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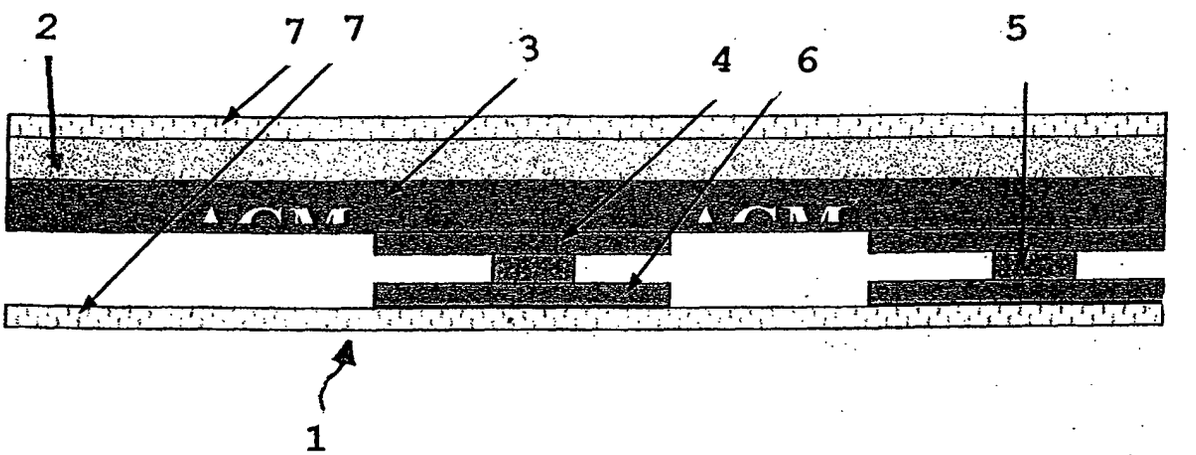
(54) Security device, preferably a security thread, comprising characters being visually readable as well as magnetic characteristics, and method of producing the same

(57) A security device, preferably a security thread (1) for being incorporated into a document such as a banknote comprises a substrate (2), preferably of a transparent polyester layer; a first layer arranged over the substrate (2) and having negative characters or scripts (3a) incorporated therein; and a magnetic code layer (5) arranged over the first layer and adjacent to the negative characters or scripts (3a), wherein the first layer is a printed ink layer (3).

Fig. 2



EP 1 334 844 A1

Description

[0001] The present invention relates to a security device and to a method for manufacturing the same. The security device preferably is a security thread having visible negative characters or scripts as well as a magnetic characteristic. The security thread can be incorporated into a document such as a banknote.

[0002] Security threads being partially or completely incorporated into a paper substrate of a banknote during the manufacturing process of the paper substrate are commonly used security devices for the check of the authenticity of the banknote.

[0003] One of those conventional security threads is used in EURO banknotes. For the realisation of such a security thread, three methods are applied in combination which have the following characteristics:

First, a method of forming negative characters and/or scripts in a thorough metal layer is used, for example by first applying a basis layer of pure aluminium on a polyester substrate so that the aluminium abuts with one surface thereof on the polyester substrate, and then by a demetallisation or by stripping off aluminium parts from the aluminium basis layer so as to form recessed characters or scripts as a negative. These characters or scripts are called "negative characters or scripts" throughout this specification. By visually checking those characters and/or scripts against the backlight, they appear transparent and are thus readable.

The presence of the metallic basis may be detected by using a capacitive or inductive circuit.

Second, the conventional security threads comprise magnetic characteristics in the so-called IMT-format. The IMT-format is realised by depositing surfaces having modulated lengths and a constant thickness, with the length of one single module being constant and defined as larger than zero. These security threads are developed and patented by the Bank of England.

Third, the security threads comprise a combination of metallic and magnetic characteristics as a single security thread.

[0004] For developing and manufacturing a security thread having the above-mentioned characteristics, apart from chemical and physical know-how, high-end and cost-expensive manufacturing methods are required, since a corrosion problem may occur when a security thread having magnetic characteristics on a metallic basis is introduced into an aqueous or wet solution conventionally used for paper manufacture. This corrosion may lead to a loss of the magnetic and/or metallic characteristics.

[0005] Further, the water used for paper manufacture sometimes has a degraded quality, is chlorinated and thereby complicates the manufacture of security threads.

[0006] Another example of a conventional security thread is disclosed in EP-0 516 790 B1 and shown in Fig. 3. Here, the conventional security thread comprises a transparent substrate, a metallic layer such as a layer of pure aluminium having negative characters 30a incorporated therein, and a magnetic layer 50 arranged over or under the metallic layer 10, with the geometrical arrangement of the magnetic layer 50 allowing the negative characters 30a to be exposed (in this specification, the terms "over" and "under" refer to opposite directions).

[0007] The production method of such a security thread comprises a step of printing an activatable ink on the substrate, a step of applying a metallic layer on the printed side of the substrate, and a step of activating the ink so as to remove the ink together with the metal deposited thereon, thereby forming recesses in the metallic layer. Thus, the negative characters are obtained.

[0008] It is an object of the present invention to provide a resistant security thread comprising characters being visible against the backlight as well as areas having coded magnetic characteristics, and an inexpensive method for manufacturing the same.

[0009] This object is solved by the inventive security device or the method for manufacturing the same according to the present invention.

[0010] According to one aspect of the present invention, a security device, preferably a security thread for being incorporated into a document such as a banknote, comprises a substrate preferably of a transparent polyester layer; a first layer arranged over the substrate and having negative characters or scripts incorporated therein; and a magnetic code layer arranged over the first layer in an area adjacent to the negative characters or scripts, with the first layer being a printed ink layer. In this way, the cost-intensive conventional aluminium layer applied on the substrate is omitted, and the security device has no metallic background where corrosion problems may occur.

[0011] Preferably, the magnetic code layer comprises a specific signal sequence formed by modulating the thickness of the magnetic code layer.

[0012] Preferably, a support layer is arranged between the printed ink layer and the magnetic code layer, with a surface of the support layer on the side of the magnetic code layer preferably having embossed recesses in accordance with the specific signal sequence.

[0013] Preferably, a cover layer is directly arranged over the magnetic code layer so as to protect and smoothen the magnetic code layer.

[0014] Preferably, a heat-bondable glue or coating layer is provided on the side of the substrate opposite to the magnetic code layer and/or on the side of the cover layer opposite to the magnetic code layer for facilitating the incorporation of the security device into a docu-

ment like a banknote.

[0015] Preferably, the printed ink layer, the support layer and/or the cover layer are made of a grey colour nitroacryl-soluble, resin-based ink containing less than 5 % of aluminium powder. Thus, the security device has an outer appearance like a metallic thread, but due to the neglectable aluminium part of the ink, the security device has no metallic background owing to a lack of electrical or heat conductance.

[0016] Preferably, the magnetic code layer is a printed layer of a magnetic ink which enables an easy manufacture of the magnetic code layer.

[0017] According to a second aspect of the present invention, there is provided a method of manufacturing a security device, preferably a security thread for being incorporated into a document such as a banknote, comprising the steps of providing a substrate preferably of a transparent polyester layer; arranging over the substrate a first layer having negative characters or scripts incorporated therein; and arranging over the first layer a magnetic code layer in an area beside or adjacent to the negative characters or scripts, wherein in the step of arranging the first layer, an ink layer is printed on the substrate.

[0018] Preferably, the method further comprises the steps of printing a support layer over the printed ink layer; embossing recesses into a surface of the support layer on the side opposite to the printed ink layer in accordance with a specific signal sequence of the magnetic code layer, preferably by means of roll embossing; and in the step of arranging the magnetic code layer, the magnetic code layer is printed on the embossed surface of the support layer by means of a magnetic ink.

[0019] Preferably, the method further comprises the step of printing a cover layer over the magnetic code layer.

[0020] Preferably, the method further comprises the step of arranging a heat-bondable glue or coating layer on the side of the substrate opposite to the magnetic code layer and/or on the side of the cover layer opposite to the magnetic code layer.

[0021] Preferably, the printed ink layer, the support layer and/or the cover layer are printed by means of a grey colour ink, preferably a nitroacryl-soluble, resin-based ink containing less than 5 % of aluminium powder.

[0022] Preferably, the step of printing the printed ink layer uses the corona phenomenon.

[0023] Other aspects and advantages of the present invention will be apparent from the following description in connection with the figures which show a preferred embodiment of the present invention.

[0024] Fig. 1 shows a schematic plan view of a security device according to an embodiment of the present invention;

[0025] Fig. 2 shows a schematic cross-sectional view of the security device shown in Fig. 1; and

[0026] Fig. 3 shows a schematic cross-sectional view of a conventional security thread.

[0027] As a system for making an inventive security device such as a security thread 1 for being incorporated in a document such as a banknote (not shown), a conventional intaglio printing machine (not shown) may be used, as is, for instance, employed for the printing of a flexible packing material.

[0028] The configuration of the inventive security thread 1 and manufacturing method are explained in connection with Figs. 1 and 2, where schematic plan and cross-sectional views of the security thread 1 are shown.

[0029] The security thread 1 is built up by a substrate which is preferably a transparent polyester substrate 2.

[0030] On the substrate 2, a printed ink layer 3 is arranged which has negative characters or scripts 3a which appear transparent when visually checking them against the backlight.

[0031] For printing, preferably a nitroacryl-soluble, resin-based ink containing less than 5 % of aluminium powder is applied under 52 dyne by virtue of the corona phenomenon. Since the ink contains a neglectable part of aluminium therein, the ink neither conducts electricity nor heat. Preferably, the ink is a grey or silver colour ink.

[0032] It is to be noted that the printed ink layer 3 is not completely covered by the characters or scripts 3a so that there are free areas 3b which are sufficient for arranging a magnetic code adjacent to the characters or scripts 3a which will be applied in a later step.

[0033] Within the free areas 3b directly above the printed ink layer 3, there is preferably a support layer 4. It is to be noted that the support layer 4 is arranged partially only within the free areas 3b adjacent to the scripts or characters 3a so that the characters or scripts 3a and the support layer 4 are arranged alternately in a longitudinal direction of the security thread 1, and the characters or scripts 3a are not covered by the support layer 4.

[0034] Preferably, the support layer 4 is also printed by a grey colour nitroacryl-soluble, resin-based ink containing less than 5 % of aluminium powder.

[0035] Directly above the support layer 4, a magnetic code layer 5 is arranged. Similarly to the support layer 4, the magnetic code layer 5 is arranged partially only within the free areas 3b between the characters or scripts 3a.

[0036] The magnetic code layer 5 is preferably formed by first embossing recesses in a surface of the support layer 4 opposite to the printed ink layer 3 by means of roll embossing (not shown). That is, by roll embossing, a plurality of recesses having different depths are formed in the support layer 4 so as to create a predetermined signal sequence where, for instance, the recesses representing the binary "1" have a depth of 100 μm, whereas the recesses representing the binary "0" have a depth of 50 μm.

[0037] After the support layer 4 has been embossed, a magnetic ink is directly applied on the embossed surface of the support layer 4. In this case, in the recesses

having a depth of 100 μm, twice the amount of the magnetic ink can be accommodated as compared to the recesses having a depth of only 50 μm. For instance, when the magnetic ink is dried, the final thickness of the magnetic ink in the recesses having a depth of 100 μm may be 10 μm, whereas the final thickness of the magnetic ink in the recesses having a depth of 50 μm may be 5 μm.

[0038] As a result, the magnetic code layer 5 comprising different thicknesses of the dried magnetic ink provides the signal sequence which can be read, for instance, by means of a capacitive or inductive circuit (not shown).

[0039] Directly above the magnetic code layer 5, there is preferably printed a cover layer 6 of ink. Similarly to the support layer 4 and the magnetic code layer 5, the cover layer 6 is arranged partially only within the free areas 3b between the scripts or characters 3a. The cover layer 6 provides a protection and also a plain surface over the magnetic code layer 5, since the magnetic code layer 5 itself may have an uneven surface when the magnetic ink is dried.

[0040] Preferably, the cover layer 6 consists of a grey colour nitroacryl-soluble, resin-based ink containing less than 5 % of aluminium powder like the printed ink layer 3 or the support layer 4.

[0041] In the end, on the side of the substrate 2 opposite to the magnetic code layer 5 and/or on the side of the thread 1 opposite to the substrate 2, a heat-bondable glue or coating layer 7 can be applied and can be reactivated during the step of the paper manufacture for the purpose of incorporating the thread 1 in the paper (not shown).

[0042] A thus produced thread 1 can be processed in any paper mills under any methods of manufacturing, for instance in a step for introducing the thread 1 into the paper.

[0043] In case of a processing under the so-called windows technology before printing the heat-bondable glue or coating layer 7, the polyester bobbin (not shown) of the polyester substrate can be coupled with another polyester.

[0044] The security thread 1 according the present invention offers the following advantages.

[0045] The optical features of the security thread 1, that means the negative characters or scripts 3a being visually readable, are printed by use of a conventional grey colour ink having a small amount of aluminium powder (less than 5 %), while the conventional thread is produced by applying a thorough aluminium-layer on a polyester substrate and then by stripping off a part of the aluminium by means of a demetallisation so as to form a negative character. Thus, the production costs of the security strip according to the present invention are reduced since the conventional, expensive steps for the metallisation and the demetallisation are omitted.

[0046] For example, while the conventional security thread of the EURO banknote requires at least two high-end apparatuses for the metallisation and the demetallisation, the security thread 1 according to the present invention can be produced by using the conventional rotary press roller (not shown) having different sections and a printing width of 1600 mm, whereas the printing width of the conventional thread in the EURO banknote having an aluminium layer, which must be subjected to a demetallisation process, is 800 mm. Thereby, the costs are further remarkably reduced.

[0047] Due to the printing width of 1600 mm according to the present invention, all necessary processing steps can be implemented in the same production assembly, and due to the double printing width of 1600 mm as compared with the conventional printing width of 800 mm, twice the production amount can be realised.

[0048] Furthermore, the grey colour ink of the printed ink layer 3 neither conducts electricity nor heat due to the neglectable amount of aluminium therein so that the printed ink layer 3 forms no metallic background. Thereby, the security thread 1 is resistive against even the worst environment conditions during the paper manufacture process.

[0049] The magnetic code layer 5 of the security thread 1 according to the present invention has, on the one hand, an even surface due to the cover layer 6 and, on the other hand, different thicknesses of the magnetic ink due to the provision of the support layer 4 having different embossed recesses. For example, the recesses representing the binary "1" are twice as deep as the recesses representing the binary "0". Since the binary "0" can be clearly differentiated as compared with the IMT-format, where the binary "0" is characterised by a complete lack of a magnetic characteristic, the security thread 1 according to the present invention can be at least 30 % longer.

[0050] As a matter of course, the above embodiment can be altered into many variations within the scope of the invention.

[0051] For instance, the support layer 4 may be omitted so that the magnetic code layer 5 is directly applied over the printed ink layer 3.

[0052] Alternatively, the function of the support layer 4 may be implemented by the printed ink layer 3, or the support layer 4 may be formed integrally with the printed ink layer 3, with the result that the printed ink layer 3 per se obtains recesses in accordance with a predetermined signal sequence, for instance by means of a roll embossing.

[0053] Also, the cover layer 6 may be omitted so that the magnetic code layer 5 is directly covered by the heat-bondable glue or coating layer 7, for instance.

[0054] The support layer 4 obtains different embossed recesses by means of the roll embossing, however the different recesses may also be formed by another device or method, such as an appropriate printing device and method.

[0055] In the above embodiment, the support layer 4 and the cover layer 6 are arranged only in the free areas

3b adjacent to the characters or scripts 3a, but it is conceivable that the support layer 4 and/or the cover layer 6 have sufficient transparency to be arranged over the characters or scripts 3a.

[0056] In the embodiment above, the characters or scripts 3a and the magnetic code layer 5 are alternately arranged, but it is conceivable that the characters or scripts 3a and the magnetic code layer 3, respectively, are arranged any way.

[0057] The magnetic code layer 5 according to the above embodiment implements the signal sequence by modulating the thicknesses of the magnetic code layer. However, the magnetic code layer 5 may be coded any way. Moreover, the magnetic code layer 5 may also be implemented by the IMT-format, and it is not restricted to the modulated thicknesses.

[0058] The preferred embodiment as described within this specification is to be considered as illustrative and not restrictive, and the invention is not to be limited to the details given herein but may be modified within the scope of the appended claims.

[0059] A security device, preferably a security thread (1) for being incorporated into a document such as a banknote comprises a substrate (2), preferably of a transparent polyester layer; a first layer arranged over the substrate (2) and having negative characters or scripts (3a) incorporated therein; and a magnetic code layer (5) arranged over the first layer and adjacent to the negative characters or scripts (3a), wherein the first layer is a printed ink layer (3).

Claims

1. A Security device, preferably a security thread (1) for being incorporated into a document such as a banknote, comprising

   a substrate (2) preferably of a transparent polyester layer;
   a first layer arranged over the substrate (2) and having negative characters or scripts (3a) incorporated therein; and
   a magnetic code layer (5) arranged over the first layer and adjacent to the negative characters or scripts (3a),

   characterised in that
   the first layer is a printed ink layer (3).

2. A Security device according to claim 1,
   characterised in that
   the magnetic code layer (5) comprises a specific signal sequence formed by modulating the thickness of the magnetic code layer (5).

3. A Security device according to claim 2, further
   characterised by
   a support layer (4) arranged between the printed ink layer (3) and the magnetic code layer (5), wherein a surface of the support layer (4) on the side of the magnetic code layer (5) preferably has embossed recesses in accordance with the specific signal sequence.

4. A Security device according to any of the preceding claims, further
   characterised by
   a cover layer (6) arranged over the magnetic code layer (5).

5. A Security device according to claim 4, further
   characterised by
   a heat-bondable glue or coating layer (7) on the side of the substrate (2) opposite to the magnetic code layer (5) and/or on the side of the cover layer (6) opposite to the magnetic code layer (4).

6. A Security device according to any of the preceding claims,
   characterised in that
   the printed ink layer (3), the support layer (4) and/or the cover layer (6) are made of a grey colour nitroacryl-soluble, resin-based ink containing less than 5 % of aluminium powder.

7. A Security device according to any of the preceding claims,
   characterised in that
   the magnetic code layer (5) is a printed layer of a magnetic ink.

8. A Method of manufacturing a security device, preferably a security thread (1) for being incorporated into a document such as a banknote, comprising the steps of

   providing a substrate (2) preferably of a transparent polyester layer;
   arranging over the substrate (2) a first layer having negative characters or scripts (3a) incorporated therein; and
   arranging over the first layer a magnetic code layer (5) adjacent to the negative characters or scripts (3a),

   characterised in that
   in the step of arranging the first layer, an ink layer (3) is printed on the substrate (2).

9. A Method according to claim 8, further
   characterised by
   the steps of

   printing a support layer (4) on the printed ink layer (3);

embossing recesses into a surface of the support layer (4) on the side opposite to the printed ink layer (3) in accordance with a specific signal sequence of the magnetic code layer (5), preferably by means of roll embossing; and,

in the step of arranging the magnetic code layer (5), the magnetic code layer (5) is printed on the embossed surface of the support layer (4) by means of a magnetic ink.

10. A Method according to claim 8 or 9, further **characterised by**
the step of printing a cover layer (6) on the magnetic code layer (5).

11. A Method according to claim 10, further **characterised by**
the step of arranging a heat-bondable glue or coating layer (7) on the side of the substrate (2) opposite to the magnetic code layer (5) and/or on the side of the cover layer (6) opposite to the magnetic code layer (4).

12. A Method according to any of claims 8 to 11, **characterised in that**
the printed ink layer (3), the support layer (4) and/or the cover layer (6) are printed by means of a grey colour ink, preferably a nitroacryl-soluble, resin-based ink containing less than 5 % of aluminium powder.

13. A Method according to any of claims 8 to 12, **characterised in that**
the step of printing the printed ink layer (3) uses the corona phenomenon.

Fig. 1

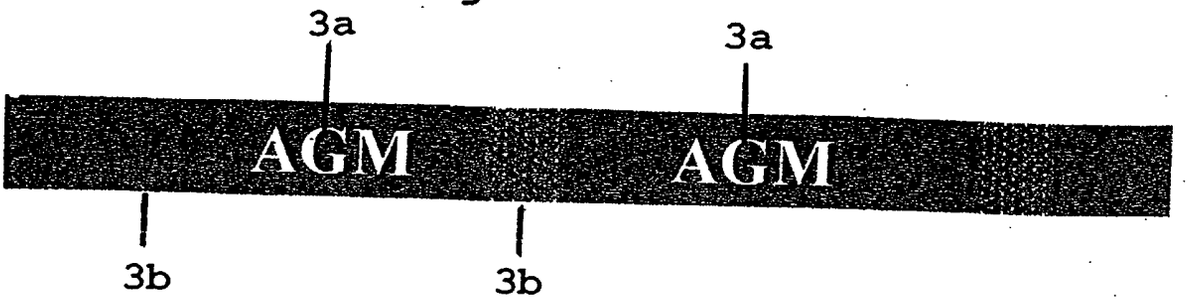


Fig. 2

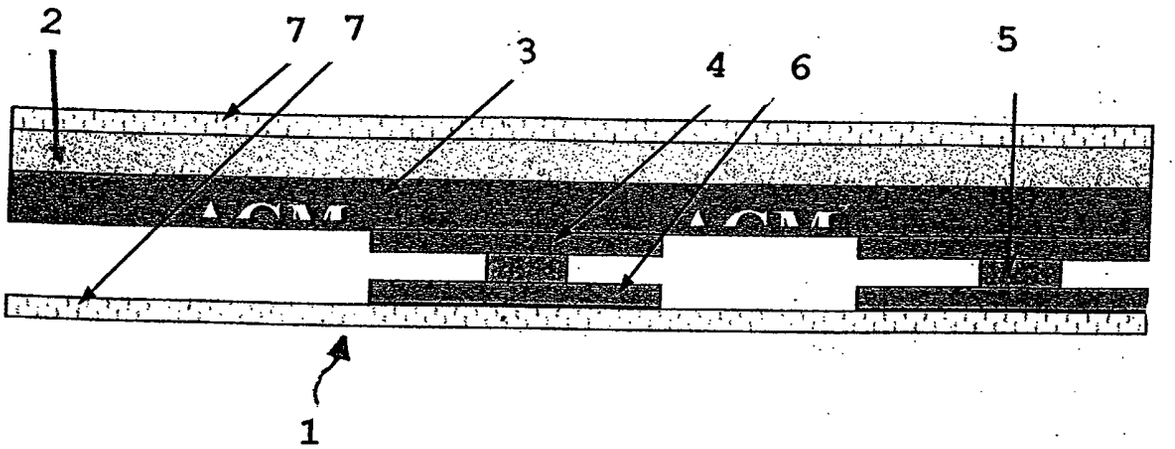
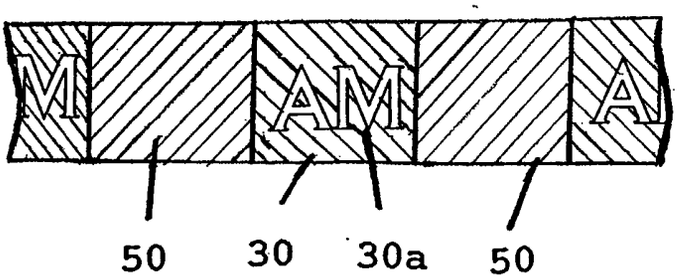


Fig. 3



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EUROPEAN SEARCH REPORT

Application Number
EP 02 00 2901

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int.Cl.7)
A	GB 2 319 215 A (BANK OF ENGLAND THE GOVERNOR A) 20 May 1998 (1998-05-20) * page 11, line 1 - page 13, line 30; figures 1-8 *	1,8	B42D15/00

TECHNICAL FIELDS SEARCHED (Int.Cl.7)

B42D

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
THE HAGUE	24 April 2002	Evans, A

CATEGORY OF CITED DOCUMENTS

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24-04-2002

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