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Declarations under Rule 4.17:

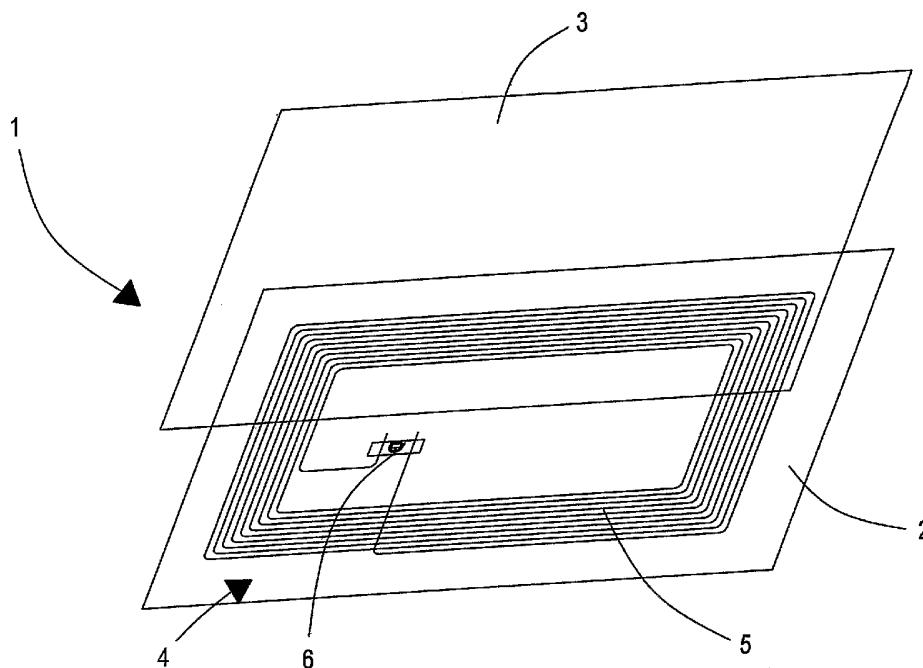
- as to applicant's entitlement to apply for and be granted a patent (Rule 4.17(ii))
- as to the applicant's entitlement to claim the priority of the earlier application (Rule 4.17(iii))
- of inventorship (Rule 4.17(iv))

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[Continued on next page]

(54) Title: PAPER DOCUMENT INCORPORATING A RADIOFREQUENCY IDENTIFICATION DEVICE



(57) Abstract: A paper document (1), wherein a radiofrequency identifying device (4) comprising an antenna (5) and a microchip (6) is incorporated, comprises a first element (2) in plastic-coated paper and a second element (3) in plastic-coated paper between which the radiofrequency identifying device (4) is enclosed, said antenna (5) being made of a wire in electrically conductive material.



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- *before the expiration of the time limit for amending the claims and to be republished in the event of receipt of amendments*
- For two-letter codes and other abbreviations, refer to the "Guidance Notes on Codes and Abbreviations" appearing at the beginning of each regular issue of the PCT Gazette.*

Paper document incorporating a radiofrequency identification device

The present invention relates to a paper document with an incorporated radiofrequency identifying device, i.e. a paper document that can be identified by said identifying device, using a suitable reading device.

From the prior art paper cards are known containing a radiofrequency identifying device made according to the two following methods:

- printing of the antenna of the identifying device onto paper with conducting inks, connecting of a microchip to the antenna, to obtain the identifying device, and lamination of the device thus obtained with a second paper;
- production of the antenna of the identifying device through chemical etching of a metal layer deposited on a suitable plastic support and lamination of the identifying device between two sheets of paper.

The devices obtained with the first method indicated above shows the drawback of poor electric quality of the product, whereas the second method mentioned above shows the drawback that the obtained document, with the identifying device incorporated in it, tends as it were to "unpeel", in other words the two sheets between which the identifying device has been laminated tend to separate along the respective contact edges, thus making the document unusable and a document of great thickness is any way generated.

The present invention aims to remedy the drawbacks specified above.

According to the present invention a paper document is provided into which a radiofrequency identifying device is incorporated comprising an antenna and a microchip, characterised in that the document comprises a first element in plastic-coated paper and a second element in plastic-coated paper between which there is enclosed the

radiofrequency identifying device, said antenna being made of a wire in electrically conductive material.

The two elements of plastic-coated paper are thermally joined together at their sides in thermoplastic material. In this way a secure and stable coupling is made between the two elements of plastic-coated paper, which does not involve the risk of the phenomenon of unpeeling.

The invention will now be disclosed with reference to the enclosed drawings, in which:

Figure 1 is an exploded view of a paper document according to the invention;

Figure 2 is a section of the paper document made with a plane that is perpendicular to the faces thereof.

With reference to Figure 1, 1 indicates a paper document according to the invention comprising a first element 2 in plastic-coated paper, consisting of a first layer 2a of thermoplastic material coupled with a second layer 2b of paper material, and a second element 3 in plastic-coated paper, also constituted by a first layer 3a of thermoplastic material and by a second layer 3b of paper material.

On the side A in thermoplastic material of the first element 2 in plastic-coated paper a radiofrequency identifying device 4 is made, comprising an antenna 5 in electrically conductive wire, for example in glazed-copper wire, connected to the ends by a microchip 6.

The identifying device 4 is enclosed in the paper document 1, thermally coupling together the first element 2 and the second element 3 with the respective sides A and A' in thermoplastic material facing one another. The thermoplastic material of the first element 2 and the thermoplastic material of the second element 3 are selected so that, during thermal coupling of the elements 2 and 3, they soften so as to enclose the identifying device 4 and melt together to form a single body with the identifying device inside.

The document 1 thus obtained will have the layers 2a and 3a in paper material of the elements 2 and 3 facing outwards

whereas the identifying device 4 will be enclosed in the internal thermoplastic material.

In this way it is also possible to at least partially compensate the variation in thickness of the document 1 due to the presence of the identifying device 4 between the two elements 2 and 3.

The thermoplastic material of the first element 2 may be similar to the thermoplastic material of the second element 3, but may also be different, provided that both materials soften sufficiently during hot coupling of the two elements and melt together.

Polyethylene can, for example, be used as thermoplastic material.

In the practical embodiment, the materials, dimensions and constructional details may be different from one another but be technically equivalent, without thereby falling outside the scope of the invention as defined by the claims.

CLAIMS

1. Paper document (1) in which a radiofrequency identifying device (4) is incorporated comprising an antenna (5) and a microchip (6), characterised in that the document
5 comprises a first element (2) in plastic-coated paper and a second element (3) in plastic-coated paper between which the radiofrequency identifying device (4) is enclosed, said antenna (5) being made of a wire in electrically conductive material.
- 10 2. Paper document (1) according to claim 1, wherein said first element (2) in plastic-coated paper comprises a first layer (2a) in thermoplastic material and a second layer (2b) in paper material.
- 15 3. Paper document (1) according to claim 1, or 2, wherein said second element (3) in plastic-coated paper comprises a first layer (3a) in thermoplastic material and a second layer (3b) in paper material.
- 20 4. Paper document (1) according to any preceding claim, wherein said first element (2) and said second element (3) are fixed together so that the respective faces (A, A') in thermoplastic material face inside the document (1), said
25 radiofrequency identifying device (4) being enclosed between said faces (A, A').
5. Paper document (1) according to claim (4) wherein said first element (2) and said second element (3) are fixed
30 together by heat.
6. Paper document (1) according to any preceding claim, wherein the thermoplastic material of the first layer (2a) of said first element (2) is the same as the thermoplastic
35 material of the first layer (3a) of said second element (3).

7. Paper document (1) according to any one of claims 1 to 5, wherein the first layer (2a) of said first element (2) is made of a first thermoplastic material and the first layer (3a) of said second element (3) is made of a second thermoplastic material different from said first thermoplastic material.
8. Paper document (1) according to any one of claims 1 to 6, wherein said thermoplastic material is polyethylene.
9. Paper document (1) according to claim 7, wherein said first thermoplastic material or said second thermoplastic material is polyethylene.
10. Paper document (1) according to any preceding claim, wherein said electrically conductive wire is glazed copper wire.
11. Method for making a paper document in which a radiofrequency identifying device (4) is inserted comprising the following phases:
- providing a first document element (2) comprising a first layer (2a) in thermoplastic material and a second layer (2b) in paper material;
 - fixing to said first layer (2a) of thermoplastic material a radiofrequency identifying device (4) comprising an antenna (5) made with a wire in electrically conducting material;
 - superimposing on said first document element (2) a second document element (3) comprising a first layer (3a) in thermoplastic material and a second layer (3b) in paper material, said superimposing being carried out in such a way that the layers (2a, 3a) in thermoplastic material face one another;
 - thermally fixing together said first document element (2) and said second document element (3).

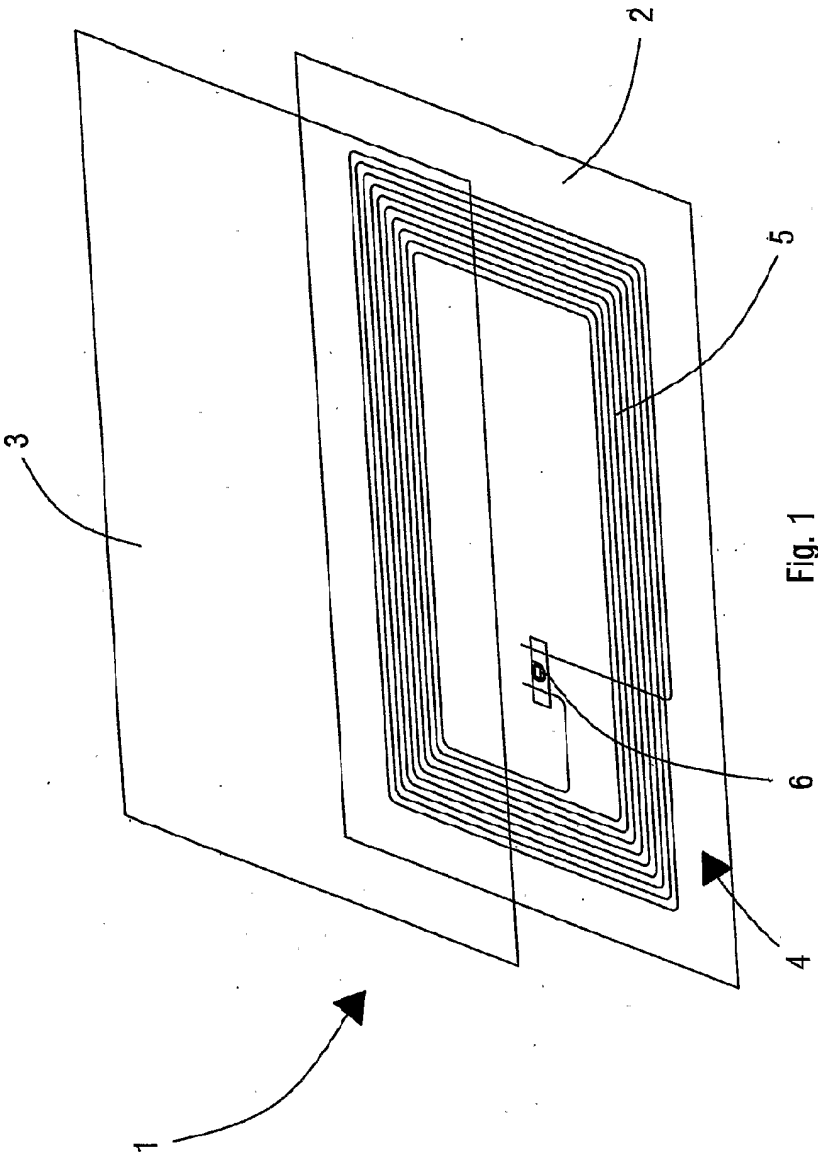


Fig. 1

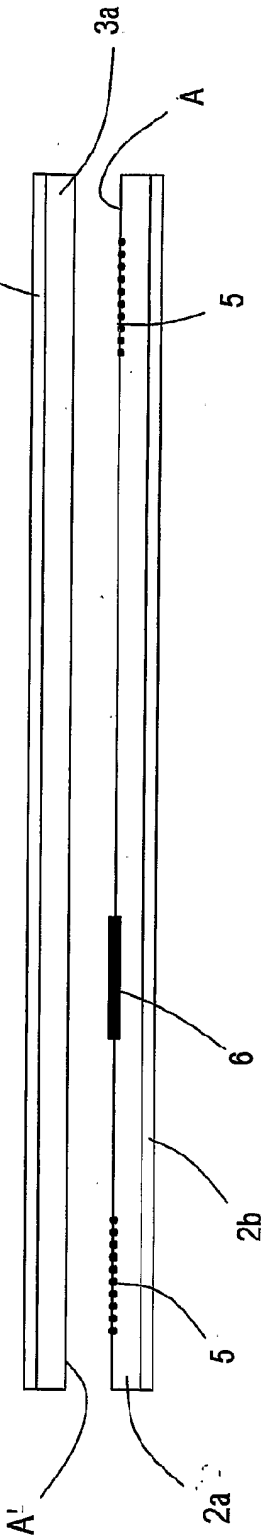


Fig. 2

INTERNATIONAL SEARCH REPORT

International application No
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A. CLASSIFICATION OF SUBJECT MATTER

INV. G06K19/077

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
G06K

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

EPO-Internal, PAJ, 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	FR 2 782 821 A (GEMPLUS) 3 March 2000 (2000-03-03) page 9, line 4 - line 11 the whole document	1-11
X	US 2003/132302 A1 (HATTORI RYOJI) 17 July 2003 (2003-07-17) paragraph [0014] - paragraph [0021] paragraph [0092] paragraph [0119] paragraph [0131]	1, 11
X	EP 1 130 542 A (LINTEC CORPORATION) 5 September 2001 (2001-09-05) paragraph [0019] - paragraph [0037] ----- -/--	1, 11

☒ Further documents are listed in the continuation of Box C.

☒ See patent family annex.

* Special categories of cited documents :

"A" document defining the general state of the art which is not considered to be of particular relevance

"E" earlier document but published on or after the international filing date

"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)

"O" document referring to an oral disclosure, use, exhibition or other means

"P" document published prior to the international filing date but later than the priority date claimed

"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

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INTERNATIONAL SEARCH REPORT

International application No
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C(Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT		
Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	DE 20 2004 003701 U1 (CUBIT ELECTRONICS GMBH) 12 August 2004 (2004-08-12) paragraph [0024] - paragraph [0026] -----	1
X	DE 200 17 736 U1 (EURO EVENT MARKETING CONSULTING GMBH; FLEXCHIP AG) 28 February 2002 (2002-02-28) page 6, line 24 - page 7, line 16 -----	1

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International application No
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