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(72) Inventeurs/Inventors:
OWEGER, BERND, DE;
WINKLER, KARIN, DE;
WIEDNER, BERNHARD, DE;
HEIM, MANFRED, DE;
PLASCHKA, REINHARD, DE;
KRETSCHMAR, FRIEDRICH, DE;
...

(73) Propriétaire/Owner:
GIESECKE & DEVRIENT GMBH, DE

(74) Agent: RIDOUT & MAYBEE LLP

(54) Titre : PROCEDE POUR FABRIQUER UN ELEMENT DE SECURITE ET ELEMENT DE SECURITE POUVANT ETRE OBTENU SELON LE PROCEDE

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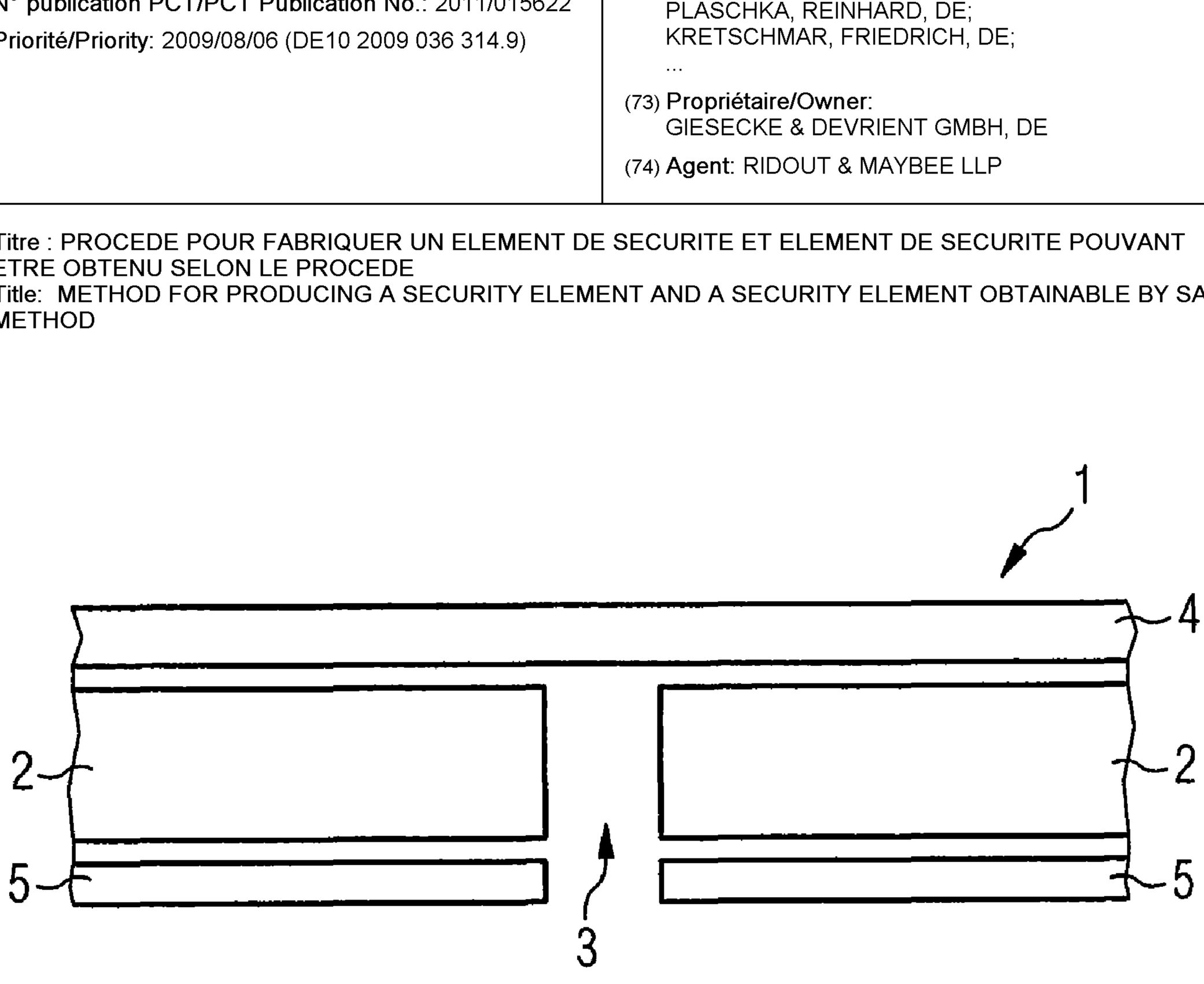

(57) Abrégé/Abstract:
A security element (1) which has a substrate (2) with at least one opening (3), whereby the opening (3) is closed on one side with an at least partly translucent or transparent foil (4), and a coating (5) is located on the side of the substrate (2) opposing the foil (4), in the region of the opening (3) and substantially in the region of the foil area, and whereby the coating (5) is not present, or substantially not present, within the opening (3).

CA 2769414 C 2013/12/10

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(72) Inventeurs(suite)/Inventors(continued): MENGEL, CHRISTOPH, DE; BURCHARD, THEODOR, DE; LIEBLER, RALF, DE; KELLER, MARIO, DE; RUCK, JUERGEN, DE; HOFFMUELLER, WINFRIED, DE

Abstract

A security element (1) which has a substrate (2) with at least one opening (3), whereby the opening (3) is closed on one side with an at least partly translucent or transparent foil (4), and a coating (5) is located on the side of the substrate (2) opposing the foil (4), in the region of the opening (3) and substantially in the region of the foil area, and whereby the coating (5) is not present, or substantially not present, within the opening (3).

Fig. 1

Method for producing a security element and a security element obtainable by said method

[0001] This invention relates to a security element which has a substrate with at least one opening, whereby the opening is closed on one side with an at least partly translucent or transparent foil, and a coating is located on the side of the substrate opposing the foil, in the region of the opening and substantially in the region of the foil area, and whereby the coating is not present, or substantially not present, within the opening. The invention relates furthermore to methods for producing such a security element. The security element of the invention is applied to a value document or is part of a value document. When the security element is part of a value document, the opening is formed in the substrate of the value document.

[0002] A value document for the purposes of this invention is in particular a bank note, a paper of value, a credit card or identification card, a passport, a deed or the like, a label, a package or another element for product authentication.

[0003] From WO 2005/116335 A1 there is known a method for producing security paper with at least one transparent region for value documents. The security paper consists here of at least one ply of substantially non-transparent material which has an opening or a window. The opening is first closed on one side by a transparent cover ply, in particular a foil or lacquer layer, and subsequently filled with a transparent filling by extrusion coating.

[0004] The invention is based on the object of developing a generic security element so as to further increase the protection from forgeries.

[0005] This object is achieved by the features of the independent claims. Developments of the invention are the subject matter of the dependent claims.

[0006] A first aspect of the invention relates to a method for producing a security element which has a substrate with at least one opening, whereby the opening is closed on one side with an at least partly translucent or transparent foil, comprising an application of a coating to one side of the substrate, a producing of a through opening

in the substrate and the coating applied to the substrate, and an application of an at least partly translucent or transparent foil to the side of the substrate opposing the coating, so that the opening is closed on one side with the at least partly translucent or transparent foil and the coating is arranged on the substrate substantially in the region of the foil area.

[0007] A second aspect of the invention relates to a method for producing a security element which has a substrate with at least one opening, whereby the opening is closed on one side with an at least partly translucent or transparent foil, comprising an application of a coating to a substrate provided with a through opening, in the region of the opening, so that the coating is not present, or substantially not present, within the opening, and an application of an at least partly translucent or transparent foil to the side of the substrate opposing the coating, so that the opening is closed on one side with the at least partly translucent or transparent foil and the coating is arranged on the substrate substantially in the region of the foil area.

[0008] A third aspect of the invention relates to a method for producing a security element which has a substrate with at least one opening, whereby the opening is closed on one side with an at least partly translucent or transparent foil, comprising an application of an at least partly translucent or transparent foil to a substrate provided with a through opening, in the region of the opening, and an application of a coating to the side of the substrate opposing the foil, so that the coating is not present, or substantially not present, within the opening, the opening is closed on one side with the at least partly translucent or transparent foil and the coating is arranged on the substrate substantially in the region of the foil area.

[0009] A fourth aspect of the invention relates to a security element which has a substrate with at least one opening, whereby the opening is closed on one side with an at least partly translucent or transparent foil, and a coating is located on the side of the substrate opposing the foil, in the region of the opening and substantially in the region of the foil area, and whereby the coating is not present, or substantially not present, within the opening.

[0010] The security element according to the fourth aspect of the invention is obtainable by the method according to the first aspect of the invention or alternatively by the method according to the second or third aspect of the invention.

[0011] In general, the physical properties, in particular the flatness, of a substrate having an opening are substantially influenced by a one-sided application of a foil. The expansibility of the substrate which consists of paper and/or a plastic foil is dependent on the parameters of temperature, moisture and orientation of the fiber strands or polymer strands of the paper or foil. If a substrate provided with a through opening is closed on one side with a foil whose expansibility differs strongly from that of the substrate, changes in moisture and/or temperature can strongly impair the flatness of the substrate.

[0012] According to the invention, bulges of the substrate as a result of moisture and temperature influences can be avoided by closing the substrate provided with an opening with an at least partly translucent or transparent foil on one side and applying a coating to the side of the substrate opposing the foil, in the region of the opening and substantially in the region of the foil area, i.e. the area of the foil. The coating is so applied here that no, or substantially no, coating material is present within the opening, i.e. the coating material does not "flow into" the opening. The coating causes an opposing force, as it were, to be built up to the at least partly translucent or transparent foil. The security element of the invention proves to be advantageous in particular upon the stacking of value documents which include the security element, or upon a further processing, e.g. printing or embossing, because a flat surface is necessary here. Special advantages of the security element of the invention are that the at least partly translucent or transparent foil applied over the through opening creates an unlimited overprintability of the region of the opening and ensures, in connection with the coating applied to the side of the substrate opposing the foil, an elevated stability upon creasing or bending through load and stress compensation.

[0013] Hereinafter the invention will be described in detail with reference to preferred embodiments, to which the invention is in no way to be limited, however.

The described single features and embodiments hereinafter described are inventive taken alone, but are also inventive in combination.

[0014] According to a first preferred embodiment, a security element which has a substrate with at least one opening, whereby the opening is closed on one side with an at least partly translucent or transparent foil, is produced by applying a coating to one side of the substrate, thereafter producing a through opening in the substrate and the coating applied to the substrate, and subsequently applying an at least partly translucent or transparent foil to the side of the substrate opposing the coating, so that the opening is closed on one side with the at least partly translucent or transparent foil and the coating is arranged on the substrate substantially in the region of the foil area.

[0015] The substrate can be of single- or multi-ply configuration and consist of paper and/or a plastic foil. As paper there can be used any type of paper, in particular cotton paper. It is of course also possible to use paper that contains a content x of polymeric material in the range of $0 < x < 100$. As a plastic foil there can be used e.g. a polyester foil. The foil can further be stretched uniaxially or biaxially. The stretch of the foil has the consequence, inter alia, that it acquires polarizing properties which can be utilized as a further security feature. It can also be expedient when the substrate material is a multilayer composite which has at least one layer of paper or a paper-like material. Such a composite is characterized by an exceptionally great stability, which is of great advantage for the durability of the paper. It is also conceivable to use as a substrate material a multilayer, paper-free composite material. Said composite material can be used advantageously in certain climatic regions of the earth. All materials used as the substrate material can have additives which serve as authentication features. In this connection one will primarily consider luminescent substances which are preferably transparent in the visible wavelength range and can be excited in the invisible wavelength range by a suitable aid, e.g. a radiation source emitting UV or IR radiation, in order to produce a luminescence that is visible or at least detectable with aids.

[0016] The coating which is applied to the one side of the substrate can be a self-supporting layer, such as a foil. Suitable foils are e.g. polyolefin foils (e.g. of PE

(polyethylene), PP (polypropylene) or cyclo-olefinic copolymers), foils of polyolefin derivatives or of polycarbonate, PMMA, in particular PET (polyethylene terephthalate), PP, PA (polyamide). The foil can be applied to the substrate for example by means of an adhesive or a lacquer. As adhesives there can be employed for example hot-melt adhesives or reaction lacquers. Suitable adhesives for applying the foil are e.g. polyvinyl acetates, polyvinyl chloride derivatives, acrylates, polyurethanes, polyesters, copolymers of these groups as well as UV adhesives.

[0017] The coating which is applied to the one side of the substrate can also be a non-self-supporting layer, i.e. a layer that is not processable as a separate layer but only together with a thicker carrier layer which is optionally laminated with further layers to form a multilayer carrier.

[0018] For forming the coating which is applied to the one side of the substrate and which is a non-self-supporting layer, lacquers can be used. Suitable lacquers are solvent-containing two-component lacquers, aqueous dispersions and UV lacquers, preferably UV lacquers with a high solids content. As a lacquer there can be employed a transparent lacquer or a colored lacquer.

[0019] The coating applied to the one side of the substrate and being a non-self-supporting layer preferably has cross-linked gum arabic. Further preferably, the coating consists substantially of cross-linked gum arabic. Gum arabic is a branched polysaccharide which has weakly acidic properties and occurs in natural form as neutral or weakly acidic potassium salt, calcium salt or magnesium salt. For forming the coating there can be used an aqueous mixture which contains gum arabic (e.g. "Quickgum Type 8074" from the company Norevo GmbH) converted to the H^+ form by means of an ion exchange resin (e.g. "Levatit Monoplus SP 112 H" from the company Lanxess), and a cross-linking agent. As a cross-linking agent there can advantageously be employed a polyfunctional aziridine cross-linker (e.g. "Crosslinker CX-100" from the company DSM-Neoresins). The aqueous mixture can be applied to the substrate e.g. by printing, preferably by screen printing, and thereafter dried at ambient temperature or at elevated temperature and thereby cross-linked. The gum

arabic treated by means of ion exchange resin and converted to the H^+ form has a very advantageous waterproofness after cross-linking.

[0020] As an alternative to the hereinabove mentioned use of cross-linked gum arabic, the coating applied to the one side of the substrate and being a non-self-supporting layer can have starch (amylose) cross-linked by means of a cross-linking agent. In this case it is preferred that the coating consists substantially of starch (amylose) cross-linked by means of a cross-linking agent. For forming the coating there can be used an aqueous mixture which contains soluble starch, i.e. amylose, and a cross-linking agent. As a cross-linking agent there can advantageously be employed a di- or higher-functionalized isocyanate cross-linker. The cross-linking agent should preferably be emulsifiable or dispersible in water. The aqueous mixture can be applied to the substrate e.g. by printing, preferably by screen printing, and thereafter dried at ambient temperature or at elevated temperature and thereby cross-linked.

[0021] Preferably, the coating which is applied to the one side of the substrate is extruded or laminated. In the case of an extrusion coating, a melt is for example pressed by means of a screw through a nozzle. If it is a slot nozzle, a film corresponding to a foil can be placed over the substrate and connected thereto. In the case of coating by lamination, solvent-containing or solvent-free one-component and two-component systems can be used as laminating adhesives.

[0022] Likewise, the coating can be applied to the substrate by printing, in particular by a gravure, flexographic, screen, offset or transfer printing method.

[0023] The term "through opening" refers to a through hole, i.e. an opening that breaks in a straight line through both the substrate and the coating optionally applied to the substrate.

[0024] The through opening which is produced in the substrate and the coating applied to the substrate can be produced by punching or cutting, in particular by laser cutting.

[0025] The through opening can have arbitrary outline contours and be for example of circular, oval, rectangular, trapezoidal, star-shaped or also strip-shaped

configuration. The through opening can be composed of several partial through openings which are separated by bars of the substrate and the coating applied to the substrate. The partial through openings can have arbitrary outline contours and are preferably used as an additional design element. For producing the respective partial openings, all the above-mentioned methods for producing the opening of the invention can be employed analogously.

[0026] The at least partly translucent or transparent foil which is applied to the side of the substrate opposing the coating, so that the opening is closed on one side with the at least partly translucent or transparent foil, is preferably of transparent configuration. Transparent is to be understood in this connection to mean a light transmission of at least 90% of the impinging light, while translucent means a light transmission of less than 90%, preferably between 80% and 20%. Preferably, the at least partly translucent or transparent foil for closing the opening has at least one translucent region in the region of the opening. In particular, it is preferred that the at least partly translucent foil for closing the opening has at least one transparent region in the region of the opening. As materials for the at least partly translucent or transparent foil there can be used for example the plastics PET (polyethylene terephthalate), PBT (polybutylene terephthalate), PP (polypropylene), PA (polyamide) and PE (polyethylene). The foil can further be stretched uniaxially or biaxially.

[0027] The at least partly translucent or transparent foil for closing the opening can be applied, in particular laminated, to the substrate as a strip, patch, label or embossing foil element. Preferably, the application is effected by means of an adhesive layer or lacquer layer. As an adhesive there can be employed the hereinabove mentioned adhesives. A patch in this connection is a label-shaped single element. A strip has a width that is substantially smaller than its length, whereby the strip preferably reaches from one edge of the substrate to an opposing edge thereof.

[0028] The hereinabove mentioned coating which is applied to the one side of the substrate, and/or the hereinabove mentioned at least partly translucent or transparent foil can expediently have at least one security feature. The security feature is in particular a diffractive structure, such as a (volume) hologram, or a hologram-like

diffractive structure, a matt structure, a metallization, whereby several different-colored metals can also be employed, a perforation, a lens structure or micro-mirror structure, a micro-optic system, in particular a micro-optic moire magnification arrangement, a thin-film element, a polarization filter or a print which has at least one substance with optically variable, luminescent, electrically conductive or magnetic properties. Suitable substances with optically variable properties are e.g. effect pigments, in particular pigments produced on the basis of liquid-crystal polymers, or so-called pearl luster pigments, such as the silver white, gold luster or metal luster pigments sold under the name Iriodin® or Colorcrypt by the company Merck KGaA. Both pigments based on liquid-crystal material and pearl luster pigments are translucent in themselves. Suitable substances with optically variable properties are further interference-layer pigments. Interference-layer pigments typically have a thin-film structure which expediently contains at least a reflective layer, an absorber layer and a dielectric spacer layer arranged between the reflective layer and the absorber layer. Interference-layer pigments can be translucent in themselves, although opaque interference-layer pigments are also known.

[0029] The at least partly translucent or transparent foil can have a security feature in particular in the region of the opening of the security element of the invention.

[0030] The coating applied to the substrate can be substantially transparent. Alternatively, the coating applied to the substrate can have a color perceptible to the viewer.

[0031] The step of applying the coating to the substrate can be part of a printing method intended for a bank note, in particular gravure printing, flexographic printing, screen printing, offset printing or transfer printing.

[0032] The coating applied to the substrate can be of single- or multi-ply configuration and consist of one, two, three, four or more plies. In particular, the coating can have a dark base layer and an optically variable layer arranged over the dark base layer, whereby the optically variable layer contains optically variable pigments, in particular interference-layer pigments or pigments produced on the basis of liquid-crystal polymers.

[0033] According to a second preferred embodiment, a security element which has a substrate with at least one opening, whereby the opening is closed on one side with an at least partly translucent or transparent foil, is produced by applying a coating to a substrate provided with a through opening, in the region of the opening, so that the coating is not present, or substantially not present, within the opening, and applying an at least partly translucent foil to the side of the substrate opposing the coating, so that the opening is closed on one side with the at least partly translucent or transparent foil and the coating is arranged on the substrate substantially in the region of the foil area.

[0034] The opening in the substrate can, as described above, be formed in the substrate by methods such as punching or cutting, in particular laser cutting. Likewise, the opening can already be formed in the substrate during the production of the substrate, e.g. during the paper production.

[0035] The application of the coating to the substrate provided with a through opening is preferably carried out in exact register, e.g. by applying a coating or a foil to the substrate over the entire area and thereafter removing it in the region of the through opening by means of laser ablation. Likewise, a coating can be applied to the substrate in exact register by printing, in particular by a gravure, flexographic, screen, offset or transfer printing method.

[0036] As the substrate, the coating and the at least partly translucent or transparent foil, the above-mentioned substrates, coatings and foils described in connection with the first preferred embodiment are respectively employable, so that the above-mentioned details will not be repeated here.

[0037] In a variant of the hereinabove described second preferred embodiment, the coating can also be applied after the foil lamination.

[0038] In the individual embodiments, the coating respectively applied to the substrate can preferably cover the entire substrate side, so that the substrate is covered with the coating substantially over the full area. Through the substantially full-area covering of the substrate, the wave formation of the substrate can be considerably restricted.

[0039] In the individual embodiments, the coating respectively applied to the substrate can cover the substrate side continuously with approximately constant layer thickness. However, the coating can also be present in the form of a gridding, e.g. in the form of strips, provided that there is obtained the effect of the opposing force to the at least partly translucent or transparent foil on the side of the substrate opposing the coating.

[0040] The invention will be made clear with reference to the following implementation variants or examples in connection with the supplementary figures.

[0041] The representations in the figures are strongly schematized for the sake of better comprehension and do not reflect the actual conditions. In particular, the proportions shown in the figures do not correspond to the relations existing in reality and serve exclusively to improve the clearness. Furthermore, the embodiments described in the following examples are reduced to the essential core information for the sake of clarity. In the practical implementation, substantially more complex patterns or images can be used.

[0042] Specifically, the figures show schematically in a side view:

Fig. 1 a security element according to the invention with a substrate with an opening which is closed on one side with an at least partly translucent or transparent foil, whereby there is located on the side of the substrate opposing the foil, in the region of the opening and substantially in the region of the foil area, a coating which is not present, or substantially not present, within the opening;

Fig. 2 a method for producing the security element from Fig. 1, wherein a through opening is produced in the substrate and the coating applied to the substrate, and subsequently an at least partly translucent foil is applied to the side of the substrate opposing the coating, so that the opening is closed on one side with the at least partly translucent or transparent foil and the coating is arranged on the substrate substantially in the region of the foil area;

Fig. 3 a further method for producing the security element from Fig. 1, wherein a coating is so applied to a substrate provided with a through opening that the coating is not present, or substantially not present, within the opening and subsequently an at least partly translucent or transparent foil is applied to the side of the substrate opposing the coating, so that the opening is closed on one side with the at least partly translucent or transparent foil and the coating is arranged on the substrate substantially in the region of the foil area.

[0043] Fig. 1 shows a security element 1 according to the invention which has a substrate 2 with an opening 3, whereby the opening 3 is closed on one side with an at least partly translucent or transparent foil 4, and a coating 5 is located on the side of the substrate 2 opposing the foil 4, in the region of the opening 3 and substantially in the region of the foil area. Within the opening 3 the coating 5 is not present or substantially not present. In the region of the opening 3 the at least partly translucent or transparent foil 4 preferably has a translucent region. In particular, it is preferred that the at least partly translucent or transparent foil 4 has a transparent region in the region of the opening 3.

[0044] Fig. 2 shows a method for producing the security element 1 from Fig. 1. As shown in Fig. 2a, a coating 5 is first applied to one side of the substrate 2. In a subsequent step shown in Fig. 2b, a through opening 3 is produced by punching or (laser) cutting in the substrate 2 and the coating 5 applied to the substrate. Subsequently, according to Fig. 2c, an at least partly translucent or transparent foil 4 is applied to the side of the substrate 2 opposing the coating 5, so that the opening 3 is closed on one side with the at least partly translucent or transparent foil 4 and the coating 5 is arranged on the substrate 2 substantially in the region of the area of the foil 4.

[0045] Alternatively, the security element 1 of the invention can be produced according to the method shown in Fig. 3. As shown in Fig. 3a, a substrate 2 provided with a through opening 3 is first made available. A coating 5 is so applied to the substrate 2 in the region of the opening 3 that the coating is not present, or

substantially not present, within the opening 3 (Fig. 3b). Subsequently, according to Fig. 3c, an at least partly translucent or transparent foil 4 is applied to the side of the substrate 2 opposing the coating 5, so that the opening 3 is closed on one side with the at least partly translucent or transparent foil 4 and the coating 5 is arranged on the substrate 2 substantially in the region of the area of the foil 4.

[0046] In a variant to the method shown in Fig. 3 for producing the security element of the invention, the foil 4 is first applied to the substrate 2 provided with the opening and subsequently the coating 5 is so applied to the substrate 2 that no, or substantially no, coating is present within the opening 3, the opening 3 is closed on one side with the at least partly translucent or transparent foil and the coating is arranged on the substrate 2 substantially in the region of the area of the foil 4.

Claims

1. A method for producing a security element suited to be applied to a value document or to be part of a value document and having a substrate with at least one opening, whereby the opening is closed on one side with an at least partly translucent or transparent foil, the method comprising:

applying a coating to one side of the substrate,

producing a through opening in the substrate and the coating applied to the substrate, and

applying an at least partly translucent or transparent foil to the side of the substrate opposing the coating, so that the opening is closed on one side with the at least partly translucent or transparent foil and the coating is arranged on the substrate substantially in the region of the foil area.

2. A method for producing a security element suited to be applied to a value document or to be part of a value document, and having a substrate with at least one opening, whereby the opening is closed on one side with an at least partly translucent or transparent foil, the method comprising:

applying a coating to a substrate provided with a through opening, in the region of the opening, so that the coating is not present, or substantially not present, within the opening, and

applying an at least partly translucent or transparent foil to the side of the substrate opposing the coating, so that the opening is closed on one side with the partly translucent or transparent foil and the coating is arranged on the substrate substantially in the region of the foil area.

3. The method according to claim 2, wherein the application of the coating is carried out in exact register by applying the coating, which is a self-supporting coating or a foil, over the entire area and thereafter removing it by means of laser ablation in the region of the through opening.

4. The method according to claim 2, wherein the application of the coating is carried out in exact register by printing.

5. The method of claim 4, wherein the printing is carried out by a gravure, flexographic, screen, offset or transfer printing method.

6. The method according to any one of claims 1 to 5, wherein the coating or the at least partly translucent or transparent foil has at least one security feature.

7. The method according to claim 5, wherein the security feature consists of a diffractive structure, a thin-film element, a polarization filter or a print containing at least one substance with optically variable, luminescent, electrically conductive or magnetic properties.

8. The method according to any one of claims 1 to 7, wherein the coating is substantially transparent.

9. The method according to any one of claims 1 to 7, wherein the coating has a color perceptible to the viewer.

10. The method according to any one of claims 1 to 9, wherein the application of the coating to the substrate is part of a printing method intended for a bank note.

11. The method according to claim 10, wherein the printing method intended for a bank note is gravure printing, flexographic printing, screen printing, offset printing or transfer printing.

12. The method according to any one of claims 1 to 7, wherein the coating has a dark base layer and an optically variable layer arranged over the dark base layer, whereby the optically variable layer contains optically variable pigments.

13. The method according to claim 12, wherein the optically variable pigments are interference-layer pigments or pigments produced on the basis of liquid-crystal polymers.

14. The method according to any one of claims 1 to 13, wherein the at least partly translucent or transparent foil for closing the opening is applied to the substrate as a strip, patch, label or embossing foil element.

15. The method according to claim 14, wherein the at least partly translucent or transparent foil for closing the opening is laminated to the substrate as a strip, patch, label or embossing foil element.

16. The method according to any one of claims 1 to 15, wherein the opening is of circular, oval, rectangular, trapezoidal or star-shaped configuration.

17. The method according to any one of claims 1 to 16, wherein the at least partly translucent or transparent foil for closing the opening has at least one transparent region in the region of the opening.

18. The method according to any one of claims 1 to 17, wherein the substrate consists of paper and/or a plastic foil.

19. A security element suited to be applied to a value document or to be part of a value document and having a substrate with at least one opening, whereby the opening is closed on one side with an at least partly translucent or transparent foil, and a coating is located on the side of the substrate opposing the foil, in the region of the opening and substantially in the region of the foil area, and whereby the coating is not present, or substantially not present, within the opening.

20. The security element according to claim 19, wherein the coating is substantially transparent.

21. The security element according to claim 19, wherein the coating has a color perceptible to the viewer.

22. The security element according to claim 19, wherein the coating has a dark base layer and an optically variable layer arranged over the dark base layer, whereby the optically variable layer contains optically variable pigments.

23. The security element according to claim 22, wherein the optically variable pigments are interference-layer pigments or pigments produced on the basis of liquid-crystal polymers.

24. The security element according to claim 19 which is obtainable by a method according to any one of claims 1 to 18.

FIG 1

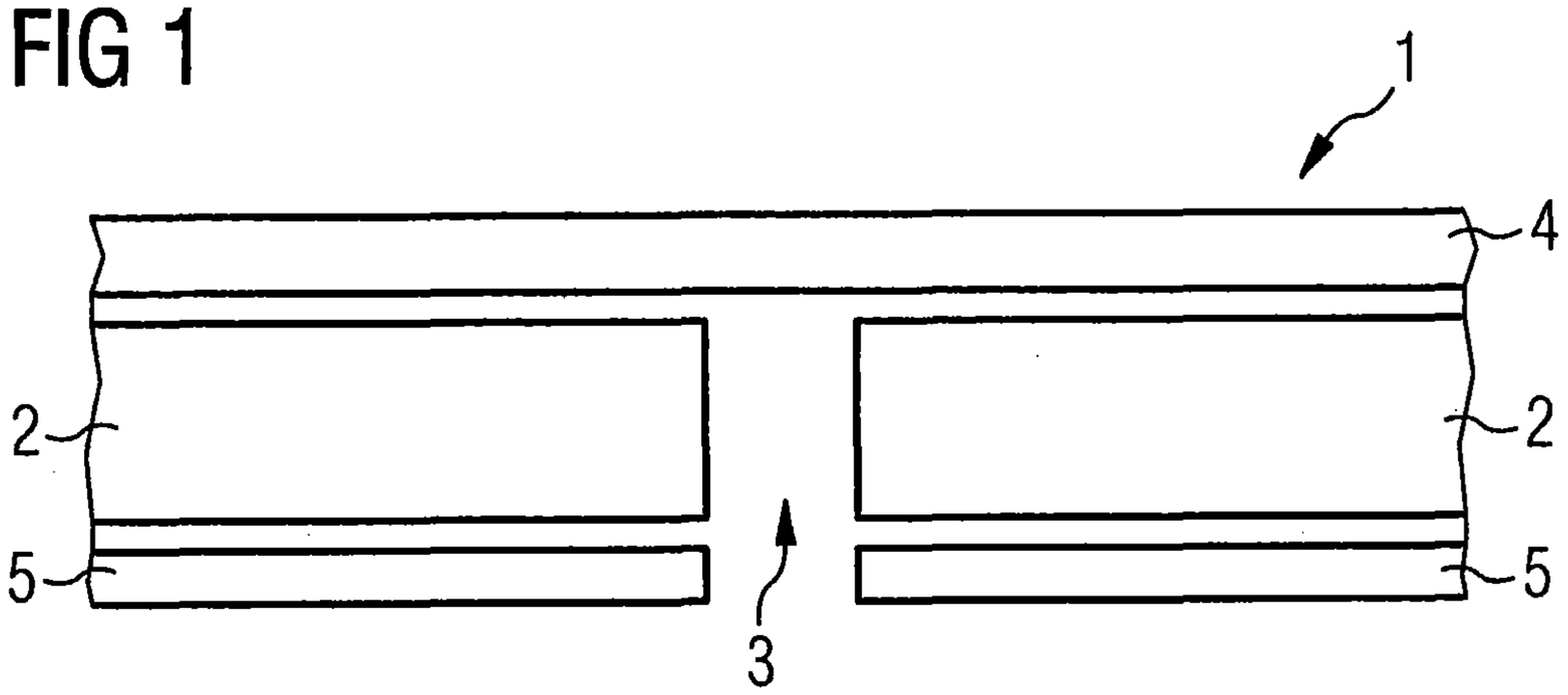


FIG 2a

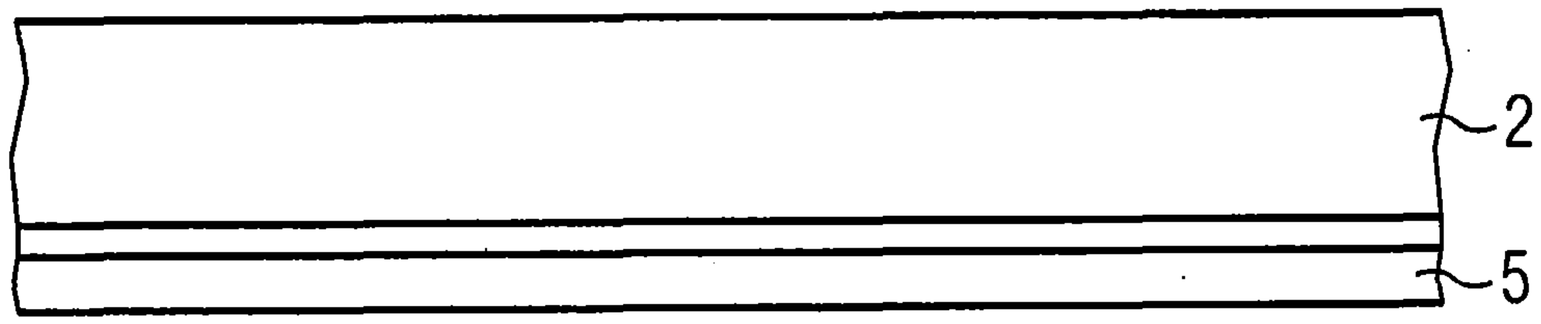


FIG 2b

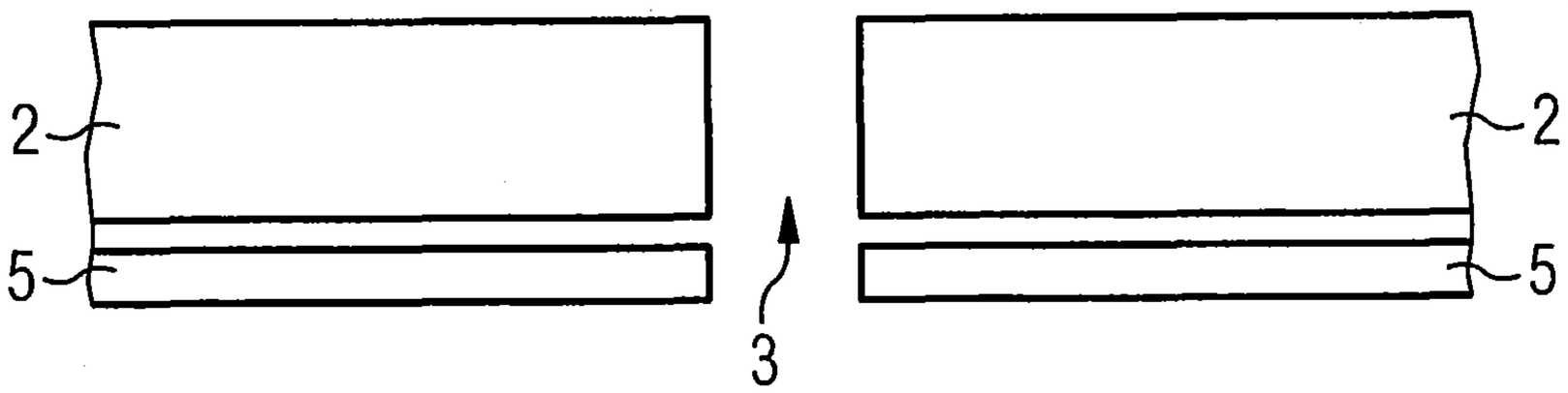


FIG 2c

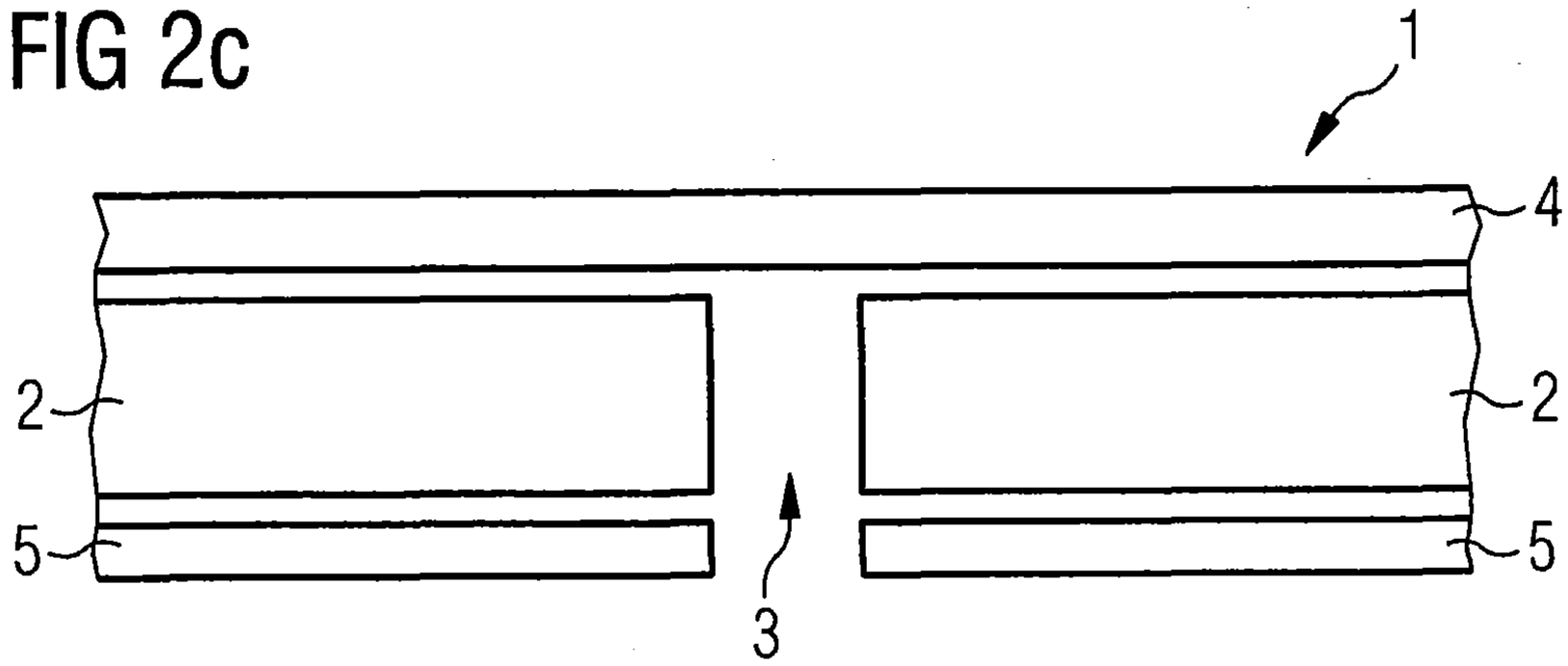


FIG 3a

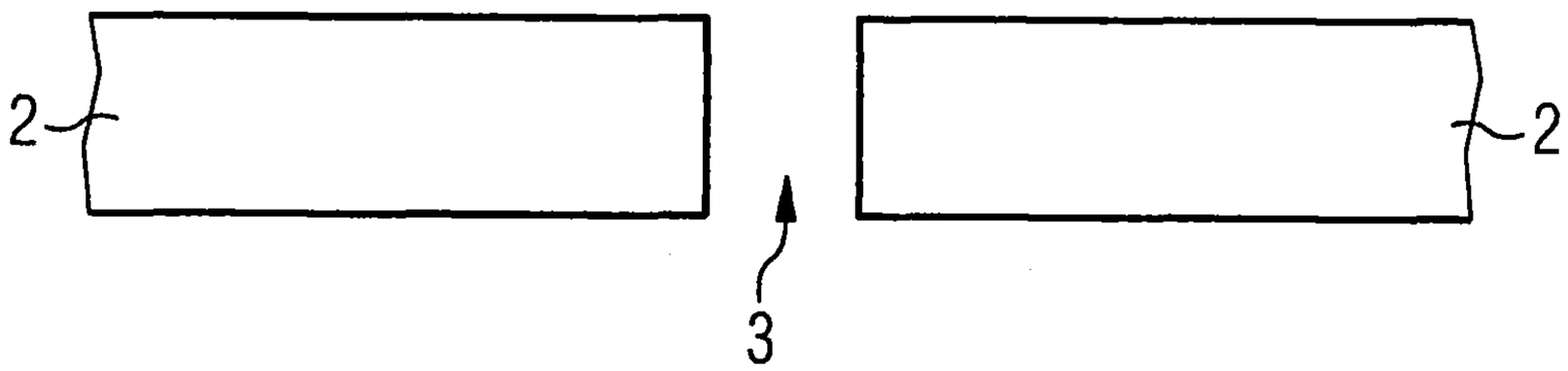


FIG 3b

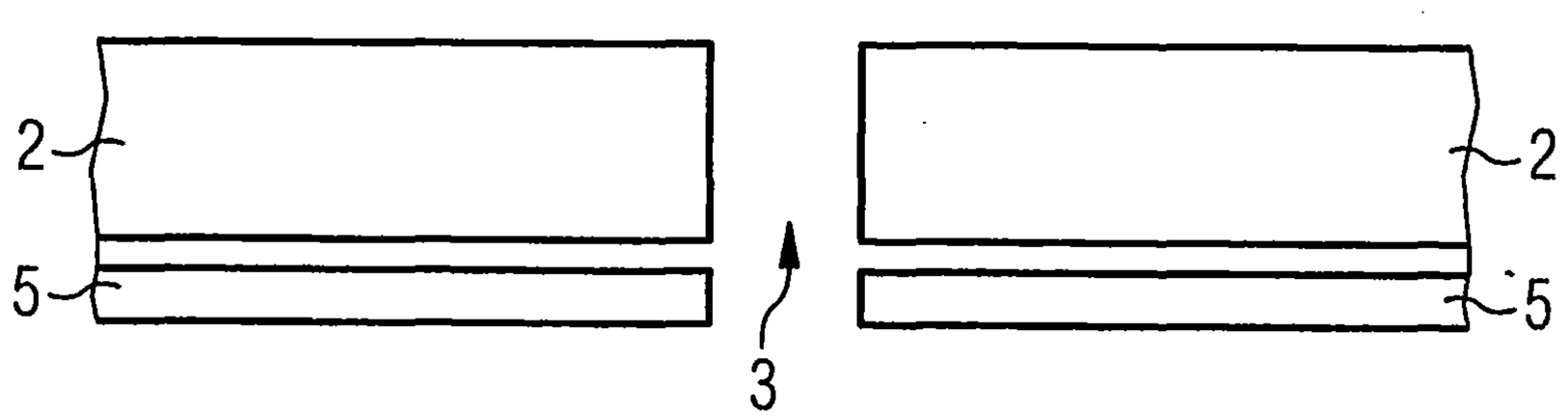
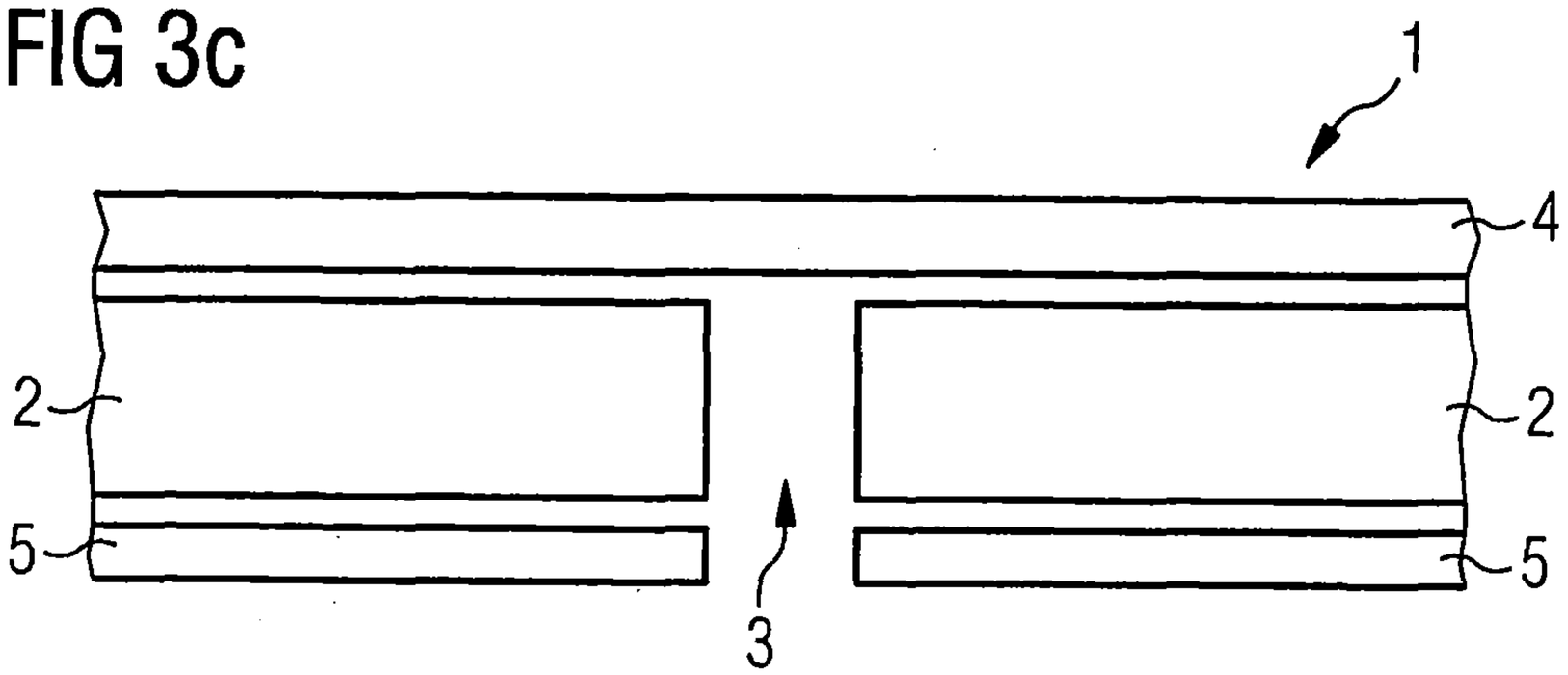
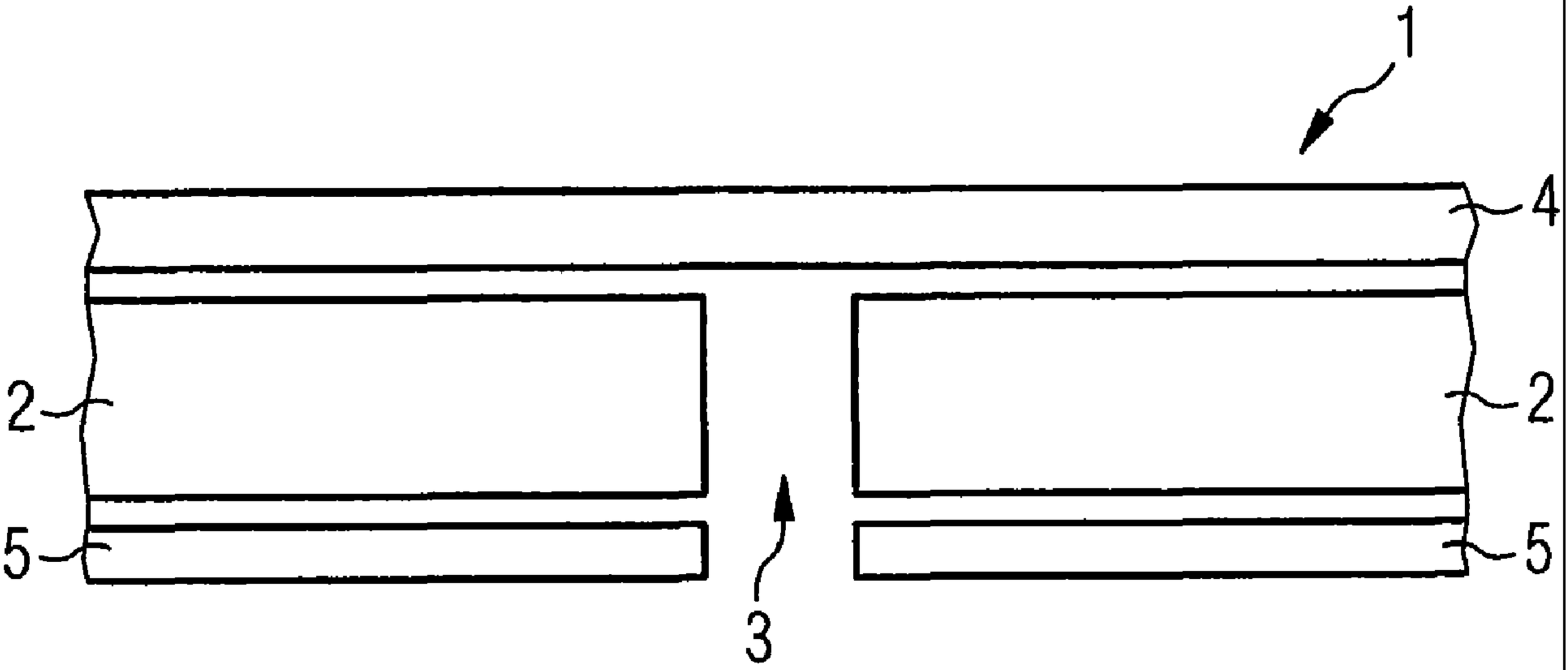


FIG 3c

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