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(54) **FORGERY-RESISTANT DOCUMENT, SUCH AS A BANKNOTE, A PASSPORT, AN IDENTITY CARD, AND A MANUFACTURING METHOD THEREOF**

FÄLSCHUNGSSICHERES DOKUMENT, WIE BEISPIELSGEWISSE BANKNOTE, PASS, PERSONALAUSWEIS, UND HERSTELLUNGSVERFAHREN DESSELBEN

DOCUMENTS RÉSIANT AUX CONTREFAÇONS TEL QUE BILLETTS DE BANQUE, PASSEPORTS, CARTES D'IDENTITÉ, ET LEUR PROCÉDÉ DE FABRICATION

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Description

[0001] The present invention relates to a forgery-resistant document according to the preamble of claim 1, such as a banknote, a passport, an identity card or the like, and to a manufacturing method thereof. In particular, the present invention relates to security documents such as banknotes, passports, identity cards or the like, which use plastic films or layers containing security images and applied to protect previously created security elements.

[0002] It is a known fact that the fight against the forgery of security documents such as banknotes involves companies that are at the forefront of creating the security documents, and consequently in creating new elements aimed at this purpose.

[0003] One of the elements that have been attempted recently is the creation of a hole with a known graphic shape on a banknote, placed in register with a thread mark, according to the production tolerance. A continuous stripe with holographic demetallised images is then placed over a part of the banknote where the hole is made. At least one of the images is placed inside the hole itself.

[0004] In this case, the stripe is actually made of a plastic polyester tape on which images and/or holographic and/or demetallised graphic signs are created. These images are joined to the plastic support and thereafter it is all applied in register over a paper sheet of the banknote to also protect the hole itself.

[0005] Several problems have emerged in the realisation of this element having the holographic and demetallised stripe with images in register with each other and with the thread mark at a fixed point on the banknote by in register application on the paper sheet. These problems can be summarized as follows.

[0006] Up to now, the realisation of an in-register demetallised holographic stripe with applied in turn in register with the thread mark and protecting the hole which is also in register, has been carried out with a plastic polyester support with thicknesses ranging from 14 to 16 micrometer (while those for transfer from the plastic support to the banknote without a hole range from 23 micrometer for the stripes to 19 micrometer for the patches). This support uses thicknesses of this type in various work phases, such as coating of lacquers dedicated of receiving embossing in order to create holographic images, together with the various protective lacquers, added to the thermo-adhesive layer to adhere to the paper support. Consequently, a total thickness of 32 micrometer +/-3 micrometer is created.

[0007] To date, these thicknesses are considered to be indispensable to bear a whole series of thermal and mechanical stresses caused by the various embossing phases, placed in register between the holographic image and the demetallization, further burdened by the in-register application and fixing around the hole, which fixing is made at about 160°C to allow the heat issued from heating cylinder to "cross" the stripe and activate thermo-

adhesive to fix the stripe on the paper sheet.

[0008] However, a stripe created in this way sets off a series of problems that can bring about the total rejection of banknote production since it may cause unacceptable costs which are around 50% of the overall production costs. For example, "loading" the paper by various processing phases, such as offset copperplate printing of numbering and cutting, in addition to checking in selecting machines, lead to a huge percentage of rejections. Further developments of the stripe created in the above way have been almost exhausted, as it is then hardly possible to keep all the printing phases under control. A particular problem is, for example, transverse and longitudinal undulations under which the paper sometimes suffers after the stripe is applied and cut into sheets for printing. In addition, the later worldwide circulation of banknotes that would then undergo severe undulation, affects all necessary accounting and verification stages at a later stage. It was found that this in due to the humidity in the air, wherein the undulations are found to be become worsen by the application of a stripe on one side of the paper sheet. The inventors have found that the material properties of the two materials used (the paper is made of 100% cotton and the stripe support is made of 100% plastic) are changed in totally different ways in a humid environment.

[0009] DE 10 2004 014 778 A1 shows a forgery-resistant document, such as a banknote, a passport, an identity card or the like, which comprises: a document sheet having a hole, which opens to both surface sides of the document sheet, a coversheet applied on one of both surface sides to close the hole, and a sheet element applied on the other surface side and opposite to the cover sheet, wherein the cover sheet and the sheet element are patches, which are applied to and fixed on the respective surface sides at an area around the hole in the document sheet, or the cover sheet and the sheet element are continuous stripes, which are applied along a transverse direction of a rectangular document sheet on the respective surface sides thereof.

[0010] WO 2005/025891 A2 shows a forgery-resistant document according to the preamble of claim 1, such as a banknote, a passport, an identity card or the like. This forgery-resistant document comprises: a document sheet having a hole, which opens to both surface sides of the document sheet, a cover sheet applied on one of both surface sides to close the hole, and a sheet element applied on the other surface side and opposite to the cover sheet, wherein the cover sheet and the sheet element are patches, which are applied to and fixed on the respective surface sides at an area around the hole in the document sheet, or the cover sheet and the sheet element are continuous stripes, which are applied along a transverse direction of a rectangular document sheet on the respective surface sides thereof, and the sheet element has a hole which corresponds to the hole in the document sheet.

[0011] It is the object of the present invention to further

develop a forgery-resistant document according to the preamble of claim 1, such as a banknote, a passport, an identity card or the like, and a manufacturing method thereof such that high quality of planarity of the forgery-resistant document with a high safety degree is obtained and manufacturing costs thereof are reduced.

[0012] The object of the present invention is achieved by the feature combinations of the independent claims.

[0013] Further advantageous developments are defined in the dependent claims.

[0014] According to an aspect of the present invention, a forgery-resistant document, such as a banknote or the like, is provided, which document comprises a document sheet having a hole, which opens to both surface sides of the document sheet, a cover sheet applied on one of both surface sides to close the hole, and a sheet element applied on the other surface side and opposite to the cover sheet. The sheet element has a hole which corresponds to the hole in the document. The cover sheet and the sheet element are patches, which are applied to and fixed on the respective surface sides at an area around the hole in the document sheet, or the cover sheet and the sheet element are continuous stripes, which are applied along a transverse direction of a rectangular document sheet on the respective surface sides thereof, and the sheet element has a hole which corresponds to the hole in the document sheet, wherein at least one marking on the cover sheet is in register with the hole.

[0015] Preferably, the cover sheet is in register with the hole.

[0016] Optionally, both the sheet element and the cover sheet are in register with the hole in the document sheet, wherein optionally, for example, both the sheet element and the cover sheet are in register with the hole in the document sheet, and the sheet element as well as the cover sheet have security means which cooperate with each other such that a visual image and/or optical effect is created.

[0017] Preferably, the outer circumferences of the cover sheet and the sheet element are substantially congruent with each other.

[0018] Preferably, the continuous stripes are applied parallel to the smaller edges of the document sheet.

[0019] Preferably, each of the cover sheet and the sheet element includes a layer structure, which comprises a thermo-adhesive layer and a plastic film layer and at least one of an adhesion primer layer, a holographic lacquer and a metallization layer, wherein the thermo-adhesive layer is fixable to the document sheet.

[0020] Preferably, at least one of the cover sheet and the sheet element includes a layer structure, which comprises a thermo-adhesive layer and at least one of an adhesion primer layer, a holographic lacquer and a metallization layer, wherein the layer structure is provided on a plastic support layer before the layer structure is applied on the document sheet by fixing the thermo-adhesive layer to the document sheet.

[0021] The plastic support layer can be a plastic film

layer which is peelable. The plastic film layer should be less than 16 micrometer, preferably 10 or 8 or 6 micrometer. Further, the plastic film layer may be made of a polyester plastic.

5 **[0022]** Optionally, each layer structure of the cover sheet and the sheet element further comprises a layer which provides a barrier against humidity. The barrier layer against humidity may comprise an acrylic and/or polyurethane-based varnish or lacquer.

10 **[0023]** Preferably, the document sheet comprises cotton paper.

[0024] According to another aspect of the invention, a manufacturing method of a forgery-resistant document, such as a banknote, a passport, an identity card or the like, is provided. The method comprises the steps of unwinding a document sheet band from a roll, registering the document sheet band, applying a sheet element band on one surface side of the document sheet band, perforating the document sheet band and the sheet element band applied on the document sheet band such that document sheets, on which sheet elements are applied, are formed with a corresponding hole perforating the document sheet and the sheet element at a predetermined position, and applying a cover sheet on the other surface side of each document sheet and opposite to each sheet element to close the hole of each document sheet.

20 **[0025]** Preferably, the method further comprises the steps of controlling the tension of the document sheet band, the

cover sheet or cover sheet band, and the sheet element or sheet element band before applying the cover sheet and/or the sheet element on the document sheet band, and/or controlling the humidity of the document sheet band before the cover sheet and/or the sheet element is/are applied on the document sheet band, and/or turning the document sheet band by substantially 180° after the cover sheet has been applied from above and applying the sheet element from above, and/or winding the document sheet band after the application step of the sheet element, and/or humidifying of the document sheet band and controlling the humidity of the document sheet band, after the applying step of the sheet element, and then rewinding the document sheet band.

30 **[0026]** Preferably, during the application steps the humidity, the tension and/or the temperature of the items to be applied are/is controlled.

[0027] Preferably, the cover sheet and/or the sheet element are attached to the document sheet by adhesion principles including melt adhesion, glueing, self adhesion, two component glueing, UV-hardening and IR-hardening glueing.

40 **[0028]** According to the aspects of the invention and the above-mentioned preferred forms, the following effects and advantages are obtained.

55 **[0029]** It is a major advantage of the invention to provide forgery-resistant documents, such as banknotes, with high quality planarity, i.e. flat paper suited to all printing phases (such as offset-printing, silkscreen, number-

ing, engraving or the like).

[0030] Since there is the possibility to the security means by two applicable elements (cover sheet and sheet element), the plastic used for the layer structure of the respective elements can be made at least 40% less thick (for example, 10, 8 or 6 micrometer) compared to the prior art.

[0031] During different coating phases of, for example, primer lacquer, protective lacquer and holographic coating phase, the cover sheet and the sheet element may pass through ventilated hoods where the temperature should be 80 - 90°C. Such a passage stabilizes the layer structures and allows later embossing steps and application at temperatures, which are on average 20/30% lower compared to the prior art, without deforming the document sheet, the cover sheet and the sheet element.

[0032] The temperature for applying the cover sheet or the sheet element to the paper in this case is also considerably lower (at least 20%) as the reduction in the thickness of the plastic material (preferably, polyester) allows the thermo adhesive layer, within the same pressure and contact time, to be activated correctly.

[0033] A stripe, patch, tape or the like created in this way, applied in register with the hole on the document sheet, provides a reduced resistance against following the document sheet's movements, due to the change in humidity.

[0034] Further, such a stripe, patch, tape or the like, applied to one side of the document sheet in register with the hole and another stripe, patch, tape or the like with the same characteristics also applied in register but on the opposite side of the document sheet, enclose the same between two layers of plastic (for example, polyester) in such a way that they preserve what is inside them and therefore reduce impact with humidity and consequently reduce the undulation of the document sheet. Therefore the aim of obtaining document sheets of paper with a hole in register with a thread mark, over which holographic elements may be applied that are in register with the afore-mentioned hole, is achieved by using two stripes, patches, tapes or the like, whose total thickness is equal to or less than 45 micrometer +/-3 micrometer, in turn applied in register with at least one of them and the hole.

[0035] The plastic support layer may provide a support element for creating a stripe, patch, tape or the like before the layer structure is applied on the document sheet, that may contain, for example, holographic characteristics created with Kinograms on transparent and/or metallic areas (evaporation of airtight aluminum) and then demetallised maintaining a register between the holograph and the demetallization, using the plastic support layer, preferably, of a thickness from 8 to 10 micrometer, and with a total thickness of 16 micrometer, added to the fact that all this must be developed at a set measurement with a tolerance in difference of +/- 0.4% maximum.

[0036] These strict measurements may be necessary for a continuous application of the stripe itself on one side

of the document sheet, in longitudinal and transverse register with the hole already made in the document sheet and in turn positioned in register with a thread mark. All this leaves the paper flat and workable at all later work stages for production of banknotes, preferably.

[0037] The sheet element and/or the cover sheet, in addition to protecting the document sheet, that is applied on the other surface side and opposite to the cover sheet, may also have additional security characteristics such as, for example, fluorescent inks and/or pigments at both 360 nanometers and 254 nanometers and/or inks or pigments that absorb infrared rays and/or pigments or particles that can be detected when agitated with ultrasound or microwaves or with magnetic elements in continuous and encoded mode, using one or more magnetic oxides or inks with different coercitivity and the same residue or different coercitivity and different residue or equal coercitivity and different residue or equal coercitivity and equal residue.

[0038] Further elements that can be used in the layer structure of the cover sheet and/or the sheet element are, for example, colourshift pigments or colored pigments that reflect in different ways depending on the angle at which they are hit by the light and at which angle they are observed.

[0039] Another example of use of the sheet element and/or the cover sheet may be that of creating a series of layers of materials, such as chrome, magnesium fluoride and aluminum on the plastic support layer and/or plastic film layer that provide color variation, depending on the inclination with which they are hit by the light and then observed.

[0040] Summarizing, one of the main innovations of the invention is seen therein that one stripe (the cover sheet) in recto and one (the sheet element) in verso are applied on the document sheet, wherein at least one of the cover sheet and the sheet element is in register with the hole in the document sheet. This solves the problem of having, for example, a stripe (cover sheet, sheet element, patch or the like) including graphic elements and/or visible patterns and/or prints and/or holographic images or the like, which stripe is made up of a polyester support and applied in transverse and longitudinal register to cover a hole in a banknote such that the document sheet, usually made of cotton-based paper, remains flat and therefore it is easily to handle in various production stages of banknote creation. Further, considering bank notes to be used all over in human live surroundings, the maintenance of the flat shape is also important for a good handling of the notes.

[0041] It is also possible that both the stripes (the cover sheet and the sheet element) can be applied in register with the hole, or that one only is in register, regardless of whether it is the one in recto or in verso of the document sheet.

[0042] Further, it is also preferable that the cover sheet and/or the sheet element when formed as continuous stripes or patches may have the same or different width

and/or length depending on the method of application for which, if carried out in two phases, it is advisable to use a larger one for one stripe/patch than for the other one thereof, for example, at least 0.5 mm so that the other stripe/patch, when pressed against the document sheet and fixed therein with an adhesive layer does not have any areas without any pressure peaks. In other words, the outer circumferences of the cover sheet and the sheet element are formed such that they are substantially congruent with each other.

[0043] It is preferable that one of the cover sheet and the sheet element may be a release-type member. That is, the layer structures of the cover sheet and/or the sheet element may be created on a support layer, preferably on a plastic film layer, used for the various stages of coating, printing, painting, embossing, metallization, demetallization, etc. Then, after finishing the manufacturing of the desired layer structure, this support layer may be removed or released from (peeled of) the layer structure when the various layer materials are transferred onto the document sheet, for example, during a heat transfer phase. In such a case of using this release-type member, the one of the cover sheet and the sheet element, which is applied first to the document sheet (in register or out of register with the hole), is such a release-type member; once it has been applied, the document sheet goes on to a perforation station where the hole may be created in register with the thread mark of the document sheet; then, the other of the cover sheet and the sheet element, which is a no-release member (i.e. where the plastic layer remains when the member is fixed on the document sheet) is then applied at a second stage or at a new station on the other surface side of the document sheet and opposite to the release-type member (in register or out of register with the hole).

[0044] According to the invention, a document sheet may be provided which is enclosed in part by stripes, patches, etc. having optionally security characteristics, in particular, enclosed between a cover sheet having a plastic (e.g. polyester) support layer and a sheet element having also a polyester support layer. The layer structures of the cover sheet and the sheet element may further comprise, for example, a thermo-adhesive layer or a self-adhesive layer or a chemical-reactant layer or another adhesive layer, and/or an adhesion primer layer and/or a holographic lacquer and/or a metallization layer and, optionally, a layer which provides a barrier against humidity, etc., wherein the adhesive layer is fixable to the document sheet. The document sheet may be thus enclosed between two layers of polyester or between one layer of polyester and one layer of high wear-resistance polyurethane paint. These two layers of materials and maintain the surface tautness or tension of the two sides of the document sheet unchanged and do not allow undulation due to humidity and the unbalancing of surface tautness on one of the two surface sides of the document sheet itself.

[0045] It is further preferable that the above-mentioned

layer structures of the cover sheet and the sheet element comprise at least one layer which provides a barrier against humidity. Such a barrier layer against humidity may comprise an acrylic and/or polyurethane-based varnish or lacquer or the like.

[0046] The manufacturing method of the forgery-resistant document according to the invention is preferably used for two stripes, bands, items, etc. applied one in recto and the other in verso of the document sheet, one at least of which in register with a hole perforated in the document sheet.

[0047] The method may comprise use of an equipment made up of devices and means including, for example, a document sheet unwinder roll, a dragging unit that advances the paper according to a preset constant speed, a first paper humidification station so that a band or tape application always takes place at a controlled temperature and humidity, a perforation station where the holes are made (one in each document sheet) in register with the thread marks thereof, a band or tape application station preferably comprising a cylinder with a diameter of at least 400 mm heated by electrical coils or diathermic oil and suitable for applying pressure of about 50 - 60 N per linear cm. A series of rolls whose contact surface with the band or stripe is in 316L steel, lapped and preheated by thermal induction from another cylinder that is heated by diathermic oil or electrical coils. The document sheet band that may unwind around the heated cylinders and have said band or stripe placed between the cylinder and the document sheet band and a second band or paper that is positioned past the application station of the first band or tape in the document sheet transfer direction, is thus arranged between the document sheet band itself and the counterpressure rolls. It should be clear that the pressure and the temperature of each roll can be regulated individually, even with significant differences, as is also the case for the cylinder temperature, which can be regulated by sectors. Further, the used materials for the rolls and cylinders are merely exemplary, thus any materials suitably for the above mentioned conditions can be used. A explanatory process for manufacturing a forgery-resistant document may comprise the steps/sections in the following order: 1 - unwinding section of the document sheet band, 2 - registering of the document sheet band such that a linear run of the document sheet band through the different manufacturing steps is achieved, 3 - controlling tension of the document sheet band, 4 - section for humidify, 5 - application section of cover sheet tape, band, patches or the like with controlling the tension of the tape, preferably either the tape may be heated when thermo-adhesive is used or a self-adhesive band may be used, 6 - perforating the hole, 7 - turning the document sheet band, 8 - application section of sheet element tape, band, patches or the like in longitudinal and transversal register with the hole, 9 - optional section for humidify, and 10 - rewinding section.

[0048] The above object, features and advantages of the present invention will become apparent upon consid-

eration of the following description of a preferred embodiment of the present invention, taking in conjunction with the accompanying drawings.

Brief description of the drawings

[0049]

Fig. 1 is a plan view of a bank note as a document sheet according to an embodiment of the invention, on which a cover sheet is to be applied.

Fig. 2A shows a plan view of the bank note according to the embodiment of the invention, on which the cover sheet has been applied.

Fig. 2B shows a front view of the bank note shown in Fig. 2A.

Fig. 3A is a bottom view of the bank note according to the embodiment of the invention, on which bank note a sheet element has been applied on the other surface side of the bank note and opposite to the cover sheet.

Fig. 3B shows a front view of the bank note shown in Fig. 3A.

Fig. 4 shows an example of a constitution of a layer structure of the cover sheet or the sheet element.

[0050] A preferred embodiment of the present invention is now described with reference to Fig. 1 to 4.

[0051] According to Fig. 1, a bank note 1 as a document sheet has a rectangular form. The bank note 1 comprises a hexagonal hole 2 and a circular watermark 3. Any geometrical forms of the hole 1 and the watermark 3 may be used. The hole 2 is formed within the bank note 1 at predetermined position in respect to the watermark 3 and to the outer circumference of the bank note 1.

[0052] A cover sheet 4 which may include several security means such as holographic pictures, Kinograms, metallic areas or the like, which are schematically shown by a sun-shaped item, a hexagonal pattern 41 and triangular-shaped forms has to be applied on the surface side of the bank note 1.

[0053] As it is shown in Fig. 2A und 2B, the cover sheet 4 is applied on the respective surface side of the bank note 1 such that the hole 2 is closed by the cover sheet 4 and the hexagonal pattern 41 of the cover sheet 4 is in register with the hole 2. Thus, the cover sheet 4 itself is in register with the hole 2. As it is further shown in Figs. 1, 2A and 2B, the cover sheet 4 consists of a rectangular stripe, which is applied along a transverse side direction of the rectangular bank note 1 on the respective surface side.

[0054] In Figs. 3A and 3B, the bank note 1 has been turned around 180° such that the bottom surface of the

bank note 4 lies now on top in Fig. 3B. As it is shown in these figures, a sheet element 5 is applied on the other surface side, i.e. the bottom surface, of the bank note 1 and opposite to the area where the cover sheet 4 has been applied to the top surface thereof. Thus, a high quality of planarity of the bank note 1 is achieved since the cover sheet 4 is applied in recto (i.e. on the top surface) and the sheet element 5 is applied in verso (i.e. on the bottom surface) on the bank note 1.

[0055] The sheet element 5 may also include security means such as a holographic item or the like which is in register with the hole 2, as it can be seen from Fig. 3A. Also the sheet element consists of a continuous stripe, which is applied along the transverse side direction of the rectangular document sheet on the bottom side of the bank note 1.

[0056] Fig. 4 shows an exemplary layer structure of the cover sheet 4 or sheet element 5, which comprises a thermo-adhesive layer, a metallization layer, a holographic lacquer, an adhesive primer layer and a plastic film layer, in particular, a polyester film layer, in this order from the bottom to the top, wherein the thermo adhesive layer is fixable to the bank note 1.

[0057] While the invention has been described with reference to the preferred embodiment disclosed above, the invention itself is not confined to the details set fourth in accordance with this embodiment and this application is intended to cover such modifications or changes as may come within the scope of the following claims.

Claims

1. A forgery-resistant document, such as a banknote, a passport, an identity card or the like, comprising:

a document sheet (1) having a hole (2), which opens to both surface sides of the document sheet (1),

a cover sheet (4) applied on one of both surface sides to close the hole (2), and

a sheet element (5) applied on the other surface side and opposite to the cover sheet (4),

wherein the cover sheet (4) and the sheet element (5) are patches, which are applied to and fixed on the respective surface sides at an area around the hole (2) in the document sheet (1),

or the cover sheet (4) and the sheet element (5) are continuous stripes, which are applied along a transverse direction of a rectangular document sheet on the respective surface sides thereof, and

the sheet element (5) has a hole which corresponds to the hole (2) in the document sheet (1),

characterized in that

at least one marking on the cover sheet (4) is in register with the hole (2).

2. A forgery-resistant document according to claim 1, wherein the cover sheet (4) is in register with the hole (2).
3. A forgery-resistant document according to claim 1 or 2, wherein the outer circumferences of the cover sheet (4) and the sheet element (5) are substantially congruent with each other.
4. A forgery-resistant document according to one of the preceding claims, wherein each of the cover sheet (4) and the sheet element (5) includes a layer structure, which comprises a thermo-adhesive layer and a plastic film layer and at least one of an adhesion primer layer, a holographic lacquer and a metallization layer, wherein the thermo-adhesive layer is fixable to the document sheet (1), or wherein at least one of the cover sheet (4) and the sheet element (5) includes a layer structure, which comprises a thermo-adhesive layer and at least one of an adhesion primer layer, a holographic lacquer and a metallization layer, wherein the layer structure is provided on a plastic support layer, and wherein the layer structure is applicable to the document sheet by fixing the thermo-adhesive layer to the document sheet (1), preferably the plastic support layer being a plastic film layer which is peelable, and/or wherein the thickness of the plastic film layer is less than 16 micron, preferably 10, or 8, or 6 μm , and/or wherein the plastic film layer is made of a polyester plastic, and/or wherein each layer structure of the cover sheet (4) and the sheet element (5) further comprises a layer which provides a barrier against humidity, preferably the barrier layer against humidity comprising an acrylic and/or polyurethane-based varnish or lacquer, and/or wherein the document sheet (1) comprises cotton paper, and/or wherein the sheet element (5) and/or the cover sheet (4) have security characteristics, preferably, fluorescent inks and/or pigments at both 360 nanometers and 254 nanometers and/or inks or pigments that absorb infrared rays and/or pigments or particles that can be detected when agitated with ultrasound or microwaves and/or with magnetic elements in continuous and/or encoded mode, using one or more magnetic oxides or inks with different coercivity and the same residue or different coercivity and different residue or equal coercivity and different residue or equal coercivity and equal residue.
5. A manufacturing method of a forgery-resistant document, such as a banknote, a passport, an identity card or the like, the method comprises the steps of:
- unwinding a document sheet band from a roll, registering the document sheet band,
- applying a sheet element band on one surface side of the document sheet band,
- perforating the document sheet band and the sheet element band applied on the document sheet band such that document sheets (1), on which sheet elements (5) are applied, are formed with a corresponding hole (2) perforating the document sheet (1) and the sheet element (5) at a predetermined position, and applying a cover sheet (4) on the other surface side of each document sheet (1) and opposite to each sheet element (5) to close the hole (2) of each document sheet (1) and to bring at least one marking on the cover sheet (4) into register with the hole (2).
6. A manufacturing method of a forgery-resistant document according to claim 5, wherein the method further comprises the steps of:
- controlling the tension of the document sheet band, the cover sheet or cover sheet band, and the sheet element (5) or sheet element band before applying the cover sheet (4) and/or the sheet element (5) on the document sheet band, and/or
- controlling the humidity of the document sheet band before the cover sheet (4) and/or the sheet element (5) is/are applied on the document sheet band, and/or
- turning the document sheet band by substantially 180° after the cover sheet (4) has been applied from above; and applying the sheet element (5) from above.
7. A manufacturing method of a forgery-resistant document according to claim 5 or 6, wherein the method further comprises the steps of:
- winding the document sheet band after the application step of the sheet element (5), or humidifying of the document sheet band and controlling the humidity of the document sheet band, after the applying step of the sheet element (5), and then rewinding the document sheet band.
8. A manufacturing method of a forgery-resistant document according to one of claims 5 to 7, wherein during the application steps the humidity, the tension and the temperature of the items to be applied is controlled, and/or wherein the cover sheet (4) and/or the sheet element (5) are attached to the document sheet (1) by adhesion principles including melt adhesion, glueing, self adhesion, two component glueing, UV hardening and IR-hardening glueing.

Patentansprüche

1. Fälschungssicheres Dokument, wie zum Beispiel eine Banknote, ein Reisepass, ein Personalausweis oder dergleichen, mit:

einem Dokumentenblatt (1) mit einem Loch (2), das an beiden Oberflächenseiten des Dokumentenblatts (1) offen ist, einem Abdeckblatt (4), das auf einer der beiden Oberflächenseiten aufgebracht ist, um das Loch (2) zu verschließen, und einem Blattelement (5), das an der anderen Oberflächenseite aufgebracht ist und dem Abdeckblatt (4) gegenüberliegt, wobei das Abdeckblatt (4) und das Blattelement (5) Patches sind, die auf den jeweiligen Oberflächenseiten an einem Bereich um das Loch (2) in dem Dokumentenblatt (1) aufgebracht und fixiert sind, oder das Abdeckblatt (4) und das Blattelement (5) kontinuierliche Streifen sind, die entlang einer Querrichtung eines viereckigen Dokumentenblatts auf dessen jeweiligen Oberflächenseiten aufgebracht sind, und das Blattelement (5) ein Loch hat, das zu dem Loch (2) in dem Dokumentenblatt (1) korrespondiert,

dadurch gekennzeichnet, dass

zumindest eine Markierung an dem Abdeckblatt (4) registerhaltig zu dem Loch (2) ist.

2. Fälschungssicheres Dokument nach Anspruch 1, wobei das Abdeckblatt (4) registerhaltig zu dem Loch (2) ist.

3. Fälschungssicheres Dokument nach Anspruch 1 oder 2, wobei die Außenumfänge des Abdeckblatts (4) und des Blattelements (5) im Wesentlichen kongruent zueinander sind.

4. Fälschungssicheres Dokument nach einem der vorangegangenen Ansprüche, wobei jedes von dem Abdeckblatt (4) und dem Blattelement (5) eine Schichtstruktur aufweist, die eine wärmehafterfähige Schicht und eine Kunststofffilmschicht und zumindest eine/einen von einer Adhäsionsprimerschicht, einem holographischen Lack und einer Metallisierungsschicht aufweist, wobei die wärmehafterfähige Schicht auf dem Dokumentenblatt (1) fixierbar ist, oder

wobei zumindest eines von dem Abdeckblatt (4) und dem Blattelement (5) eine Schichtstruktur aufweist, die eine wärmehafterfähige Schicht und zumindest eine/einen von einer Adhäsionsprimerschicht, einem holographischen Lack und einer Metallisierungsschicht aufweist, wobei die Schichtstruktur auf einer Kunststoffträgerschicht vorgesehen ist, und wobei die Schichtstruktur auf das Dokumentenblatt durch

Fixieren der wärmehafterfähigen Schicht an dem Dokumentenblatt (1) aufbringbar ist, wobei die Kunststoffträgerschicht bevorzugt eine Kunststofffilmschicht ist, die abziehbar ist, und/oder

wobei die Dicke der Kunststofffilmschicht kleiner als 16 Mikrometer, bevorzugt 10 oder 8 oder 6 Mikrometer ist, und/oder

wobei die Kunststofffilmschicht aus einem Polyesterkunststoff hergestellt ist, und/oder

wobei jede Schichtstruktur des Abdeckblatts (4) und des Blattelements (5) des Weiteren eine Schicht aufweist, die eine Barriere gegenüber Feuchtigkeit vorsieht, wobei die Barrierschicht gegenüber Feuchtigkeit einen auf Acryl und/oder Polyurethan basierenden Firnis oder Lack aufweist, und/oder

wobei das Dokumentenblatt (1) Baumwollpapier aufweist und/oder

wobei das Blattelement (5) und/oder das Abdeckblatt (4) Sicherheitscharakteristika haben, bevorzugt

fluoreszente Tinten und/oder Pigmente mit sowohl 360 Nanometer als auch 254 Nanometer und/oder Tinten oder Pigmente, die Infrarotstrahlen absorbieren, und/oder Pigmente oder Partikel, die detektiert werden können, wenn sie mit Ultraschall oder Mikro-

wellen erregt werden, und/oder mit magnetischen Elementen in kontinuierlichen und/oder kodierten Modus, wobei ein oder mehrere magnetische Oxide oder Tinten mit unterschiedlicher Koerzitivfeldstärke und derselben Reststärke oder unterschiedlicher Koerzitivfeldstärke und unterschiedlicher Reststärke oder der gleichen Koerzitivfeldstärke und unterschiedlicher Reststärke verwendet werden.

5. Herstellungsverfahren eines fälschungssicheren Dokuments, wie zum Beispiel einer Banknote, eines Reisepasses, eines Personalausweises oder dergleichen, wobei das Verfahren die folgenden Schritte aufweist:

Abwickeln eines Dokumentenblattbands von einer Rolle,

Registrieren des Dokumentenblattbands,

Aufbringen eines Blattelementbands auf eine Oberflächenseite des Dokumentenblattbands,

Perforieren des Dokumentenblattbands und des Blattelementbands, das auf dem Dokumentenblattband aufgebracht ist, derart, dass Dokumentenblätter (1), auf denen Blattelemente (5)

aufgebracht sind, mit einem korrespondierenden Loch (2), das das Dokumentenblatt (1) und das Blattelement (5) an einer vorbestimmten

Position durchdringt, ausgebildet werden, und

Aufbringen eines Abdeckblatts (4) auf die andere Oberflächenseite jedes Dokumentenblatts (1) und gegenüberliegend zu jedem Blattelement (5), um das Loch (2) jedes Dokumenten-

blatts (1) zu verschließen, und um zumindest eine Markierung an dem Abdeckblatt (4) registerhaltig zu dem Loch (2) zu bringen.

6. Herstellungsverfahren eines fälschungssicheren Dokuments nach Anspruch 5, wobei das Verfahren des Weiteren die folgenden Schritte aufweist:

Steuern der Spannung des Dokumentenblattbands, des Abdeckblatts oder des Abdeckblattbands und des Blattelements (5) oder des Blattelementbands vor dem Aufbringen des Abdeckblatts (4) und/oder des Blattelements (5) auf das Dokumentenblattband, und/oder Steuern der Feuchtigkeit des Dokumentenblattbands, bevor das Abdeckblatt (4) und/oder das Blattelement (5) auf das Dokumentenblattband aufgebracht werden/wird, und/oder Drehen des Dokumentenblattbands um im Wesentlichen 180°, nachdem das Abdeckblatt (4) von oben aufgebracht worden ist; und Aufbringen des Blattelements (5) von oben.

7. Herstellungsverfahren eines fälschungssicheren Dokuments nach Anspruch 5 oder 6, wobei das Verfahren des Weiteren die folgenden Schritte aufweist:

Aufwickeln des Dokumentenblattbands nach dem Aufbringungsschritt des Blattelements (5), oder Befeuchten des Dokumentenblattbands und Steuern der Feuchtigkeit des Dokumentenblattbands nach dem Aufbringungsschritt des Blattelements (5), und danach Aufwickeln des Dokumentenblattbands.

8. Herstellungsverfahren eines fälschungssicheren Dokuments nach einem der Ansprüche 5 bis 7, wobei während der Aufbringungsschritte die Feuchtigkeit, die Spannung und die Temperatur der Gegenstände, die aufzubringen sind, gesteuert wird, und/oder wobei das Abdeckblatt (4) und/oder das Blattelement (5) auf das Dokumentenblatt (1) durch Adhäsionsprinzipien einschließlich Schmelzadhäsion, Kleben, Selbstadhäsion, Zwei-Komponenten-Kleben, UV-Härten und IR-Aushärtekleben angebracht werden.

Revendications

1. Document résistant aux contrefaçons, tels que les billets de banque, les passeports, les cartes d'identité ou similaires, comprenant :

une feuille de document (1) ayant un trou (2) qui s'ouvre des deux côtés de surface de la feuille de document (1),

une feuille de couverture (4) appliquée sur l'un des deux côtés de surface pour fermer le trou (2), et

un élément de feuille (5) appliqué sur l'autre côté de surface et opposé à la feuille de couverture (4),

dans lequel la feuille de couverture (4) et l'élément de feuille (5) sont des pastilles qui sont appliquées sur et fixées sur les côtés de surface respectifs au niveau d'une zone autour du trou (2) dans la feuille de document (1), ou la feuille de couverture (4) et l'élément de feuille (5) sont des bandes continues qui sont appliquées le long d'une direction transversale d'une feuille de document rectangulaire sur ses côtés de surface respectifs, et

l'élément de feuille (5) a un trou qui correspond au trou (2) dans la feuille de document (1),

caractérisé en ce que :

au moins un marquage sur la feuille de couverture (4) est en registre avec le trou (2).

2. Document résistant aux contrefaçons selon la revendication 1, dans lequel la feuille de couverture (4) est en registre avec le trou (2).

3. Document résistant aux contrefaçons selon la revendication 1 ou 2, dans lequel les circonférences externes de la feuille de couverture (4) et de l'élément de feuille (5) sont sensiblement en harmonie entre elles.

4. Document résistant aux contrefaçons selon l'une des revendications précédentes, dans lequel chacun parmi la feuille de couverture (4) et l'élément de feuille (5) comprend une structure de couche, qui comprend une couche thermoadhésive et une couche de film plastique et au moins l'une parmi une couche d'accroche d'adhérence, une laque holographique et une couche de métallisation, dans lequel la couche thermoadhésive peut être fixée sur la feuille de document (1), ou

dans lequel au moins l'un parmi la couche de couverture (4) et l'élément de feuille (5) comprend une structure de couche, qui comprend une couche thermoadhésive et au moins une couche d'accroche d'adhérence, une laque holographique et une couche de métallisation, dans lequel la structure de couche est prévue sur une couche de support en plastique et dans lequel la structure de couche peut être appliquée sur la feuille de document en fixant la couche thermoadhésive sur la feuille de document (1), de préférence la couche de support en plastique étant une couche de film plastique qui est détachable, et/ou

dans lequel l'épaisseur de la couche de film plastique est inférieure à 16 microns, de préférence 10, ou 8, ou 6 µm, et/ou

dans lequel la couche de film plastique est réalisée à partir d'un plastique de polyester, et/ou

dans lequel chaque structure de couche de la feuille de couverture (4) et de l'élément de feuille (5) comprend en outre une couche qui fournit une barrière contre l'humidité, de préférence la couche de barrière contre l'humidité comprenant un vernis ou une laque à base d'acrylique et/ou de polyuréthane, et/ou dans lequel la feuille de document (1) comprend du papier coton, et/ou

dans lequel l'élément de feuille (5) et/ou la feuille de couverture (4) ont des caractéristiques de sécurité, de préférence des encres fluorescentes et/ou des pigments à la fois de 360 nanomètres et 254 nanomètres et/ou des encres ou des pigments qui absorbent les rayons infrarouges et/ou des pigments ou des particules qui peuvent être détectés lorsqu'ils sont agités avec des ultrasons ou des micro-ondes et/ou avec des éléments magnétiques en mode continu et/ou encodé, en utilisant un ou plusieurs oxydes magnétiques ou des encres avec une coercivité différente et un résidu identique ou une coercivité différente et un résidu différent ou une coercivité identique et un résidu différent ou une coercivité identique et un résidu identique.

5. Procédé de fabrication d'un document résistant aux contrefaçons, tels que les billets de banque, les passeports, les cartes d'identité ou similaires, le procédé comprend les étapes suivantes :

dérouler une bande de feuille de document d'un rouleau,

aligner la bande de feuille de document, appliquer une bande d'élément de feuille sur un côté de surface de la bande de feuille de document,

perforer la bande de feuille de document et la bande d'élément de feuille appliquée sur la bande de feuille de document de sorte que les feuilles de document (1), sur lesquelles les éléments de feuille (5) sont appliqués, sont formées avec un trou (2) correspondant, perforant la feuille de document (1) et l'élément de feuille (5) dans une position prédéterminée, et

appliquer une feuille de couverture (4) sur l'autre côté de surface de chaque feuille de document (1) et opposé à chaque élément de feuille (5) pour fermer le trou (2) de chaque feuille de document (1) et pour amener au moins un marquage sur la feuille de couverture (4) en registre avec le trou (2).

6. Procédé de fabrication d'un document résistant aux contrefaçons selon la revendication 5, dans lequel le procédé comprend en outre les étapes suivantes :

contrôler la tension de la bande de feuille de

document, la feuille de couverture ou la bande de feuille de couverture, et l'élément de feuille (5) ou la bande d'élément de feuille avant d'appliquer la feuille de couverture (4) et/ou l'élément de feuille (5) sur la bande de feuille de document, et/ou

contrôler l'humidité de la bande de feuille de document avant que la feuille de couverture (4) et/ou l'élément de feuille (5) ne soit/soient appliqué(s) sur la bande de feuille de document, et/ou

tourner la bande de feuille de document sensiblement à 180° après que la feuille de couverture (4) a été appliquée de dessus ; et appliquer l'élément de feuille (5) de dessus.

7. Procédé de fabrication d'un document résistant aux contrefaçons selon la revendication 5 ou 6, dans lequel le procédé comprend en outre les étapes suivantes :

enrouler la bande de feuille de document après l'étape d'application de l'élément de feuille (5), ou

humidifier la bande de feuille de document et contrôler l'humidité de la bande de feuille de document, après l'étape d'application de l'élément de feuille (5) et ensuite dérouler la bande de feuille de document.

8. Procédé de fabrication d'un document résistant aux contrefaçons selon l'une des revendications 5 à 7, dans lequel pendant les étapes d'application, l'humidité, la tension et la température des articles à appliquer sont contrôlées et/ou dans lequel la feuille de couverture (4) et/ou l'élément de feuille (5) sont fixés sur la feuille de document (1) par des principes d'adhérence comprenant l'adhérence par fusion, le collage, l'auto-adhérence, le collage à deux composants, le durcissement aux UV et le collage par durcissement aux IR.

FIG. 1

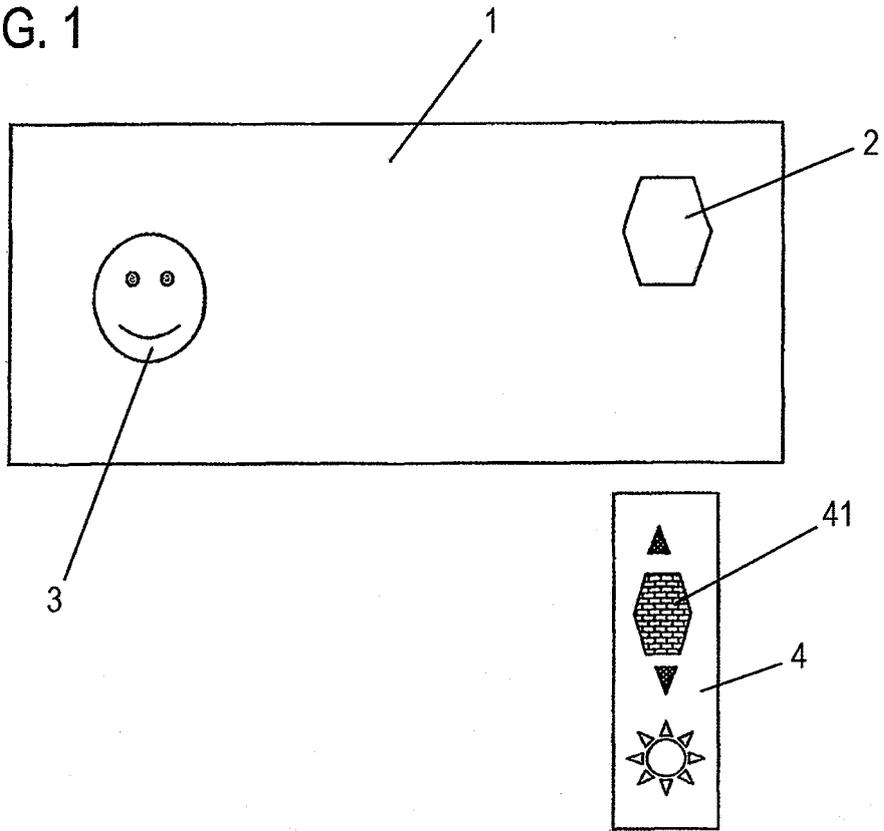


FIG. 2A

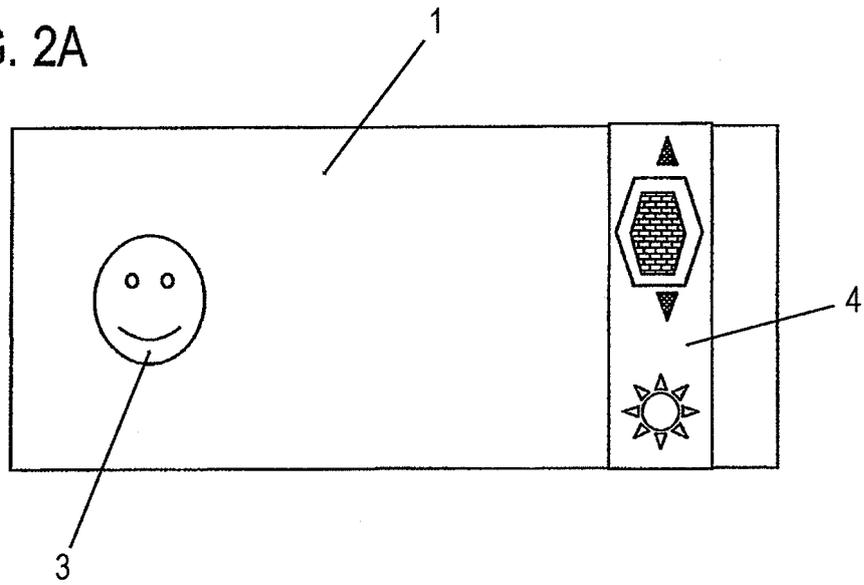


FIG. 2B

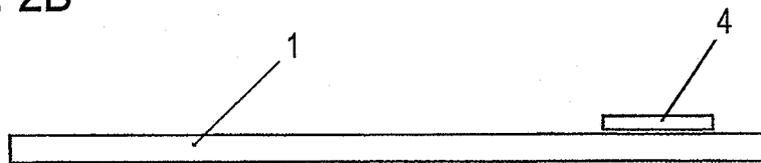


FIG. 3A

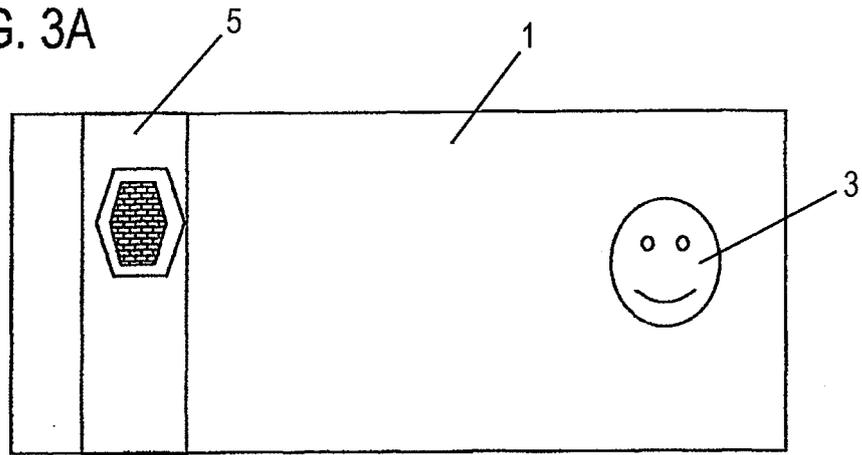
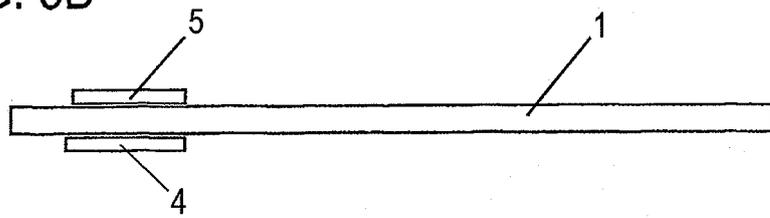


FIG. 3B



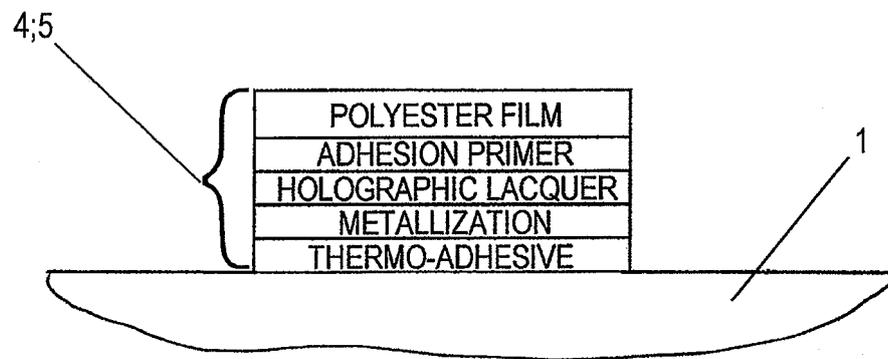


FIG. 4

REFERENCES CITED IN THE DESCRIPTION

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