



(12) **EUROPEAN PATENT APPLICATION**

(43) Date of publication:
05.04.2023 Bulletin 2023/14

(21) Application number: **22199294.4**

(22) Date of filing: **30.09.2022**

(51) International Patent Classification (IPC):

B42D 25/41 ^(2014.01) **B42D 25/435** ^(2014.01)
B42D 25/455 ^(2014.01) **B42D 25/46** ^(2014.01)
B42D 25/23 ^(2014.01) **B42D 25/305** ^(2014.01)
B42D 13/00 ^(2006.01) **B41M 3/14** ^(2006.01)

(52) Cooperative Patent Classification (CPC):

B42D 25/23; B41M 3/14; B42D 13/00;
B42D 25/305; B42D 25/41; B42D 25/435;
B42D 25/455; B42D 25/46; B41M 5/24

(84) Designated Contracting States:
AL AT BE BG CH CY CZ DE DK EE ES FI FR GB
GR HR HU IE IS IT LI LT LU LV MC MK MT NL NO
PL PT RO RS SE SI SK SM TR
Designated Extension States:
BA ME
Designated Validation States:
KH MA MD TN

(30) Priority: **30.09.2021 PL 43910821**

(71) Applicant: **Polska Wytwornia Papierow**
Wartosciowych S.A.
00-222 Warszawa (PL)

(72) Inventor: **GAWEL , Kamil**
05-807 Podkowa Lesna (PL)

(74) Representative: **Marcinska-Porzuc, Aleksandra**
Kancelaria Patentowa
Ul. J. Slowackiego 5/149
01-592 Warszawa (PL)

(54) **SECURITY ELEMENT, SECURITY DOCUMENT WITH SECURITY ELEMENT, AND METHOD FOR MANUFACTURING SAME**

(57) This invention relates to a securing element in the form of personalization data placed on and/or within a security document, which data contains an extra, separate identification entry. Also, this invention relates to a

security document comprising the securing element of the invention and a method for manufacturing the securing element.

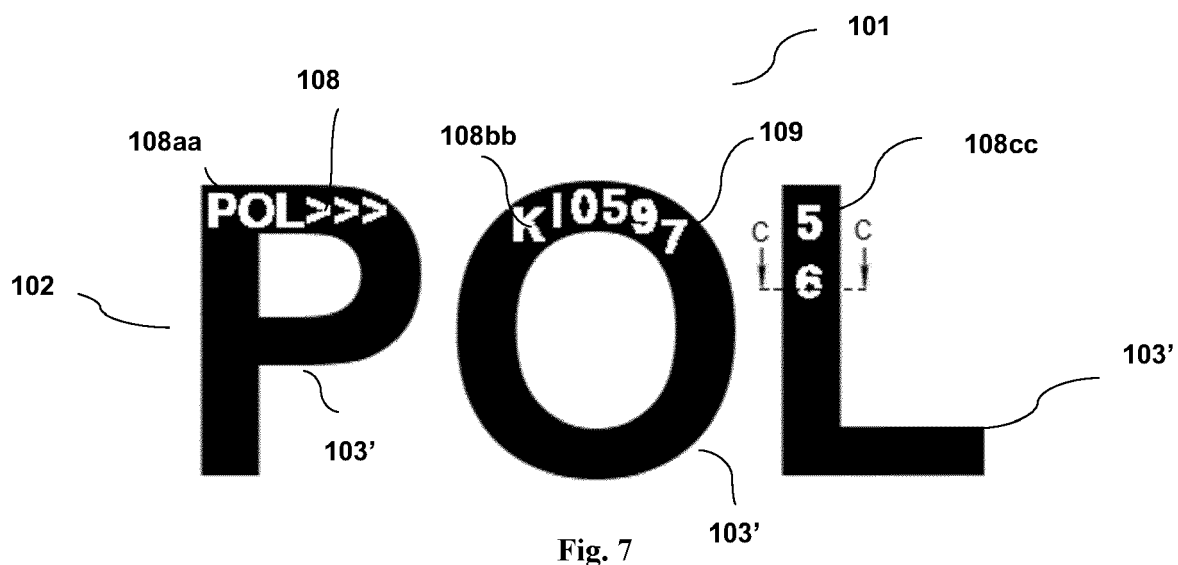


Fig. 7

Description

Field

[0001] This invention relates to a securing element in the form of personalization data placed on and/or within a security document, which data contains an extra, separate identification entry. Also, this invention relates to a security document comprising a securing element of the invention and a method for manufacturing the securing element.

State of the art

[0002] In the field of valuable documents, identifying and/or security documents, particularly identity cards, passports, driving licenses, and bank cards, it is known to place, in or on them, one or more securing elements of different types to protect these documents against counterfeiting, replicating or falsifying.

[0003] Valuable documents, identifying and/or secured documents, referred to as security documents, comprise personalizing data such as the document owner's name and last name, document number, his/her nationality, place, and date of birth, the document owner's identification number, document date of issue, document validity date, and many other data related to the document type, or distinctive marks. Lasers have been used for many years to personalize documents. Thanks to that, it is possible to make long-lasting and irreversible markings of the document in the form of photolithography or text data, alphanumerical characters, and/or distinctive marks.

[0004] For example, from DE2907004B1, it is known that when personalizing documents, a plastic substrate is blackened using a suitably guided laser beam.

[0005] Also, one knows methods for making personalizing data by producing markings tactilely palpable.

[0006] However, the act of placing personalizing data in the form of text data, alphanumerical characters, and/or distinctive marks on and/or within a security document is not a protection against counterfeiting or falsifying itself.

Summary

[0007] The problem addressed by the present invention is to make the personalizing data extra protection of a security document, being simultaneously recognizable, both visually and tactilely, but simultaneously difficult to produce and falsify.

[0008] The purpose of the present invention is to make that personalizing data located on and/or within a security document is extra protection of the security document, preferably of the first and second order, thus making it difficult both to remake the original documents as well as to produce a totally false one.

[0009] Thus, the aim of the invention is to place a sep-

arate identifying entry within the surface of at least one mark of personalizing data to increase the safety of these documents against scanning, replicating by xerography, and falsifying.

[0010] This aim has been achieved by a securing element, a security document, and a method for manufacturing the securing element of the invention.

[0011] This invention relates to a securing element placed on a security document and comprising at least one mark of a first personalized marking in the form of personalized alphanumerical data and/or text data and/or distinctive marking and at least one mark of a second personalized marking that is entirely contained within the surface of at least one mark of the first personalized marking constituting the first identification entry.

[0012] Preferably, the mark of the second personalized marking is an unmarked fragment of the substrate within the mark of the first personalized marking.

[0013] Also, the mark of the first personalized marking may be made as a pop-out relative to the substrate. Then, the mark of the first personalized marking is convex, whereas the mark of the second personalized marking placed in a given mark of the first personalized marking is concave.

[0014] The mark of the second personalized marking is one of the following: a letter, a numeral, a geometrical shape, a distinctive mark, or a mark of any shape.

[0015] According to the invention, the mark of the second personalized marking may be placed in any arbitrary location within the surface of the mark of the first personalized marking. If there is more than one mark, then marks of the second personalized marking may constitute, into the trace of the mark of the first personalized marking, an arrangement and/or a vertical and/or horizontal entry and/or an entry of such a shape that is consistent with the shape of the mark of the first personalized marking in which it is placed.

[0016] The same single mark of the second personalized marking may reoccur into the trace of at least two marks of the first personalized marking, or a single different mark of the second personalized marking is placed into the trace of each of the at least two marks of the first personalized marking.

[0017] Optionally, the same marks of the second personalized marking reoccur into the trace of at least two marks of the first personalized marking in the same or different order and/or in the same or different arrangement and/or entry. Also, different marks of the second personalized marking may be placed into the trace of at least two marks of the first personalized marking in the same or different arrangement and/or entry.

[0018] According to the invention, a single arbitrary mark of the second personalized marking is placed in the mark of the first personalized marking, which, together with the remaining single arbitrary marks of the second personalized marking placed in other selected marks of the first personalized marking, creates the first identification entry. However, it is also possible that the marks

of the second personalized marking, which are collectively constituting the first identification entry, are placed in arbitrarily selected marks amongst all the marks of the first personalized marking. Alternatively, it also is possible to place the marks of the second personalized marking that collectively make the first identification entry within all the marks of the first personalized marking. According to the invention, the first identification entry is created by all marks of the second personalized marking, which are arranged in arbitrarily selected marks amongst all the marks of the first personalized marking. Optionally, the marks of the second personalized marking, which are collectively constituting the first identification entry, are placed in a single arbitrarily selected mark amongst all the marks of the first personalized marking. The marks of the second personalized marking are the same or different marks or any arbitrary combination thereof.

[0019] According to the invention, the first identification entry is created by at least one mark of the second personalized marking placed in one and/or many marks of the first personalized marking being a repetition of the first personalized marking entirely or partially. Also, the first identification entry is created by marks of the second personalized marking, which are personalized for the owner of the given security document.

[0020] According to the invention, if the substrate beneath the first personalized marking has regions of different colors, then the unmarked fragment of the substrate takes the color of the substrate of the given coloristic region, whereby the marks of the second personalized marking, which are unmarked fragments of the substrate within the mark of the first personalized marking, may have the same or different colors, depending on the coloristic region in which they are located.

[0021] Also, at least one mark of a third personalized marking may be entirely written into the surface of at least one mark of the second personalized marking. Then, the mark of the third personalized marking that is entirely written into the surface of at least one mark of the second personalized marking creates a second identification entry. The mark of the third personalized marking may be printed onto the substrate in the region of the unmarked fragment. The mark of the third personalized marking is one of the following: a letter, a numeral, a geometrical shape, a distinctive marking, a mark of any shape, a graphic, a picture, and also any other arbitrary coloristic combination of lines, circles, and points.

[0022] Preferably, a mark of the second personalized marking and/or a mark of the third personalized marking is a micro mark.

[0023] According to the invention, at least one mark of the first personalized marking is placed into the surface of at least one engrave-able layer of the security document by means of a laser beam, which is visible as irreversible changes in the optical properties of the security document caused by the laser beam.

[0024] Also, this invention relates to a security document comprising a securing element as described above,

comprising a substrate and any number of additional layers, making a consistent inseparable unity, the securing element constituting a built-in fragment of the layer in the structure of the security document. The substrate may be at least one layer that can be laser-engraved, preferably at least one white polycarbonate foil that can be laser-engraved. Also, the substrate may be any number of laser-engraved layers and/or additional layers, including transparent and white ones.

[0025] According to the invention, the substrate may have regions of different colors beneath the first personalized marking. Also, an ink layer may be placed between the substrate and the transparent layer. The ink layer may have regions of different colors beneath the first personalized marking. Moreover, at least one mark of the third personalized marking is printed on the ink layer beneath the first personalized marking.

[0026] Also, this invention relates to a method for manufacturing a security document with a securing element comprising the following steps:

- a) merging at least one layer of a substrate with any number of additional layers into a consistent inseparable structure of the security document,
- b) placing at least one mark of the first personalized marking in the form of personalized alphanumerical data and/or text data and/or distinctive marking, at least into the surface of the substrate by means of a laser beam,
- c) marking, by means of a laser beam, at least one mark of the second personalized marking entirely within the surface of at least one mark of the first personalized marking, the at least one mark of the second personalized marking constituting the first identification entry.

[0027] Preferably, during the marking process, the substrate and/or at least one upper layer is subjected to irreversible changes in the optical properties making a mark of the first personalized marking, whereas a mark of the second personalized marking is an unmarked fragment of the substrate. Preferably, however, during the marking process, the substrate and/or at least one upper layer is subjected to blackening or brightening, making the mark of the first personalized marking, whereas the mark of the second personalized marking is an unmarked fragment of the substrate.

[0028] Also, it is possible that, during the marking process, the substrate and/or at least one upper layer is subjected to foaming, causing a convexity of the mark of the first personalized marking, whereas the mark of the second personalized marking is an unmarked fragment of the substrate.

[0029] According to the invention, the marking process is executed using a marking laser in which the pulse spot is of small dimensions. Preferably, the mark of the second personalized marking is produced by means of a laser beam by suitably concentrating points marked with the

laser. The better the quality of the laser beam and the smaller the pulse spot, and the more precise the scanning head, the smaller and clearer the mark of the second personalized marking is.

[0030] The securing element of the invention is a first personalized marking and at least a second personalized marking. The second personalized marking is entirely contained within the surface of the first personalized marking. According to the invention, the first personalized marking may be any personalizing data produced by laser engraving onto/within the security document during the personalization process of the given document. For example, this data is data identifying the document owner, like the document owner's identification number, document number, country of origin, city, and date of birth. The personalizing data includes all text data and/or alphanumerical and/or distinctive marks that are placed onto or within the document and that are required for the security document of the given type. According to the invention, a mark of the first personalized marking is at least one letter and/or numeral and/or distinctive marking. Marks of the first personalized marking may be a series of arbitrarily connected marks in the form of text or alphanumerical characters and/or distinctive marks. Preferably, marks of the first personalized marking are produced by blackening the substrate and/or at least one additional layer during the process of laser engraving (marking). All the additional layers located above the substrate may get blackened during the marking process of the first personalized marking. The second personalized marking may be at least one mark, for example, in the form of a letter, a numeral, a geometrical shape, a distinctive marking, or a mark of any shape. For example, it may be an asterisk, a line, a zigzag, a butterfly, a building, or a plant. Also, the second personalized marking may be constituted by marks creating a series of arbitrary marks and/or a series of personalized marks created by numbers, numerals, distinctive marks, marks of any shape, and/or a combination thereof.

[0031] According to the invention, the height of the first personalized marking is from 1 mm to several dozen mm, for example, 10 mm, preferably from 1.5 mm to 2.5 mm. The height of the second personalized marking is from 0.1 mm to 0.5 mm, preferably from 0.2 mm to 0.3 mm. The heights of the marks of the second personalized marking depend on the amount of the markings or the lengths thereof.

[0032] So, one mark and/or a series of marks of the second personalized marking may be written into one mark of the first personalized marking. The mark, marks, or series of marks of the second personalized marking may be placed in any arbitrary location within the surface of at least one mark of the first personalized marking. The terms "within the surface" and "into the trace" of the mark are used interchangeably. Optionally, a mark, marks, or a series of marks of the second personalized marking creates, into the trace of a mark of the first personalized marking, a vertical and/or horizontal entry,

and/or it has a shape that is consistent with the mark it is placed in. Also, the mark and/or marks of the second personalized marking may be arranged arbitrarily. They may be arranged in rows and/or columns vertically, horizontally, or obliquely.

[0033] According to the invention, at least one mark, or marks or a series of marks of the second personalized marking placed in at least one mark of the first personalized marking creates a first separate identification entry - also referred to as a first identification entry or identification entry. For example, the first identification entry may be any vector graphic, any distinctive marking, a mark of any shape, or any letter or numeral. Also, the first identification entry may be personalized data that is not placed on/within the security document. The personalized data, in the sense of the present invention, is data related to the owner of the security document, and it may be, for example, the first letter of the name or the last name of the security document owner, the owner's initials, his/her identification number, the day, month, and year of birth, the document owner's full name and/or last name, etc., or a part of this data. Also, the first identification entry may be a reoccurred piece of personalized data or several arbitrarily selected pieces of data that are placed on/within the security document, such as passport number, number of the given document, the document owner's identification number, his/her date of birth, the document owner's name or last name, etc., or a part of this data. Also, the identification entry may be created by a single mark of personalizing data or several selected marks of the personalizing data placed in/on the security document. For example, it may be data selected according to adopted rules - every second mark, every third mark out of the name and last name of the document owner, and/or out of the document number. Also, it may be randomly selected marks of the personalizing data. According to an embodiment of this invention, the first identification entry may be arbitrarily selected marks personalized for the given document owner, including a password he/she selected, a pin number, an individual code, and/or any data or name. According to an embodiment of this invention, the first identification entry may be constituted by arbitrarily selected alphanumerical and/or text marks and/or distinctive marks, including marks selected randomly. Also, it is possible that the first identification entry is at least one identical mark and/or identical marks and/or a series of identical marks of the second personalized marking placed in every mark, in selected marks, or only in selected at least one mark of the first personalized marking. All the marks that make the first identification entry may be placed in a single one arbitrarily selected mark of the first personalized marking. Optionally, the first identification entry is created by marks of the second personalized marking spanning all the marks or only across a part of the marks of the first personalized marking. So, any part of the marks of the second personalized marking constituting the first identification entry may be written into the first mark of the

first personalized marking, whereas a subsequent part of the marks of the second personalized marking constituting the first identification entry is written into the trace of subsequent following each other marks of the first personalized marking. Thus, the marks of the second personalized marking may be at least two marks of the first personalized marking and within all the marks of the first personalized marking. Also, they may be placed only in arbitrarily selected marks of the first personalized marking, for example, in marks of the first personalized marking selected in any arbitrary order or in marks selected in an even or uneven order, or in every second, every third mark of the first personalized marking, etc. Also, the number of marks of the first personalized marking, into which the marks of the second personalized marking are written, is arbitrary. However, irrespective of the number of marks of the first personalized marking, into which the marks of the second personalized marking are written and/or registered, they create together the first identification entry. The marks constituting the first identification entry may constitute logical entry and/or abstractional entry. The term logical entry is to be understood as a commonly known word, document number, ID number, reoccurred personalized data or a part thereof, a code known to the owner, a pin number, a password, distinctive marks, a number, or another data, etc. The term abstractional entry is to be understood as a group of arbitrarily randomly selected text and/or alphanumerical marks and/or distinctive marks.

[0034] According to another embodiment of the invention, a securing element may also have a third personalized marking. The third personalized marking is entirely written within the surface of the second personalized marking. Similarly to the second personalized marking, the third personalized marking may be created by a single mark, a group of marks, or a series of arbitrary marks in the form of letters, numerals, geometrical shapes, a distinctive marking, or a mark of any shape, for example, an asterisk, a line, a zigzag, a butterfly, a building, or a plant. Optionally, the third personalized marking may be created by a reoccurred text and/or alphanumerical data and/or distinctive marking that is placed in/on the security document. According to the invention, the third personalized marking creates a second identification entry. It is the second identification entry placed in personalizing data located in/on the security document. Preferably, the third personalized marking is created by micro marks. They may have, for example, dimensions of 0.1 - 0.2 mm, preferably 0.05 - 0.15 mm.

[0035] The ratio of the dimension of the mark of the first personalized marking to the dimension of the mark of the second personalized marking may be, for example, at least 25:1, preferably 7.5:1, and most preferably 5:1, whereas the ratio of the dimension of the mark of the second personalized marking to the dimension of the mark of the third personalized marking is at least 10:1, preferably 5:1. However, it is obvious that the ratio of the dimensions may vary widely and it depends, for example,

on the font type, emboldening (maximum micro text size relative to the whole mark of the first personalized marking). Every case of personalized markings placed on/within the security document may have different individual dimensions.

[0036] The elements that constitute the first, second, and third personalized marking are interchangeably referred to as a mark, marks, or a series of marks, where a series of marks is created by at least two marks. A mark, marks, or a series of any arbitrary and/or personalized marks of the second and third personalized markings, are, preferably, micro marks. Marks or a series of marks may be placed in a mark of the first or second personalized marking in any arbitrary location, in any arbitrary order, and in any arbitrary arrangement.

[0037] The personalizing data is placed on the substrate of the security document. The substrate, in the sense of the present invention, is a layer of the security document onto which the first personalized marking is placed. According to the invention, the substrate may be the upper (outer) layer of the document, which can be laser-engraved, or any inner layer of the document. Also, the substrate may be created by any number of layers that can be laser-engraved. Preferably, at least one upper layer is laid onto the substrate.

[0038] The proposed solution may be employed on various substrates that are in use in documents. The substrate may be a material free of outer protective layers, i.e., for example, it may be a paper substrate, a paper-like and/or made from paper-like materials like Teslin, as well as any polymer substrate such as polycarbonate (PC) and/or PVC (poly(vinyl chloride)) and/or polyester (e.g., poly(ethylene terephthalate) (PET)), and/or polyolefins, e.g., polyethylene (PE), polypropylene (PP) and/or acrylonitrile/butadiene/styrene copolymer, (copolymer) ABS and/or polyurethane (PU) and/or polyether ether ketone (PEEK), and combinations thereof. These materials may be used to produce additional layers, for example, transparent layers and a white layer that can be laser-engraved.

[0039] The security document may have any structure, i.e., any thickness, any number of layers making the document, and any arrangement of the layers. However, at least one of the document layers is a layer that can be laser-engraved. According to the invention, the document structure preferably has at least two layers that can be laser-engraved, yet more preferably, all the layers can be laser-engraved.

[0040] Preferably, the document structure has at least one white layer that can be laser-engraved, for example, made from polycarbonate foil. Preferably, there are two white layers. The first personalized marking is placed on the white foil layer and on transparent foils that are located above it. Also, the first personalized marking may be placed only on the substrate or on the substrate and foils located below the substrate and on foils located above the substrate. Optionally, it is possible that the document structure only consists of transparent layers,

including at least one laser-engraved layer. The term substrate in the sense of the present invention is understood widely. It can be a single layer that can be laser-engraved or a stack of many such layers, also layers that can be or not laser engraved. The layers may be transparent or white.

[0041] The substrate may be printed with ink for offset printing, relief printing, flexographic printing, or ink printing. Also, the ink may have optically changing properties, as well as fluorescent properties.

[0042] According to the invention, the whole surface of the substrate may be printed with ink of the same color. Optionally, the fragment of the substrate on which the first personalized marking is located has a different color than the remaining part of the substrate of the document. According to yet another embodiment, the substrate below every mark of the first personalized marking may have another color. The term another color of the substrate is understood as a single uniform color of imprinting or a multi-color combination- colored lines, zigzags, asterisks, etc.

[0043] The marking process is carried out by scanning with a laser beam according to a prepared layout in which marks of the second personalized marking are placed within basic marks, i.e., marks of the first personalized marking. A classical marking, blackening, or a marking tactilely palpable may be achieved when using a combination of process parameters with a similar power applied throughout the whole process. Optimally, these are the maximum speed and frequency of the laser and spacing of individual lines of the object filling combined with the appropriate laser power output. In the case of marking with the marks of the second personalized marking within the given mark of the first personalized marking, the optimization (depending on the system's precision) is shifted. With the same frequencies of the laser, it is preferable to perform the marking process with a lower speed and smaller spacings between the lines of the object filling, such as to obtain a higher density of points. Even if neighboring points overlap significantly, an appropriate blackening effect / "a pop-out" effect is obtained by adapting the laser power suitably.

[0044] According to the first embodiment of the invention, a securing element is placed on and/or within the security document. The securing element is constituted by a first personalized marking and at least a second personalized marking. According to the invention, the first personalized marking may be at least one mark of the personalizing data placed on or into the given document by laser engraving, which identifies the document owner or the given document. According to the first embodiment of the invention, the second personalized marking is at least one mark which is a lack of marking within the surface of at least one mark of the first personalized marking. The first personalized marking is created by marking the substrate: an appropriately guided laser beam darkens appropriate regions of the substrate, making the first personalized marking. In the proposed solution, at least one

unmarked fragment is created within at least one mark of the first personalized marking. The non-darkened region makes a second personalized marking. In other words, at least one mark, or a series of marks constituting the second personalized marking, is created in such a way that one can see the region of the substrate that had not been darkened by the laser action when making the first personalized marking. The unmarked fragment of the substrate, in which the first personalized marking of the security document is placed, becomes visible after making the first personalized marking. Thus, the second personalized marking adopts the color of the substrate located beneath the first personalized marking (unmarked substrate), around which the darkened region of the first personalized marking is located. The term darkened region means darkening in black, gray, or in any arbitrary grayscale.

[0045] In the first variant of the invention, the height of a single mark of the first personalized marking is from 1 mm to 10 mm, preferably from 1.5 mm to 2.5 mm.

[0046] According to this embodiment of the invention, the second personalized marking is at least one mark in the color of the substrate. Optionally, the second personalized marking may be constituted by marks in different colors. For example, at least one mark of the second personalized marking may be of another color than the color of the substrate. In this case, the region of the substrate into which personalizing data is placed has the substrate printed in colors other than the original color of the substrate. Thanks to that, it is possible that at least one or any and/or a selected mark of the second personalized marking has another different color. Also, it is possible that an additional print of another color is made on the substrate in the region of placing personalization data.

[0047] At least one mark, or marks, or a series of marks of the second personalized marking is placed entirely into the trace at least one mark of the first personalized marking and constitutes the first identification entry.

[0048] According to an embodiment of this invention, a securing element may have, additionally, a third personalized marking. The third personalized marking is entirely written within the surface of at least one mark of the second personalized marking. The third personalized marking may be constituted by a single mark or a series of arbitrary marks. Marks may be in the form of letters, numerals, geometrical shapes, distinctive markings, or a mark of any shape, for example, an asterisk, a line, a zigzag, a butterfly, a building, a plant, or other graphical, text, or alphanumerical elements placed in a mark of the second personalized marking. Optionally, the third personalized marking is a color, for example, in grayscale, or a color the same as that of the first personalized marking.

[0049] In one embodiment of this invention, the third personalized marking is constituted by at least one mark, or marks, or a series of marks placed in an unmarked fragment of the substrate of the second personalized

marking. The above description related to at least one mark of the second personalized marking is correspondingly applied to at least one mark of the third personalized marking. According to the invention, a mark and/or marks of the third personalized marking may be arbitrarily distributed and arranged in a trace at least one mark or a series of marks of the second personalized marking. Optionally, a mark and/or marks of the third personalized marking may have any arbitrarily formed arrangement. They may be arranged in rows and/or columns vertically, horizontally, or obliquely. Preferably at least one mark or a series of marks of the third personalized marking is printed on the substrate located beneath the first personalized marking. Preferably, a mark and/or a series of marks constituting the third personalized marking are micro marks of dimensions 0.05 - 0.5 mm, preferably of dimensions 0.05 - 0.2 mm. According to the invention, the third personalized marking may constitute a second separate identification entry.

[0050] According to this embodiment, the second personalized marking is entirely contained in the interior surface of at least one mark of the first personalized marking, i.e., into the trace of at least one mark of the first personalized marking. This second personalized marking may be at least one mark in the form of an unmarked fragment of the substrate. On the other hand, at least one mark of the third personalized marking is entirely contained in the interior surface of at least one mark of the second personalized marking. Thus, the mark (marks) of the second personalized marking, which is entirely written into the trace of the mark (marks) of the first personalized marking, constitutes (constitute) the first identification entry. Whereas the mark (marks) of the third personalized marking, which is entirely written in the mark (marks) of the second personalized marking, constitutes (constitute) the second identification entry.

[0051] According to the second embodiment of the invention, the securing element is placed on and/or within a security document. The securing element is constituted by a first personalized marking and at least a second personalized marking written entirely into the trace of the first personalized marking, whereas the first personalized marking is convex and the second personalized marking is concave. According to the second embodiment of the invention, the first personalized marking is constituted by personalizing data made as a pop-out relative to the substrate on which the first personalized marking is located. So, preferably, the first personalized marking is convex and tactilely palpable. On the other hand, the second personalized marking is contained in a trace of at least one mark of the first personalized marking. The second personalized marking may be obtained by the lack of convexity that constitutes the first personalized marking. In the second variant of the invention, similarly to the first variant, the second personalized marking may be constituted by an unmarked fragment of the substrate, where the substrate is intact. Because of the fact that the first personalized marking is convex, the second personal-

ized marking seems to be concave, and it is surrounded by a convex region of the mark of the first personalized marking. The second personalized marking written into the trace of the first personalized marking constitutes the first identification entry. Also, the second embodiment of the invention may have a third personalized marking that is produced in the same way as described in the case of the first embodiment of the present invention. According to the present embodiment, a/the mark and/or series of marks stanowiące third personalized marking is constituted by preferably micro marks of dimensions 0.02 mm - 0.5 mm, yet more preferably of dimensions 0.05 mm - 0.15 mm.

[0052] In the second variant of the invention, the pop-out of a single mark of the first personalized marking relative to the substrate is from 0.05 mm to 0.5 mm. The sides of the mark and/or marks of the second personalized marking and the sides of the pop-out of a single mark of the first personalized marking may have a semicircular or polygonal cross-section shape.

[0053] According to the invention, the marking process, or a process of personalizing a security document with personalization data in the form of text and/or alphanumerical and/or distinctive marks, i.e., producing a first personalized marking, is carried out on the white foil layer and on transparent foils placed above it. Preferably, the marking process is carried out on a ready document that consists of many foil layers after laminating and constitutes a uniform inseparable whole. Depending on the version and the size, the present solution may also be applied with engrave-able paper or paper laminated with a plastic foil that creates a uniform inseparable whole. Also, the marking process may be performed on a printed substrate.

[0054] The solution of the invention may be realized with infrared, RGB, or UV pulse lasers. The better the quality of the laser beam and the smaller the spot, and the more precise the scanning head, the smaller and clearer the proposed second and third personalized markings may be. Depending on the size of the mark or the whole text of the second and/or third personalized marking, the second and/or third personalized markings may be observed with the naked eye or under magnification. The second and/or third personalized markings may be placed in a document personalization text of a typical size, i.e., 2.5 mm or smaller, for example, in a text of a height of 1.25 mm. As mentioned above, it depends on the laser design and a proposed embodiment. The ratio of the dimension of a mark of the first personalized marking to the dimension of a mark of the second personalized marking is at least 25:1, preferably 7.5:1, and most preferably 5:1. The ratio results from the ratio of the trace part of a letter to the whole letter. Depending on the selected fonts, the solution may have another ratio.

Definitions

[0055] According to the invention, the term security

document is understood as any document, such as personal documents, driving licenses, passports, and also other valuable and security documents, and data media being media for safe data registration and storage.

[0056] For a better understanding, the embodiments described in the following examples are reduced to significant basic information, and the illustrations shown in the figures are very schematical and do not reflect real conditions. First of all, the proportions shown in the figures do not correspond to real conditions and only serve for illustrating purposes. It should be emphasized that the drawings neither reflect the actual colors of the personalized markings placed on the security document. The colors in the drawings only serve to distinguish individual elements shown in these drawings. In practical realization, one may use much more complex patterns and pictures made in a single color or multi-colored. The same relates to engravable structures. The examples of information presented in the following examples may be replaced with complex and combined graphical/text information.

[0057] The terms "first," "second," and "third," as used in the specification and the patent claims, are only intended to distinguish similar elements and not to dictate any sequential or chronological order. One should understand that terms used in this way are interchangeable in particular circumstances and that the embodiments of the present invention described in this document may function in other sequences than described or illustrated in the present document. According to the invention, the security document may contain all three personalized markings, and also, it may only contain the first and second personalized markings.

[0058] Also, the references to colors - first/second color - aim to distinguish coloristic elements. Simultaneously, all the described embodiments related to a single coloristic sequence are suitable for every coloristic sequence. If a solution for a single coloristic sequence has been indicated in the specification, it also means that it is appropriate for any other coloristic sequence. If no colors are referred to in the specification, it means that the given solution is valid for any other coloristic sequence. It relates to coloristic variants of the substrate and the first, second, and third personalized marking.

[0059] The same single mark of the second and/or third personalized marking denotes the same letter, numeral, geometrical shape, distinctive marking, or mark of any shape.

[0060] A single different mark of the second and/or third personalized marking denotes another, different, not the same, nonidentical letter, numeral, geometrical shape, distinctive marking, or mark of any shape.

[0061] A single arbitrary mark of the second and/or third personalized marking denotes the same single mark or a single different mark of the second and/or third personalized marking.

[0062] Marks or a series of marks of the second and/or third personalized marking denotes any number of single

arbitrary marks, i.e., any number of the same and/or different single marks of the second personalized marking. The number of marks of the second personalized marking is selected according to the planned personalization of the security document.

[0063] The same marks of the second and/or third personalized marking denote at least two of the same single marks of the second and/or third personalized marking, and a multiplicity of the marks is possible, for example, PP, XXXX, >>>, ?????.

[0064] Different marks of the second and/or third personalized marking denote at least two single different marks of the second and/or third personalized marking, for example, POL, 567, POL%&, PL678, "KAMIL," POL567&*>><<. It means that in every selected arbitrary mark of the first and/or second personalized marking, another mark, marks, or a series of marks is written.

[0065] Marks of both the first and second personalized marking are selected according to the planned personalization of the security document.

[0066] Examples show preferred embodiments that in no way are intended to limit the scope of the invention. In particular, different embodiments are not limited to the described forms, and their combinations may be employed to obtain still better results.

[0067] The present invention will be better understood and appreciated when after reading the following detailed description with reference to the drawing in which:

- 30 Fig. 1 shows a simplified plan view of a security document comprising a securing element;
- Fig. 2 shows a mark of a first personalized marking with a series of marks of a second personalized marking placed on a substrate of a second color (here: black) within the first marking, according to a first embodiment;
- 35 Fig. 3 shows section A of Fig. 2;
- 40 Fig. 4 shows a mark of a first personalized marking with a series of marks of a second personalized marking placed on a substrate of a second color (here: black) within the first marking, according to a first embodiment of the invention;
- 45 Fig. 4a shows a cross-section of section A of Fig. 4 along a line B-B showing marks "6" and "7" of the second personalized marking written within a mark of the first personalized marking according to the first embodiment of the invention;
- 50 Fig. 5 shows a mark of a first personalized marking with a series of marks of a second personalized marking placed within the first marking, according to the first embodiment of the inven-

- tion;
- Fig. 6 shows a mark of the first personalized marking with a series of marks of a second personalized marking placed within the first marking, and within the second personalized marking, a third personalized marking is written, according to the first embodiment in another variant;
- Fig. 7 shows a series of marks of the first personalized marking POL with a first separate identification entry placed within these marks, the first separate identification entry having a form of marks of the second personalized marking, in a second variant of the first embodiment;
- Fig. 7a shows a cross-section along a line C-C of Fig. 7 showing mark "6" of the second personalized marking written within the mark of the first personalized marking, in a second variant of the first embodiment;
- Fig. 8 shows a mark of the first personalized marking with a series of marks of the second personalized marking placed within the first marking, according to a second embodiment;
- Fig. 8a shows a cross-section of a section along a line C-C of Fig. 7, showing mark "6" of the second personalized marking written into a mark of the first personalized marking, according to the second embodiment;
- Fig. 8b shows a mark of the first personalized marking with marks of the second personalized marking in the form of the word "KAMIL" placed within the first marking, according to the second embodiment;
- Fig. 8c shows a cross-section of a section along a line F-F of Fig. 8b, showing marks of the second personalized marking in the form of the word "KAMIL" written into a mark of the first personalized marking, according to the second embodiment;
- Fig. 8d shows a cross-section of a mark of the second personalized marking in the form of the letter "L" of Fig. 8 in a second embodiment in the first variant of realization;
- Fig. 8e shows a cross-section of a/the mark of a/the second personalized marking in the form of the letter "L" of Fig. 8 in the second embodiment of the second variant of realization;
- Fig. 9 shows a section of a cross-section of a security document according to the first embodiment with a securing element contained therein in the form of a single mark of the first personalized marking with a series of marks of the second personalized marking in the form of the word "KAMIL" placed therein, that constitutes the first separate identification entry;
- Fig. 10 shows a section of a cross-section of a security document according to the second embodiment with a securing element contained therein in the form of a single mark of the first personalized marking with a series of marks of the second personalized marking in the form of the word "KAMIL" placed therein, that constitutes the first separate identification entry;
- [0068]** The following description presents examples of the realization of a securing element of a security document and a method for manufacturing the securing element composed of personalized markings written into personalizing data located on and/or in the document, thanks to which various effects securing the documents are obtained. However, it must be emphasized that the examples described below are not intended to limit the scope of protection and only illustrate one of many possible uses of the present invention. The present invention may be employed in any application in which a personalized laser marking is needed that gives additional protection for the document.
- Detailed description
- [0069]** In one embodiment, a security document has the form and format of a card, such as an identity card. In alternative embodiments, another data medium may function as the security document, e.g., inserts for passports, chip cards, smart cards, personal documents, driving licenses, other valuable and security documents, and data media being media for safe data registration and storage.
- [0070]** Fig. 1 shows a security document 100 according to the invention with various securing means. The securing means are elements that increase the safety against counterfeiting the security document. For example, personalization may be applied on/within the security document 100, having the form of the document owner's photograph (not shown in the drawing) and/or in the form of personalization data that, preferably, is produced by means of printing or laser engraving in a layer of the security document 100 that is laser active or sensitive. This data identifies the document owner's, for example, name and last name, the document owner's identification number, document number, country of origin, place/date of birth, etc. So, this is data that is placed onto or within the document and is required for the security document of the given type. The security document 100 may also contain electronic components such as an RFID trans-

ponder, chip modules, antennas for dual-interface modules, or a hologram. These securing means are not shown in the drawing since it is not a matter of the present invention. The security document 100 comprises a securing element 101, 201 composed of a first personalized marking 102, 202, into which a second personalized marking 104, 104', 204 is entirely placed, constituting the first identification entry.

[0071] According to the invention, the first personalized marking 102, 202 is composed of at least one mark 103, 103', 203 or a series of marks 103, 103', 203 that is/are placed on the substrate 110, 110' of the security document 100. According to the invention, the first personalized marking 103, 103', 203 is constituted by at least one letter, numeral, distinctive marking, or a series of arbitrarily connected marks in the form of text or alphanumerical characters and/or distinctive marks. The second personalized marking 104, 104', 204, may be constituted by at least one mark 108, 108', 208, for example, in the form of a letter, a numeral, geometrical shape, distinctive marking, or a mark of any shape, for example, it may be an asterisk, a line, a zigzag, a butterfly, a building, a plant, or any combination thereof. The first personalized marking 102, 202, along with the second personalized marking 104, 104', 204, produces an optical and/or tactile effect and also constitutes the first identification entry, making the securing element 101, 201. The first identification entry is an additional separate identification entry in the securing element 101, 201. The first laser personalized marking 102, 202, and the second laser personalized marking 104, 104', 204 can be assessed both visually and automatically. The visual assessment is done using the human eye. The first personalized marking 102, 202 may be located on the substrate of any arbitrary color, for example, of a first color 110 or a second color 110', and also it is possible to divide the substrate regions in which the personalized marking 102, 202 is located, into different coloristic regions.

[0072] Fig. 2 shows the first embodiment of the invention, wherein into the trace of the letter "P" - being a single mark 103, of the first personalized marking 102, of a first color placed on the substrate 110', of the security document 100, of a second color, here black - a second personalized marking 104' is placed, i.e., a series of marks "8894267" of a second color. The series of these marks, 104', written in mark 103, i.e., the letter "P," constitutes a separate first identification entry. Thus, the series of marks 108', in the form of numerals "8894267" of the second personalized marking 104', placed in at least one mark 103, of the first personalized marking 102, constitutes the first identification entry. According to the invention, it is possible that the first identification entry is constituted by personalized, for the owner of the given security document 100, marks 108', 108, of the second personalized marking 104', 104, in any arbitrary text and/or alphanumerical form and/or as distinctive marks, or as any combination thereof.

[0073] The first personalized marking 102 has a height

from 1 mm to 10 mm.

[0074] Fig. 3 shows section A showing a fragment of mark 103 of the first color (shown as white in the drawing) of the first personalized marking 102 of Fig. 2. Within mark 103 of the first personalized marking 102, numerals "6" and "7" are contained that constitute marks 108' of the second personalized marking 104' of a second color. According to the invention, an appropriately guided laser beam brightens corresponding regions of the substrate 110' of a second color, making the first personalized marking 102. In this embodiment, the printing ink is used that is subjected to brightening, whereas the foil located above it is not getting black. At least one unmarked fragment 109' of a second color is created within mark 103 of the first personalized marking 102, i.e., the darkened region shown in the drawing in black. The unmarked fragment 109' in the mark 108' of the first personalized marking 102 constitutes the second personalized marking 104'. Thus, the second personalized marking 104' adopts the color of the substrate 110', being of a second color, located beneath the first personalized marking 102, around which a brightened region of the first personalized marking 102 is located. In the present example, the unmarked substrate fragment 109' takes the color of the substrate 110' and is shown as mark 108' of the second personalized marking 104' in the form of numerals "6" and "7". According to this embodiment, the marks 108' constituting the second personalized marking 104' adopt the color of the substrate 110', the marks having here a second color, black, for example. On the other hand, the mark and/or marks of the first personalized marking 102 have another color, the first one, for example, that is brighter than the color of the substrate 110', i.e., white color as shown here for example.

[0075] According to the invention, the second personalized marking 104, 104' has dimensions from 0.05 mm to 0.5 mm, preferably from 0.05 mm to 0.3 mm. Preferably, the marks 108, 108' of the second personalized marking 104, 104' are micro marks.

[0076] Fig. 4 also shows the first embodiment of the present invention in another variant. The second personalized marking 104' is a series of marks 108' in the form of numerals "8894267", this series being a lack of marking within the surface of at least one mark 103 of the first personalized marking 102. The single mark 103 of the first personalized marking has a height from 1 mm to 10 mm, preferably from 1.5 mm to 2.5 mm, and may be registered with a thin or bold font, in italics, in any font style (or in one's own style). It may be entirely blackened - black or brighter - gray. Fig. 4 shows the same entry of the second personalized marking 104' but registered with a font thinner than in Fig. 2. Also, a single mark 108', of the second personalized marking may be registered with a thin or bold font, and its height is from 0.05 mm to 0.3 mm.

[0077] The substrate 110, 110a, 110', 110a' may be made from plastic material, for example, polycarbonate (PC) or polyester. The substrate may be composed of

transparent or white foil or a combination of transparent and white foils, but also only from transparent foils. The substrate in the meaning of this invention also may be paper laminated with PC or PCV foils. The foils may have different thicknesses ranging from 30 to 300 μm . Optionally, at least one printing ink layer may be applied onto the substrate. Then, according to the invention, the substrate 110, 110a, 110', 110a' takes the color of the printing ink layer. It may be printed with currently available printing techniques, for example, offset printing, relief printing, ink printing, screen printing, spraying, or pad printing. The thickness of the printing ink layer is, for example, from 5 to 20 μm , preferably from 5 to 10 μm . Any number of additional layers may be placed onto the substrate 110, 110a, 110', 110a' on both sides thereof.

[0078] Fig. 4a shows a cross-section through section A of the security document 100 of Fig. 2 or Fig. 4. The exemplary structure of the security document 100 shown in this drawing is a stack of layers comprising a substrate 110' made from a single white polycarbonate foil, a second white polycarbonate foil layer 110'a, and two layers of transparent polycarbonate foil 111, 113 on one side of the substrate 110', 110'a, and two transparent polycarbonate foil 112, 114 placed on the other side of the substrate 110', 110'a.

[0079] In the present embodiment, the first personalized marking 102 has a first color, whereas the substrate 110', 110'a has a second color. The color of at least one mark 103 of the first personalized marking 102 is brighter than the color of the substrate 110', 110'a of a second color. For example, as shown in Fig. 4a, the substrate 110' of a second color has a dark color, for example, black. On the contrary, the mark 103 of the first personalized marking 102 has a bright color, for example, white. The substrate 110' of a second color may have a dark color if printing will be produced using any dark printing ink (not shown in the drawing) between the white polycarbonate foil being the substrate 110' and the first polycarbonate foil 111. Optionally, between the substrate 110' and the first polycarbonate foil 111, one may locate a colored polycarbonate foil having a color darker than the color of the first personalized marking 102. Then, the color of the colored polycarbonate foil is the color of the substrate 110' having a second color. In Fig. 4a, the layers of the substrate are marked with oblique lines. For clarity, these layers of the document have been left not darkened. Due to appropriate parameters of the laser operation, at least one mark 103 of the first personalized marking 102 of the first color is brighter than the substrate 110' of a second color. Those fragments of the substrate that have not been subjected to the laser treatment create unmarked fragments 109' of the substrate 110' of a second color, for example, in black or of another dark color. These unmarked fragments 109' of the substrate 110' of a second color create marks 108'a, 108'b of the second personalized marking 104'. Thus, the marks 108'a, 108'b of the second personalized marking 104' take the color of the substrate 110' of a second color and are visible,

when enlarged, in the color of black or another dark color of the substrate 110'. In section A, the second personalized marking 104' is constituted by the first mark 108'a, corresponding to the numeral "6", and the second mark 108'b, corresponding to the numeral "7".

[0080] According to another alternative of the first embodiment of the present invention, it is possible that both the first personalized marking 102 and the second personalized marking 104, 104', which constitute the securing element 101, are printed onto the security document 100 using any printing technique.

[0081] According to yet another alternative of the first embodiment of the invention, instead of a numeral, any text personalization data may be written in mark 103 of the first personalized marking 102, for example, the name, last name, or initials of the owner of the security document 100. This is shown in Fig. 5. In this variant, the securing element 101 is constituted by at least one mark 103 of the first personalized marking 102 in the form of the letter "P" of Fig. 1, and the second personalized marking 104, written into this mark 103, in the form of any text data. In the drawing, it is the word of the name "KAMIL," which is the whole or a fragment of a separate first identification entry.

[0082] According to the invention, the second personalized marking 104, 104' may have an unmarked fragment 109, 109' in different colors. It results from the fact that the substrate 110, 110' may have different colors beneath the first personalized marking 102. For example, it is possible that in one region, in which the second personalized marking 104 is placed, the substrate may have a first color 110, whereas, in a second region, in which the second personalized marking 104' is placed, the substrate may have a second color 110'. Also, the substrate 110, 110' beneath the first personalized marking 102 may be divided into more than two coloristic regions, and, for example, the substrate below every mark 103, 103' of the first personalized marking 102 has a different color. Hence, it is possible that every mark or selected marks 108, 108' of the second personalized marking 104, 104', taking the color of the substrate, have another color and/or another shade of the same color.

[0083] Within the surface of at least one mark 103 of the first personalized marking 102, a second personalized marking 104 may be entirely contained in the form of text and/or alphanumerical data. In Fig. 6 is the word "KAMIL." Thus, the mark, marks, or a series of marks 108 of the second personalized marking 104, create any first identification entry. The whole first identification entry may be located only in one mark 103 of the first personalized marking 102. Simultaneously, in at least one mark 108 of the second personalized marking 104, a third personalized marking 106 may be entirely contained in its trace. So, for example, still smaller marks 116 are placed in the word "KAMIL," constituting the third personalized marking 106. Preferably, marks 116, constituting the third personalized marking 106, are micro marks, for example, of dimensions 0.05 mm - 0.2 mm. In this embodiment, it

is a series of numerals arranged vertically and horizontally, fulfilling the total area of the unmarked fragment 109 of mark 108 of the second personalized marking 104. The mark and/or marks 116 of the third personalized marking 106 may have a formed arrangement. They may be arranged in rows and/or columns, vertically or horizontally, as is shown in Fig. 6, or obliquely, as well as they may be placed in any arbitrary location. A mark or a series of marks 116 of the third personalized marking 106 may be printed onto the substrate located beneath the first personalized marking 102. It is possible that marks 116 of the third personalized marking 106 are identical, the same, and/or reoccur in the same order in all or selected marks 108 of the second personalized marking 104, or that different marks 116 of the third personalized marking are placed in the mark 108 of the second personalized marking 104, reoccurring in the same or in any arbitrary order.

[0084] According to the invention, the third personalized marking may constitute a second identification entry. The second identification entry may be randomly reoccurring numerals and/or a series of selected numerals and/or text marks. For example, it may be reoccurring document owner's identification number. All the information given in reference to the first identification entry also applies to the second identification entry.

[0085] Optionally, the third personalized marking 106 is constituted by an additional print on the substrate 110, 110' of another color than the color of the substrate 110, 110', for example, in shades of gray or such a color as the color of the first personalized marking 102. It is possible that a coloristically different mark 106 of the third personalized marking 116 is placed in every mark 108, 108' of the second personalized marking, creating, for example, an entry of distinctive marks +-<\.

[0086] Fig. 7 shows the securing element 101 placed on substrate 110 of the security document 100, as shown in Fig. 1 in the first embodiment in its second variant. According to the invention, an appropriately guided laser beam darkens appropriate regions of the substrate 110 and/or at least one of the top layers 111, 113 constituting the first personalized marking 102. At least one unmarked fragment 109 of a first color, i.e., a non-darkened region, is created within at least one mark 103' of the first personalized marking 102 of a second color. The unmarked fragment 109 of the first color in mark 108 of the first personalized marking 102 constitutes the second personalized marking 104. Thus, the second personalized marking 104 adopts the color of substrate 110, having the first color, and the substrate is located beneath the first personalized marking 102, around which the darkened region of the first personalized marking 102 is located. In the present example, the unmarked fragment of substrate 109 takes the color of substrate 110 and is, for example, of a first color, e.g., of a bright or white color. The marks 108 of the second personalized marking 104 are of the first color, for example, bright or white. Correspondingly, the mark/marks 103' of the first personalized

marking 102 and also the whole first personalized marking 102 have a second color, for example, black or another dark color.

[0087] The securing element 101 is composed of the first personalized marking 102 in the form of letters "POL" 103' and marks 108 of the second personalized marking 104 that are entirely written into the trace of the first personalized marking 102 and may have a form of text data and/or alphanumerical characters and/or distinctive marks. For example, into the first letter "P," constituting a mark 103' of the first personalized marking 102, marks 108aa are written that belong to the second personalized marking 104 and have the form of marks POL>>>. Into the second mark 103' in the form of the letter "O" of the first personalized marking 102, subsequent marks 108bb are written that belong to the second personalized marking 104 and have the form of marks KI0597. Into yet subsequent mark 103' - the letter "L" - a series of marks 108cc is written that belongs to the second personalized marking 104 and has the form of marks 56. According to the invention, the mark 108 and marks 108aa, 108bb, 108cc of the second personalized marking 104 may be written in any arbitrary arrangement. For example, they may be written into the trace of mark 103' of the first personalized marking 102 vertically, as the series of marks 108cc in the letter L, horizontally, as the series of marks 108aa in the letter P, or stepwise as the series of marks 108bb in the letter O. Obviously, the marks 108, 108aa, 108bb, 108cc of the second personalized marking 104 may also be arranged into the trace of mark 103' of the first personalized marking 102 along an arc or in a curvy way.

[0088] According to this embodiment, marks 108 of the second personalized marking that are entirely written into the trace of marks 103' of the first personalized marking 102 constitute the first identification entry. In the present embodiment, the first identification entry has the form of reoccurring personalizing data POL>>>KI059756 located on the substrate 110 of the security document 100 of Fig. 1, which is placed in three marks 103' of the first personalized marking 102. Also, it is possible that the whole first identification entry is entirely located in a single selected mark 103' of the first personalized marking 102, or it is distributed throughout several, or all, or selected marks 103' of the first personalized marking 102. Also, it is possible that the first identification entry is constituted by the same mark 108 of the second personalized marking 104, reoccurring in every mark 103' of the first personalized marking 102, or that different marks 108aa, 108bb, 108cc of the second personalized marking 104 are placed in every selected mark.

[0089] Marks 108, 108aa, 108bb, 108cc may be arranged in marks 103' of the first personalized marking 102, in the same or different order and/or in the same or different arrangement.

[0090] According to the present invention, as shown in Fig. 7, the securing element 101 may also have a third personalized marking 106 (not shown in the drawing),

for example, in selected marks 108, 108aa, 108bb, 108cc, and/or in only a single mark 108, and/or within all the marks 108aa, 108bb, 108cc of the second personalized marking 104. It is possible to place a print in the form of at least one mark 116 of the third personalized marking 106, onto the substrate 110, only in a part of the first personalized marking 102. In this case, the third personalized marking 106 would be visible only in the selected mark 108 and/or in selected marks 108 of the second personalized marking 104. Optionally, the third personalized marking 106 is located in a single mark 108 and/or within all the marks 108, 108aa, 108bb, 108cc of the second personalized marking 104. Also, in this case, the third personalized marking 106 may define the second identification entry.

[0091] Fig. 7a shows a structure of the security document 100 of Fig. 4a, wherein different colors have been used, since, in Fig. 7a, the substrate 110 is of a first color, i.e., for example, white or bright, whereas the marks 103' of the first personalized marking are of a second color, for example, black or dark. In this case, an appropriately guided laser beam blackens appropriate regions of the substrate 110 and/or at least one of the top layers 111, 113 (shown in Fig. 4a), thus making the first personalized marking 102 of a second dark or black color. Marks 108 of the second personalized marking 104 are of the first color, i.e., for example, white or bright.

[0092] Fig. 7a shows a cross-section, along the line C-C, of the mark 108 of the second personalized marking 104 in the form of the numeral "6" written entirely into a mark 103' of the first personalized marking 102 of the second color in the form of the letter "L" of Fig. 7. As can be seen, an unmarked fragment 109 (non-darkened region exposing the substrate 110 of a first color) is created inside the mark 103' L of the first personalized marking 102, which constitutes, simultaneously, the second personalized marking 104 (here the numeral "6"). The numeral "6" takes the color of the substrate 110, which in this case is a color of a polycarbonate foil.

[0093] According to a second embodiment of the invention, a securing element 201 is placed in a security document 100. The securing element 201 is constituted by a first personalized marking 202 and at least a second personalized marking 204 that is entirely written into the first personalized marking 202, thus making the first identification entry. According to the second embodiment of the invention, the first personalized marking 202 is convex, whereas the second personalized marking 204 is concave. Fig. 8 shows one mark 203 of the first personalized marking 202 made as pop-out b relative to substrate 110, wherein mark 203 of the first personalized marking 202 is shown schematically. Due to making the first personalized marking 202 as a pop-out, it is convex and palpable tactilely. The pop-out b of the single mark 203 of the first personalized marking 202 from the substrate 110 may have a height from 0.05 mm to 0.5 mm. It is important that it is palpable tactilely. The second personalized marking 204 is contained within the trace at

least one mark 203 of the first personalized marking 202. The second personalized marking 204 is produced by the lack of convexity that constitutes the first personalized marking 202. However, because of the fact that the first personalized marking 202 is convex, the second personalized marking 204 seems to be concave and is surrounded by a convex region of mark 203 of the first personalized marking 202.

[0094] In the second embodiment of the invention, similarly to the first embodiment, the second personalized marking 204 may be constituted by the unmarked fragment 209 of the substrate 110, 110', where the substrate is intact. The mark and/or marks 208 of the second personalized marking 204 adopts/adopt the color of the substrate 110, 110', or is/are darkened without the convexity.

[0095] Fig. 8a shows the structure of the security document 100 described with Fig. 4a, wherein, according to this embodiment, the structure of the security document 100 is only composed of a single transparent layer 112 placed on the substrate 110 on the opposite side relative to the securing element 101. The securing element 101, according to the second embodiment of the invention, is composed of at least one mark 203 of the first personalized marking 202 and at least one mark 208 of the second personalized marking 204 that is entirely written therein. Fig. 8a shows a cross-section of a section of the security document 100, particularly relating to the mark 203 of the first personalized marking 202 of Fig. 7, however, according to the second embodiment of the present invention. In this section, the mark 208 of the second personalized marking 204 shows the numeral "6" that is entirely written into the letter "L" - mark 203 of the first personalized marking 202. Here one can see that the mark 203 of the first personalized marking 202 is produced "as a pop-out," i.e., convexities are produced above the edge of the upper transparent layer 111 of the security document 100. Thin white lines within the mark 203 of the first personalized marking 202 illustrate the mark 208 of the second personalized marking 204 in the form of the numeral "6" of Fig. 7. After enlarging, the human eye can notice the color of the substrate 110 that is transmitted via the thin white lines. This embodiment is produced so that after the marking process with appropriately selected laser parameters, the substrate 110 and/or the upper layer 111 is subjected to gentle foaming, producing a convexity in the given spot. In a place not affected by the laser, e.g., within the mark 203 of the first personalized marking, the lines illustrating the mark 208 of the second personalized marking are obtained without the laser action, i.e., the micro-mark 208 is defined by the substrate. Because of a gaussian distribution of the laser power, the borders between the convexities and the substrate (unmarked) are gradient transitions. It means that the convexity is not ideally vertical but gently oblique or arcuate. Moreover, this effect may also be influenced by the physical properties of the substrate 110.

[0096] According to this embodiment, the mark or marks 208 of the second personalized marking 204,

which are entirely written into the trace of the mark or marks 203 of the first personalized marking 202, constitute the first separate identification entry. As shown in Fig. 8b, the first separate identification entry may have the form of the word "KAMIL," i.e., for example, the name of the owner of the security document 100. According to the first embodiment, it is also possible that the whole first separate identification entry is located entirely within a single selected mark 203 of the first personalized marking 202. Also, the first separate identification entry may be divided into two or more parts and, for example, its second part - the last name of the owner of document 100 - may be placed entirely in a subsequent mark 203 or, in groups of several syllables of the name, in subsequent marks and/or selected marks 203 of the first personalized marking 202. Optionally, the same marks 208 of the second personalized marking 204 may be placed in every mark 203 of the first personalized marking 202.

[0097] Also, the second embodiment of the invention may have a third personalized marking that is produced in the same way as described in the case of the first embodiment of the present invention. According to the present embodiment, the mark 116 and/or a series of marks 116 constituting the third personalized marking 106, preferably are micro marks of dimensions from 0.02 mm to 0.2 mm.

[0098] Fig. 8b shows a front view of the mark 203 of the first personalized marking 202, and Fig. 8c shows a cross-section along the line F-F of Fig. 8b through the first personalized marking 202 in the form of the letter "P" of Fig. 8 and the second personalized marking 204 in the form of the word "KAMIL" placed entirely within the first personalized marking. According to this variant, "cavities" are the traces of the letters "KAMIL," whereas "posts" are fragments of the mark 203 of the first personalized marking 204. Thus, in Fig. 8b, the first mark 208 of the second personalized marking 204 corresponds to the letter "K," the second mark 208a corresponds to the letter "A," the third mark 208b corresponds to the letter "M," the fourth mark 208c corresponds to the letter "I," and the fifth mark 208d corresponds to the letter "L."

[0099] According to this embodiment, at least one produced "cavity" constituting the second personalized marking 204, is produced within a pop-out of the mark 203 of the first personalized marking 202 such that the "cavity" at least one mark 208, 208a, 208b, 208c, 208d of the second personalized marking 204 has no contact with the substrate 110, 110'. Also, although a convex mark 203 of the first personalized marking 204 is located around the cavity of the mark 208, 208a, 208b, 208c, 208d of the second personalized marking 204, marks 208-208c of the second personalized marking 204 may be so small as almost non-palpable tactilely.

[0100] The sides of the mark 208 and/or marks 208, 208a, 208b, 208c, 208d of the second personalized marking 204 may have polygonal cross-sections with slightly semicircular sides, or semicircular cross-sections, optionally of irregular semicircular cross-sections.

Fig. 8d schematically shows a largely enlarged and simplified view of mark 208 of the second personalized marking 202, which is a cavity of a rectangular cross-section. Fig. 8e shows, in turn, a mark 208 of the second personalized marking 202, which is a cavity of a semicircular cross-section. The dimensions of a semicircular or polygonal cavity are proportional to the dimensions of the convexity.

[0101] Fig. 9 schematically shows a cross-section of a security document 100 composed of a stack of foil layers of various dimensions and colors. Preferably, the substrate 110, 110a is a layer made from polycarbonate, poly(vinyl chloride), polyester, or derivatives thereof in various combinations. The remaining layers of the security document 100 are nontransparent or transparent foils 111, 112, 114 from polycarbonate, poly(vinyl chloride), polyester, or derivatives thereof, and their number depends on the safety means and graphics to be used. According to the invention, depending on the version and size of the solution, one may also use engravable paper or paper laminated with plastic foil or similar materials, e.g., Teslin. The securing element 101, 201 is applied onto the substrate, preferably the substrate 110, 110a, in the form of at least one engravable foil, preferably white, and yet more preferably at least two white engravable foils. Also, it is possible to use transparent foils as the substrate 110, 110a. Also, an ink layer may be applied onto the foils, for example, an offset or inkjet ink, preferably of a thickness from 10 to 20 μm , preferably from 5 to 10 μm .

[0102] According to the invention, the security document 100 may be built, for example, as shown in Fig. 4a. Also, it may be composed of a stack of layers, starting from above: a transparent layer 111, two layers of white polycarbonate foil that constitute the substrate 110, 110a, and subsequent two transparent layers 112, 114 applied one on the top of the other. This structure of the document 100 is subjected to a merging process, for example, lamination.

[0103] After applying additional securing elements, which are not the subject matter of the present invention, the structure of the document 100, created in any arbitrary manner, is subjected to a merging process in a temperature from 130 to 210°C, preferably from 140 to 200°C. Also, the layers may be merged with the substrate 110, 110a by lamination, welding, gluing, fusing, etc. In all embodiments of the present invention, the engraving/marking process is carried out after the merging process on the laminate produced by merging the foil layers, having the form of the security document 100. This process is carried out on a ready-to-use security document 100 that, after being laminated, is a uniform inseparable whole.

[0104] According to the invention, the marking process is performed using a pulse marking laser, in which the spot is of small dimensions, and the beam is guided by means of a precise scanning head. The laser beam is guided according to predefined graphics with personali-

zation data. Additionally, it is necessary to concentrate individually laser-marked points, such as to obtain an appropriate resolution and, in consequence, the quality of the picture. In the sense of the present invention, the picture may be any graphics, in particular alphanumerical or text marks defining the first personalized marking, and text or any other marks, or vector graphics defining the second personalized marking.

[0105] Embodiments of the invention may be produced with infrared, RGB, or UV pulse lasers. The better the quality of the laser beam and the smaller the spot and more precise the scanning head, the smaller and clearer the proposed mark 108, 108', 208 of the second personalized marking 104, 104', 204 may be. Depending on the size of the first personalized marking 102, 202, the mark 108, 108', 208 of the second personalized marking 104, 104', 204 may be observed with the naked eye or under magnification. At least one mark 108, 108', 208 of the second personalized marking 104, 104', 204 may be placed in typically sized marks of personalization data of security documents 100, which correspond to the first personalized marking 102, 202, or in smaller marks of the first personalized marking 102, 202, for example, of a height of 1.25 mm. As mentioned above, it depends on the laser design and a proposed embodiment.

[0106] After the merging and marking process, the securing element 101, 201 is a built-in and infringement-resistant fragment of a layer within the structure of the security document 100.

[0107] Fig. 9 schematically shows a section of a cross-section of the security document 100 with the securing element 101 with the above-described structure of the security document 100, according to the first embodiment of the invention of Fig. 5 in a cross-section along the line F-F of Fig. 8b. The securing element 101 is placed on the substrate 110, 110a that is composed of two layers of laser-engravable white polycarbonate foils. The marking is produced within the transparent layer 111 placed on the substrate 110 and on the top the white layer placed directly below it. The drawing shows, for example, one mark 103' in a second color, i.e., in black, that corresponds to the letter "P" of the first personalized marking 102. In its trace entirely placed is a second personalized marking 104 in the form of marks: 108, 108a, 108b, 108c, 108d of the second personalized marking 104 of a first color - white. The series of marks 108, 108a, 108b, 108c, 108d of the second personalized marking 104 corresponds to the name "KAMIL." According to this drawing, the mark 108 of the second personalized marking 104 corresponds to the letter "K," the mark 108a corresponds to the letter "A," the mark 108b corresponds to the letter "M," the mark 108c corresponds to the letter "I," and the mark 108d corresponds to the letter "L." The securing element 101, in the form of a series of marks 108, 108a, 108b, 108c, 108d of the second personalized marking 104 written into the mark 103' of the first personalized marking 102, constitutes a built-in fragment of a layer in the structure of the security document.

[0108] Fig. 10 schematically shows a section of a cross-section of the security document 100 with the securing element 201 with the above-described structure of the security document 100, according to the second embodiment of the invention of Fig. 8 in a cross-section along the line F-F of Fig. 8. The securing element 201 is placed on the substrate 110, 110a that is composed of two layers of laser-engravable white polycarbonate foils. The marking is produced within the transparent layer 111 placed on the substrate 110. The drawing shows, for example, one mark 203' in a second color, i.e., in black, that corresponds to the letter "P" of the first personalized marking 202. The mark 203 of the first personalized marking 202 is made as a pop-out b, i.e., a convexity is produced above the line of the outer transparent layer 111 of the security document 100. In its trace entirely placed is a second personalized marking 204 in the form of marks: 208, 208a, 208b, 208c, 208d of the second personalized marking 204 that are shown as white in the drawing. The series of marks 208, 208a, 208b, 208c, 208d of the second personalized marking 204 corresponds to the name "KAMIL." According to this drawing, the mark 208 of the second personalized marking 204 corresponds to the letter "K," the mark 208a corresponds to the letter "A," the mark 208b corresponds to the letter "M," the mark 208c corresponds to the letter "I," and the mark 208d corresponds to the letter "L." The marks 208, 208a, 208b, 208c, 208d of the second personalized marking 204 adopted the color of the substrate 110, 110a. When observing the security document 100 under magnification, the human eye receives the color of the first personalized marking 202, and the word "KAMIL" written into at least one mark 203 of the first personalized marking 202, which constitutes the second personalized marking 204 that, simultaneously, is the first separate identification entry according to the invention. The securing element 201, in the form of a series of marks 208, 208a, 208b, 208c, 208d corresponding to the name "KAMIL" of the second personalized marking 204 written into the mark 203 of the first personalized marking 102, constitutes a built-in fragment of a layer in the structure of the security document. The securing element 201, made according to the second embodiment, is also palpable tactilely.

[0109] According to the method for producing the first embodiment of the invention, when using appropriate parameters of a UV laser in a range of wavelengths from 150 nm to 380 nm, visible light lasers in a range of wavelengths from 400 nm to 720 nm, infrared lasers of wavelengths from 0.8 to 3.3 μm, one obtains blackening/darkening of the substrate 110 or at least one of additional layers 111, 113. According to appropriately prepared graphics, the laser darkens marks 103' of the first personalized marking 102 on the substrate 110, leaving unmarked fragments 109 of the substrate 110 of a first color. In this embodiment, a second personalized marking 104, 104' is produced in the same run of the laser and with the same laser parameters.

[0110] Optionally, under laser irradiation in a range VIS, ink present on the substrate 110, 110' and constituting the first personalized marking 102 is getting discolored. The first personalized marking 102 changes its interference properties and transforms from the original color into another color. At least one mark 103 of the first personalized marking 102 is produced by means of laser, using laser radiation of a wavelength in a range from 400 nm to 700 nm, preferably from 400 nm to 700 nm. At least one mark 108, 108' of the second personalized marking 104 is coloristically distinguished from the mark 103, 103' of the first personalized marking 102 because it is not changing color and has the color of the substrate 110, 110'. The color of the first personalized marking 102 may be light gray, gray, or white.

[0111] Due to the delicate interaction of the laser radiation with the ink layer, no undesired stresses are produced that could affect the structure of the laminated security document 100. Using a marking laser, the radiation energy of which is not significantly absorbed by the transparent layer, for example, made from a polycarbonate foil (engrave-able or not), allows for the marking process of the first, 102, and second, 104, 104', personalized markings in different depths in the structure of the laminated security document 100. *Glebokosc nalozenia /of layer/s farbowej pod layermi transparentnymi, on the substrate 110', 110, may be from 50 μ m to 300 μ m. To this end, every time, individually for the given structure of a laminated security document 100, one selects the appropriate values of exposure time, frequency, and speed of advance.*

[0112] After the merging and marking process, the securing element 101, 201, 301 is a built-in and infringement-resistant fragment of a layer within the structure of the security document 100.

[0113] According to the method for producing the second embodiment of the invention, firstly, the relevant graphics is prepared in the form of personalization data. Then, the first personalized marking 202 and the second personalized marking 204 are produced simultaneously in a single laser pass, using the appropriate parameters of UV lasers in a wavelength range from 150 nm to 380 nm, visible light lasers in a wavelength range from 400 nm to 720 nm, or infrared lasers of wavelengths from 0.8 to 3.3 μ m. When using the appropriate laser parameters, one may obtain such a change of the material - of at least one upper transparent layer 111, 113 or the substrate 110, 110a, depending on the structure of the security document 100 - that raises the region directly affected by the laser, making the first personalized marking 202 tactilely palpable, i.e., convex. Depending on the side of the security document 100 that is processed, the upper layer may be any outer layer 111, 113, 114 of the structure of the document 100, up to the substrate 110, 110a, 110', 110a'. Optionally, it is possible that with the very big size of the first personalized marking 202, also the second personalized marking 204 will be tactilely palpable.

[0114] According to the invention, marks 108, 208 of

the second personalized marking 104, 204 are marked with a slower laser speed, increasing the resolution and concentrating pixels and having a smaller spacing of lines between subsequent rows of the marking laser passes.

[0115] The mark 116 of the third personalized marking 106 is produced in the first or second laser pass, both according to the first or the second embodiment of the present invention. Depending on the combination, the third personalized marking may be produced with the same parameters as the first one in a single laser pass, such that the third personalized marking 106 is contained within an unmarked trace of the second personalized marking 104, 204 not affected by the laser. For the third personalized marking 106, combinations are possible, e.g., the third marking may be obtained in the second laser pass with other laser parameters, giving another coloristic shade. For example, for the first embodiment, the third personalized marking 106 may be convex, and the first one is not.

References in the figures:

[0116]

25	100	security document
	101	securing element in a first embodiment
	102	first personalized marking in a first embodiment
	103	mark in the first personalized marking in a first embodiment and/or also of a first color (here: white)
30	103'	mark in the first personalized marking in a first embodiment and/or also of a second color (here: black)
35	104	a/the second personalized marking in a first embodiment and/or of a first color (here: white)
	104'	second personalized marking in a first embodiment and/or of a second color (here: black)
	106	third personalized marking in a first and second embodiments
40	108	mark in the second personalized marking in a first embodiment and/or of a first color (here: white)
45	108a	mark in the second personalized marking in a first embodiment and/or of a first color (here: white)
	108aa	series of marks of the second personalized marking
	108b	mark in the second personalized marking in a first embodiment and/or of a first color (here: white)
50	108bb	series of marks of the second personalized marking
	108c	mark in the second personalized marking in a first embodiment and/or of a first color (here: white)
55	108cc	series of marks of the second personalized marking

108d	mark in the second personalized marking in a first embodiment and/or of a first color (here: white)	
108'	mark in the second personalized marking in a first embodiment and/or of a second color (here: black)	5
108'a	mark in the second personalized marking in a first embodiment and/or of a second color (here: black)	
108'b	mark in the second personalized marking in a first embodiment and/or of a second color (here: black)	10
108'c	mark in the second personalized marking in a first embodiment and/or of a second color (here: black)	
108'd	mark in the second personalized marking in a first embodiment and/or of a second color (here: black)	15
109	unmarked fragment of the substrate of a first color (here: white)	20
109'	unmarked fragment of the substrate of a second color (here: black)	
110	layer of the substrate of a first color (here: white)	
110a	second layer of the substrate of a first color (here: white)	25
110'	layer of the substrate of a second color (here: black)	
110'	second layer of the substrate of a second color (here: black)	30
111	foil / additional layer	
112	foil / additional layer	
113	foil / additional layer	
114	foil / additional layer	
116	mark in the third personalized marking in the first and second embodiments	35
201	securing element in a second embodiment	
202	first personalized marking in a second embodiment	40
203	mark in the first personalized marking in a second embodiment	
204	second personalized marking in a second embodiment	
208	mark in the second personalized marking in a second embodiment	45
208a	mark in the second personalized marking in a second embodiment	
208b	mark in the second personalized marking in a second embodiment	50
208c	mark in the second personalized marking in a second embodiment	
208d	mark in the second personalized marking in a second embodiment	
209	unmarked fragment of the substrate	55

Claims

1. A securing element (101, 201) placed on a substrate (110, 110a, 110', 110'a) of a security document (100) comprising at least one mark (103, 103', 203) of a first personalized marking (102, 202) in the form of personalized alphanumeric data and/or text data and/or distinctive marking, and at least one mark (108-108d, 108'-108'd, 208-208d) of a second personalized marking (104, 104', 204), that is entirely contained within the surface of at least one mark (103, 103', 203) of the first personalized marking (102, 202) constituting the first identification entry.
2. The securing element according to claim 1, wherein the mark (108-108d, 108'-108'd, 208-208d) of the second personalized marking (104, 104', 204) is an unmarked fragment (109, 109', 209) of the substrate (110, 110a, 110', 110'a) within the mark (103, 103', 203) of the first personalized marking (102, 202).
3. The securing element according to claims 1 or 2, wherein the mark (203) of the first personalized marking (202) is made as pop-out (b) relative to the substrate (110, 110a, 110', 110'a).
4. The securing element according to any one of the preceding claims, wherein the mark (203) of the first personalized marking (202) is convex, whereas the mark (208-208d) of the second personalized marking (204) placed in the given mark (203) of the first personalized marking (202) is concave.
5. The securing element according to any one of the preceding claims, wherein the marks (108-108d, 108'-108'd, 208-208d) of the second personalized marking (104, 104', 204) create, into the trace of the mark (103, 103', 203) of the first personalized marking (102, 202), an arrangement and/or a vertical and/or horizontal entry and/or an entry of such a shape that is consistent with the shape of the mark (103, 103', 203) of the first personalized marking (102, 202) in which it is placed.
6. The securing element according to claim 1, wherein the same marks (108-108d, 108'-108'd, 208-208d) of the second personalized marking (104, 104', 204) reoccur into the trace of at least two marks (103, 103', 203) of the first personalized marking (102, 202) in the same or different order and/or in the same or different arrangement and/or entry, and/or different marks (108-108d, 108'-108'd, 208-208d) of the second personalized marking (104, 104', 204) are placed into the trace of at least two marks (103, 103', 203) of the first personalized marking (102, 202) in the same or different arrangement and/or entry.
7. The securing element according to claim 1, wherein

- a single arbitrary mark (108-108d, 108'-108'd, 208-208d, 308-308d) of the second personalized marking (104, 104' 204) is placed in the mark (103, 103' 203) of the first personalized marking (102, 202), that, together with the remaining single arbitrary marks (108-108d, 108'-108'd, 208-208d) of the second personalized marking (104, 104' 204) placed in other selected marks (103, 103', 203) of the first personalized marking (102, 202), constitutes the first identification entry.
8. The securing element according to claim 1, wherein the first identification entry is created by all marks (108-108d, 108'-108'd, 208-208d) of the second personalized marking (104, 104', 204) that are arranged in arbitrarily selected marks (103, 103', 203) amongst all the marks (103, 103', 203) of the first personalized marking (102, 202).
9. The securing element according to claim 1, wherein marks (108-108d, 108'-108'd, 208-208d) of the second personalized marking (104, 104', 204) that are collectively constituting the first identification entry are placed in a single arbitrarily selected mark (103, 103', 203) amongst all the marks (103, 103', 203) of the first personalized marking (102, 202).
10. The securing element according to claim 2, wherein an unmarked fragment (109, 109', 209) of the substrate (110, 110a, 110', 110'a) takes the color of the substrate (110, 110a, 110', 110'a).
11. The securing element according to claim 1, wherein at least one mark (116) of a third personalized marking (106) is entirely written into the surface of at least one mark (108-108d, 108'-108'd, 208-208d) of the second personalized marking (104, 104', 204), wherein the mark (116) of the third personalized marking (106) that is entirely written into the surface of at least one mark (108-108d, 108'-108'd, 208-208d) of the second personalized marking (104, 204) creates a second identification entry.
12. The security document (100) comprising the securing element (101, 201, 301) produced according to claims 1-11, comprising a substrate (110, 110a, 110', 110'a) and any number of additional layers (111, 112, 113, 114), making a consistent inseparable unity, wherein the securing element (101, 201) constitutes a built-in fragment of a layer in the structure of the security document (100), wherein the substrate (110, 110a, 110', 110'a) is constituted by at least one layer that can be laser-engraved.
13. A method for manufacturing a security document (100) with a securing element (101, 201) comprising the following steps:
- a) merging at least one layer of a substrate (110, 110a, 110', 110'a) with any number of additional layers (111, 112, 113, 114) into a consistent inseparable structure of the security document (100);
- b) placing at least one mark (103, 103', 203) of the first personalized marking (102, 202) in the form of personalized alphanumeric data and/or text data and/or distinctive marking, at least into the surface of the substrate (110, 110a, 110', 110'a) by means of a laser beam,
- c) marking, by means of a laser beam, at least one mark (108-108d, 108'-108'd, 208-208d) of the second personalized marking (104, 104', 204) entirely within the surface of at least one mark (103, 103', 203) of the first personalized marking (102, 202), the at least one mark (108-108d, 108'-108'd, 208-208d) of the second personalized marking (104, 104', 204) constituting the first identification entry.
14. The method for manufacturing the security document (100) according to claim 13, wherein, during the marking process, the substrate (110, 110a, 110', 110'a) and/or at least one additional layer (111, 112, 113) is subjected to irreversible changes of the optical properties making a mark (103, 103', 203) of the first personalized marking (102, 202), whereas a mark (108-108d, 108'-108'd, 208-208d) of the second personalized marking (104, 104', 204) is an unmarked fragment of the substrate (109, 109', 209).
15. The method for manufacturing the security document (100) according to claim 13 or claim. 14, wherein, during the marking process, the substrate (110, 110a, 110', 110'a) and/or at least one additional layer (111, 112, 113) is subjected to blackening or brightening, making a mark (103, 103' 203) of the first personalized marking (102, 202), whereas a mark (108-108d, 108'-108'd, 208-208d) of the second personalized marking (104, 104', 204) is an unmarked fragment of the substrate (109, 109', 209).
16. The method for manufacturing the security document (100) according to any one of the preceding claims, wherein, during the marking process, the substrate (110, 110a, 110', 110'a) and/or at least one additional layer (111, 112, 113) is subjected to foaming causing a convexity of the mark (203) of the first personalized marking (202), whereas the mark (208-208d) of the second personalized marking (204) is an unmarked fragment of the substrate (209).

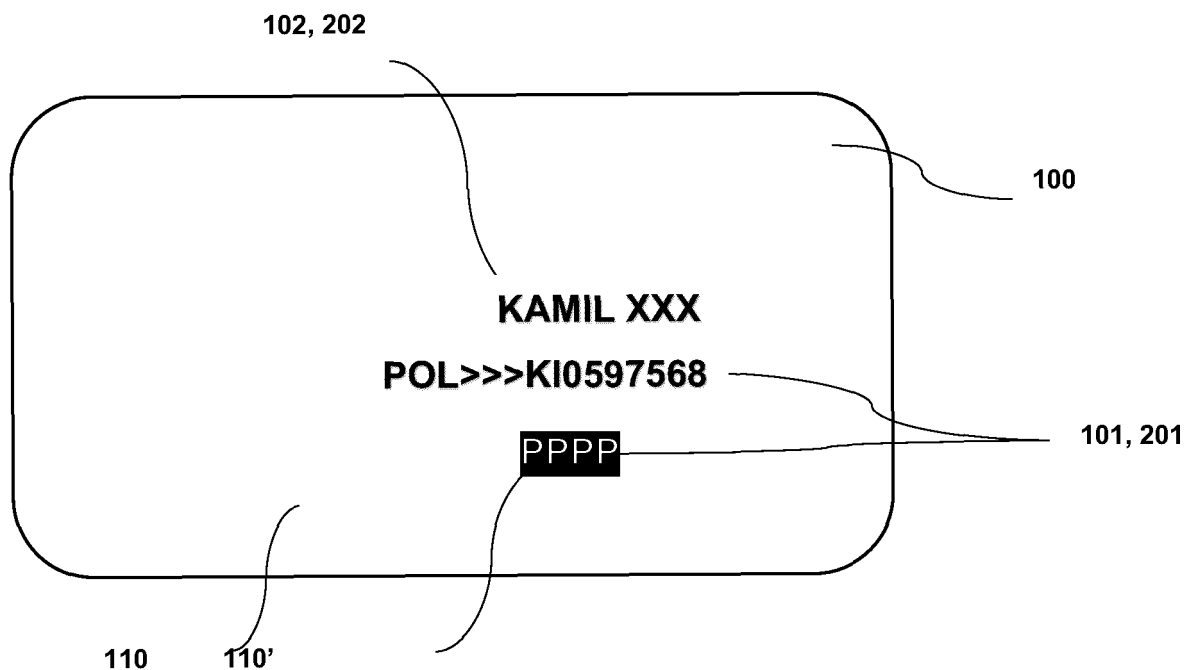


Fig. 1

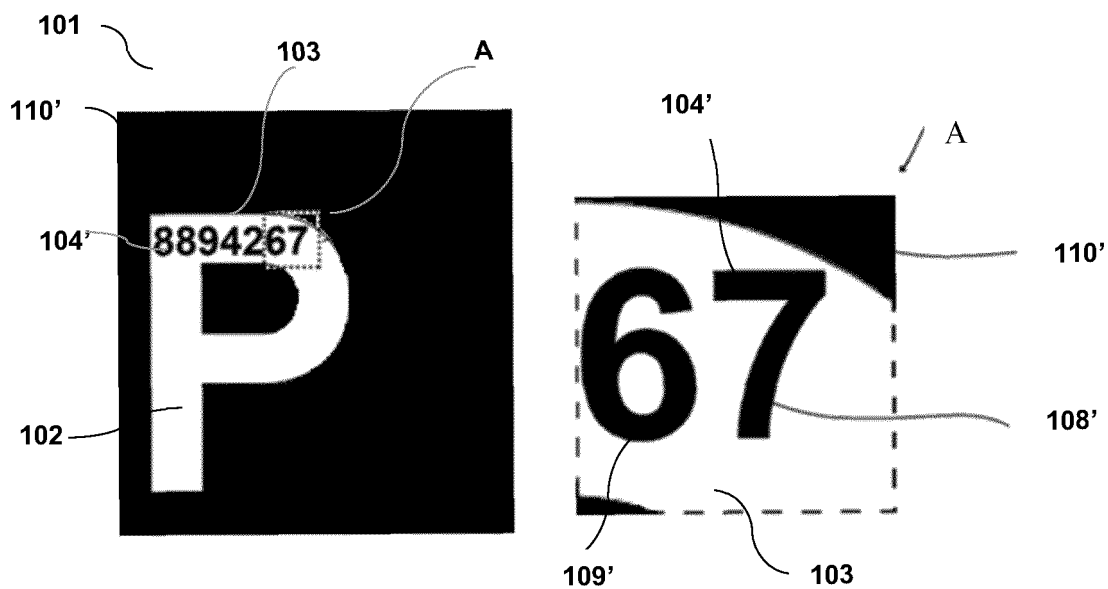


Fig. 2

Fig. 3

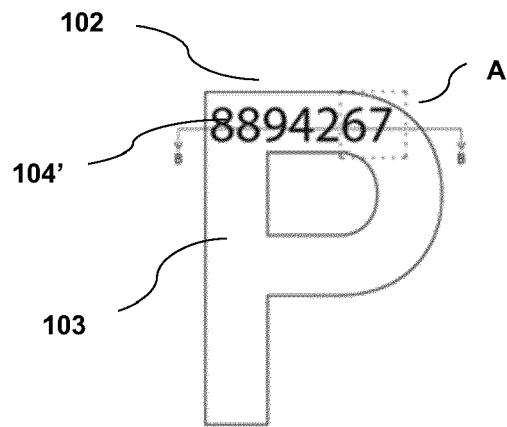


Fig. 4

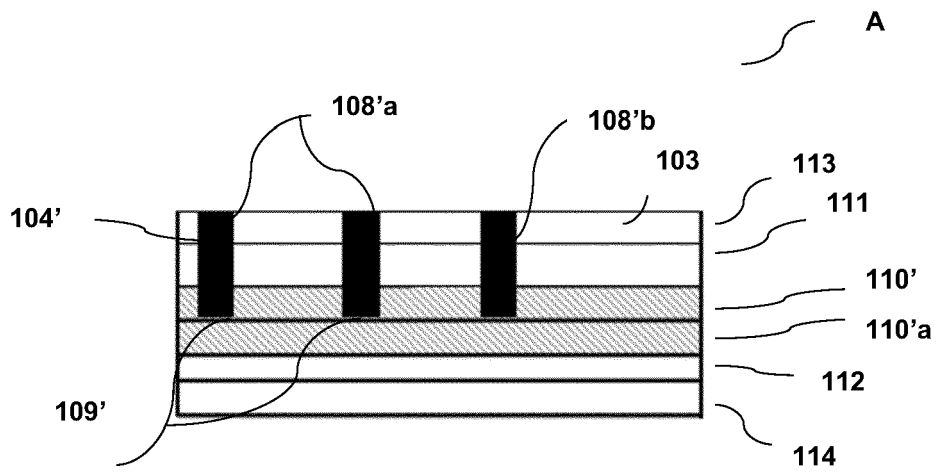


Fig. 4a

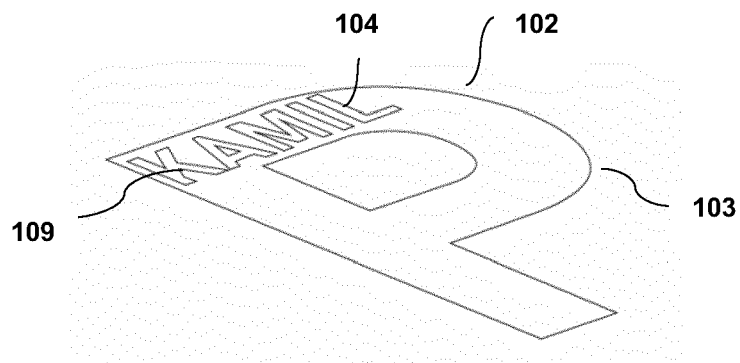


Fig. 5

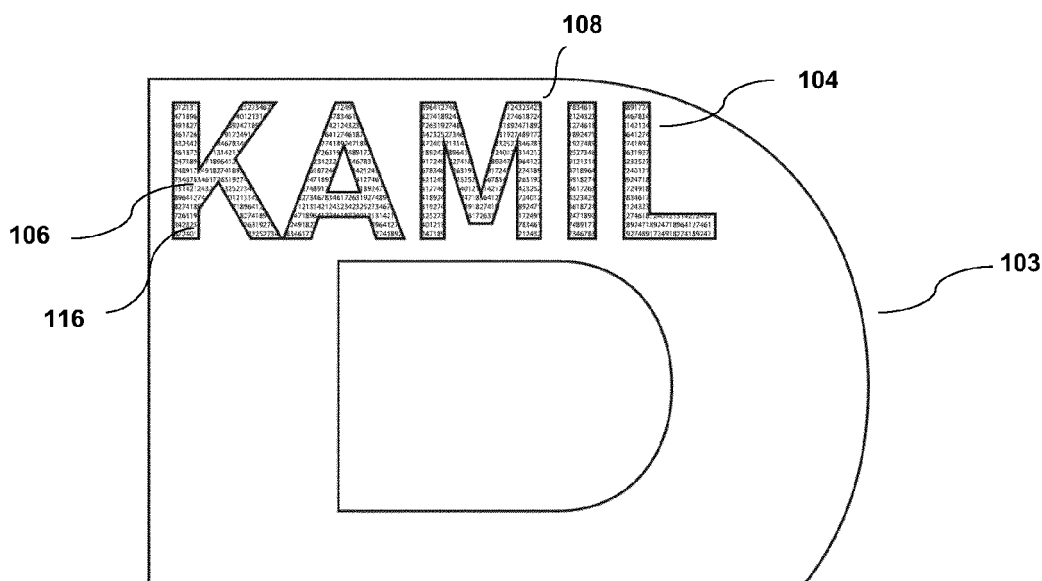


Fig. 6

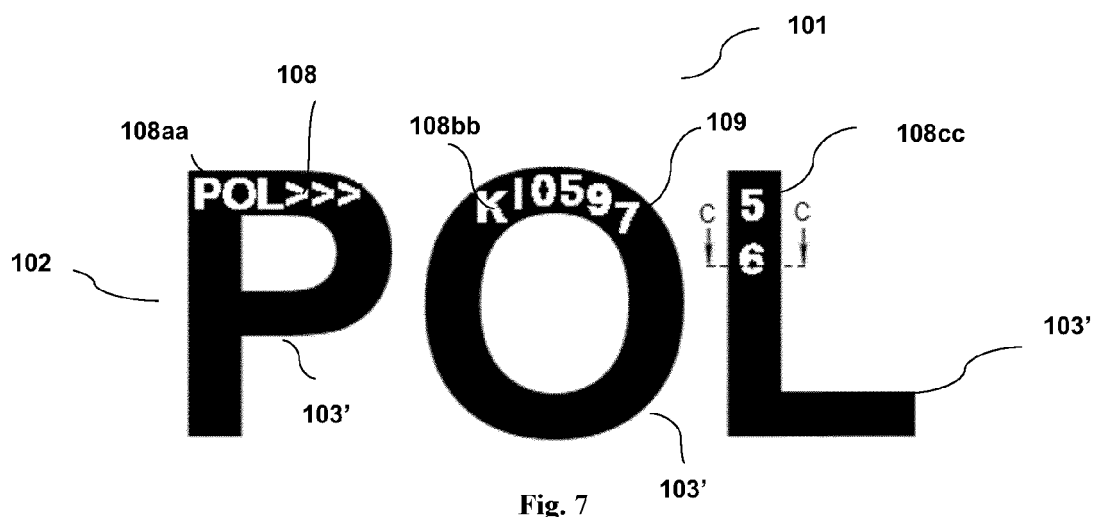


Fig. 7

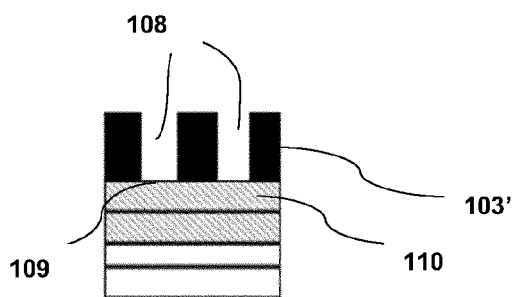


Fig. 7a

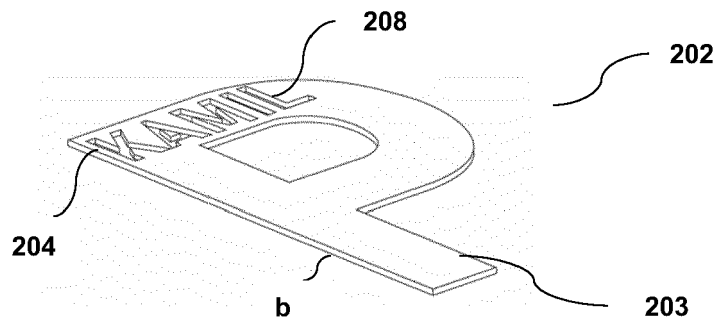


Fig. 8

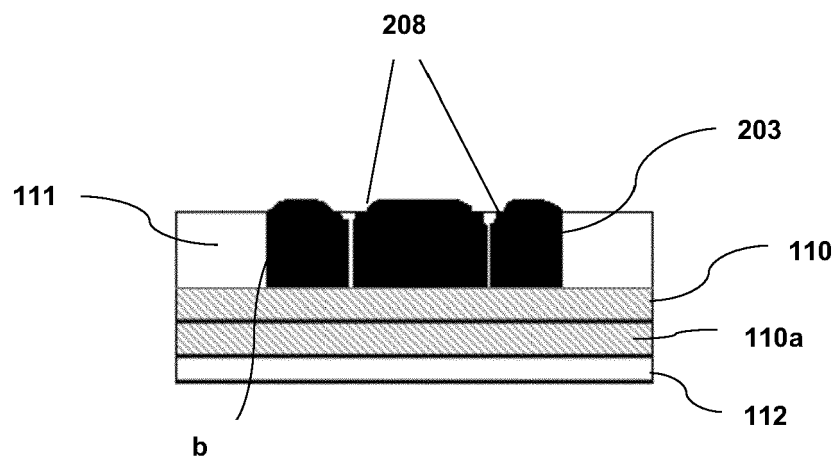


Fig. 8a

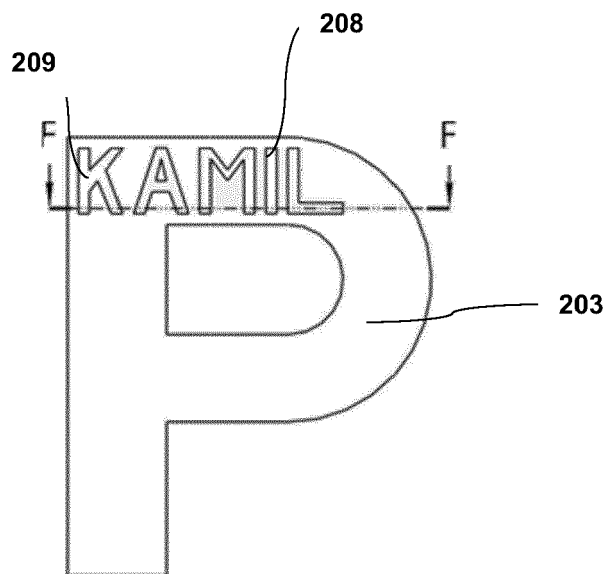


Fig. 8b

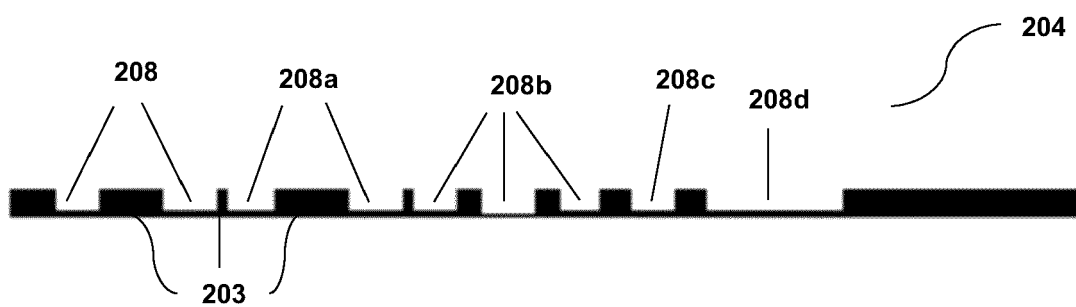


Fig. 8c



Fig. 8d



Fig. 8e

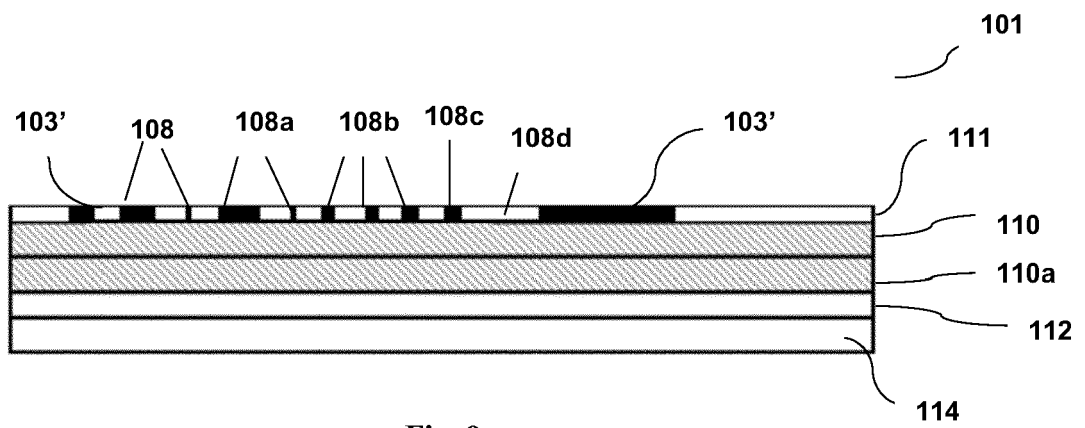


Fig. 9

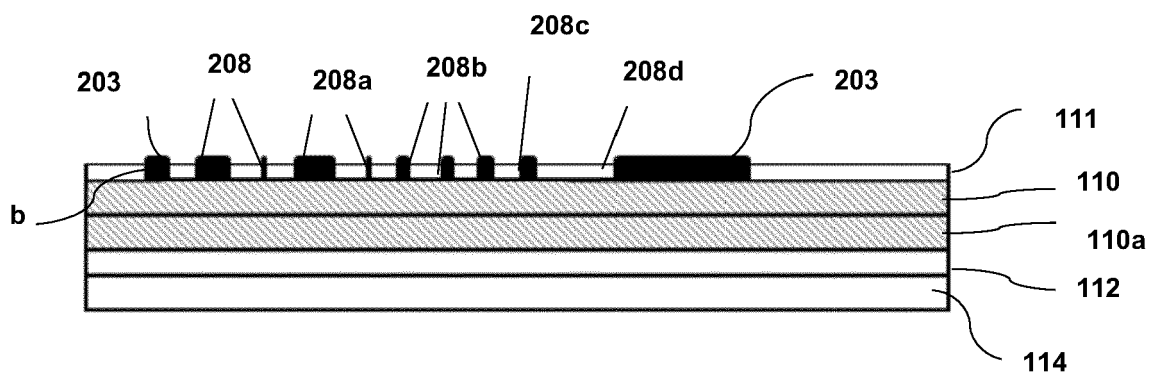


Fig. 10



EUROPEAN SEARCH REPORT

Application Number

EP 22 19 9294

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
X	DE 100 06 377 A1 (SCHREINER ETIKETTEN [DE]) 23 August 2001 (2001-08-23)	1, 2, 5, 6, 8-10, 12-14	INV. B42D25/41 B42D25/435
Y	* paragraph [0008] - paragraph [0065];	3	B42D25/455
A	claims 1-36; figures 1-8 *	4, 7, 11, 15, 16	B42D25/46 B42D25/23 B42D25/305
Y	US 2005/095408 A1 (LABREC BRIAN C [US] ET AL) 5 May 2005 (2005-05-05) * paragraph [0111] - paragraph [0113]; claims 1-19; figure 3 *	3	B42D13/00 B41M3/14
A	DE 10 2019 004518 A1 (MUEHLBAUER GMBH & CO KG [DE]) 31 December 2020 (2020-12-31) * paragraph [0005] - paragraph [0064]; claims 1-15; figures 1-10 *	1-16	
A	EP 2 641 746 A1 (OBERTHUR TECHNOLOGIES [FR]) 25 September 2013 (2013-09-25) * paragraph [0008] - paragraph [0078]; claims 1-18; figures 1-8 *	1-16	
			TECHNICAL FIELDS SEARCHED (IPC)
			B42D
The present search report has been drawn up for all claims			
Place of search		Date of completion of the search	Examiner
Munich		17 February 2023	Seiler, Reinhold
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	
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		& : member of the same patent family, corresponding document	

EPO FORM 1503 03:82 (P04C01)

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

EP 22 19 9294

5

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 The European Patent Office is in no way liable for these particulars which are merely given for the purpose of information.

17-02-2023

10

15

20

25

30

35

40

45

50

55

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
DE 10006377 A1	23-08-2001	AT 304202 T	15-09-2005
		AU 3917001 A	20-08-2001
		DE 10006377 A1	23-08-2001
		EP 1224650 A1	24-07-2002
		WO 0159745 A1	16-08-2001
US 2005095408 A1	05-05-2005	AT 435757 T	15-07-2009
		AU 2002353174 A1	15-07-2003
		AU 2009202090 A1	18-06-2009
		CA 2469938 A1	10-07-2003
		CA 2671998 A1	10-07-2003
		CN 1628318 A	15-06-2005
		EP 1550077 A2	06-07-2005
		HK 1079597 A1	07-04-2006
		US 2003234286 A1	25-12-2003
		US 2005003297 A1	06-01-2005
		US 2005095408 A1	05-05-2005
		WO 03055684 A2	10-07-2003
DE 102019004518 A1	31-12-2020	NONE	
EP 2641746 A1	25-09-2013	EP 2641746 A1	25-09-2013
		FR 2988327 A1	27-09-2013

REFERENCES CITED IN THE DESCRIPTION

This list of references cited by the applicant is for the reader's convenience only. It does not form part of the European patent document. Even though great care has been taken in compiling the references, errors or omissions cannot be excluded and the EPO disclaims all liability in this regard.

Patent documents cited in the description

- DE 2907004 B1 [0004]