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(54) **Latent colour**

(57) The invention relates to a method for printing one or more security items (10) on a substrate of which at least a part is made of a transparent material, wherein the method comprises the steps of

- printing a darker coloured image (1) on one side of the substrate;
- printing a lighter coloured image (2) on the opposite side of the substrate, such that the lighter coloured image (2) is at least partially overlapped by the darker coloured image (1);
- the darker and lighter coloured image (1, 2) being such that, when the lighter coloured image (2) is faced to an

observer, when this observer looks at either side of the substrate perpendicularly in transmission, this lighter coloured image (2) is not visible, and when the substrate is tilted in a way that the light of a light source falls on the lighter coloured image (2), due to the better illumination of the lighter coloured image and the reflection of the light on the surface of the substrate, the lighter coloured image (2) becomes visible for the observer.

The invention further relates to a security item printed on such a security document by such a method.

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Description

[0001] The present invention relates to a method for printing one or more security items on a substrate of which at least a part is made of a transparent material, and in particular to a method for printing one or more security items on security documents, on a part of a security document or on a substrate that can be transferred to a security document. Security documents are in particular: banknotes, postage stamps, identity cards, passports, checks, certificates, certificates of authenticity, The present invention relates also to a printed security item manufactured according to such a method.

[0002] Printing security items, so called security printing is an application or combination of printing technologies such as offset, intaglio, silkscreen and letterpress. Security printing encompasses the printing of banknotes, postage stamps, stamps, stock certificates, identity cards, passports, checks, deeds, plane tickets, diploma's and other documents needing a protection against counterfeiting.

[0003] Security papers, such as banknotes circulate in a world where the threat of the counterfeiter is ever present. With the development of new printing processes and the introduction of new technologies, more methods of reproduction are available to the counterfeiter than ever before. It is therefore essential that security documents, such as banknotes should be practically forgery proof. This is achieved not only by the way in which the printing technologies and their combinations are used, but also through the nature of the substrate and the ink, and the use of special additional elements such as security threads, holograms, and so on.

[0004] Banknotes are generally printed on a substrate made of 100 % cotton and are further protected by a watermark, a security thread, fluorescent fibres of different colours and length, optical variable inks or other visual or machine detectable characteristics.

[0005] However, a disadvantage of such banknotes is their restricted lifespan. Banknotes in a synthetic material do not have this drawback, as they can last about four times as long as the conventional cotton notes. The plastic note technology uses a polymer plastic substrate instead of paper. Compared to paper, plastic banknotes are stronger and non-porous.

[0006] However, plastic banknotes have the disadvantage that a number of safety features such as real multitone watermarks, windowed security threads which are successfully used in paper notes, can not be used or are less effective when used in plastic notes.

[0007] Therefore it is an object of the present invention to provide a new method for printing one or more security items on a substrate, in particular, a method for printing one or more security items on a banknote, with which the above mentioned drawbacks are overcome and which results in a security item with a much higher security level against counterfeiting than the known methods.

[0008] The above mentioned object is achieved by pro-

viding a method for printing one or more security items on a substrate of which at least a part is made of a transparent material, wherein the method comprises the steps of

- printing a darker coloured image on one side of the substrate;
- printing a lighter coloured image on the opposite side of the substrate, such that the lighter coloured image is at least partially overlapped by the darker coloured image;
- the darker and lighter coloured image being such that, when the lighter coloured image is faced to an observer, when this observer looks at either side of the substrate perpendicularly in transmission, this lighter coloured image is not visible, and when the substrate is tilted in a way that the light of a light source falls on the lighter coloured image, due to the better illumination of the lighter coloured image and the reflection of the light on the surface of the substrate, the lighter coloured image becomes visible for the observer.

[0009] The expression "image" as used in this text refers to any representation, text, message, symbol pattern and the like, which may be applied in visible form on a document or which can be visualised under specific light circumstances, for example use of an invisible fluorescent ink which becomes visible under black light, etc.

[0010] As this invention is meant to be printed on a transparent substrate, it is clear that beyond the traditional printing technique all possible techniques to transfer images to the transparent substrate or to generate an image on such a substrate can be used, such as inkjet printing, thermal transfer printing, sublimation printing, etc.

[0011] This invention enables the printer of security documents to improve the security level of security documents, through an optimal use of the technical possibilities of existing banknote presses and/or other high tech machinery.

[0012] In a preferred method according to the invention, the lighter coloured image and the darker coloured image are printed in register.

This seriously hampers the counterfeiting, because the slightest shift of the images with respect to one another results in a situation wherein the lighter coloured image becomes at least partially visible when looking in transmission at either sides of the substrate.

[0013] In an advantageous method according to the invention, the images that are printed on the substrate are a photo, drawing or a pattern consisting of indicia.

[0014] In a more advantageous method according to the invention, the darker and the lighter coloured images consist of a line pattern.

[0015] In a favourable method according to the invention, the lighter coloured image is more transparent than the darker coloured image.

[0016] In a more favourable method according to the invention, the darker coloured image is printed in an opaque ink or a transparent ink printed in a high density such that, when the observer looks at the lighter coloured image in transmission, the lighter coloured image is not visible.

[0017] In a particular method according to the invention, the method comprises the steps of

- printing the darker coloured image being a black coloured line pattern in an opaque ink on one side of the substrate in a black opaque ink;
- printing the lighter coloured image being a multicoloured line pattern in a transparent ink in register with the black coloured line pattern on the opposite side of the substrate.

[0018] It is a further object of the present invention to provide a new security item printed on a security document consisting of a substrate of which at least a part is made of a transparent material, in particular, a security item that is printed on a banknote, with which the above mentioned drawbacks are overcome and which results in a security item with a much higher security level against counterfeiting than the known security items.

[0019] This further object of the invention is solved by providing a security item printed on a security document consisting of a substrate of which at least a part is made of a transparent material, wherein the security item consists of

- a darker coloured image printed on one side of the substrate;
- a lighter coloured image printed on the other side of the substrate, such that the lighter coloured image is overlapped by the darker coloured image;
- the darker and lighter coloured image being such that, when the lighter coloured image is faced to an observer, when this observer looks at the lighter coloured image perpendicularly in transmission, this lighter coloured image is not visible, and when the substrate is tilted in a way that the light of a light source falls on the lighter coloured image, due to the better illumination of the lighter coloured image and the reflection of the light on the surface of the substrate, the lighter coloured image becomes visible to the observer.

[0020] Preferably, the transparent material is a transparent synthetic material.

[0021] The transparent material preferably has a thickness of between 5 and 1000 μm .

[0022] In a preferred embodiment of a security item according to the invention, the security item is printed by a method according to the invention as described above.

[0023] Additional features and advantages of the invention will be further explained on the basis of non-restricting exemplifying embodiments represented in the

attached drawings and in the following detailed description. In this description reference is made to the following drawings wherein

- 5 - *figure 1* is a representation of a darker coloured image being a black opaque line pattern that is printed on one side of a transparent substrate;
- *figure 2* is a representation of a lighter coloured image being a line pattern in the form of Euro-signs that is printed in a transparent red, yellow and cyan ink on the opposite side of the transparent substrate in register with the black opaque line pattern as shown in *figure 1*, and that is intended to be overlapped by the darker coloured line pattern as shown in *figure 1*;
- 10 - *figure 3* is a representation of what is viewed when an observer looks perpendicularly at the security item in transmission when the lighter coloured image is faced to the observer;
- 15 - *figure 4* is a representation of what is viewed when an observer looks at the security item when the lighter coloured image is faced to the observer and the substrate is looked at in a tilted way.

25 **[0024]** According to the invention, security documents, such as banknotes, credit cards, drivers' licenses, etc. printed on a substrate (1) of which at least a part is made of a transparent material can be provided with a new security item via known banknote presses. This transparent material can be made out of a transparent synthetic material such as polyethylene, polypropylene, polyester, polycarbonate, polyamide or a combination thereof. Also plastic substrates made out of another material are possible as well.

30 **[0025]** Another possibility is transferring a transparent substrate, comprising a security item according to the invention, to a document. The transparent material preferably has a thickness between 5 and 1000 μm . The thickness of the substrate therewith depends from the type of security document and also from the design of the security document ("graphism").

35 **[0026]** In the method according to this invention, a darker coloured image (1) is printed on one side of a substrate of which at least part is made of a transparent material, and a lighter coloured image (2) is printed on the other side of the substrate such that the lighter coloured image (2) is at least partially overlapped by the darker coloured image (1). The darker and lighter coloured image (1, 2) are such that, when the lighter coloured image (2) is faced to an observer, when this observer looks at it perpendicularly in transmission, this lighter coloured image (2) is not visible, and when the substrate is tilted in a way that the light of a light source falls on the lighter coloured image (2), due to the better illumination of the lighter coloured image and the reflection of the light on the surface of the substrate, the lighter coloured image (2) becomes visible for the observer.

40 **[0027]** The darker and lighter coloured images (1, 2)

can therewith be of any kind such as photos, drawings, or patterns consisting of indicia such as lines, dots, etc. can be printed on the substrate. The images (1, 2) preferably consist of lines; the lines therewith all having the same width or different lines having different widths.

[0028] These images (1, 2) can consist of a single colour as well as being multicoloured. Preferably, the lighter coloured image (2) is printed in a more transparent ink than the darker coloured image (1). The darker coloured image (1) is therewith preferably printed in an opaque ink, while the lighter coloured image (2) preferably is printed in a transparent ink.

[0029] In order to hamper the counterfeit, the images (1, 2) are preferably printed in perfect register.

[0030] In an exemplary security item (10) printed by a method according to the invention, a darker coloured line pattern (1) in the form of a guilloche structure (being a mutual crossing network of round lines in a repetitive pattern) (see figure 1) is printed in a black opaque ink on one side of the transparent substrate, while on the other side of the transparent substrate a lighter coloured line pattern (2) in the form of three Euro-signs (2A, 2B, 2C) (see figure 2), respectively printed in three different colours, i.e. yellow, magenta and cyan, using the same guilloche structure, are printed in a more transparent ink than the black ink in register with the darker coloured line pattern (1).

[0031] When the lighter coloured line pattern (2) is faced to the observer, and when this observer looks at it perpendicularly in transmission, this lighter coloured line pattern (2) is not visible, and only the black coloured guilloche structure can be seen (see figure 3), while when the substrate is tilted in a way that the light of a light source (not shown in the figures) falls on the lighter coloured line pattern (2), then the lighter coloured line pattern, i.e. the multicoloured Euro-signs (2A, 2B, 2C) becomes visible to the observer (see figure 4).

[0032] When this security item (10) is reproduced by a counterfeiter by simply copying the security item (10), then an image is obtained that corresponds with figure 1, in other words the information as shown in figure 2 gets lost.

[0033] Also when this security item (10) is simply scanned, then a digital image is obtained corresponding with figure 1, wherein the information as shown in figure 2 is lost. When a counterfeiter wants to go further, then figure 2 has to be selected from the result of the scan, i.e. figure 1, and then this obtained selection has to be printed in the right colour and in perfect register with the obtained figure 1 as is the case on the scanned original.

[0034] The slightest shift of the images (1, 2) with respect to each other (or in other words when the images (1, 2) are not printed in perfect register), at least part of the lighter coloured image (2) will become visible when looking in transmission.

Claims

1. Method for printing one or more security items (10) on a substrate of which at least a part is made of a transparent material, **characterised in that** the method comprises the steps of

- printing a darker coloured image (1) on one side of the substrate;
- printing a lighter coloured image (2) on the opposite side of the substrate, such that the lighter coloured image (2) is at least partially overlapped by the darker coloured image (1);
- the darker and lighter coloured image (1, 2) being such that, when the lighter coloured image (2) is faced to an observer, when this observer looks at this lighter coloured image (2) perpendicularly in transmission, this lighter coloured image (2) is not visible, and when the substrate is tilted in a way that the light of a light source falls on the lighter coloured image (2), due to the better illumination of the lighter coloured image and the reflection of the light on the surface of the substrate, the lighter coloured image (2) becomes visible for the observer.

2. Method according to claim 1, **characterised in that** the lighter coloured image (2) and the darker coloured image (1) are printed in register.

3. Method according to claim 1 or 2, **characterised in that** the images (1, 2) that are printed on the substrate are a photo, drawing or a pattern consisting of indicia.

4. Method according to claim 3, **characterised in that** the darker and the lighter coloured images (1, 2) consist of a line pattern.

5. Method according to any one of claims 1 to 3, **characterised in that** the lighter coloured image (2) is more transparent than the darker coloured image (1).

6. Method according to claim 5, **characterised in that** the darker coloured image (1) is printed in an opaque ink or a transparent ink printed in a high density such that, when the observer looks at the lighter coloured image (2), the lighter coloured image (2) is not visible.

7. Method according to any one of claims 3 to 6, **characterised in that** the method comprises the steps of

- printing the darker coloured image being a black coloured line pattern (1) in an opaque ink on one side of the substrate;
- printing the lighter coloured image (2) being a multicoloured line pattern in a transparent ink in register with the black coloured line pattern (1)

on the opposite side of the substrate.

8. Security item (10) printed on a security document consisting of a substrate of which at least a part is made of a transparent material, **characterised in that** the security item (10) consists of 5
- a darker coloured image (1) printed on one side of the substrate; 10
 - a lighter coloured image (2) printed on the other side of the substrate, such that the lighter coloured image is at least partially overlapped by the darker coloured image (1); 10
 - the darker and lighter coloured image (1, 2) being such that, when the lighter coloured image (2) is faced to an observer, when this observer looks at this lighter coloured image (2) perpendicularly in transmission, this lighter coloured image (2) is not visible, and when the substrate is tilted in a way that the light of a light source falls on the lighter coloured image (2), due to the better illumination of the lighter coloured image (2) and the reflection of the light on the surface of the substrate, the lighter coloured image (2) becomes visible to the observer. 25
9. Security item according to claim 8, **characterised in that** the transparent material is a synthetic transparent material. 30
10. Security item according to claim 8 or 9, **characterised in that** the transparent material has a thickness of between 5 and 1000 μm . 35
11. Security item according to any one of claims 8 to 10, **characterised in that** the security item (10) is printed by a method according to any one of claims 1 to 7. 40

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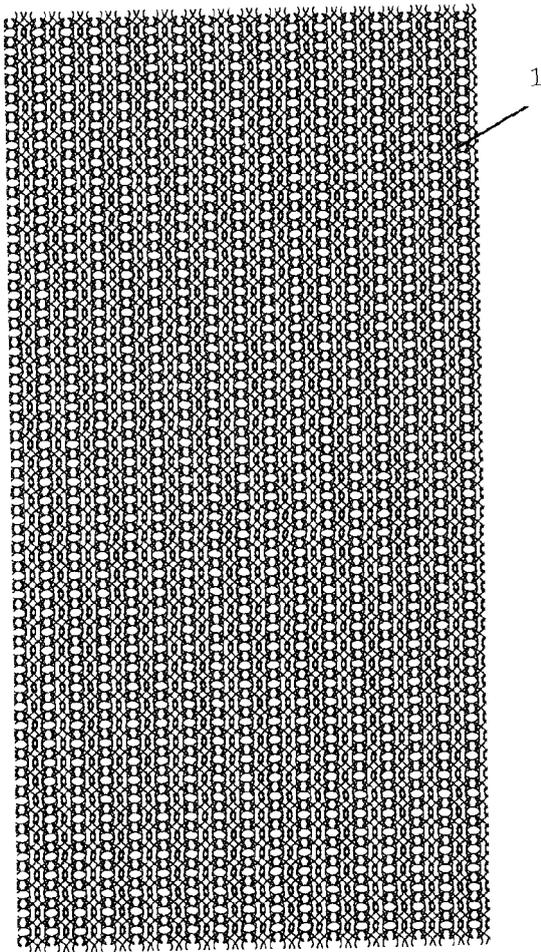


FIG. 1

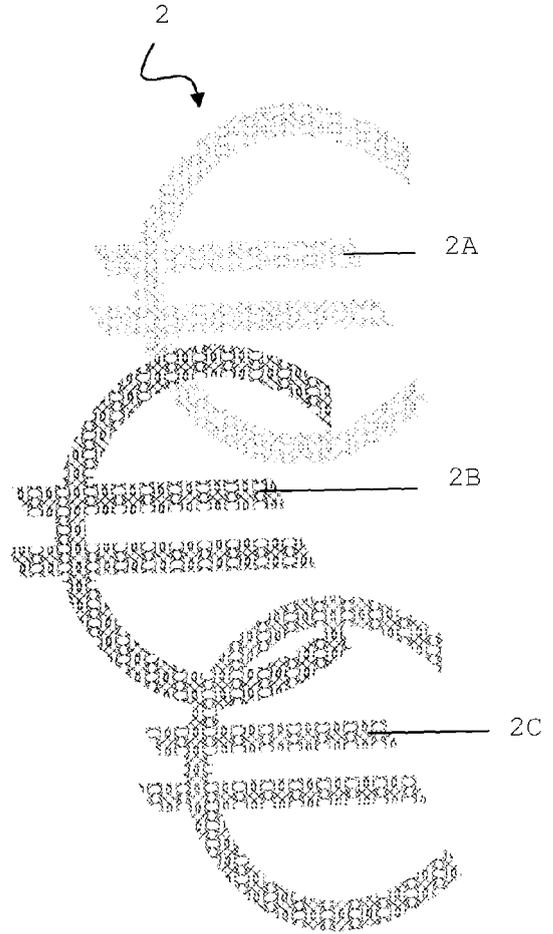


FIG. 2

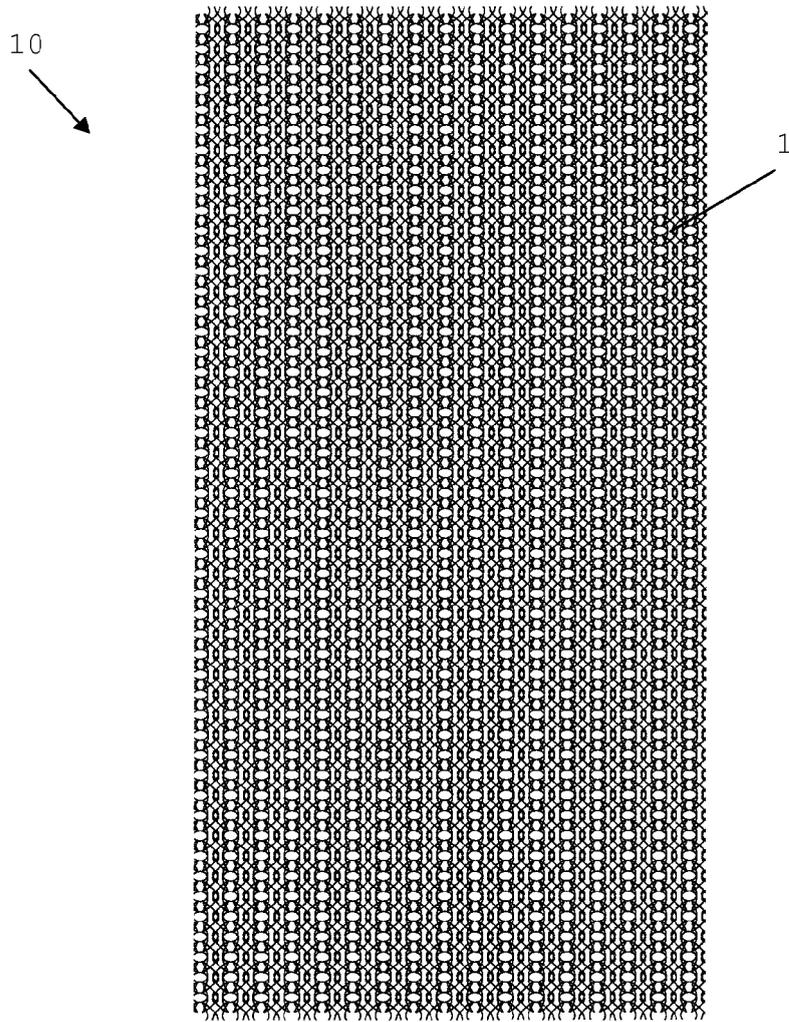


FIG. 3

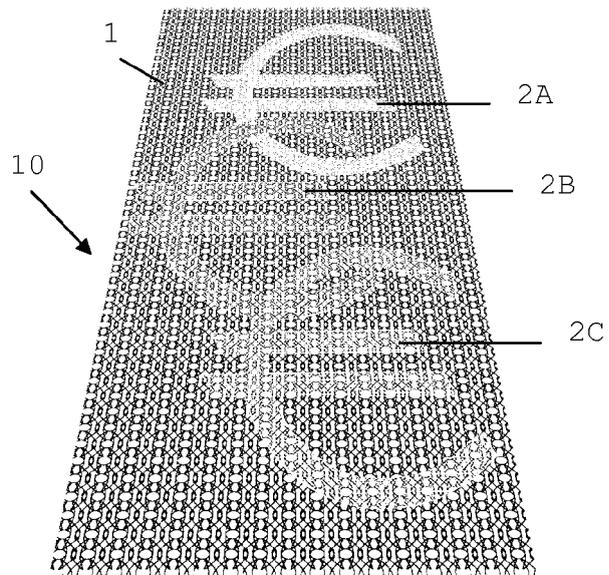


FIG. 4



DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
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A	WO 2007/085808 A (DE LA RUE INTERNATIONAL LTD [GB]) 2 August 2007 (2007-08-02) * figure 1 *	1-11	
			TECHNICAL FIELDS SEARCHED (IPC)
			B41M B42D
The present search report has been drawn up for all claims			
Place of search		Date of completion of the search	Examiner
Munich		18 June 2008	Vogel, Thomas
CATEGORY OF CITED DOCUMENTS		T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons & : member of the same patent family, corresponding document	
X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document			

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ANNEX TO THE EUROPEAN SEARCH REPORT
ON EUROPEAN PATENT APPLICATION NO.

EP 08 10 1160

This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report.
The members are as contained in the European Patent Office EDP file on
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18-06-2008

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