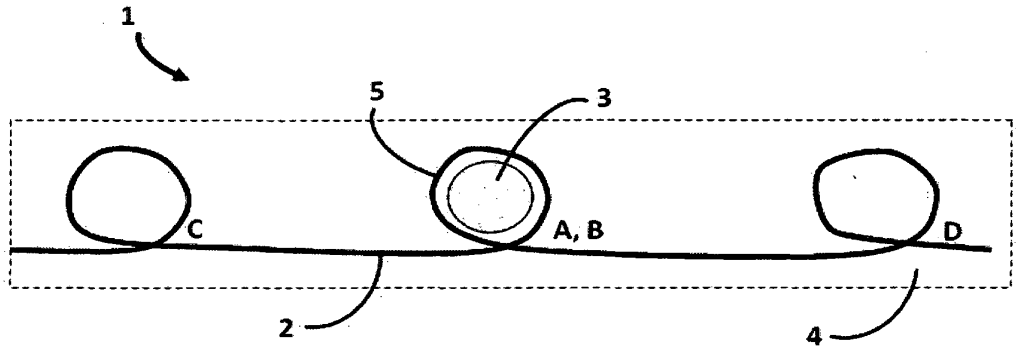


Fig. 2.

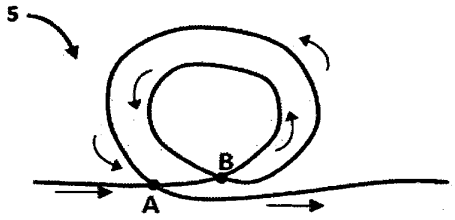
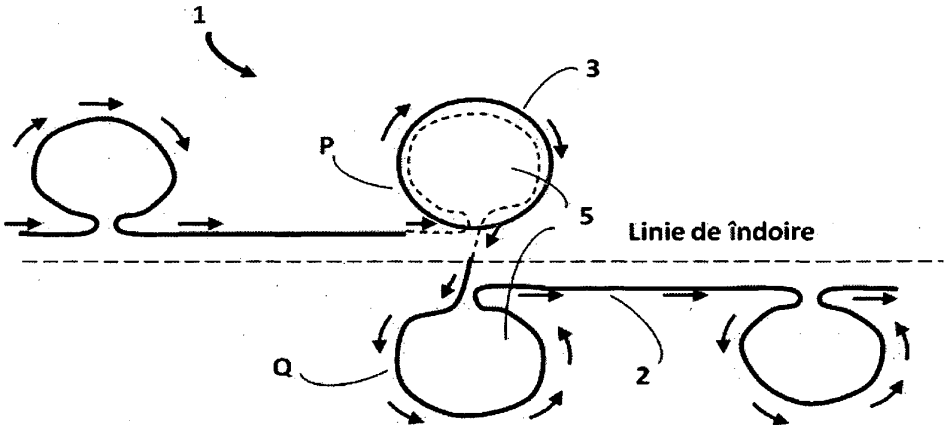


Fig. 3.



INTERNATIONAL SEARCH REPORT

International application No
PCT/RO2017/000023

A. CLASSIFICATION OF SUBJECT MATTER
INV. G06K19/077 G06K19/02
ADD.

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 practicable, 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.
Y	WO 2017/060652 A1 (FENOTAG [FR]) 13 April 2017 (2017-04-13) page 3, lines 7-24 page 23, line 20 - page 25, line 21; figures 2, 2A, 2B	1-5
Y	US 2009/079574 A1 (OROKU NORIYUKI [JP] ET AL) 26 March 2009 (2009-03-26) cited in the application paragraphs [0069], [0070]; figure 7(b)	1-5
Y	DE 10 2013 102051 A1 (INFINEON TECHNOLOGIES AG [DE]) 4 September 2014 (2014-09-04) paragraphs [0057] - [0059]; figure 2B	1-5

☐ 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 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
7 June 2018	14/06/2018

Name and mailing address of the ISA/	Authorized officer
European Patent Office, P.B. 5818 Patentlaan 2 NL - 2280 HV Rijswijk Tel. (+31-70) 340-2040, Fax: (+31-70) 340-3016	Schmidt, Rainer

1

Form PCT/ISA/210 (second sheet) (April 2005)

INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No
PCT/RO2017/000023

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
WO 2017060652 A1	13-04-2017	FR 3042296 A1	14-04-2017
		WO 2017060652 A1	13-04-2017
US 2009079574 A1	26-03-2009	CN 101393614 A	25-03-2009
		JP 2009075687 A	09-04-2009
		KR 20090030241 A	24-03-2009
		TW 200931320 A	16-07-2009
		US 2009079574 A1	26-03-2009
DE 102013102051 A1	04-09-2014	CN 104022340 A	03-09-2014
		DE 102013102051 A1	04-09-2014
		US 2014246503 A1	04-09-2014

Form PCT/ISA/210 (patent family annex) (April 2005)

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ORGANIZATION

DOCUMENT MADE AVAILABLE UNDER THE PATENT COOPERATION TREATY (PCT)

International application number:		**PCT/RO2017/000023**
International filing date:		**19 December 2017 (19.12.2017)**
Document type:		**Certified copy of priority document**
Document details:	Country/Office:	**RO**
	Number:	**a 2017 00388**
	Filing date:	**16 June 2017 (16.06.2017)**
Date of receipt at the International Bureau:		**22 March 2018 (22.03.2018)**

Remark: Priority document submitted or transmitted to the International Bureau in compliance with Rule 17.1(a),(b) or (b-*bis*)

34, chemin des Colombettes
1211 Geneva 20, Switzerland
www.wipo.int

PST /RO2017/000023

ROMÂNIA

OFICIUL DE STAT PENTRU INVENȚII ȘI MĂRCI

CERTIFICAT DE PRIORITATE

Solicitant: PROMAR TEXTIL S.R.L., BRAŞOV, BV, RO

Cerere de brevet de invenţie nr.: a 2017 00388

Data de depozit: 16/06/2017

Titlul invenţiei: ETICHETĂ IDRF PENTRU MEDII AGRESIVE CU CUPLAJ INDUCTIV ÎN BUCLĂ DUBLĂ

Certificăm că documentaţia anexată, în număr de 6 file, este copia descrierii, revendicărilor şi desenelor din cererea de brevet de invenţie aşa cum a fost depusă la Oficiul de Stat pentru Invenţii şi Mărci.

Confirm cele de mai sus prin semnarea şi aplicarea sigiliului
Director General

CERERE DE BREVET DE INVENTIE

Nr. referinta solicitant/mandatar	Registratura OSIM (numarul si data primirii):
	a 2017 00388 16 -06- 2017

Se completeaza de catre OSIM	
Numarul cererii de brevet de inventie	a 2017 00388
Data primirii la Registratura Generala a OSIM	
Data de depozit	16 -06- 2017
Data primirii partii lipsa la Registratura Generala a OSIM	
Data de depozit după primirea părţii lipsă la Registratura Generală a OSIM	
Data primirii cererii de retragere a partii lipsa la Registratura Generala a OSIM	
Data de depozit atribuita cererii de brevet	

1.Solicitanţi (nume şi prenume/denumire,adresă de domiciliu/sediu,telefon, fax, e- mail)

S.C. PROMAR TEXTIL S.R.L.

ROMANIA, BRASOV, BRASOV, STRADA LANURILOR, NR. 1

☐ continuare pe pag.3

2. Solicitam în baza Legii nr. 64/1991 privind brevetele de invenţie, republicată, modificată prin Legea nr.83/2014 privind invenţiile de serviciu acordarea unui brevet de invenţie cu titlul: **Etichetă IDRF pentru medii agresive cu cuplaj inductiv în buclă dublă**

2.1. Solicitantul este îndreptăţit la depunerea cererii de brevet de invenţie în baza :

- ☐ Legii nr. 64/1991 privind brevetele de invenţie, republicată;
- ☐ Legii nr.83/2014 privind invenţiile de serviciu.
- ☐ unui contract de cercetare

2.2. Referinta la o cerere depusă anterior (numar, data de depozit, tara/oficiul):

3. **Declarăm că inventatorii sunt cei desemnaţi în formularul „ Declaraţie conţinând desemnarea inventatorilor"** X - anexat ☐ care va fi transmis ulterior

4. Rezumatul invenţiei se publică împreună cu figura numarul:

5. Revendicăm prioritatea convenţională (stat, numar, data depozit):

6. Revendicăm prioritatea internă (numar cerere de brevet, data depozit):

FORM. B 01 - citiţi Ghidul de completare

7. Cererea de brevet este:

- ☐ divizionara din cererea de brevet (numar, data depozit):
- ☐ transformată din cererea de brevet european (nr., data de depozit)
- ☐ rezultată din conversia unei cereri de înregistrare a unui model de utilitate (nr. cerere înreg, dată depozit)

8. La data depunerii cererii solicităm următoarele proceduri:

8.1. Publicarea de urgenţă a cererii de brevet de invenţie	☐
8.2. Întocmirea unui raport de documentare	☐
8.3. Întocmirea unui raport de documentare cu opinie scrisă privind brevetabilitatea	☐
8.4. Examinarea cererii cerută la data de depozit	☐

9. Mandatar autorizat (denumire, sediu) : WEIZMANN ARIANA & PARTNERS AGENTIE DE PROPRIETATE INTELECTUALA, prin consilier VIOLETA BOZOCEA
ROMANIA, Bucuresti, BUCURESTI, Str. 11 Iunie Nr. 51, Sc. A, Et. 1, Ap. 4, Sector 4
prin ☐ procura ; sau X - procura generală (nr, dată): 31.10.2016

10. Solicitantul/reprezentantul desemnat de solicitant (nume, prenume / denumire, adresă/ sediu) pentru corespondenţa cu OSIM: WEIZMANN ARIANA & PARTNERS AGENTIE DE PROPRIETATE INTELECTUALA
ROMANIA, Brasov, BRASOV, B-dul Mihail Kogalniceanu, Nr. 17, Bl. C4, et. 7

11. Semnătură solicitanţi/mandatar autorizat:
Semnătură
L.S. Data 15.06.2017

12. Documente depuse la OSIM de solicitant/mandatar			**14.** Documente primite la OSIM	
12.1. Formular de cerere	în 3 exemplare, a 2 file	X	în 3 exemplare, a 2 file	☑
12.2. Descriere	în 3 exemplare, a 3 file	X	în 3 exemplare, a 4 file	☑
12.3. Revendicari	în 3 exemplare, a 1 file	X	în 3 exemplare, a 1 file	☑
12.4. Desene	în 3 exemplare, a 1 file	X	în 3 exemplare, a 1 file	☑
12.5. Rezumat	în 3 exemplare, a 1 file	X	în 3 exemplare, a 1 file	☒
12.6. Lista de secvente de nucleotide si/sau aminoacizi, parte a descrierii		☐		☐
12.6.1. pe suport hârtie	în ....exemplare, a .... file	☐	în ....exemplare, a .... file	☐
12.6.2. pe suport electronic	tip .... , în .... exemplare	☐	tip..... , în ....exemplare	☐
12.7. Actul din care rezultă dreptul la acordarea brevetului		☐		☐
12.8. Declaraţia conţinând desemnarea inventatorilor	a 1 file	X	a 1 file	☑
12.9. Procura/copie procura generala	a 1 file	X	a 1 file	☑
12.10. Document referitor la plata taxelor	a 1 file	X	a 1 file	☒
12.11. Act privind solicitarea reducerii taxelor	a .... file	☐	a .... file	☐
12.12. Autorizatia privind transmiterea dreptului de prioritate	a .... file	☐	a .... file	☐
12.13. Act de prioritate	a .... file	☐	a .... file	☐
12.14. Act referitor la depozitul microorganismului/materialului biologic		☐	a .... file	☐
12.15. Document privind o divulgare a inventiei	a ...file	☐	a .... file	☐
12.16. Copie/traducere a cererii anterioare de la rubrica 2.2.	a....file	☐	a .... file	☐
12.17. Alte documente	a ....file	☐	a 1 file	☒

13. Persoana care a depus cererea, alta decât solicitantul, mandatarul (nume, prenume, act identitate) :

Confirmare OSIM (nume, prenume şi dată)
L.S.

OFICIUL DE STAT PENTRU INVENTII SI MARCI * ROMANIA * OSIM 2017

REFERENT BRÂNDUŞA TĂRNĂUCEANU

FORM. B 01 - citiţi Ghidul de completare

Declaraţie

conţinand desemnarea inventatorilor invenţiei cu titlul:

Etichetă IDRF pentru medii agresive

cu cuplaj inductiv în buclă dublă

care face obiectul cererii de brevet cu ..... şi data de depozit .....

Aceasta declaraţie este făcută si depusă la OSIM până la data luării unei hotărâri privind cererea de brevet de inventie

*Semnatura:*_____ *Data: 15.06.2017*

L.S. _____

PROMAR TEXTIL SRL

Nume si prenume: MORARU AURELIAN

Adresa de domiciliu ROMANIA, BRASOV, BRASOV, STR CRISULUI NR 14, BL D14, SC E, AP 11

Locul de munca la data crearii inventiei: PROMAR TEXTIL SRL

Nume si prenume: _URSACHI CORNELIU

Adresa de domiciliu___ROMANIA, BRASOV, BRASOV STR NICOLAE TITULESCU, NR 37, BL 7, SC B, ET 3, AP 16

Locul de munca la data crearii inventiei: __ PROMAR TEXTIL SRL

Semnatura solicitantului sau a mandatarului autorizat *(numele si prenumele precum si calitatea persoanei cu capacitate de reprezentare a solicitantului sau a mandatarului autorizat):*

WEIZMANN ARIANA & PARTNERS AGENTIE DE PROPRIETATE INTELECTUALA, prin consilier VIOLETA BOZOCEA

_____

*Semnatura:*_____ *Data: 15.06.2017*

L.S. _____

OFICIUL DE STAT PENTRU INVENȚII ȘI MĂRCI
Cerere de brevet de invenție
Nr. a 2017 00 338
Data depozit 16-06-2017

Etichetă IDRF pentru medii agresive cu cuplaj inductiv în buclă dublă

DESCRIERE

[0001] Un sistem de identificare prin radio frecvență (IDRF) minimal este compus dintr-un cititor-interogator conectat la un PC și o populație de etichete sau taguri atașate produselor pe care le identifică în mod unic. Un software de aplicație gestionează informația IDRF în scopul urmăririi și inventarierii acestor produse. Sunt utilizate etichete IDRF pasive care funcționează în domeniul de frecvență UIF(860-960MHz) sau SIF(2,45GHz).

[0002] În ceea ce privește articolele textile identificate IDRF care sunt întreținute în spălătoriile și curățătoriile industriale, solicitările la care sunt supuse acestea și implicit etichetele atașate sunt următoarele:

- introducere repetată în mediu acvatic,
- temperaturi de spălare de până la 90°C, mai mult de 20 minute,
- variații mari de temperatură - rece/fierbinte (8°C/90°C),
- agenți chimici utilizați în procedurile de spălare,
- presiuni de stoarcere de 40-60 bari,
- temperaturi de finisare/călcare de 220°C, 20 secunde.
- solicitări mecanice (indoiri, presări etc) repetate,
- număr de cicluri de spălare mai mare de 200.

[0003] Din punct de vedere istoric, pentru aplicațiile IDRF, mai întâi au fost utilizate etichete IDRF pasive, care funcționau în domenioul IF(13,65MHz). Constructiv, erau alcătuite dintr-un circuit integrat conectat galvanic la o bobină spirală plană cu multe spire. Raza de citire era de sub un metru, iar viteza de citire era de circa o etichetă pe secundă. Odată cu introducerea etichetelor IDRF pasive care operau în domeniul UIF și dezvoltarea protocoalelor de comunicații, performanțele au crescut spectaculos ajungându-se la viteze ridicate de citire (10 etichete IDRF/s) și distanțe de citire de până la 7m.

[0004] Pentru aplicațiile destinate urmăririi textilelor a fost adoptat pe scară largă designul unei etichete IDRF compusă dintr-un trasponder capsulat, protejat astfel de mediului agresiv al spălătoriilor industriale, și dintr-o antenă UIF din fir metalic. Transponderul capsulat conține un circuit integrat și o antenă de câmp apropiat prin care este cuplat inductiv la un segment al antenei UIF.

[0005] În această categorie se încadrează etichetele UIF IDRF, obiect al brevetelor EP 2405054 A1, DE 102007026720 A1, US 20090079574 A1.

[0006] Dar chiar și acest design are limitele sale. Se reușește prin capsulare, protejarea contactelor dintre pinii circuitului integrat (CI) și terminalele antenei de câmp apropiat, dar la nivelul antenei UIF rămân discrepanțe majore relativ la caracteristicile mecanice și termice ale substratului textil față de cele ale firului metalic din care este realizată antena UIF.
Iată o scurtă listă a problemelor apărute la utilizarea acestor taguri în spălătoriile industriale:
-slăbirea cusăturilor și ruperea materialului textil, pe care este fixată eticheta IDRF,
-firul metalic din care este realizată antena UHF oxidează în contact cu apa și substanțele chimice oxidante utilizate în procesul de spălare, pătează materialul textil și compromite aspectul acestuia. De asemenea în urma oxidării sunt modificați parametrii electrici ai

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materialului antenei și implicit performanțele electromagnetice.
-materialul firului metalic din care este realizată antena înmagazinează mult mai multă energie termică decât suportul textil, această diferență ducând la străpungerfea, perforarea materialului textil de către firul metalic al antenei care iese în afara acestuia.
Acestea duc la desprinderea transponderului IDRF capsulat **3** și prin urmare la pierderea identității obiectelor textile monitorizate, la probleme de aspect al articolului textil, dar mai ales probleme pentru clienți, respectiv rănirea lor la utilizarea articolului textil (prosoape, fețe de pernă, cearceafuri) care a fost străpuns de firul metalic.
Totodată tagurile UIF actuale au dimensiuni considerabile care fac nepotrivită, inestetică utilizarea lor pentru identificarea articolelor de mici dimensiuni (șervete de masă).

[0007] Eticheta IDRF pasivă ideală pentru identificarea articolelor textile a căror întreținere se face în spălătorii și curățătorii chimice este:
- performantă din punct de vedere electromagnetic(distanță de citire mare),
- de dimensiuni mici,
- flexibilă și rezistentă la îndoire,
- rezistentă la stres chimic,
- rezistentă la un număr de expuneri mai mare decât produsul pe care îl identifică;la peste 200 de cicluri de spălare.

Așadar o etichetă IDRF performantă din punct de vedere electromagnetic, rezistentă și discretă.
[0008] Căile de apropiere de acest prototip ideal sunt:
- utilizarea unor materiale de capsulare care să protejeze eficient, la nivelul transponderului, circuitul integrat și contactele acestuia cu antena de câmp apropiat,
- proiectarea unei geometri a antenei UIF care să-i confere proprietăți electromagnetice superioare și în același timp să aibă dimensiuni cât mai reduse,
- la construcția antenei UIF să fie utilizate materiale electro conductoare cu parametrii mecanici apropiați articolului textil,
- componentele tagului care sunt în interacțiune directă, să aibă coeficienți de dilatare termică apropiați.

[0009] Antenele UIF ale etichetelor IDRF existente pe piață sunt realizate din fir metalic izolat electric, fixat pe un suport textil prin coasere sau brodare. Ele au formă de meandre(EP 2405054 A1), sau bucle încălecate(WO 2013128299 A1). Toate prezintă vulnerabilitățile și limitările descrise la paragraful [0006].

[0010] Prezentul brevet propune pentru antena UIF fire textile electroconductive realizate din fire metalice, din oțel inox, care rezistă la acțiunea agenților oxidanți. Prin utilizarea firului textil electroconductiv la realizarea antenei UIF, dată fiind flexibilitatea sa, firul textil electroconductiv, permite realizarea unor geometri imposibil de realizat cu un fir metalic izolat electric. Devine posibilă realizarea unor curbe cu rază foarte mică fără a crea tensiuni mecanice în structura tagului. De asemenea antena UIF realizată din fir textil electroconductiv este foarte discretă, nici nu se simte, se integrează natural în materialul textil al produsului pe care îl identifică.

[0011] Antena UIF **2** are o geometrie particulară, inovativă, caracterizată prin aceea că are în zona centrală o buclă dublă **5** prin care este realizat un cuplaj inductiv eficient cu transponderul IDRF capsulat **3**, obținându-se astfel o eticheta IDRF performantă din punct de vedere electromagnetic.

[0012] De asemenea bucla dublă **5** permite realizarea unei etichete IDRF de dimensiuni reduse,

materialului antenei și implicit performanțele electromagnetice.
-materialul firului metalic din care este realizată antena înmagazinează mult mai multă energie termică decât suportul textil, această diferență ducând la străpungerfea, perforarea materialului textil de către firul metalic al antenei care iese în afara acestuia.
Acestea duc la desprinderea transponderului IDRF capsulat **3** și prin urmare la pierderea identității obiectelor textile monitorizate, la probleme de aspect al articolului textil, dar mai ales probleme pentru clienți, respectiv rănirea lor la utilizarea articolului textil (prosoape, fețe de pernă, cearceafuri) care a fost străpuns de firul metalic.
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[0012] De asemenea bucla dublă **5** permite realizarea unei etichete IDRF de dimensiuni reduse,

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discretă și ușor de integrat chiar și în articole textile de mici dimensiuni.

[0013] Antena UIF a etichetei pasive IDRF poate fi realizată în două variante Fig. **2** și Fig. **3**. La prima variantă, Fig. **2**, firul textil electroconductiv este izolat electric și permite încălecarea firului în anumite puncte (A, B, C, D) fără contact electric. Pentru a doua variantă, Fig. **3**, geometria antenei UIF permite și utilizarea unui fir textil electroconductiv neizolat. Ambele variante sunt realizate prin broadare.

[0014] În prima variantă constructivă, Fig. **2**, bucla dublă **5** a antenei UIF **2** prin care este realizat cuplajul inductiv cu transponderul IDRF capsulat **3,** este o spirală cu două spire, (în care prima spiră are diametrul de 7mm, iar cea de-a doua are un diametru de 9mm), geometrie care a creat o antenă UHF eficientă din punct de vedere al transferului de putere și al asigurării integrității informației, și permite dimensiuni constructive substanțial reduse. În punctele A, B, C, și D nu există contact electric.

[0014] În a doua variantă constructivă a antenei UIF, Fig. **3**, desenul broderiei e realizat astfel încât firul textil electroconductiv să fie brodat continuu, fără să se încrucișeze pe parcurs.
După realizarea broderiei, prin îndoirea pe linia punctată și suprapunerea celor două bucle P și Q, se va forma bucla dublă. Bucla P are diametrul de 7mm iar bucla Q are diametrul de 9mm. Se observă că, după îndoire și suprapunere, curenții în cele două bucle au același sens, contribuind împreună la realizarea unui cuplaj inductiv eficient. Înainte de îndoire intre cele două planuri P și Q se va fixa cu adeziv pe bucla P, transponderul capsulat **3**. După îndoire și suprapunere transponderul capsulat **3** va fi fixat între cele două bucle, Pși Q.

[0015] Prezentul Brevet de invenție vine în completarea brevetului de invenție nr **a 2016 00791**, care propunea un Transponder IDRF destinat funcționării în medii agresive. Transponderul IDRF, era descris ca fiind proiectat să poată fi utilizat atât independent, în cazul aplicațiilor IDRF pentru care distnța de citire este de ordinul centimetrilor, cât și împreună cu o antenă UIF-SIF, în cazul aplicațiilor IDRF pentru care distnța de citire este de ordinul metrilor.

[0016]Designul prezentului tag, prin înglobarea în structura sa a transponderului capsulat **3**, obiect al brevetului **a 2016 00791** depășește problemele create de discrepanțele dimensionale dintre minusculele CI și antenele la care sunt conectate galvanic, conectare care necesită utilizarea unor tehnologii de conectare scumpe(wire bonding) sau inadecvate mediului agresiv din spălătoriile industriale(lipire cu adezivi conductori).

[0017] Designul tagului caută o dreaptă măsură relativ dimensiunile obiectelor pe care le identifică și dimensiunile tagului. Nu cade în plasa miniturizării excesive când nu este cazul.

[0018] Este propus un design maximal- maximul realizabil cu componenetele disponibile la ora actuală, păstrând măsura.
- transponder cu număr minim de contacte galvanice, două, egal cu numărul pinilor IC, contacte galvanice robuste prin utilizarea unui CI în carcasă SOT323, sudat în tehnologie SMT ieftină și matură, la terminalele antenei de câmp apropiat, capsulat și protejat astfel la mediul agresiv din spălătoriile industriale,
- cuplaj inductiv între transponderul capsulat 3 și antena UIF,
- omogenitatea componenetelor ansmblului antena UIF-substrat textil, ambele din material textil,
- lungime substanțial redusă a tagului prin utilizarea buclei duble a antenei UIF.
- Tag Născut și nu făcut pentru lumea textilelor prin materialele utlizate (fir textil pe suport textil), și metodele de realizare (brodare a firului textil electroconductiv pe syportul textil).

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REVENDICĂRI

1. O etichetă IDRF **1**, care conține:
   - o antenă UIF **2** cu o geometrie particulară, caracterizată prin aceea că are în zona centrală o buclă dublă **5** prin care este realizat cuplajul inductiv cu Transponderul IDRF capsulat **3**. Antenă UIF 2 este realizată din fir textil electroconductiv, brodat pe suport textil,
   - un Transponder IDRF capsulat destinat funcționării în medii agresive **3**,
   - un substart din material textil **4** pe care sunt plasate Transponderul IDRF pentru medii agresive **3** și Antena UIF **2**. Întregul ansamblu este etanșat prin lipirea la cald a unui al doilea substrat textil

2. Domeniul de frecvență în care poate opera eticheta IDRF 1, este UIF (860-960MHz) sau SIF(2,5GHz RFID).

3. Antena UIF **2** este realizată dintr-un fir textil electroconductiv sau fir metalic izolat, în două variante constructive.

4. În prima variantă constructivă, bucla dublă **5** a antenei UIF **2** prin care este realizat cuplajul inductiv cu Transponderul IDRF capsulat **3,** este o spirală cu două spire, (în care prima spiră are diametrul de 7mm, iar cea de a doua are un diametru de 10mm, geometrie care realizează un transfer de energie electromagnetică eficient, și permite dimensiuni constructive substanțial reduse. În punctele A și B (Fig. 2). nu există contact electric. De asemenea, și buclele din capetele antenei UIF 2, sunt realizate fără contact electric în punctele C și D(Fig. 1).

5. În a doua variantă constructivă antena UIF, desenul broderiei e realizat astfel încât firul textil electroconductiv să fie cusut continuu fără să se încrucișeze pe parcurs. După realizarea broderiei, prin îndoirea pe linia punctată și suprapunerea celor două bucle P și Q, se va forma bucla dublă. Bucla P are diametrul de 7mm iar bucla Q are diametrul de 9mm. Se observă că, după îndoire și suprapunere, curenții în cele două bucle au același sens, contribuind împreună la realizarea unui cuplaj inductiv eficient. Înainte de îndoire, intre cele două planuri P și B se va fixa cu adeziv pe bucla P, transponderul capsulat **3**. După îndoire și suprapunere transponderul capsulat 3 va fi fixat între cele două bucle, Pși Q.

FIGURI

Fig. 1 . Etichetă RFID **1** în buclă dublă **5**

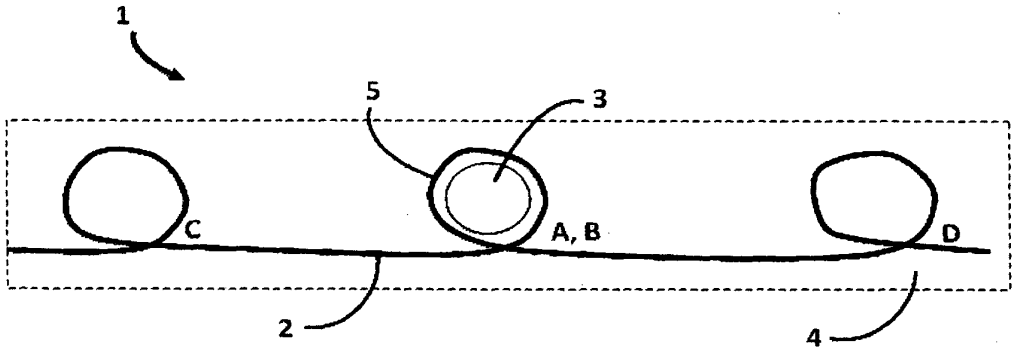


Fig. 2. Detaliu, bucla dublă **5** de cuplaj inductiv cu transponderul IDRF capsulat **3**

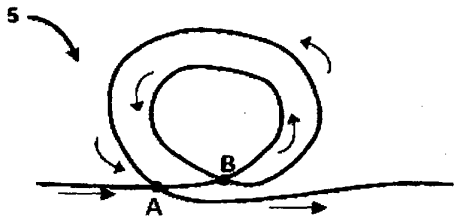
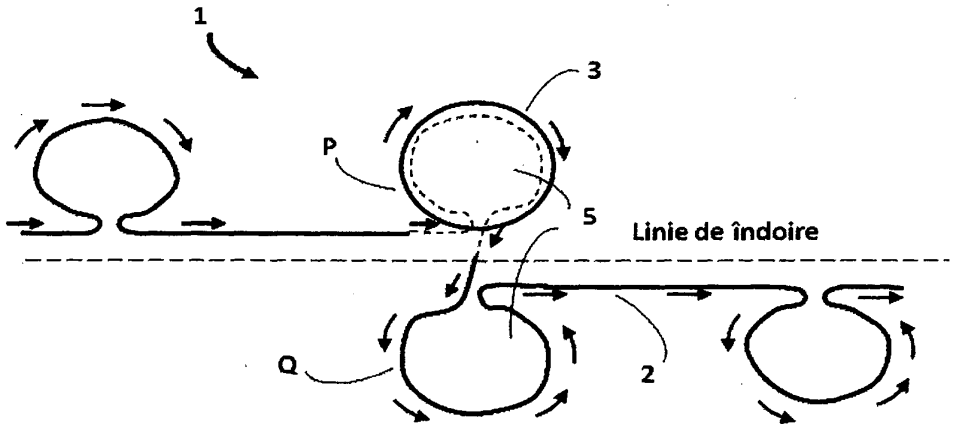


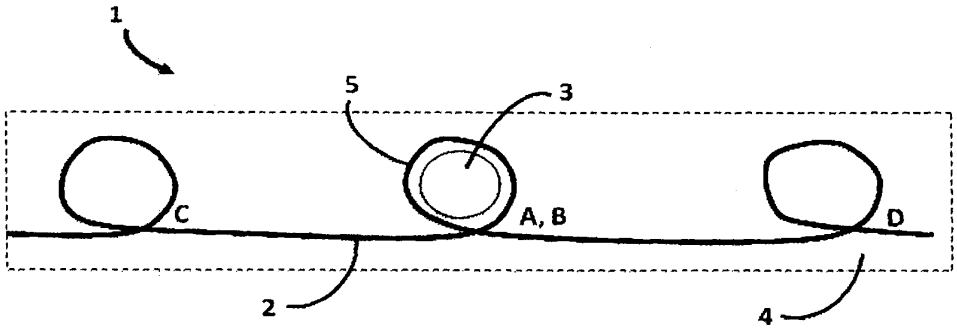
Fig. 3. Etichetă RFID **1** în buclă dublă **5** realizată prin îndoire



REZUMAT

Prezentul Brevet de invenție, se referă la o etichetă IDRF (IDentificare prin Radio Frecvență) **1**, pentru domeniul de frcvență UIF-SIF, proiectatăt să funcționeze în domeniul mediilor industriale agresive. Eticheta IDRF **1**, este compusă dintr-un Transponder IDRF capsulat **3**, cuplat inductiv cu antena UIF **2**, realizată din fir textil electroconductiv, fixată prin brodare pe un substrat de material textil **4**. Antena UIF **2** are o geometrie particulară, caracterizată de o buclă de cuplare inductivă dublă **5**, geometrie care generează un transfer de energie superior și permite realizarea unor etichete IDRF de dimensiuni reduse.

Fig. 1 . Etichetă RFID **1** în buclă dublă **5**



Ursaa

PATENT COOPERATION TREATY

From the
INTERNATIONAL SEARCHING AUTHORITY

To:

see form PCT/ISA/220

PCT

WRITTEN OPINION OF THE INTERNATIONAL SEARCHING AUTHORITY

(PCT Rule 43*bis*.1)

Date of mailing
(day/month/year) see form PCT/ISA/210 (second sheet)

Applicant's or agent's file reference
see form PCT/ISA/220

FOR FURTHER ACTION
See paragraph 2 below

International application No.	International filing date *(day/month/year)*	Priority date *(day/month/year)*
PCT/RO2017/000023	19.12.2017	16.06.2017

International Patent Classification (IPC) or both national classification and IPC
INV. G06K19/077 G06K19/02

Applicant
PROMAR TEXTIL INDUSTRIES SRL

1. This opinion contains indications relating to the following items:

- ☒ Box No. I Basis of the opinion
- ☐ Box No. II Priority
- ☐ Box No. III Non-establishment of opinion with regard to novelty, inventive step and industrial applicability
- ☐ Box No. IV Lack of unity of invention
- ☒ Box No. V Reasoned statement under Rule 43*bis*.1(a)(i) with regard to novelty, inventive step and industrial applicability; citations and explanations supporting such statement
- ☐ Box No. VI Certain documents cited
- ☐ Box No. VII Certain defects in the international application
- ☒ Box No. VIII Certain observations on the international application

2. **FURTHER ACTION**

If a demand for international preliminary examination is made, this opinion will usually be considered to be a written opinion of the International Preliminary Examining Authority ("IPEA") except that this does not apply where the applicant chooses an Authority other than this one to be the IPEA and the chosen IPEA has notifed the International Bureau under Rule 66.1*bis*(b) that written opinions of this International Searching Authority will not be so considered.

If this opinion is, as provided above, considered to be a written opinion of the IPEA, the applicant is invited to submit to the IPEA a written reply together, where appropriate, with amendments, before the expiration of 3 months from the date of mailing of Form PCT/ISA/220 or before the expiration of 22 months from the priority date, whichever expires later.

For further options, see Form PCT/ISA/220.

Name and mailing address of the ISA:	Date of completion of this opinion	Authorized Officer
European Patent Office D-80298 Munich Tel. +49 89 2399 - 0 Fax: +49 89 2399 - 4465	see form PCT/ISA/210	Schmidt, Rainer Telephone No. +49 89 2399-0

Form PCT/ISA/237 (Cover Sheet) (January 2015)

Box No. I Basis of the opinion

1. With regard to the **language**, this opinion has been established on the basis of:

   ☒ the international application in the language in which it was filed.

   ☐ a translation of the international application into , which is the language of a translation furnished for the purposes of international search (Rules 12.3(a) and 23.1 (b)).

2. ☐ This opinion has been established taking into account the **rectification of an obvious mistake** authorized by or notified to this Authority under Rule 91 (Rule 43*bis*.1(a))

3. ☐ With regard to any **nucleotide and/or amino acid sequence** disclosed in the international application, this opinion has been established on the basis of a sequence listing:

   a. ☐ forming part of the international application as filed:

      ☐ in the form of an Annex C/ST.25 text file.

      ☐ on paper or in the form of an image file.

   b. ☐ furnished together with the international application under PCT Rule 13*ter*.1(a) for the purposes of international search only in the form of an Annex C/ST.25 text file.

   c. ☐ furnished subsequent to the international filing date for the purposes of international search only:

      ☐ in the form of an Annex C/ST.25 text file (Rule 13*ter*.1(a)).

      ☐ on paper or in the form of an image file (Rule 13*ter*.1(b) and Administrative Instructions, Section 713).

4. ☐ In addition, in the case that more than one version or copy of a sequence listing has been filed or furnished, the required statements that the information in the subsequent or additional copies is identical to that forming part of the application as filed or does not go beyond the application as filed, as appropriate, were furnished.

5. Additional comments:

Box No. V Reasoned statement under Rule 43*bis*.1(a)(i) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement

1. Statement

Novelty (N)	Yes:	Claims	1-5
	No:	Claims	
Inventive step (IS)	Yes:	Claims	
	No:	Claims	1-5
Industrial applicability (IA)	Yes:	Claims	1-5
	No:	Claims	

2. Citations and explanations

see separate sheet

Box No. VIII Certain observations on the international application

The following observations on the clarity of the claims, description, and drawings or on the question whether the claims are fully supported by the description, are made:

see separate sheet

1 **Re Item V**

Reasoned statement with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement

1.1 Reference is made to the following documents:

D1 WO 2017/060652 A1 (FENOTAG [FR]) 13 April 2017 (2017-04-13)

D2 US 2009/079574 A1 (OROKU NORIYUKI [JP] ET AL) 26 March 2009 (2009-03-26)cited in the application

D3 DE 10 2013 102051 A1 (INFINEON TECHNOLOGIES AG [DE]) 4 September 2014 (2014-09-04)

2 Regarding the subject-matter of claim 1, document D1 discloses an RFID tag (1) for use in harsh environments (cf. page 3, lines 7 - 24) comprising an antenna (20) made of an textile electroconductive thread, electrically insulated, embroidered on a textile substrate (30) (cf. Figs. 2, 2A, 2B and page 23, line 20 - page 25, line 21), an RFID transponder (10), and a substrate of textile material (TP3) on which the RFID transponder (10) and the antenna (20) are placed, the whole assembly being sealed by hot-dipping of a second textile substrate (TP2), wherein the antenna (20) has a central zone formed by a loop (20L) (cf. Fig. 2A) by which it inductively couples with the encapsulated transponder (10).

2.1 Hence, the subject-matter of claim 1 therefore differs from this known tag only in that said loop is defined to be a double loop.

2.2 The problem to be solved by the present invention may therefore be regarded as how to enhance the coupling between the antenna and the RFID transponder.

2.3 A double loop of an antenna for coupling to an RFID transponder is described in document D2 (cf. Fig. 7B and paragraph 0069) as providing the same advantages (cf. paragraph 0070) as in the present application. The skilled person would therefore regard it as a normal design option to include this feature in the device described in D1 in order to solve the problem posed.

2.4 Hence, the subject-matter of claim 1 does not involve an inventive step in view of the teachings of D1 and D2 (Art. 33(3) PCT).

3 D3 represents another document teaching a double loop coupling portion in an antenna for coupling to an RFID transponder and describes the same advantages (cf. Fig. 2B and paragraphs 0057 - 0059). Hence, the subject-matter of claim 1 is also obvious in view of D1 and D3.

4 The features added by dependent claims 2 and 3 are also known or at least clearly suggested by the cited prior art. For instance, D1 describes that the antenna (20) is made of an electrically insulated electroconductive textile thread, by continuous embroidering, starting from one end to the other (cf. page 25, lines 8 - 21), and Fig. 2 of D1 shows that the antenna has simple loops in each extremity. It is also perfectly clear from the cited documents that the antenna loops do neither show electrical contacts at the crossing points in the construction of the loops in the extremities nor in the crossing points of the central double loops since otherwise the antenna would be rendered defunct due to short-circuits in the loops.

5 As far as the remaining dependent claims 3 and 4 can be understood (cf.Item VIII, below), they do not appear to add anything inventive.

6 **Re Item VIII**

Certain observations on the international application

7 Claim 1 reads:

1. An RFID tag (1) for use in harsh environments comprising a UHF-SHF antenna (2) made of an textile electroconductive thread, electrically insulated, embroidered on a textile substrate, an RFID transponder (3), and a substrate of textile material (4) on which the RFID transponder (3) and the UIF-SIF antenna (2) are placed, the whole assembly being sealed by hot-dipping of a second textile substrate, wherein the UIF-SIF antenna (2) has a central zone formed by a double loop (5) by which it inductively couples with the encapsulated IDRF Transponder (3).

7.1 The independent claim lacks clarity in the sense of Art. 6 for several reasons:

- It is not clear from the wording of the claim what is exactly denoted by the acronyms "UHF", "SHF", "UIF", "SIF", and "IDRF".

- Expressions appear to be used inconsistently since it is not apparent whether expressions like "UHF-SHF antenna"/"UIF-SIF antenna" or "RFID transponder"/"IFRF Transponder" intend to denote identical items with different names or whether the different expressions should actually refer to different items.

7.2 Further unclarities can be found in the dependent claims:

- It is not apparent from the wording of claim 3 what might be denoted by "the crossing points A and B" or by "the crossing points C and D".
- Likewise, it remains obscure what might be considered to be "the longitudinal direction" or "the same longitudinal axis".
- Claim 5 appears to be at least very difficult to interpret since it is not apparent what could be meant by "the upper plane loop", "the transponder being fixed and centered on the loop", or by "the loop (Q) ... will overlapp the loop (P) by **bending over the logitudinal axis**".

Electronic Patent Application Fee Transmittal					
Application Number:					
Filing Date:					
Title of Invention:	RFID TAG FOR HARSH ENVIRONMENT INDUCTIVELY COUPLED IN DOUBLE LOOP				
First Named Inventor/Applicant Name:	Aurelian MORARU				
Filer:	Roy D. Gross				
Attorney Docket Number:	07610-P0002A				
Filed as Small Entity					
Filing Fees for U.S. National Stage under 35 USC 371					
Description		**Fee Code**	**Quantity**	**Amount**	**Sub-Total in USD($)**
Basic Filing:					
BASIC NATIONAL STAGE FEE		2631	1	150	150
NATL STAGE SEARCH FEE - REPORT PROVIDED		2642	1	260	260
NATL STAGE EXAM FEE - ALL OTHER CASES		2633	1	380	380
Pages:					
Claims:					
Miscellaneous-Filing:					
Petition:					
Patent-Appeals-and-Interference:					

Description	Fee Code	Quantity	Amount	Sub-Total in USD($)
Post-Allowance-and-Post-Issuance:				
Extension-of-Time:				
Miscellaneous:				
		Total in USD ($)		**790**

Electronic Acknowledgement Receipt	
EFS ID:	37589195
Application Number:	16609260
International Application Number:	PCT/RO2017/000023
Confirmation Number:	1148
Title of Invention:	RFID TAG FOR HARSH ENVIRONMENT INDUCTIVELY COUPLED IN DOUBLE LOOP
First Named Inventor/Applicant Name:	Aurelian MORARU
Customer Number:	136531
Filer:	Roy D. Gross
Filer Authorized By:	
Attorney Docket Number:	07610-P0002A
Receipt Date:	29-OCT-2019
Filing Date:	
Time Stamp:	11:58:59
Application Type:	U.S. National Stage under 35 USC 371

Payment information:

Submitted with Payment	yes
Payment Type	CARD
Payment was successfully received in RAM	$790
RAM confirmation Number	E20190SB59182264
Deposit Account	
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File Listing:

Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)
1	Miscellaneous Incoming Letter	07610-P0002A-Application-Cover-Sheet.pdf	67221 16647db385cb2b5be59be1a46ff1cbe6cdcc0099	no	1
Warnings:					
Information:					
2		07610-P0002A-Specification-Drawings.pdf	690208 da5fed28d0253984acbda58f3b3f4b2f22b1c1e7	yes	8

	Multipart Description/PDF files in .zip description		
	Document Description	**Start**	**End**
	Specification	1	5
	Claims	6	6
	Abstract	7	7
	Drawings-only black and white line drawings	8	8

Warnings:					
Information:					
3	Application Data Sheet	07610-P0002A-ADS-non-provisional.pdf	1256215 bf40ffe52f0a494bc9abef5f5cbdba7a9e3a1dbf	no	8
Warnings:					
Information:					
4		07610-P0002A-POA-Declaration-signed.pdf	1410695 01bbb0469da7188d082682c7ab440dfc1927dd91	yes	3

	Multipart Description/PDF files in .zip description		
	Document Description	**Start**	**End**

	Power of Attorney		1	1	
	Oath or Declaration filed		2	3	
Warnings:					
Information:					
5		07610-P0002A-Preliminary-Amendment.pdf	70613 4dcefff47b241fce7643eacb9768fd12e86b1863	yes	3
	Multipart Description/PDF files in .zip description				
	Document Description		**Start**	**End**	
	Preliminary Amendment		1	1	
	Specification		2	2	
	Applicant Arguments/Remarks Made in an Amendment		3	3	
Warnings:					
Information:					
6	Transmittal of New Application	07610-P0002A-pto1390.pdf	266386 884b46604538d8fa75c890b2502df3d232a870c2	no	4
Warnings:					
Information:					
7	Other Reference-Patent/App/Search documents	WO2018231083-ISR-20181220-2935.pdf	98315 80915624404c5e1159b782f1c7cec06cf42e4fb1	no	3
Warnings:					
Information:					
8	Documents submitted with 371 Applications	WO2018231083-PAMPH-20181220-5149.pdf	475547 8ee0c5c556f4e3a91db657e3ab9e747557fa2566	no	12
Warnings:					
Information:					
9	Interim Copy of the Foreign Priority Document	WO2018231083-PDOC-20181220-8651.pdf	639034 68cb1a795a30ca25f615286255eb7b7163fcdd79	no	12
Warnings:					

Information:					
10	Other Reference-Patent/App/Search documents	WO2018231083-WOSA-20181220-2936.pdf	209808 e6a54be352da8e648eaa59537b724519758 88caf	no	6
Warnings:					
Information:					
11	Fee Worksheet (SB06)	fee-info.pdf	34910 ffb720a07489ddbb9b790dfdfb5d03ffbabc 5be8	no	2
Warnings:					
Information:					
		Total Files Size (in bytes):	5218952		

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If a new application is being filed and the application includes the necessary components for a filing date (see 37 CFR 1.53(b)-(d) and MPEP 506), a Filing Receipt (37 CFR 1.54) will be issued in due course and the date shown on this Acknowledgement Receipt will establish the filing date of the application.
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AMENDED CLAIMS
received by the International Bureau on 15 October 2018 (15.10.2018)

1. An RFID tag (**1**) for use in harsh enviroments comprising an UHF-SHF antenna (**2**) made from a continuous electroconductive textile thread, electrically insulated, embroided on textile substrate, an RFID transponder (**3**) and a substrate of textile material (**4**) on which the RFID transponder (**3**) and the UHF-SHF antenna (**2**) are placed, the whole assembly being sealed by hot-dipping of a second textile substrate, **characterized in that** the UHF-SHF antenna (**2**) has a central zone formed by a double loop (**5**) by which it inductively couples with the encapsulated RFID transponder (**3**).

2. The RFID tag (**1**) according to claim 1, **characterised in that** the UHF-SHF antenna (**2**) is made of an electroconductive textile thread, electrically insulated, by continuous embroidering, starting from one end to the other, and has simple loops in each extremity, and in the central area a double loop (**5**) consisting of a first loop with a smaller diameter, followed by a second concentric loop with a larger diameter.

3. The RFID tag (**1**) according to claim 1, **characterized in that** the UHF-SHF antenna (**2**) does not show electrical contacts in the crossing points (**C** and **D**) in the construction of the simple loops located at the extremities nor in the crossing points (**A** and **B**) by which the central loop (**5**) is formed.

4. The RFID tag (**1**) according to claim 1, **characterized in that** the UHF-SHF antenna (**2**) is made by cotinuous embroidering of the elctroconductive textile thread in the form of two open loops disposed in a upper plane in relation to the longitudinal direction and two open loops disposed in a lower plane in relation to the same longitudinal direction.

5. The RFID tag (**1**) according to claim 4, **characterized in that**, in the central area, the upper plane loop (**P**) has a smaller diameter than the loop (**Q**) from the lower plane, the transponder (**3**) being fixed and centered on the loop (**P**) in the upper plane, and the loop (**Q**) from the lower plane will overlapp the loop (**P**)) from the upper plane by bending over said longitudinal direction, so that the double loop (**5**) is created having the transponder (**3**) inside it.

ABSTRACT

The invention relates to an IDRF label for use in aggressive environments. The IDRF label (1) according to the invention comprises a UIF-SIF (2) antenna made of an electrically conductive textile, electrically insulated, embroidered on a textile backing, an IDRF transponder (3) and a textile substrate (4) and the UIF-SIF antenna (2), the whole assembly being sealed by hot-dipping a second textile substrate, wherein the UIF-SIF (2) antenna has a central loop formed by a loop (5) by which it inductively couples with the encapsulated IDRF transponder 3.

Drawings

Fig. 1 .

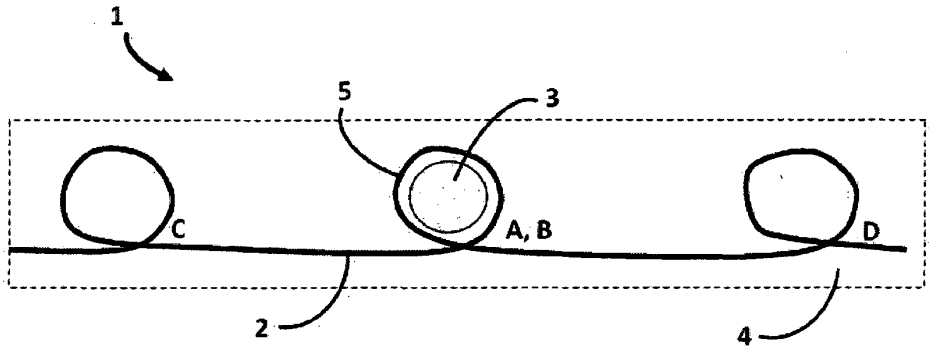


Fig. 2.

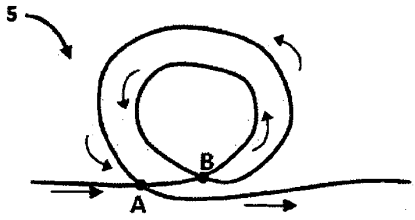
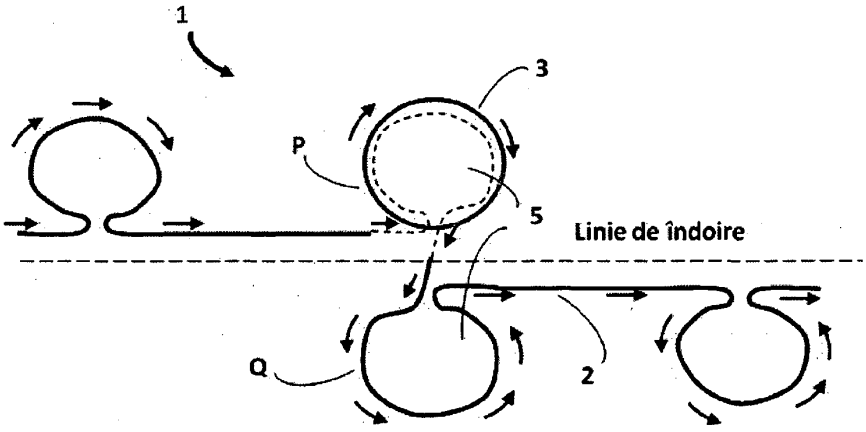


Fig. 3.



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Application Data Sheet 37 CFR 1.76	Attorney Docket Number	07610-P0002A
	Application Number	
Title of Invention	RFID TAG FOR HARSH ENVIRONMENT INDUCTIVELY COUPLED IN DOUBLE LOOP	

The application data sheet is part of the provisional or nonprovisional application for which it is being submitted. The following form contains the bibliographic data arranged in a format specified by the United States Patent and Trademark Office as outlined in 37 CFR 1.76.
This document may be completed electronically and submitted to the Office in electronic format using the Electronic Filing System (EFS) or the document may be printed and included in a paper filed application.

Secrecy Order 37 CFR 5.2:

☐ Portions or all of the application associated with this Application Data Sheet may fall under a Secrecy Order pursuant to 37 CFR 5.2 (Paper filers only. Applications that fall under Secrecy Order may not be filed electronically.)

Inventor Information:

Inventor 1 [Remove]

Legal Name

Prefix	Given Name	Middle Name	Family Name	Suffix
	Aurelian		MORARU	

Residence Information (Select One) US Residency ● Non US Residency Active US Military Service

City	Brasov	Country of Residence [i]	RO

Mailing Address of Inventor:

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Address 2	sc. E ap. 11
City	Brasov **State/Province**
Postal Code	**Country** [i] RO

Inventor 2 [Remove]

Legal Name

Prefix	Given Name	Middle Name	Family Name	Suffix
	Corneliu		URSACHI	

Residence Information (Select One) US Residency ◉ Non US Residency Active US Military Service

City	Brasov	Country of Residence [i]	RO

Mailing Address of Inventor:

Address 1	str. Nicolae Titulesc, nr. 37, bl. 7
Address 2	sc. B, ap. 16
City	Brasov **State/Province**
Postal Code	**Country** [i] RO

All Inventors Must Be Listed - Additional Inventor Information blocks may be generated within this form by selecting the **Add** button. [Add]

Correspondence Information:

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Application Data Sheet 37 CFR 1.76	Attorney Docket Number	07610-P0002A
	Application Number	
Title of Invention	RFID TAG FOR HARSH ENVIRONMENT INDUCTIVELY COUPLED IN DOUBLE LOOP	

Enter either Customer Number or complete the Correspondence Information section below.
For further information see 37 CFR 1.33(a).

☐ **An Address is being provided for the correspondence Information of this application.**

Customer Number	136531		
Email Address	roy@rgrosslaw.com	Add Email	Remove Email

Application Information:

Title of the Invention	RFID TAG FOR HARSH ENVIRONMENT INDUCTIVELY COUPLED IN DOUBLE LOOP		
Attorney Docket Number	07610-P0002A	**Small Entity Status Claimed**	☒
Application Type	Nonprovisional		
Subject Matter	Utility		
Total Number of Drawing Sheets (if any)	1	**Suggested Figure for Publication (if any)**	

Filing By Reference:

Only complete this section when filing an application by reference under 35 U.S.C. 111(c) and 37 CFR 1.57(a). Do not complete this section if application papers including a specification and any drawings are being filed. Any domestic benefit or foreign priority information must be provided in the appropriate section(s) below (i.e., "Domestic Benefit/National Stage Information" and "Foreign Priority Information").

For the purposes of a filing date under 37 CFR 1.53(b), the description and any drawings of the present application are replaced by this reference to the previously filed application, subject to conditions and requirements of 37 CFR 1.57(a).

Application number of the previously filed application	Filing date (YYYY-MM-DD)	Intellectual Property Authority or Country

Publication Information:

☐ Request Early Publication (Fee required at time of Request 37 CFR 1.219)

☐ **Request Not to Publish.** I hereby request that the attached application not be published under 35 U.S.C. 122(b) and certify that the invention disclosed in the attached application **has not and will not** be the subject of an application filed in another country, or under a multilateral international agreement, that requires publication at eighteen months after filing.

Representative Information:

Representative information should be provided for all practitioners having a power of attorney in the application. Providing this information in the Application Data Sheet does not constitute a power of attorney in the application (see 37 CFR 1.32).
Either enter Customer Number or complete the Representative Name section below. If both sections are completed the customer Number will be used for the Representative Information during processing.

Please Select One:	● Customer Number	US Patent Practitioner	○ Limited Recognition (37 CFR 11.9)
Customer Number	136531		

Application Data Sheet 37 CFR 1.76	Attorney Docket Number	07610-P0002A
	Application Number	
Title of Invention	RFID TAG FOR HARSH ENVIRONMENT INDUCTIVELY COUPLED IN DOUBLE LOOP	

Domestic Benefit/National Stage Information:

This section allows for the applicant to either claim benefit under 35 U.S.C. 119(e), 120, 121, 365(c), or 386(c) or indicate National Stage entry from a PCT application. Providing benefit claim information in the Application Data Sheet constitutes the specific reference required by 35 U.S.C. 119(e) or 120, and 37 CFR 1.78.
When referring to the current application, please leave the "Application Number" field blank.

Prior Application Status	Pending		Remove
Application Number	Continuity Type	Prior Application Number	Filing or 371(c) Date (YYYY-MM-DD)
	a 371 of international	PCT/RO2017/000023	2017-12-19

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Foreign Priority Information:

This section allows for the applicant to claim priority to a foreign application. Providing this information in the application data sheet constitutes the claim for priority as required by 35 U.S.C. 119(b) and 37 CFR 1.55. When priority is claimed to a foreign application that is eligible for retrieval under the priority document exchange program (PDX)[i] the information will be used by the Office to automatically attempt retrieval pursuant to 37 CFR 1.55(i)(1) and (2). Under the PDX program, applicant bears the ultimate responsibility for ensuring that a copy of the foreign application is received by the Office from the participating foreign intellectual property office, or a certified copy of the foreign priority application is filed, within the time period specified in 37 CFR 1.55(g)(1).

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Application Number	Country[i]	Filing Date (YYYY-MM-DD)	Access Code[i] (if applicable)
a 2017 00388	RO	2017-06-16	

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Statement under 37 CFR 1.55 or 1.78 for AIA (First Inventor to File) Transition Applications

☐ This application (1) claims priority to or the benefit of an application filed before March 16, 2013 and (2) also contains, or contained at any time, a claim to a claimed invention that has an effective filing date on or after March 16, 2013.
NOTE: By providing this statement under 37 CFR 1.55 or 1.78, this application, with a filing date on or after March 16, 2013, will be examined under the first inventor to file provisions of the AIA.

Application Data Sheet 37 CFR 1.76	Attorney Docket Number	07610-P0002A
	Application Number	
Title of Invention	RFID TAG FOR HARSH ENVIRONMENT INDUCTIVELY COUPLED IN DOUBLE LOOP	

Authorization or Opt-Out of Authorization to Permit Access:

When this Application Data Sheet is properly signed and filed with the application, applicant has provided written authority to permit a participating foreign intellectual property (IP) office access to the instant application-as-filed (see paragraph A in subsection 1 below) and the European Patent Office (EPO) access to any search results from the instant application (see paragraph B in subsection 1 below).

Should applicant choose not to provide an authorization identified in subsection 1 below, applicant **must opt-out** of the authorization by checking the corresponding box A or B or both in subsection 2 below.

NOTE: This section of the Application Data Sheet is **ONLY** reviewed and processed with the **INITIAL** filing of an application. After the initial filing of an application, an Application Data Sheet cannot be used to provide or rescind authorization for access by a foreign IP office(s). Instead, Form PTO/SB/39 or PTO/SB/69 must be used as appropriate.

1. Authorization to Permit Access by a Foreign Intellectual Property Office(s)

A. Priority Document Exchange (PDX) - Unless box A in subsection 2 (opt-out of authorization) is checked, the undersigned hereby **grants the USPTO authority** to provide the European Patent Office (EPO), the Japan Patent Office (JPO), the Korean Intellectual Property Office (KIPO), the State Intellectual Property Office of the People's Republic of China (SIPO), the World Intellectual Property Organization (WIPO), and any other foreign intellectual property office participating with the USPTO in a bilateral or multilateral priority document exchange agreement in which a foreign application claiming priority to the instant patent application is filed, access to: (1) the instant patent application-as-filed and its related bibliographic data, (2) any foreign or domestic application to which priority or benefit is claimed by the instant application and its related bibliographic data, and (3) the date of filing of this Authorization. See 37 CFR 1.14(h)(1).

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The applicant is reminded that the EPO's Rule 141(1) EPC (European Patent Convention) requires applicants to submit a copy of search results from the instant application without delay in a European patent application that claims priority to the instant application.

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Application Data Sheet 37 CFR 1.76	Attorney Docket Number	07610-P0002A
	Application Number	
Title of Invention	RFID TAG FOR HARSH ENVIRONMENT INDUCTIVELY COUPLED IN DOUBLE LOOP	

Applicant Information:

Providing assignment information in this section does not substitute for compliance with any requirement of part 3 of Title 37 of CFR to have an assignment recorded by the Office.

Applicant 1 — Remove

If the applicant is the inventor (or the remaining joint inventor or inventors under 37 CFR 1.45), this section should not be completed. The information to be provided in this section is the name and address of the legal representative who is the applicant under 37 CFR 1.43; or the name and address of the assignee, person to whom the inventor is under an obligation to assign the invention, or person who otherwise shows sufficient proprietary interest in the matter who is the applicant under 37 CFR 1.46. If the applicant is an applicant under 37 CFR 1.46 (assignee, person to whom the inventor is obligated to assign, or person who otherwise shows sufficient proprietary interest) together with one or more joint inventors, then the joint inventor or inventors who are also the applicant should be identified in this section.

Clear

● Assignee	Legal Representative under 35 U.S.C. 117	Joint Inventor
Person to whom the inventor is obligated to assign.	Person who shows sufficient proprietary interest	

If applicant is the legal representative, indicate the authority to file the patent application, the inventor is:

Name of the Deceased or Legally Incapacitated Inventor:

If the Applicant is an Organization check here. ☒

Organization Name	PROMAR TEXTIL INDUSTRIES S.R.L.		
Mailing Address Information For Applicant:			
Address 1	str. Lanurilor, nr. 1A.		
Address 2			
City	Brasov	**State/Province**	
Country	RO	Postal Code	
Phone Number		Fax Number	
Email Address			

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Application Data Sheet 37 CFR 1.76	Attorney Docket Number	07610-P0002A
	Application Number	
Title of Invention	RFID TAG FOR HARSH ENVIRONMENT INDUCTIVELY COUPLED IN DOUBLE LOOP	

Assignee 1

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Application Data Sheet 37 CFR 1.76	Attorney Docket Number	07610-P0002A
	Application Number	
Title of Invention	RFID TAG FOR HARSH ENVIRONMENT INDUCTIVELY COUPLED IN DOUBLE LOOP	

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PATENT
07610-P0002A RDG

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RFID TAG FOR HARSH ENVIRONMENT INDUCTIVELY COUPLED IN DOUBLE LOOP

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RFID tag for harsh environment inductively coupled in double loop

DESCRIPTION

[0001] A Minimum Radio Frequency Identification (RFID) system consists of a interrogator reader connected to a PC and a population of tags attached to the products they uniquely identify. An application software handles RFID information to trace and inventory these products. Passive RFID tags operating in the UIF (860-960MHz) or SIF (2.45GHz) frequency range are used.

Objects identified using RFID tags and intended for use in harsh environments shall withstand the following requirements:

- repeated immersion in the aquatic environment
- exposure to high temperatures of up to 200 ° C, more than 20 minutes
- high temperature variations - (8 ° C / 90 ° C),
- corrosive chemicals
- mechanical pressures of 40-60 bar,
- repeated mechanical stresses (bending, pressing, etc.)
- number of cycles of use greater than 300

[0003] From a historical point of view, for RFID applications, passive RFID tags operating in the HF domain (13.65MHz) were used first. Constructively, they were made up of an integrated circuit galvanically connected to a multi-spiral coil. The reading range was under one meter, and the reading speed was about one label per second. With the introduction of passive RFID tags operating in the UHF range, and with the development of communications protocols, performance has increased spectacularly at high read speeds (10 RFID tags / sec) and read ranges of up to 7m.

[0004] For textile tracking applications, the design of an RFID tag composed of a capsulated traponder, thus protected by the harsh environment of industrial laundries, and a UHF antenna made of metallic wire, has been widely adopted. The encapsulated transponder contains an integrated circuit and a near-field antenna by which it is inductively coupled to a segment of the UHF antenna.

[0005] This category includes the RFID UHF tags, the subject of patents EP 2405054 A1, DE 102007026720 A1, US 20090079574 A1.

[0006] But even this design has its limits. Capsulation is achieved by protecting the contacts between the integrated circuit (IC) pins and the near field antenna terminals, but at the UHF antenna there are major discrepancies relative to the mechanical and thermal characteristics of the textile substrate relative to the metallic conductors of the UHF antenna .

Here's a short list of problems with using these labels in industrial laundries:

- loosening the seams and breaking the textile fabric, to which the RFID tag is attached,
- the metal wire from which the UHF antenna is made oxidizes in contact with the water and the oxidant chemicals used in the washing process, stains the fabric and compromises its appearance. Also due to oxidation the electrical parameters of the antenna material, and implicitly its electromagnetic performances, are affected.
- the material of the metal wire from which the antenna is made stores much more thermal energy than the textile support, this difference leading to the piercing/ perforation of the textile material by the metal wire of the antenna that protrudes out of it.
- because of the rigidity of the metal wire, the entire tag is a little flexible compared to the textile material from which the article to be identified is being made. Low flexibility creates break lines on the RFID tagline.

These lead to the detachment of the encapsulated RFID transponder 3 and consequently to the loss of the identity of the textile objects being monitored, to the appearance problems of the textile item, but especially to the problems for the customers, respectively their injury to the use of textile articles (towels, pillows, sheets) that were pierced by the metal wires.

At the same time, current UHF tags have considerable dimensions that make them inappropriate, unsightly for identifying small items (tablecloths).

[0007] The ideal passive RFID tag for the identification of textile items that are maintained in laundries and dry cleaners is:

- electromagnetic performance (high reading distance),
- of small size,
- flexible and resistant to bending,
- resistant to chemical stress,
- resistant to a number of exposures greater than the product it identifies, over 200 washing cycles.

So an electromagnetically performant, resistant and discreet RFID tag.

[0008] The ways to approach this ideal prototype are:

- the use of encapsulating materials to effectively protect the integrated circuit and its contacts with the near field antenna at the transponder level,
- designing a UHF/SHF antenna geometry to give it superior electromagnetic properties and at the same time to have as small a size as possible,
- use of electrically conductive materials with mechanical parameters close to the textile, to the construction of the UHF/SHF antenna
- tag components that are in direct interaction, have close thermal expansion coefficients.

[0009] The UHF antennas of the RFID tags available on the market are made of electrically insulated metallic wire, attached to a textile support by sewing or embroidering. They have the meandered shape (EP 2405054 A1), or crossed loops (WO 2013128299 A1). All have the vulnerabilities and limitations described in paragraph [0006].

[0010] The present invention overcomes the aforementioned drawbacks associated with prior art solutions by providing a tag having the features mentioned in the independent claim 1.

[0011] Other preferred features of the present invention are set forth in the appended dependent claims.

[0012] The present invention proposes for the UHF-SHF antenna an electroconductive yarn made of metallic stainless steel wire that resists the action of oxidizing agents. By using the electroconductive textile wire to make the UHF-SHF antenna, due to its flexibility, the electroconductive textile thread allows for the realization of geometries impossible to achieve with an electrically isolated metal wire. It is possible to make very small radius curves without creating mechanical stresses in the tag structure. Also the UHF-SHF antenna made of electroconductive textile thread is very discreet and does not feel, it naturally integrates into the textile material of the product it identifies.

[0013] Other features and advantages of the present invention will become more apparent from the following detailed description, given in connection with the accompanying drawings, in which:

- Figure 1 shows a schematic view of the double-loop RFID tag according to a first embodiment of the invention;
- Figure 2 shows a the double loop in detail according to the first embodiment of the invention;
- Figure 3 shows a schematic view of the double-loop RFID tag according to a second embodiment of the invention;

[0014] The UHF-SHF antenna **2** has a particularly innovative geometry characterized in that it has in the central region a double loop **5** through which an efficient inductive coupling with the encapsulated RFID transponder **3** is provided, thereby obtaining an electromagnetically efficient RFID tag.

[0015] The double loop 5 also allows for a small, discreet and easy-to-integrate RFID tag even in small-sized textile articles.

[0016] The RFID passive UHF-SHF antenna can be made in two variants Fig. 2 and Fig. 3. In the first embodiment, Fig. 2, the electroconductive textile thread is electrically insulated and allows the thread overlapping at certain points (A, B, C, D) without electrical contact. For the second embodiment, Fig. 3, the UHF-SHF antenna geometry allows the use of a non-insulated electroconductive textile thread. Both variants are embroidered.

[0017] In the first embodiment, Fig. 2, the double loop **5** of the UHF antenna **2** through which the inductive coupling with the encapsulated RFID transponder 3 is made, has created an UHF antenna with efficient power transfer and information integrity, with substantially reduced design dimensions. There is no electrical contact at points A, B, C, and D.

[0018] In the second embodiment of the UHF-SHF antenna, Fig. 3, the drawing of the embroidery is made so that the electroconductive textile thread is continuously embroidered without crossings in its path.

After embroidering, by bending over the dotted line and overlapping the two P and Q loops, a double loop **(5)** will form. The loop P has a smaller diameter than the Q loop. It is noted that, after bending and overlap, the currents in the two loops have the same direction, contributing together to an efficient inductive coupling. Prior to bending between the two loops P and Q, the encapsulated transponder **(3)** will be fixed with adhesive on the loop P. After folding and overlapping the encapsulated transponder **(3)** will be secured between the two loops P and Q.

[0019] The present invention is complementary to patent No. a 2016 00791, which proposed an RFID Transponder designed to operate in aggressive environments. The RFID transponder was described as being designed to be used both independently for RFID applications for which the reading range is in centimeters and with a UHF-SHF antenna for RFID applications for which the reading range is of meters order.

[0020] The design of this tag by embedding in its structure the encapsulated transponder **3**, object of the patent **a 2016 00791**, overcomes the problems created by the dimensional discrepancies between tiny integrated cicuits and the antennas, they are galvanically

connected, which require the use of expensive technologies (wire bonding) or inadequate to the harsh environment of industrial laundry (bonding with conductive adhesives).

[0021] The tag design looks for a straight measure relative to the dimensions of the objects it identifies and the size of the tag. It does not fall into excessive miniaturization when it is not. necessary.

[0022] A maximal design is proposed for the maximum achievable design with the currently available components, keeping the measure.

- transponder with a minimum number of galvanic contacts, equal to the number of active integrated circuit pins, robust galvanic contacts using an integrated circuit in SOT323 package, welded in the cheap and mature SMT technology, at the near-field antenna terminals, encapsulated and thus protected from the harsh environment of industrial laundry,
- inductive coupling between encapsulated transponder **(3)** and UIF-SIF antenna **(2)**,
- the homogeneity of the components of the UIF-SIF antenna **(2)** - textile substrate and the antenna, both of textile material,
- substantially reduced length of the tag by using the double loop of the UHF-SHF antenna.
- a tag born and not made for the textile world by the materials used (textile thread on a textile substrate), and the methods of making (embroidering the textile thread on the textile substrate).

Referinţe bibliografice

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